

Noise Programs Portable Noise Monitor Report

Nautilus Elementary 1000 S 289th St, Federal Way

Data collected from November 5, 2020 to February 4, 2021

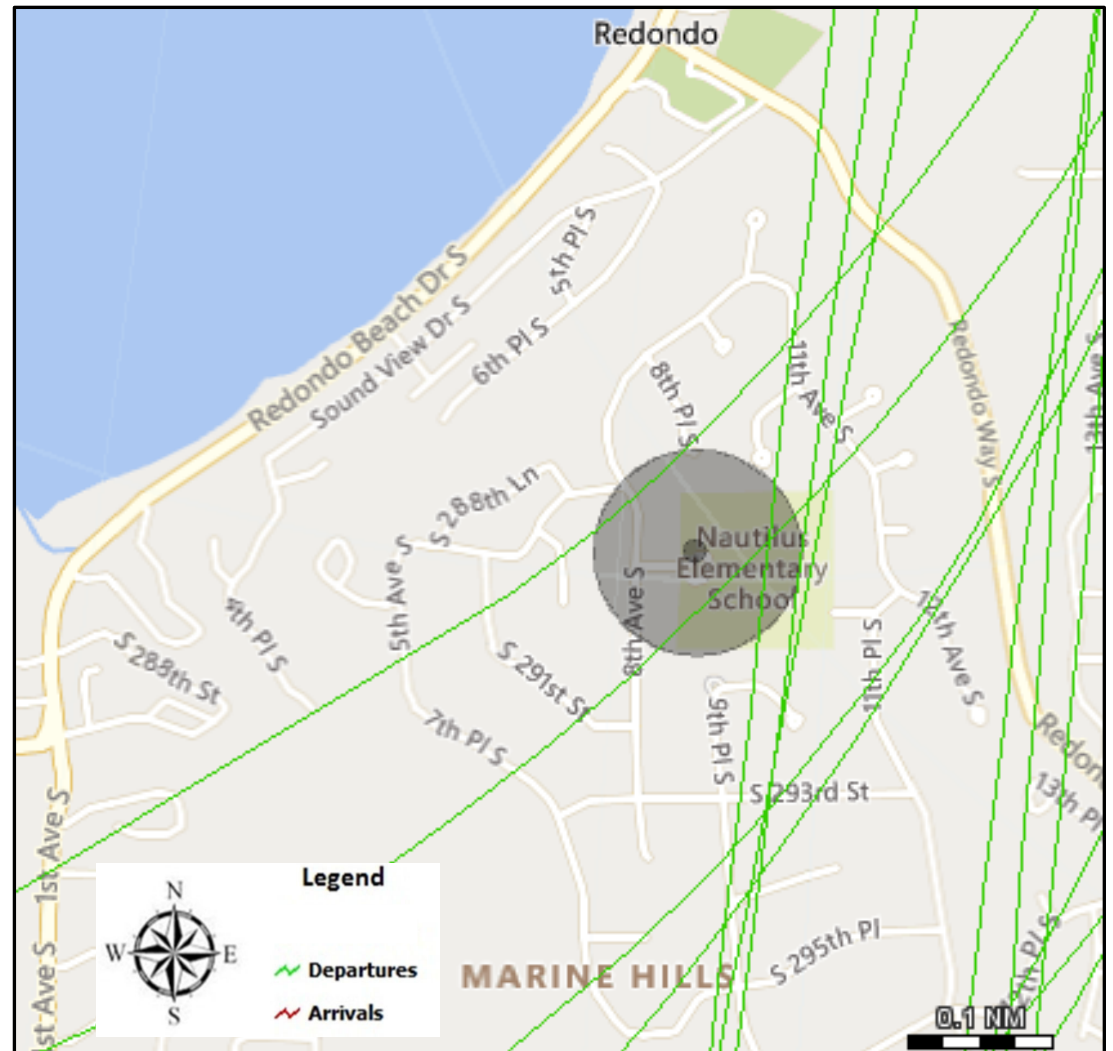


Table of Contents

Summary

Portable Monitor Location

- Location Details
- Installation of Portable

SEA Flight Paths and Traffic Flow Direction

- North Flow Map: November 6, 2020
- North Flow Map: December 28, 2020
- South Flow Map: November 30, 2020
- South Flow Map: January 3, 2021
- Traffic Flow (monthly overview)
- Traffic Flow (during data collection overview)

Appendix

- Resources
- Daily Traffic Flow
- LEQ and SEL Noise Metrics
- Daily LEQ at Nautilus
- SEL Reports Available Online

Summary

The Port of Seattle Airport Noise Programs Office installed a portable noise monitor to temporarily measure aircraft and community noise at Nautilus Elementary, located within the Marine Hills neighborhood in Federal Way. A portable classroom provided exterior power to the noise monitoring equipment. The equipment was placed on the north-west portion of the school campus. Federal Way Public Schools facilities were closed to students due to COVID-19, with minimal staff on-site.

Nautilus Elementary was selected as the monitoring location at the recommendation and request of the City of Federal Way.

