# WELCOME






# Crosstown Parkway Noise Monitoring Study - Phase1 & 2

City of Port St. Lucie, FL

Special City Council Meeting | May 17, 2021, 9:30 AM

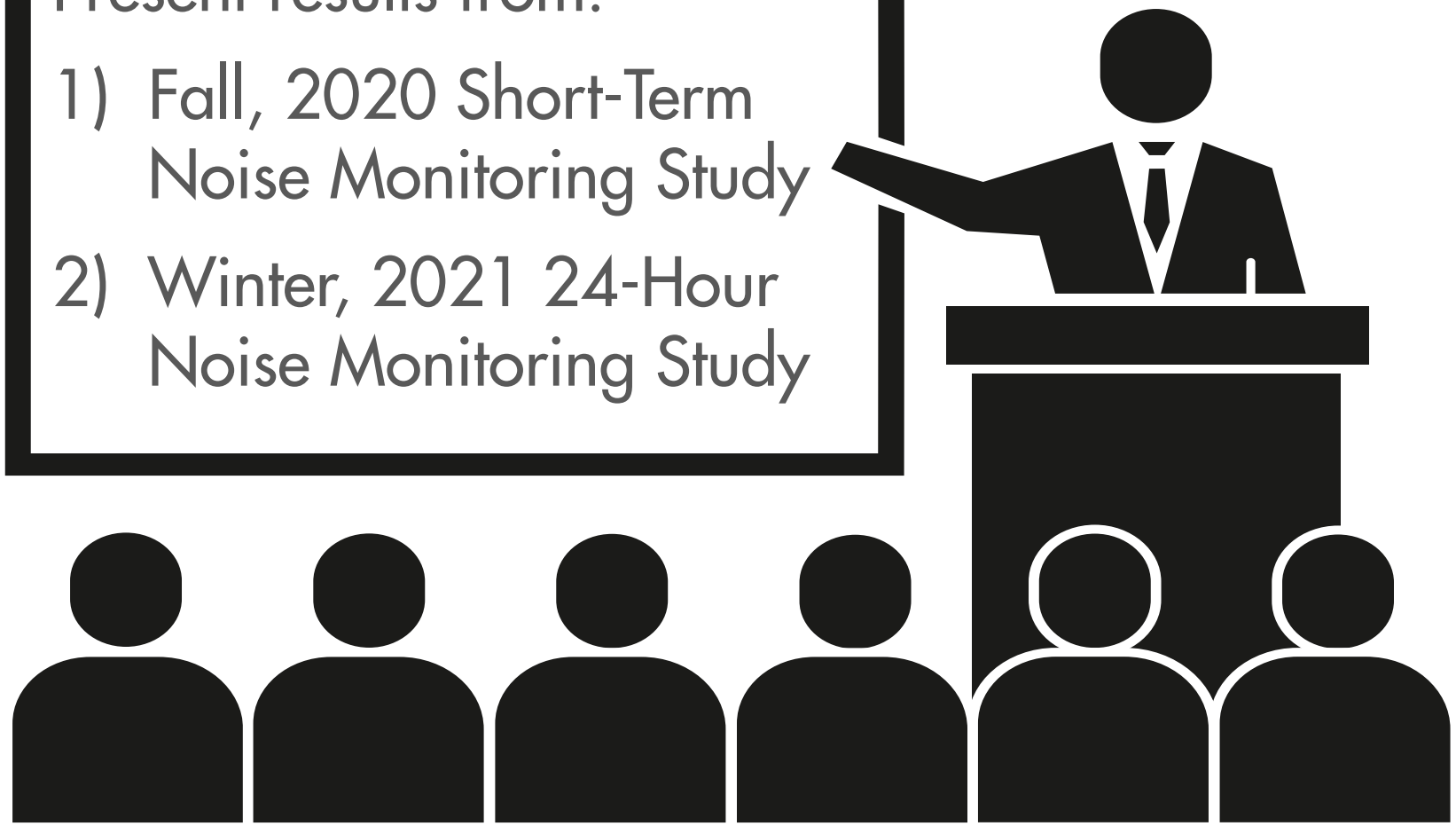
CITY of PORT ST. LUCIE FLORIDA INCORPORATED 1961

KCI TECHNOLOGIES

# PURPOSE OF THIS MEETING

Present results from:

1) Fall, 2020 Short-Term Noise Monitoring Study
2) Winter, 2021 24-Hour Noise Monitoring Study



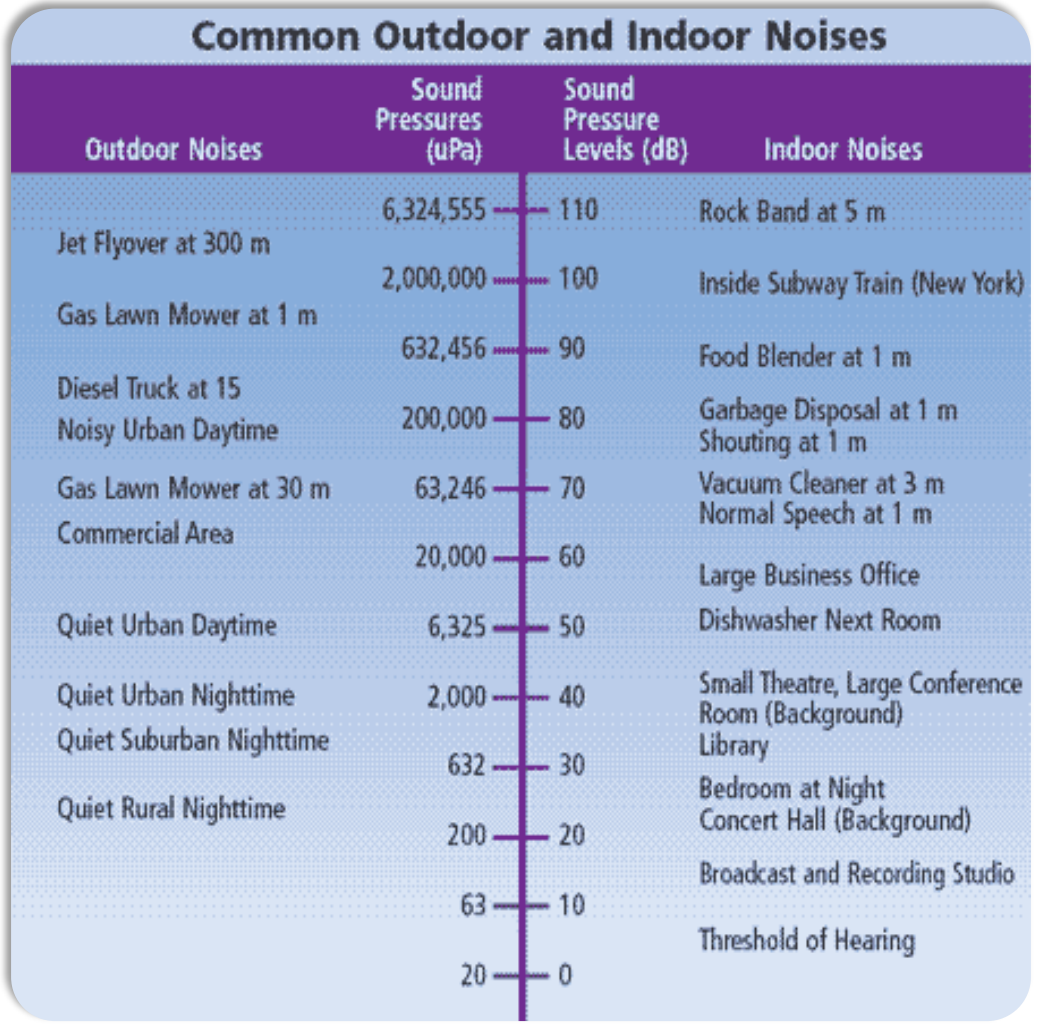
# WHAT IS NOISE?

- Noise is a sound that is **unpleasant, undesired or interferes** with one's hearing of something
- **"Unwanted"** - one's perception of sound is subjective; Some sounds will annoy one person and not another and can interfere with sleep and/or outdoor conversations

# NOISE FUNDAMENTALS

## How is Noise Measured?

- Decibel (db): The unit of measurement for noise
- A-weighted decibel (dBA): Scale that most closely matches how humans perceive sound
- $L_{eq}$: The level of a constant sound over a specific time period that has the same sound energy as the actual (unsteady) sound over the same period *(preferred measurement descriptor, used by FHWA)*
- $L_{peak}$: The highest instantaneous sound level, in decibels, with no time weighting




*Source: Federal Highway Administration*

# GENERAL NOISE FUNDAMENTALS

## Human Perception of Noise Level Changes:

- 3 dBA *(increase or decrease)*: Minimum change most humans typically perceive
- 5 dBA *(increase or decrease)*: Clearly noticeable change to almost everyone
- 10 dBA *(increase or decrease)*: Perceived as twice as loud *(or half as loud)*

## 3 dBA Traffic Noise Rules:

- Distance: Noise reduces by 3 dBA per-doubling of distance
- Speed: Increase speed by 10 mph, noise increases by 3 dBA
- Traffic Volumes: Each time the number of vehicles doubles, overall noise generally increases by 3 dBA

# TRAFFIC NOISE

## Traffic Noise Sources:


Cars


Medium Truck


Heavy Truck


Bus


Motorcycle

## Causes of Traffic Noise:

- The loudness of traffic noise is generally increased by proximity to the highway, heavier traffic volumes, higher speeds, and a large number of trucks
- Vehicle noise is a combination engine, exhaust, and tire noise
- Defective/Modified mufflers and other faulty/modified vehicle parts can also increase the loudness of traffic noise
- Any condition, such as a steep incline, that causes heavy laboring of motor vehicle engines can also increase traffic noise levels

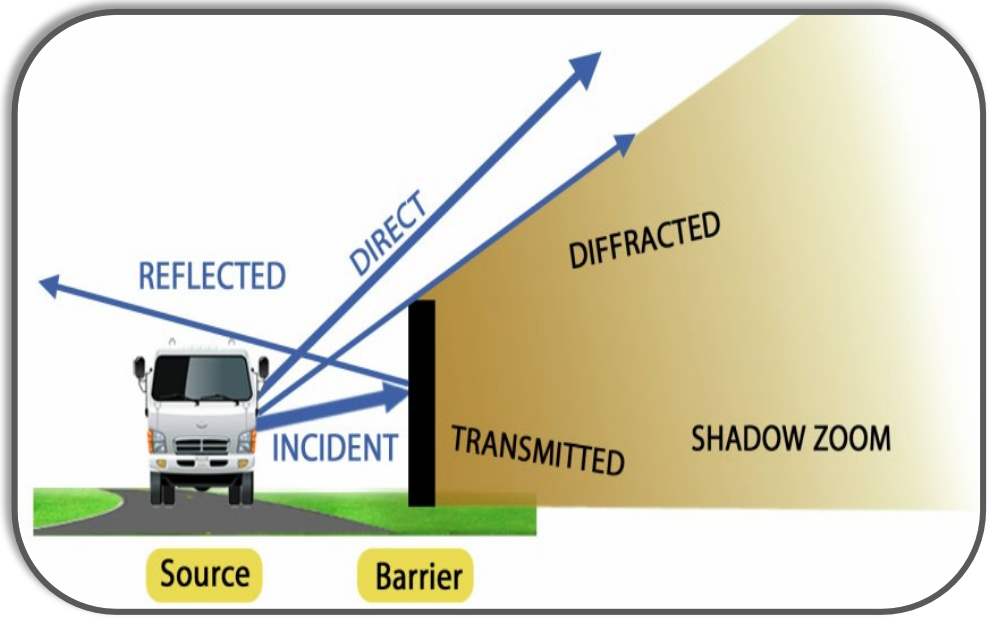
# SOUND BARRIERS

## Sound Barriers:

- A sound barrier is a solid obstruction built between the highway to **reduce the loudness** of highway traffic noise
- Sound barriers can be solid walls or can be constructed linear mounds of dirt called earth berms; Berms of the same height as solid walls can **provide slightly more noise reduction** due to their wider tops and their soft, grass-covered sloping sides

## How Sound Barriers Work?

- A sound barrier reduces noise from a highway by absorbing, reflecting, or forcing the sound to take a longer path over and around the barrier; Sound is energy that decreases in intensity as it travels away from its point of origin
- A sound barrier can generally achieve a 5 dBA noise level reduction, when it is tall enough to break the line-of-sight from the highway *(source)* to the resident *(receptor)*




*Source: National Highway Institute*

# FDOT TRAFFIC NOISE CRITERIA

## Approach Criteria:

- Approaching the criteria is defined as **within 1 decibel dBA** of the appropriate FHWA Noise Abatement Criteria (NAC)
- For Activity Category B *(includes the exterior impact for residences)* the approach NAC level for this activity category is **66 dBA**; No NAC criteria exist for the interior areas of residential land uses
- For Activity Category B a level of **65.9 dBA** would not be considered to have approached or exceeded the abatement criterion and abatement consideration would not be required

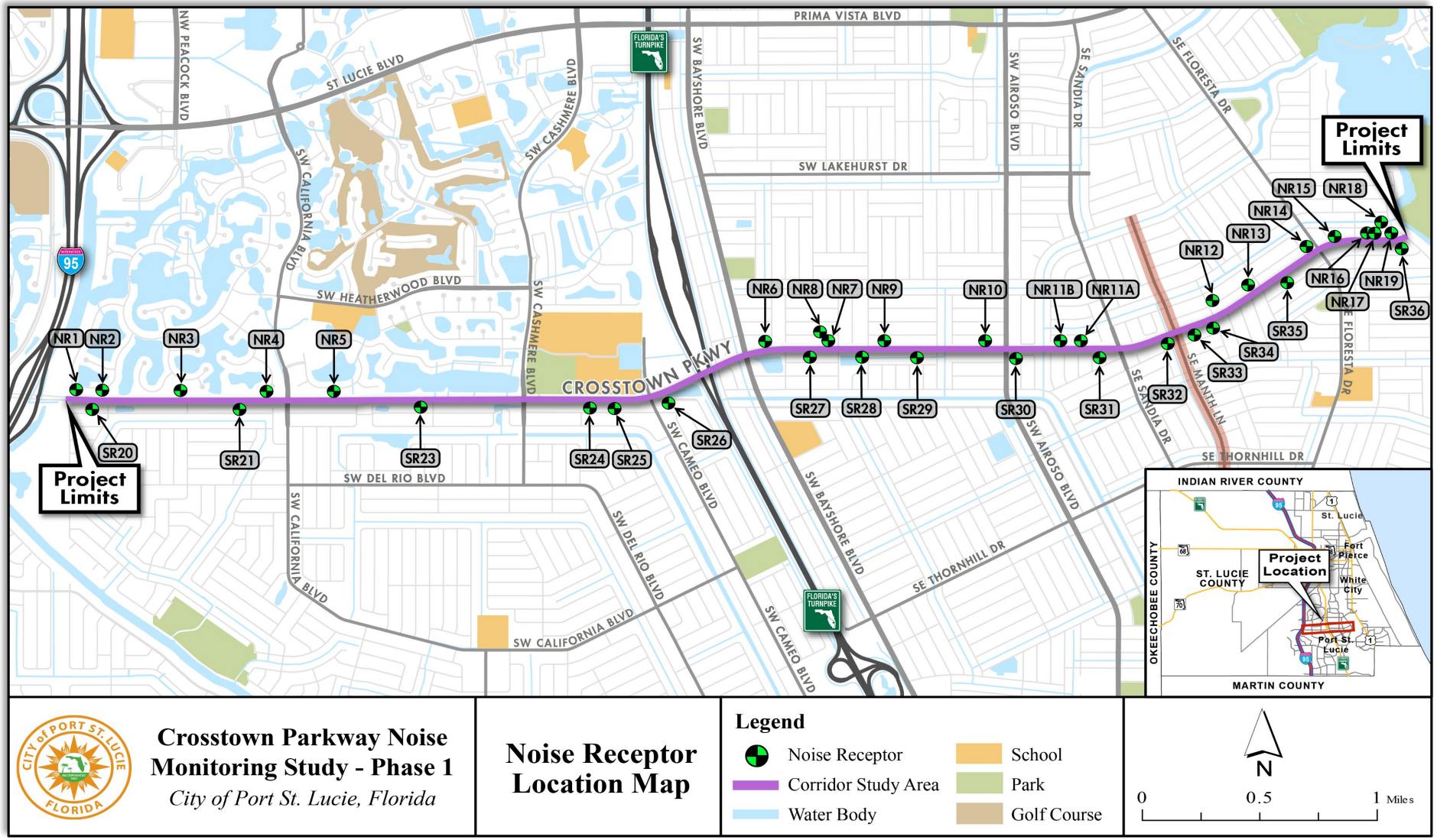
## Traffic Noise Impacts:

