SFO COMMUNITY ROUNDTABLE

Meeting Agenda
Regular Meeting

Wednesday, June 4, 2025 - 7:00 p.m.
David J. Chetcuti Community Room
450 Poplar Ave | Millbrae, CA 94030
Hybrid Option: https://smcgov.zoom.us/j/93011857218
Call-in: US: +1(669)900-6833 Webinar ID: 930 1185 7218

This meeting of the San Francisco Airport Community Roundtable will be in person at the above-mentioned address. Members of the public will be able to participate in the meeting remotely via the Zoom platform or in person at 450 Poplar Avenue, Millbrae, CA 94030.

Public Comment

In-person Participation:
If you wish to speak to the Membership, please fill out a speaker's slip located at the entrance. If you have anything you want to distribute to the Membership and include in the official record, please hand it to the Clerk who will distribute the information to the Membership and Staff.

Via Teleconference (Zoom):
The meeting may be accessed through Zoom online at https://smcgov.zoom.us/j/93011857218
The webinar ID: 930 1185 7218. The meeting may also be accessed via telephone by dialing +1-669-900-6833, entering webinar 930 1185 7218 then pressing #. You will be asked to enter an email address and name. We request that you identify yourself by name as this will be visible online and will be used to notify you that it is your turn to speak. When the Chairperson calls for the item on which you wish you speak click on the "raise-hand" icon. You will then be called on and unmuted to speak.

Written Public Comments:
Written comment should be emailed to sforoundtable@smcgov.org. Your email should include the specific agenda item for which you are submitting a comment. Members of the public are limited to one written comment per agenda item and the length of the emailed comment should be commensurate with two minutes or approximately 300 words. Written comments received by 5:00 pm on the day before the meeting, will be provided to the Roundtable, made publicly available on the website and read during the meeting.

ADA Requests

Individuals who require special assistance or a disability-related modification or accommodation to participate in this meeting, or who have a disability and wish to request an alternative format for the agenda packet or other writings that may be distributed at the meeting, should contact staff as early as possible but no later than 10:00 am the day before the meeting at SFORoundtable@smcgov.org Notification in advance of the meeting will enable Staff to make reasonable arrangements to ensure accessibility to this meeting, the materials related to it, and your ability to comment.

TOWN OF ATHERTON| CITY OF BELMONT| CITY OF BRISBANE| CITY OF BURLINGAME| TOWN OF COLMA| CITY OF DALY CITY CITY OF EAST PALO ALTO| CITY OF FOSTER CITY| CITY OF HALF MOON BAY| TOWN OF HILLSBOROUGH| CITY OF MENLO PARK| CITY OF MILLBRAE| CITY OF PACIFICA|TOWN OF PORTOLA VALLEY| CITY OF REDWOOD CITY| CITY OF SAN BRUNO CITY OF SAN CARLOS| CITY OF SAN MATEO| CITY OF SOUTH SAN FRANCISCO| TOWN OF WOODSIDE

AGENDA

1. Call to Order / Roll Call / Declaration of a Quorum Present

2. Public Comment on Items NOT on the Agenda
   Speakers are limited to two minutes. Roundtable members cannot discuss or take action on any matter raised under this item.

3. Action to set Agenda and to Approve Consent Items

4. Chairman Update

CONSENT AGENDA

All items on the Consent Agenda are approved/accepted in one motion. A Roundtable Member can make a request, before action on the Consent Agenda, to transfer a Consent Agenda item to the Regular Agenda. Any items on the Regular Agenda may be similarly transferred to the Consent Agenda.

5.	Approval of SFO Community Roundtable Minutes: April 2, 2025	*Action*	Page 3
6.	Airport Director's Report: • March 2025 • April 2025	*Action*	Page 7
7.	HMMH FAA IFP Information Gateway: • April 2025 • May 2025	*Information*	Page 21

REGULAR AGENDA

Public Comment will be received on Regular Agenda items prior to action or discussion by the Roundtable.

8.	SFO International Airport Update • Update on SFO's Fly Quiet Program • Aircraft Noise Office Update	*Information*	Page 27
9.	Ground-Based Noise Measurement Program Summary of Results	*Information*	Page 37

UPDATES

10.	Member Updates	*Information*	Verbal

11. Adjourn

SFO Airport/Community Roundtable
Meeting No 355 -- Minutes
Wednesday, April 2, 2025

Call to Order / Roll Call / Declaration of a Quorum Present (00:03:53)

Roundtable Chair Christine Krolik called to order the Regular Meeting of the SFO Airport/Community Roundtable on Wednesday, April 2, at 7:00 p.m., at the David J. Chetcuti Community Room, 450 Poplar Avenue, Millbrae, CA.

All regular members were present with the exception of City and County of San Francisco Board of Supervisors; City and County of San Francisco Mayor's Office; San Mateo County Board of Supervisors; Town of Atherton, Town of Colma, City of East Palo Alto, City of Menlo Park, City of Pacifica, City of San Mateo.

A quorum (at least 13 Regular Members) was present.

ROUNDTABLE STAFF
Vanessa Lee – Roundtable Coordinator
Diane Estipona – Roundtable Administrative Secretary
Eugene Reindel, HMMH – Roundtable Technical Consultant

SAN FRANCISCO INTERNATIONAL AIRPORT STAFF
Bert Ganoung, Noise Office Manager
Doug Yakel, Chief Information Officer
Anthony Carpeneti, Noise Abatement Specialist

AGENDA

2. Public Comments for Items NOT on the Agenda (00:05:37)

Chair Krolik opened public comments for items not on the agenda. Public comments were heard by:

- Michael Harris pointed out that the noise insulation in his home is inadequate and noted that he reached out the SFO's Noise Office for assistance. He encouraged Roundtable members to support seniors in South San Francisco.
- Darlene Yaplee expressed her gratitude to Mark Nagales for coordinating speakers for the Aviation Noise & Emissions (ANE) Symposium in March 2025, and to Bert Ganoung for leading the session on the 21st Century Noise Office.
- Ann Schneider thanked the SFO Noise Office and Roundtable staff for sharing the ground-based noise studies with the City of Millbrae. She also recommended that the Technical Working Group subcommittee incorporate noise monitoring topics from the ANE Symposium into their discussions.

- Gerardo Frias from the SFO Noise Office provided clarification on his interactions with an earlier commenter, Michael Harris.

Chair Krolik closed public comments.

3. Action to set Agenda and to Approve Consent Items (00:14:25)
Vice Chair O'Connell pulled Item 7 for further discussion.

Member DiGiovanni moved to approve to set and approve the consent calendar. Member Alvarez seconded the motion. The motion passed with all present members.

4. Chairman Update (0:29:40)
Chair Krolik thanked everyone for taking part in the subcommittee poll and noted that she will be contacting potential candidates for the Technical Working Group. Chair Krolik also informed the members that an invitation has been extended to federal elected officials to involve them in the Roundtable meeting. She concluded by station that staff has developed a draft work plan for fiscal year 2025-2026, which will be reviewed in an upcoming Technical Working Group meeting.

CONSENT AGENDA

5. *ACTION:* Approval of SFO Community Roundtable Minutes: February 5, 2025 (00:14:40)
This was approved in item three.

6. *INFORMATION:* San Francisco Airport Community Roundtable FY 2025-26 Workplan Update (00:30:30)
Chair Krolik stated that this item will first be reviewed by the Technical Working Group Subcommittee before being presented to the full Roundtable membership at the June meeting.

7. *ACTION:* Airport Director's Report: January 2025 and February 2025
Vice-chair O'Connell requested that the SFO Noise Office provide clarification on the purpose of the Airport Directors Reports so that members can interpret them more effectively. Bert Ganoung explained that the report presents aircraft noise levels, showing monthly fluctuations and comparing data across different noise monitoring models and measurements.

Chair Krolik opened public comments for items not on the agenda. Public comments were heard by:

- Remi Tan expressed appreciation to Bert for sharing the noise data but noted that noise remains a problem at his residence.
- Ann Schneider remarked that, historically, Millbrae residents have struggled to file noise complaints due to difficulty identifying the responsible aircraft. However, if the process has improved, she would be glad to share that information with fellow neighbors.

- Bert Ganoung assured the public that every complaint reported to the SFO Noise Office is documented, investigated, and evaluated by the SFO Noise Office.

Chair Krolik closed public comments.

Vice-chair O'Connell moved to approve to set and approve this item. Member DiGiovanni seconded the motion. The motion passed with all present members.

8. *INFORMATION:* HMMH FAA IFP Information Gateway: January 2025 through March 2025

Chair Krolik opened and closed public comments for this item. No public comments were received.

REGULAR AGENDA

9. *INFORMATION:* SFO International Airport Update (00:32:15)

Mike Nakornkhet introduced himself as the new SFO director and provided a brief overview of his professional background.

Mr. Nakornkhet began his presentation by sharing that SFO's passenger traffic in March has reached 96% of pre-pandemic 2019 levels, noting that airlines are now deploying newer, larger aircraft to accommodate the growing number of travelers. He noted that United Airlines has launched a new route from SFO to Adelaide, Australia, and will continue to offer flights to Panama City, San Jose (Costa Rica), and Portugal later this year.

a) SFO International Airport Development Plan (00:35:50)
   Doug Yakel highlighted that this presentation, originally shared in 2019 with the Roundtable and City Councils, was delayed by the pandemic and offers an update on the project's progress. He noted that the plan details how SFO, with its existing four runways can efficiently serve passengers without adding more runways. The goals are to modernize SFO, improve the passenger experience, and align facilities with the current runway capacity.

b) Aircraft Noise Office Update (00:58:48)
   Bert Ganoung opened the presentation and provided updates on several initiatives, including the Fly Quiet Program, the Portable Noise Monitoring Program, with a specific focus on monitoring in East Palo Alto and Pacifica, and the Second Chance Initiatives.

Chair Krolik opened public comments for items not on the agenda. Public comments were heard by:

- Ann Schneider expressed concern about the limited input the City of Millbrae has on land use developments within San Mateo County, particularly regarding the airport's addition of Terminal One, which has led to increased low-frequency noise affecting the city.

- Remi Tan expressed concerns about the airport expansion, noting that the increased passenger capacity is likely to result in more late-night flights and overall nighttime noise from the airport.

Member Patric Jonsson inquired whether the newer, higher-capacity aircraft are louder during takeoff. Bert Ganoung confirmed that while heavier aircraft generally tend to be louder, the newer models are not necessarily louder.

Chair Krolik closed public comments.

UPDATES

10. *INFORMATION:* Noise 101 Training (01:01:25)

SFO Roundtable Coordinator Vanessa Lee opened the presentation on the Noise 101 training, which covered the Roundtable's objectives, the purpose of its meetings, and an overview of the key partners and members that comprise the Aircraft Roundtable Panel.

The membership viewed an informational video presented by HMMH Technical Consultants Gene Reindel and Kate Larson, as well as Bert Ganoung of the SFO Noise Office. The training covered aircraft noise metrics, relevant regulations, historical context regarding airport Noise, and associated impacts of Noise from airports.

Members engaged in discussions regarding the use of portable noise monitors, runways, and aircraft operations.

11. *INFORMATION:* Member Updates (01:57:05)

No new updates from the membership.

12. Adjournment

Chairman Krolik adjourned the meeting at approximately 9:00 P.M.

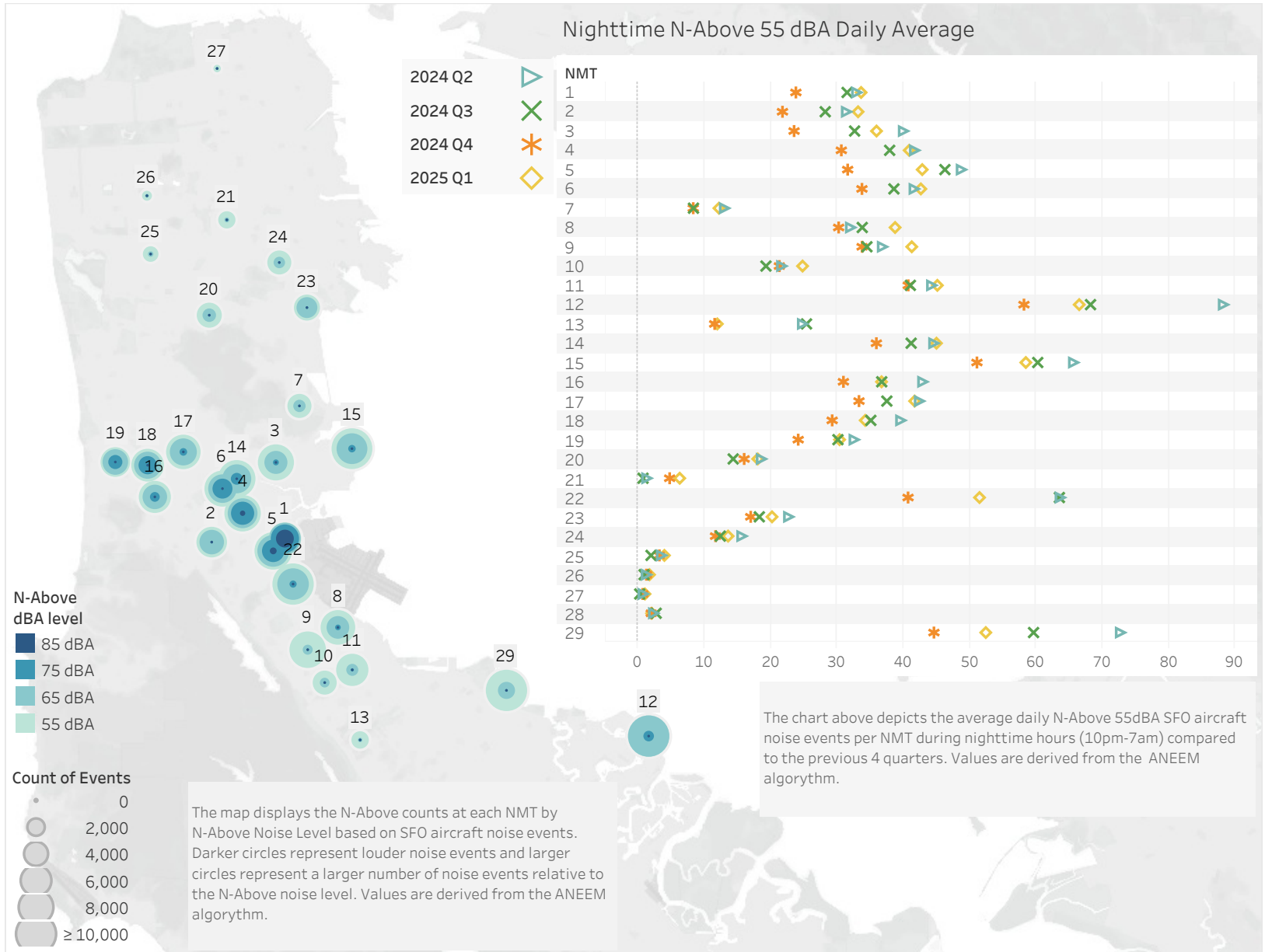
Airport Director's Report

Presented at the June 4, 2025
Airport/Community Roundtable Meeting

Aircraft Noise Office
March 2025

Aircraft Noise Levels Summary

March 2025

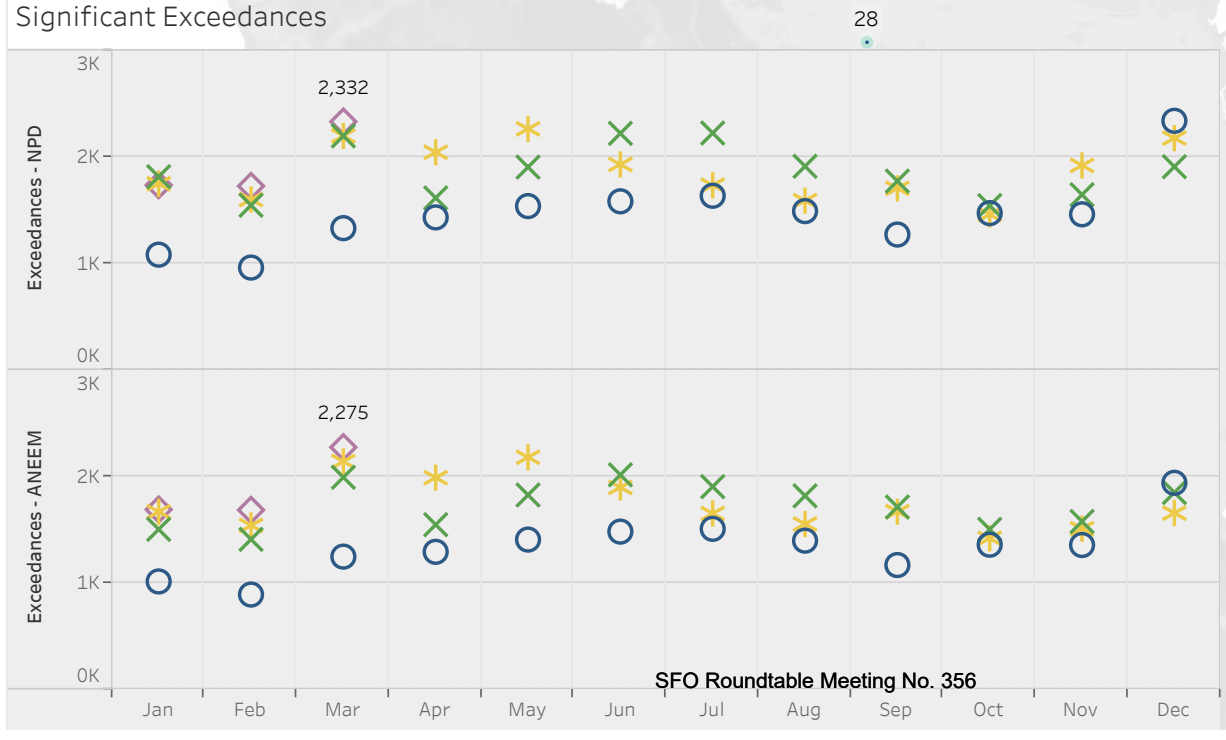


The map displays the N-Above counts at each NMT by N-Above Noise Level based on SFO aircraft noise events. Darker circles represent louder noise events and larger circles represent a larger number of noise events relative to the N-Above noise level. Values are derived from the ANEEM algorithm.

Nighttime N-Above 55 dBA Daily Average

The chart above depicts the average daily N-Above 55dBA SFO aircraft noise events per NMT during nighttime hours (10pm-7am) compared to the previous 4 quarters. Values are derived from the ANEEM algorithm.

Significant Exceedances



Significant Exceedances (right) displayes a total count of SFO aircraft noise events that produced a noise level higher than the maximum allowable decibel value established for a particular monitoring site.

Aircraft Noise Levels Details

March 2025

		ANOMS						ANEEM			
		Aircraft				Community		Aircraft			
NMT	City	Noise Events (AVG Day)	CNEL (dBA)	SEL (dBA)	LMax (dBA)	CNEL (dBA)	Ambient Level (dBA)	Noise Events (AVG Day)	CNEL (dBA)	SEL (dBA)	LMax (dBA)
1	San Bruno	183	73	93	82	66	55	204	73	93	80
2	San Bruno	106	57	81	69	64	51	187	58	79	66
3	SSF	91	57	81	69	60	47	287	58	77	64
4	SSF	157	68	89	77	59	45	279	68	86	70
5	San Bruno	169	67	88	76	61	47	281	67	86	70
6	SSF	147	65	87	75	57	43	273	65	84	68
7	Brisbane	34	50	79	68	57	44	164	52	74	61
8	Millbrae	16	53	89	75	65	50	238	57	78	64
9	Millbrae	10	41	80	66	58	41	376	51	70	57
10	Burlingame	8	41	81	67	59	43	184	49	74	59
11	Burlingame	10	44	82	67	57	42	275	52	72	58
12	Foster City	374	63	82	71	59	42	476	63	81	69
13	Hillsborough	5	36	78	65	56	41	90	46	70	57
14	SSF	150	62	83	71	59	43	304	62	80	65
15	SSF	172	59	82	70	60	45	353	59	80	65
16	SSF	118	61	83	71	56	42	238	61	80	65
17	SSF	133	60	82	70	58	44	244	61	80	66
18	Daly City	129	65	87	75	59	45	218	65	84	69
19	Pacifica	112	62	84	73	58	42	172	62	83	69
20	Daly City	81	51	78	66	60	44	147	51	75	62
21	San Francisco	21	42	76	64	58	46	88	45	71	60
22	San Bruno	105	58	81	71	62	46	362	60	78	65
23	San Francisco	85	53	79	68	60	47	167	55	78	65
24	San Francisco	52	49	77	65	60	46	151	50	74	62
25	San Francisco	17	41	77	65	56	42	71	43	71	59
26	San Francisco	4	36	77	65	57	43	43	41	75	60
27	San Francisco	8	41	78	66	61	43	40	41	74	61
28	Redwood City	9	39	76	65	53	36	37	41	71	58
29	San Mateo	145	53	77	65	58	43	417	55	74	61

Noise Monitor's CNEL values (above) are derived from actual measured events and are used to validate the 65dBA CNEL noise footprint. Aircraft monthly CNELs from both ANOMS NPD and ANEEM algorithms for each monitor site are provided with daily average aircraft counts, the average Sound Exposure Level (SEL), and average Maximum Level (LMax). Noise levels from other noise sources in the community calculated by ANOMS is provided as Community CNEL. Ambient Level is represented by the LA90 noise value which is the noise level exceeded at the monitor for 90% of the time.

SFO N-Above NPD

NMT	Min:Max LMax	55 dBA	60 dBA	65 dBA	70 dBA	75 dBA	80 dBA
1	66:103	5,589	5,589	5,589	5,374	4,677	3,362
2	61:84	3,263	3,263	2,915	1,074	36	2
3	62:85	2,653	2,653	2,342	789	218	47
4	61:94	4,850	4,850	4,742	4,164	3,122	1,504
5	62:90	5,168	5,168	5,135	4,523	2,945	1,264
6	61:88	4,540	4,540	4,429	3,807	2,343	636
7	61:80	928	928	763	282	35	1
8	68:95	397	397	397	340	143	73
9	60:80	198	196	109	63	22	1
10	59:83	155	153	94	48	20	3
11	59:83	131	129	100	79	50	13
12	63:86	11,674	11,674	11,602	7,916	681	37
13	59:76	99	97	43	14	2	0
14	62:85	4,629	4,629	4,482	2,814	817	24
15	62:96	5,297	5,297	4,968	2,242	327	24
16	61:90	3,420	3,420	3,323	2,046	560	5
17	61:84	4,119	4,119	3,914	2,077	345	5
18	64:89	3,985	3,985	3,978	3,413	1,950	541
19	65:86	3,482	3,482	3,482	2,708	1,156	60
20	59:90	2,381	2,345	1,223	327	100	25
21	59:83	435	428	146	24	6	1
22	64:87	3,109	3,109	3,100	1,848	253	15
23	62:84	2,555	2,555	2,385	727	27	2
24	59:88	1,376	1,359	654	127	19	3
25	58:79	402	386	181	41	4	0
26	60:80	86	85	34	3	1	0
27	60:78	116	116	72	13	5	0
28	60:77	187	185	72	17	3	0
29	59:85	4,573	4,477	1,799	406	41	2

SFO N-Above ANEEM

NMT	Min:Max LMax	55 dBA	60 dbA	65 dBA	70 dBA	75 dBA	80 dBA
1	54:103	6,198	6,151	5,872	5,432	4,683	3,350
2	50:78	5,483	5,298	3,521	1,078	24	0
3	50:85	7,630	6,074	3,108	809	206	41
4	51:94	7,767	6,854	5,211	4,241	3,144	1,502
5	50:89	8,217	7,308	5,903	4,614	2,951	1,263
6	49:88	7,602	6,435	4,782	3,818	2,334	635
7	49:80	3,382	2,023	890	284	34	1
8	47:95	7,024	5,800	3,000	785	187	79
9	49:81	7,807	2,448	584	138	26	2
10	39:82	3,369	1,680	553	144	24	3
11	37:83	6,082	2,819	842	218	64	14
12	51:84	14,457	13,293	11,849	7,910	654	26
13	49:76	1,769	608	120	15	2	0
14	44:83	8,200	6,915	4,913	2,840	819	21
15	49:84	9,731	7,973	5,553	2,296	325	16
16	49:90	6,030	4,750	3,519	2,060	558	4
17	49:82	6,971	5,951	4,280	2,113	337	4
18	51:89	6,284	5,364	4,293	3,417	1,938	537
19	50:86	5,129	4,614	3,830	2,728	1,162	59
20	50:83	3,667	2,797	1,067	145	19	4
21	50:74	1,727	828	146	14	0	0
22	49:85	10,670	8,989	5,834	2,284	296	15
23	49:78	3,957	3,581	2,547	736	25	0
24	50:79	3,359	2,489	768	145	8	0
25	49:75	1,415	698	178	17	1	0
26	49:72	573	311	87	9	0	0
27	51:78	319	200	56	7	2	0
28	50:75	579	274	54	3	0	0
29	49:77	12,338	7,447	1,708	285	13	0

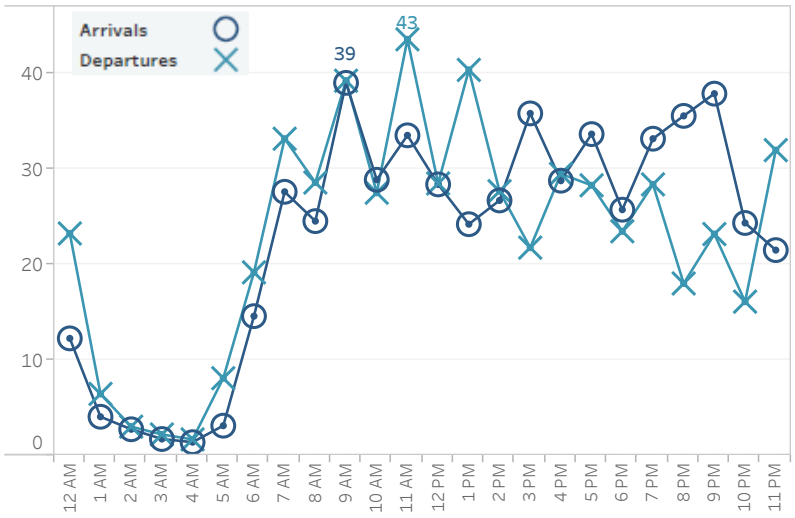
Noise Monitor N-Above values (above) are derived from actual measured events and assigned to aircraft overflights using both ANOMS NPD and ANEEM algorithms. N-Above represents the count of events where the peak noise (LMax) reached above the designated dBA value. Note, the charts on this page represent only SFO aircraft related noise events.

Operations

March 2025

Monthly Ops	AVG Daily Ops	12 Month AVG	YOY Growth
34,017	1,097	32,484	7%

March 2025 Average Day (Hourly)



Major Arrival and Departure Routes (West Flow)

West Flow is depicted in the above image and is a predominate flow at SFO.

West Flow
90%

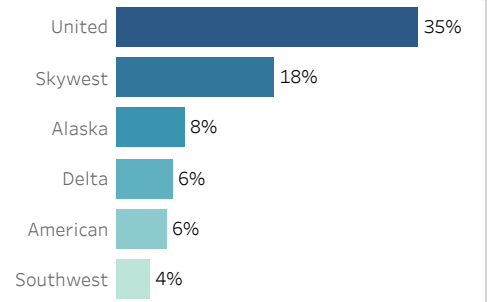
Arrival Route	
1. BDEGA	28%
2. DYAMD	38%
3. SERFR	28%
4. PIRAT	7%

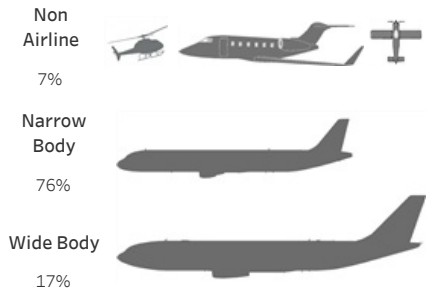
Departure Route	
A. GAP	28%
B. SSTIK	27%
C. NIITE	7%
D. TRUKN RWY 01	28%
D. TRUKN RWY 28	9%

Top Destinations		
Los Angeles	San Diego	Las Vegas
7%	4%	3%

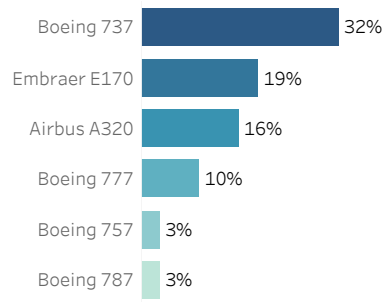
Down the Bay vs Peninsula	
1.1 Down the Bay Visual	32%
1.2 BDEGA Arrival	68%

Airlines with the Most Operations

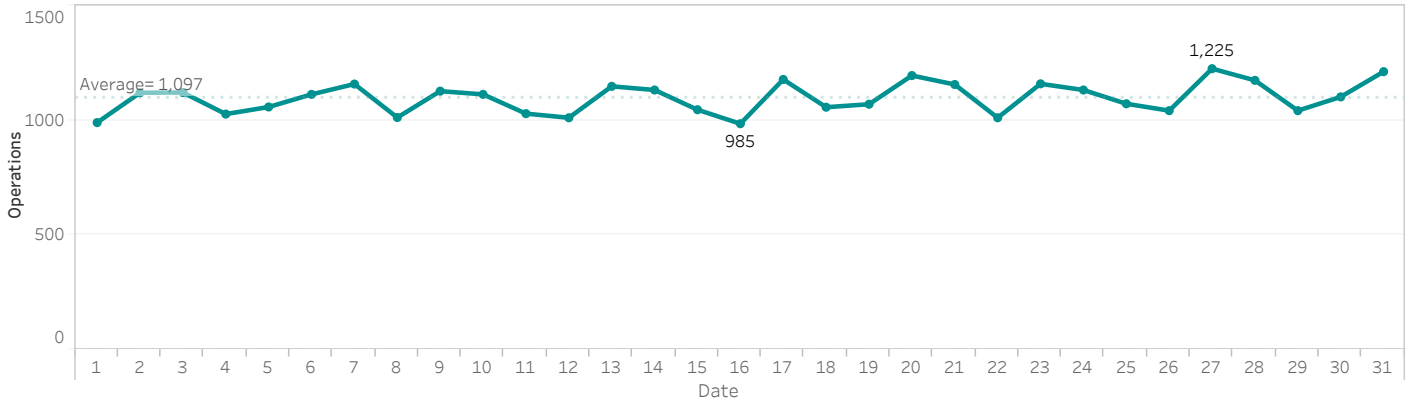




Most Utilized Aircraft Types



Daily Aircraft Operations



Runway Usage and Nighttime Operations

Leftmost Runway Utilization table shows percent of runway usage for arrivals and departures by runway based on air carrier operations using jet, regional jet, and turboprop aircraft. Late Night Preferential Runway Use table depicts departure runway usage between 1am - 6am for jet aircraft for the whole month (top) and during nighttime hours only (bottom). Percentages [%] are rounded to the nearest whole number.

Runway Utilization

	Arrivals	Departures
01 L/R		58% 8,990
10 L/R		9% 1,474
19 L/R	10% 1,482	0% 69
28 L/R	90% 14,088	32% 5,036

Late Night Preferential Runway Use (1 am - 6 am)

	Departures
10 L/R	10% 56
01 L/R	41% 228
28 L/R	49% 274

Runway Utilization

Arrivals

28L	28R
41%	59%

Night (10pm-7am)

28L	28R
27%	73%

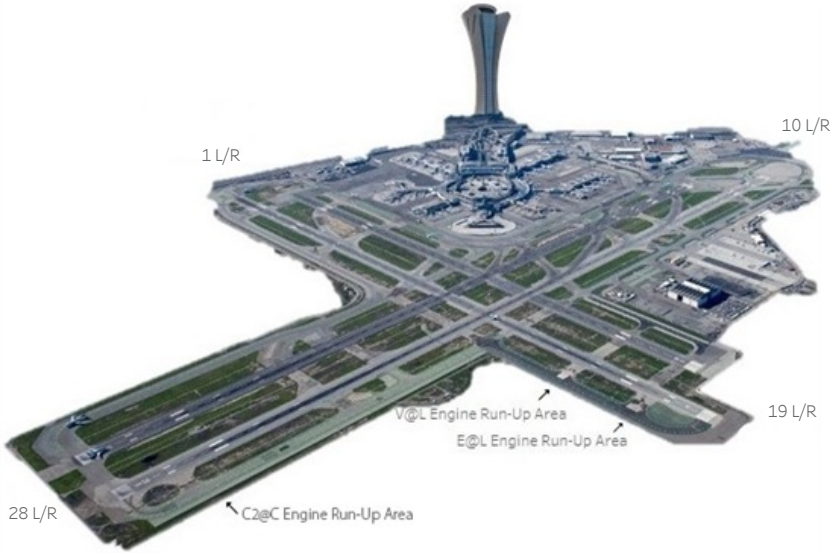
Nighttime Power Run-Ups

10pm-7am

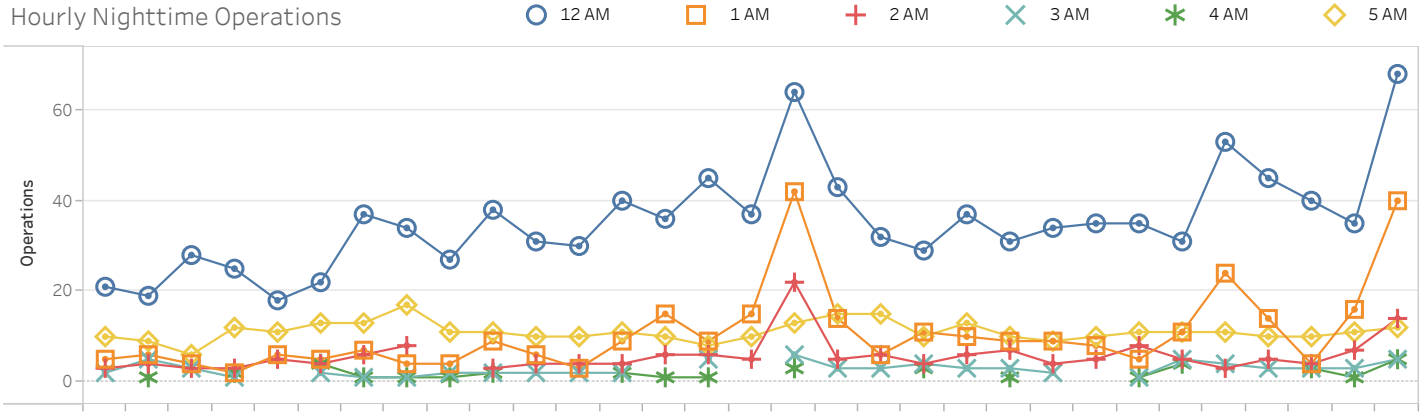
American Airlines	5
Skywest Airlines	1
United Airlines	13

A power runup is a procedure used to test an aircraft engine after maintenance is completed. This is done to ensure safe operating standards prior to returning the aircraft to service. The Aircraft power settings range from idle to full power and may vary in duration.

