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# Summary

The Port of Seattle Airport Noise Programs Office installed a portable noise monitor to temporarily measure aircraft and community noise at Seahurst Elementary School, located within a neighborhood community in the City of Burien. Seahurst Elementary, within the Highline School District, was selected as the monitoring location at the recommendation and request of the City of Burien.

One of the school's portable classrooms provided exterior power to the noise monitoring equipment. The equipment was placed on the south end of metal decking for Portable classrooms P-3 & P-4 . Highline School District was on summer break during a portion of the monitoring time, with students returning to school in early September.

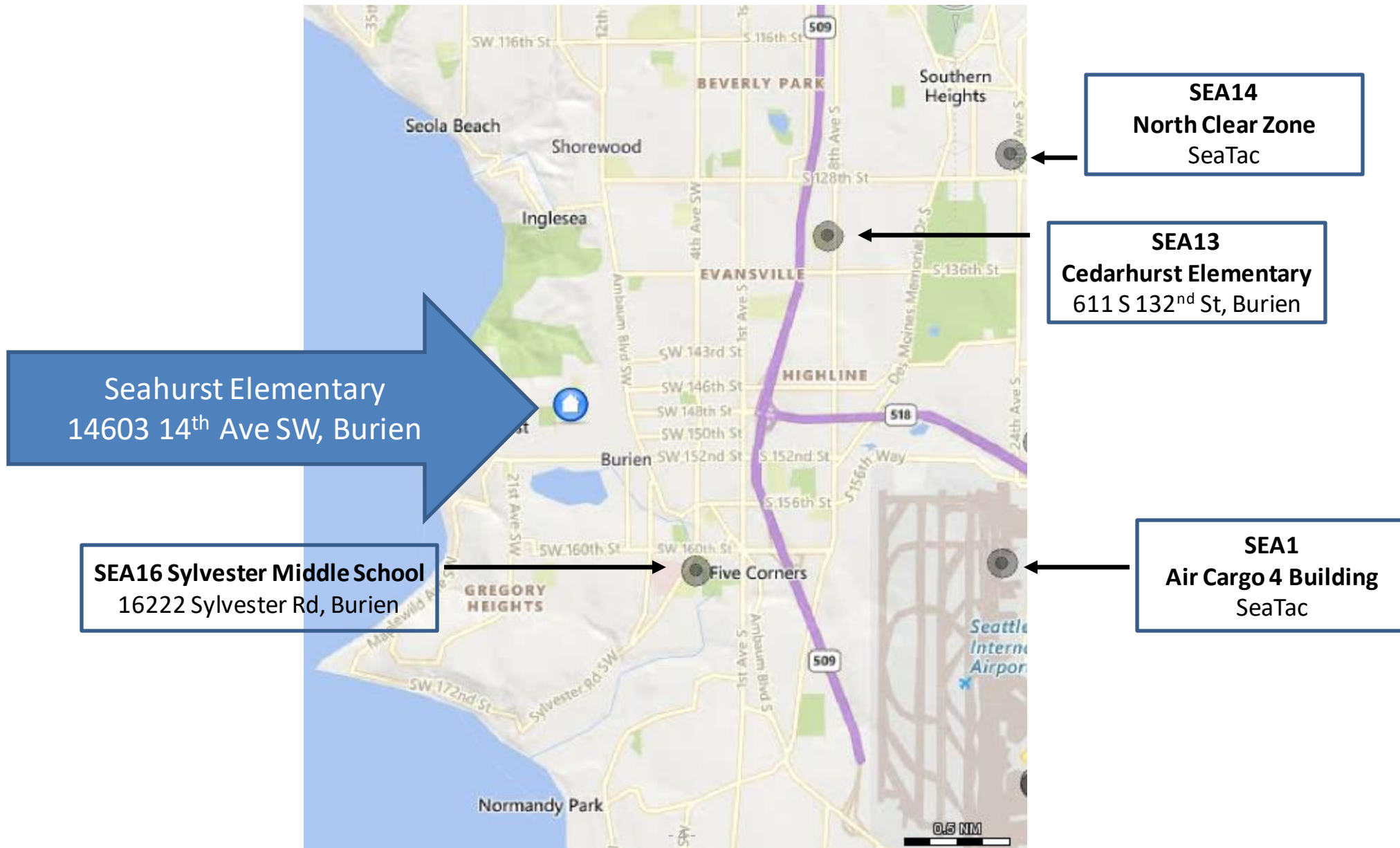
The Port of Seattle has a total of [24 permanent noise monitors](#) located throughout the local Seattle area. Within approximately 2 nautical miles from the Seahurst location are two permanent noise monitors. One nautical mile away is Sylvester Middle School (SEA15) at 16222 Sylvester Road in Burien and approximately 1.4 nautical miles from Seahurst is the Port's noise monitor at Cedarhurst Elementary School (SEA13) located at 611 S 132<sup>nd</sup> Street in Burien. Seahurst Elementary is located northwest of SEA Airport and is less than 2 nautical miles away from all three of SEA's runways.

Noise data collection at Seahurst began on July 16, 2021 and the last full day of data was September 30, 2021. The portable noise monitor was removed from Seahurst Elementary on October 1<sup>st</sup>. During this period SEA operated in south-flow 56% of the time and north-flow 44%. Through October, SEA has operated in south-flow 69% and north-flow 31% in 2021. During the monitoring period the Puget Sound region was experiencing warm summer weather and north-flow days were more frequent than at other periods of the year. During north-flow operations, aircraft depart the runways to the north and approach for landing from the south.