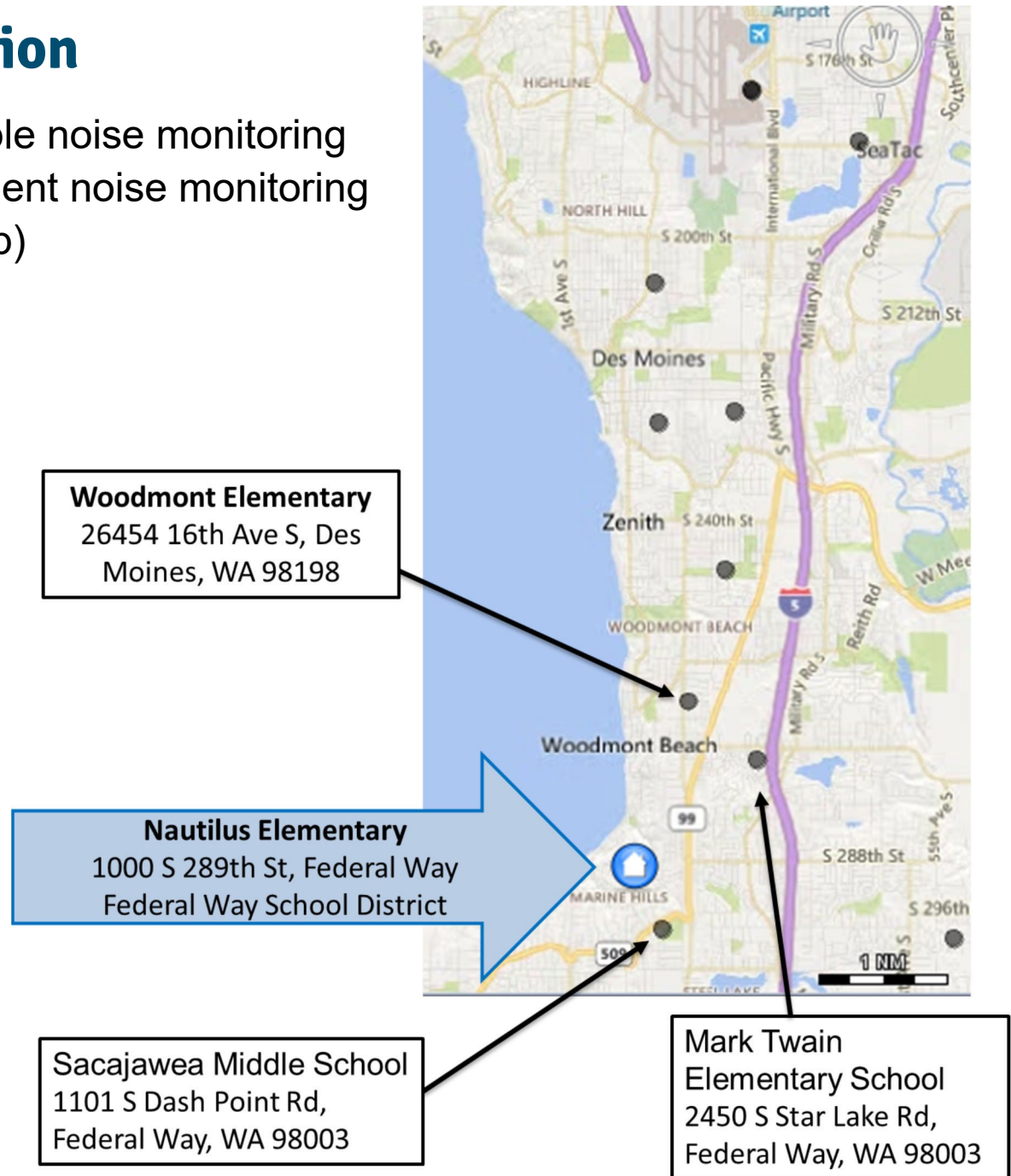
The Port of Seattle has a total of [24 permanent noise monitors](#) located throughout the local Seattle area. The closest Port of Seattle noise monitor to Nautilus elementary is located at Sacajawea Junior High, a little less than a mile away and at a higher elevation compared to Nautilus Elementary. Sacajawea is more directly under the arrival and departure flight path for Seattle-Tacoma International Airport (SEA).

Noise data collection at Nautilus began on November 5, 2020 and the last full day of data was February 4, 2021. The portable noise monitor was removed from Nautilus on February 5th. During this period SEA operated in south-flow 89% of the time and north-flow 11%, which is typical for the Fall and Winter months when winds are primarily from the south. During south-flow operations, aircraft depart the runways to the south and approach for landing from the north. For the year 2020, SEA operated in south-flow 78% of the time.

LEQ and SEL noise levels were recorded at the Nautilus location. The SEL, or Sound Exposure Level, metric represents the acoustic energy of an individual aircraft noise event as if it occurred over a 1 second time period. LEQ is the Equivalent Continuous Sound Pressure Level, the constant noise level that would result in the same total sound energy being produced over a given period, in this case a 24-hour day. LEQ depicts daily aircraft and community noise levels. Data for both of these noise metrics can be viewed and downloaded on the Port's [Tableau Noise](#) data site

Portable Monitor Location

Map shows the location of portable noise monitoring site in relation to existing permanent noise monitoring sites (shown as gray dots on map)



Location Details

The location selected was north of portable classroom #29 (NW corner of school property) at Nautilus elementary. A fenced-in dugout along the ball field was used to secure portable noise monitoring equipment and outdoor power supply was available from the nearby portable classroom.

Yellow star notes the approximate location of the portable noise monitor on school property.



Installation of Portable A002



North side of
Portable Classroom
#29



Location of power
source for portable
noise monitor

Orange extension cord leading from power
source to portable noise monitor. Extension cord
secured to ground with landscaping staples.

Installation of Portable A002

Portable noise monitor was installed approximately 40 feet north of portable classroom #29, away from the classroom heating system.

The school was closed due to COVID19 and the school baseball field dugout, where the portable noise monitor was secured, was not being utilized. There were no unusual noise sources near the portable noise monitor during this deployment timeframe that could negatively affect the ambient neighborhood environment.