- Occurs when the modeled future highway traffic noise levels for the worst case noise condition *(usually Level of Service (LOS) "C")* approach or exceed the NAC
- Traffic noise impact also occurs when modeled future highway traffic noise levels substantially exceed the existing highway traffic noise level, even though the modeled levels may not exceed the NAC; A substantial increase occurs when the increase over existing conditions *(measured or predicted)* is **15 dBA or greater**

# PHASE 1-NOISE MONITORING STUDY

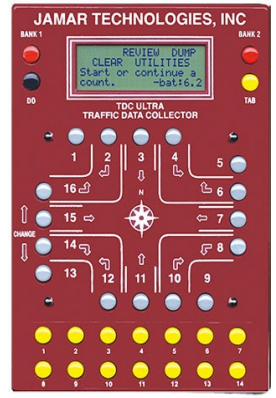
- The City met with concerned residents prior to and during implementation of the Crosstown Parkway "Landscape Enhancements" program
- Post-construction traffic noise monitoring was conducted along the Crosstown Parkway corridor, from east of I-95 to the west approach of the Crosstown Parkway Bridge over the North Fork of the St. Lucie River
- 36 noise receptors were monitored from east of I-95 to the west approach of the Crosstown Parkway Bridge over the North Fork of the St. Lucie River were monitored. These included:
  - 11 sites between I-95 and Florida Turnpike (SR91)
  - 12 sites between Bayshore Boulevard and Manth Lane
  - 11 sites between Manth Lane and the west approach of the Crosstown Parkway Bridge
  - 2 second level receptors along the corridor
- Noise monitoring took place on eight days *(Tuesdays through Thursdays)* between September 15, 2020 and October 14, 2020 and were conducted during the AM *(6:30 am & 9:30 am)* and PM *(3:30 pm and 6:30 pm)* peak traffic hours

# PHASE 1-NOISE MONITORING STUDY



# PHASE 1-SHORT-TERM MONITORING

- Contacted property owners for permission
- Two TSI Quest NoisePro DLX Type 2 Personal Noise Dosimeters, set at a height of five feet *(to approximate average human ear height)* were used to record 30-minute noise monitoring periods *(30-minutes is defined in FDOT Noise Abatement Criteria to represent the hourly dBA Leq)*
- A pre/post calibration of the noise dosimeter was performed at each receptor
- Traffic counts were recorded by vehicle type (car, medium truck, heavy truck, bus and motorcycle) using a TDC-ULTRA Traffic Data Collector; Traffic Counts were recorded at 1-minute intervals
- A portable electronic traffic speed counter supplemented by driving in traffic between sessions, was used to collect average vehicle speeds

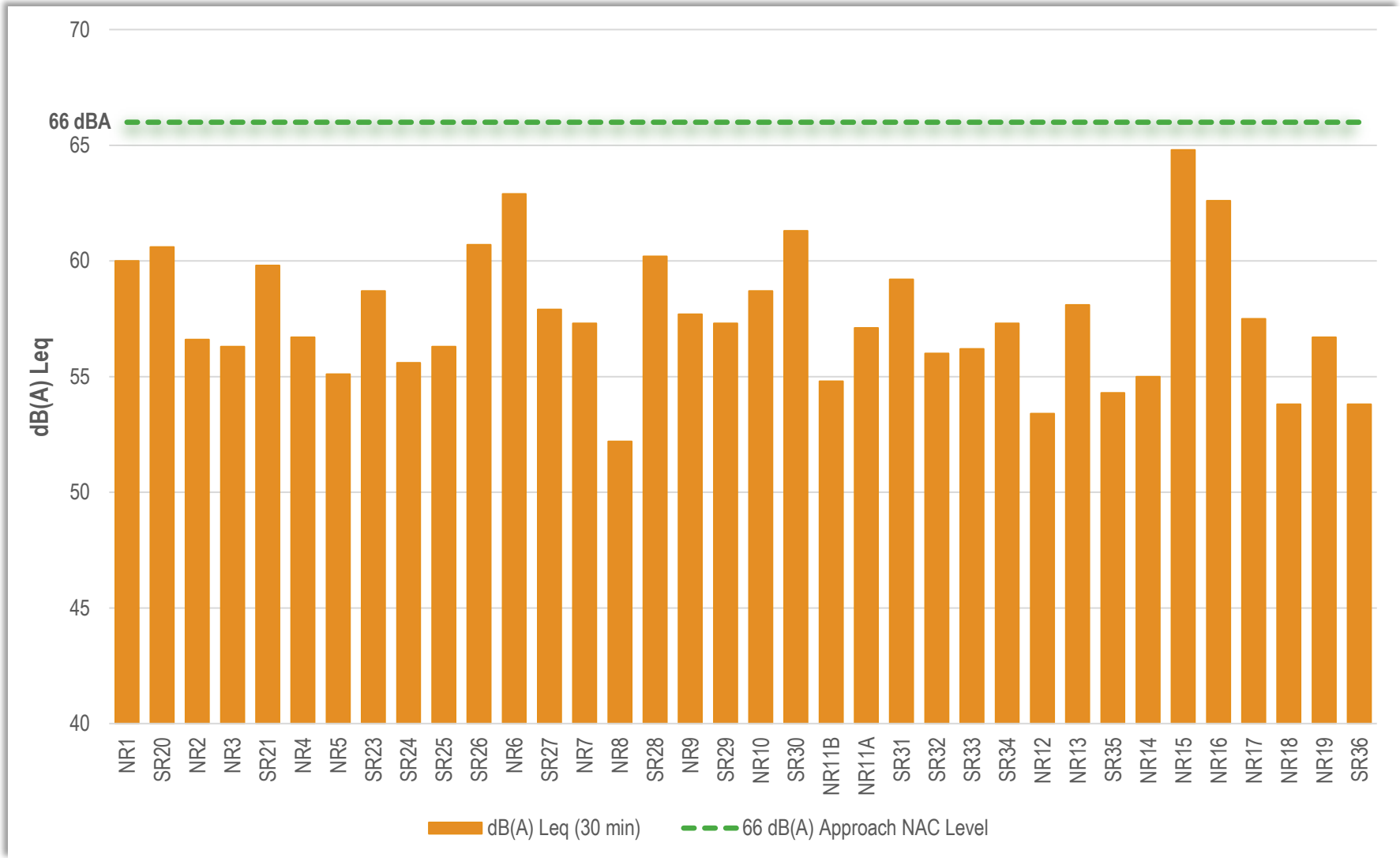




# PHASE 1–MONITORING RESULTS

## Noise Levels:

Majority of the receptors were measured between 55 dBA Leq and 59.9 dBA Leq. In summary;

- 6 receptor sites were measured between **50** dBA Leq and **54.9** dBA Leq
- 22 receptor sites were measured between **55** dBA Leq and **59.9** dBA Leq
- 8 receptor sites were measured between **60** dBA Leq and **64.9** dBA Leq



# PHASE 1–MONITORING RESULTS

## Noise Levels at Documented Noise Concern Sites:

- The City has received noise concerns from 11 residences located between Manth Lane and the Crosstown Parkway Bridge
- All monitored noise levels were less than predicted noise levels w/the exception of NR15 where monitored levels *(64.8 dBA Leq)* exceeded 2014 predicted levels *(62.2 dBA Leq)* by 2.6 decibels
- NR18 was not included in the 2014 study
- Noise measurements at the 11 receptor sites east of Manth Lane *(areas of documented noise concerns)* ranged between 53.8 dBA Leq at NR18 and 64.8 dBA Leq at NR15

| Receiver # | Monitored Date | Start Time | End Time | 2020 Receiver dB(A) Leq (30 Minutes) | 2014 Noise Study Receiver # | 2014 Noise Study Receiver dB(A) for Build (2037) with Design Changes | dBA Leq Difference |
|---|---|---|---|---|---|---|---|
| NR13 | 9/15/2020 | 3:00 PM | 3:34 PM | **58.1** | B67 | **62.0** | **(3.9)** |
| NR14 | 9/15/2020 | 5:00 PM | 5:30 PM | **55.0** | B79 | **62.8** | **(7.8)** |
| NR15 | 9/15/2020 | 4:40 PM | 5:14 PM | **64.8** | B82 | **62.2** | **2.6** |
| NR16 | 9/15/2020 | 4:40 PM | 5:14 PM | **62.6** | B90 | **65.6** | **(3.0)** |
| NR17 | 9/29/2020 | 5:10 PM | 5:44 PM | **57.5** | B91 | **64.6** | **(7.1)** |
| NR18 | 9/29/2020 | 5:10 PM | 5:44 PM | **53.8** | N/A | **N/A** | **N/A** |
| NR19 | 9/15/2020 | 6:00 PM | 6:34 PM | **56.7** | B93 | **65.4** | **(8.7)** |
| SR33 | 9/16/2020 | 4:10 PM | 4:44 PM | **56.2** | B5 | **60.3** | **(4.1)** |
| SR34 | 9/30/2020 | 6:15 PM | 6:49 PM | **57.3** | B10 | **61.4** | **(4.1)** |
| SR35 | 9/15/2020 | 3:00 PM | 3:34 PM | **54.3** | B21 | **60.2** | **(5.9)** |
| SR36 | 9/15/2020 | 6:00 PM | 6:34 PM | **53.8** | B43 | **61.6** | **(7.8)** |

# PHASE 1–MONITORING RESULTS

## Traffic Data:

- A consistent law enforcement presence was observed during most monitoring periods with average vehicle speeds ranging between **47 and 50 mph** with one monitoring session averaging **51 mph**
- A Level-of-Service *(LOS)* C traffic volume of 2,720 *(6% trucks)* was evaluated in the 2014 noise study to predict future noise levels; LOS C traffic generally represents the maximum amount of hourly traffic that can operate at free-flow conditions at or near the posted speed limit
- Traffic counts approached or exceeded 2,720 total vehicles at:
  - SR20 *(60.6 dBA Leq)* - 2,424 total vehicles *(3% trucks)*
  - SR28 *(60.2 dBA Leq)* - 2,568 total vehicles *(5% trucks)*
  - NR17 *(57.5 dBA Leq)* & NR18 *(53.8 dBA Leq)* - 2,648 total vehicles *(1% trucks)*
  - NR14 *(55.0 dBA Leq)* - 2,698 total vehicles *(3% trucks)*
  - NR1 *(60.0 dBA Leq)* - 2,852 total vehicles *(5% trucks)*

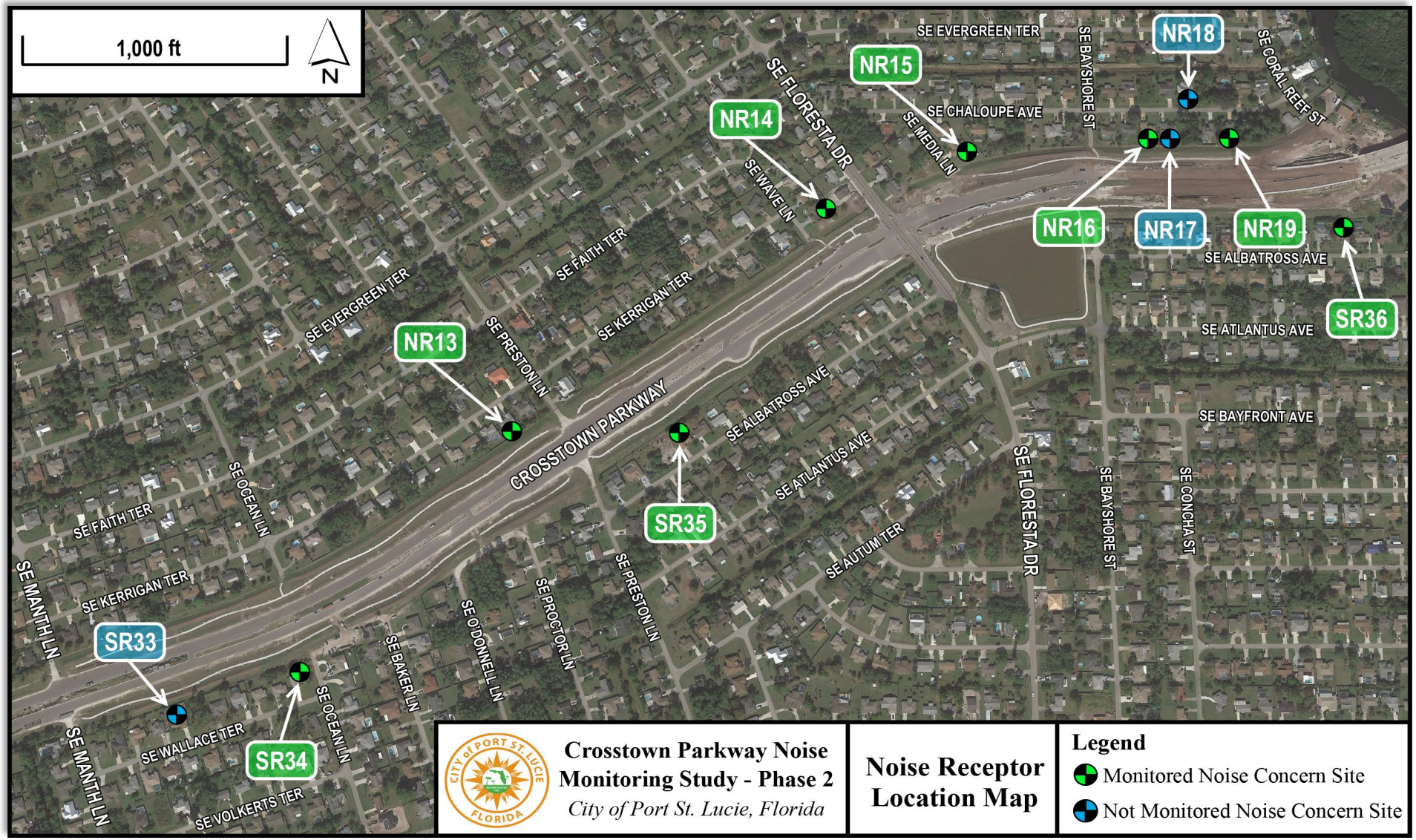
# PHASE 1-CONCERNS RESIDENTS SHARED

- Evening & early morning noise levels are the most problematic
- Consistent law enforcement presence during the day & early evening helps regulate noise during these hours
- Impossible to hold outdoor conversations with neighbors
- Traffic movements at the Crosstown Parkway & Floresta Drive intersection make it difficult to have conservations in their backyards; Floresta Dr. intersection is right-out only, causing many vehicles to U-turn down the road
- Fridays & Saturdays are horrendous. Friday evenings with motorcycles headed to beach area & again on Sundays perhaps with folks leaving beach area
- Noise is worst at night and cars drag racing along with speeding to get through the SW Airoso Blvd signal
- After 7:00 pm and into the early morning, noise events can be heard including
  - Cars revving engines & doing burnouts at stoplights
  - Loud motorcycles
  - Cars with modified muffler/exhaust systems
  - Multiple simultaneous speeding cars/potential racing
  - Loud music from cars/motorcycles

# PHASE 2-NOISE MONITORING STUDY

- The city conducted a 24-hour noise monitoring study to follow-up on the residents' concerns
- 24-hour monitoring was focused on addressing noise inquiries received from residents adjacent to Crosstown Parkway between Manth Lane to the west and the Crosstown Bridge to the east. 8 concurrent & continuous 24-hour noise monitoring sessions were conducted between 6:00 pm Thursday, February 18 *(monitoring at NR16 began at 6:00 pm Friday, February 19 due to a wire malfunction)* and 7:00 am Monday, February 22. The following are descriptions of the receptors/residences monitored:
  - NR14 – This residence is located in a good location to capture noise at the Crosstown Parkway/Floresta Drive Superstreet
  - NR15 – NR15 recorded the loudest short-term noise level *(64.8 dBA Leq)* during the Phase I Study
  - NR16 – The residence's lanai is closely situated to the sound berm and yielded a 62.6 dBA Leq during the Phase I Study
  - NR19 – Captured noise levels from westbound Crosstown Parkway traffic travelling downgrade from the Crosstown Parkway Bridge and braking at the eastbound to westbound Floresta Drive signalized U-turn
  - SR34 *(representative of NR 33)* – KCI staff experienced a motorcycle interrupting our conversation as we concluded the Phase I monitoring here
  - NR13 & SR35 – Several residences mentioned drag racing during the evening and early morning hours; These two locations are on opposite sides of Crosstown Parkway
  - Receptor SR36 – This receptor captured vehicles accelerating upgrade to cross the bridge