Designated Power Runup locations are 19 L/R depicted on the airfield map (right) with airlines nighttime power runup counts shown above.



Hourly Nighttime Operations



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12 AM	21	19	28	25	18	22	37	34	27	38	31	30	40	36	45	37	64	43	32	29	37	31	34	35	35	31	53	45	40	35	68
1 AM	5	6	4	2	6	5	7	4	4	9	6	3	9	15	9	15	42	14	6	11	10	9	9	8	5	11	24	14	4	16	40
2 AM	3	4	3	3	5	4	6	8		3	4	4	4	6	6	5	22	5	6	4	6	7	4	5	8	5	3	5	4	7	14
3 AM	2	5	3	1		2	1	1	2	2	2	2	2		5		6	3	3	4	3	3	2		1	5	4	3	3	3	5
4 AM		1		2		4	1	1	1	2			2	1	1		3			3		1			1	4			3	1	5
5 AM	10	9	6	12	11	13	13	17	11	11	10	10	11	10	8	10	13	15	15	10	13	10	9	10	11	11	11	10	10	11	12

Noise Reports

		Noise Reporters	Noise Reports
Roundtable	Atherton	2	14
	Belmont	1	1
	Brisbane	13	478
	Burlingame	1	1
	Daly City	6	1,058
	East Palo Alto	2	5
	El Granada	1	826
	Emerald Hills	5	637
	Foster City	13	186
	Hillsborough	3	6
	Menlo Park	11	323
	Millbrae	1	9
	Montara	1	752
	Pacifica	13	955
	Portola Valley	24	6,304
	Redwood City	5	342
	San Bruno	5	14
	San Carlos	2	3
	San Francisco	15	1,948
	San Mateo	5	306
	South San Francisco	15	706
	Woodside	5	1,361
Other	Alameda	7	130
	Berkeley	3	26
	Capitola	2	18
	Cupertino	1	131
	Danville	2	19
	Felton	2	109
	Fremont	3	56
	Gualala	1	12
	Kensington	1	1
	Lafayette	1	4
	Los Altos	30	4,310
	Los Altos Hills	10	796
	Los Gatos	25	2,295
	Moraga	2	44
	Mountain View	8	3,220
	Oakland	6	2,733
	Occidental	1	30
	Orinda	1	136
	Palo Alto	87	13,979
	Penngrove	1	18
	Richmond	3	171
	San Jose	1	3
	Santa Cruz	29	7,556
	Scotts Valley	18	2,869
	Soquel	19	3,495
	Stanford	2	194
	Sunnyvale	3	111
	Walnut Creek	1	2
	Watsonville	1	79
Grand Total		**420**	**58,782**

Reporters Annual AVG

424

Reports Annual AVG

63,649

New Reporters

23

New Reporters Top City

South San Francisco

Furthest Report

105 miles

Reports per SFO Operation

2

Top Aircraft Types

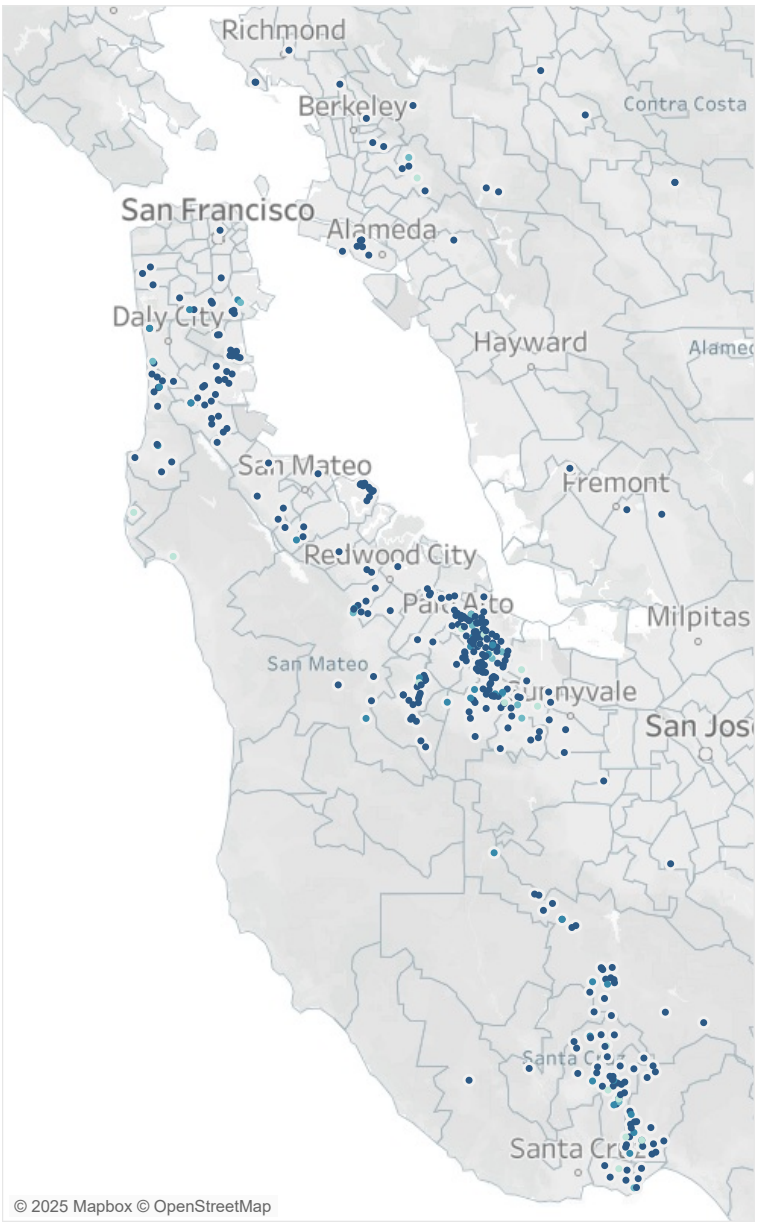
B737
E75L
A320

Top Flight Numbers

UAL505
KAL214
TAI560

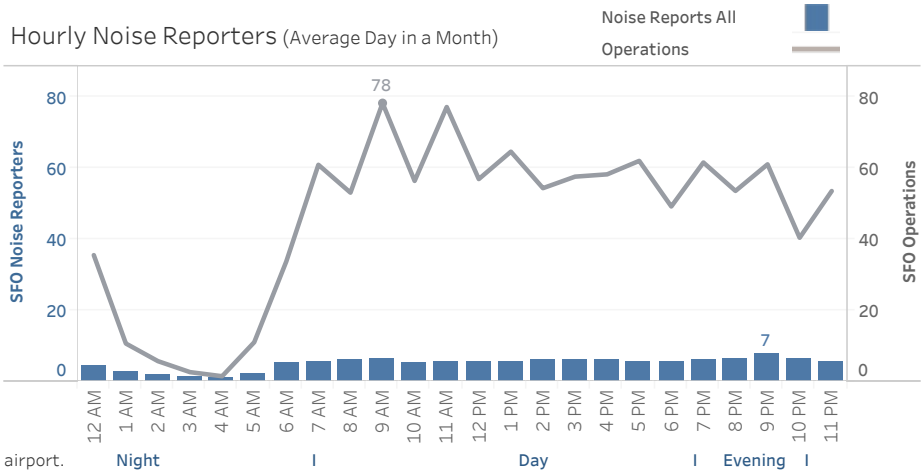
Noise Reporters Location Map

March 2025

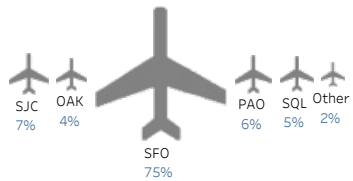


Notes:
Address validation Relies on USPS-provided ZIP Code look up table and USPS-specified default city values.

Hourly Noise Reporters (Average Day in a Month)



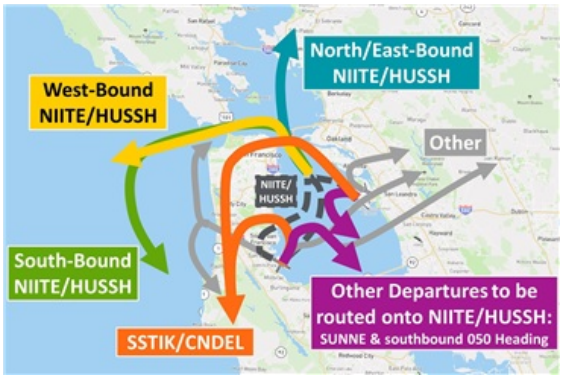
Noise Reports by Airport



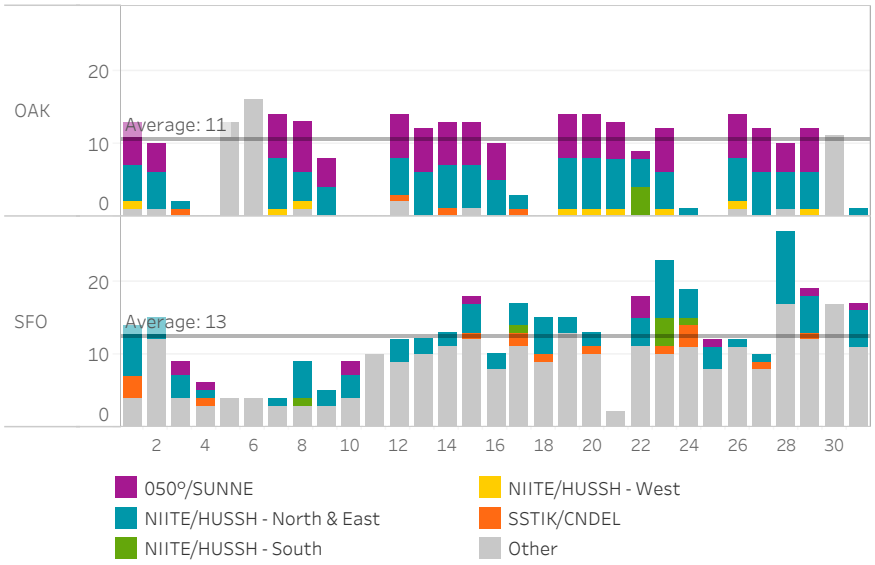
99% of noise reports correlate to a flight origin/destination airport.

Source: SF Intl Airport Noise Monitoring System

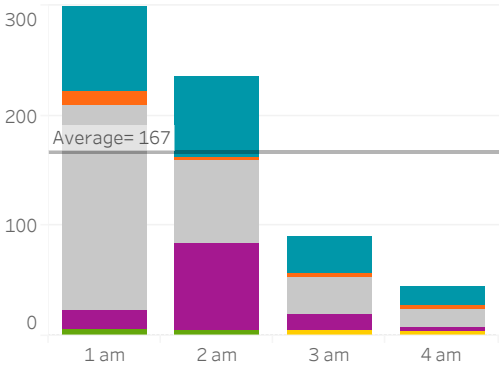
NIITE to GOBBS 1 am to 5 am (March 2024)



Count of Departures per Night



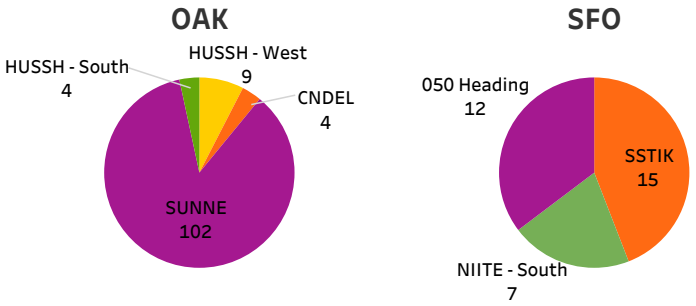
Average Total Departures per Hour



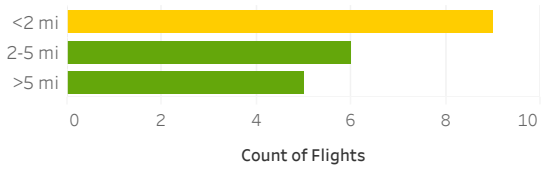
Departure Runway Usage

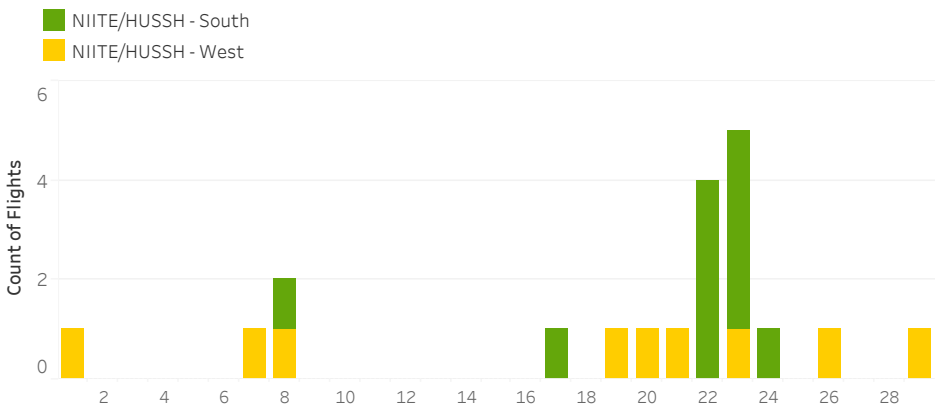
OAK		SFO					
12	30	01L	01R	10L	19L	19R	28R
15%	85%	11%	21%	8%	1%	2%	58%

CNDEL and SSTIK Departures vs HUSSH and NIITE

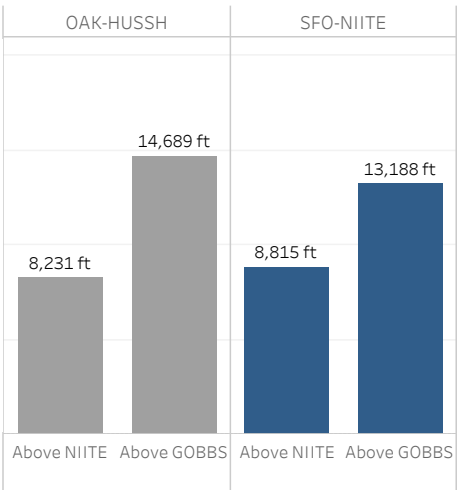


How Close are Aircraft Flying to GOBBS?





Average Altitude at NIITE and GOBBS



Airport Director's Report

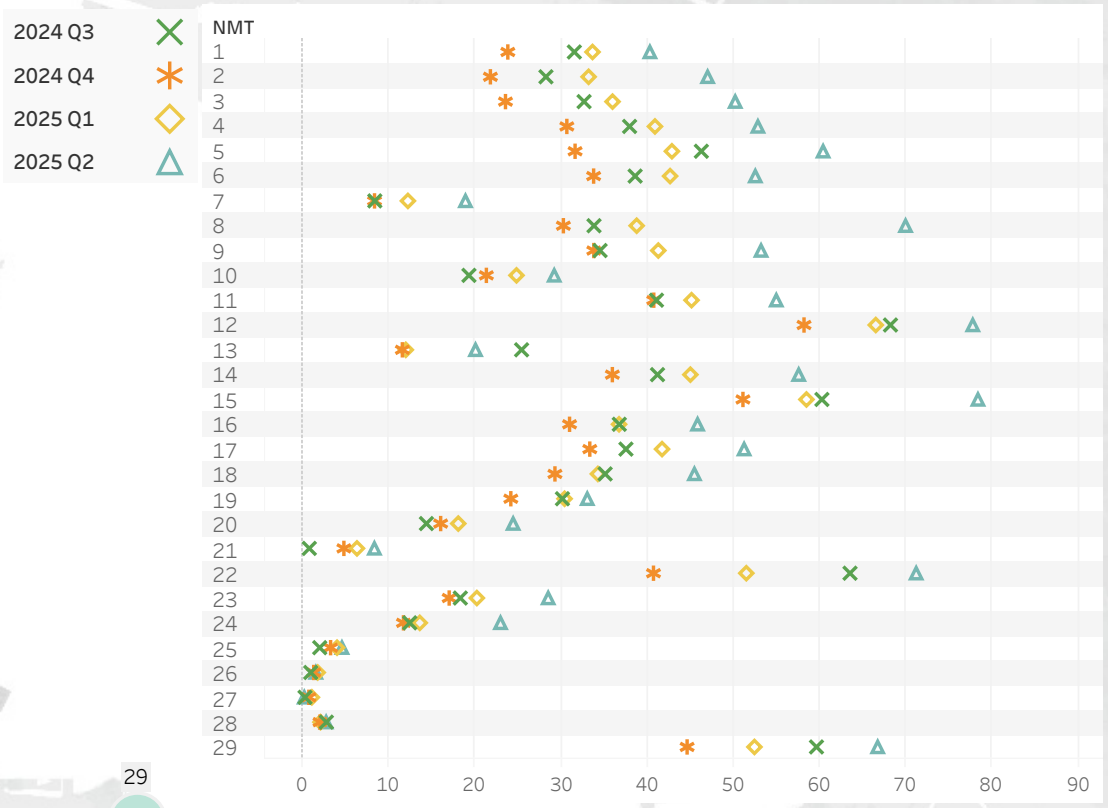
Presented at the June 4, 2025
Airport/Community Roundtable Meeting

Aircraft Noise Office
April 2025

Aircraft Noise Levels Summary

April 2025

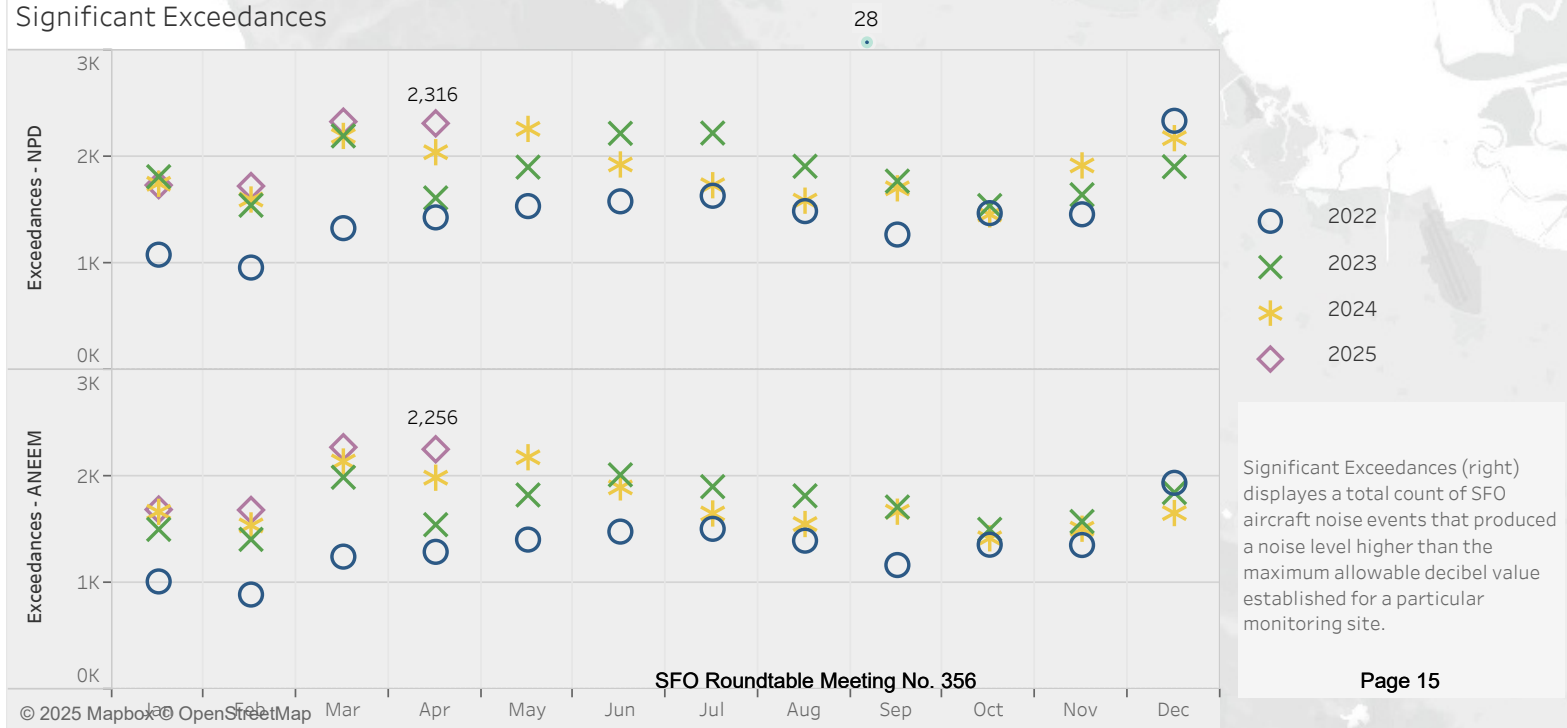
Nighttime N-Above 55 dBA Daily Average



The chart above depicts the average daily N-Above 55dBA SFO aircraft noise events per NMT during nighttime hours (10pm-7am) compared to the previous 4 quarters. Values are derived from the ANEEM algorithm.

The map displays the N-Above counts at each NMT by N-Above Noise Level based on SFO aircraft noise events. Darker circles represent louder noise events and larger circles represent a larger number of noise events relative to the N-Above noise level. Values are derived from the ANEEM algorithm.

Significant Exceedances



Significant Exceedances (right) displayes a total count of SFO aircraft noise events that produced a noise level higher than the maximum allowable decibel value established for a particular monitoring site.

Aircraft Noise Levels Details

April 2025

		ANOMS						ANEEM			
		Aircaft				Community		Aircaft			
NMT	City	Noise Events (AVG Day)	CNEL (dBA)	SEL (dBA)	LMax (dBA)	CNEL (dBA)	Ambient Level (dBA)	Noise Events (AVG Day)	CNEL (dBA)	SEL (dBA)	LMax (dBA)
1	San Bruno	135	73	94	83	67	55	147	73	94	81
2	San Bruno	87	57	81	69	63	51	201	58	78	66
3	SSF	63	54	79	68	59	43	294	56	75	62
4	SSF	128	68	90	77	59	45	268	68	86	68
5	San Bruno	123	67	89	77	60	46	243	67	86	69
6	SSF	120	65	87	75	58	44	271	65	84	66
7	Brisbane	24	48	78	67	57	44	187	50	72	59
8	Millbrae	10	50	86	73	65	50	297	56	75	64
9	Millbrae	7	36	75	64	57	41	483	51	68	56
10	Burlingame	6	37	78	65	58	42	203	49	70	57
11	Burlingame	8	39	77	65	58	42	351	53	71	57
12	Foster City	397	63	82	71	57	41	506	63	81	69
13	Hillsborough	2	31	76	65	56	40	118	47	69	57
14	SSF	118	61	83	71	59	43	313	61	80	64
15	SSF	199	59	81	69	59	44	409	59	78	65
16	SSF	100	60	83	71	57	42	258	60	79	64
17	SSF	112	60	83	70	59	44	253	60	79	65
18	Daly City	103	64	87	76	60	45	233	64	84	67
19	Pacifica	90	61	85	73	58	40	152	61	83	68
20	Daly City	109	52	77	65	60	43	200	52	74	62
21	San Francisco	21	42	75	64	59	46	101	45	71	60
22	San Bruno	78	57	81	71	61	45	372	59	76	63
23	San Francisco	115	54	79	69	59	46	237	56	77	65
24	San Francisco	43	48	76	65	60	45	217	51	74	62
25	San Francisco	17	41	77	65	56	41	85	43	71	59
26	San Francisco	5	37	77	65	57	44	43	41	71	58
27	San Francisco	5	36	78	66	57	43	37	40	72	60
28	Redwood City	8	38	77	65	52	35	41	41	70	57
29	San Mateo	96	49	76	64	57	42	460	54	72	60

Noise Monitor's CNEL values (above) are derived from actual measured events and are used to validate the 65dBA CNEL noise footprint. Aircraft monthly CNELs from both ANOMS NPD and ANEEM algorithms for each monitor site are provided with daily average aircraft counts, the average Sound Exposure Level (SEL), and average Maximum Level (LMax). Noise levels from other noise sources in the community calculated by ANOMS is provided as Community CNEL. Ambient Level is represented by the LA90 noise value which is the noise level exceeded at the monitor for 90% of the time.

SFO N-Above NPD

NMT	Min:Max LMax	55 dBA	60 dBA	65 dBA	70 dBA	75 dBA	80 dBA
1	66:99	3,946	3,946	3,946	3,795	3,404	2,773
2	61:86	2,593	2,593	2,318	946	39	5
3	62:88	1,774	1,774	1,558	403	82	14
4	61:98	3,804	3,804	3,699	3,215	2,652	1,595
5	63:90	3,619	3,619	3,592	3,212	2,374	1,283
6	61:96	3,587	3,587	3,462	2,943	2,058	622
7	61:83	606	606	473	127	11	1
8	68:85	275	275	275	233	78	13
9	60:73	78	76	25	4	0	0
10	60:75	72	72	32	8	1	0
11	59:75	50	48	25	6	1	0
12	63:86	11,964	11,964	11,901	8,246	746	28
13	60:72	20	20	6	2	0	0
14	62:84	3,518	3,518	3,362	2,154	705	27
15	62:99	6,000	6,000	5,578	1,998	148	10
16	61:86	2,992	2,992	2,858	1,904	520	2
17	62:85	3,344	3,344	3,138	1,785	292	6
18	65:94	3,092	3,092	3,086	2,702	1,822	516
19	65:85	2,693	2,693	2,692	2,216	990	56
20	59:90	3,119	3,077	1,456	349	93	21
21	59:79	364	353	124	12	2	0
22	64:85	2,227	2,227	2,223	1,384	158	5
23	63:85	3,342	3,342	3,145	947	41	5
24	59:83	1,155	1,147	570	87	9	1
25	58:77	396	373	172	27	6	0
26	59:75	75	71	29	2	1	0
27	63:75	15	15	11	2	1	0
28	59:83	168	160	56	18	3	1
29	59:85	2,922	2,814	679	149	32	5

SFO N-Above ANEEM

Min:Max LMax	55 dBA	60 dbA	65 dBA	70 dBA	75 dBA	80 dBA
53:99	4,289	4,258	4,098	3,789	3,382	2,754
51:78	5,601	5,346	2,980	949	28	0
49:88	6,986	4,713	2,034	371	63	10
50:92	6,921	5,528	3,901	3,204	2,632	1,586
49:90	6,737	5,595	4,142	3,261	2,366	1,274
49:88	7,059	5,490	3,715	2,929	2,041	616
49:77	3,409	1,505	551	128	10	0
48:87	8,531	7,063	3,171	623	101	18
48:79	8,683	2,134	460	72	8	0
39:80	3,301	1,193	320	62	8	0
37:84	6,791	2,869	914	221	28	3
50:83	14,824	13,274	11,890	8,190	716	19
48:72	2,239	699	139	5	0	0
41:84	7,844	5,998	3,727	2,169	693	23
50:81	11,376	9,155	6,132	1,995	133	4
50:82	6,572	4,651	3,096	1,922	519	1
50:85	6,950	5,546	3,428	1,741	278	4
49:93	6,242	4,801	3,446	2,713	1,815	512
50:85	4,229	3,674	2,965	2,225	986	54
50:85	4,927	3,689	1,310	196	23	3
49:77	1,800	805	170	15	1	0
49:82	10,304	7,214	4,053	1,656	180	1
51:82	5,552	5,016	3,466	962	32	1
49:76	4,707	3,391	1,023	121	3	0
49:75	1,563	791	188	13	1	0
49:75	456	207	38	2	1	0
50:75	155	74	22	1	1	0
49:73	505	197	27	1	0	0
49:77	13,016	6,647	723	52	2	0

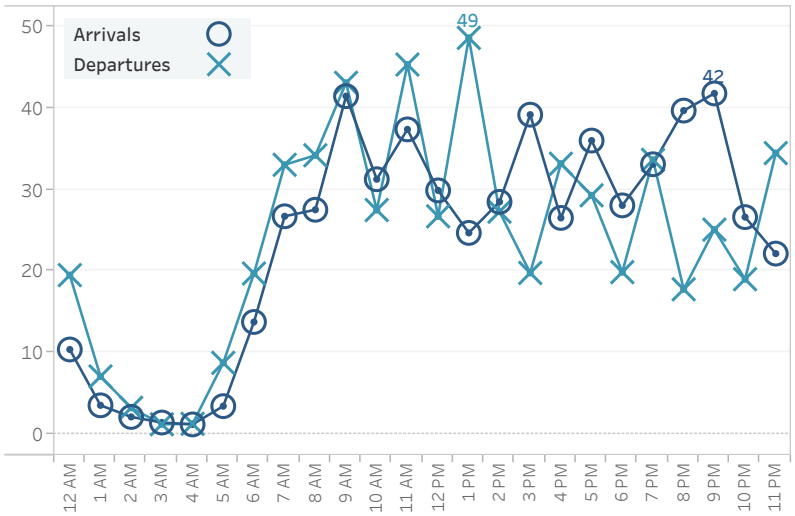
Noise Monitor N-Above values (above) are derived from actual measured events and assigned to aircraft overflights using both ANOMS NPD and ANEEM algorithms. N-Above represents the count of events where the peak noise (LMax) reached above the designated dBA value. Note, the charts on this page represent only SFO aircraft related noise events.

Operations

April 2025

Monthly Ops	AVG Daily Ops	12 Month AVG	YOY Growth
34,598	1,153	32,830	12%

April 2025 Average Day (Hourly)



Major Arrival and Departure Routes (West Flow)

West Flow is depicted in the above image and is a predominate flow at SFO.

West Flow
100%

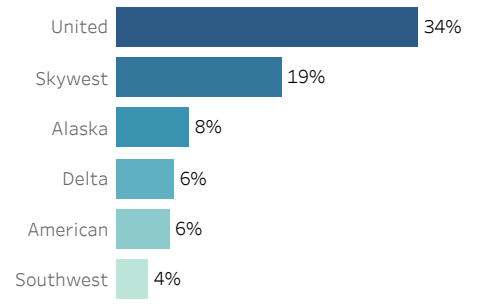
Arrival Route	
1. BDEGA	29%
2. DYAMD	37%
3. SERFR	28%
4. PIRAT	6%

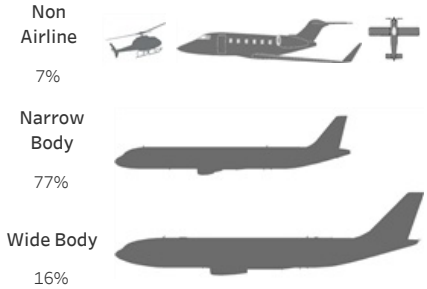
Departure Route	
A. GAP	20%
B. SSTIK	34%
C. NIITE	8%
D. TRUKN RWY 01	35%
D. TRUKN RWY 28	3%

Top Destinations		
Los Angeles	San Diego	JFK
6%	4%	3%

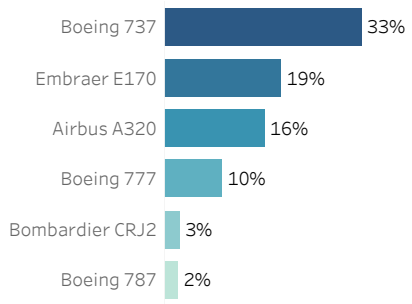
Down the Bay vs Peninsula	
1.1 Down the Bay Visual	31%
1.2 BDEGA Arrival	69%

Airlines with the Most Operations

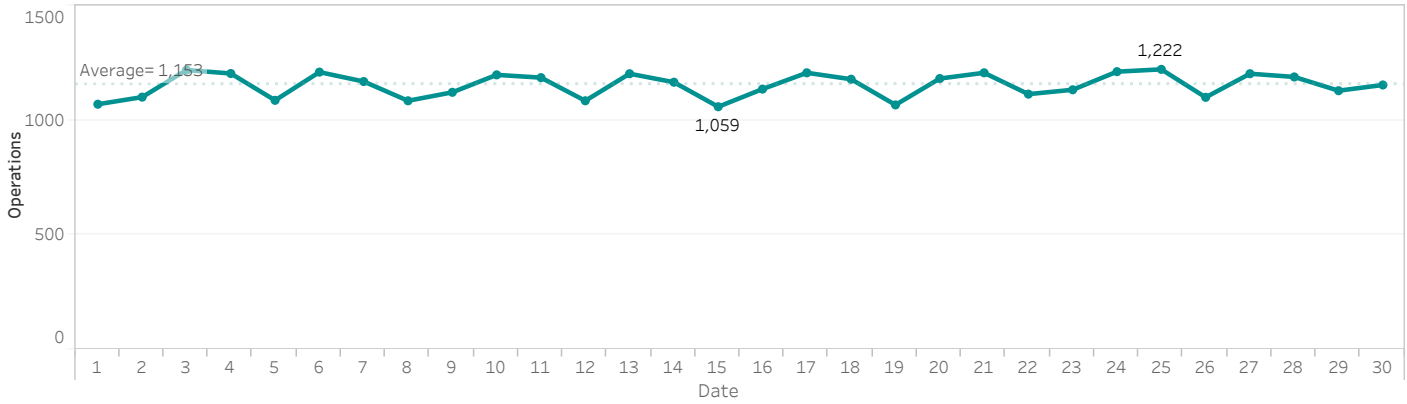




Most Utilized Aircraft Types



Daily Aircraft Operations



Runway Usage and Nighttime Operations

Leftmost Runway Utilization table shows percent of runway usage for arrivals and departures by runway based on air carrier operations using jet, regional jet, and turboprop aircraft. Late Night Preferential Runway Use table depicts departure runway usage between 1am - 6am for jet aircraft for the whole month (top) and during nighttime hours only (bottom). Percentages [%] are rounded to the nearest whole number.