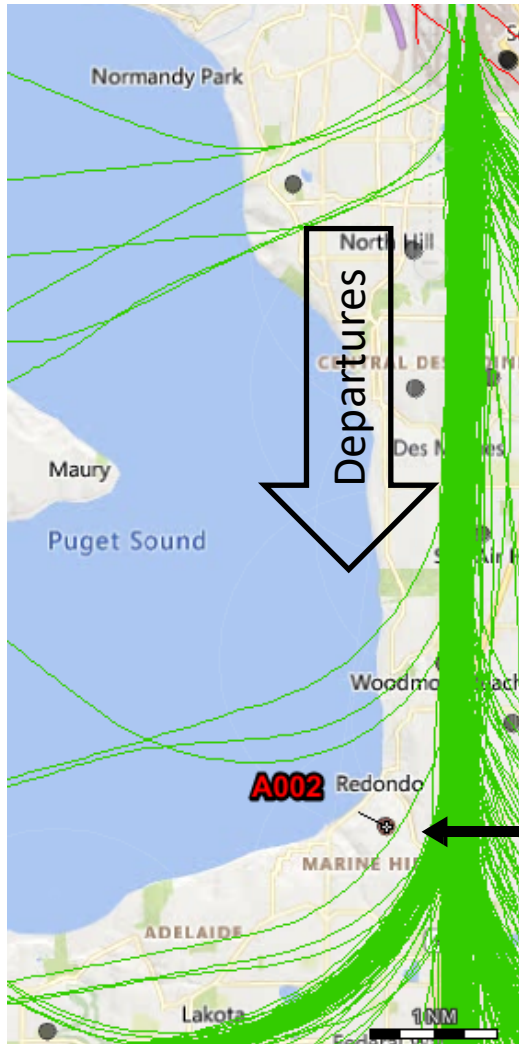


North side of Portable Classroom #29

SEA Flight Paths and Traffic Flow Direction

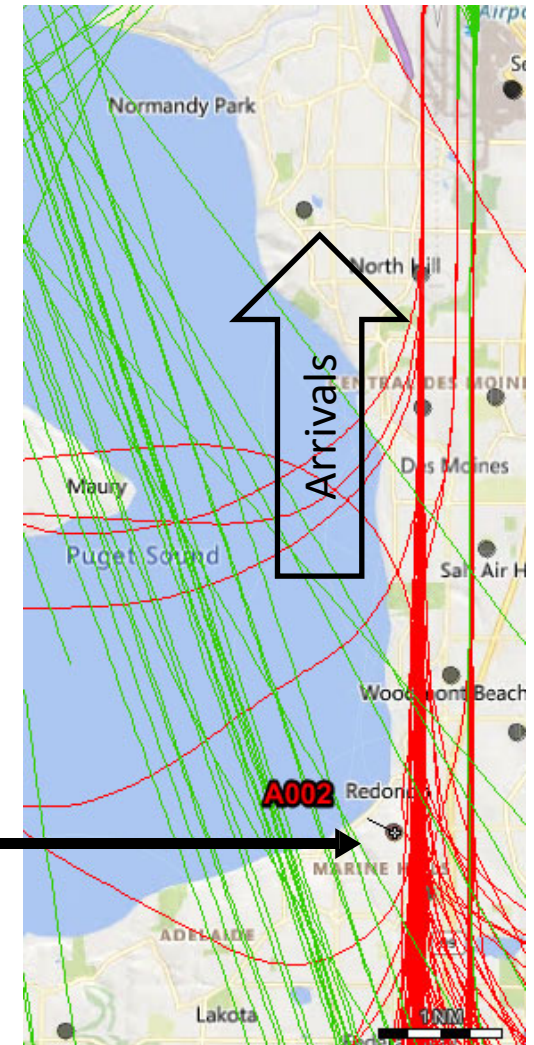
Aircraft primarily take-off and land facing into the prevailing winds. SEA operates in a south-flow or north-flow condition, depending upon the direction of the prevailing winds. More information about flight patterns at SEA can be found on our website: www.portseattle.org/projects/flight-patterns

South-flow Jan 3, 2021



During south-flow operations at SEA, departing aircraft passed over portable noise monitor A002 at Nautilus Elementary.

North-flow Dec 28, 2020



During north-flow operations at SEA, arriving aircraft passed over portable noise monitor A002 at Nautilus Elementary.