LEQ and SEL noise levels were recorded at the Seahurst 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 on the south side of portable classrooms P-4 and P-4 at Seahurst Elementary on the metal deck and ramp leading to the classroom entry.

**Yellow star on the map notes the approximate location of the portable noise monitor on school campus.**



# Installment of Portable B003



Portable noise monitoring microphone mast and equipment box was placed on the metal deck on the south side of the school's portable classrooms P-3 and P-4. From the main street, 14<sup>th</sup> Ave SW the mast and equipment is barely visible. Note black microphone mast in yellow photo above.

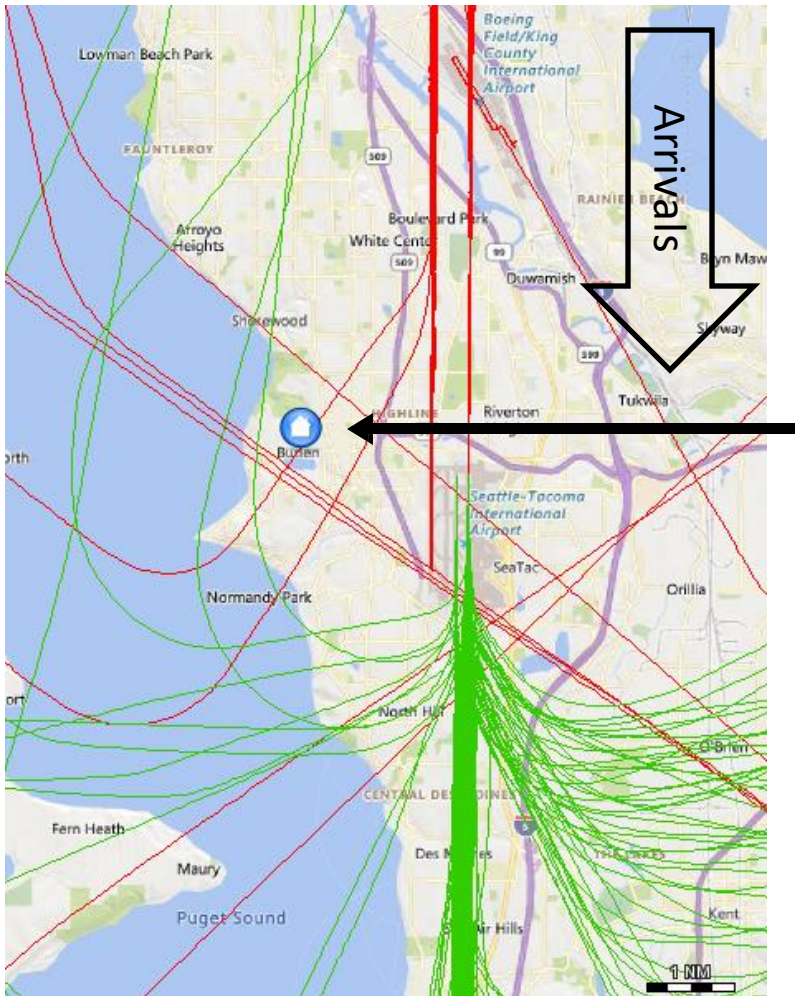
# Installation of Portable B003

The noise monitoring equipment consists of a mast that raises the microphone and a security box that houses the noise monitor, battery back-up, and other equipment. These items were secured together with a safety cable and looped through the metal handrail of the deck with a padlock. An additional padlock kept the security box tamper resistant. Power was available on the west side of the building.

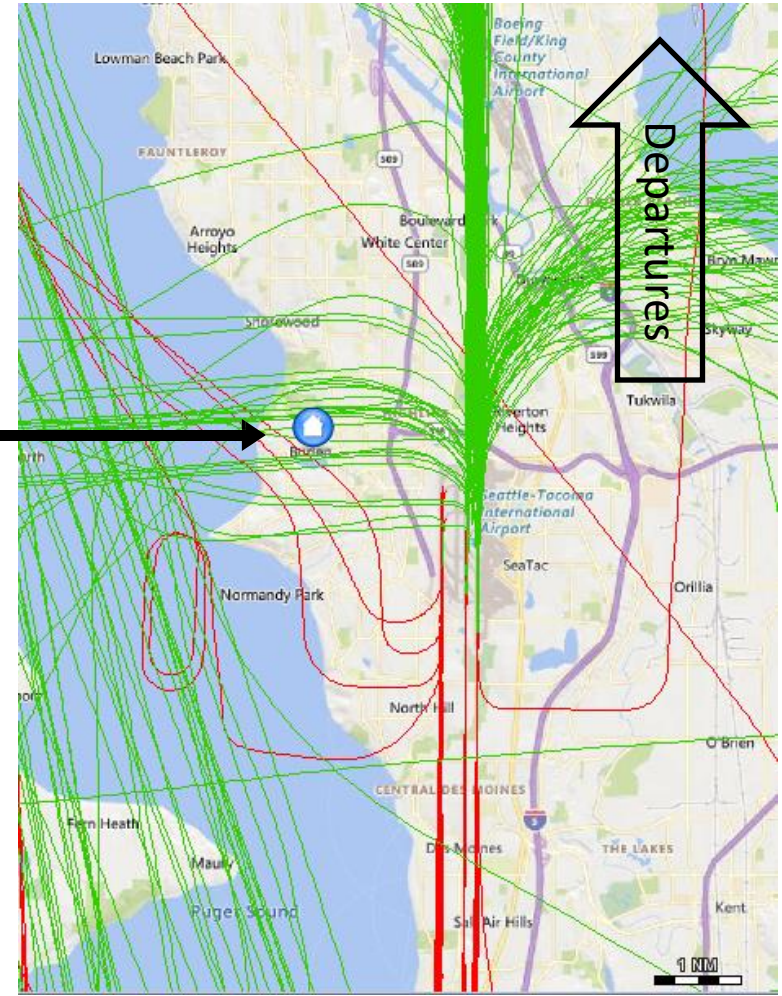


# SEA Flight Paths and Traffic Flow Direction

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](http://www.portseattle.org/projects/flight-patterns)