Runway Utilization

	Arrivals	Departures
01 L/R		80% 12,818
28 L/R	100% 16,053	20% 3,237

Late Night Preferential Runway Use (1 am - 6 am)

	Departures
01 L/R	52% 319
28 L/R	48% 292

Runway Utilization

Arrivals

28L	28R
44%	56%

Night (10pm-7am)

37%	63%

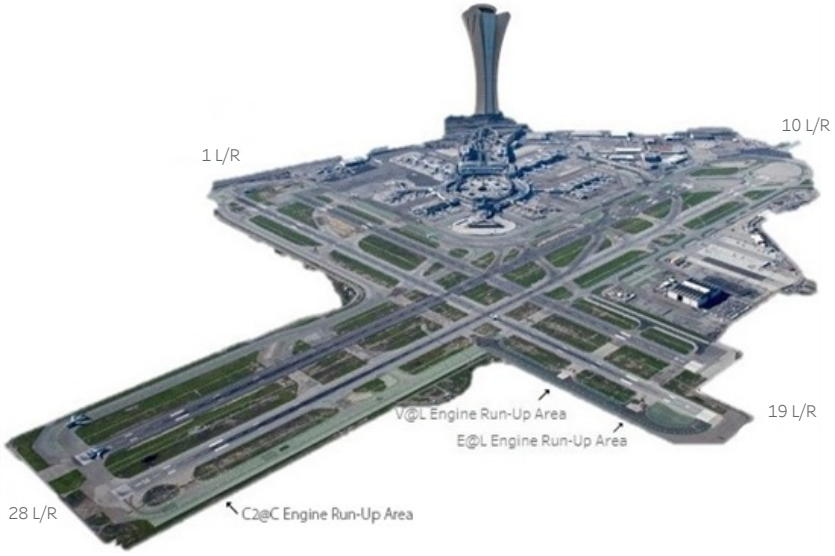
Nighttime Power Run-Ups

10pm-7am

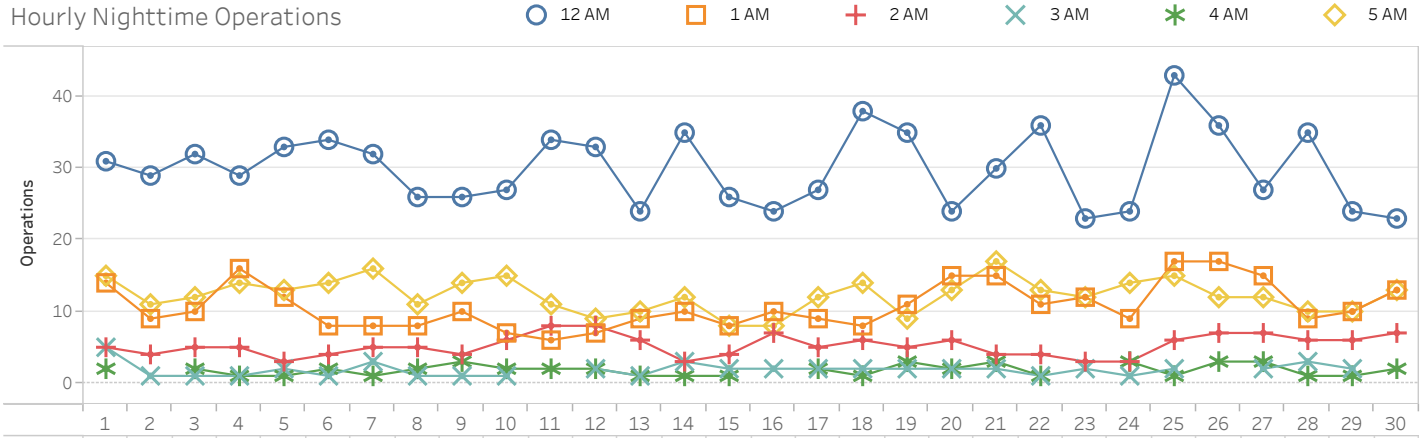
Alaska Airlines	1
American Airlines	3
United Airlines	16

A power runup is a procedure used to test an aircraft engine after maintenance is completed. This is done to ensure safe operating standards prior to returning the aircraft to service. The Aircraft power settings range from idle to full power and may vary in duration.

Designated Power Runup locations are 19 L/R depicted on the airfield map (right) with airlines nighttime power runup counts shown above.



Hourly Nighttime Operations



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12 AM	31	29	32	29	33	34	32	26	26	27	34	33	24	35	26	24	27	38	35	24	30	36	23	24	43	36	27	35	24	23
1 AM	14	9	10	16	12	8	8	8	10	7	6	7	9	10	8	10	9	8	11	15	15	11	12	9	17	17	15	9	10	13
2 AM	5	4	5	5	3	4	5	5	4	6	8	8	6	3	4	7	5	6	5	6	4	4	3	3	6	7	7	6	6	7
3 AM	5	1	1	1	2	1	3	1	1	1		2	1	3	2	2	2	2	2	2	2	1	2	1	2		2	3	2	
4 AM	2		2	1	1	2	1	2	3	2	2	2	1	1	1		2	1	3	2	3	1		3	1	3	3	1	1	2
5 AM	15	11	12	14	13	14	16	11	14	15	11	9	10	12	8	8	12	14	9	13	17	13	12	14	15	12	12	10	10	13

Noise Reports

		Noise Reporters	Noise Reports
Roundtable	Atherton	3	74
	Brisbane	12	452
	Burlingame	2	5
	Daly City	9	1,214
	El Granada	1	970
	Emerald Hills	4	264
	Foster City	8	89
	Half Moon Bay	1	6
	Hillsborough	3	11
	Menlo Park	11	302
	Millbrae	2	5
	Montara	1	452
	Pacifica	10	679
	Portola Valley	24	12,702
	Redwood City	6	295
	San Bruno	8	18
	San Carlos	1	2
	San Francisco	19	1,996
	San Mateo	7	76
	South San Francisco	11	287
	Woodside	4	1,609
Other	Alameda	1	48
	Berkeley	4	113
	Boulder Creek	1	2
	Capitola	1	51
	Cupertino	1	12
	Felton	2	102
	Fremont	1	52
	Hayward	1	1
	La Honda	2	2
	Los Altos	29	3,833
	Los Altos Hills	7	905
	Los Gatos	24	2,379
	Moraga	2	40
	Mountain View	7	2,938
	Newark	8	8
	Oakland	6	2,308
	Orinda	1	53
	Palo Alto	74	11,374
	Penngrove	1	1
	Richmond	3	73
	Santa Cruz	25	6,664
	Saratoga	1	1
	Scotts Valley	15	2,739
	Soquel	19	3,048
	Stanford	2	188
	Sunnyvale	3	26
	Watsonville	1	47
Grand Total		**389**	**58,516**

Reporters Annual AVG

418

Reports Annual AVG

62,678

New Reporters

22

New Reporters Top City

Newark

Furthest Report

64 miles

Reports per SFO Operation

2

Top Aircraft Types

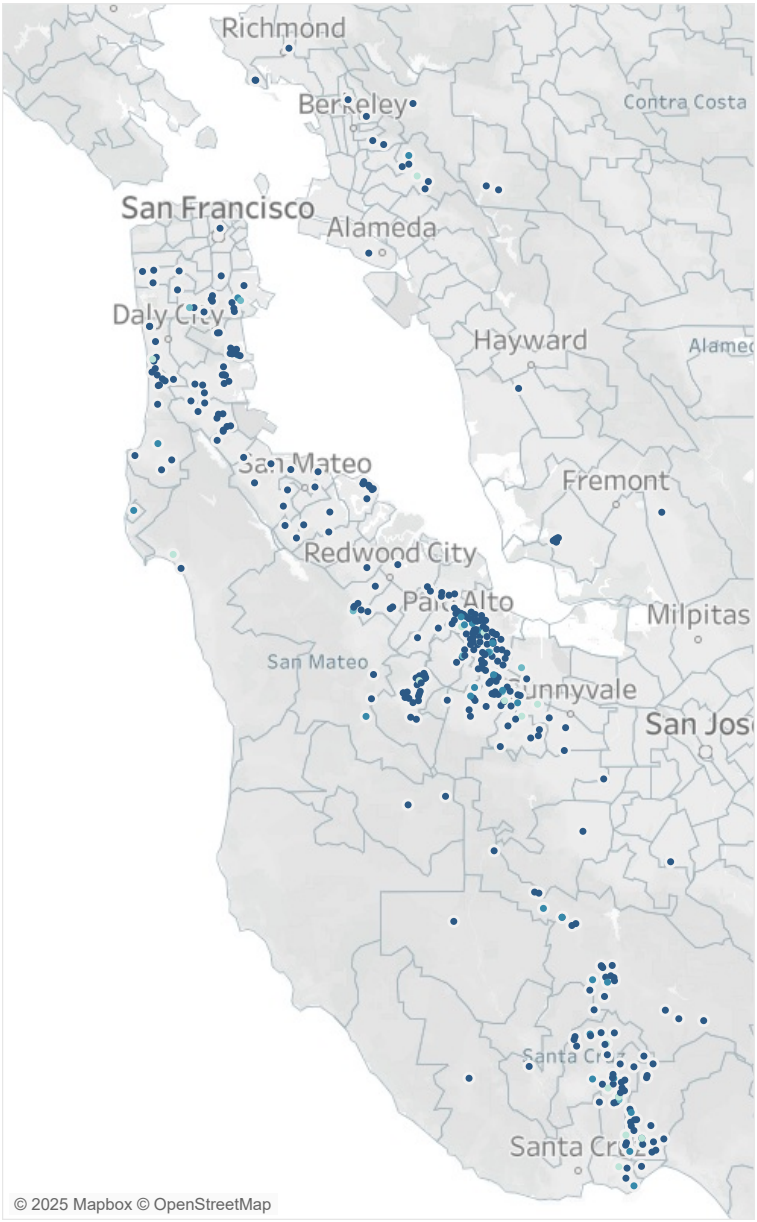
B737
E75L
A320

Top Flight Numbers

KAL214
UAL505
TAI560

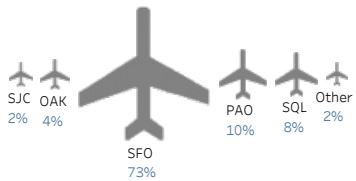
Noise Reporters Location Map

April 2025

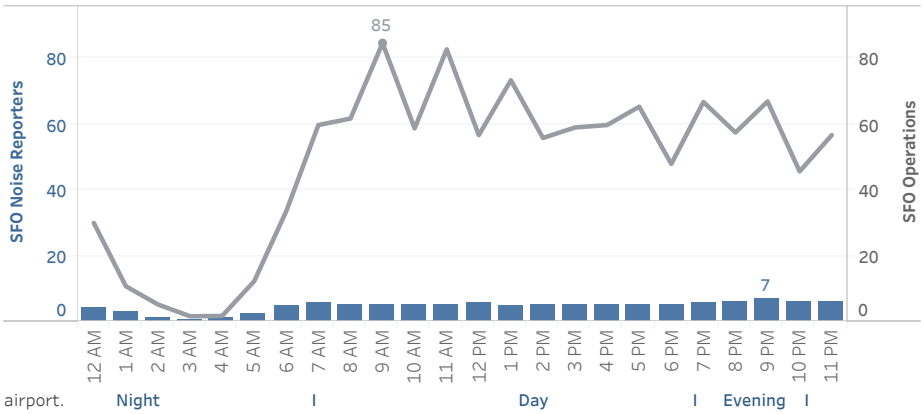


Notes:
Address validation Relies on USPS-provided ZIP Code look up table and USPS-specified default city values.

Noise Reports by Airport



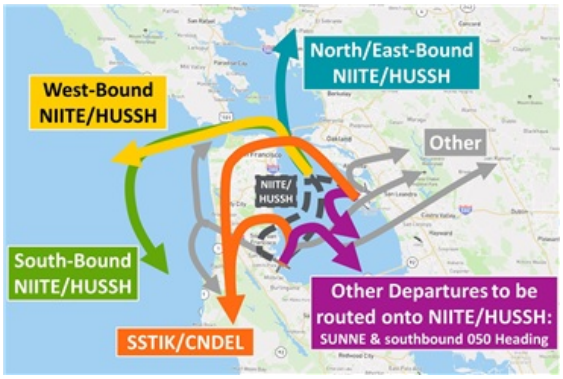
Hourly Noise Reporters (Average Day in a Month)



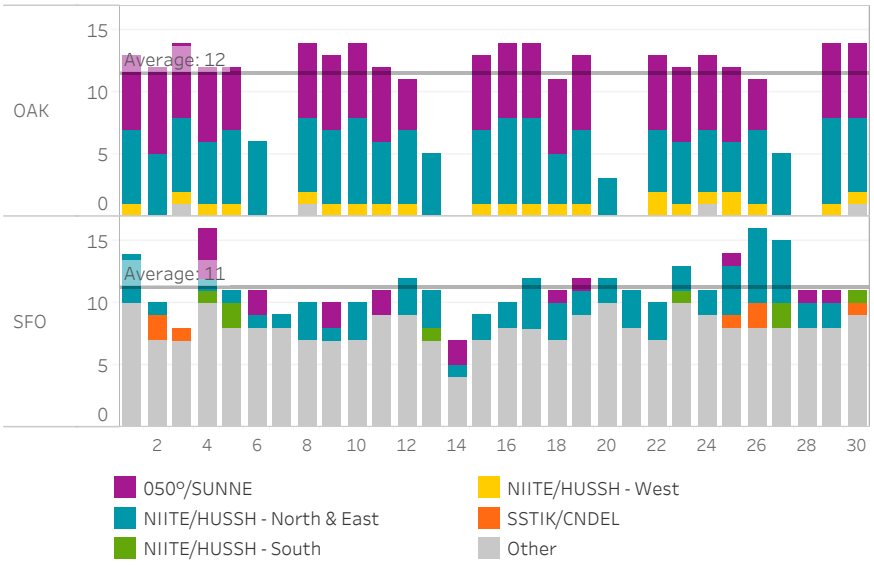
99% of noise reports correlate to a flight origin/destination airport.

Source: SF Intl Airport Noise Monitoring System

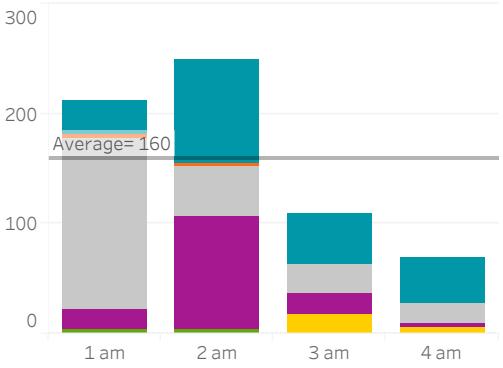
NIITE to GOBBS 1 am to 5 am (April 2025)



Count of Departures per Night



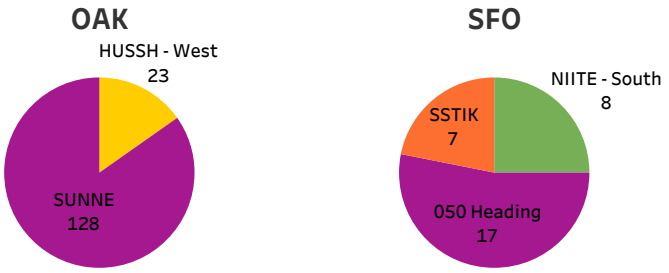
Average Total Departures per Hour



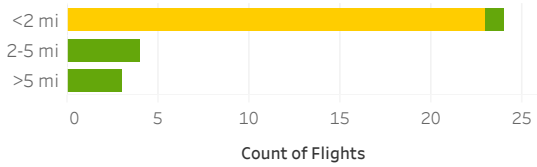
Departure Runway Usage

OAK	SFO			
30	01L	01R	28L	28R
100%	6%	19%	53%	21%

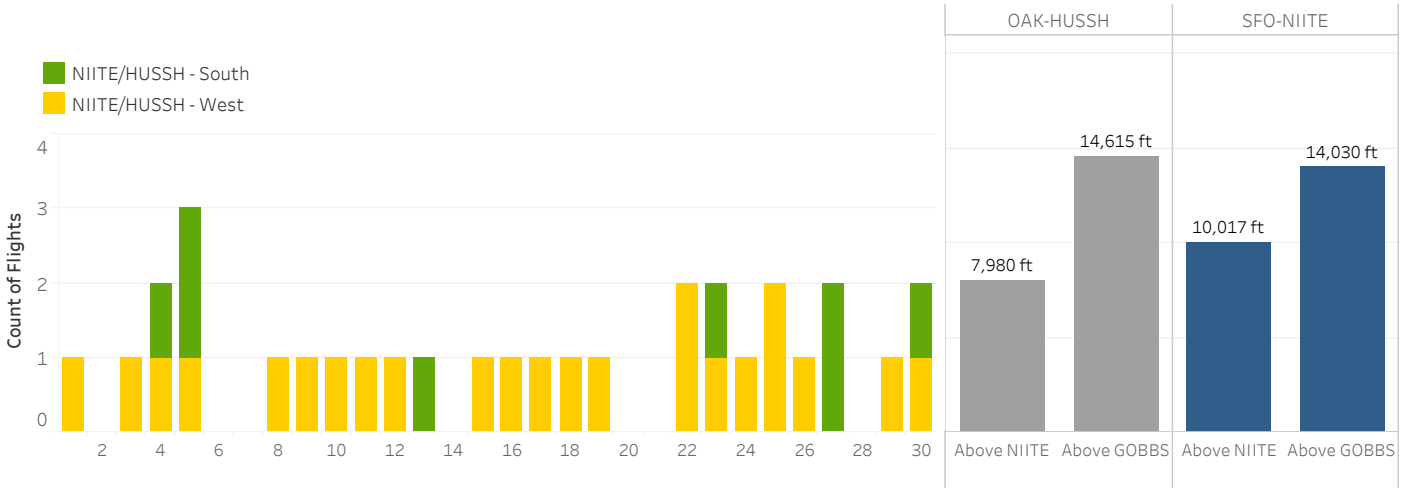
CNDEL and SSTIK Departures vs HUSSH and NIITE



How Close are Aircraft Flying to GOBBS?



Average Altitude at NIITE and GOBBS



HMMH
700 District Avenue, Suite 800
Burlington, MA 01803
781.229.0707

MEMORANDUM

To:	SFO Community Roundtable Members and Interested Parties
From:	Jason R. Stoddard, Senior Airspace Analyst Eugene M. Reindel, Vice President
Date:	May 01, 2025
Subject:	Federal Aviation Administration (FAA) Instrument Flight Procedures (IFP) Information Gateway Review
Reference:	HMMH Project Number 312310

At the request of the Roundtable, Harris Miller Miller & Hanson Inc. (HMMH) is monitoring and reviewing updates to procedures published onto the FAA's IFP Information Gateway in the regions of San Francisco International Airport (SFO), Metropolitan Oakland International Airport (OAK), and Norman Y. Mineta San Jose International Airport (SJC).

After analyzing the documents posted, HMMH determines proposed changes and the reason for the changes. The FAA IFP Information Gateway published one update for SFO and one update for OAK. There are currently three open comment periods. The next publication is expected on May 15, 2025.

Important Terms and Items:

- FAA Stage Definitions
  1. FPT: Procedures are coordinated with Air Traffic, Tech Ops and Airports for feasibility, preparation, and priority (FPO)
  2. DEV: Development of the procedures
  3. FC: FAA Flight Inspection of the developed procedures
  4. PIT: Production Integration Team (TS)
  5. CHARTING: Procedures at Arnav Products Charting for publication (NACO)

- FAA Status Definitions
  1. At Flight Check: At Flight Inspection for procedure validation
  2. Awaiting Publication: At Arnav Products Charting for publication
  3. Complete: Procedure development action finished
  4. On Hold: Procedure waiting data/information to allow it to proceed/continue to next stage
  5. Pending: Procedure development work on-going
  6. Published: Procedure charted and published
  7. Under Development: Procedure is being worked on by the FAA
  8. Terminated: Procedure/project terminated

- Glossary
  - RNAV: Area Navigation
  - ATC: Air Traffic Control
  - IAP: Instrument Approach procedure
  - STAR: Standard Terminal Arrival Route
  - SID: Standard Instrument Departure
  - GPS: Global Positioning System
  - ILS: Instrument Landing System
  - LOC: Localizer

Updates:

- SFO RNAV (GPS) Z RWY 19R AMDT 0A
  - Status changed to Published
  - Publication date of April 17, 2025
- OAK BANND (RNAV) TWO ARRIVAL
  - Awaiting Cancellation
  - Cancellation date of June 12, 2025

Open Comment Periods:

- **OAK BANND (RNAV) TWO ARRIVAL**
  - Comment period ends May 15, 2025
    The following changes are expected:
    - Arrival procedure is due to be canceled on June 12, 2025.

- **OAK OAKES (RNAV) THREE ARRIVAL**
  - Comment period ends May 15, 2025
    The following changes are expected:
    - Various changes to routing, waypoints and speed along the OAKES THREE arrival. All changes occur east of OAK and are not expected to affect communities surrounding SFO.

- **OAK SHARR (RNAV) ONE ARRIVAL - CAN**
  - Comment period ends May 15, 2025
    The following changes are expected:
    - Arrival procedure is due to be canceled on June 12, 2025.

HMMH
700 District Avenue, Suite 800
Burlington, MA 01803
781.229.0707

MEMORANDUM

To:	SFO Community Roundtable Members and Interested Parties
From:	Jason R. Stoddard, Senior Airspace Analyst Eugene M. Reindel, Vice President
Date:	May 28, 2025
Subject:	Federal Aviation Administration (FAA) Instrument Flight Procedures (IFP) Information Gateway Review
Reference:	HMMH Project Number 312310

At the request of the Roundtable, Harris Miller Miller & Hanson Inc. (HMMH) is monitoring and reviewing updates to procedures published onto the FAA's IFP Information Gateway in the regions of San Francisco International Airport (SFO), Metropolitan Oakland International Airport (OAK), and Norman Y. Mineta San Jose International Airport (SJC).

After analyzing the documents posted, HMMH determines proposed changes and the reason for the changes. The FAA IFP Information Gateway published five updates for SFO and nine updates for OAK. There are currently six open comment periods. The next publication is expected on June 12, 2025.

Important Terms and Items:

- FAA Stage Definitions
  1. FPT: Procedures are coordinated with Air Traffic, Tech Ops and Airports for feasibility, preparation, and priority (FPO)
  2. DEV: Development of the procedures
  3. FC: FAA Flight Inspection of the developed procedures
  4. PIT: Production Integration Team (TS)
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  5. Pending: Procedure development work on-going
  6. Published: Procedure charted and published
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- Glossary
  - RNAV: Area Navigation
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  - STAR: Standard Terminal Arrival Route
  - SID: Standard Instrument Departure
  - GPS: Global Positioning System
  - ILS: Instrument Landing System
  - LOC: Localizer

Updates:

- SFO ILS OR LOC RWY 19L, AMDT 24
  - Status changed to Pending
  - Publication date of May 14, 2026
- SFO QUIET BRIDGE VISUAL RWY 28L/R AMDT 13
  - Status changed to Pending
  - Publication date of July 9, 2026
- SFO SID SEGUL TWO
  - Status changed to Pending
  - Publication date of July 9, 2026
- SFO SID SAHEY FIVE
  - Status changed to Pending
  - Publication date of December 24, 2026
- OAK RNAV (GPS) Y RWY 28L AMDT 5
  - Status changed to Awaiting Publication
  - Publication date of June 12, 2025
- OAK RNAV (GPS) Y 28R AMDT 4
  - Status changed to Awaiting Publication
  - Publication date of June 12, 2025
- OAK RNAV (GPS) Y RWY 30 AMDT 6
  - Status changed to Awaiting Publication
  - Publication date of June 12, 2025
- SFO SID SAN FRANCISCO FIVE
  - Status changed to Pending
  - Publication date of May 14, 2026
- OAK ILS OR LOC RWY 28R AMDT 38
  - Status changed to Awaiting Publication
  - Publication date of June 12, 2025
- OAK ILS OR LOC RWY 30 AMDT 32
  - Status changed to Awaiting Publication
  - Publication date of June 12, 2025
- OAK OAKES (RNAV) THREE ARRIVAL
  - Status changed to Awaiting Publication
  - Publication date of June 12, 2025
- OAK RNAV (RNP) Z RWY 28L AMDT 3
  - Status changed to Awaiting Publication
  - Publication date of June 12, 2025
- OAK RNAV (RNP) Z RWY 28R AMDT 3
  - Status changed to Awaiting Publication
  - Publication date of June 12, 2025
- OAK RNAV (RNP) Z RWY 30 AMDT 4
  - Status changed to Awaiting Publication
  - Publication date of June 12, 2025

Open Comment Periods:

- **OAK ILS or LOC RWY 30 AMDT 32**
  - Comment period ends May 28, 2025
    The following changes are expected:
    - Added two initial route segments to the start of the approach. The addition of these route segments are not expected to impact member communities of the SFO Roundtable. Route segments were added to connect to newly updated Standard Terminal Arrivals (STARs).
    - Various administrative amendments were made to the procedure and are not expected to impact community members.

- **OAK RNAV (GPS) Y RWY 28L AMDT 5**
  - Comment period ends May 28, 2025
    The following changes are expected:
    - Added multiple initial route segments to the start of the approach. The addition of these route segments are not expected to impact member communities of the SFO Roundtable. Route segments were added to connect to newly updated Standard Terminal Arrivals (STARs).
    - Various Administrative amendments were made to the procedure and are not expected to impact community members.

- **OAK RNAV (GPS) Y RWY 28R AMDT 4**
  - Comment period ends May 28, 2025
    The following changes are expected:
    - Added two initial route segments to the start of the approach. The addition of these route segments are not expected to impact member communities of the SFO Roundtable. Route segments were added to connect to newly updated Standard Terminal Arrivals (STARs).
    - Various administrative amendments were made to the procedure and are not expected to impact community members.

- **OAK RNAV (GPS) Y RWY 30 AMDT 6**
  - Comment period ends May 28, 2025
    The following changes are expected:
    - Added multiple initial route segments to the start of the approach. The addition of these route segments are not expected to impact member communities of the SFO Roundtable. Route segments were added to connect to newly updated Standard Terminal Arrivals (STARs).

- **OAK RNAV (RNP) Z RWY 28L AMDT 3**
  - Comment period ends May 28, 2025
    The following changes are expected:
    - Added two initial route segments from waypoint FFIST to waypoint JUPAP and from waypoint MYSHIN to waypoint CYMBL
    - Altitude restriction at waypoint BBUBB was raised from AT 5,000 ft. MSL to AT OR ABOVE 6,000 ft. MSL.
    - Speed restriction added to waypoint FFIST of AT OR BELOW 200 Knots in Indicated Airspeed (KIAS)
    - Altitude restriction at waypoint CYMBL was changed from AT 5,300 ft. MSL to AT OR ABOVE 5,300 ft. MSL
    - Various decision height/altitudes and visibility requirements were raised due to new obstacle evaluations and to maintain accordance with federal regulations.

- **OAK RNAV (RNP) Z RWY 28R AMDT 3**
  - Comment period ends May 28, 2025
    The following changes are expected:
    - Added two initial route segments from waypoint FFIST to waypoint NAGVY and from waypoint MYSHIN to waypoint CYMBL
    - Added waypoint SKYLN between waypoints NAGVY and GROVE
    - Altitude restriction at waypoint BBUBB was raised from AT 5,000 ft. MSL to AT OR ABOVE 6,000 ft. MSL.
    - Speed restriction added to waypoint FFIST of AT OR BELOW 200 KIAS
    - Altitude restriction at waypoint CYMBL was changed from AT 5,300 ft. MSL to AT OR ABOVE 5,300 ft. MSL
    - Various decision height/altitudes and visibility requirements were changed due to new obstacle evaluations and to maintain accordance with federal regulations.