# PHASE 2-NOISE MONITORING STUDY

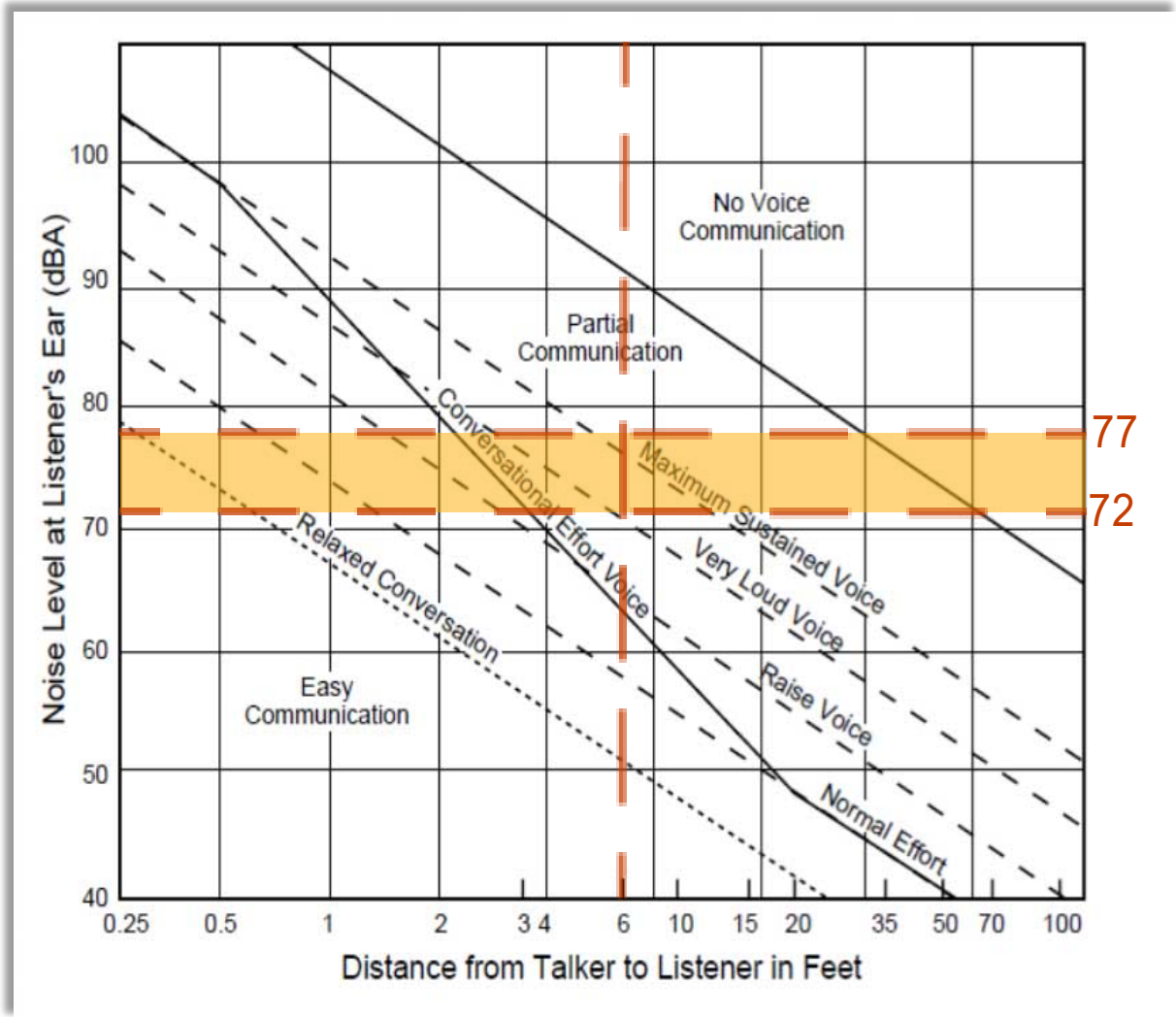


# PHASE 2-24-HOUR MONITORING

- Initiated contact on Tuesday, February 2 and Wednesday, February 3 with residents selected for the 24-hour study
- 8 Larson Davis SoundAdvisor Portable Noise Monitoring Systems Model NMS044 *(powered by SoundAdvisor Model 831C Class 1 sound level meter)* were used to record 1-hour noise monitoring periods
- This type of noise monitoring system allowed for 24/7 remote monitoring access, recording of sound events with a 65.5 dBA Leq or greater, and solar charging

# RESIDENTIAL SPEECH INTERFERENCE

- Speech Inference Level (or PSIL): Evaluates the impact of background noise on communication
- The degree to which noise disturbs speech depends on many factors, including:
  - voice level
  - background noise level
  - distance between speakers
  - room acoustics
- A primary effect of noise is its tendency to drown out or "mask" speech, making it difficult to carry on uninterrupted conversations




*Source: EPA*

# NOISE DISTURBANCE EVENTS

## Loud Music

- Rec. NR15 at 9:37 pm Thursday, February 18 *(85.1 $L_{peak}$)*

## Possible Racing

- Rec. NR14 at 10:39 pm Thursday, February 18 *(87.5 $L_{peak}$)*

## Motorcycle

- Rec. NR15 at 9:13 pm Friday, February 19 *(87.2 $L_{peak}$)*

## Modified Muffler/Exhaust System

- Rec. SR34 at 6:56 pm Saturday, February 18 *(108.5 $L_{peak}$)*

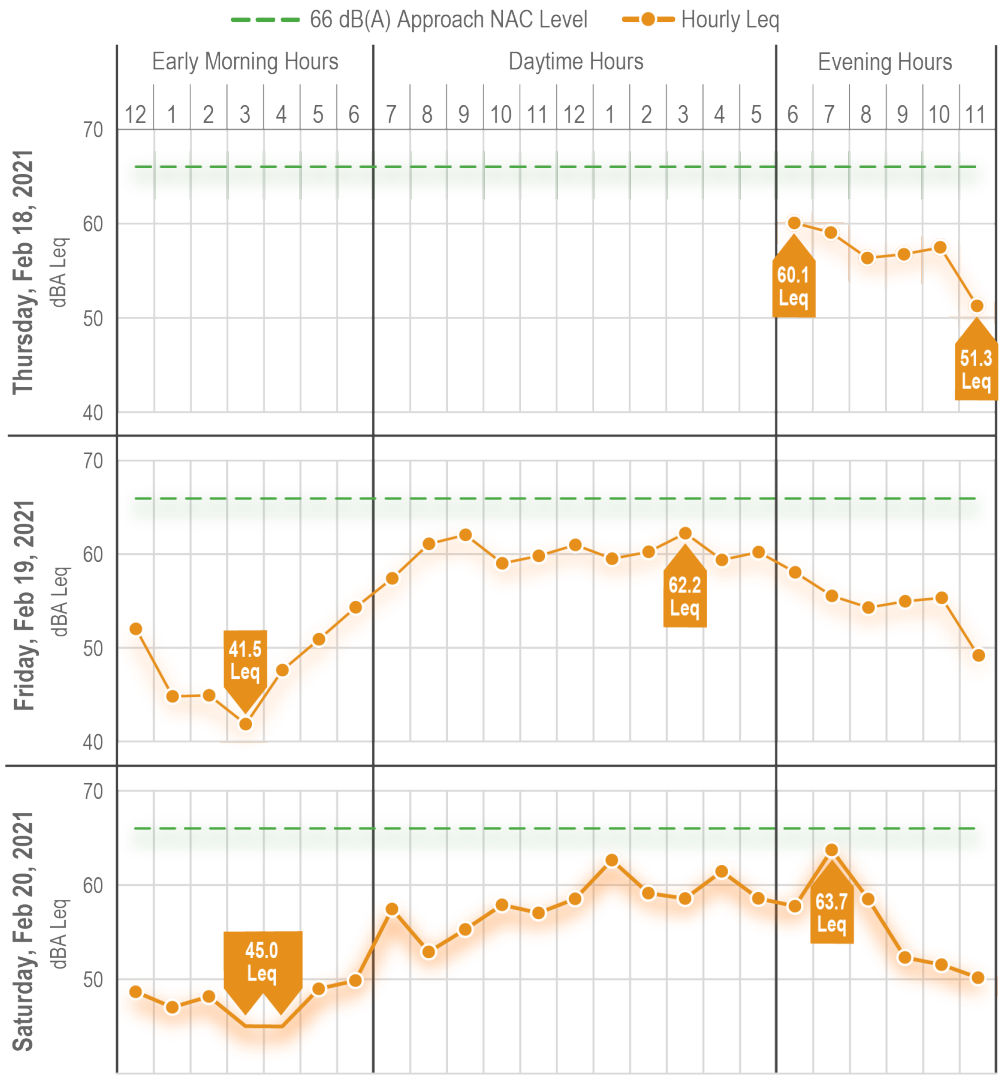
## Burnout

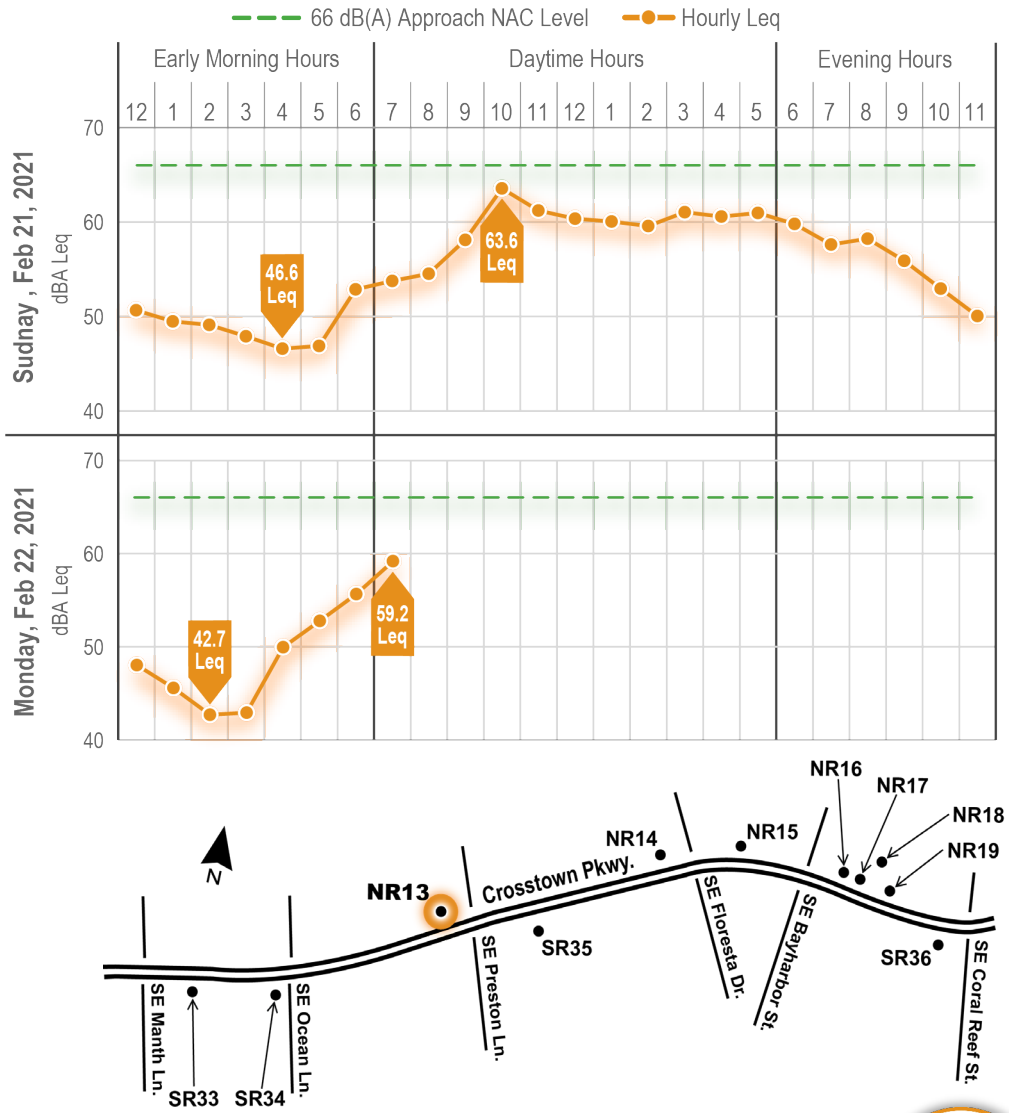
- Rec. NR16 at 12:22 am Sunday, February 21 *(86.9 $L_{peak}$)*