Flight track map for November 6, 2020

24 hours

Jet and Propeller Aircraft

872 total operations

This map represents typical north flow operations



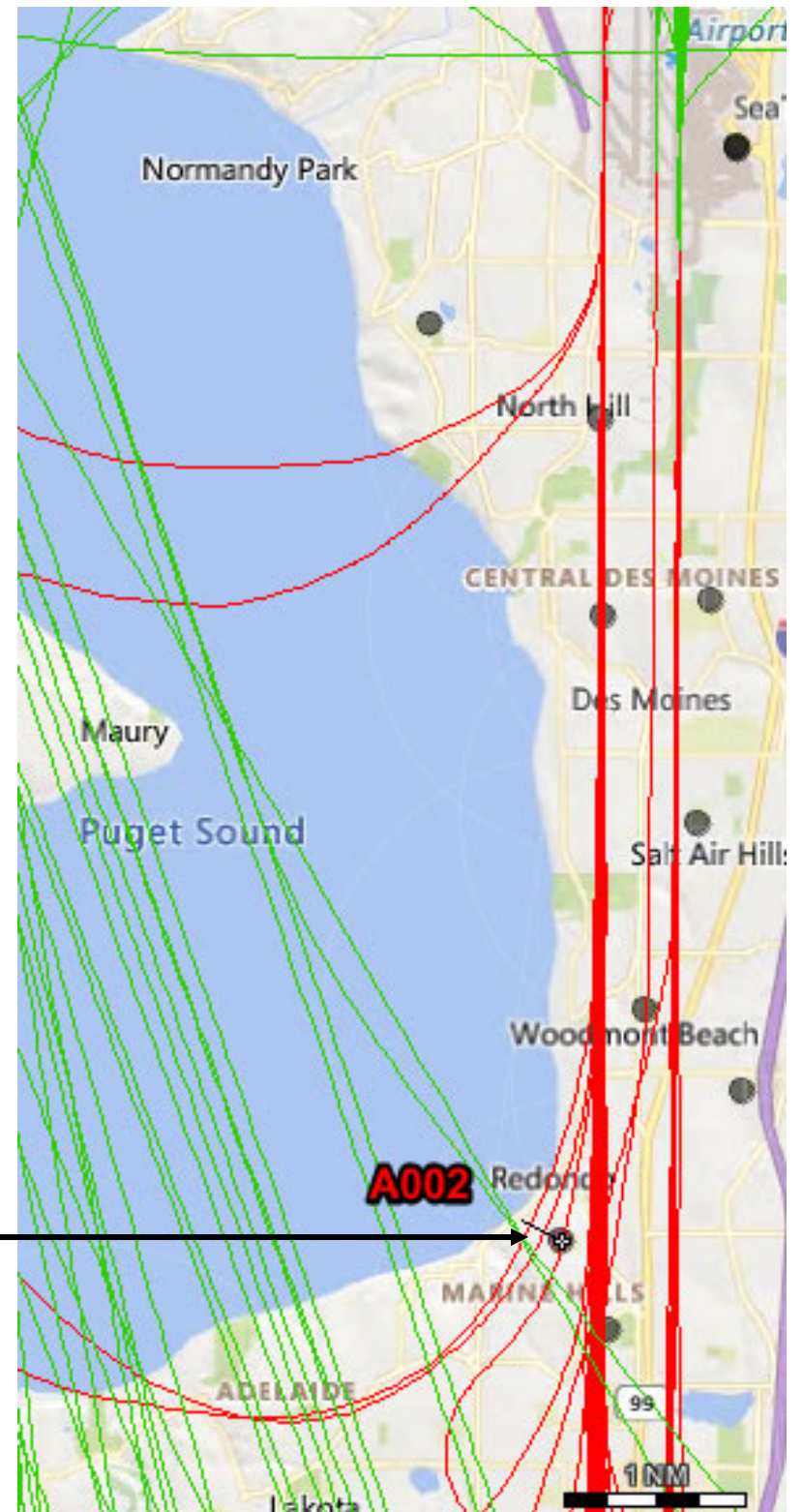
Legend

- Departures
- Arrivals

Portable A002 at Nautilus Elementary



A002



Flight track map for December 28, 2020

24 hours

Jet and Propeller Aircraft

887 total operations

This map represents typical north flow operations



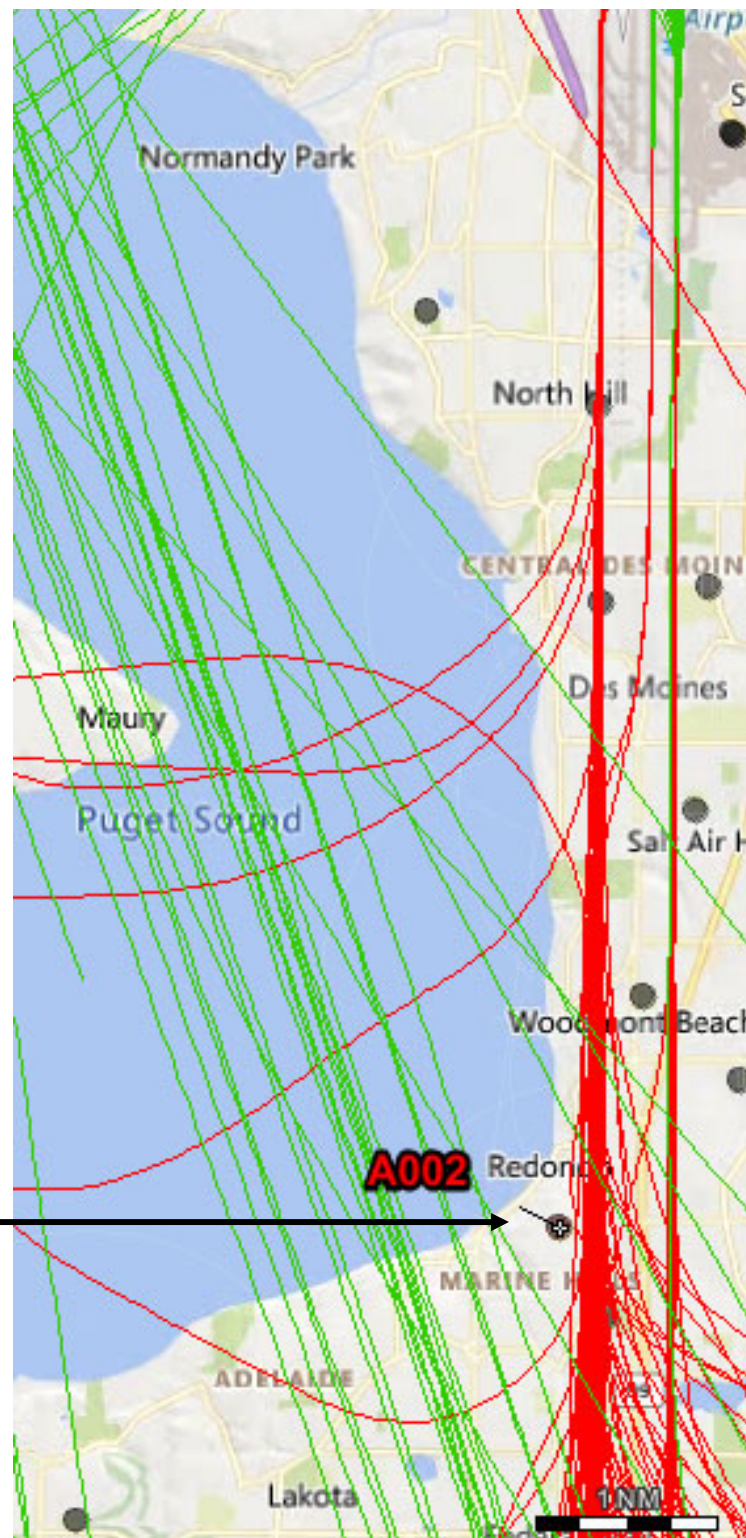
Legend

-  Departures
-  Arrivals

Portable A002 at Nautilus Elementary



A002



Flight track map for November 30, 2020

24 hours

Jet and Propeller Aircraft

928 total operations

This map represents typical south flow operations

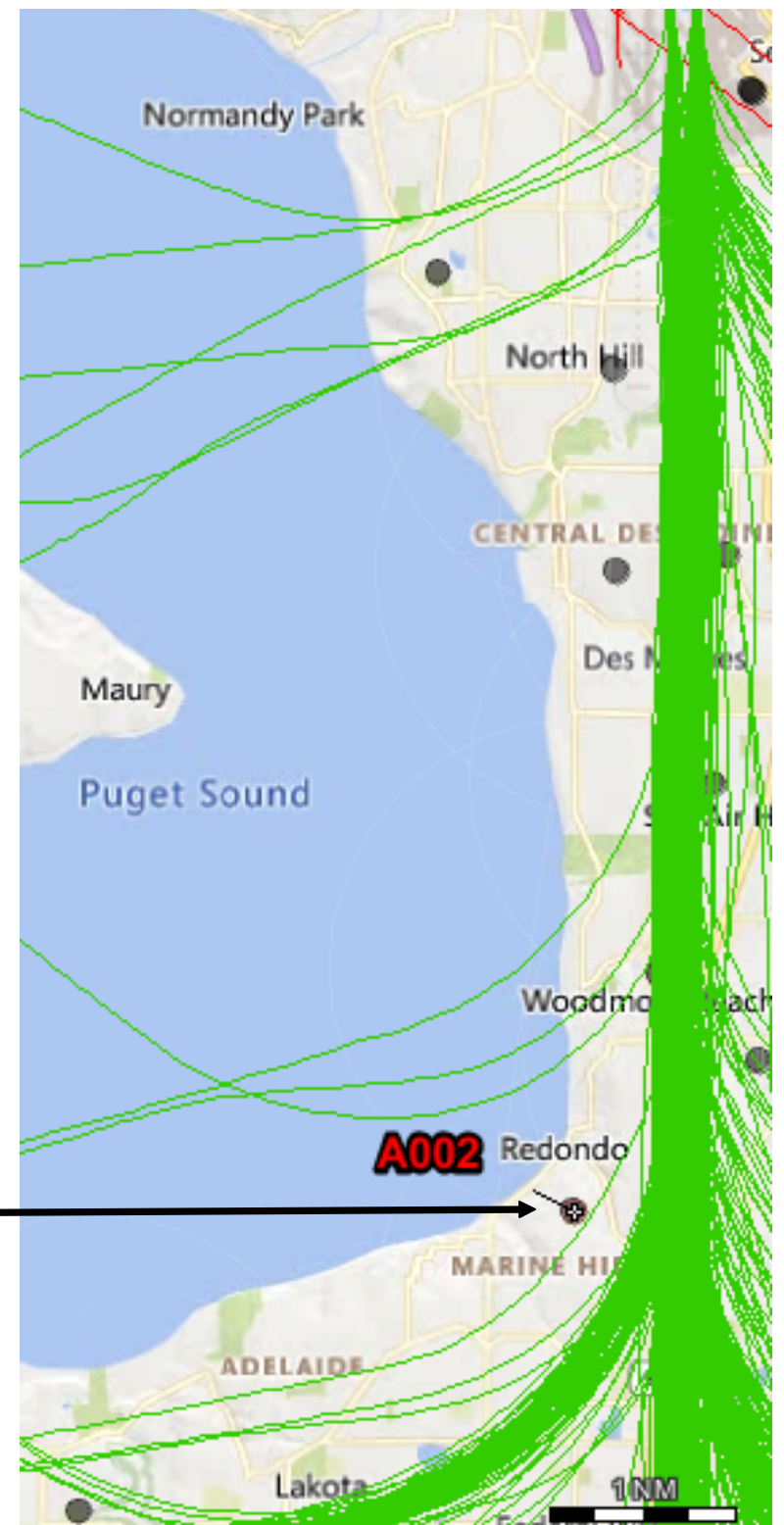


Legend

 Departures

 Arrivals

Portable A002 at Nautilus Elementary



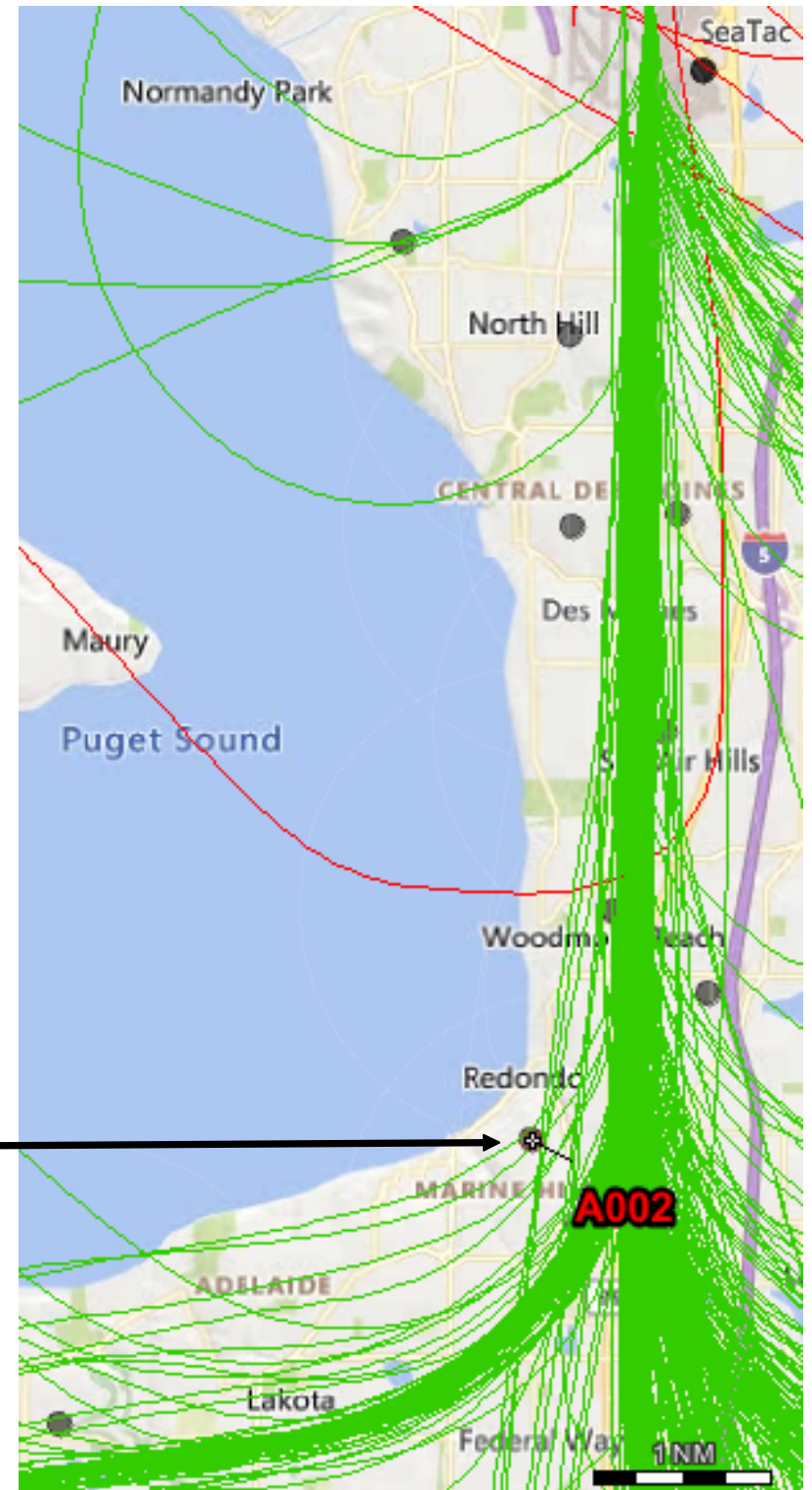
Flight track map for January 3, 2021

24 hours

Jet and Propeller Aircraft

898 total operations

This map represents typical south flow operations



Portable A002 at Nautilus Elementary



Legend

↗ Departures

↖ Arrivals

Traffic Flow—Nov 5, 2020 to midnight on Feb 4, 2021

The graph below shows the percentage of north-flow and south-flow operations for SEA and total operations for each flow. Note the data for November includes the 5th through the end of the month, and the data for February is through the 4th.