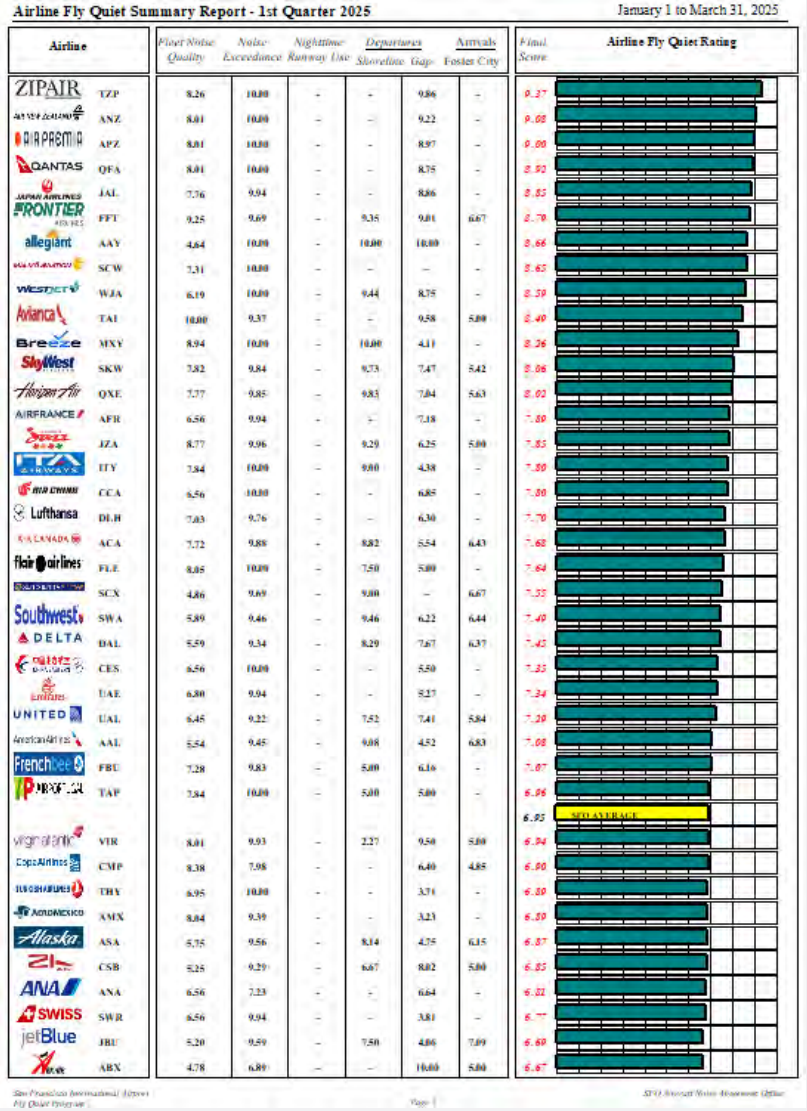
SAN FRANCISCO
INTERNATIONAL AIRPORT

Fly Quiet Program

Presented at the SFO Airport/Community Roundtable Meeting

June 4, 2025

Fly Quiet Program



Airline Fly Quiet Summary Report - 1st Quarter 2025

January 1 to March 31, 2025

Airline		Fleet Noise Quality	Noise Exceedance	Nighttime Runway Use	Departures Shoreline	Departures Gap	Arrivals Foster City	Final Score	Airline Fly Quiet Rating
ZIPAIR	TZP	9.26	10.00	-	-	9.86	-	9.27	
AIR NEW ZEALAND	ANZ	8.01	10.00	-	-	9.22	-	9.05	
AIR PREMIA	APZ	8.01	10.00	-	-	8.97	-	9.00	
QANTAS	QFA	8.01	10.00	-	-	8.75	-	8.92	
JAPAN AIRLINES	JAL	7.76	9.94	-	-	8.86	-	8.83	
FRONTIER	FFT	9.25	9.69	-	9.35	9.01	6.67	8.79	
allegiant	AAY	4.64	10.00	-	10.00	10.00	-	8.66	
SOUTHWEST	SCW	7.31	10.00	-	-	-	-	8.65	
WESTJET	WJA	6.19	10.00	-	9.44	8.75	-	8.59	
Avianca	TAI	10.00	9.37	-	-	9.58	5.00	8.40	
Breeze	MXY	8.94	10.00	-	10.00	4.11	-	8.36	
SkyWest	SKW	7.82	9.84	-	9.73	7.47	5.42	8.06	
Horizon Air	QXE	7.77	9.85	-	9.83	7.04	5.63	8.02	
AIRFRANCE	AFR	6.56	9.94	-	-	7.18	-	7.80	
JETSMART	JZA	8.77	9.96	-	9.29	6.25	5.00	7.85	
ITA AIRWAYS	ITY	7.84	10.00	-	9.00	4.38	-	7.80	
AIR CHINA	CCA	6.56	10.00	-	-	6.85	-	7.80	
Lufthansa	DLH	7.03	9.76	-	-	6.30	-	7.70	
AIR CANADA	ACA	7.72	9.88	-	8.82	5.54	6.43	7.68	
flair airlines	FLE	8.05	10.00	-	7.50	5.00	-	7.64	
SUNCOUNTRY	SCX	4.86	9.69	-	9.00	-	6.67	7.52	
Southwest	SWA	5.89	9.46	-	9.46	6.22	6.44	7.49	
DELTA	DAL	5.59	9.34	-	8.29	7.67	6.37	7.45	
CHINA EASTERN	CES	6.56	10.00	-	-	5.50	-	7.35	
Emirates	UAE	6.80	9.94	-	-	8.27	-	7.34	
UNITED	UAL	6.46	9.22	-	7.52	7.41	5.84	7.30	
American Airlines	AAL	5.54	9.45	-	9.08	4.52	6.83	7.08	
French bee	FBU	7.28	9.83	-	5.00	6.16	-	7.07	
TAP	TAP	7.84	10.00	-	5.00	5.00	-	6.96	
								6.95	SFO AVERAGE
virgin atlantic	VIR	8.01	9.93	-	2.27	9.50	5.00	6.94	
CopaAirlines	CMP	8.38	7.98	-	-	6.40	4.85	6.90	
HONG KONG AIRLINES	HKE	6.95	10.00	-	-	3.71	-	6.89	
AeroMexico	AMX	8.04	9.39	-	-	3.23	-	6.89	
Alaska	ASA	5.75	9.56	-	8.14	4.75	6.15	6.87	
ZIPAIR	CSB	5.25	9.29	-	6.67	8.02	5.00	6.85	
ANA	ANA	6.56	7.23	-	-	6.64	-	6.81	
SWISS	SWR	6.56	9.94	-	-	3.81	-	6.77	
jetBlue	JBU	5.20	9.59	-	7.50	4.86	7.09	6.69	
ABX	ABX	4.78	6.89	-	-	10.00	5.00	6.67	

1. Fleet Noise Quality
2. Noise Exceedance Rating
3. Nighttime Preferential Runway Use
4. Shoreline Departure Rating
5. Gap Departure Rating
6. Foster City Arrival Rating

1

Fleet Noise Quality

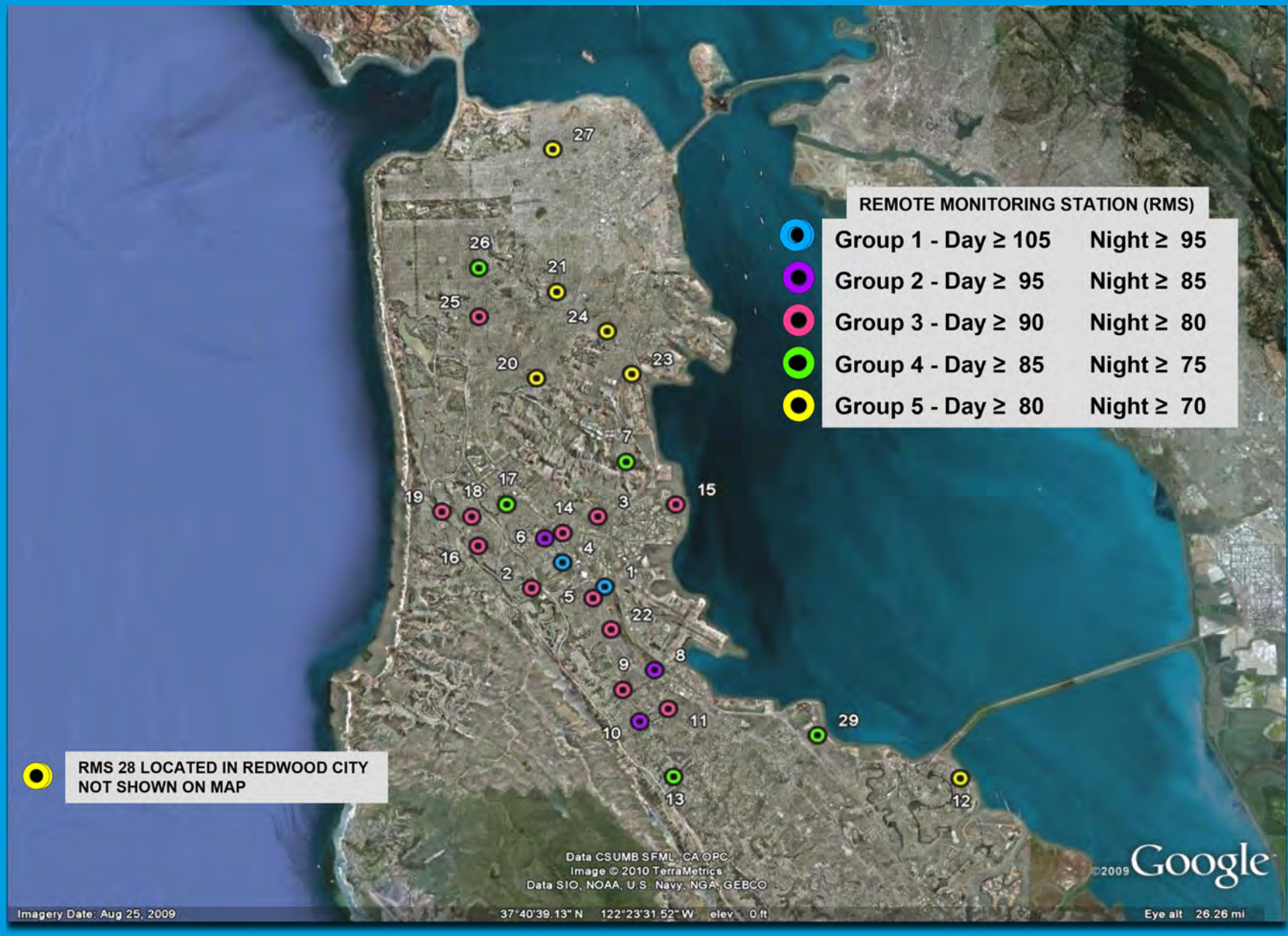
The Fly Quiet Program Fleet Noise Quality Rating evaluates the noise contribution of each airline's fl eet as it actually operates at SFO. Airlines generally own a variety of aircraft types and schedule them according to both operational and marketing considerations. Fly Quiet assigns a higher rating or grade to airlines operating quieter, new generation aircraft, while airlines operating older, louder technology aircraft would rate lower. The goal of this measurement is to fairly compare airlines—not just by the fleet they own, but by the frequency that they schedule and fly particular aircraft into SFO.

2

Noise Exceedance Rating

Whenever an aircraft overflight produces a noise level higher than the maximum decibel value established for a particular monitoring site, the noise threshold is surpassed, and a noise exceedance occurs. An exceedance may take place during approach, takeoff, or possibly during departure ground roll before lifting off.

Noise exceedances are logged by the exact operation along with the aircraft type and airline name.



3

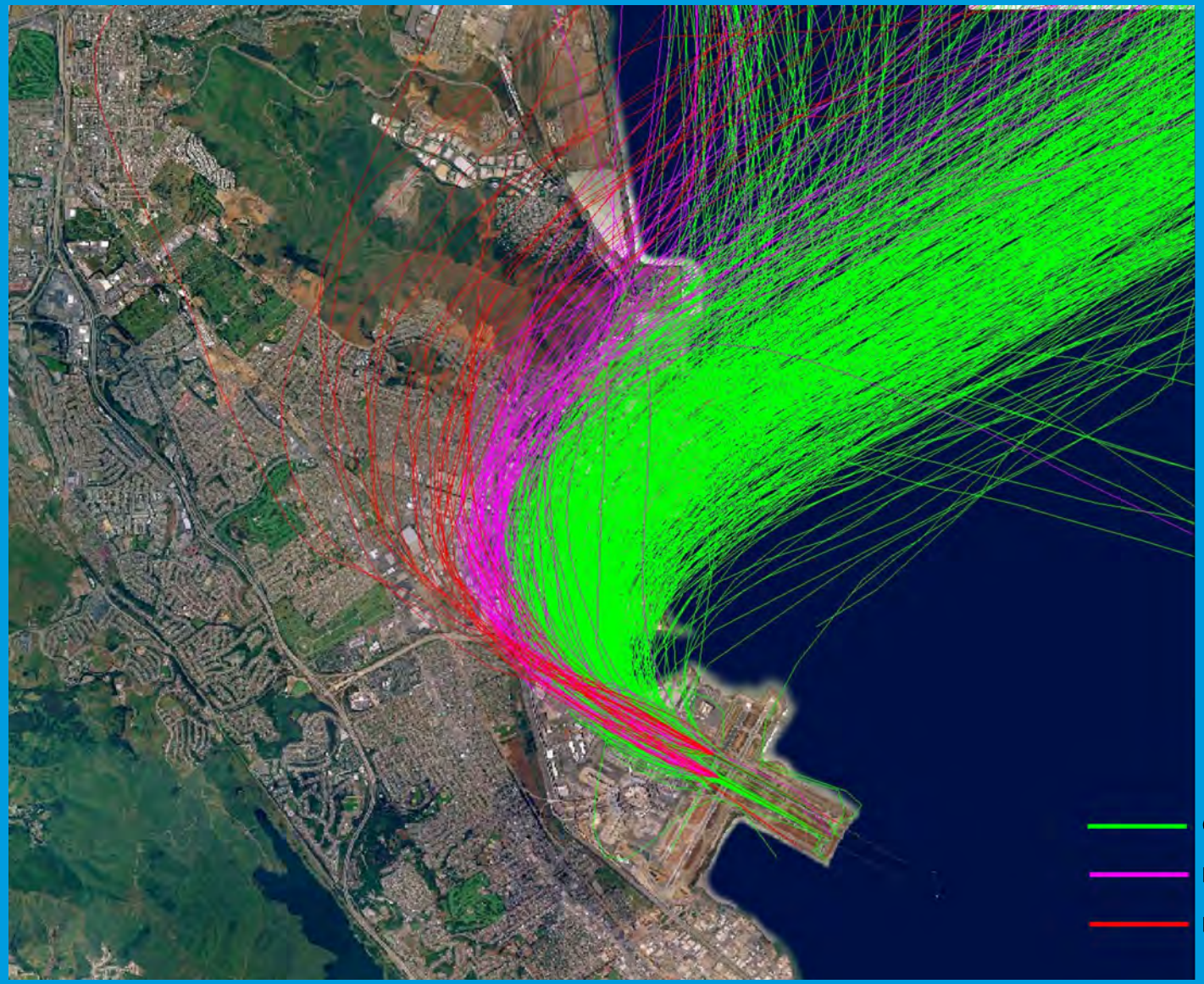
Nighttime Preferential Runway Use

SFO's Nighttime Preferential Runway Use program was developed in 1988. Although the program cannot
be used 100% of the time because of winds, weather, and other operational factors, the Airport, the Community
Roundtable, the FAA, and the Airlines have all worked together to maximize its use when conditions
permit. The program is voluntary; compliance is at the discretion of the pilot in command. The main focus of
this program is to maximize flights over water and minimize flights over land and populated areas between
1:00 a.m. and 6:00 a.m.

4

Shoreline Departure

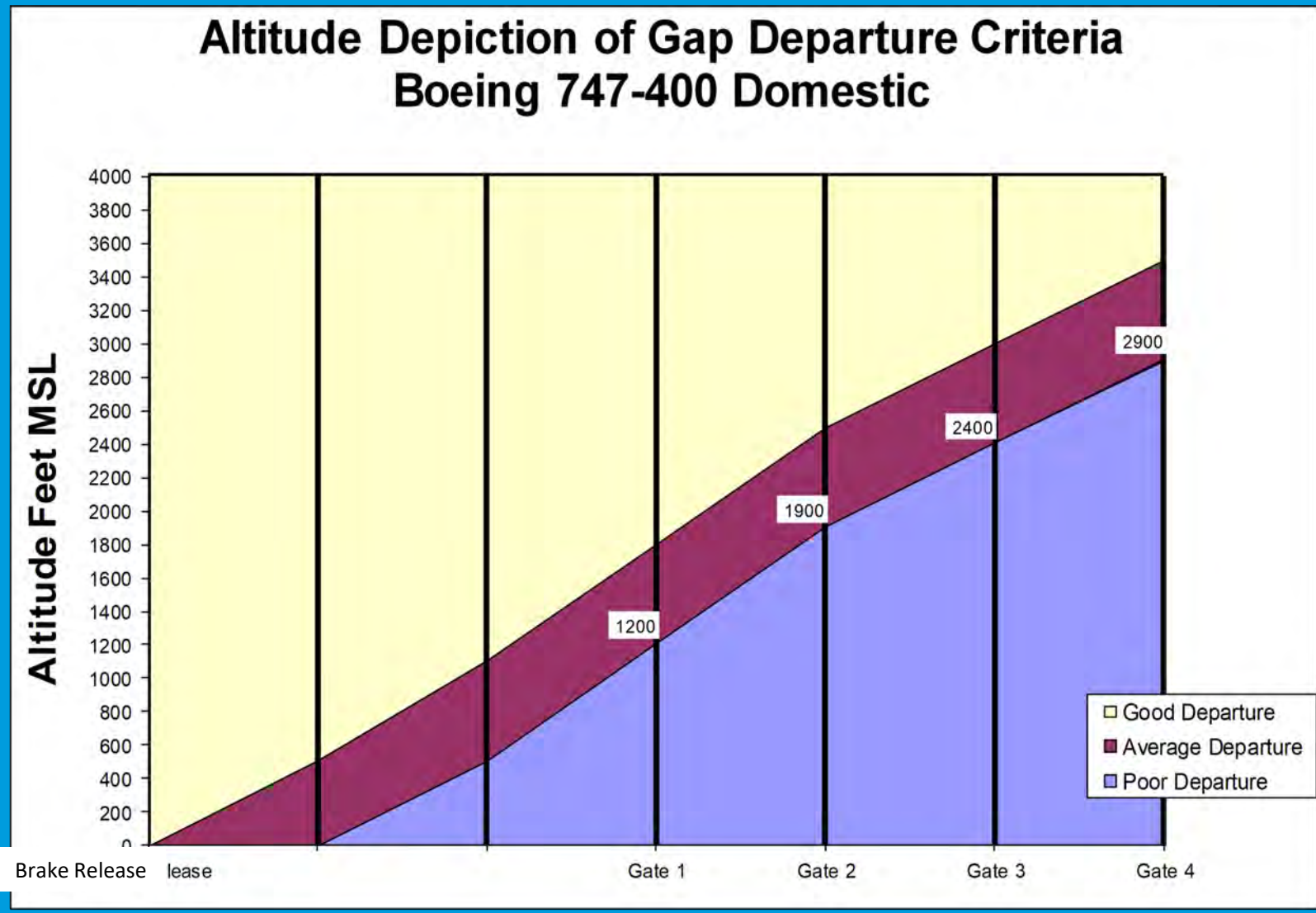
In order to evaluate each airline's performance when flying a Shoreline Departure, a corridor was established using Interstate 101 (green colored flight tracks) as a reference point. The corridor runs north along 101,
beginning approximately one-mile north-northwest of the end of Runways 28L and 28R and continuing up
into the City of Brisbane. Departures west of 101 are scored marginal or poor depending on their location



5

Gap Departure Rating

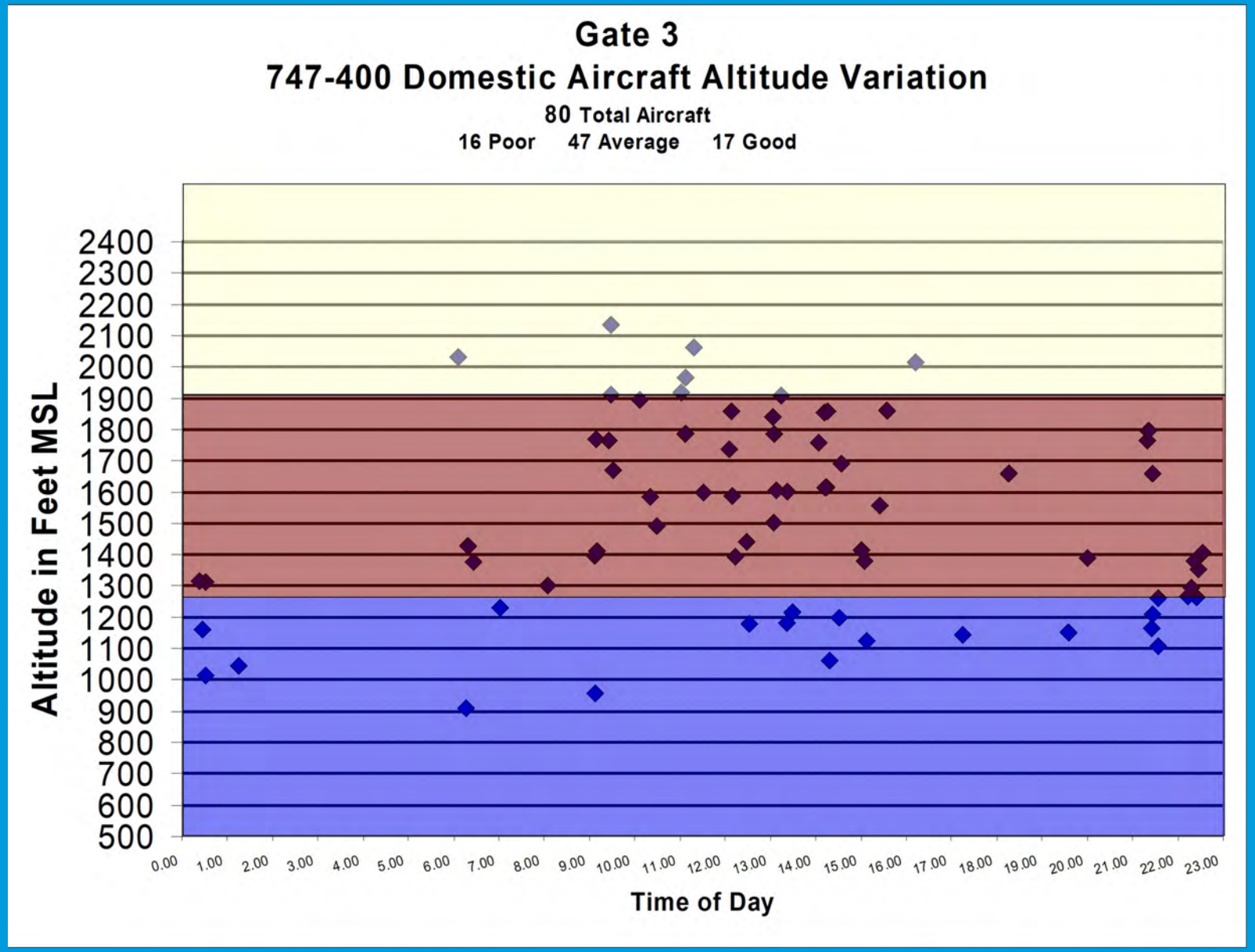
Aircraft departing SFO using Runways 28L and 28R frequently depart straight out using a procedure known as the Gap Departure. This procedure directs air traffic to fly a route that takes them over the area northwest of the airport over the cities of South San Francisco, San Bruno, Daly City, and Pacifica. In an attempt to mitigate noise in this specific area, the Gap Departure Quality Rating has been included as a category in the Fly Quiet Program.



5

Gap Departure Rating

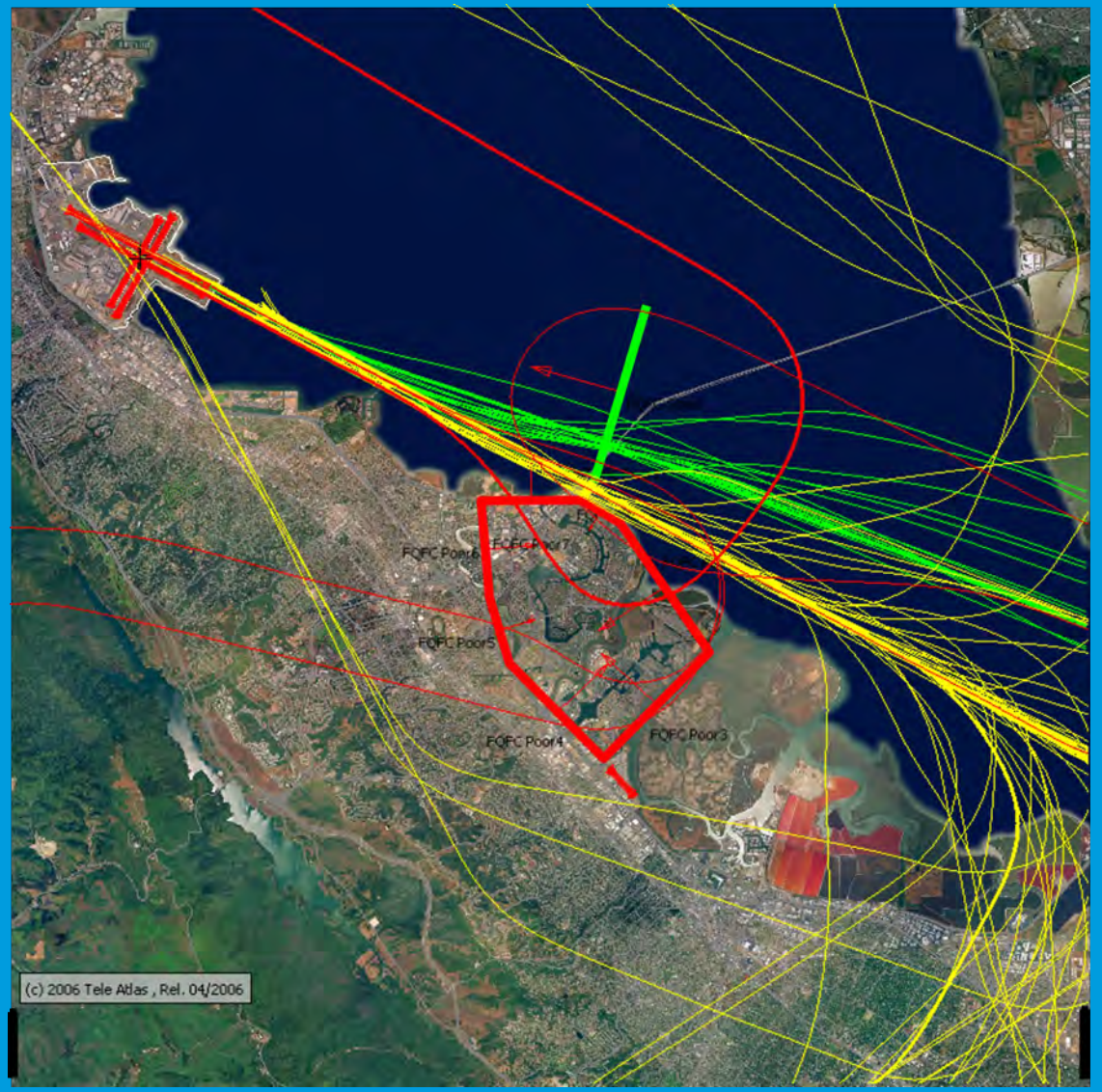
Since “higher is quieter”, aircraft altitudes are recorded along the departure route. Scores are assigned at specified points or gates set approximately one mile apart, with the higher aircraft receiving higher scores.



6

Foster City Arrival

The Arrival Quality Rating is the latest addition to the Fly Quiet Program. In an effort to further reduce nighttime noise in neighboring communities, this rating is designed to maximize over-bay approaches to Runways 28 between 11:00 p.m. and 6:00 a.m. Airlines arriving to Runways 28 during these hours are assessed based on which approach flight path was used. Over-the-bay approaches are rated good, versus over-the-communities which are rated poor.



Jon C. Long Fly Quiet Awards

Noise Abatement Officer

Mr. Long worked tirelessly on implementing the Fly Quiet Program at SFO. His dedication to this project is evident in its success. After his untimely passing in June 2003, SFO named the annual awards in his honor. Each year the Jon C. Long Fly Quiet Awards are presented to the airlines that operated the quietest, the most improved and those that exemplify the Fly Quiet Program goals.

SFO Noise Abatement Office 2000 – 2003.

San Francisco International
Airport/Community Roundtable

455 County Center, 2nd Floor
Redwood City, CA 94063
T (650) 363-4220
F (650) 363-4849
www.sforoundtable.org

May 28, 2025

TO:	SFO Airport Community Roundtable Members
FROM	Vanessa Lee, SFO Roundtable Coordinator
SUBJECT:	Ground-Base Noise Measurement Program Summary of Results

BACKGROUND

SFO maintains a comprehensive aircraft noise monitoring system to track and manage noise levels in the communities surrounding the Airport. In recent years, concerns have been raised by residents and community representatives that the existing CNEL (Community Noise Equivalent Level) contours may not adequately capture the true aircraft noise environment, particularly in adjacent hillside communities where aircraft do not typically fly overhead. There was also a perception that low-frequency noise might be more prominent in these areas due to the way sound propagates over ground surfaces.

To address these concerns, the SFO Airport/Community Roundtable partnered with its technical consultant, HMMH, and the San Francisco International Airport (SFO) Aircraft Noise Office to design and conduct a targeted noise monitoring program. This initiative, known as the 'Up-the-Hill' noise study, aimed to measure and analyze actual aircraft noise levels in specific communities perceived to be impacted, including Millbrae and Burlingame. The goal was to gather data that would assess and validate these community concerns by examining both standard A-weighted and low-frequency C-weighted sound measurements during typical SFO operational conditions.

OVERVIEW

The primary objective of the study was to better understand how noise from aircraft departures, particularly from Runways 1L and 1R, propagates into the surrounding communities. Following direction from the Ground-Based Noise (GBN) Subcommittee, a focused project study area was established, targeting locations directly adjacent to and southwest of the runway alignments. Noise monitoring was conducted over a 21-day period, from July 7 to July 27, 2024; and data collection took place at a total of 14 locations, including five temporary portable monitoring sites and nine permanent noise monitoring stations. The geographic range of monitoring included communities in Millbrae, Burlingame, San Bruno, South San Francisco, and Daly City. Both A-weighted (typical human hearing sensitivity) and C-weighted (low-frequency sensitive) sound levels were measured, providing a robust dataset for evaluating community noise exposure relative to standard noise modeling practices.

SUMMARY OF RESULTS

The study results indicated that noise levels, both A-weighted and C-weighted, within the standard CNEL contours were consistently higher than those measured in adjacent communities outside the contours. The overall findings suggest that low-frequency noise levels remain proportionally consistent with A-weighted noise levels and do not show a distinct pattern of increased exposure in the adjacent communities.

Attachments: SFO Roundtable Up-The-Hill Noise Monitoring Studies

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: San Bruno Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
SFO Permanent Noise Monitoring Location – Site 1 in San Bruno

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

San Bruno, South San Francisco, and Daly City are situated adjacent to SFO, with San Bruno sitting directly to the west, South San Francisco to the northwest, and Daly City further northwest. Much of the aircraft noise that reaches San Bruno, South San Francisco, and Daly City is caused by departing aircraft traveling overhead at low altitudes from the west runways, Runways 28L and 28R. But, because of their proximity to the airport, they may also receive noise from takeoffs and landings that do not directly overfly them. Aircraft operations on the airfield, takeoffs (takeoff thrust) and landings (reverse thrust from jet engine thrust reversers) generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may be logically correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at aircraft thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD threshold for the total monitoring period was 65 dBA. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 340 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 100% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily direct overflights from departing aircraft from SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included noise from departing aircraft from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using thrust reversers to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 73 dBA and the Aircraft CNEL and Community CNEL using NPD were 73 dBA and 55 dBA, respectively. This noise monitor was located in a busy suburban area with daily ambient noise ranging between 53 and 58 dba. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

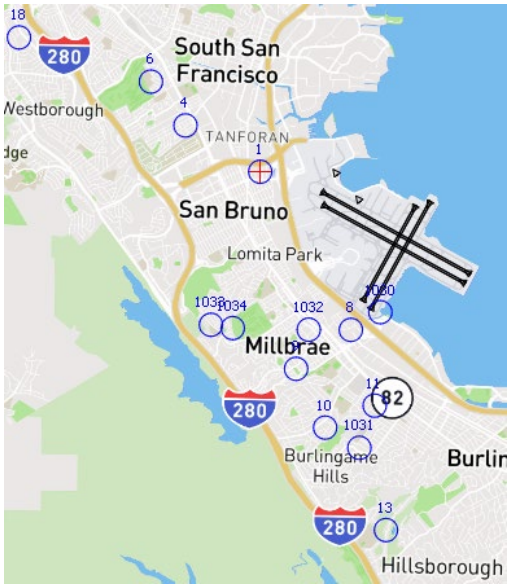
During the monitoring period, the SFO Aircraft Noise Office received 139 noise reports from 7 San Bruno residents. Most noise reports were generated between 8AM and 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 1AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Site 1, San Bruno
Monitoring Site Elevation (ft)	16
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	56
NPD Community (non-aircraft) CNEL (dBA)	55
NPD Aircraft CNEL (dBA)	73
NPD Avg Daily SFO Noise Events	211
ANEEM Aircraft CNEL (dBA)	73
ANEEM Avg Aircraft SEL (dBA)	91
ANEEM Avg Aircraft SEL (dBC)	98
ANEEM Avg Aircraft Lmax (dBA)	73
ANEEM Avg Aircraft Lmax (dBC)	83
ANEEM Avg Daily SFO Noise Events	340
SFO West Flow	100%
SFO Southeast Flow	0%

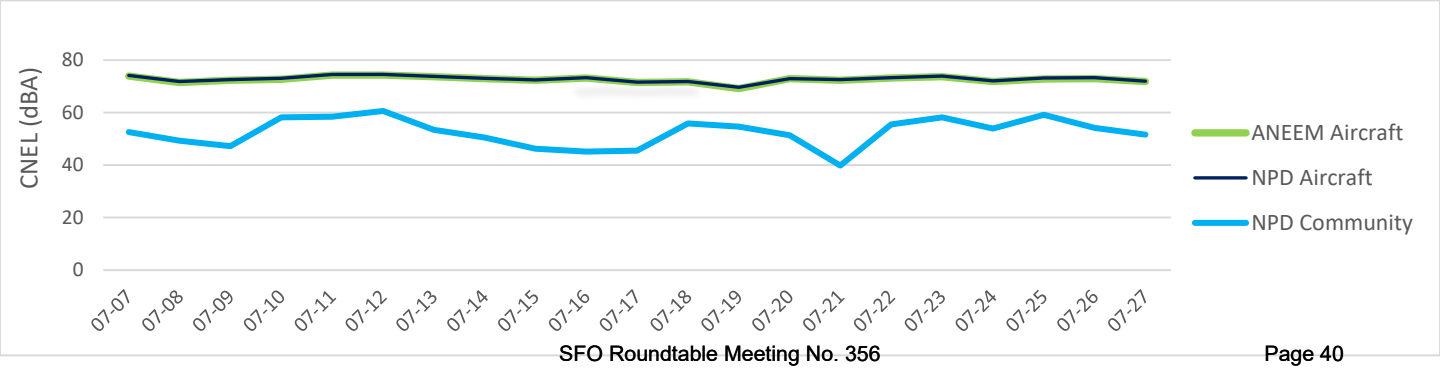
B – Monitoring Location



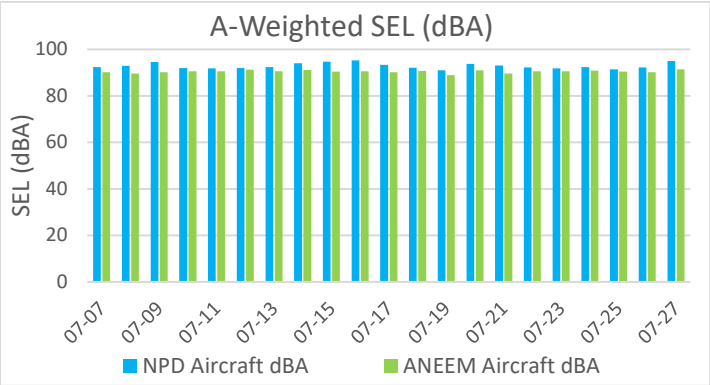
C – Daily Noise Event Averages

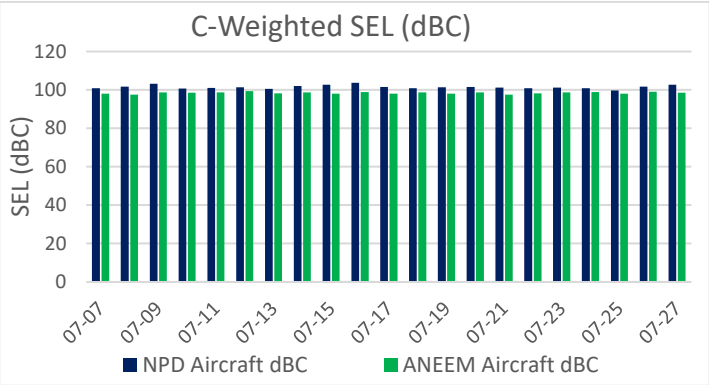
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	253	93	77	411	90	73	253	101	86	411	98	83	115	79	68
07-08	167	93	79	356	90	71	167	102	88	356	98	81	105	78	68
07-09	125	95	84	328	90	71	125	103	90	328	99	82	5	89	73
07-10	257	92	77	328	91	74	257	101	87	328	98	83	281	80	68
07-11	316	92	77	406	91	74	316	101	87	406	99	84	298	80	68
07-12	344	92	76	384	91	75	344	101	87	384	99	85	467	80	68
07-13	280	92	77	418	91	73	280	101	85	418	98	82	122	79	68
07-14	171	94	81	323	91	74	171	102	89	323	99	82	30	84	72
07-15	124	95	85	317	91	72	124	103	91	317	98	81	11	84	71
07-16	108	95	86	321	91	71	108	104	93	321	99	83	8	79	72
07-17	141	93	81	279	90	73	141	102	89	279	98	82	43	77	68
07-18	204	92	78	275	91	74	204	101	87	275	99	84	268	79	68
07-19	178	91	78	274	89	74	178	101	88	274	98	84	169	79	68
07-20	188	94	80	358	91	73	188	102	88	358	99	84	55	81	70
07-21	169	93	81	360	90	72	169	101	88	360	98	82	10	77	68
07-22	264	92	77	373	91	74	264	101	87	373	98	83	240	79	68
07-23	275	92	76	348	91	74	275	101	87	348	99	84	291	80	68
07-24	239	92	78	327	91	75	239	101	87	327	99	84	137	78	68
07-25	269	92	76	331	90	74	269	100	85	331	98	83	381	79	68
07-26	238	92	78	370	90	74	238	102	88	370	99	84	199	79	68
07-27	118	95	86	261	91	73	118	103	91	261	99	81	8	82	71
Daily Average	**211**	**93**	**79**	**340**	**91**	**73**	**211**	**101**	**87**	**340**	**98**	**83**	**154**	**80**	**68**
Total Count	**4,428**			**7,148**			**4,428**			**7,148**			**3,243**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