## Heavy Truck

- Rec. SR35 at 5:58 am Monday, February 22 *(79.8 $L_{peak}$)*

# PHASE 2–NR13 MONITORING RESULTS



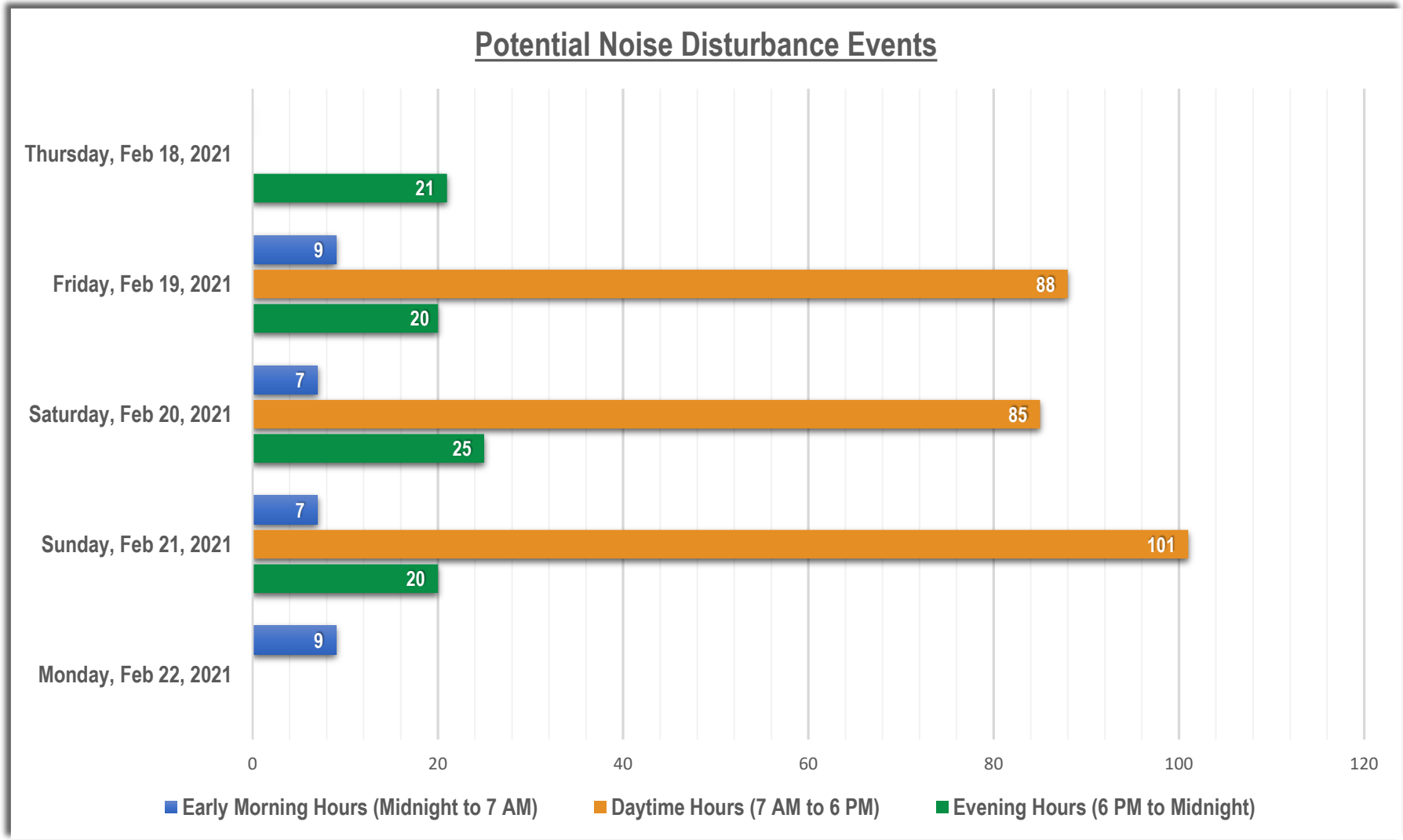



# PHASE 2–NR13 MONITORING RESULTS

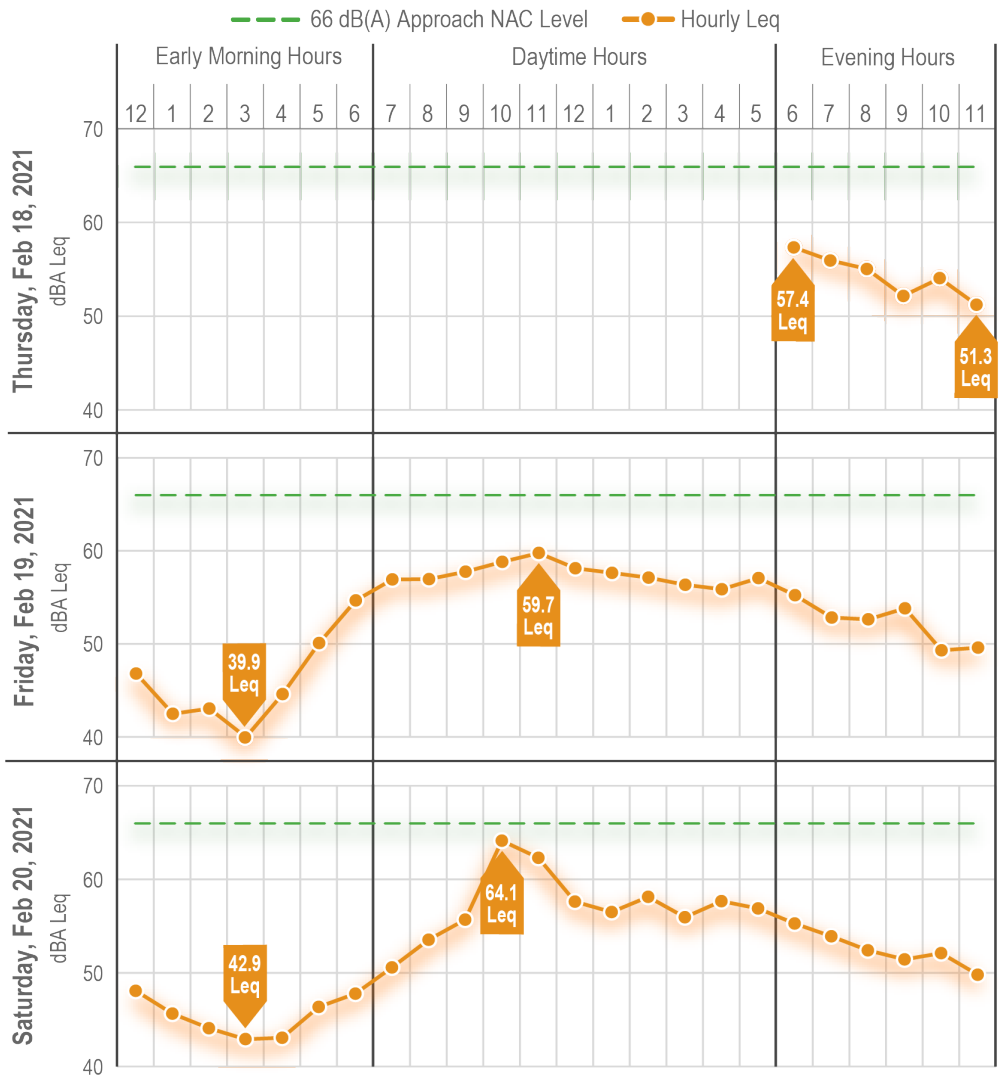
Total Potential noise Disturbance Events = 392

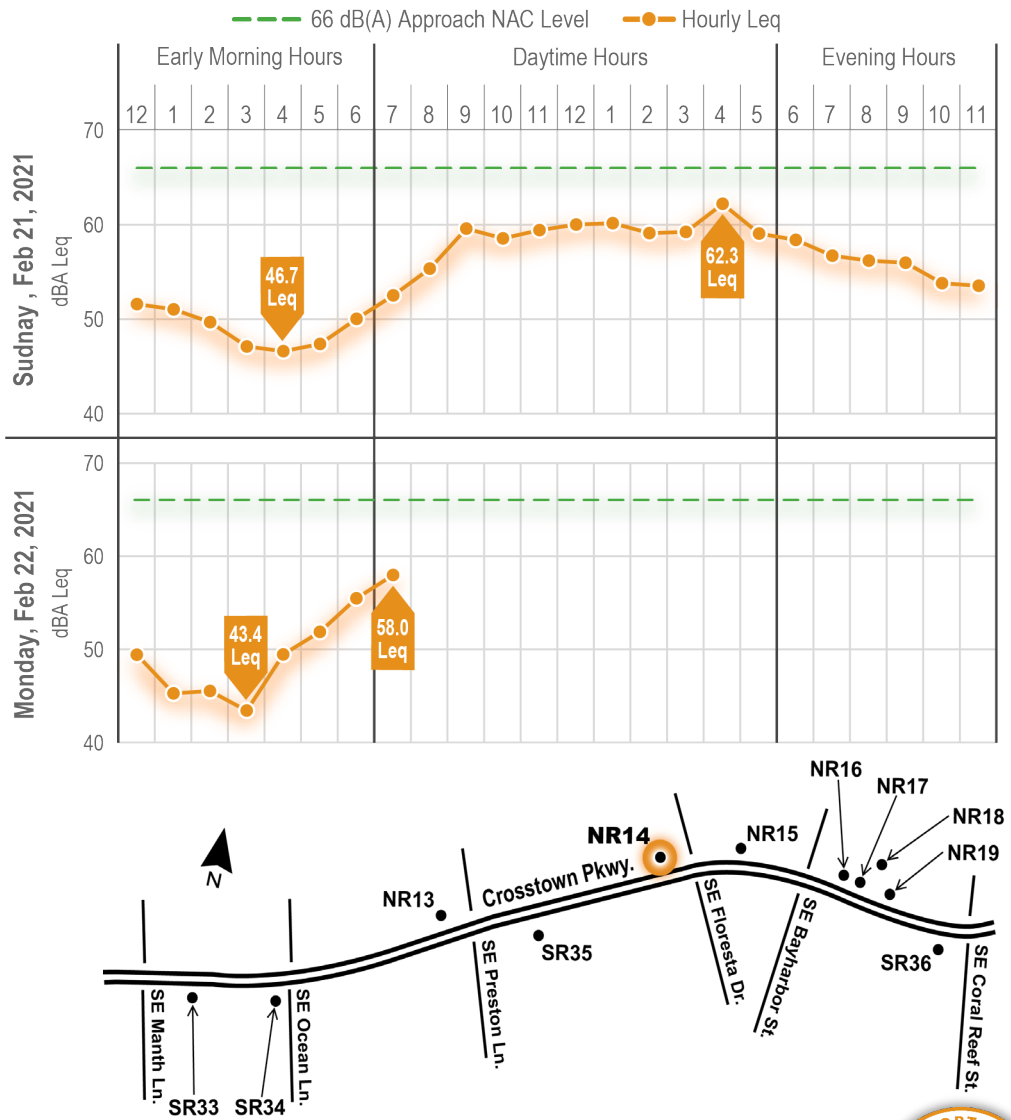
- Early Morning Hours = 32
- Daytime Hours = 274
- Evening Hours = 86
- Cars with modified muffler/exhaust systems = 231

**65.5 dBA Leq was the threshold used to capture noise disturbance events (events were marked by cars with modified muffler/exhaust systems, car tires, motorcycle, heavy truck, general traffic, music).*



# PHASE 2–NR14 MONITORING RESULTS



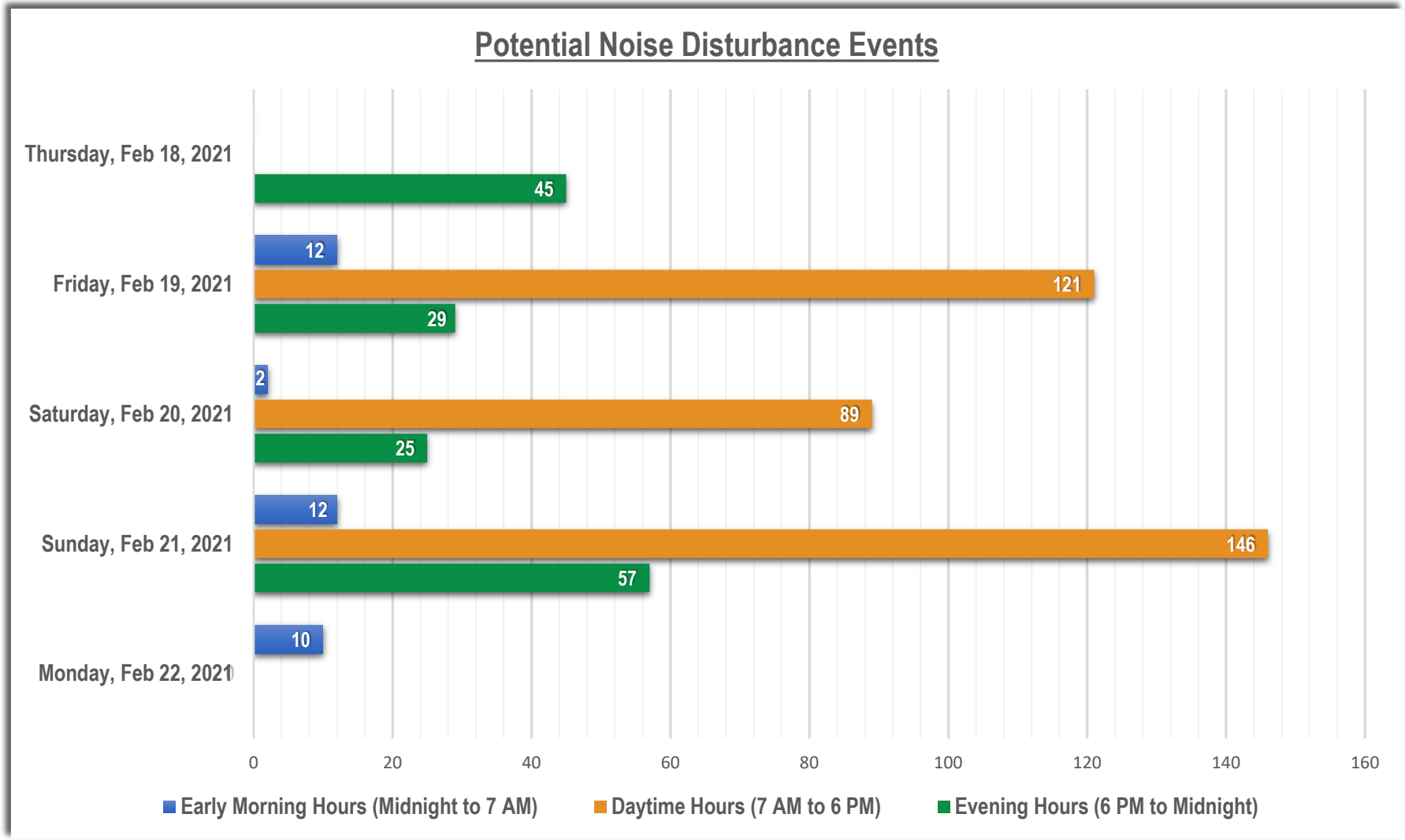



# PHASE 2–NR14 MONITORING RESULTS

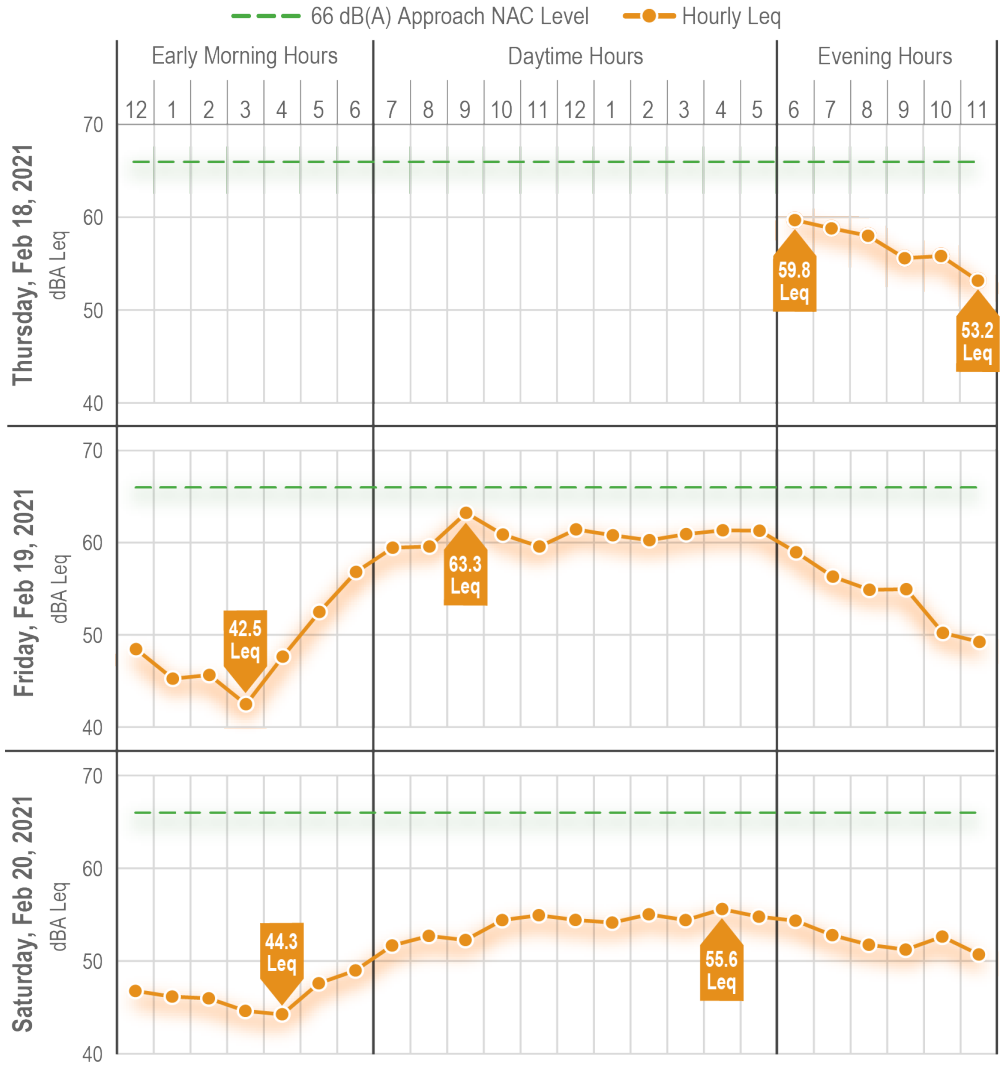
Total Potential noise Disturbance Events = 548