The portable noise monitor was removed from Nautilus on February 5th, and February 4th was the last full day at this location.

Monthly operations at SEA were primarily South Flow from November 5, 2020 to February 4, 2021.

Start Date 2020-11-05 00:00:00
 End Date 2021-02-04 23:59:59
 Summary Level Month
 Airport SEA

Month	Flow	Percentage	Operations
2020-11	North Flow	13%	2,944
	South Flow	87%	19,466
2020-12	North Flow	11%	2,926
	South Flow	89%	23,070
2021-01	North Flow	9%	2,244
	South Flow	91%	22,107
2021-02	North Flow	6%	205
	South Flow	94%	2,961

Traffic Flow—Nov 5, 2020 to midnight on Feb 4, 2021

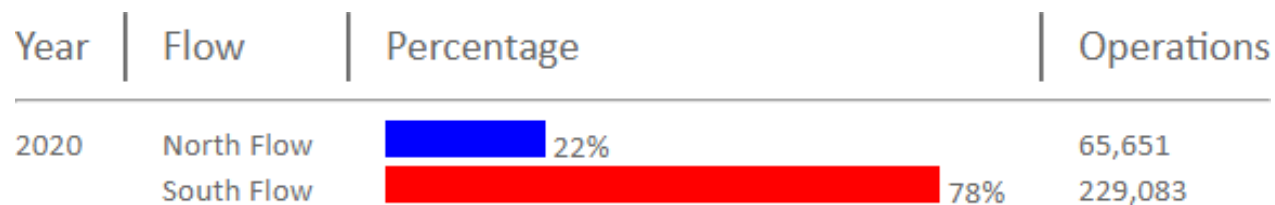
Monthly operations at SEA were primarily South Flow from November 5, 2020 to February 4, 2021.

Airport Flow Graph

Start Date 2020-11-05 00:00:00
 End Date 2021-02-04 23:59:59
 Summary Level Period
 Airport SEA



The graph above shows the percentage of north-flow and south-flow operations for SEA, and the total operations numbers for each flow during the entire time the portable noise monitor was collecting data at Nautilus Elementary. The graph below shows the total percentages and operations for SEA for all of 2020, based upon operations tracked in the Port of Seattle flight tracking system.