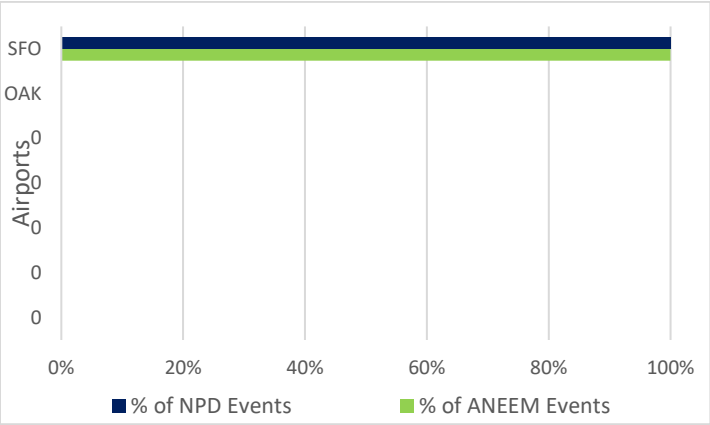


F – SFO ANEEM Aircraft Noise Events by Time of Day

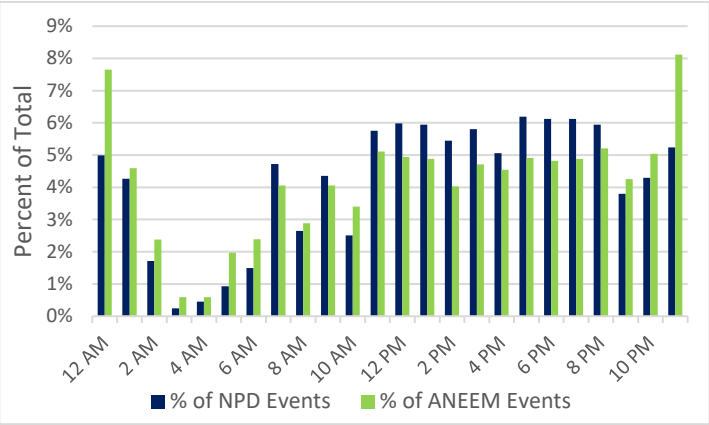
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	3,742	52%	91	69	104	75	60	104	13	4	98
Evening (7pm-10pm)	1,025	14%	89	68	109	73	61	99	13	4	79
Night (10pm-7am)	2,381	33%	91	59	106	71	53	100	16	4	98

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	3,742	52%	99	74	111	85	66	108	13	4	98
Evening (7pm-10pm)	1,025	14%	97	73	112	83	67	103	13	4	79
Night (10pm-7am)	2,381	33%	98	66	115	80	58	108	16	4	98

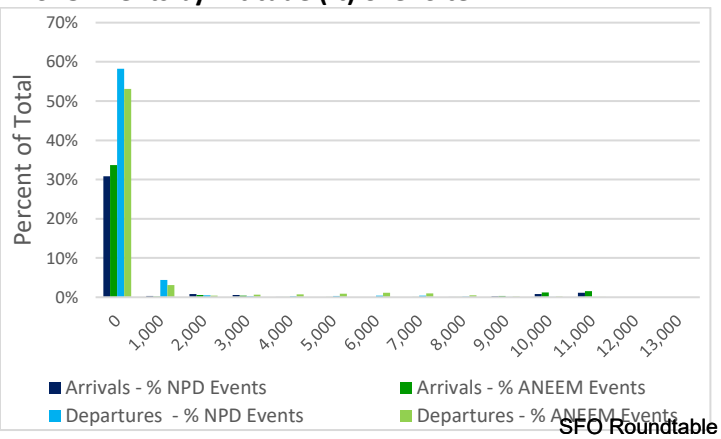
G – Percentage of Events by Airports



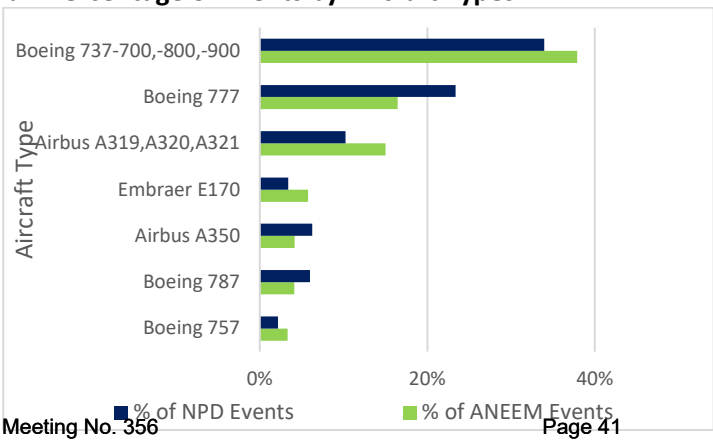
H – SFO Noise Events by Hour of the Day



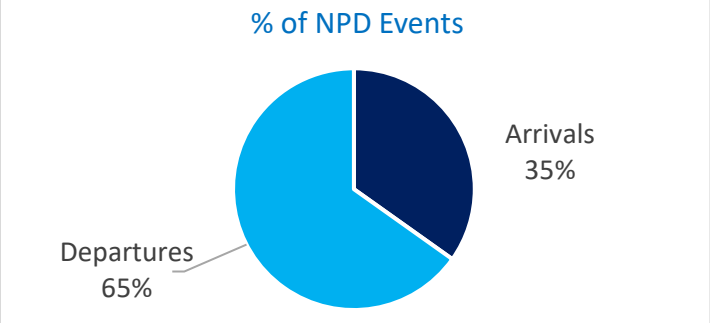
I – SFO Events by Altitude (ft) over Site

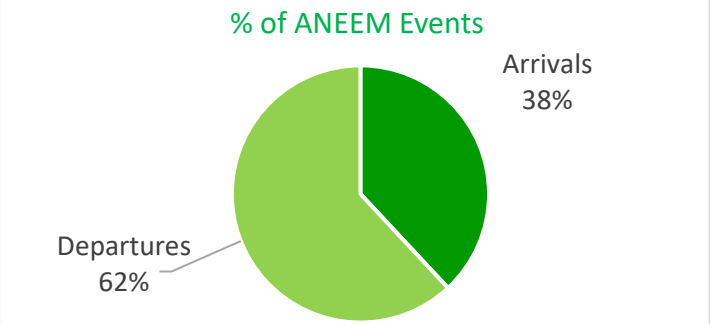


J – Percentage of Events by Aircraft Types

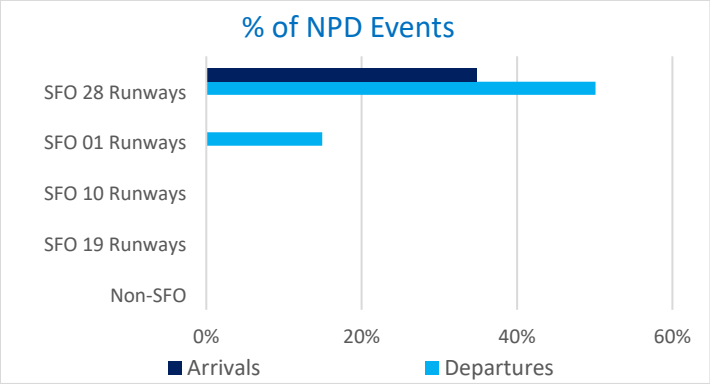


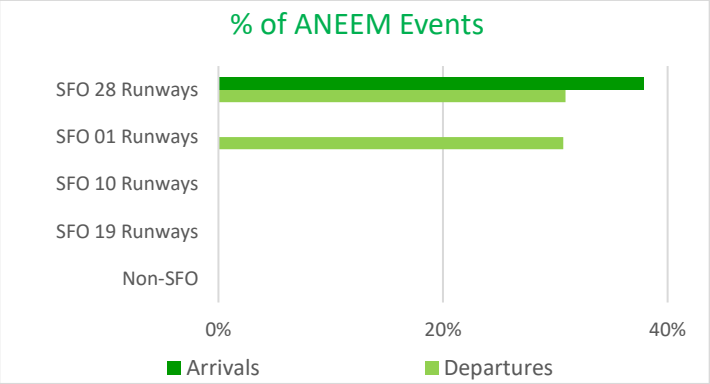
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

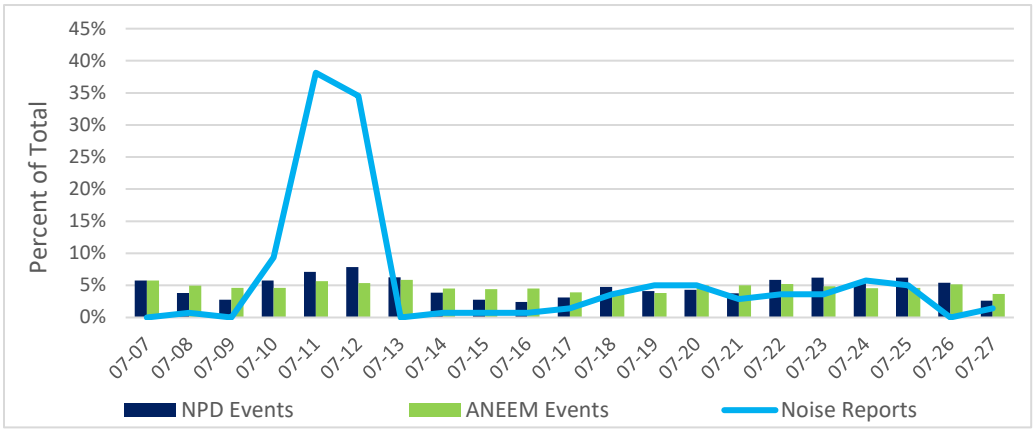




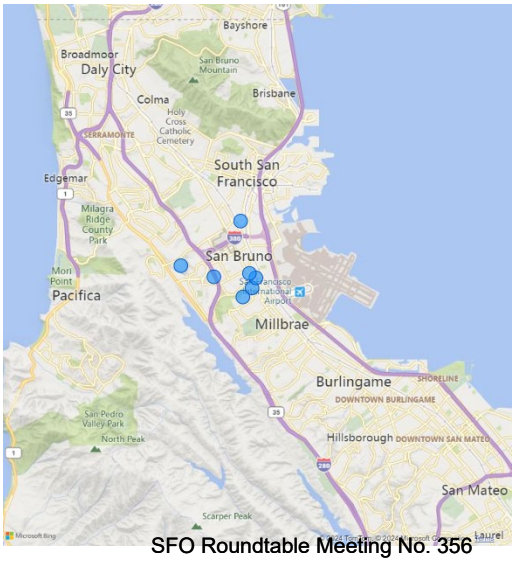
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	0	0
07-08	1	1
07-09	0	0
07-10	1	13
07-11	3	53
07-12	3	48
07-13	0	0
07-14	1	1
07-15	1	1
07-16	1	1
07-17	1	2
07-18	1	5
07-19	1	7
07-20	1	7
07-21	2	4
07-22	1	5
07-23	2	5
07-24	1	8
07-25	2	7
07-26	0	0
07-27	1	2
Total	**7**	**139**

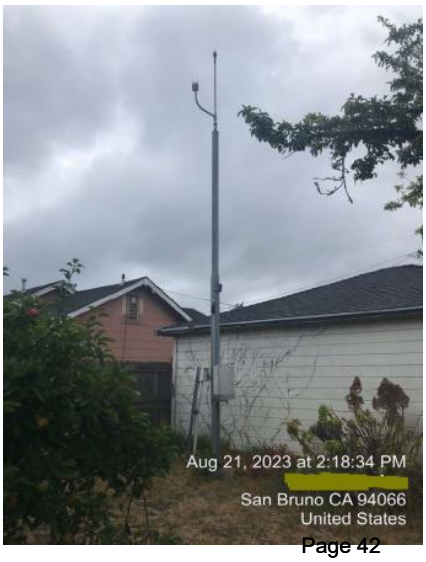
N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location



Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

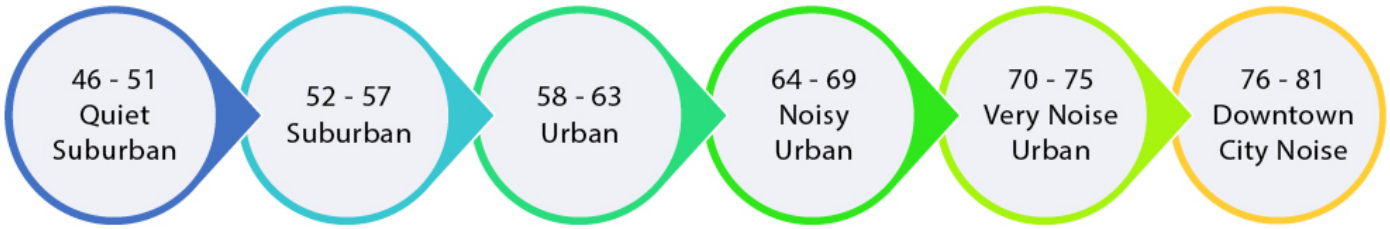
Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

C-Weighted Noise Level – Denoted in dBC, is a different scale for loudness perception of sound pressure levels than A-weighted noise. A C-weight scale is used to measure sounds with approximately equal sensitivity at all frequencies. The C-weighted scale accounts for low-frequency ranges of sounds more than an A-weighted scale, often resulting in more of the overall noise energy to be included in the measurement.

California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).



Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: South San Francisco Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
SFO Permanent Noise Monitoring Location – Site 4 in South San Francisco

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

San Bruno, South San Francisco, and Daly City are situated adjacent to SFO, with San Bruno sitting directly to the west, South San Francisco to the northwest, and Daly City further northwest. Much of the aircraft noise that reaches San Bruno, South San Francisco, and Daly City is caused by departing aircraft traveling overhead at low altitudes from the west facing runways, Runways 28L and 28R. But, because of their proximity to the airport, they may also receive noise from takeoffs and landings that do not directly overfly them. Aircraft operations on the airfield, takeoffs (takeoff thrust) and landings (reverse thrust from jet engine thrust reverser), generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may be logically correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD thresholds for the total monitoring period were 62 dBA for daytime and 60 dBA for nighttime. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 583 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 100% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily direct overflights from departing aircraft from SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included noise from departing aircraft from SFO's North-facing runways, Runways 01L and 01R, and from landing aircraft using thrust reversers thrust to assist with slowing down after touching-down on SFO's West-facing runways, Runways 28L and 28R.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 67 dBA and the Aircraft CNEL and Community CNEL using NPD were 67 dBA and 45 dBA, respectively. This noise monitor was located in a suburban area with daily ambient noise ranging between 41 and 49 dba. Aircraft noise above ambient levels

may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

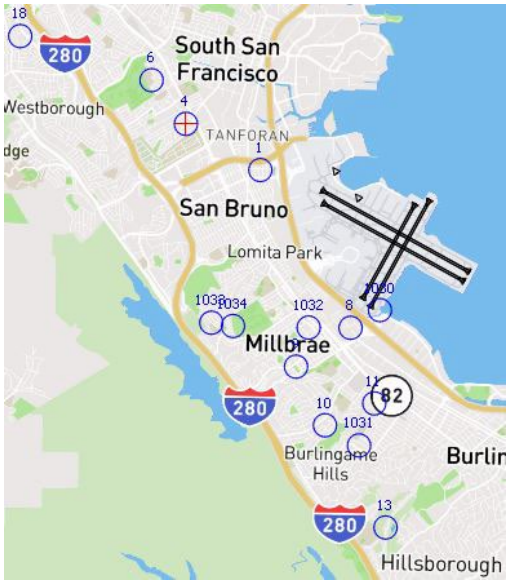
During the monitoring period, the SFO Aircraft Noise Office received 29 noise reports from 7 South San Francisco residents. Most of the noise reports were generated between 2AM and 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 8AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Site 4, South San Francisco
Monitoring Site Elevation (ft)	52
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	47
NPD Community (non-aircraft) CNEL (dBA)	45
NPD Aircraft CNEL (dBA)	67
NPD Avg Daily SFO Noise Events	170
ANEEM Aircraft CNEL (dBA)	67
ANEEM Avg Aircraft SEL (dBA)	83
ANEEM Avg Aircraft SEL (dBC)	94
ANEEM Avg Aircraft Lmax (dBA)	65
ANEEM Avg Aircraft Lmax (dBC)	80
ANEEM Avg Daily SFO Noise Events	582
SFO West Flow	100%
SFO Southeast Flow	0%

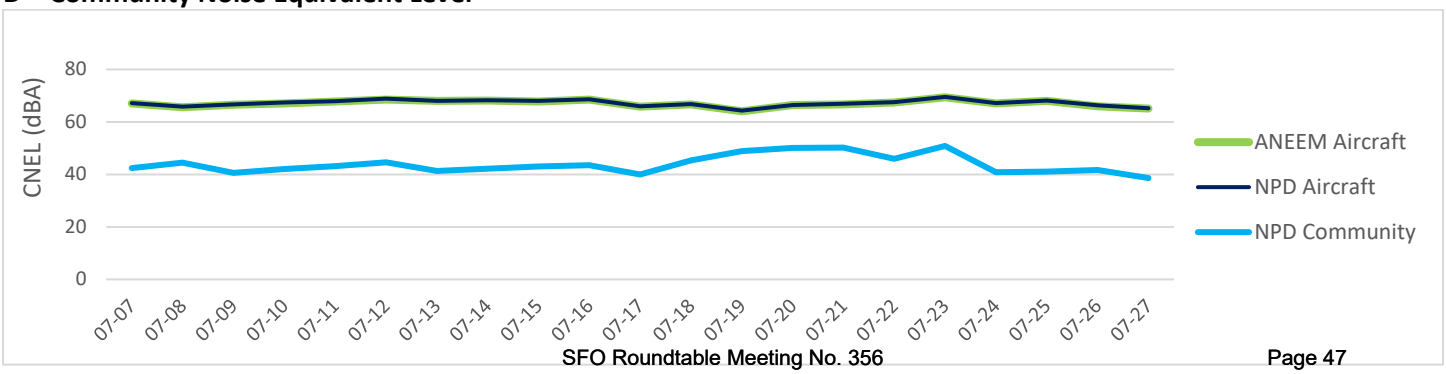
B – Monitoring Location



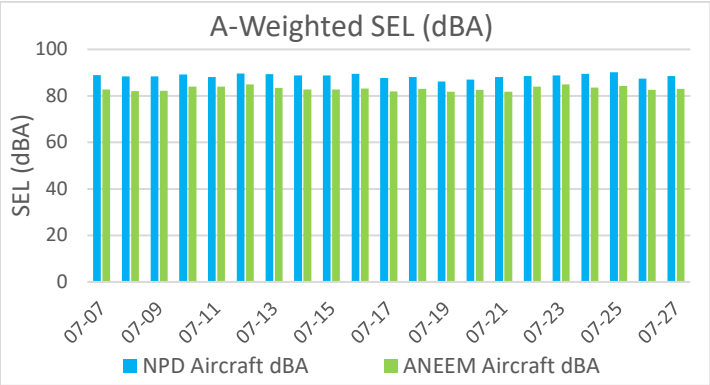
C – Daily Noise Event Averages

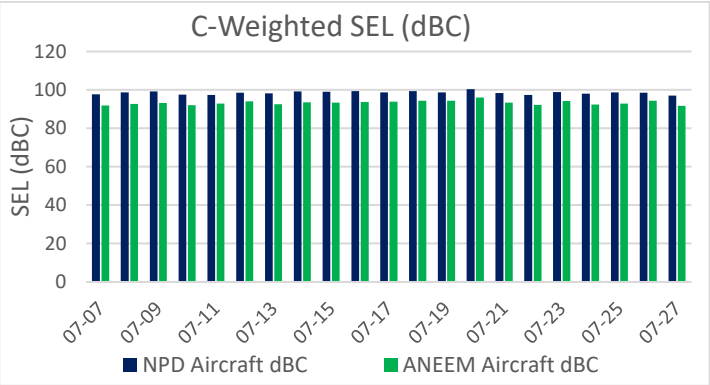
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	142	89	76	587	83	64	142	98	85	587	92	78	11	76	69
07-08	151	88	76	625	82	64	151	99	87	625	93	79	25	80	72
07-09	165	88	76	671	82	64	165	99	87	671	93	78	16	77	70
07-10	148	89	76	486	84	64	148	98	84	486	92	76	12	75	66
07-11	161	88	75	416	84	66	161	97	84	416	93	78	13	77	68
07-12	168	90	76	466	85	67	168	99	86	466	94	81	14	76	68
07-13	180	89	76	693	83	65	180	98	85	693	93	78	12	76	69
07-14	203	89	76	800	83	64	203	99	87	800	94	79	19	79	71
07-15	182	89	76	723	83	65	182	99	87	723	93	80	19	79	70
07-16	159	90	77	676	83	65	159	99	87	676	94	80	18	79	70
07-17	182	88	76	686	82	65	182	99	87	686	94	81	22	76	70
07-18	187	88	75	598	83	66	187	99	88	598	94	81	35	78	71
07-19	180	86	74	490	82	66	180	99	87	490	94	81	38	77	70
07-20	245	87	75	662	83	68	245	100	89	662	96	84	66	78	70
07-21	151	88	76	654	82	64	151	98	86	654	93	81	36	75	68
07-22	186	89	74	508	84	65	186	97	84	508	92	77	36	79	66
07-23	199	89	74	468	85	67	199	99	85	468	94	79	70	77	67
07-24	148	90	76	577	84	65	148	98	85	577	92	78	13	75	68
07-25	115	90	77	431	84	65	115	99	85	431	93	78	13	77	68
07-26	195	87	75	586	83	67	195	99	87	586	94	83	21	77	71
07-27	125	88	77	428	83	64	125	97	84	428	92	77	7	75	68
Daily Average	**170**	**89**	**76**	**582**	**83**	**65**	**170**	**99**	**86**	**582**	**94**	**80**	**25**	**78**	**69**
Total Count	**3,572**			**12,231**			**3,572**			**12,231**			**516**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



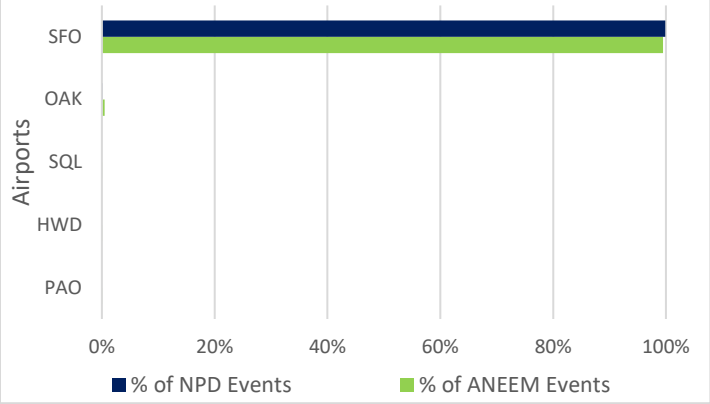


F – SFO ANEEM Aircraft Noise Events by Time of Day

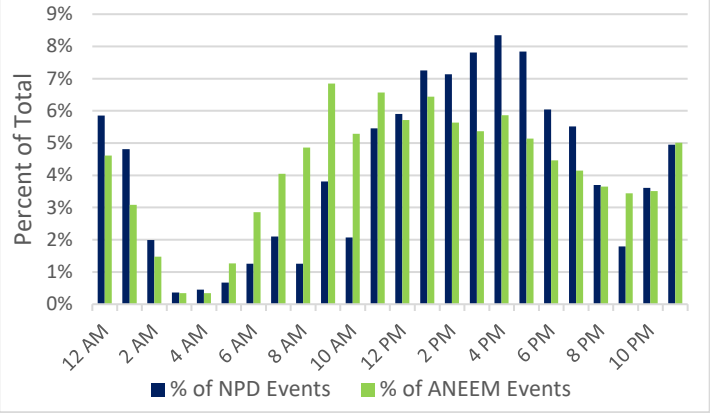
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	8,103	66%	83	57	100	66	49	93	12	4	97
Evening (7pm-10pm)	1,375	11%	82	59	98	65	52	91	12	4	99
Night (10pm-7am)	2,753	23%	84	50	105	63	43	98	14	4	85

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	8,103	66%	94	66	109	81	58	101	12	4	97
Evening (7pm-10pm)	1,375	11%	92	67	108	80	60	99	12	4	99
Night (10pm-7am)	2,753	23%	93	61	114	76	54	106	14	4	85

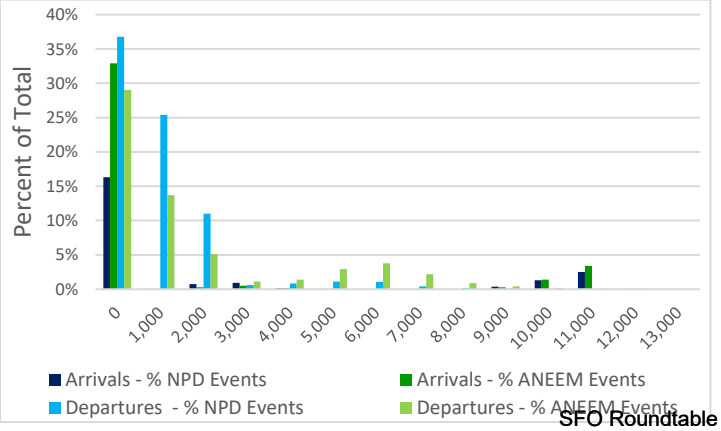
G – Percentage of Events by Airports



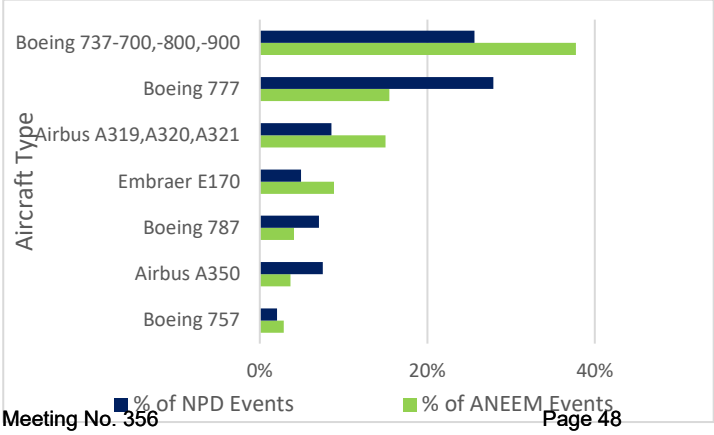
H – SFO Noise Events by Hour of the Day



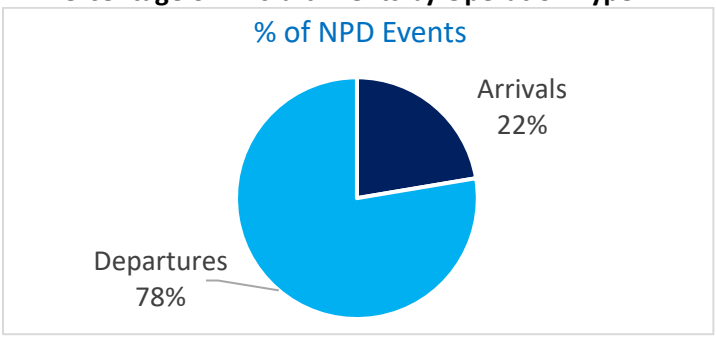
I – SFO Events by Altitude (ft) over Site

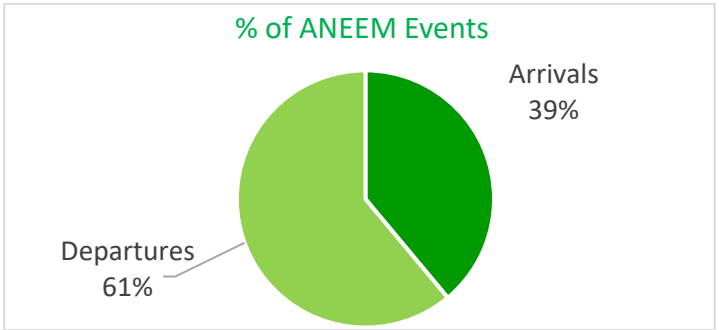


J – Percentage of Events by Aircraft Types

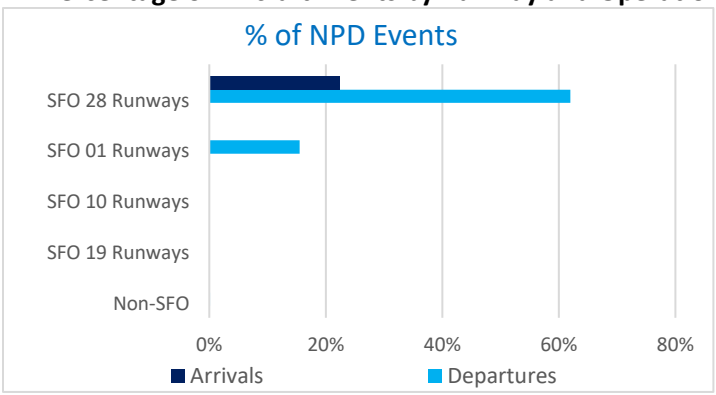


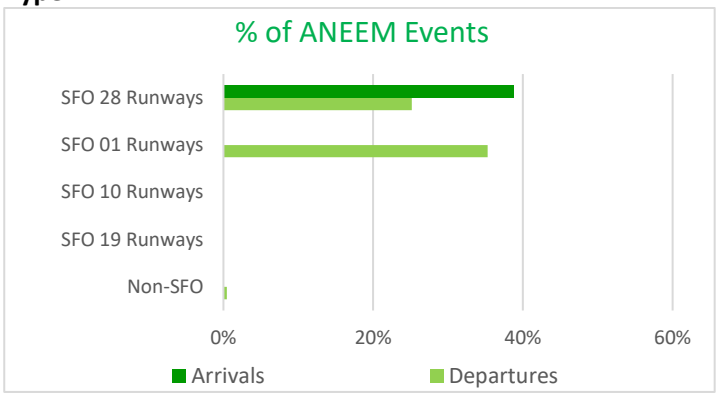
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

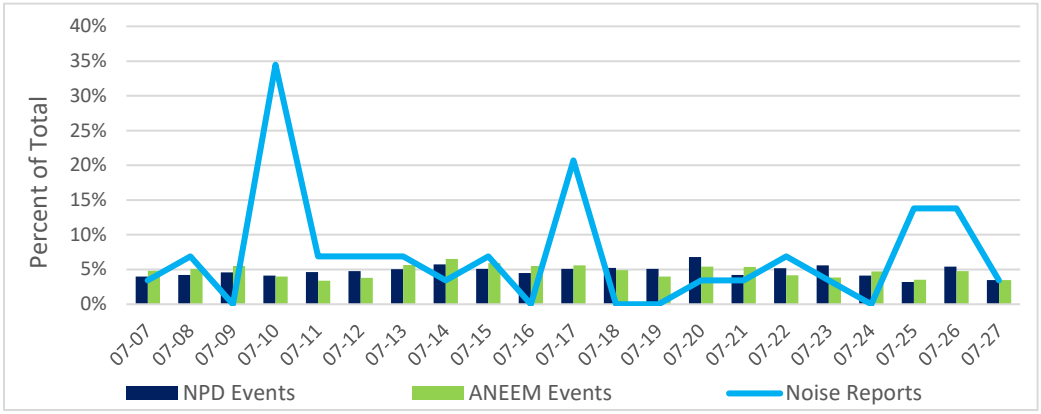




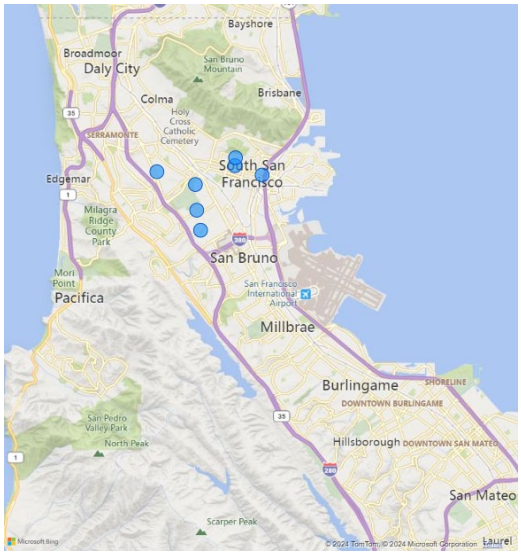
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	1	1
07-08	2	2
07-09	0	0
07-10	3	10
07-11	1	2
07-12	1	2
07-13	1	2
07-14	1	1
07-15	1	2
07-16	0	0
07-17	1	6
07-18	0	0
07-19	0	0
07-20	1	1
07-21	1	1
07-22	2	2
07-23	1	1
07-24	0	0
07-25	1	4
07-26	1	4
07-27	1	1
Total	**7**	**29**

N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location

Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

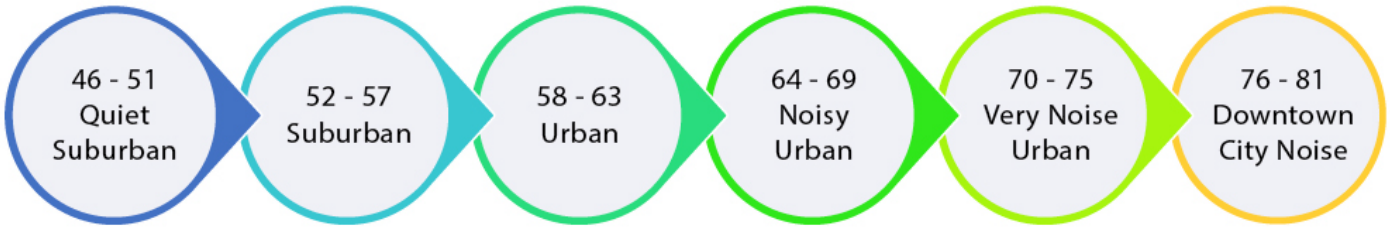
Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

C-Weighted Noise Level – Denoted in dBC, is a different scale for loudness perception of sound pressure levels than A-weighted noise. A C-weight scale is used to measure sounds with approximately equal sensitivity at all frequencies. The C-weighted scale accounts for low-frequency ranges of sounds more than an A-weighted scale, often resulting in more of the overall noise energy to be included in the measurement.