**Seahurst Elementary  
Portable B003**



During south-flow operations at SEA, arriving aircraft that are instructed to perform a go-around may pass over the portable noise monitor B003 at Seahurst Elementary

During north-flow operations at SEA, a portion of departing propeller aircraft are typically instructed to turn to the west after initial take off and passed over or near the portable noise monitor B003 at Seahurst Elementary



# Flight track map for July 24, 2021

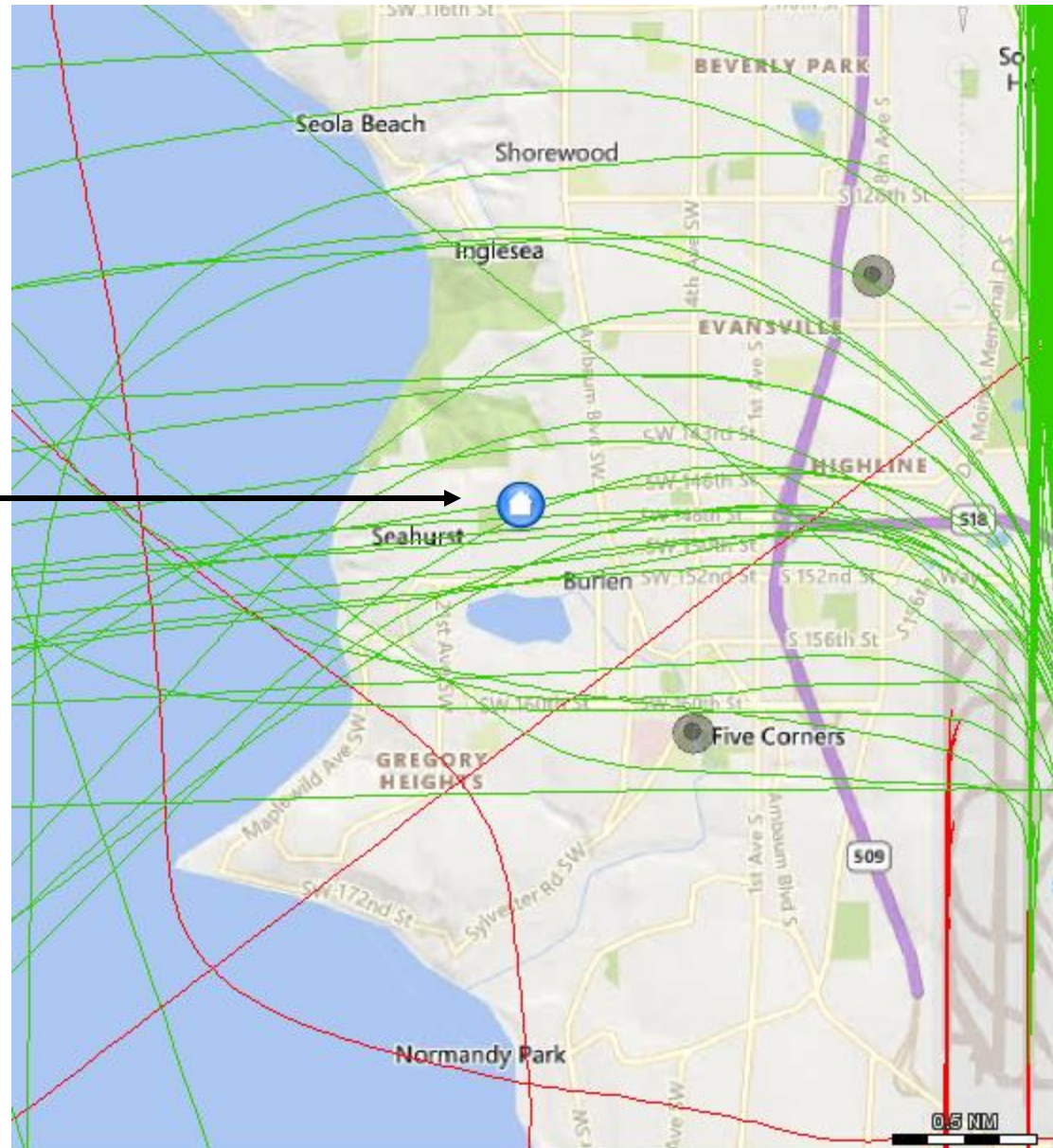
24 hours

Jet and Propeller Aircraft