Appendix

Port of Seattle

Airport Noise Programs, Aircraft Noise Monitoring System (includes map of where the Port of Seattle permanent noise monitors are located)
www.portseattle.org/page/aircraft-noise-monitoring-system

Airport Noise Programs, Noise Abatement Procedures for Jet Aircraft www.portseattle.org/projects/noise-abatement-procedures-jet-aircraft

Airport Noise Programs, Flight Patterns (maps and explanations of north-flow and south-flow operations at Sea-Tac Airport)
www.portseattle.org/projects/flight-patterns

Airport Noise Programs Questions and Answers www.portseattle.org/page/airport-noise-programs-questions-and-answers

Federal Aviation Administration (FAA)

Fundamentals of Noise and Sound www.faa.gov/regulations_policies/policy_guidance/noise/basics/

Aviation Noise www.faa.gov/regulations_policies/policy_guidance/noise/

Community Response to Noise www.faa.gov/regulations_policies/policy_guidance/noise/community/

Appendix - Traffic Flow

Daily overview of traffic flow direction at SEA, along with the daily operations count to the right of the percentages graph.

This daily bar graph shows the percentage of north-flow and south-flow for each day with the total of Sea-Tac Airport operations for the traffic flow for that particular day.

Day	Flow	Percentage	Operations
2020-11-05	North Flow	27%	239
	South Flow	73%	631
2020-11-06	North Flow	100%	867
	South Flow	0%	0
2020-11-07	North Flow	59%	466
	South Flow	41%	329
2020-11-08	North Flow	98%	860
	South Flow	2%	16
2020-11-09	North Flow	0%	0
	South Flow	100%	861
2020-11-10	North Flow	0%	0
	South Flow	100%	829
2020-11-11	North Flow	0%	0
	South Flow	100%	846
2020-11-12	North Flow	0%	0
	South Flow	100%	886
2020-11-13	North Flow	0%	0
	South Flow	100%	890
2020-11-14	North Flow	0%	0
	South Flow	100%	829
2020-11-15	North Flow	0%	0
	South Flow	100%	875

Appendix - Traffic Flow

Daily overview of traffic flow direction at SEA, along with the daily operations count to the right of the percentages graph.

Day	Flow	Percentage	Operations
2020-11-16	North Flow	0%	0
	South Flow	100%	850
2020-11-17	North Flow	0%	0
	South Flow	100%	817
2020-11-18	North Flow	0%	0
	South Flow	100%	853
2020-11-19	North Flow	0%	0
	South Flow	100%	886
2020-11-20	North Flow	0%	0
	South Flow	100%	927
2020-11-21	North Flow	56%	497
	South Flow	44%	394
2020-11-22	North Flow	2%	15
	South Flow	98%	891
2020-11-23	North Flow	0%	0
	South Flow	100%	885
2020-11-24	North Flow	0%	0
	South Flow	100%	885
2020-11-25	North Flow	0%	0
	South Flow	100%	931
2020-11-26	North Flow	0%	0
	South Flow	100%	606
2020-11-27	North Flow	0%	0
	South Flow	100%	806

Appendix - Traffic Flow

Daily overview of traffic flow direction at SEA, along with the daily operations count to the right of the percentages graph.

Day	Flow	Percentage	Operations
2020-11-28	North Flow	0%	0
	South Flow	100%	865
2020-11-29	North Flow	0%	0
	South Flow	100%	954
2020-11-30	North Flow	0%	0
	South Flow	100%	924
2020-12-01	North Flow	67%	592
	South Flow	33%	293
2020-12-02	North Flow	34%	279
	South Flow	66%	540
2020-12-03	North Flow	0%	0
	South Flow	100%	856
2020-12-04	North Flow	0%	0
	South Flow	100%	856
2020-12-05	North Flow	0%	0
	South Flow	100%	766
2020-12-06	North Flow	0%	0
	South Flow	100%	846
2020-12-07	North Flow	0%	0
	South Flow	100%	830
2020-12-08	North Flow	13%	104
	South Flow	87%	679
2020-12-09	North Flow	0%	0
	South Flow	100%	799

Appendix - Traffic Flow

Daily overview of traffic flow direction at SEA, along with the daily operations count to the right of the percentages graph.

Day	Flow	Percentage	Operations
2020-12-10	North Flow	0%	0
	South Flow	100%	839
2020-12-11	North Flow	0%	0
	South Flow	100%	858
2020-12-12	North Flow	0%	0
	South Flow	100%	757
2020-12-13	North Flow	0%	0
	South Flow	100%	845
2020-12-14	North Flow	0%	0
	South Flow	100%	817
2020-12-15	North Flow	0%	0
	South Flow	100%	789
2020-12-16	North Flow	0%	0
	South Flow	100%	805
2020-12-17	North Flow	0%	0
	South Flow	100%	881
2020-12-18	North Flow	0%	0
	South Flow	100%	933
2020-12-19	North Flow	0%	0
	South Flow	100%	866
2020-12-20	North Flow	0%	0
	South Flow	100%	895
2020-12-21	North Flow	19%	168
	South Flow	81%	712

Appendix - Traffic Flow

Daily overview of traffic flow direction at SEA, along with the daily operations count to the right of the percentages graph.

Day	Flow	Percentage	Operations
2020-12-22	North Flow	0%	0
	South Flow	100%	901
2020-12-23	North Flow	41%	374
	South Flow	59%	548
2020-12-24	North Flow	3%	24
	South Flow	97%	727
2020-12-25	North Flow	0%	0
	South Flow	100%	674
2020-12-26	North Flow	0%	0
	South Flow	100%	832
2020-12-27	North Flow	57%	504
	South Flow	43%	381
2020-12-28	North Flow	99%	875
	South Flow	1%	8
2020-12-29	North Flow	1%	6
	South Flow	99%	887
2020-12-30	North Flow	0%	0
	South Flow	100%	903
2020-12-31	North Flow	0%	0
	South Flow	100%	747
2021-01-01	North Flow	0%	0
	South Flow	100%	731
2021-01-02	North Flow	0%	0
	South Flow	100%	861

Appendix - Traffic Flow

Daily overview of traffic flow direction at SEA, along with the daily operations count to the right of the percentages graph.

Day	Flow	Percentage	Operations
2021-01-03	North Flow	0%	2
	South Flow	100%	895
2021-01-04	North Flow	0%	0
	South Flow	100%	889
2021-01-05	North Flow	0%	0
	South Flow	100%	773
2021-01-06	North Flow	0%	0
	South Flow	100%	781
2021-01-07	North Flow	0%	0
	South Flow	100%	815
2021-01-08	North Flow	9%	72
	South Flow	91%	740
2021-01-09	North Flow	0%	0
	South Flow	100%	715
2021-01-10	North Flow	0%	0
	South Flow	100%	795
2021-01-11	North Flow	0%	0
	South Flow	100%	795
2021-01-12	North Flow	0%	0
	South Flow	100%	759
2021-01-13	North Flow	0%	0
	South Flow	100%	758

Appendix - Traffic Flow

Daily overview of traffic flow direction at SEA, along with the daily operations count to the right of the percentages graph.