California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).



Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: South San Francisco Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
SFO Permanent Noise Monitoring Location – Site 6 in South San Francisco

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

San Bruno, South San Francisco, and Daly City are situated adjacent to SFO, with San Bruno sitting directly to the west, South San Francisco to the northwest, and Daly City further northwest. Much of the aircraft noise that reaches San Bruno, South San Francisco, and Daly City is caused by departing aircraft traveling overhead at low altitudes from the west runways, Runways 28L and 28R. But, because of their proximity to the airport, they may also receive noise from takeoffs and landings that do not directly overfly them. Aircraft operations on the airfield, takeoffs (takeoff thrust) and landings (reverse thrust from jet engine thrust reverser), generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may be logically correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD thresholds for the total monitoring period were 62 dBA for daytime and 60 dBA for nighttime. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 420 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 100% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily direct overflights from departing aircraft from SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included noise from departing aircraft from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using thrust reversers to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 64 dBA and the Aircraft CNEL and Community CNEL using NPD were 64 dBA and 49 dBA, respectively. This noise monitor was located in a suburban area with daily ambient noise ranging between 39 and 49 dba. Aircraft noise above ambient levels

may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

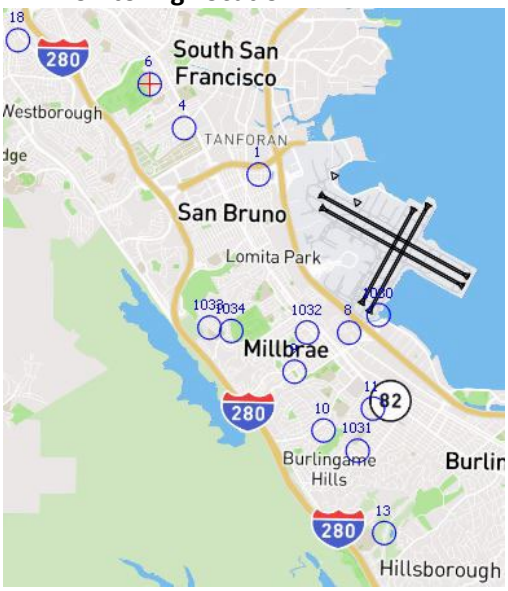
During the monitoring period, the SFO Aircraft Noise Office received 29 noise reports from 7 South San Francisco residents. Most of the noise reports were generated between 2AM and 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 9AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Site 6, South San Francisco
Monitoring Site Elevation (ft)	89
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	46
NPD Community (non-aircraft) CNEL (dBA)	49
NPD Aircraft CNEL (dBA)	64
NPD Avg Daily SFO Noise Events	128
ANEEM Aircraft CNEL (dBA)	64
ANEEM Avg Aircraft SEL (dBA)	82
ANEEM Avg Aircraft SEL (dBC)	91
ANEEM Avg Aircraft Lmax (dBA)	64
ANEEM Avg Aircraft Lmax (dBC)	77
ANEEM Avg Daily SFO Noise Events	420
SFO West Flow	100%
SFO Southeast Flow	0%

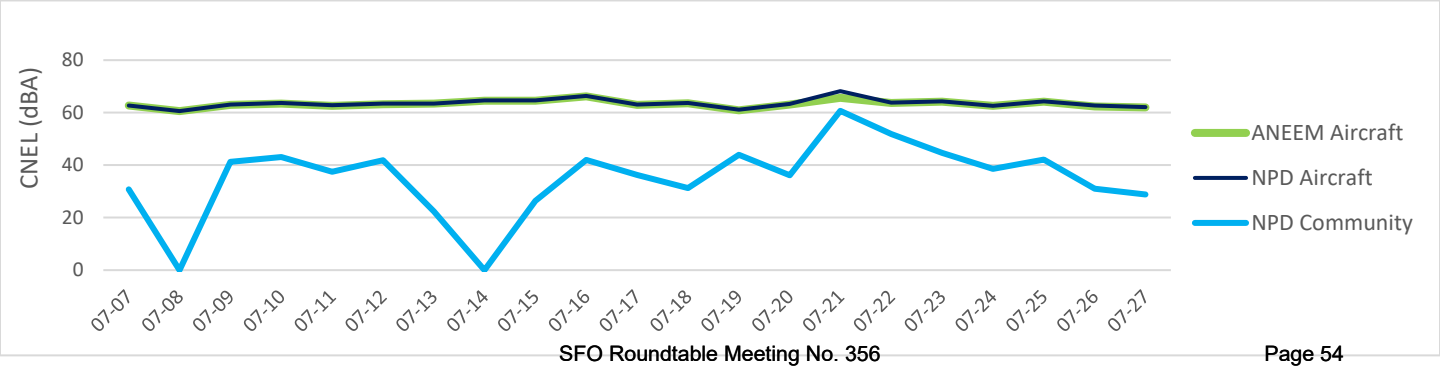
B – Monitoring Location



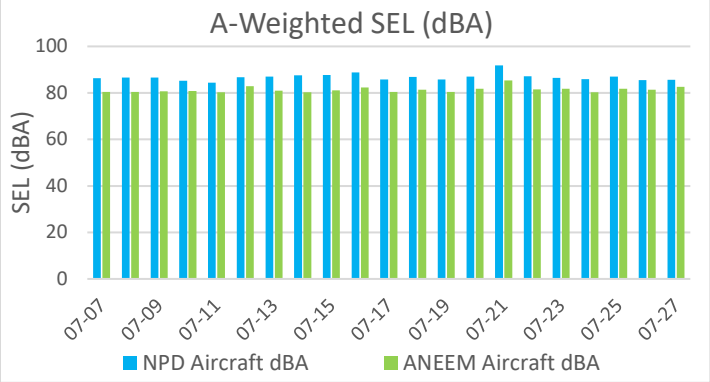
C – Daily Noise Event Averages

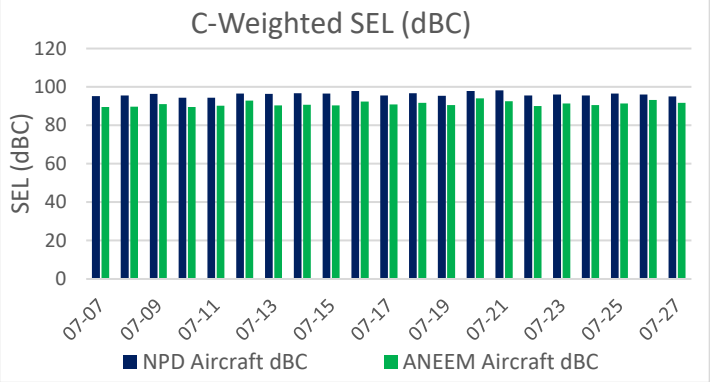
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	108	86	75	424	80	62	108	95	83	424	90	75	1	80	68
07-08	96	87	75	399	80	62	96	96	83	399	90	75	0	-	-
07-09	117	87	75	447	81	63	117	96	84	447	91	76	9	81	68
07-10	164	85	73	448	81	64	164	94	80	448	90	75	24	78	68
07-11	142	84	72	367	80	65	142	94	81	367	90	76	7	75	65
07-12	111	87	75	261	83	67	111	97	84	261	93	79	2	79	70
07-13	126	87	75	499	81	63	126	96	83	499	90	75	1	72	66
07-14	125	88	75	663	80	61	125	97	84	663	91	76	0	-	-
07-15	117	88	76	530	81	62	117	97	84	530	90	76	2	77	66
07-16	107	89	77	469	82	62	107	98	85	469	92	77	6	84	69
07-17	150	86	74	508	80	63	150	96	82	508	91	77	12	76	68
07-18	111	87	75	388	81	63	111	97	84	388	92	77	1	71	66
07-19	96	86	74	334	80	63	96	95	82	334	91	75	14	77	65
07-20	115	87	75	372	82	65	115	98	85	372	94	80	2	78	72
07-21	270	92	79	512	85	70	270	98	85	512	93	81	54	93	80
07-22	130	87	74	448	82	64	130	96	82	448	90	75	13	90	70
07-23	128	87	74	372	82	64	128	96	83	372	91	76	9	84	68
07-24	127	86	74	464	80	63	127	96	82	464	91	76	7	77	66
07-25	103	87	75	349	82	64	103	97	83	349	91	77	11	78	67
07-26	125	86	74	320	81	66	125	96	83	320	93	80	1	70	64
07-27	119	86	75	237	83	67	119	95	83	237	92	77	2	75	68
Daily Average	**128**	**88**	**75**	**420**	**82**	**64**	**128**	**96**	**83**	**420**	**91**	**77**	**8**	**88**	**71**
Total Count	**2,687**			**8,811**			**2,687**			**8,811**			**178**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



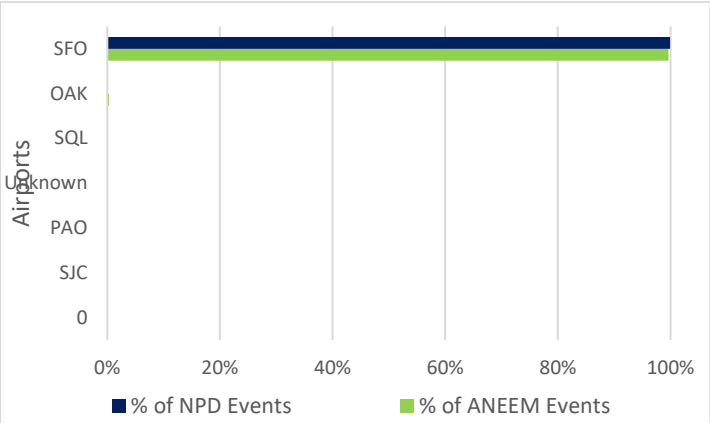


F – SFO ANEEM Aircraft Noise Events by Time of Day

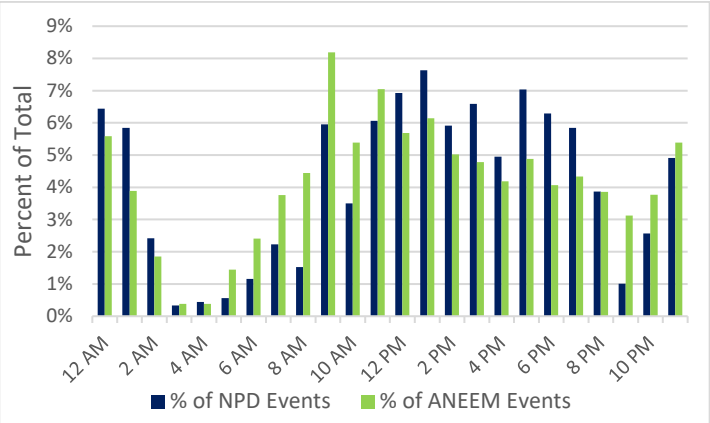
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	5,602	64%	82	56	97	65	49	88	14	4	95
Evening (7pm-10pm)	997	11%	80	57	96	63	49	87	14	4	79
Night (10pm-7am)	2,212	25%	81	48	99	62	39	91	15	4	82

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	5,602	64%	92	64	107	78	57	101	14	4	95
Evening (7pm-10pm)	997	11%	90	69	106	76	62	101	14	4	79
Night (10pm-7am)	2,212	25%	91	59	107	74	54	99	15	4	82

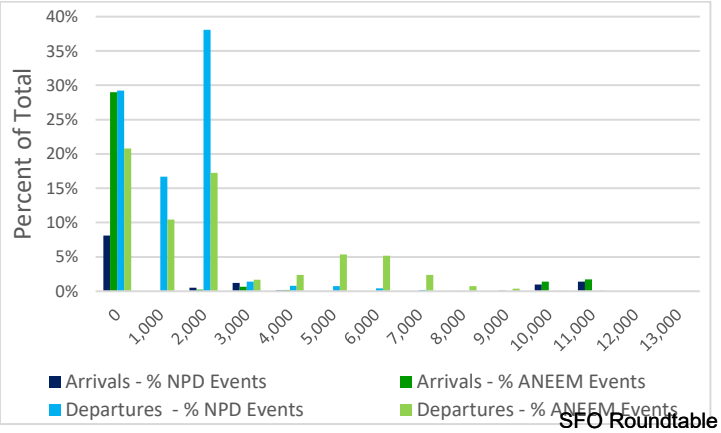
G – Percentage of Events by Airports



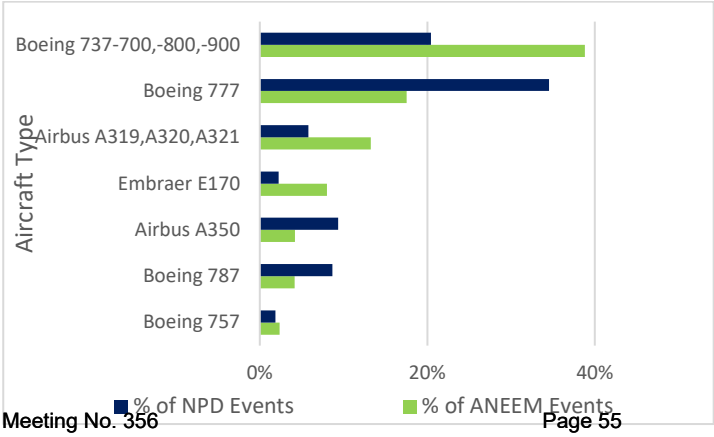
H – SFO Noise Events by Hour of the Day



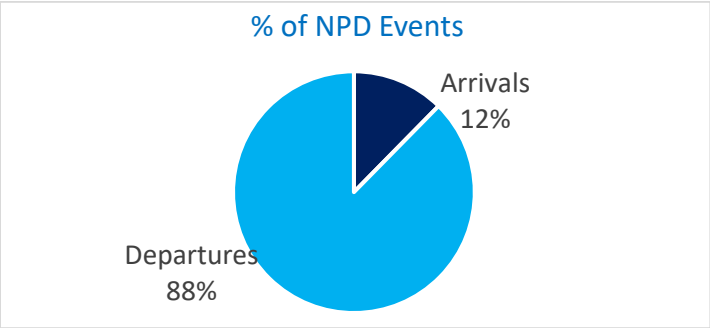
I – SFO Events by Altitude (ft) over Site

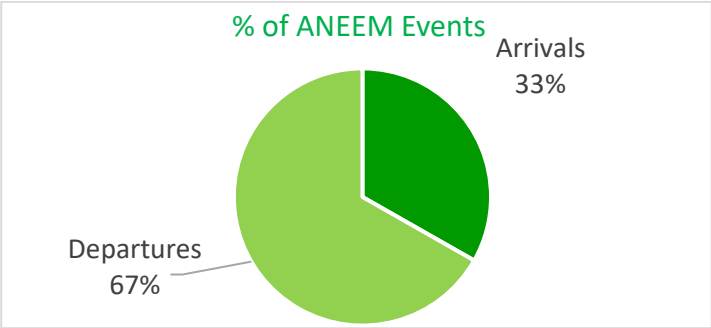


J – Percentage of Events by Aircraft Types

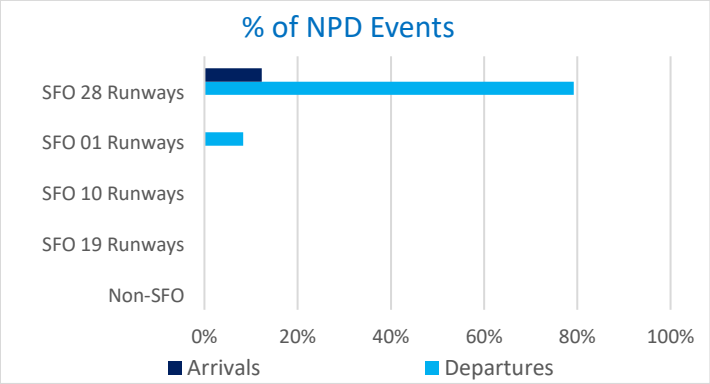


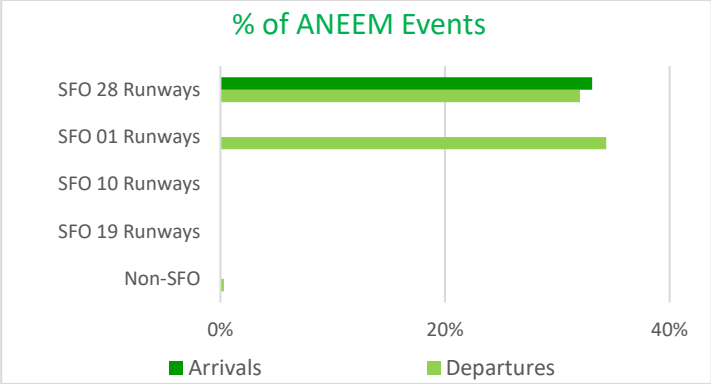
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

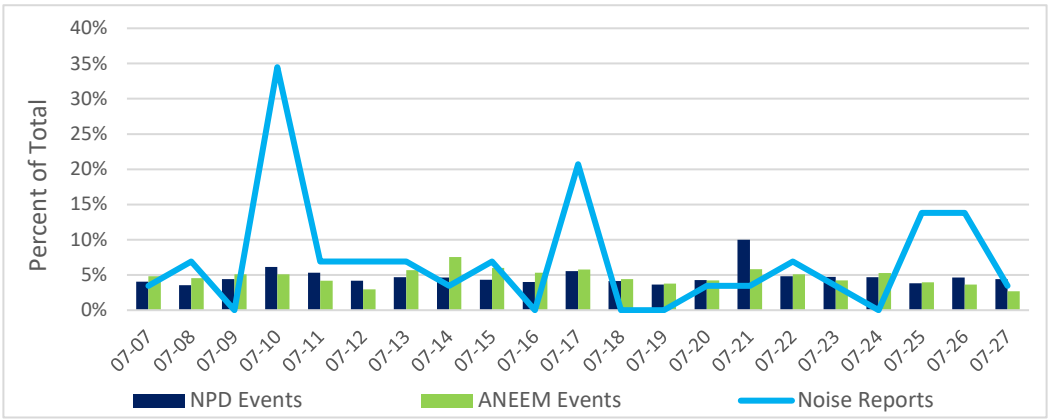




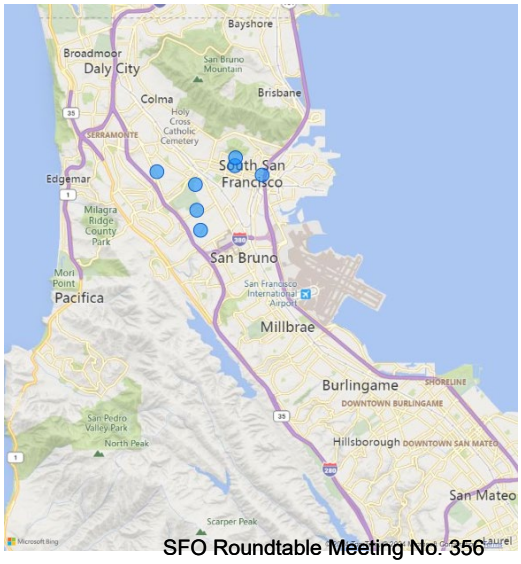
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	1	1
07-08	2	2
07-09	0	0
07-10	3	10
07-11	1	2
07-12	1	2
07-13	1	2
07-14	1	1
07-15	1	2
07-16	0	0
07-17	1	6
07-18	0	0
07-19	0	0
07-20	1	1
07-21	1	1
07-22	2	2
07-23	1	1
07-24	0	0
07-25	1	4
07-26	1	4
07-27	1	1
Total	7	29

N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location

Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

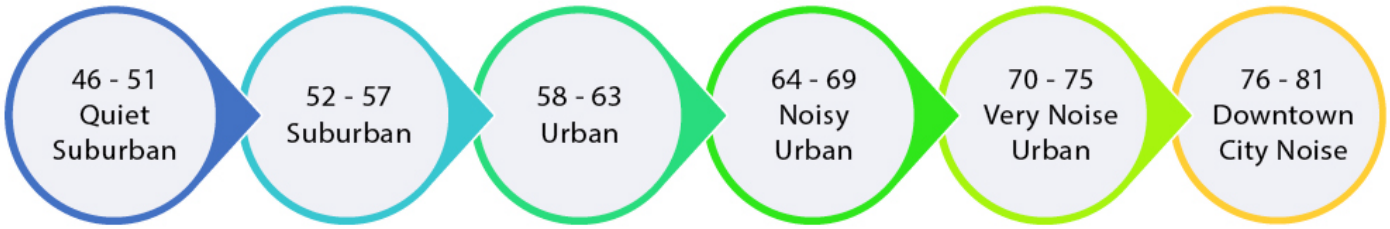
Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

C-Weighted Noise Level – Denoted in dBC, is a different scale for loudness perception of sound pressure levels than A-weighted noise. A C-weight scale is used to measure sounds with approximately equal sensitivity at all frequencies. The C-weighted scale accounts for low-frequency ranges of sounds more than an A-weighted scale, often resulting in more of the overall noise energy to be included in the measurement.

California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).



Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Millbrae Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
SFO Permanent Noise Monitoring Location – Site 8 in Millbrae

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae, Burlingame, and Hillsborough are situated adjacent to SFO, with Millbrae sitting to the southwest, Burlingame to the south, and Hillsborough further south. Much of the aircraft noise that reaches Millbrae, Burlingame, and Hillsborough is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs (takeoff thrust) and landings (reverse thrust from jet engine thrust reversers), generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may be logically correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD threshold for the total monitoring period was 67 dBA. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 632 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 100% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily departing aircraft from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using thrust reversers to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's west-facing runways, Runways 28L and 28R.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 60 dBA and the Aircraft CNEL and Community CNEL using NPD were 54 dBA and 47 dBA, respectively. This noise monitor was located in an urban area with daily ambient noise ranging between 47 and 53 dba. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

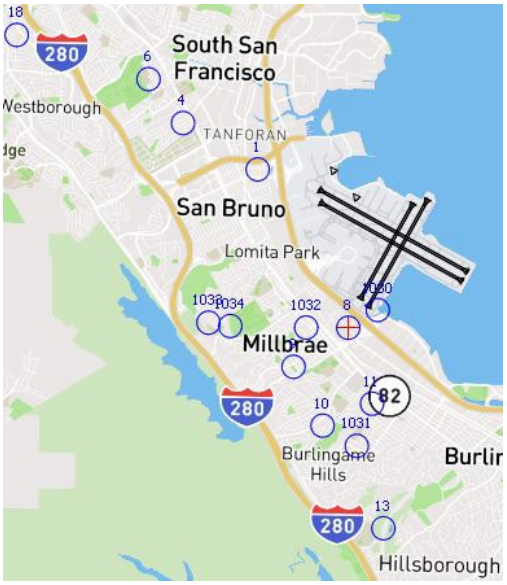
During the monitoring period, the SFO Aircraft Noise Office received 11 noise reports from 4 Millbrae residents. Most of these noise reports were generated between 5AM and 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 8AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Site 8, Millbrae
Monitoring Site Elevation (ft)	7
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	50
NPD Community (non-aircraft) CNEL (dBA)	47
NPD Aircraft CNEL (dBA)	54
NPD Avg Daily SFO Noise Events	25
ANEEM Aircraft CNEL (dBA)	60
ANEEM Avg Aircraft SEL (dBA)	76
ANEEM Avg Aircraft SEL (dBC)	89
ANEEM Avg Aircraft Lmax (dBA)	65
ANEEM Avg Aircraft Lmax (dBC)	77
ANEEM Avg Daily SFO Noise Events	632
SFO West Flow	100%
SFO Southeast Flow	0%

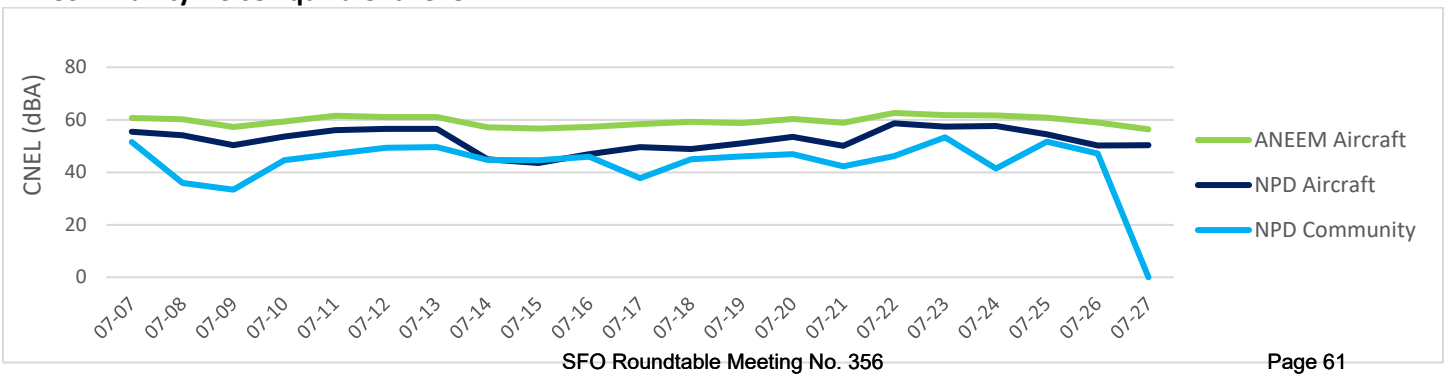
B – Monitoring Location



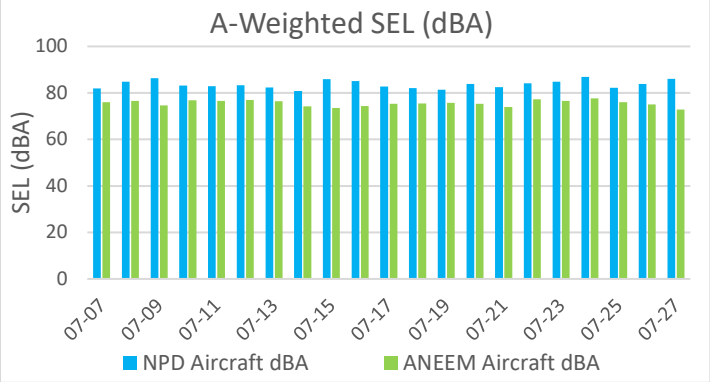
C – Daily Noise Event Averages

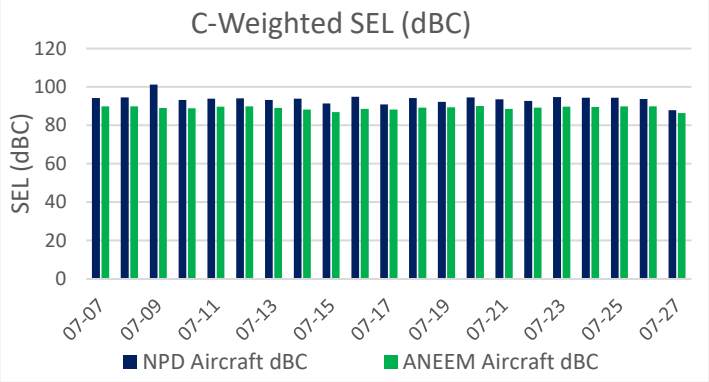
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	32	82	72	665	76	65	32	94	83	665	90	77	9	83	71
07-08	25	85	74	585	77	66	25	95	84	585	90	78	3	80	73
07-09	15	87	76	625	75	62	15	102	84	625	89	76	1	83	73
07-10	52	83	73	682	77	66	52	93	82	682	89	77	5	79	71
07-11	40	83	72	698	77	66	40	94	82	698	90	77	7	82	72
07-12	44	83	72	641	77	66	44	94	82	641	90	78	10	81	72
07-13	36	82	72	626	76	65	36	93	81	626	89	76	8	81	69
07-14	17	81	72	598	74	63	17	94	84	598	88	75	3	80	72
07-15	5	86	76	612	74	62	5	91	81	612	87	75	5	85	76
07-16	13	85	77	614	74	63	13	95	86	614	89	77	5	84	76
07-17	15	83	75	581	75	64	15	91	82	581	88	76	2	82	74
07-18	17	82	73	691	75	65	17	94	83	691	89	77	4	81	71
07-19	19	81	73	565	76	66	19	92	82	565	89	78	3	83	75
07-20	18	83	74	630	75	64	18	94	82	630	90	78	6	82	73
07-21	10	82	72	574	74	62	10	94	82	574	89	76	1	82	71
07-22	46	84	73	755	77	66	46	93	81	755	89	77	8	85	73
07-23	44	85	73	689	77	66	44	95	83	689	90	77	8	86	74
07-24	36	87	74	629	78	66	36	94	83	629	90	77	4	81	72
07-25	29	82	73	648	76	65	29	95	83	648	90	77	11	82	72
07-26	18	84	75	667	75	64	18	94	84	667	90	78	5	80	71
07-27	3	86	79	498	73	61	3	88	81	498	86	74	0	-	-
Daily Average	**25**	**84**	**73**	**632**	**76**	**65**	**25**	**94**	**83**	**632**	**89**	**77**	**5**	**83**	**72**
Total Count	**534**			**13,273**			**534**			**13,273**			**108**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



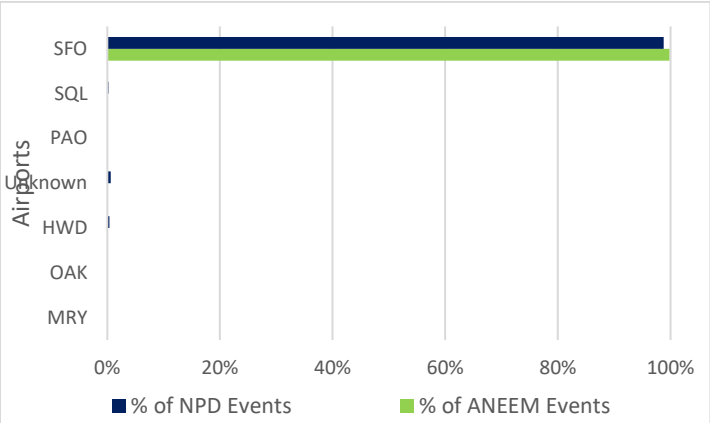


F – SFO ANEEM Aircraft Noise Events by Time of Day

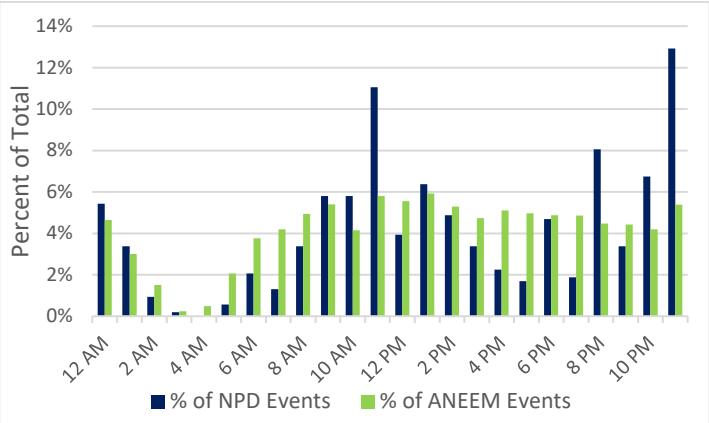
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	8,090	61%	76	60	94	65	53	87	13	4	99
Evening (7pm-10pm)	1,827	14%	76	62	98	65	54	95	13	4	98
Night (10pm-7am)	3,356	25%	76	55	96	64	46	83	15	4	97