1229 total operations

This map represents typical north flow operations

Portable B003 at  
Seahurst Elementary



### Legend

-  Departures
-  Arrivals

# Flight track map for September 24, 2021

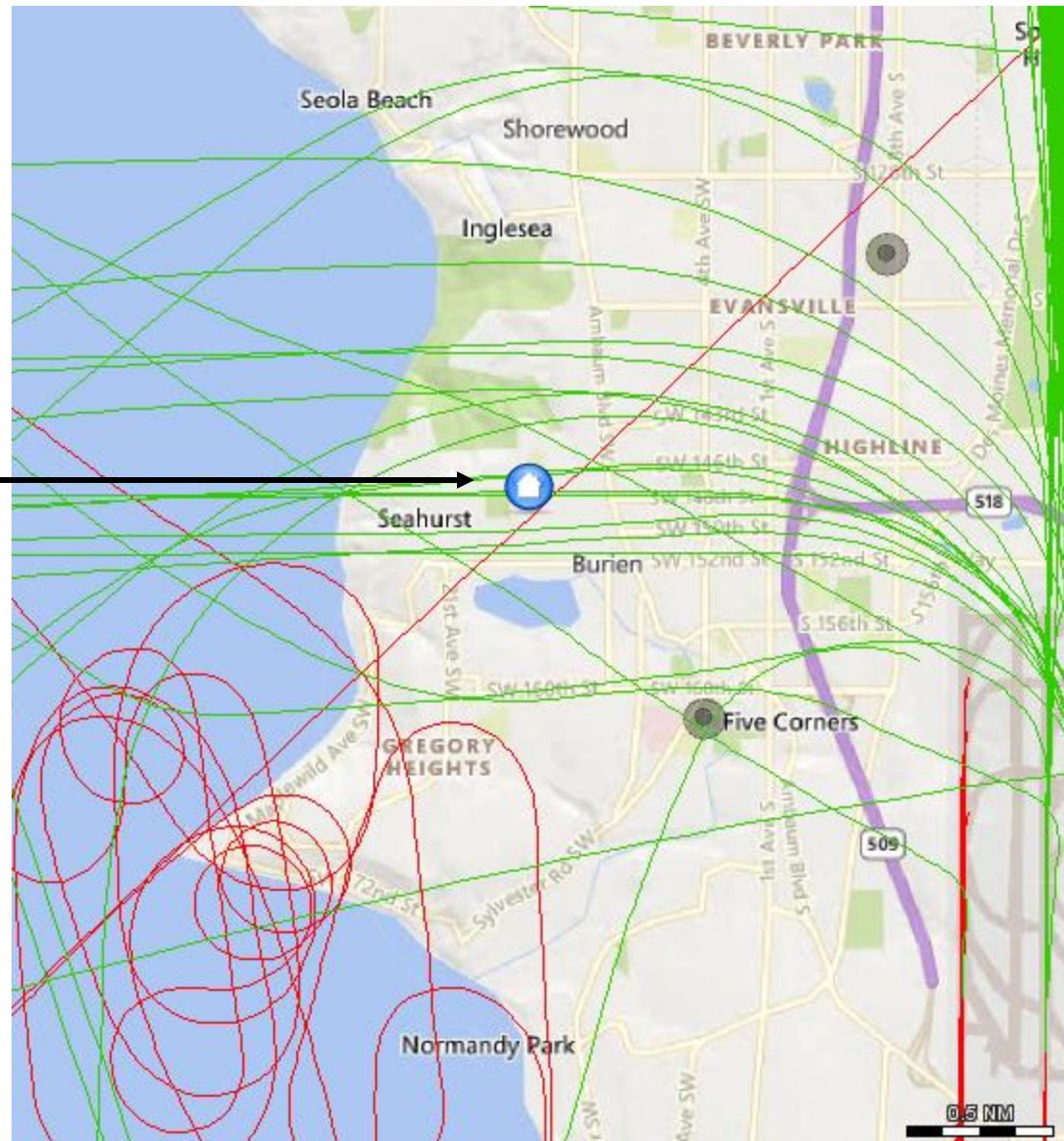
24 hours

Jet and Propeller Aircraft

1203 total operations

This map represents typical north flow operations

Portable B003 at  
Seahurst Elementary



# Flight track map for August 8, 2021

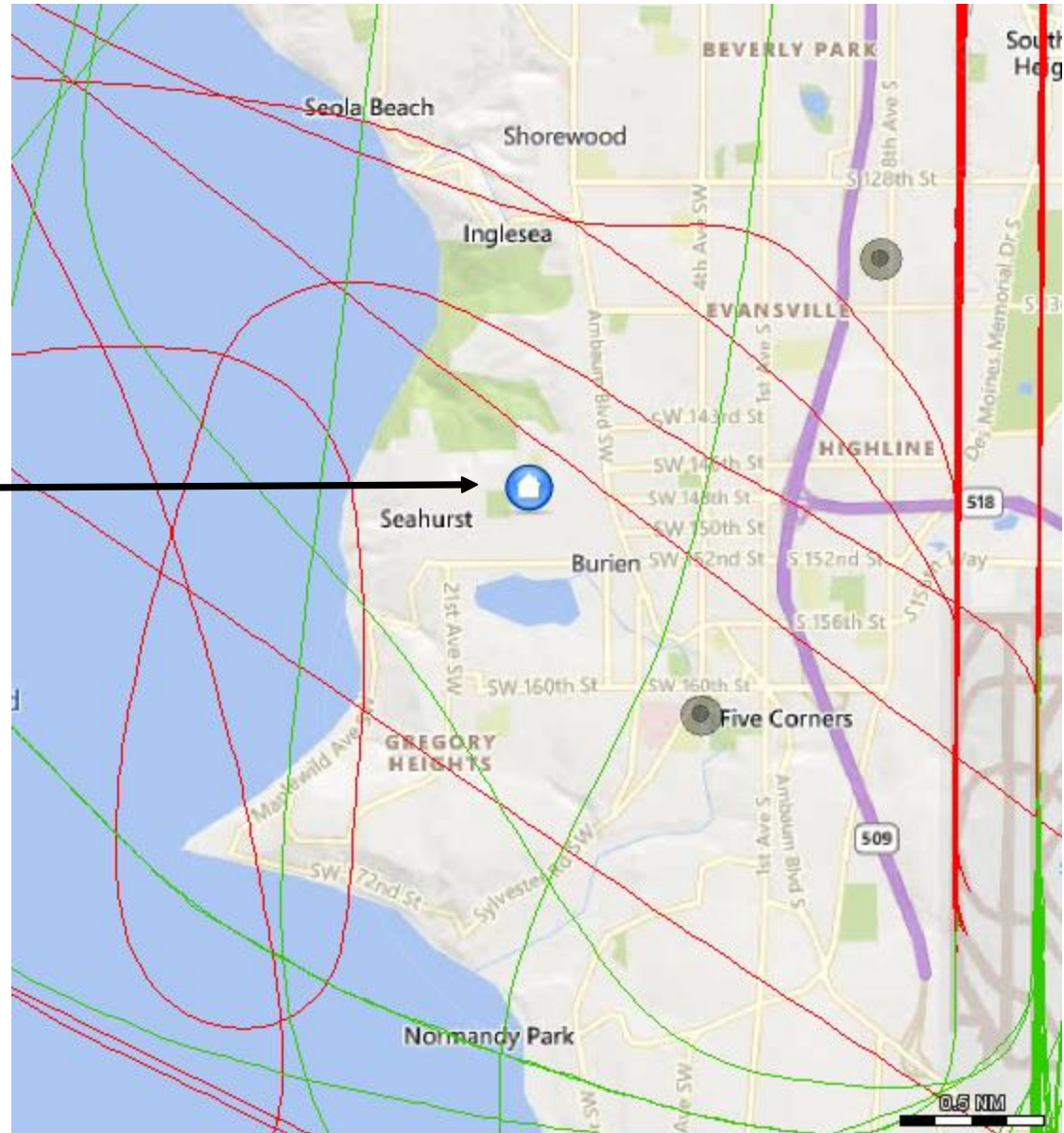
24 hours

Jet and Propeller Aircraft

1201 total operations

This map represents typical south flow operations