Day	Flow	Percentage	Operations
2021-01-14	North Flow	37%	302
	South Flow	63%	517
2021-01-15	North Flow	0%	1
	South Flow	100%	823
2021-01-16	North Flow	0%	0
	South Flow	100%	704
2021-01-17	North Flow	0%	0
	South Flow	100%	744
2021-01-18	North Flow	80%	636
	South Flow	21%	164
2021-01-19	North Flow	1%	7
	South Flow	99%	756
2021-01-20	North Flow	0%	0
	South Flow	100%	758
2021-01-21	North Flow	43%	347
	South Flow	57%	464
2021-01-22	North Flow	100%	859
	South Flow	0%	0
2021-01-23	North Flow	3%	18
	South Flow	97%	688
2021-01-24	North Flow	0%	0
	South Flow	100%	772

Appendix - Traffic Flow

Daily overview of traffic flow direction at SEA, along with the daily operations count to the right of the percentages graph.

Day	Flow	Percentage	Operations
2021-01-25	North Flow	0%	0
	South Flow	100%	776
2021-01-26	North Flow	0%	0
	South Flow	100%	752
2021-01-27	North Flow	0%	0
	South Flow	100%	753
2021-01-28	North Flow	0%	0
	South Flow	100%	804
2021-01-29	North Flow	0%	0
	South Flow	100%	810
2021-01-30	North Flow	0%	0
	South Flow	100%	701
2021-01-31	North Flow	0%	0
	South Flow	100%	814
2021-02-01	North Flow	0%	1
	South Flow	100%	786
2021-02-02	North Flow	0%	0
	South Flow	100%	768
2021-02-03	North Flow	26%	204
	South Flow	74%	583
2021-02-04	North Flow	0%	0
	South Flow	100%	824

Appendix - Basic Noise Metrics

Sound Exposure Level (SEL)

The Sound Exposure Level (SEL) metric represents all the acoustical energy (sound pressure) of an individual noise event as if that event had occurred within a one-second time period. SEL captures both the level (magnitude) and the duration of a sound event in a single numerical quantity, by “squeezing” all the noise energy from an event into one second. This provides a uniform way to make comparisons among noise events of various durations.

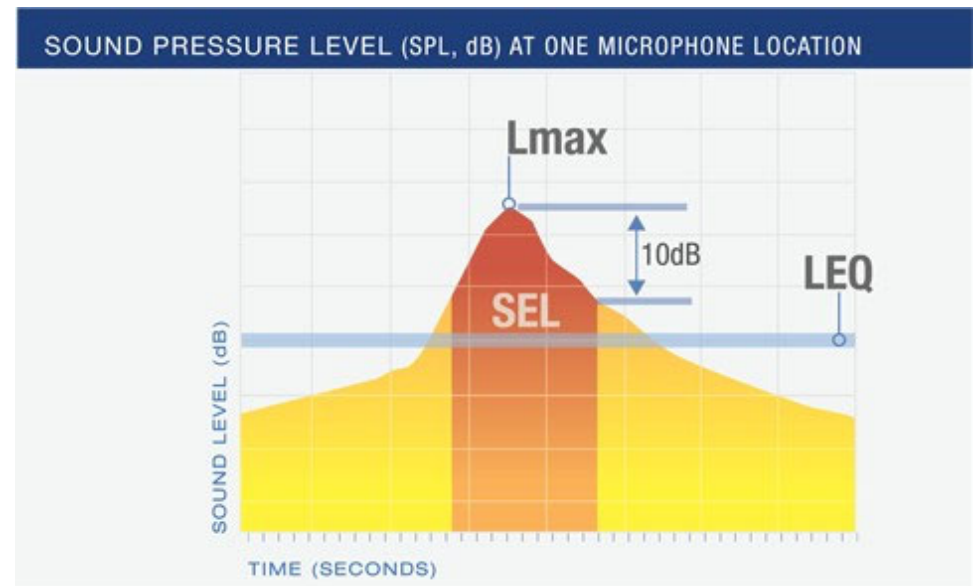
Equivalent Sound Level (LEQ)

The equivalent sound level (LEQ) measures the average acoustic energy over a period of time to take account of the cumulative effect of multiple noise events. This could, for example, provide a measure of the aggregate sound at a location that has aircraft overflights throughout the day. LEQ is defined as the level of continuous sound over a given time period that would deliver the same amount of energy as the actual, varying sound exposure.

Maximum Sound Level (Lmax)

This is the highest level displayed on a sound level during a noise event or time period. *Peak is not the same as Maximum Sound Level.*

Source: FAA website: https://www.faa.gov/regulations_policies/policy_guidance/noise/basics/



Appendix - Noise Metrics: Daily LEQ at Nautilus

Equivalent Sound Level (LEQ)

The equivalent sound level (LEQ) measures the average acoustic energy over a period of time to take account of the cumulative effect of multiple noise events. This could, for example, provide a measure of the aggregate sound at a location that has aircraft overflights throughout the day.

LEQ is defined as the level of continuous sound over a given time period that would deliver the same amount of energy as the actual, varying sound exposure.

Date/Time	NMT	LEQ Community Noise average community noise (all recorded noise not correlated with an aircraft overflight)	LEQ Aircraft Noise average aircraft noise levels	LEQ Total
11/5/2020	A002	54	54	57
11/6/2020	A002	55	55	58
11/7/2020	A002	55	54	57
11/8/2020	A002	55	51	56
11/9/2020	A002	54	46	55
11/10/2020	A002	54	50	55
11/11/2020	A002	54	52	56
11/12/2020	A002	54	48	55
11/13/2020	A002	56	48	57
11/14/2020	A002	55	49	56
11/15/2020	A002	55	48	56
11/16/2020	A002	55	49	56
11/17/2020	A002	54	44	55
11/18/2020	A002	55	49	56
11/19/2020	A002	55	48	55
11/20/2020	A002	55	49	56
11/21/2020	A002	54	54	57
11/22/2020	A002	54	47	55
11/23/2020	A002	54	50	56
11/24/2020	A002	55	47	56
11/25/2020	A002	54	50	56
11/26/2020	A002	52	48	54

Appendix - Noise Metrics: Daily LEQ at Nautilus

Equivalent Sound Level (LEQ)

The equivalent sound level (LEQ) measures the average acoustic energy over a period of time to take account of the cumulative effect of multiple noise events. This could, for example, provide a measure of the aggregate sound at a location that has aircraft overflights throughout the day. LEQ is defined as the level of continuous sound over a given time period that would deliver the same amount of energy as the actual, varying sound exposure.