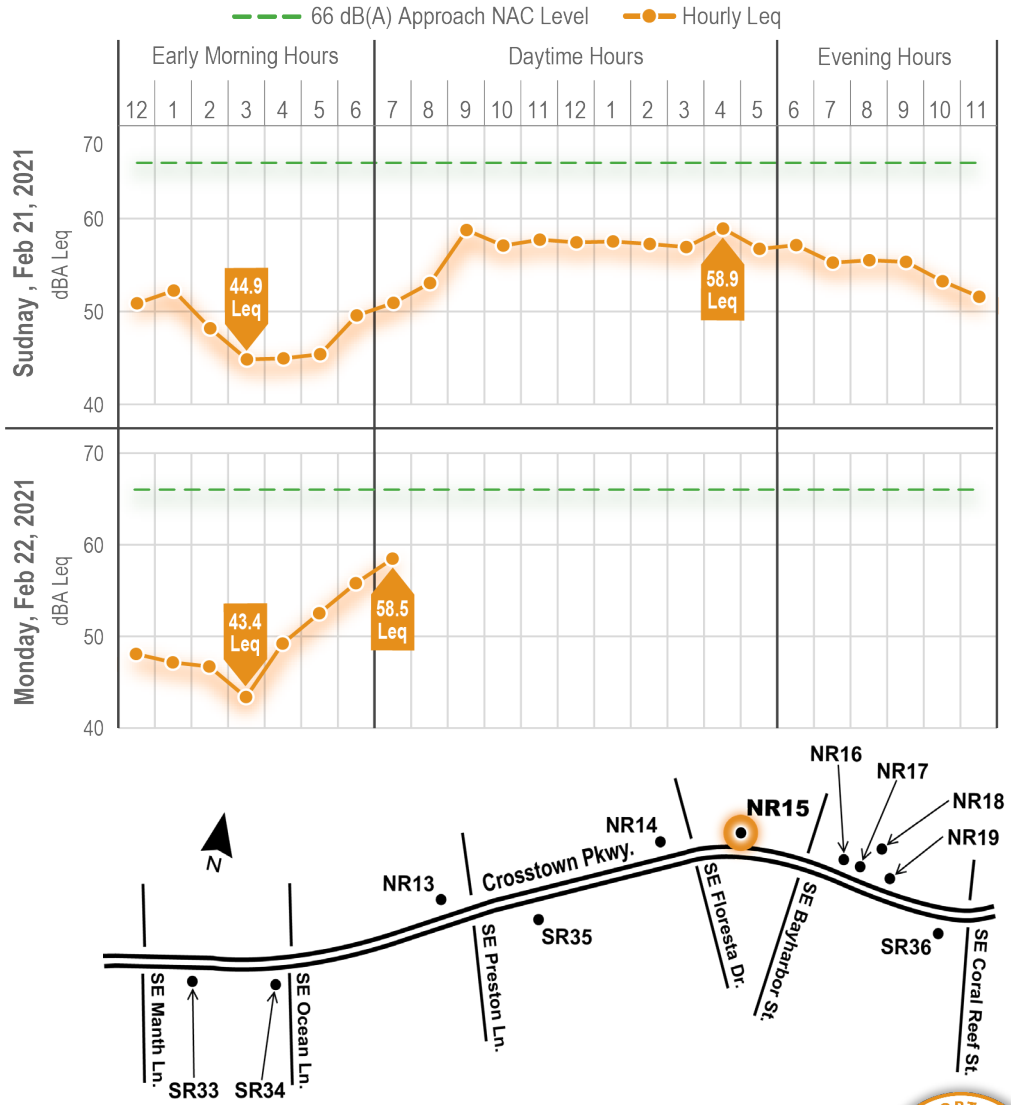
- Early Morning Hours = 36
- Daytime Hours = 356
- Evening Hours = 156
- Cars with modified muffler/exhaust systems = 402

**65.5 dBA Leq was the threshold used to capture noise disturbance events (events were marked by cars with modified muffler/exhaust systems, car tires, motorcycle, heavy truck, general traffic, music).*



# PHASE 2–NR15 MONITORING RESULTS



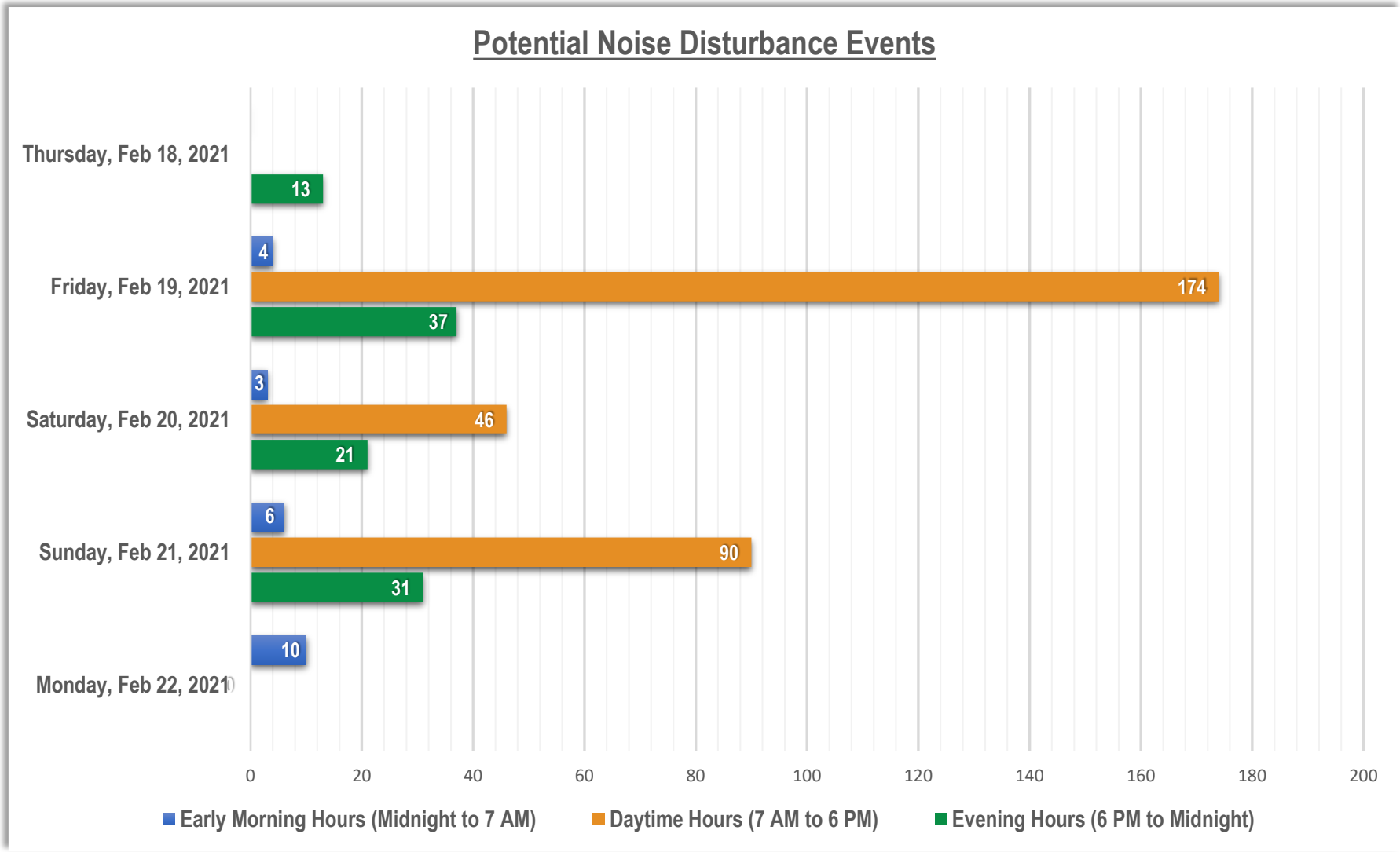



# PHASE 2–NR15 MONITORING RESULTS

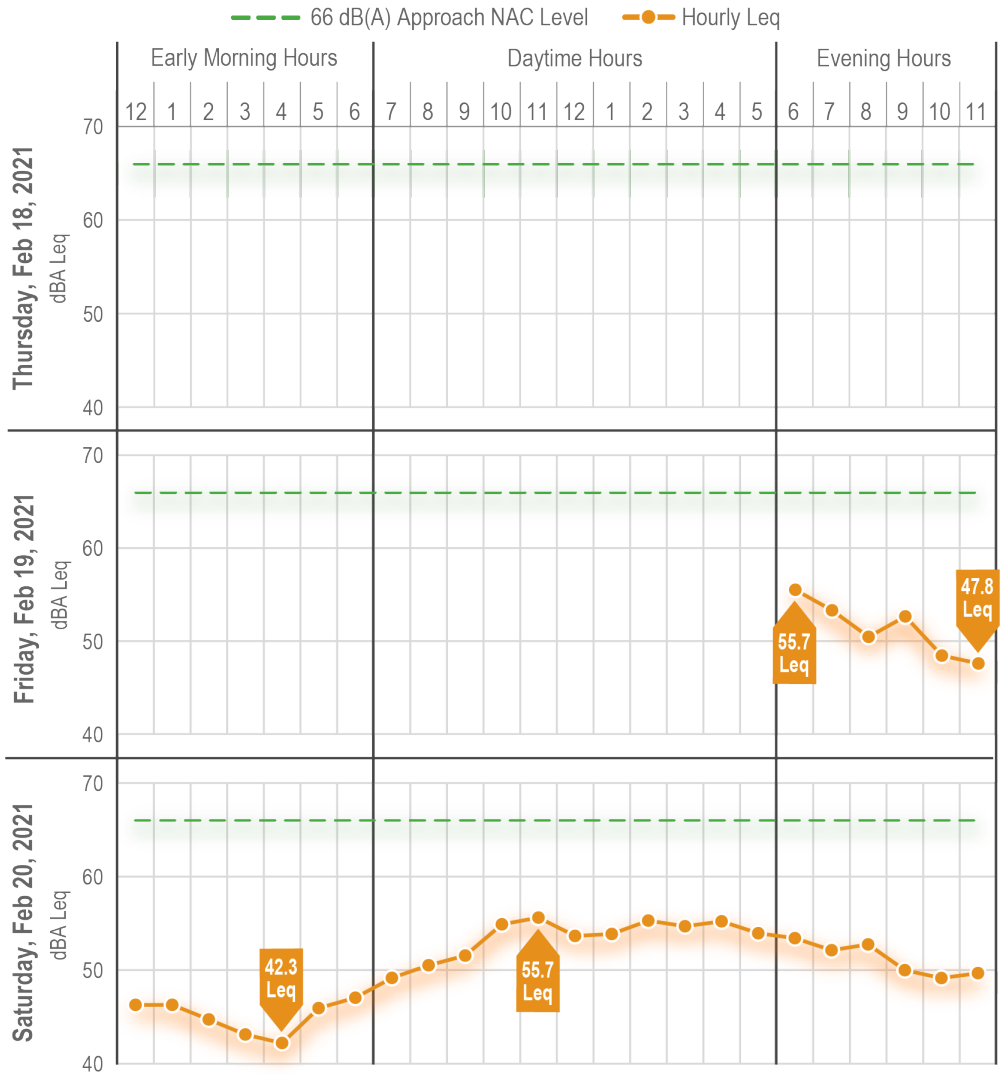
Total Potential Noise Disturbance Events = 435

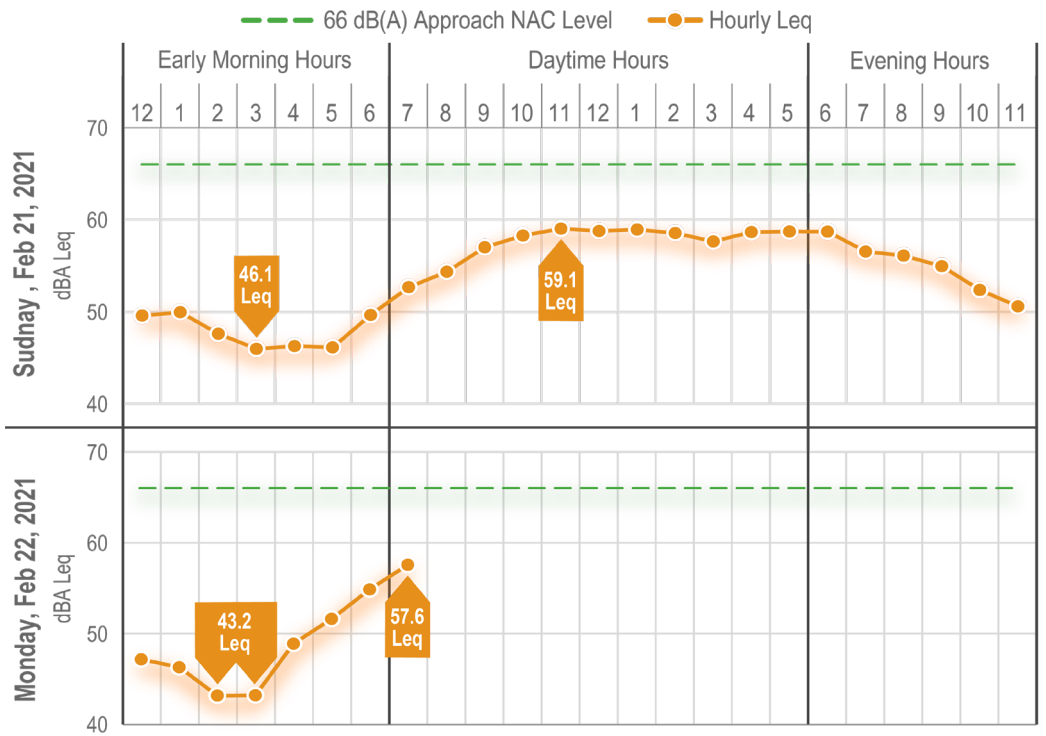
- Early Morning Hours = 23
- Daytime Hours = 310
- Evening Hours = 102
- Cars with modified muffler/exhaust systems = 223
- Motorcycles = 108
- Heavy Trucks = 95

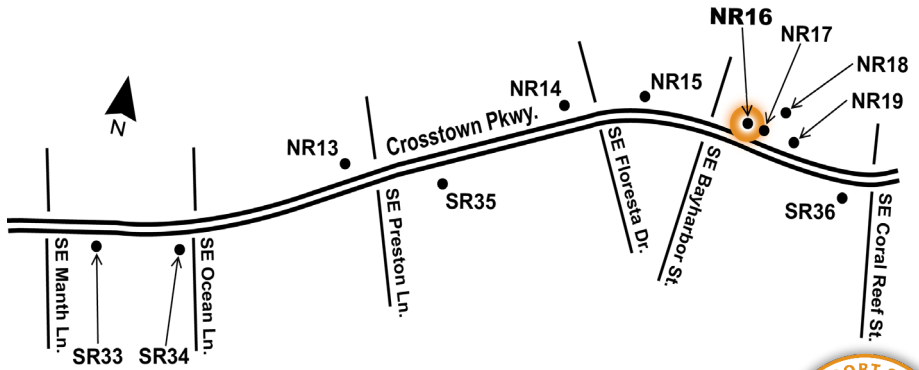
**65.5 dBA Leq was the threshold used to capture noise disturbance events (events were marked by cars with modified muffler/exhaust systems, car tires, motorcycle, heavy truck, general traffic, music).*