Portable B003 at Seahurst Elementary



### Legend

Departures

Arrivals

# Flight track map for September 30, 2021

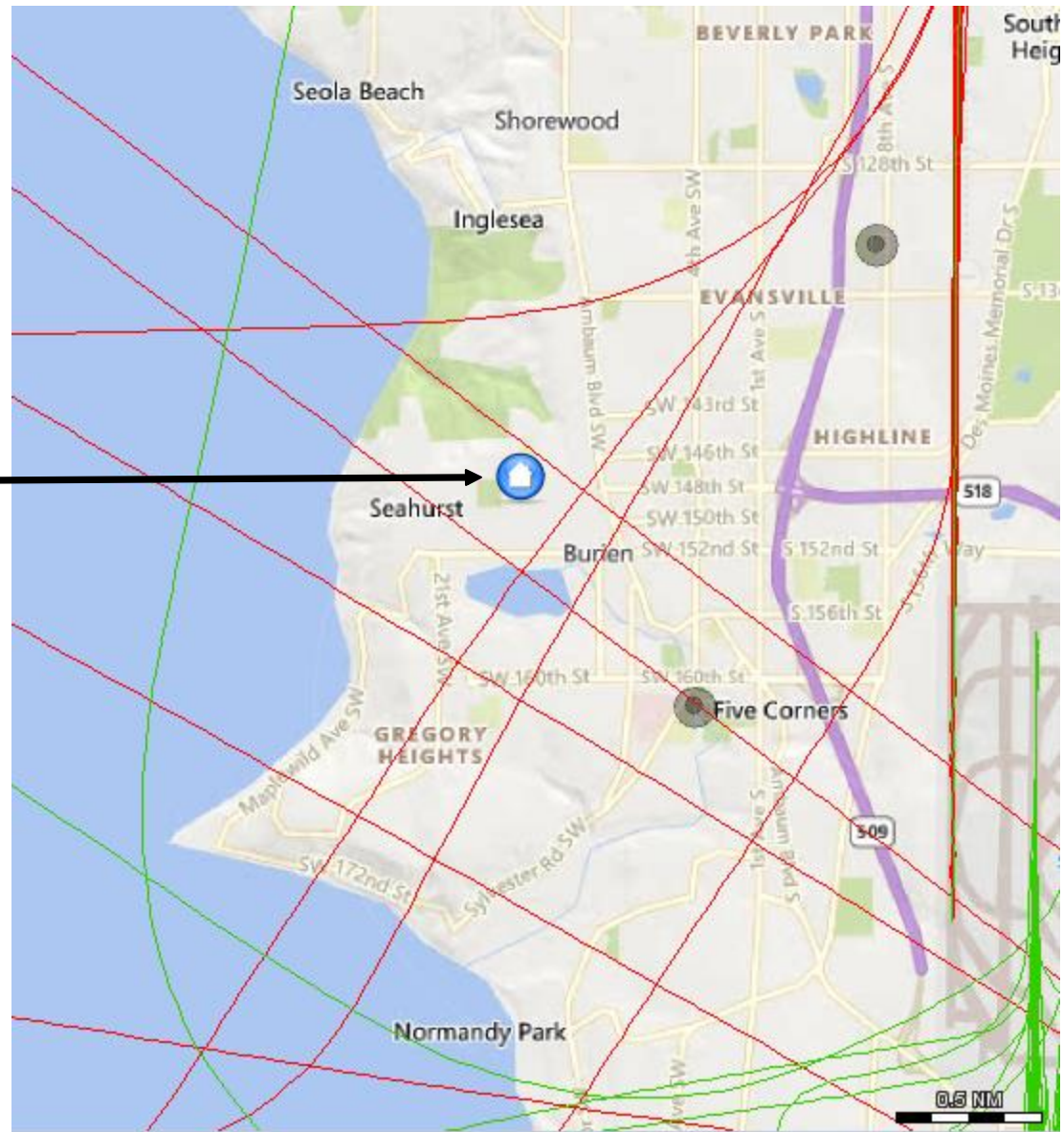
24 hours

Jet and Propeller Aircraft

1163 total operations

This map represents typical south flow operations

Portable B003 at  
Seahurst Elementary



### Legend

-  Departures
-  Arrivals

# Monthly Traffic Flow— July 16, 2021 thru October 1, 2021

The graph below shows the percentage of north-flow and south-flow operations for SEA and total operations for each flow.