Date/Time	NMT	LEQ Community Noise average community noise (all recorded noise not correlated with an aircraft overflight)	LEQ Aircraft Noise average aircraft noise levels	LEQ Total
11/27/2020	A002	53	48	54
11/28/2020	A002	53	49	55
11/29/2020	A002	54	48	55
11/30/2020	A002	62	62	65
12/1/2020	A002	55	54	57
12/2/2020	A002	55	49	56
12/3/2020	A002	53	47	54
12/4/2020	A002	54	50	55
12/5/2020	A002	54	45	54
12/6/2020	A002	54	50	55
12/7/2020	A002	53	43	53
12/8/2020	A002	53	51	55
12/9/2020	A002	53	47	54
12/10/2020	A002	54	49	55
12/11/2020	A002	54	52	56
12/12/2020	A002	54	50	56
12/13/2020	A002	54	50	56
12/14/2020	A002	54	48	55
12/15/2020	A002	54	49	55
12/16/2020	A002	55	49	56
12/17/2020	A002	55	50	56
12/18/2020	A002	55	49	56
12/19/2020	A002	55	49	56
12/20/2020	A002	54	50	56
12/21/2020	A002	55	52	57
12/22/2020	A002	55	53	57
12/23/2020	A002	54	51	56
12/24/2020	A002	53	42	54
12/25/2020	A002	54	48	55

Appendix - Noise Metrics: Daily LEQ at Nautilus

Equivalent Sound Level (LEQ)

The equivalent sound level (LEQ) measures the average acoustic energy over a period of time to take account of the cumulative effect of multiple noise events. This could, for example, provide a measure of the aggregate sound at a location that has aircraft overflights throughout the day. LEQ is defined as the level of continuous sound over a given time period that would deliver the same amount of energy as the actual, varying sound exposure.

Date/Time	NMT	LEQ Community Noise average community noise (all recorded noise not correlated with an aircraft overflight)	LEQ Aircraft Noise average aircraft noise levels	LEQ Total
12/26/2020	A002	55	47	55
12/27/2020	A002	55	54	57
12/28/2020	A002	54	54	57
12/29/2020	A002	55	52	57
12/30/2020	A002	55	47	56
12/31/2020	A002	55	48	56
1/1/2021	A002	55	48	56
1/2/2021	A002	55	48	56
1/3/2021	A002	55	50	56
1/4/2021	A002	55	47	56
1/5/2021	A002	55	47	55
1/6/2021	A002	54	53	56
1/7/2021	A002	54	51	56
1/8/2021	A002	54	52	56
1/9/2021	A002	54	47	55
1/10/2021	A002	54	50	56
1/11/2021	A002	55	47	56
1/12/2021	A002	54	50	56
1/13/2021	A002	56	50	57
1/14/2021	A002	54	48	55
1/15/2021	A002	54	52	56
1/16/2021	A002	53	50	55
1/17/2021	A002	53	50	55
1/18/2021	A002	55	55	58
1/19/2021	A002	53	47	54
1/20/2021	A002	53	51	55
1/21/2021	A002	54	54	57
1/22/2021	A002	55	53	57
1/23/2021	A002	53	50	55

Appendix - Noise Metrics: Daily LEQ at Nautilus

Equivalent Sound Level (LEQ)

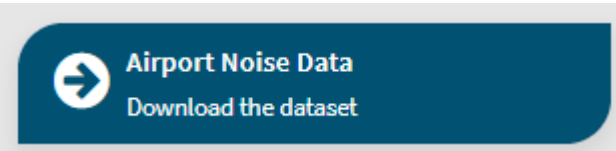
The equivalent sound level (LEQ) measures the average acoustic energy over a period of time to take account of the cumulative effect of multiple noise events. This could, for example, provide a measure of the aggregate sound at a location that has aircraft overflights throughout the day. LEQ is defined as the level of continuous sound over a given time period that would deliver the same amount of energy as the actual, varying sound exposure.

Date/Time	NMT	LEQ Community Noise average community noise (all recorded noise not correlated with an aircraft overflight)	LEQ Aircraft Noise average aircraft noise levels	LEQ Total
1/24/2021	A002	54	49	55
1/25/2021	A002	54	48	55
1/26/2021	A002	54	48	55
1/27/2021	A002	54	51	56
1/28/2021	A002	55	52	57
1/29/2021	A002	54	50	55
1/30/2021	A002	54	48	55
1/31/2021	A002	54	49	55
2/1/2021	A002	54	48	55
2/2/2021	A002	54	49	55
2/3/2021	A002	53	53	56
2/4/2021	A002	54	47	55

Appendix - SEL Reports Available Online

SEL

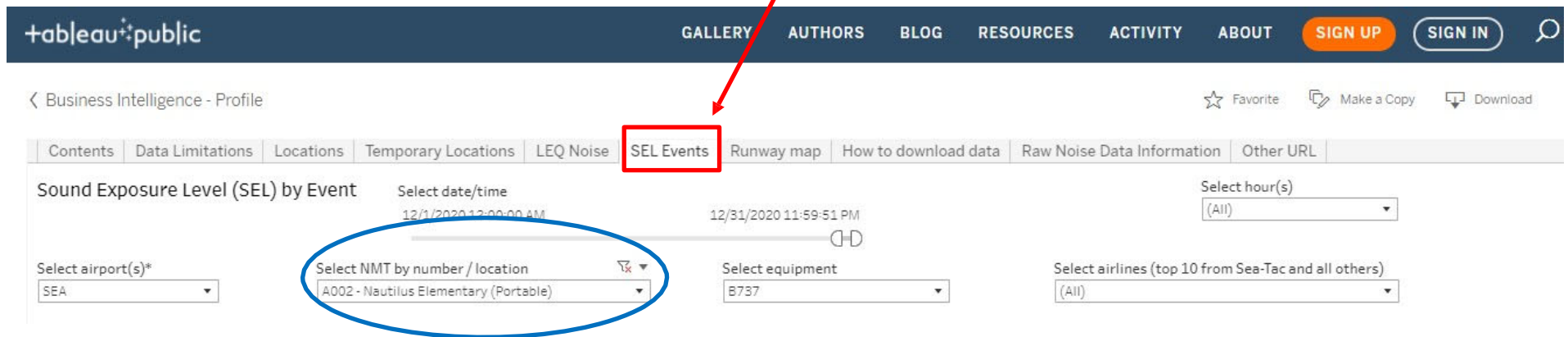
SEL—Sound Exposure Level of a noise event is measured over time between the initial and final points when the noise level exceeds a predetermined threshold and its energy is compressed into one second.



SEL data can be found on the Port of Seattle, SEA noise monitoring system data page:

<https://public.tableau.com/profile/portofseattlebi#!/vizhome/Sea-Tacnoisemonitoringsystemdata/Contents>

There you will find the SEL EVENTS tab



Data for the portable noise monitor A002—Nautilus Elementary is available on the drop down, this allows you to view and download the SEL noise events for the time the noise monitor was deployed, from November 5, 2020 to February 4, 2021. You can also download and compare SEL events at other noise monitors, such as SEA22 at Sacajawea the same way, from the drop down menu.