# PHASE 2–NR16 MONITORING RESULTS



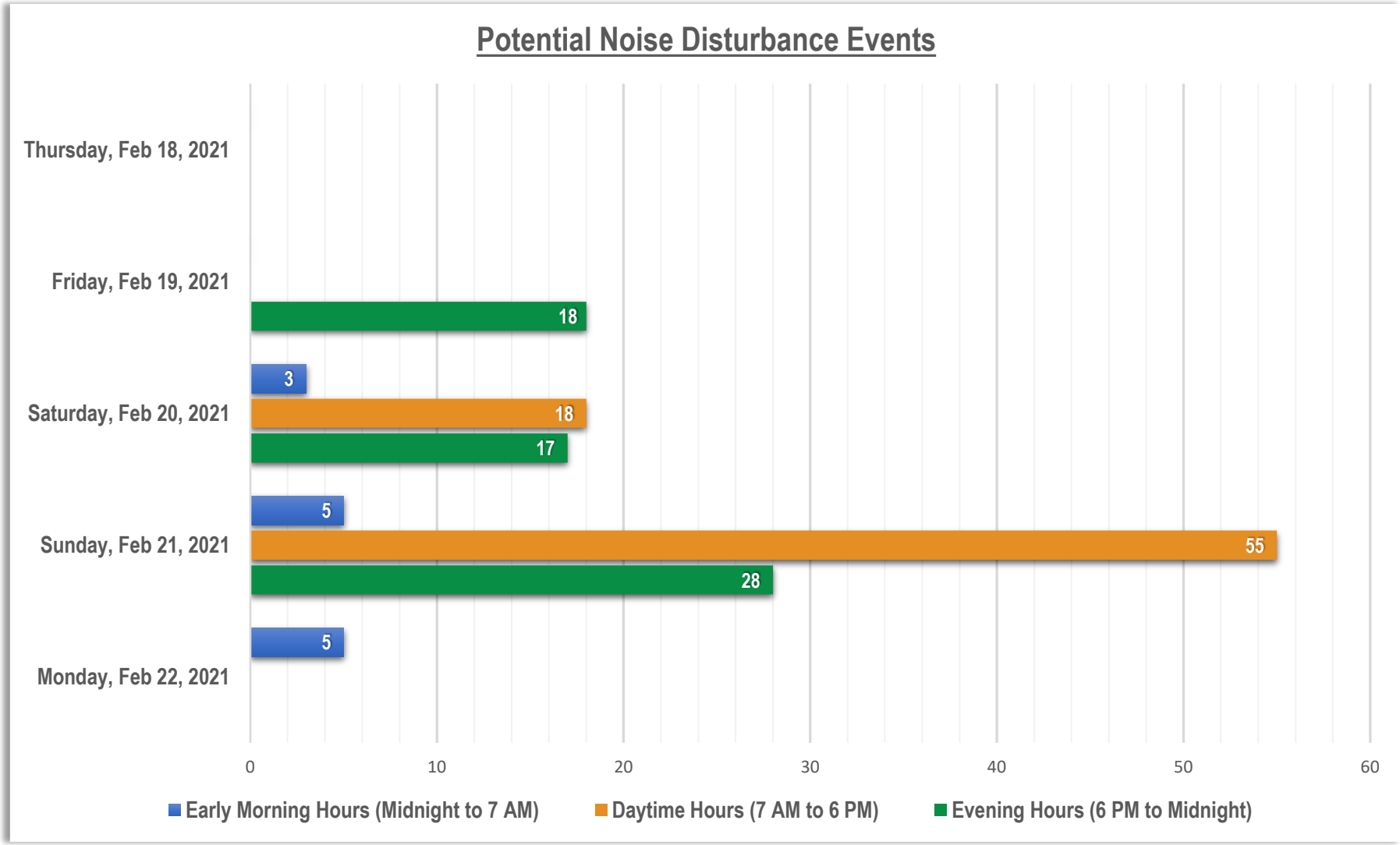



# PHASE 2–NR16 MONITORING RESULTS

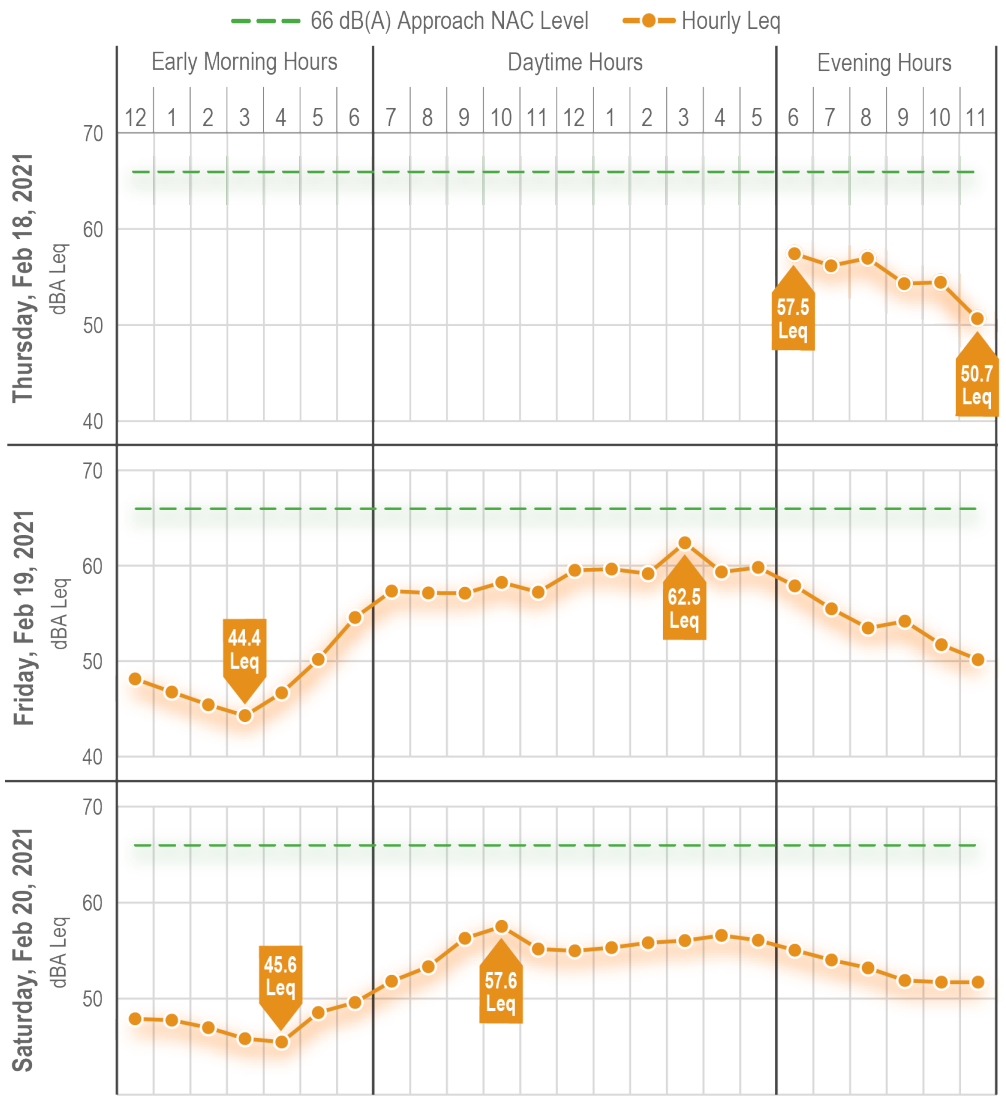
Total Potential Noise Disturbance Events = 149

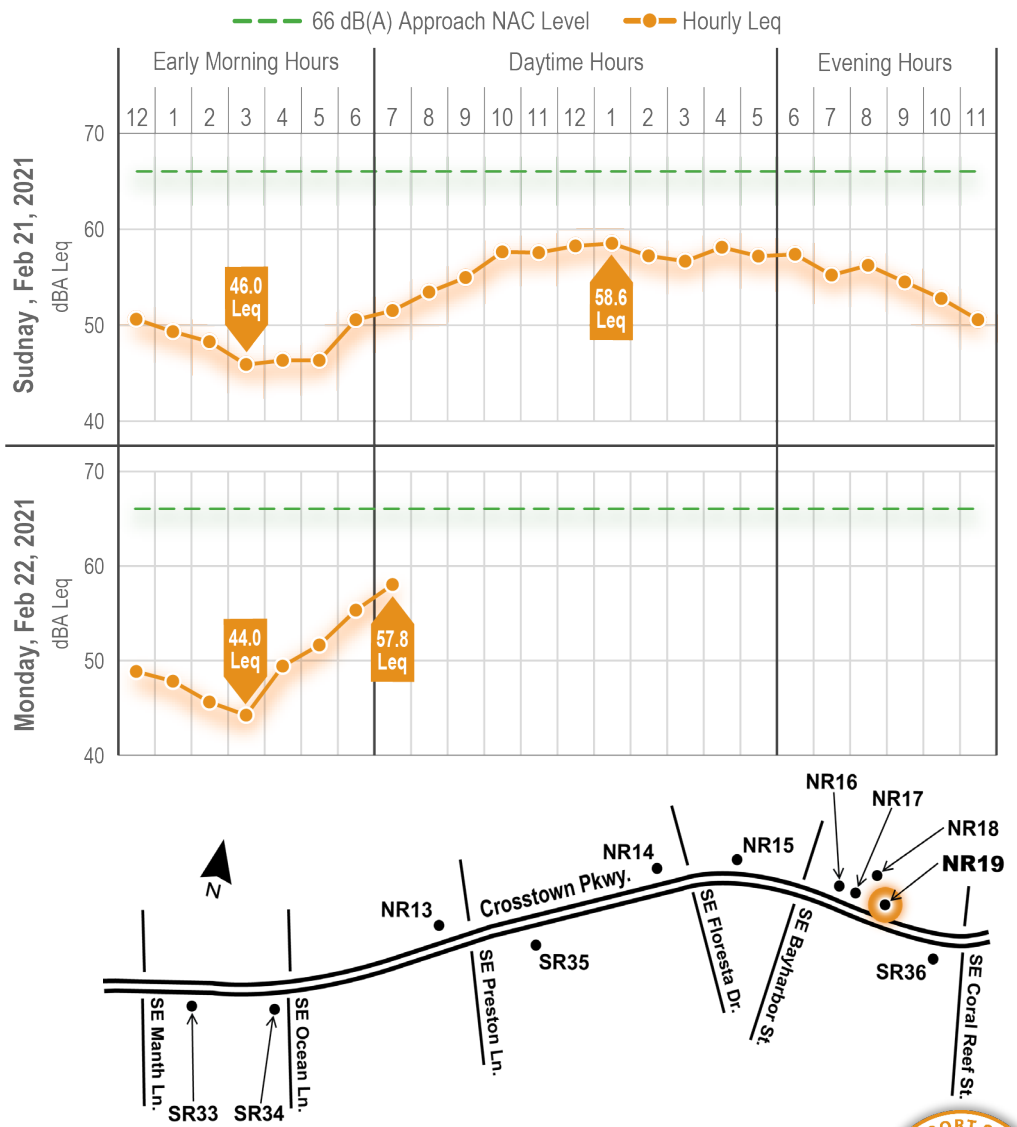
- Early Morning Hours = 13
- Daytime Hours = 73
- Evening Hours = 63
- Cars with modified muffler/exhaust systems = 81
- Motorcycles = 43

**65.5 dBA Leq was the threshold used to capture noise disturbance events (events were marked by cars with modified muffler/exhaust systems, car tires, motorcycle, heavy truck, general traffic, music).*



# PHASE 2–NR19 MONITORING RESULTS



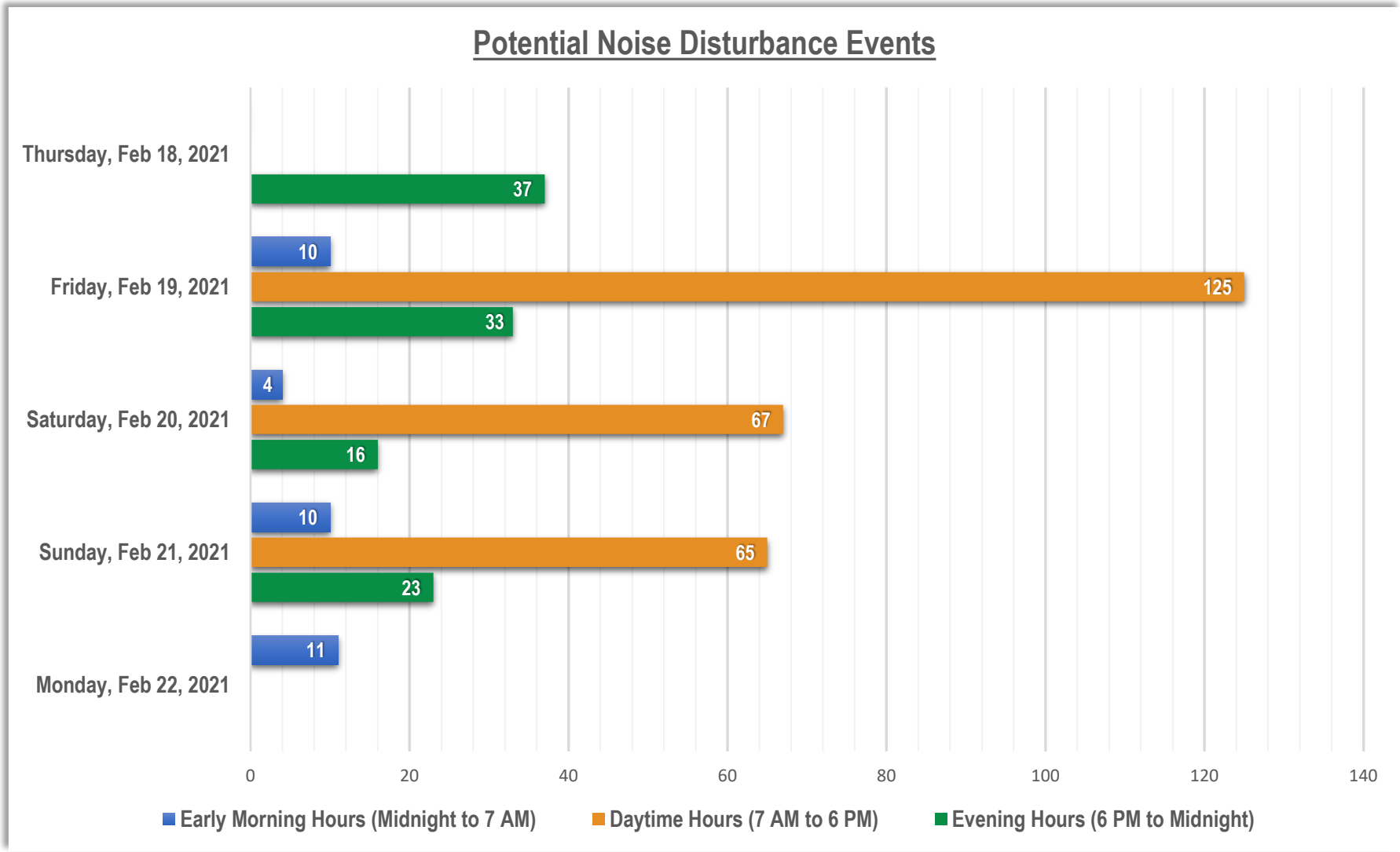



# PHASE 2–NR19 MONITORING RESULTS

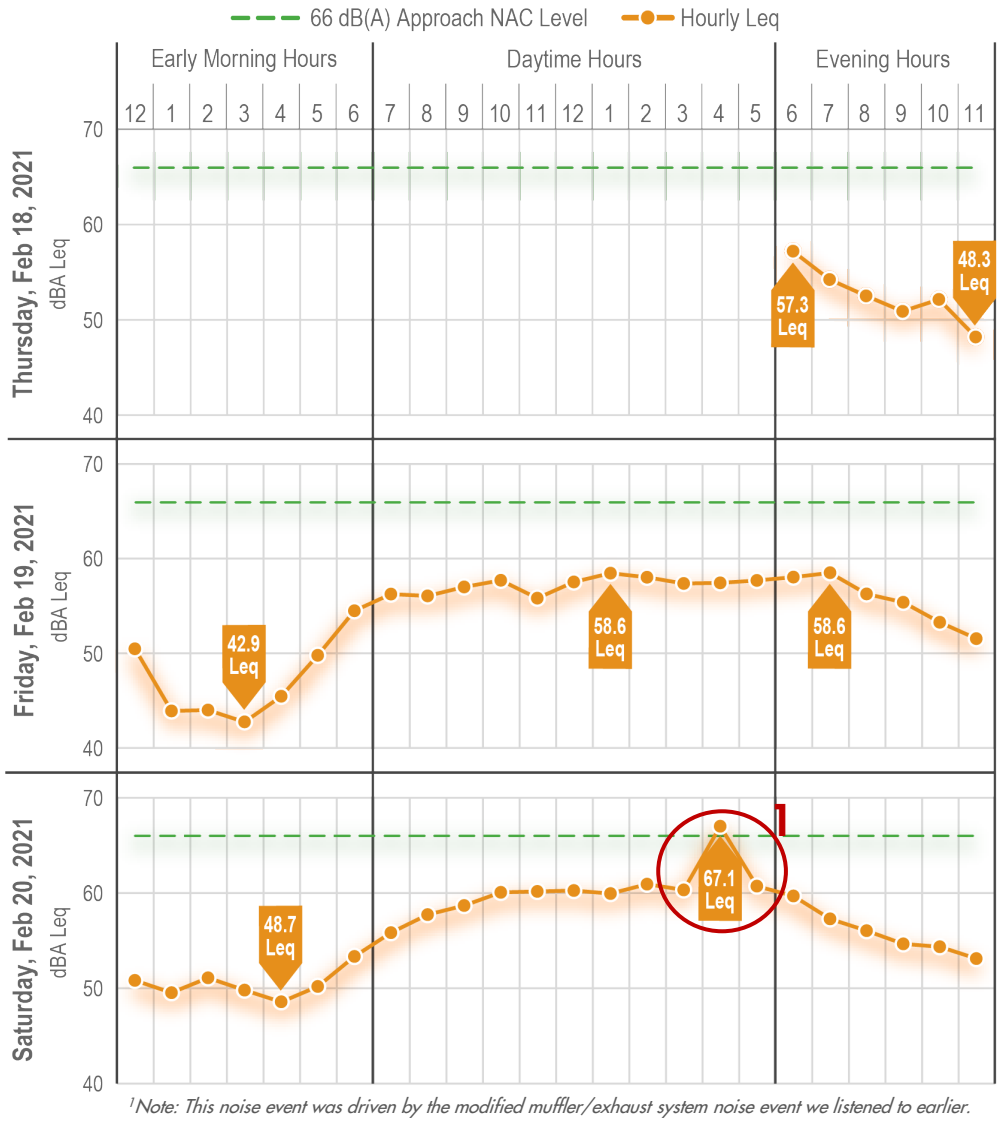
Total Potential Noise Disturbance Events = 401