The portable noise monitor was removed from Seahurst on October 1, 2021 around 2pm. The last full day of data at this location was September 30, 2021

Monthly operations at SEA were primarily South Flow from July 16 to Oct 1, 2021.

Start Date 2021-07-16 00:00:00  
 End Date 2021-10-01 23:59:59  
 Summary Level Month  
 Airport SEA

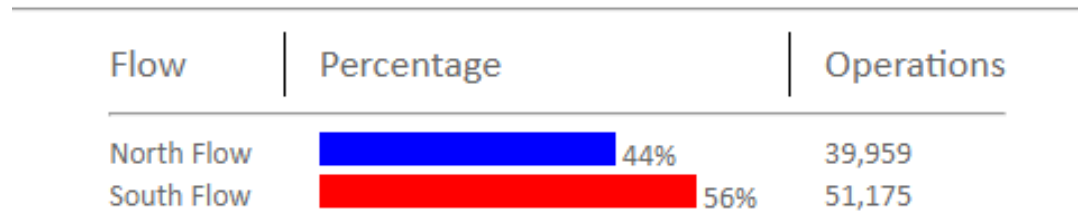
Month	Flow	Percentage	Operations
2021-07	North Flow	74%	14,049
	South Flow	26%	4,859
2021-08	North Flow	35%	13,036
	South Flow	65%	23,845
2021-09	North Flow	36%	12,337
	South Flow	64%	22,108
2021-10	North Flow	69%	815
	South Flow	31%	363

# Overall Traffic Flow— July 16, 2021, thru October 1, 2021

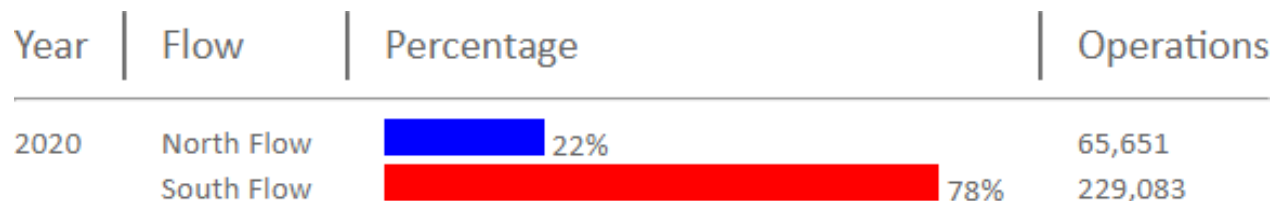
Monthly operations at SEA were primarily South Flow from July 16, 2021, to October 1, 2021.

## Airport Flow Graph

Start Date 2021-07-16 00:00:00  
 End Date 2021-10-01 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 Seahurst 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](http://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](http://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](http://www.portseattle.org/projects/flight-patterns)

**Airport Noise Programs Questions and Answers** [www.portseattle.org/page/airport-noise-programs-questions-and-answers](http://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/](http://www.faa.gov/regulations_policies/policy_guidance/noise/basics/)

Aviation Noise [www.faa.gov/regulations\\_policies/policy\\_guidance/noise/](http://www.faa.gov/regulations_policies/policy_guidance/noise/)

Community Response to Noise [www.faa.gov/regulations\\_policies/policy\\_guidance/noise/community/](http://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.

Day	Flow	Percentage	Operations
2021-07-16	North Flow	0%	0
	South Flow	100%	1,198
2021-07-17	North Flow	46%	524
	South Flow	54%	623
2021-07-18	North Flow	100%	1,168
	South Flow	0%	0
2021-07-19	North Flow	18%	219
	South Flow	82%	972
2021-07-20	North Flow	0%	0
	South Flow	100%	1,188
2021-07-21	North Flow	34%	404
	South Flow	66%	768
2021-07-22	North Flow	100%	1,195
	South Flow	0%	0
2021-07-23	North Flow	100%	1,217
	South Flow	0%	1
2021-07-24	North Flow	100%	1,160
	South Flow	0%	0
2021-07-25	North Flow	100%	1,172
	South Flow	0%	0
2021-07-26	North Flow	100%	1,186
	South Flow	0%	0
2021-07-27	North Flow	100%	1,171
	South Flow	0%	0
2021-07-28	North Flow	100%	1,181
	South Flow	0%	0
2021-07-29	North Flow	100%	1,202
	South Flow	0%	0
2021-07-30	North Flow	100%	1,202
	South Flow	0%	0
2021-07-31	North Flow	91%	1,048
	South Flow	9%	109