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	8,090	61%	89	68	109	77	62	101	13	4	99
Evening (7pm-10pm)	1,827	14%	89	70	104	77	63	97	13	4	98
Night (10pm-7am)	3,356	25%	89	63	102	76	57	95	15	4	97

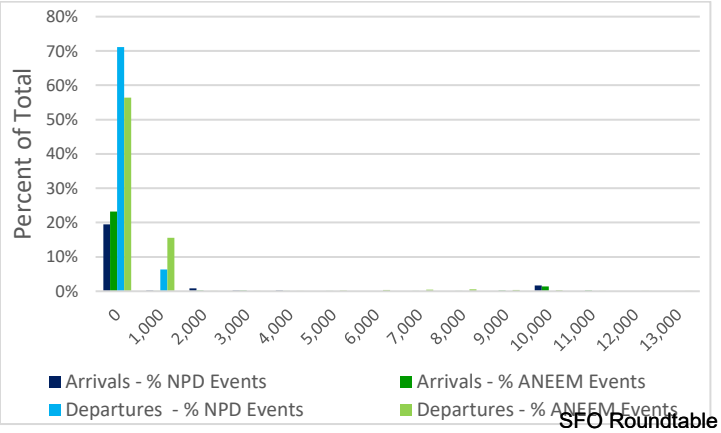
G – Percentage of Events by Airports



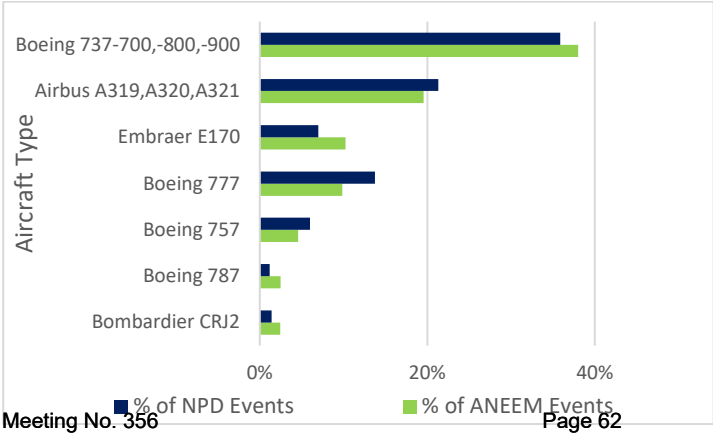
H – SFO Noise Events by Hour of the Day



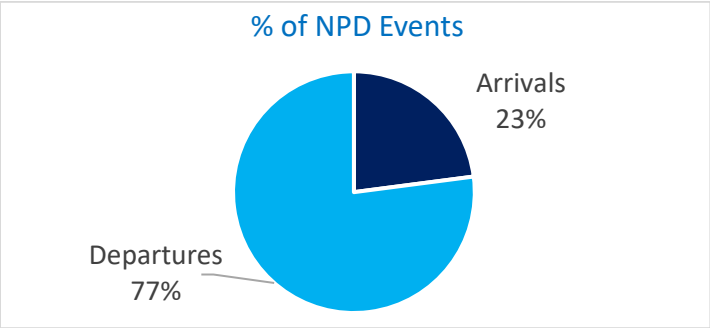
I – SFO Events by Altitude (ft) over Site

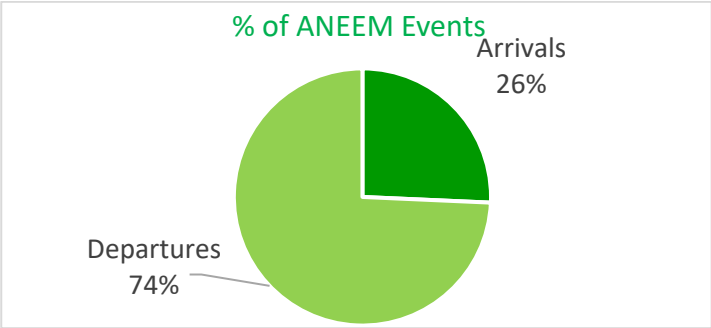


J – Percentage of Events by Aircraft Types

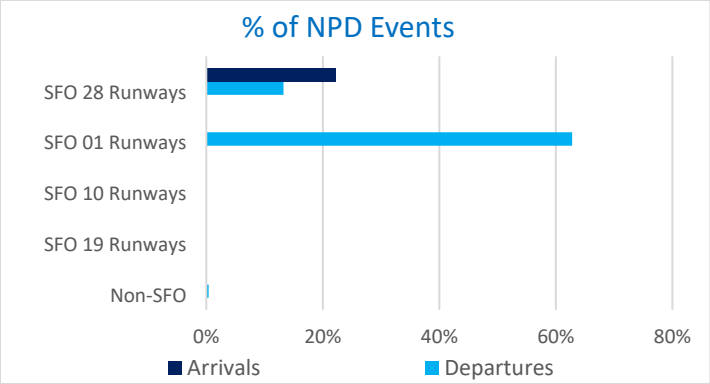


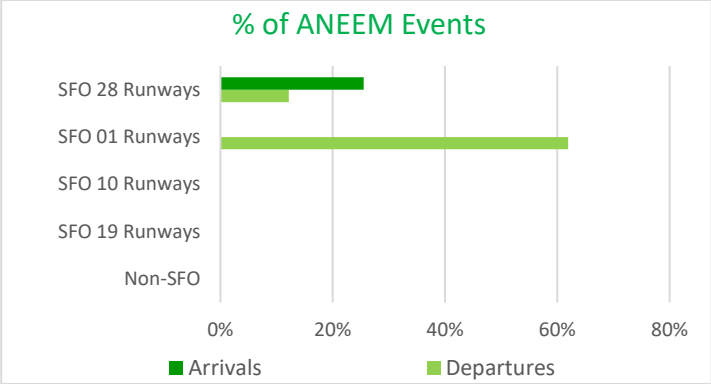
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

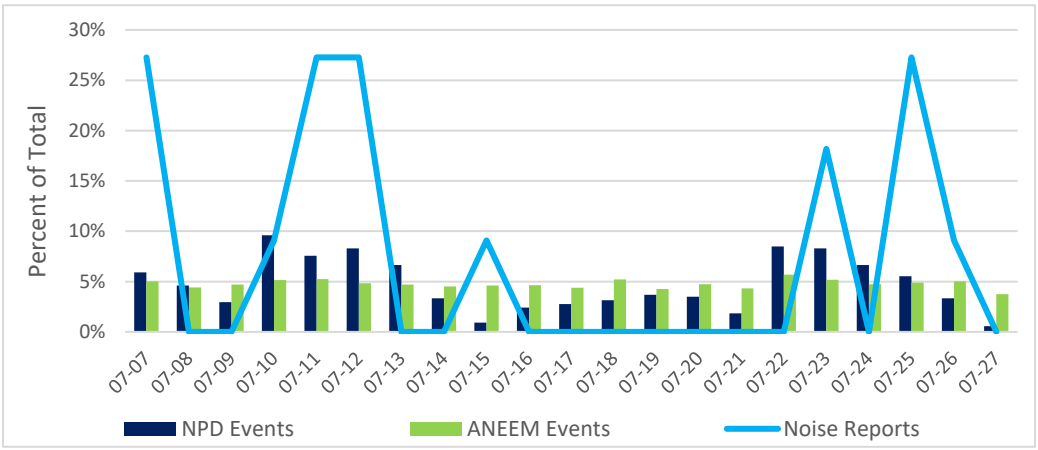




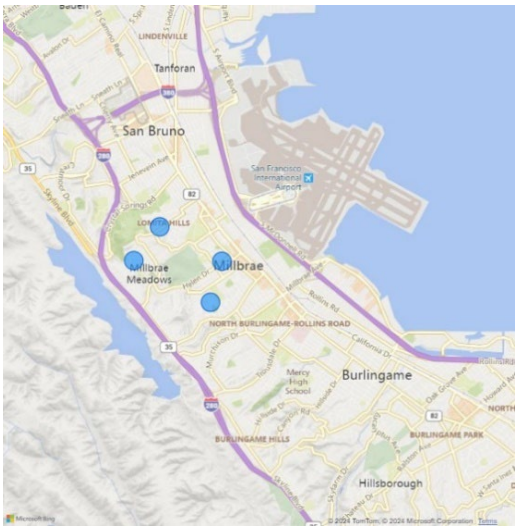
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	1	3
07-08	0	0
07-09	0	0
07-10	1	1
07-11	1	3
07-12	2	3
07-13	0	0
07-14	0	0
07-15	1	1
07-16	0	0
07-17	0	0
07-18	0	0
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	2	2
07-24	0	0
07-25	1	3
07-26	1	1
07-27	0	0
Total	**4**	**11**

N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location

Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

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Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

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A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

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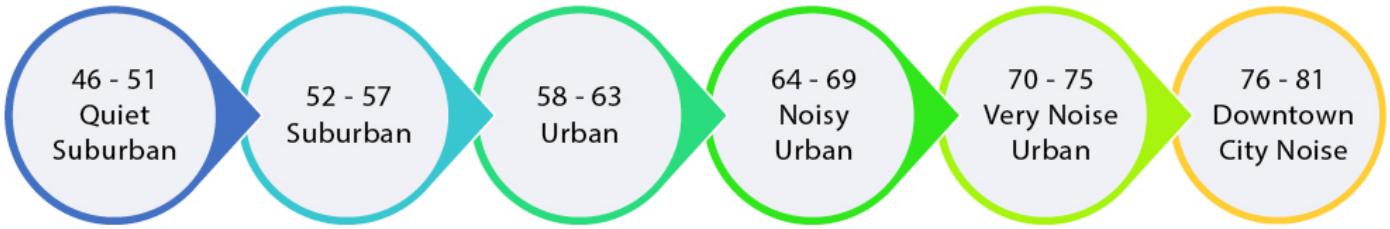
California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).



Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Millbrae Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
SFO Permanent Noise Monitoring Location – Site 9 in Millbrae

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae, Burlingame, and Hillsborough are situated adjacent to SFO, with Millbrae sitting to the southwest, Burlingame to the south, and Hillsborough further south. Much of the aircraft noise that reaches Millbrae, Burlingame, and Hillsborough is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs (takeoff thrust) and landings (reverse thrust from jet engine thrust reversers), generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may be logically correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD threshold for the total monitoring period was 58 dBA. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 1037 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 99% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily departing aircraft from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using thrust reversers to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's west-facing runways, Runways 28L and 28R. In addition to noise from airfield operations, there was also noise from aircraft overflights, majority of which were aircraft from Oakland International Airport (OAK) headed south/southeast utilizing the CNDEL departure procedure. Approximately 1% of all aircraft noise events were from OAK aircraft.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 55 dBA and the Aircraft CNEL and Community CNEL using NPD were 54 dBA and 43 dBA, respectively. This noise monitor was located in a quiet suburban area with daily ambient noise ranging between 34 and 44 dba. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

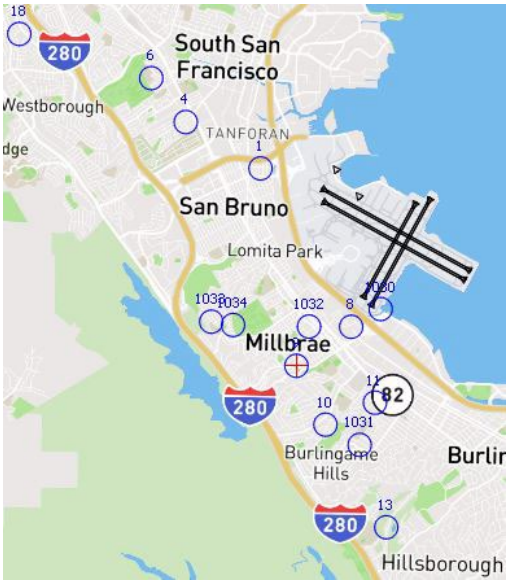
During the monitoring period, the SFO Aircraft Noise Office received 11 noise reports from 4 Millbrae residents. Most of the noise reports were generated between 5AM and 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 8AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Site 9, Millbrae
Monitoring Site Elevation (ft)	157
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	42
NPD Community (non-aircraft) CNEL (dBA)	43
NPD Aircraft CNEL (dBA)	54
NPD Avg Daily SFO Noise Events	118
ANEEM Aircraft CNEL (dBA)	55
ANEEM Avg Aircraft SEL (dBA)	69
ANEEM Avg Aircraft SEL (dBC)	84
ANEEM Avg Aircraft Lmax (dBA)	56
ANEEM Avg Aircraft Lmax (dBC)	70
ANEEM Avg Daily SFO Noise Events	1036
SFO West Flow	100%
SFO Southeast Flow	0%

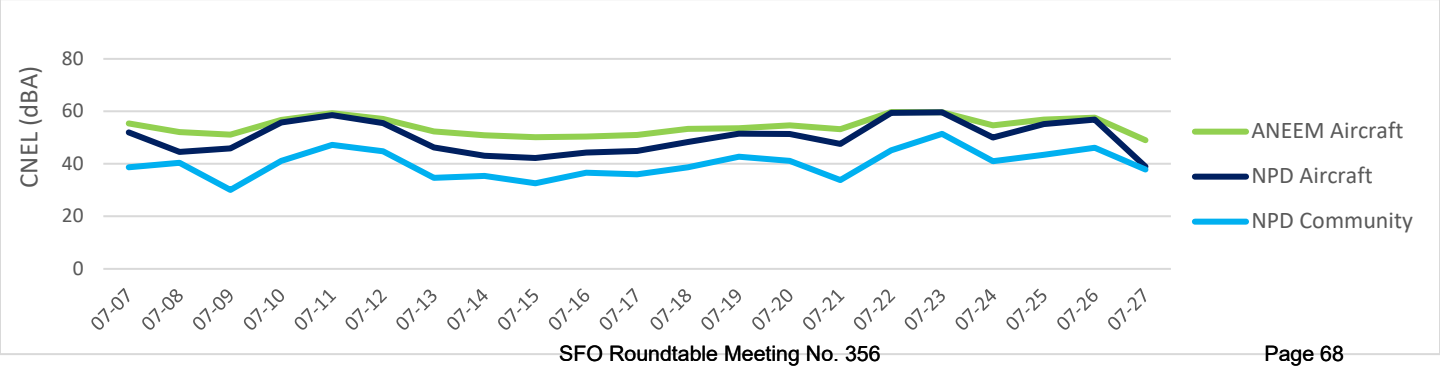
B – Monitoring Location



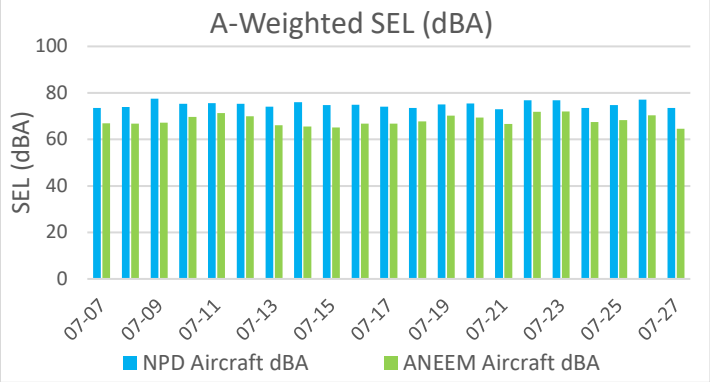
C – Daily Noise Event Averages

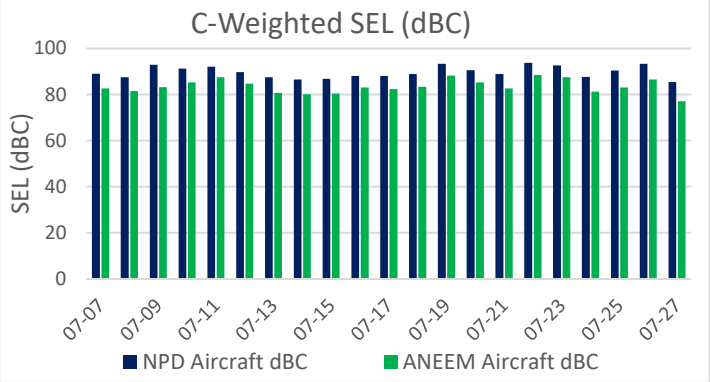
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	77	74	64	1,190	67	55	77	89	79	1,190	83	68	7	71	63
07-08	55	74	64	1,070	67	56	55	88	77	1,070	82	68	12	73	64
07-09	52	77	65	1,054	67	55	52	93	77	1,054	83	70	6	70	62
07-10	198	75	64	1,121	70	57	198	91	78	1,121	85	70	25	73	63
07-11	280	76	64	1,047	71	59	280	92	79	1,047	88	73	26	74	63
07-12	195	75	64	1,035	70	58	195	90	78	1,035	85	72	24	78	64
07-13	51	74	64	1,081	66	55	51	88	77	1,081	81	68	9	70	63
07-14	21	76	65	1,099	66	54	21	87	78	1,099	80	67	6	72	63
07-15	23	75	64	1,093	65	54	23	87	76	1,093	81	68	4	75	67
07-16	47	75	65	938	67	55	47	88	75	938	83	69	13	74	64
07-17	58	74	65	1,017	67	55	58	88	79	1,017	82	70	6	74	64
07-18	100	73	63	1,015	68	56	100	89	79	1,015	83	70	7	76	67
07-19	204	75	64	816	70	58	204	93	82	816	88	74	31	76	64
07-20	113	75	64	870	69	57	113	91	80	870	85	72	15	77	64
07-21	55	73	64	991	67	55	55	89	80	991	83	69	9	72	64
07-22	251	77	64	1,003	72	58	251	94	80	1,003	89	72	30	74	64
07-23	268	77	65	999	72	59	268	93	79	999	87	72	64	75	62
07-24	92	74	64	1,179	68	56	92	88	77	1,179	81	68	10	74	65
07-25	133	75	64	1,163	68	57	133	91	78	1,163	83	69	15	75	64
07-26	192	77	64	969	70	57	192	93	80	969	87	71	60	74	62
07-27	15	73	66	1,016	65	54	15	85	77	1,016	77	65	5	74	67
Daily Average	**118**	**76**	**64**	**1,036**	**69**	**56**	**118**	**92**	**79**	**1,036**	**84**	**70**	**18**	**75**	**63**
Total Count	**2,480**			**21,766**			**2,480**			**21,766**			**384**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



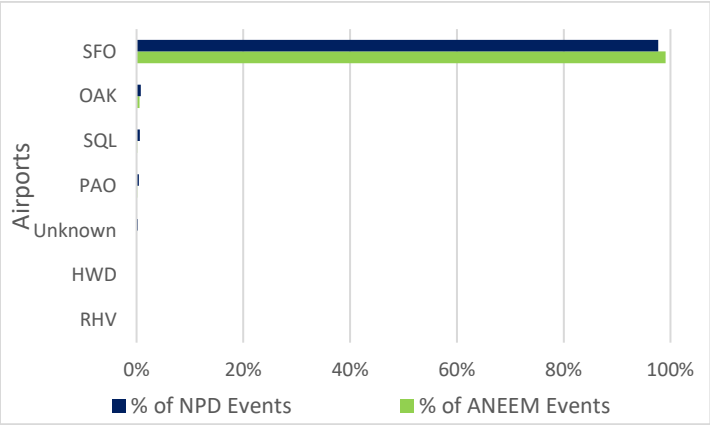


F – SFO ANEEM Aircraft Noise Events by Time of Day

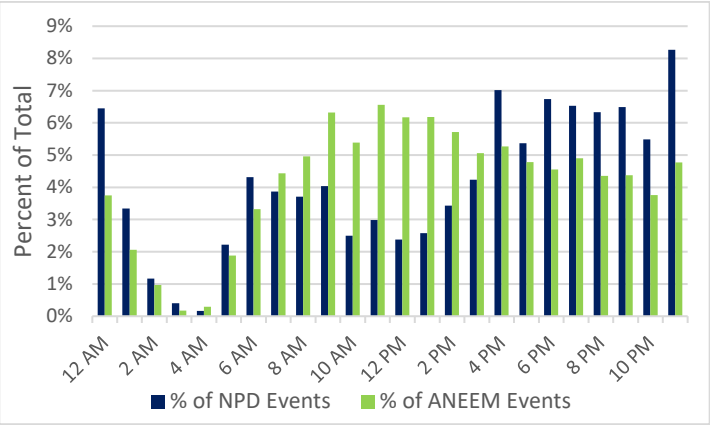
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	14,233	65%	68	51	88	56	45	83	13	4	98
Evening (7pm-10pm)	2,967	14%	69	54	85	57	47	77	15	4	99
Night (10pm-7am)	4,566	21%	70	45	89	56	37	80	18	4	98

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	14,233	65%	83	64	103	70	55	96	13	4	98
Evening (7pm-10pm)	2,967	14%	86	62	102	70	56	93	15	4	99
Night (10pm-7am)	4,566	21%	87	58	105	70	50	96	18	4	98

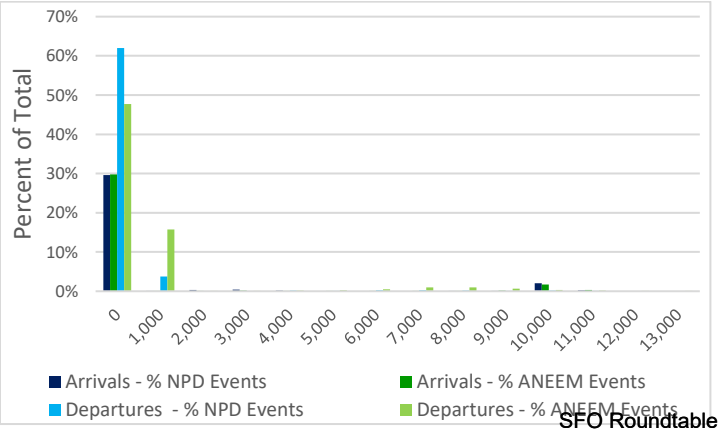
G – Percentage of Events by Airports



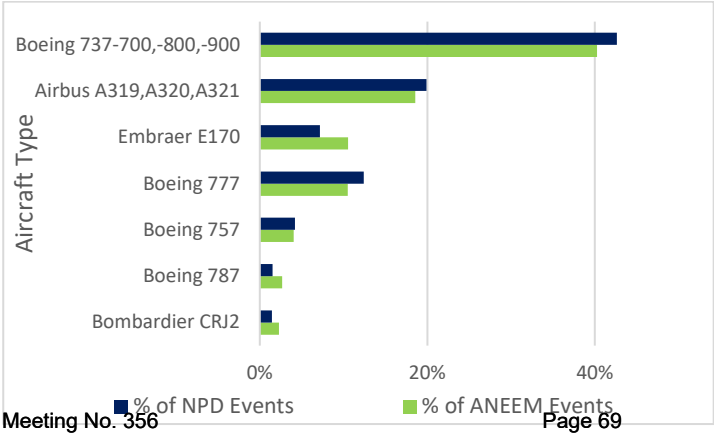
H – SFO Noise Events by Hour of the Day



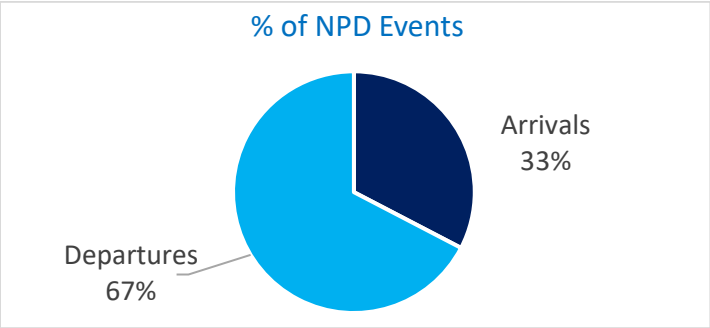
I – SFO Events by Altitude (ft) over Site

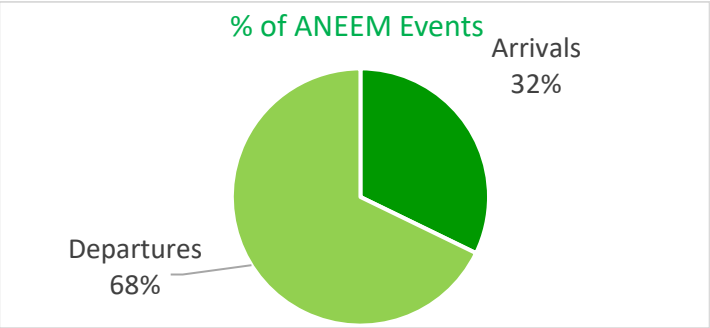


J – Percentage of Events by Aircraft Types

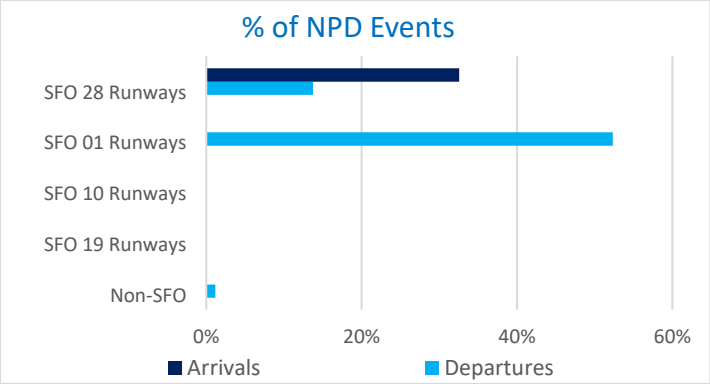


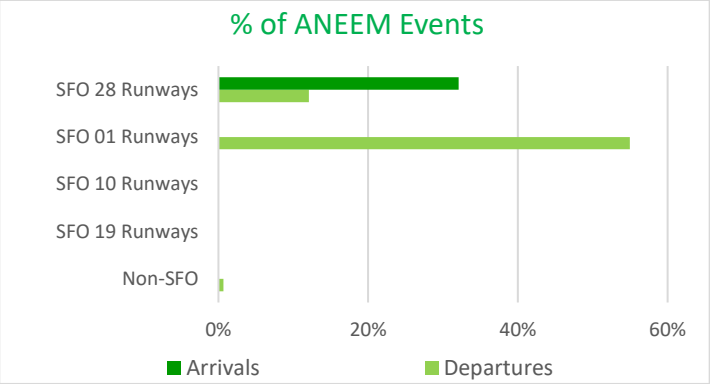
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

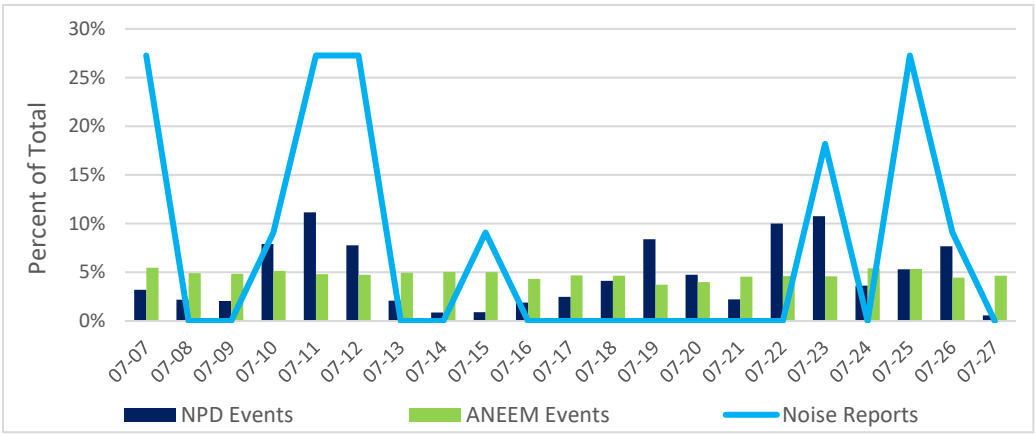




M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	1	3
07-08	0	0
07-09	0	0
07-10	1	1
07-11	1	3
07-12	2	3
07-13	0	0
07-14	0	0
07-15	1	1
07-16	0	0
07-17	0	0
07-18	0	0
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	2	2
07-24	0	0
07-25	1	3
07-26	1	1
07-27	0	0
Total	4	11

N – Noise Reports vs Aircraft Noise Events per Day



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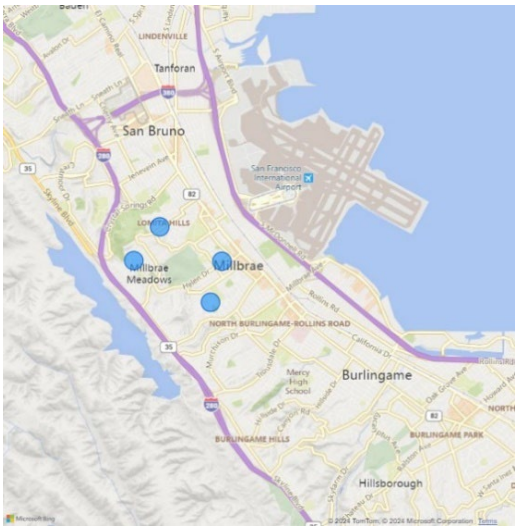

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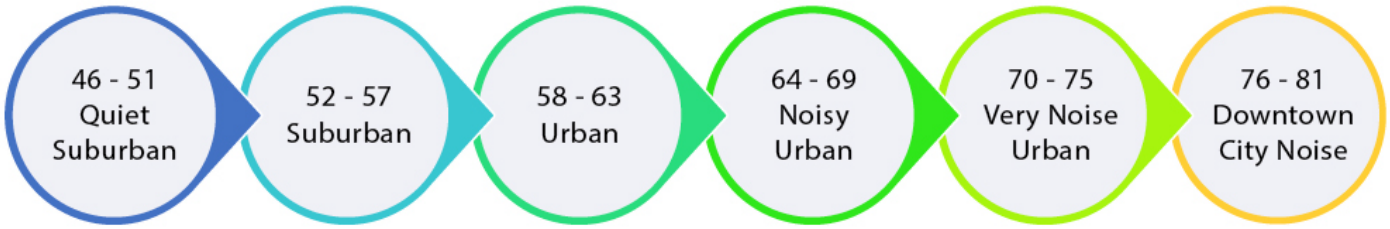

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Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Burlingame Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
SFO Permanent Noise Monitoring Location – Site 10 in Burlingame

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae, Burlingame, and Hillsborough are situated adjacent to SFO, with Millbrae sitting to the southwest, Burlingame to the south, and Hillsborough further south. Much of the aircraft noise that reaches Millbrae, Burlingame, and Hillsborough is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs (takeoff thrust) and landings (reverse thrust from jet engine thrust reversers), generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may be logically correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD threshold for the total monitoring period was 58 dBA. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 566 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 99% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily departing aircraft from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using thrust reversers to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's west-facing runways, Runways 28L and 28R. In addition to noise from airfield operations, there was also noise from aircraft overflights, majority of which were aircraft from Oakland International Airport (OAK) headed south/southeast utilizing the CNDEL departure procedure. Approximately 1% of all aircraft noise events were from OAK aircraft.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 53 dBA and the Aircraft CNEL and Community CNEL using NPD were 50 dBA and 40 dBA, respectively. This noise monitor was located in a suburban area with daily ambient noise ranging between 38 and 45 dba. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

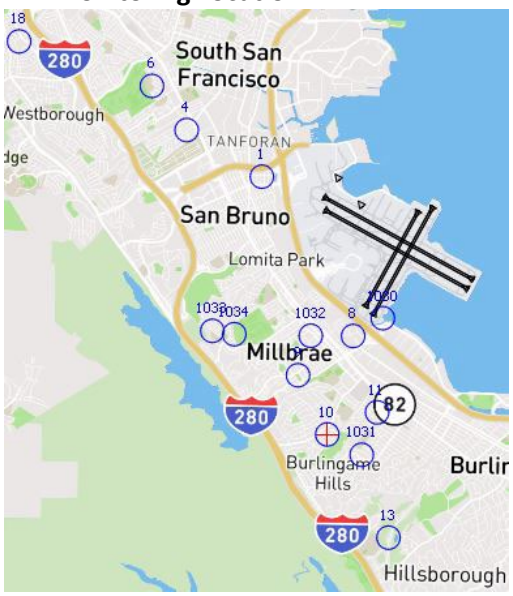
During the monitoring period, the SFO Aircraft Noise Office received 1 noise report from 1 Burlingame resident. The noise report was generated in the 2AM hour. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 9AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Site 10, Burlingame
Monitoring Site Elevation (ft)	335
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	42
NPD Community (non-aircraft) CNEL (dBA)	40
NPD Aircraft CNEL (dBA)	50
NPD Avg Daily SFO Noise Events	72
ANEEM Aircraft CNEL (dBA)	53
ANEEM Avg Aircraft SEL (dBA)	70
ANEEM Avg Aircraft SEL (dBC)	88
ANEEM Avg Aircraft Lmax (dBA)	57
ANEEM Avg Aircraft Lmax (dBC)	73
ANEEM Avg Daily SFO Noise Events	566
SFO West Flow	100%
SFO Southeast Flow	0%