- Early Morning Hours = 35
- Daytime Hours = 257
- Evening Hours = 109
- Cars with modified muffler/exhaust systems = 293
- Motorcycles = 95

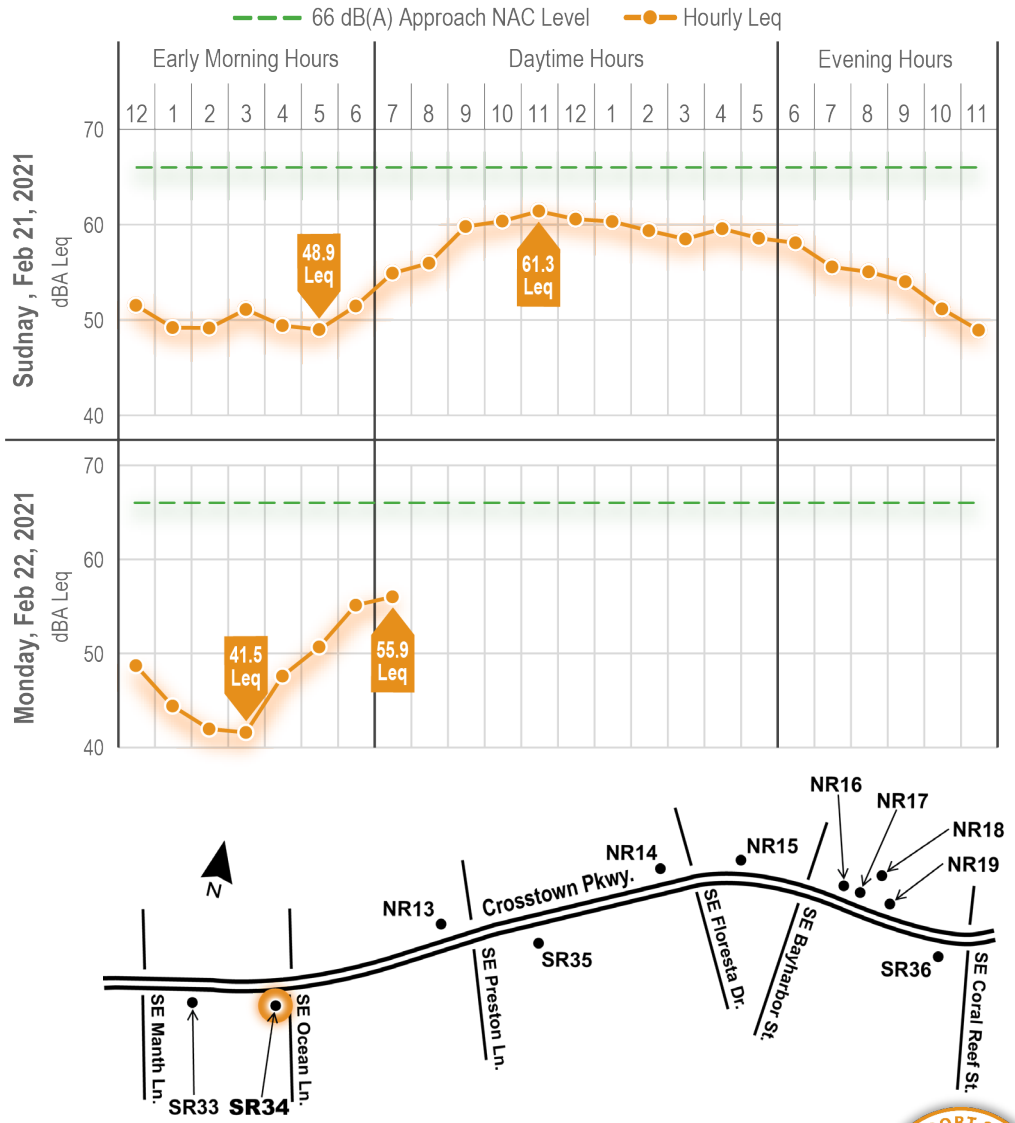
**65.5 dBA Leq was the threshold used to capture noise disturbance events (events were marked by cars with modified muffler/exhaust systems, car tires, motorcycle, heavy truck, general traffic, music).*



# PHASE 2–SR34 MONITORING RESULTS




[1]*Note: This noise event was driven by the modified muffler/exhaust system noise event we listened to earlier.*

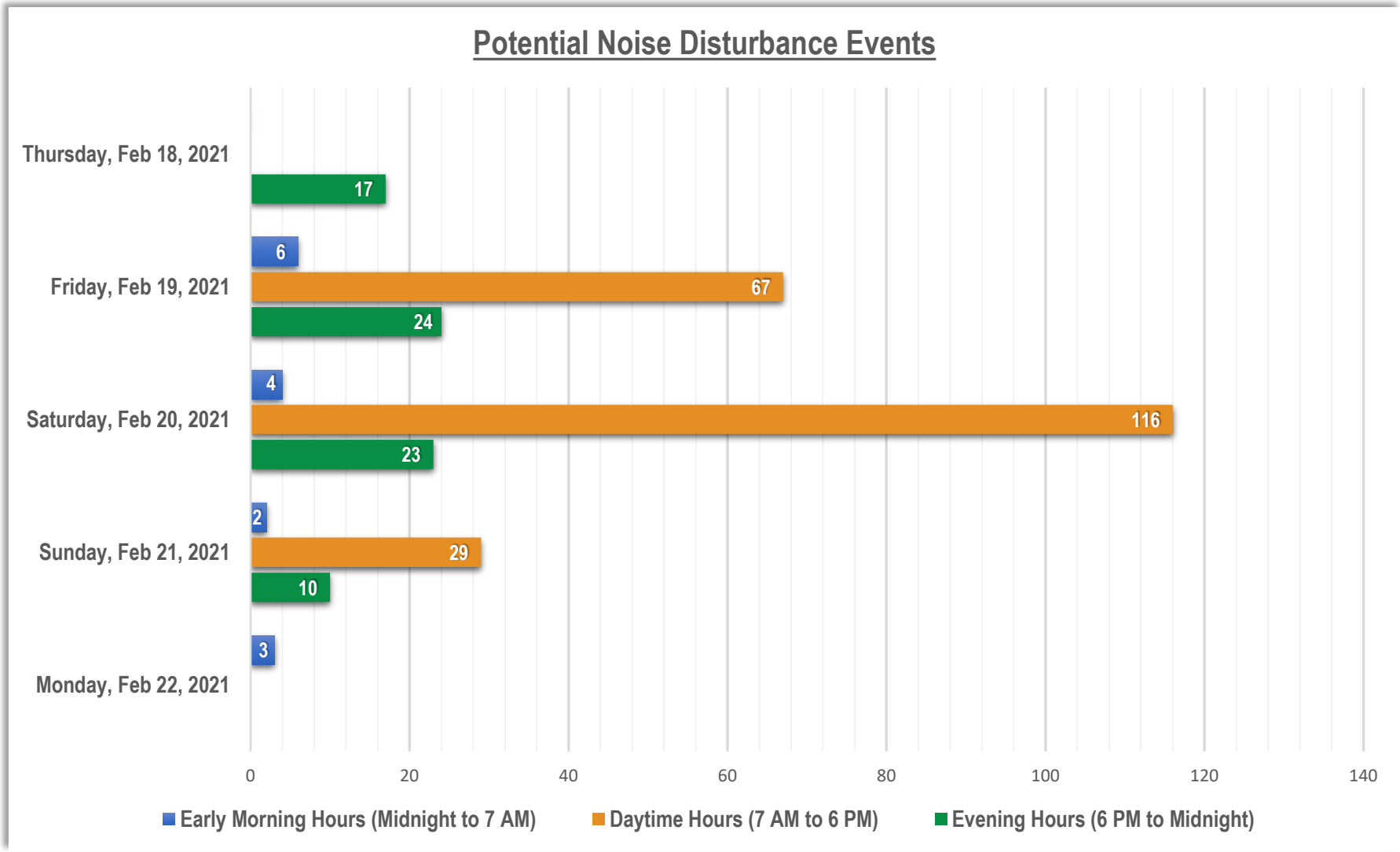


# PHASE 2–SR34 MONITORING RESULTS

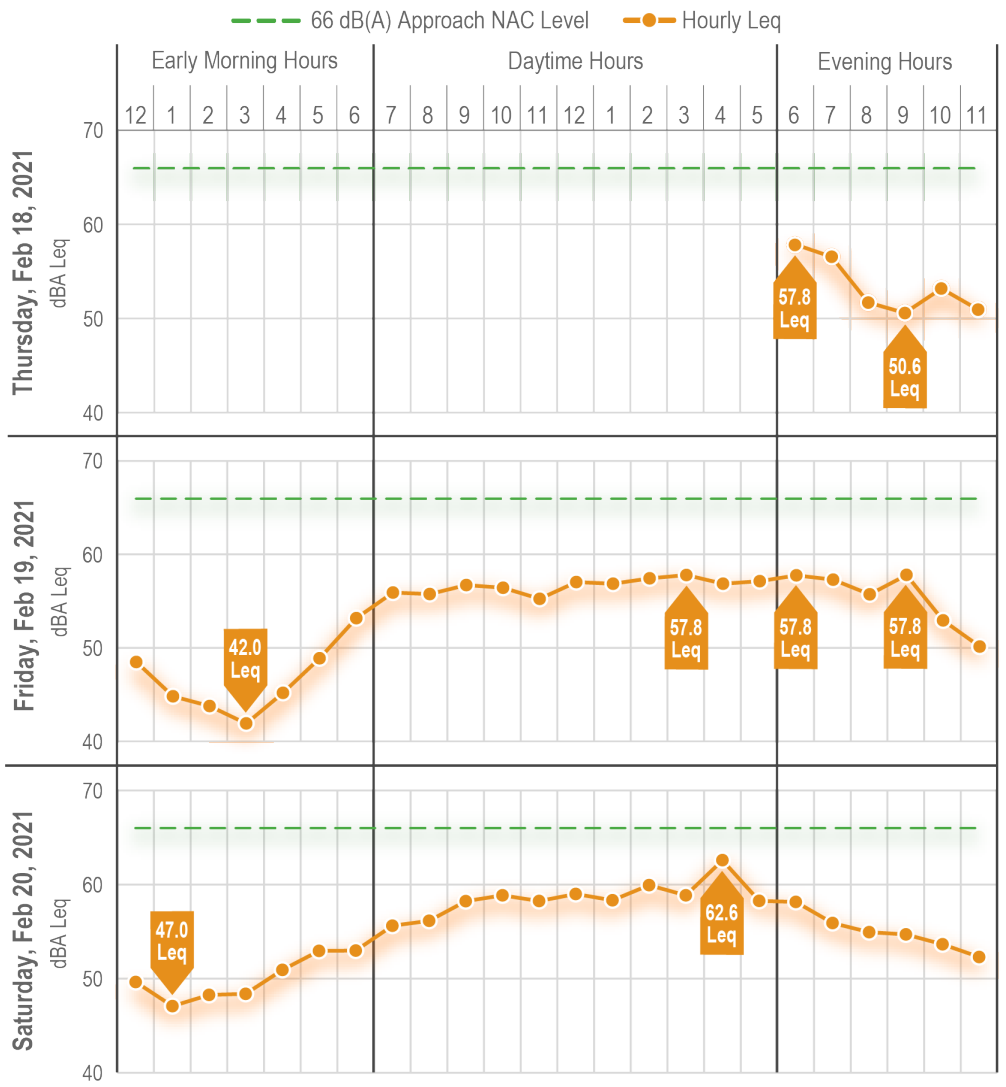
Total Potential Noise Disturbance Events = 301

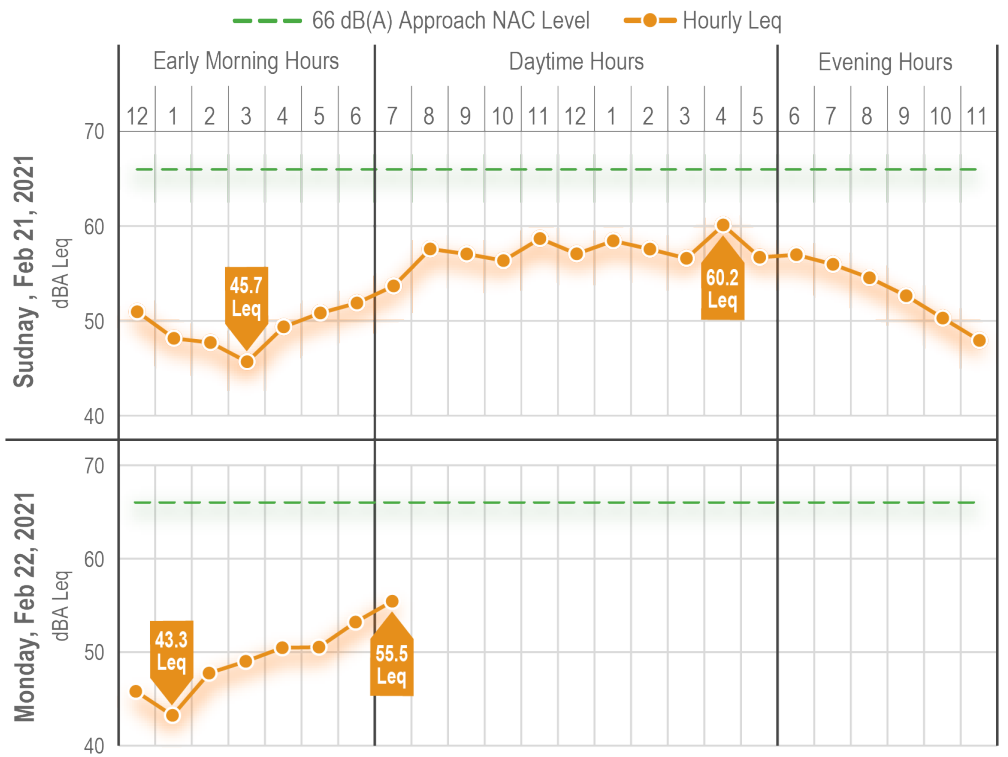
- Early Morning Hours = 15
- Daytime Hours = 212
- Evening Hours = 74
- Cars with modified muffler/exhaust systems = 106
- Motorcycles = 68
- Heavy Trucks = 62

**65.5 dBA Leq was the threshold used to capture noise disturbance events (events were marked by cars with modified muffler/exhaust systems, car tires, motorcycle, heavy truck, general traffic, music).*