# 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
2021-08-01	North Flow	 25%	293
	South Flow	 75%	877
2021-08-02	North Flow	 64%	756
	South Flow	 36%	428
2021-08-03	North Flow	 61%	710
	South Flow	 39%	452
2021-08-04	North Flow	 100%	1,155
	South Flow	0%	0
2021-08-05	North Flow	 6%	76
	South Flow	 94%	1,155
2021-08-06	North Flow	0%	0
	South Flow	 100%	1,208
2021-08-07	North Flow	0%	0
	South Flow	 100%	1,182
2021-08-08	North Flow	0%	0
	South Flow	 100%	1,200
2021-08-09	North Flow	 52%	623
	South Flow	 48%	573
2021-08-10	North Flow	 100%	1,196
	South Flow	0%	0
2021-08-11	North Flow	 100%	1,185
	South Flow	0%	0
2021-08-12	North Flow	 100%	1,231
	South Flow	0%	0
2021-08-13	North Flow	 5%	58
	South Flow	 95%	1,145
2021-08-14	North Flow	0%	1
	South Flow	 100%	1,144
2021-08-15	North Flow	0%	0
	South Flow	 100%	1,188
2021-08-16	North Flow	0%	0
	South Flow	 100%	1,208

# 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
2021-08-17	North Flow	0%	0
	South Flow	100%	1,159
2021-08-18	North Flow	34%	404
	South Flow	66%	770
2021-08-19	North Flow	2%	24
	South Flow	98%	1,193
2021-08-20	North Flow	0%	0
	South Flow	100%	1,215
2021-08-21	North Flow	0%	0
	South Flow	100%	1,162
2021-08-22	North Flow	0%	0
	South Flow	100%	1,179
2021-08-23	North Flow	44%	522
	South Flow	56%	671
2021-08-24	North Flow	100%	1,172
	South Flow	0%	0
2021-08-25	North Flow	5%	55
	South Flow	95%	1,135
2021-08-26	North Flow	0%	1
	South Flow	100%	1,213
2021-08-27	North Flow	51%	632
	South Flow	49%	599
2021-08-28	North Flow	100%	1,164
	South Flow	0%	0
2021-08-29	North Flow	100%	1,189
	South Flow	0%	0
2021-08-30	North Flow	7%	81
	South Flow	93%	1,113
2021-08-31	North Flow	43%	508
	South Flow	57%	676
2021-09-01	North Flow	72%	855
	South Flow	28%	329

# 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
2021-09-02	North Flow	61%	746
	South Flow	39%	472
2021-09-03	North Flow	61%	742
	South Flow	39%	471
2021-09-04	North Flow	3%	40
	South Flow	97%	1,111
2021-09-05	North Flow	23%	266
	South Flow	77%	876
2021-09-06	North Flow	58%	680
	South Flow	42%	485
2021-09-07	North Flow	100%	1,166
	South Flow	0%	0
2021-09-08	North Flow	1%	10
	South Flow	99%	1,106
2021-09-09	North Flow	0%	0
	South Flow	100%	1,177
2021-09-10	North Flow	0%	0
	South Flow	100%	1,168
2021-09-11	North Flow	43%	466
	South Flow	57%	617
2021-09-12	North Flow	59%	665
	South Flow	41%	462
2021-09-13	North Flow	65%	744
	South Flow	35%	404
2021-09-14	North Flow	2%	22
	South Flow	98%	1,110
2021-09-15	North Flow	95%	1,056
	South Flow	5%	57
2021-09-16	North Flow	73%	852
	South Flow	27%	323
2021-09-17	North Flow	1%	12
	South Flow	99%	1,170

# 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
2021-09-18	North Flow	0%	0
	South Flow	100%	1,086
2021-09-19	North Flow	0%	0
	South Flow	100%	1,166
2021-09-20	North Flow	46%	533
	South Flow	54%	614
2021-09-21	North Flow	100%	1,132
	South Flow	0%	1
2021-09-22	North Flow	43%	484
	South Flow	57%	632
2021-09-23	North Flow	55%	636
	South Flow	45%	524
2021-09-24	North Flow	100%	1,186
	South Flow	0%	0
2021-09-25	North Flow	4%	43
	South Flow	96%	1,070
2021-09-26	North Flow	0%	0
	South Flow	100%	1,127
2021-09-27	North Flow	0%	0
	South Flow	100%	1,160
2021-09-28	North Flow	0%	0
	South Flow	100%	1,114
2021-09-29	North Flow	0%	0
	South Flow	100%	1,114
2021-09-30	North Flow	0%	1
	South Flow	100%	1,162
2021-10-01	North Flow	69%	815
	South Flow	31%	363

# 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.

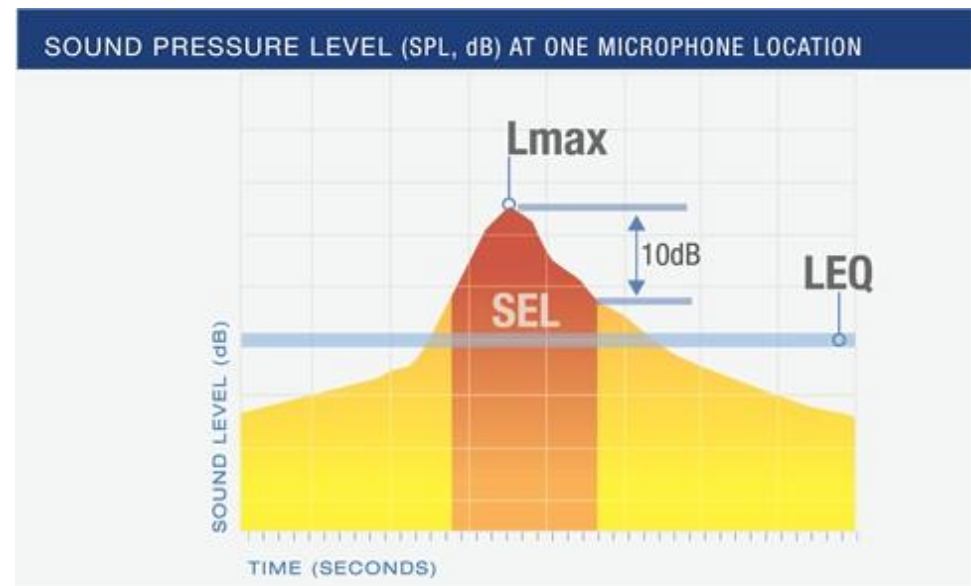
## Equivalent Sound Level (LEQ)

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/](https://www.faa.gov/regulations_policies/policy_guidance/noise/basics/)



# Appendix - Noise Metrics: Daily LEQ at Seahurst B003

## 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	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
7/17/2021	B003	46	39	46
7/18/2021	B003	47	40	47
7/19/2021	B003	58	39	58
7/20/2021	B003	54	40	54
7/21/2021	B003	49	40	50
7/22/2021	B003	48	42	49
7/23/2021	B003	48	40	49
7/24/2021	B003	47	39	48
7/25/2021	B003	48	40	49
7/26/2021	B003	48	41	49
7/27/2021	B003	48	41	49
7/28/2021	B003	50	41	50
7/29/2021	B003	49	43	50
7/30/2021	B003	62	61	65
7/31/2021	B003	50	46	51
8/1/2021	B003	44	37	45
8/2/2021	B003	48	40	49
8/3/2021	B003	48	43	49
8/4/2021	B003	48	43	50
8/5/2021	B003	48	43	49
8/6/2021	B003	51	34	51
8/7/2021	B003	46	36	46
8/8/2021	B003	44	30	45
8/9/2021	B003	47	40	48
8/10/2021	B003	50	42	50
8/11/2021	B003	57	43	57
8/12/2021	B003	53	44	53
8/13/2021	B003	48	39	48
8/14/2021	B003	47	39	48

# Appendix - Noise Metrics: Daily LEQ at Seahurst B003

## 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 account of energy as the actual, varying sound exposure.

Date	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
8/15/2021	B003	46	38	47
8/16/2021	B003	57	53	58
8/17/2021	B003	45	41	47
8/18/2021	B003	46	37	47
8/19/2021	B003	45	38	46
8/20/2021	B003	53	52	56
8/21/2021	B003	45	39	46
8/22/2021	B003	45	36	46
8/23/2021	B003	46	42	47
8/24/2021	B003	47	40	48
8/25/2021	B003	47	41	48
8/26/2021	B003	46	37	46
8/27/2021	B003	48	42	49
8/28/2021	B003	48	41	49
8/29/2021	B003	49	41	49
8/30/2021	B003	46	42	47
8/31/2021	B003	48	41	48
9/1/2021	B003	47	40	48
9/2/2021	B003	51	43	52
9/3/2021	B003	50	42	50
9/4/2021	B003	46	38	47
9/5/2021	B003	46	41	47
9/6/2021	B003	46	41	47
9/7/2021	B003	68	42	68
9/8/2021	B003	50	44	51
9/9/2021	B003	51	43	52
9/10/2021	B003	48	45	50
9/11/2021	B003	46	38	46
9/12/2021	B003	46	40	47

# Appendix - Noise Metrics: Daily LEQ at Seahurst B003

## 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.

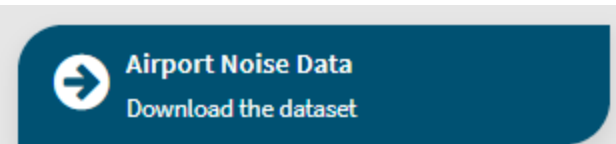
Date	NMT	LEQ Community Noise average community noise (all recorded noise not correlated with an aircraft overflight)	LEQ Aircraft Noise average aircraft noise levels	LEQ Total
9/13/2021	B003	47	40	48
9/14/2021	B003	50	43	51
9/15/2021	B003	54	42	55
9/16/2021	B003	51	47	52
9/17/2021	B003	51	48	53
9/18/2021	B003	52	0	52
9/19/2021	B003	47	38	47
9/20/2021	B003	51	44	52
9/21/2021	B003	53	47	54
9/22/2021	B003	51	43	52
9/23/2021	B003	51	43	52
9/24/2021	B003	51	42	52
9/25/2021	B003	48	40	49
9/26/2021	B003	49	43	50
9/27/2021	B003	52	48	53
9/28/2021	B003	51	47	52
9/29/2021	B003	52	47	53
9/30/2021	B003	52	46	53
10/1/2021	B003	52	45	53



# 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

A screenshot of the Tableau public interface for "Sea-Tac noise monitoring system data" by Business Intelligence. The top navigation bar includes "DISCOVER", "BLOG", "RESOURCES", "ABOUT", "SIGN UP", and "SIGN IN". Below the navigation bar, a series of tabs are visible: "Contents", "Data Limitations", "Locations", "Temporary Locations", "LEQ Noise", "SEL Events" (highlighted with a red box and a red arrow), "Runway map", "How to download data", "Raw Noise Data Information", "Other URL", and "NMT Data Gaps". The main content area is titled "Sound Exposure Level (SEL) by Event" and features several filters: "Select date/time" (7/16/2021 12:00:00 AM to 10/1/2021 11:59:51 PM), "Select hour(s)" ((All)), "Select airport(s)\*" (SEA), "Select NMT by number / location" (B003 - Seahurst Elementary (Portable) - circled in blue), "Select equipment" ((All)), and "Select airlines (top 10 from Sea-Tac and all others)" ((All)).

Data for the portable noise monitor B003—Seahurst 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 July 16, 202, to October 1, 2021. You can also download and compare SEL events at other noise monitors from the drop-down menu.