# PHASE 2–SR35 MONITORING RESULTS



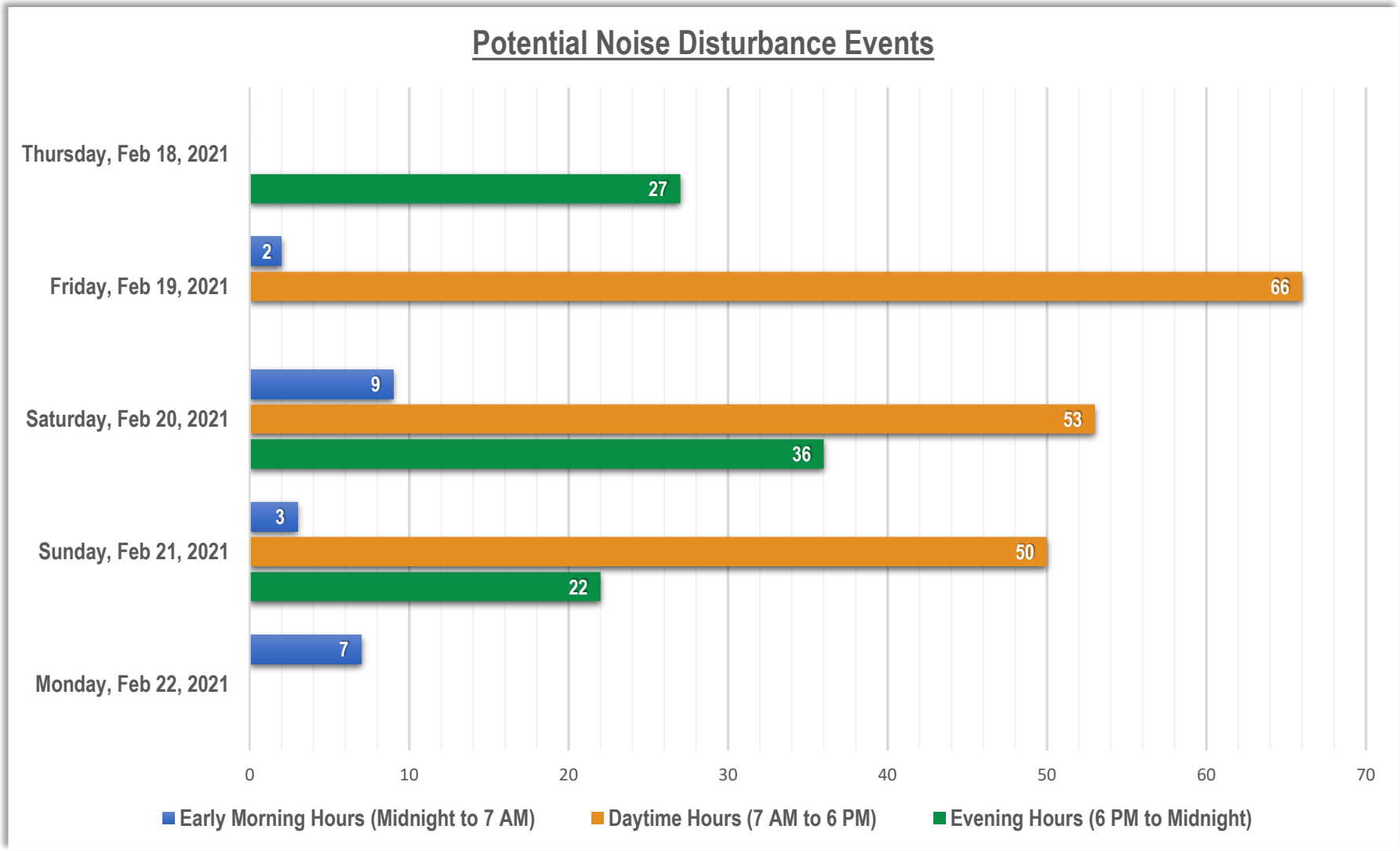




# PHASE 2–SR35 MONITORING RESULTS

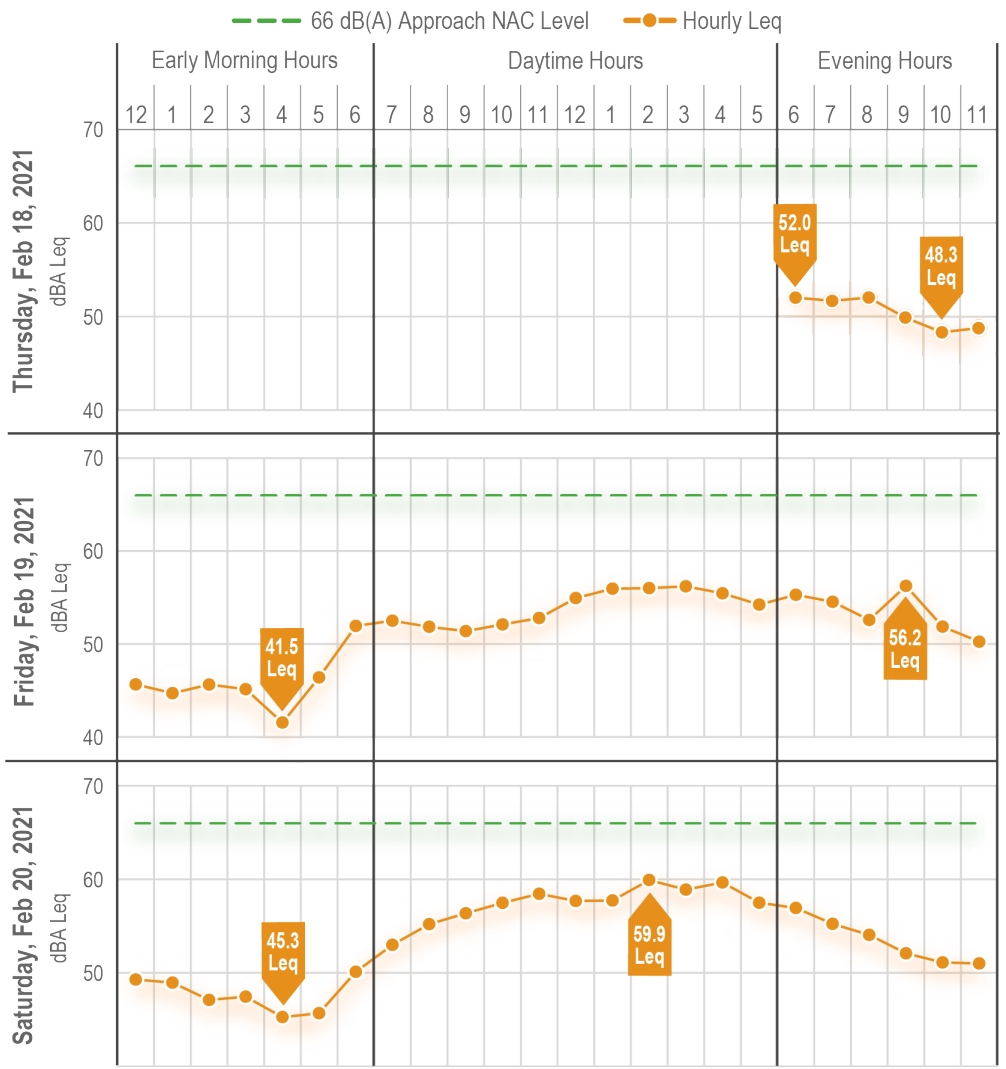
Total Potential Noise Disturbance Events = 275

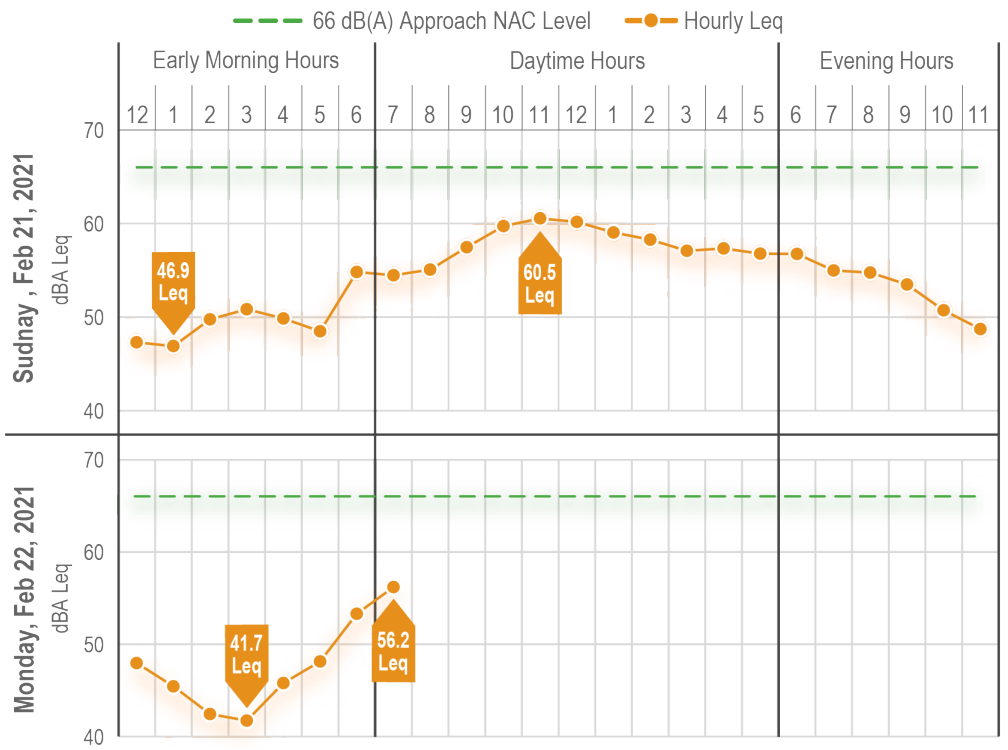
- Early Morning Hours = 21
- Daytime Hours = 169
- Evening Hours = 85
- Cars with modified muffler/exhaust systems = 187

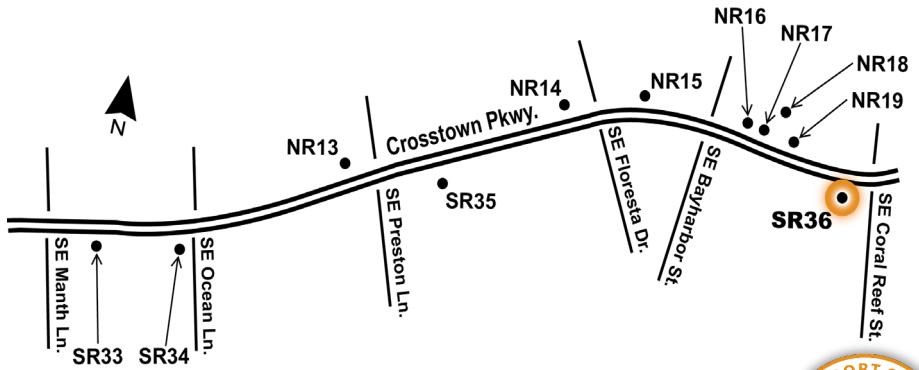
**65.5 dBA Leq was the threshold used to capture noise disturbance events (events were marked by cars with modified muffler/exhaust systems, car tires, motorcycle, heavy truck, general traffic, music).*



# PHASE 2–SR36 MONITORING RESULTS



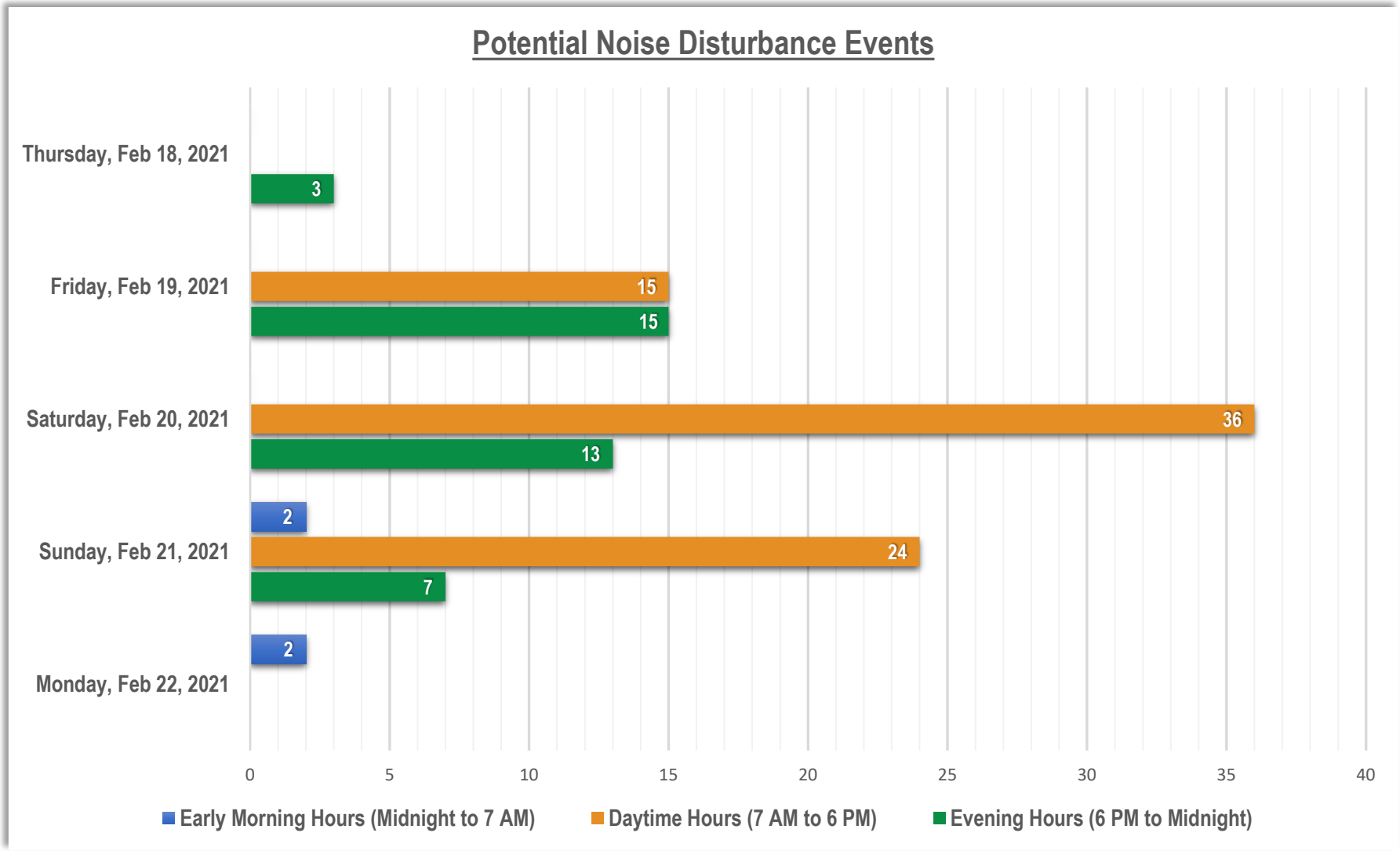



# PHASE 2–SR36 MONITORING RESULTS

Total Potential Noise Disturbance Events = 117

- Early Morning Hours = 4
- Daytime Hours = 75
- Evening Hours = 38
- Cars with modified muffler/exhaust systems = 99

**65.5 dBA Leq was the threshold used to capture noise disturbance events (events were marked by cars with modified muffler/exhaust systems, car tires, motorcycle, heavy truck, general traffic, music).*



# PHASE 2-SUMMARY

- Overall hourly dBA Leq noise levels were measured at levels below FDOT's "approaching" Noise Abatement Criteria (NAC) threshold of 66 dBA Leq during the 24-hour monitoring period *(with the exception of one instance highlighted at SR 34)*
- As residents have expressed, annoying peak noise level events occur at levels that interfere with outdoor speech and sleeping
- These noise levels are principally generated from vehicles sporting loud exhaust systems and additional noise generators including motorcycles, and heavy trucks
- These peak noise levels wouldn't be efficiently addressed by sound barriers which provide a general mitigation benefit of 5 to 10 dBA *(based on their position between the noise receiver and noise source)*
- So, what can be done to address these peak noise levels?

# RECOMMENDATIONS

- What we heard from several residents during the Short-Term and 24-Hour monitoring sessions:
  - A visible police presence along Crosstown Parkway helps to monitor daytime vehicle behavior
  - The city's landscape enhancement efforts have helped block views of Crosstown Parkway traffic
- Police presence effective in controlling noise disturbance events
- Noise Team observation
  - The team set up a noise meter at NR 14 around 7:00 pm on Tuesday, September 15, 2020 in attempt to capture resident described evening noise events at the Floresta Drive/Crosstown Parkway intersection
  - Shortly after starting, a police officer with his/her flashing lights pulled a vehicle over as it crossed the Port St. Lucie River Bridge along WB Crosstown Parkway
  - Traffic was clearly on its best behavior during this time *(approximately 20 minutes)*; no loud mufflers, radios, wheel squealing, engine revving were observed

# RECOMMENDATIONS

## Port St. Lucie Strategic Plan:

- Current Strategic Plan development efforts highlights plans to expand the police force to address citizen requests for greater community police presence and to address speeding and aggressive driving
- *"More enforcement for modified exhaust systems"* was a city-wide concern heard during the Strategic Plan's public outreach program


# RECOMMENDATIONS

- Florida State Statute (FSS) 316.293 (5)(a): *No person shall modify the exhaust system of a motor vehicle or any other noise-abatement device of a motor vehicle operated or to be operated upon the highways of this state in such a manner that the noise emitted by the motor vehicle is above that emitted by the vehicle as originally manufactured*
- The Police Department will be working with the Communications Department to initiate a City-wide campaign focused on educating residents on illegal exhaust systems including mufflers, manifold pipes & tailpipes

*Source: Loud Vehicle Exhaust Enforcement - Article*

# RECOMMENDATIONS

- Additional measures to augment current law enforcement operations with the goal of minimizing peak noise events include:
  - The City will be signing Crosstown Parkway as a *"residential noise control area"* and/or *"strict enforcement area"*
  - Consideration of additional evening and early morning police patrols
- The City will monitor and maintain the enhanced landscaping to block/minimize views of the parkway



# Q&A DISCUSSION