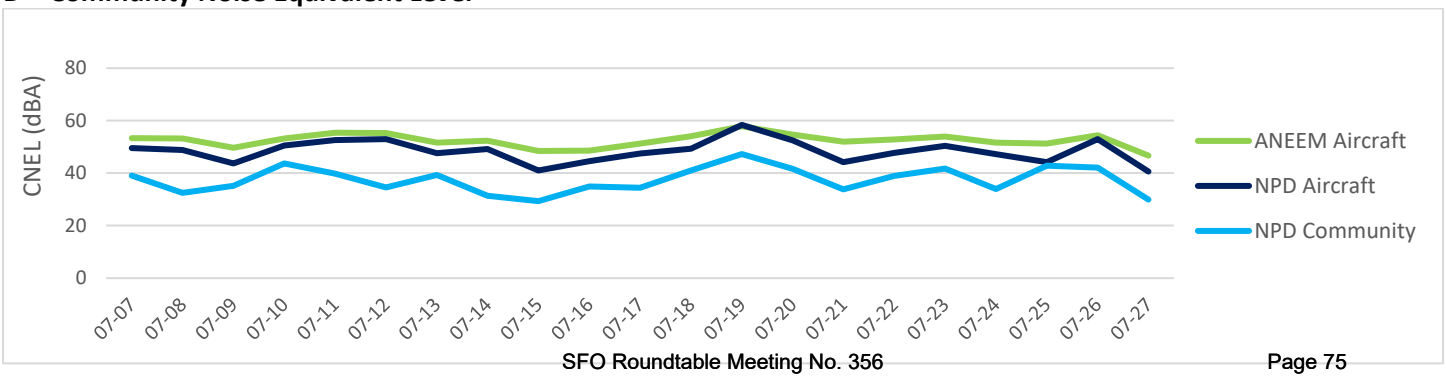
B – Monitoring Location



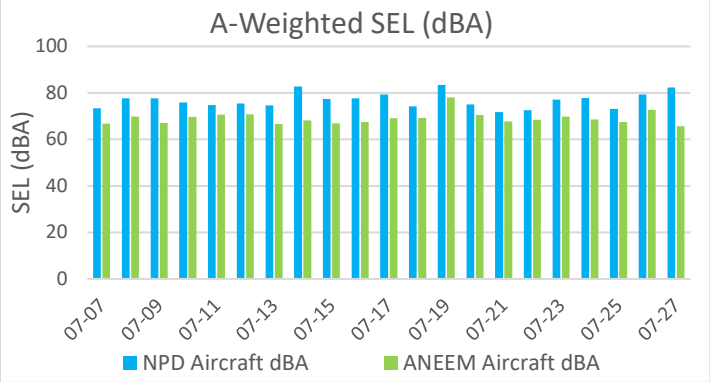
C – Daily Noise Event Averages

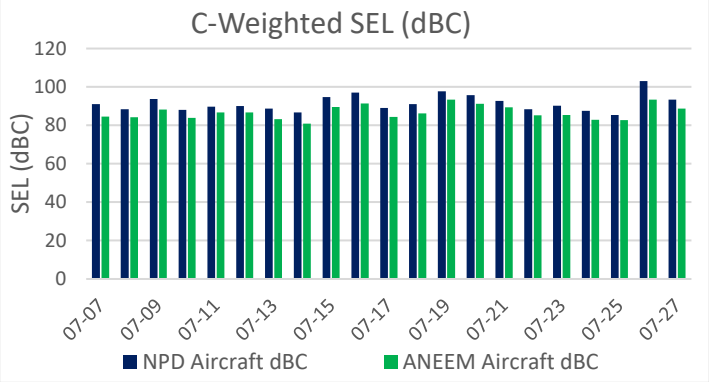
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	42	73	62	651	67	54	42	91	80	651	85	70	3	74	64
07-08	54	78	66	605	70	57	54	88	77	605	84	71	5	75	65
07-09	24	78	65	527	67	56	24	94	80	527	88	75	7	75	66
07-10	85	76	63	667	70	57	85	88	75	667	84	71	17	80	67
07-11	154	75	63	642	71	59	154	90	78	642	87	74	13	72	62
07-12	137	76	63	595	71	58	137	90	78	595	87	73	13	70	62
07-13	25	75	64	569	67	55	25	89	78	569	83	70	5	80	68
07-14	11	83	68	668	68	53	11	87	77	668	81	68	2	71	63
07-15	20	77	66	500	67	55	20	95	81	500	90	75	3	74	64
07-16	27	78	66	465	67	55	27	97	84	465	91	75	6	76	65
07-17	40	80	66	516	69	56	40	89	79	516	84	72	7	73	64
07-18	93	74	63	619	69	58	93	91	79	619	86	73	17	73	63
07-19	242	83	66	629	78	61	242	98	83	629	93	79	43	78	64
07-20	136	75	63	527	71	58	136	96	83	527	91	76	20	73	63
07-21	33	72	62	521	68	56	33	93	82	521	89	74	3	72	63
07-22	89	73	63	610	68	57	89	88	78	610	85	72	8	76	66
07-23	72	77	64	583	70	57	72	90	78	583	85	72	10	73	64
07-24	44	78	65	562	69	55	44	88	77	562	83	69	1	73	65
07-25	43	73	63	493	67	57	43	85	75	493	83	70	5	75	67
07-26	136	79	65	575	73	59	136	103	85	575	93	76	29	75	63
07-27	5	82	69	368	66	54	5	93	81	368	89	73	3	72	65
Daily Average	**72**	**79**	**64**	**566**	**70**	**57**	**72**	**96**	**80**	**566**	**88**	**73**	**10**	**76**	**64**
Total Count	**1,512**			**11,892**			**1,512**			**11,892**			**220**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



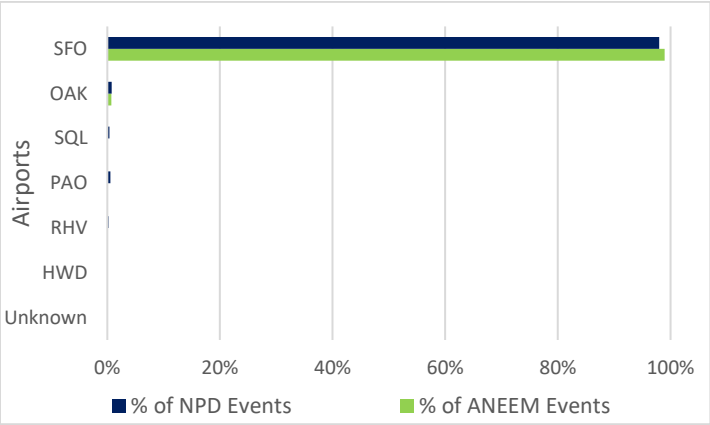


F – SFO ANEEM Aircraft Noise Events by Time of Day

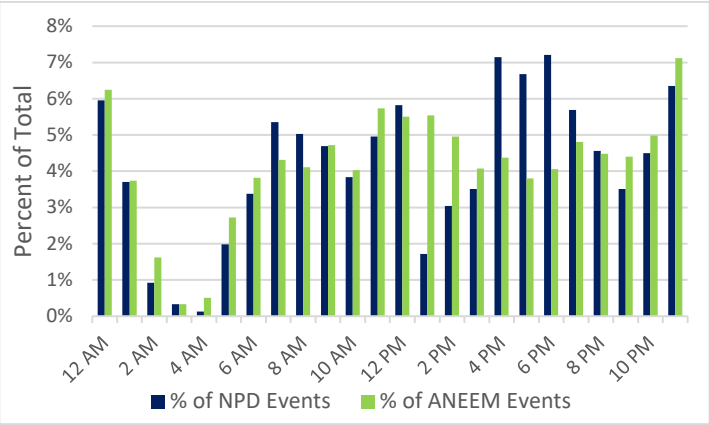
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	6,566	55%	72	54	97	58	46	84	12	4	97
Evening (7pm-10pm)	1,628	14%	69	54	93	57	47	83	14	4	88
Night (10pm-7am)	3,698	31%	68	45	81	55	37	76	19	4	98

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	6,566	55%	89	63	107	74	57	100	12	4	97
Evening (7pm-10pm)	1,628	14%	89	64	105	74	56	97	14	4	88
Night (10pm-7am)	3,698	31%	86	61	103	71	53	90	19	4	98

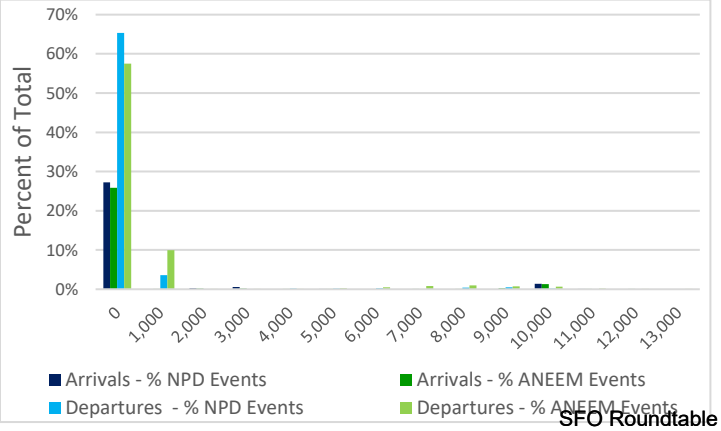
G – Percentage of Events by Airports



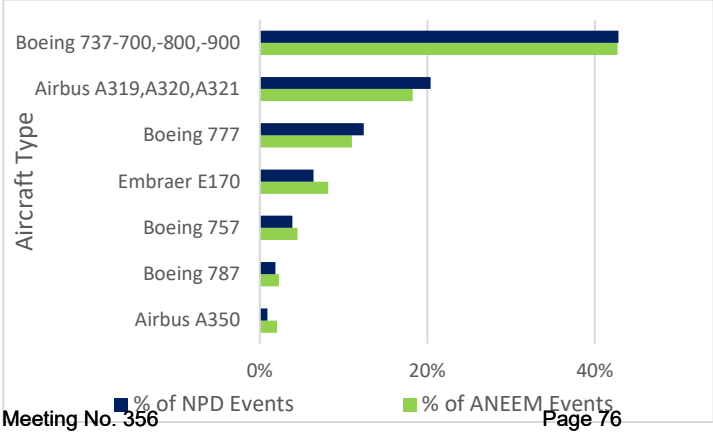
H – SFO Noise Events by Hour of the Day



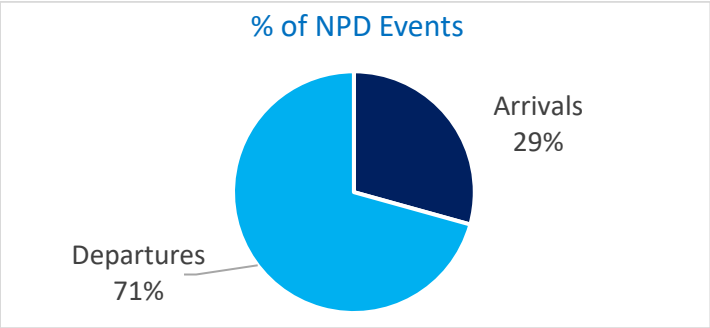
I – SFO Events by Altitude (ft) over Site

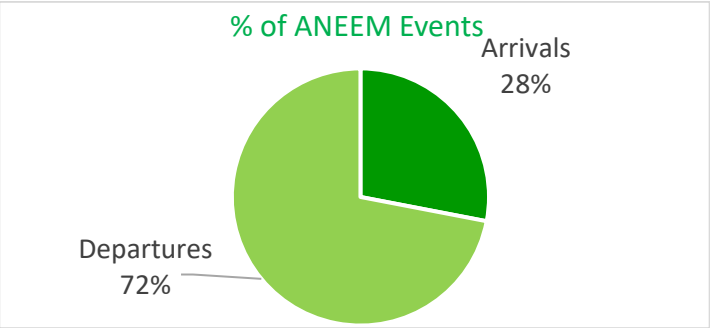


J – Percentage of Events by Aircraft Types

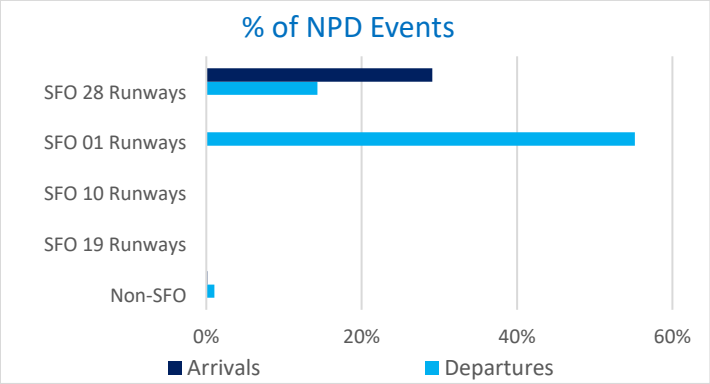


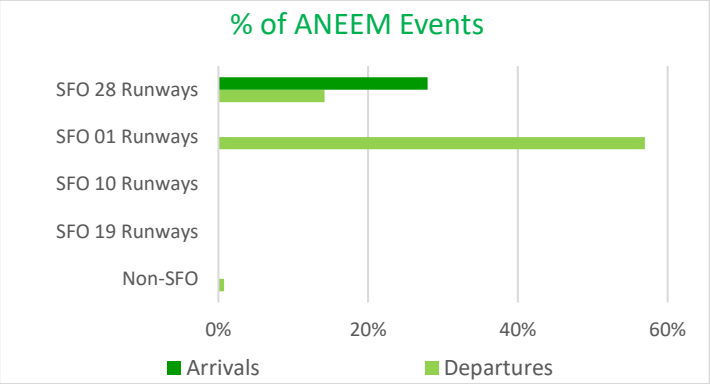
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

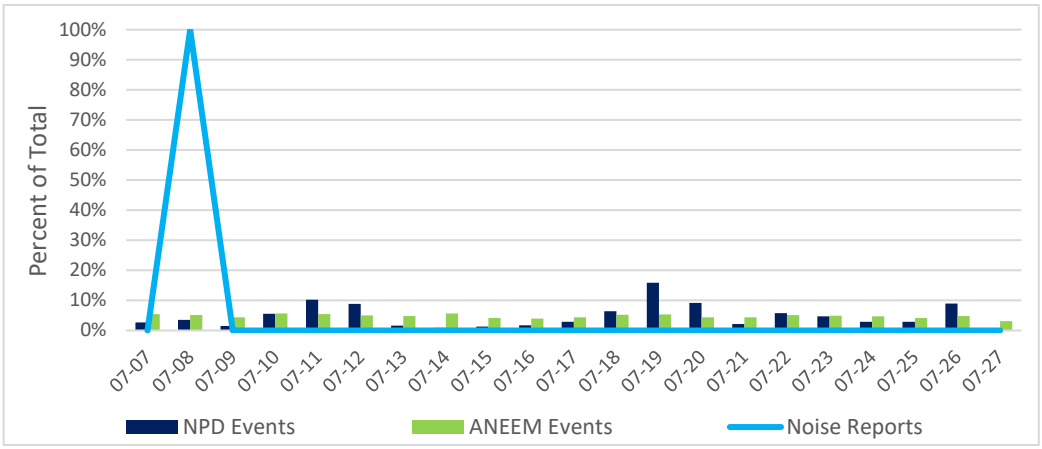




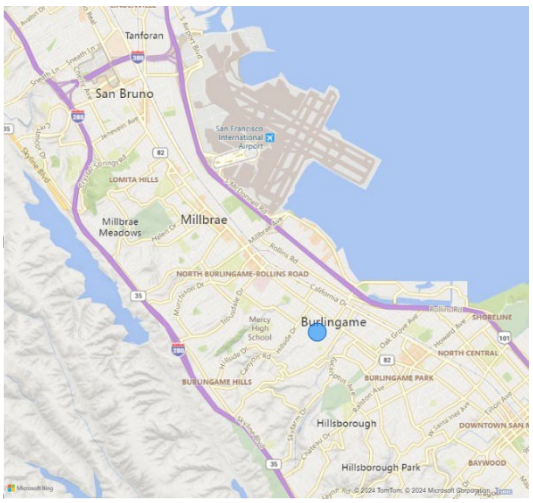
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	0	0
07-08	1	1
07-09	0	0
07-10	0	0
07-11	0	0
07-12	0	0
07-13	0	0
07-14	0	0
07-15	0	0
07-16	0	0
07-17	0	0
07-18	0	0
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	0	0
07-24	0	0
07-25	0	0
07-26	0	0
07-27	0	0
Total	1	1

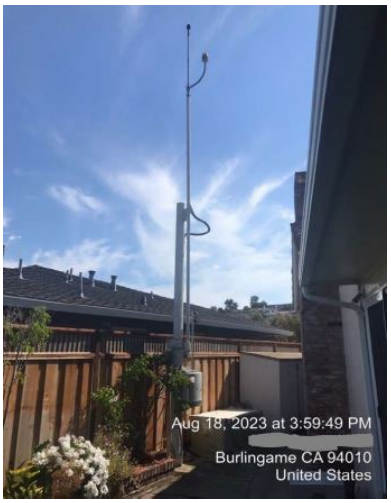
N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location



Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

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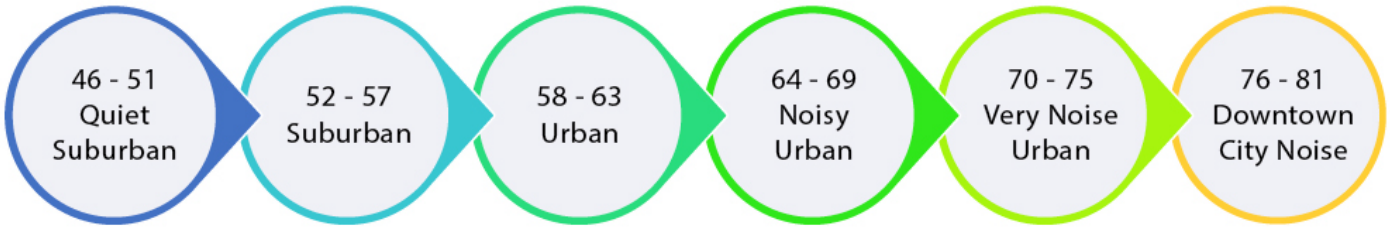

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SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Burlingame Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
SFO Permanent Noise Monitoring Location – Site 11 in Burlingame

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae, Burlingame, and Hillsborough are situated adjacent to SFO, with Millbrae sitting to the southwest, Burlingame to the south, and Hillsborough further south. Much of the aircraft noise that reaches Millbrae, Burlingame, and Hillsborough is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs (takeoff thrust) and landings (reverse thrust from jet engine thrust reverser), generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may be logically correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD threshold for the total monitoring period was 58 dBA. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 815 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 99% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily departing aircraft from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using thrust reversers to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's west-facing runways, Runways 28L and 28R. In addition to noise from airfield operations, there was also noise from aircraft overflights, majority of which were aircraft from Oakland International Airport (OAK) headed south/southeast utilizing the CNDEL departure procedure. Approximately 1% of all aircraft noise events were from OAK aircraft.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 54 dBA and the Aircraft CNEL and Community CNEL using NPD were 51 dBA and 42 dBA, respectively. This noise monitor was located in a quiet suburban area with daily ambient noise ranging between 37 and 44 dba. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

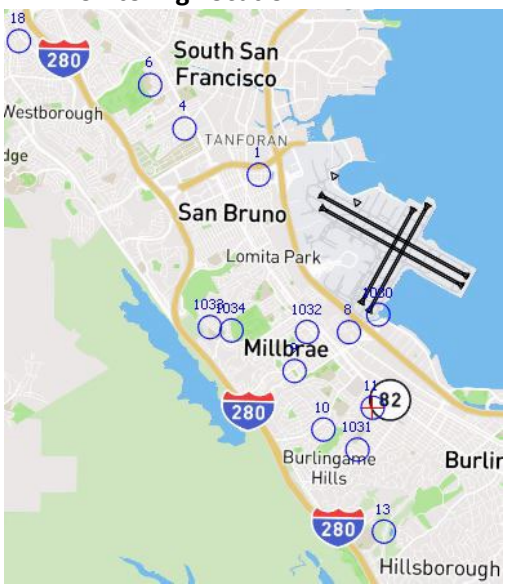
During the monitoring period, the SFO Aircraft Noise Office received 1 noise report from 1 Burlingame resident. The noise report was generated in the 2AM hour. Likewise, the most of the SFO Aircraft noise events using ANEEM occurred between 8AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Site 11, Burlingame
Monitoring Site Elevation (ft)	62
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	41
NPD Community (non-aircraft) CNEL (dBA)	42
NPD Aircraft CNEL (dBA)	51
NPD Avg Daily SFO Noise Events	73
ANEEM Aircraft CNEL (dBA)	54
ANEEM Avg Aircraft SEL (dBA)	69
ANEEM Avg Aircraft SEL (dBC)	82
ANEEM Avg Aircraft Lmax (dBA)	56
ANEEM Avg Aircraft Lmax (dBC)	69
ANEEM Avg Daily SFO Noise Events	815
SFO West Flow	100%
SFO Southeast Flow	0%

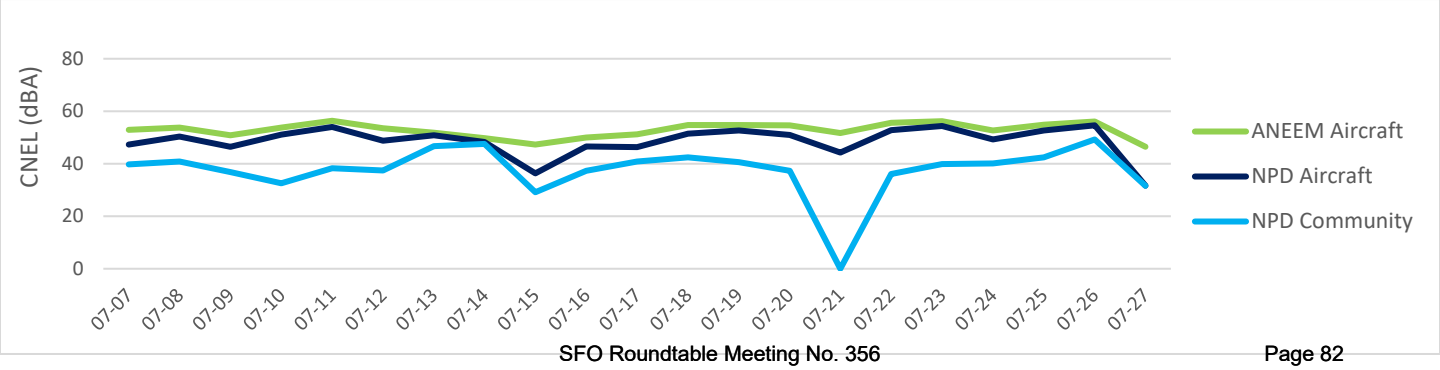
B – Monitoring Location



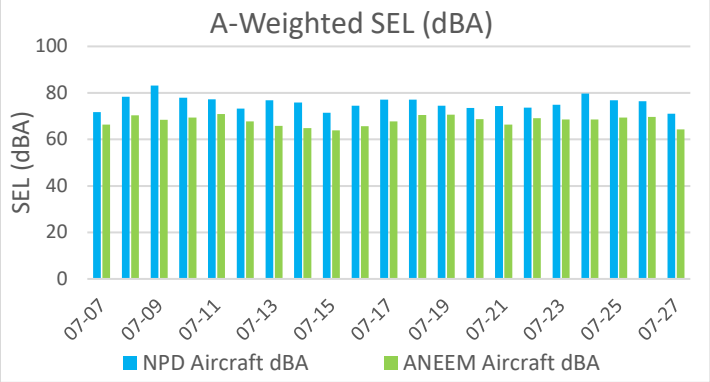
C – Daily Noise Event Averages

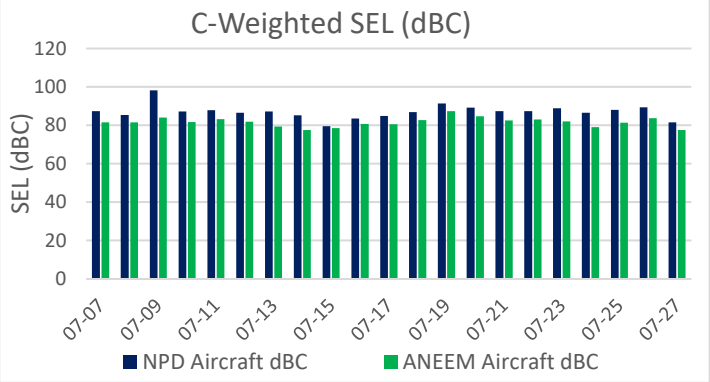
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	41	72	63	808	66	55	41	88	78	808	82	68	4	74	65
07-08	91	78	65	792	70	57	91	85	73	792	82	69	27	75	63
07-09	18	83	67	785	68	55	18	98	79	785	84	70	2	78	70
07-10	92	78	65	937	69	56	92	87	75	937	82	69	4	76	66
07-11	155	77	64	995	71	58	155	88	76	995	83	70	11	74	64
07-12	71	73	64	853	68	57	71	87	76	853	82	69	8	71	63
07-13	23	77	65	746	66	55	23	88	76	746	79	67	6	79	66
07-14	18	76	64	723	65	53	18	85	75	723	78	66	4	81	67
07-15	9	71	64	737	64	53	9	80	72	737	79	67	2	68	63
07-16	26	75	64	787	66	55	26	83	72	787	81	67	2	74	65
07-17	42	77	66	843	68	56	42	85	75	843	80	69	7	81	68
07-18	144	77	65	951	70	58	144	87	76	951	83	70	27	76	65
07-19	206	74	63	789	71	59	206	91	80	789	87	73	17	72	63
07-20	113	73	63	799	69	57	113	89	78	799	85	71	10	73	63
07-21	23	74	64	758	66	55	23	87	78	758	83	69	0	-	-
07-22	124	74	64	833	69	57	124	87	77	833	83	70	11	70	63
07-23	89	75	64	849	69	57	89	89	78	849	82	68	5	73	65
07-24	47	80	67	844	69	56	47	87	75	844	79	67	7	74	65
07-25	89	77	64	832	69	57	89	88	75	832	81	68	5	85	68
07-26	97	76	65	785	70	57	97	89	76	785	84	70	18	78	66
07-27	10	71	64	669	64	53	10	82	73	669	78	66	3	72	64
Daily Average	**73**	**76**	**64**	**815**	**69**	**56**	**73**	**89**	**76**	**815**	**82**	**69**	**9**	**77**	**64**
Total Count	**1,528**			**17,115**			**1,528**			**17,115**			**180**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



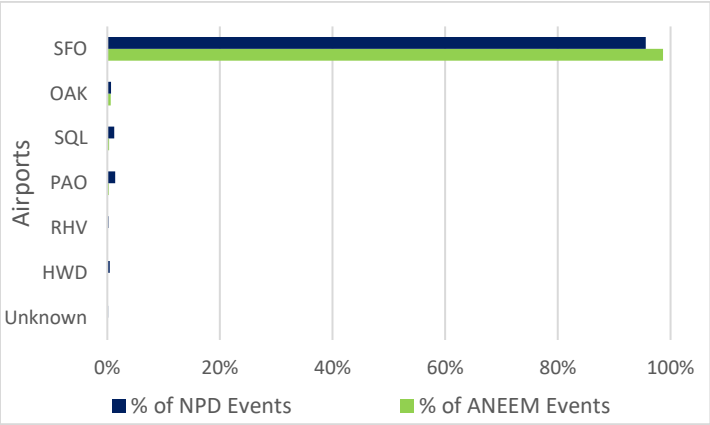


F – SFO ANEEM Aircraft Noise Events by Time of Day

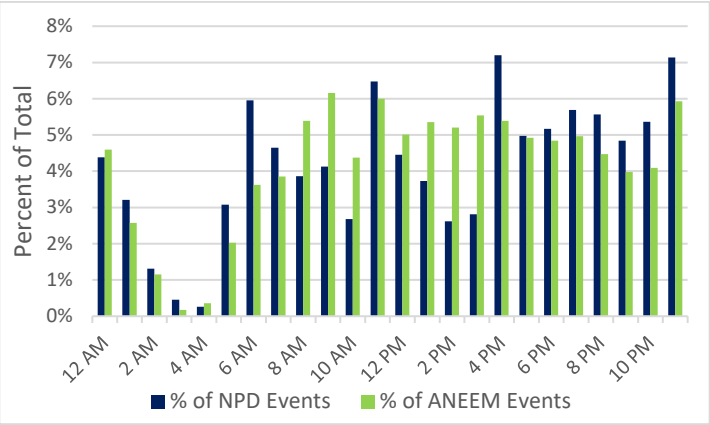
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	10,617	62%	69	50	93	56	43	85	15	4	96
Evening (7pm-10pm)	2,297	13%	68	52	83	56	44	75	16	4	94
Night (10pm-7am)	4,201	25%	68	47	85	55	40	77	18	4	96

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	10,617	62%	82	59	108	69	52	100	15	4	96
Evening (7pm-10pm)	2,297	13%	83	61	100	69	54	90	16	4	94
Night (10pm-7am)	4,201	25%	83	58	100	69	51	91	18	4	96

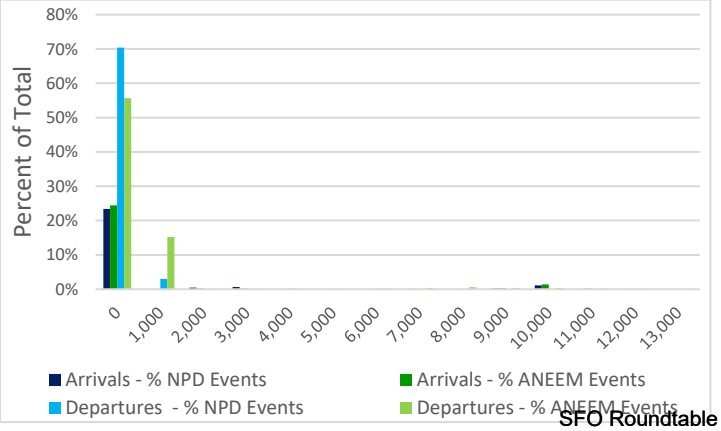
G – Percentage of Events by Airports



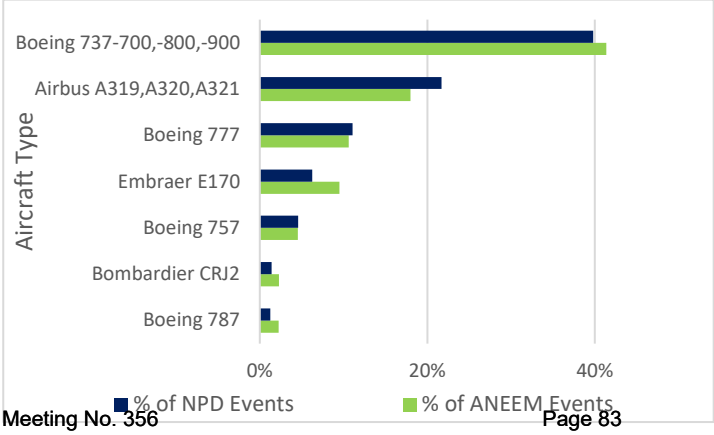
H – SFO Noise Events by Hour of the Day



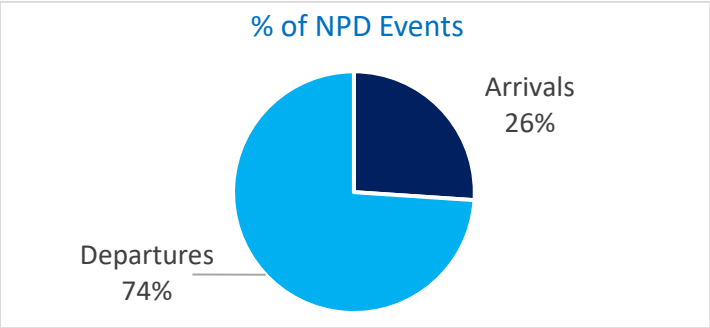
I – SFO Events by Altitude (ft) over Site

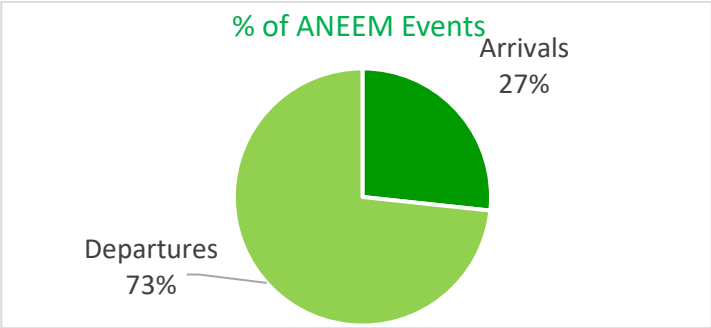


J – Percentage of Events by Aircraft Types

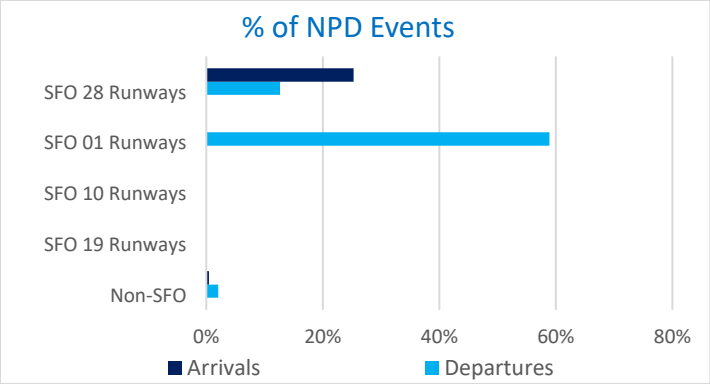


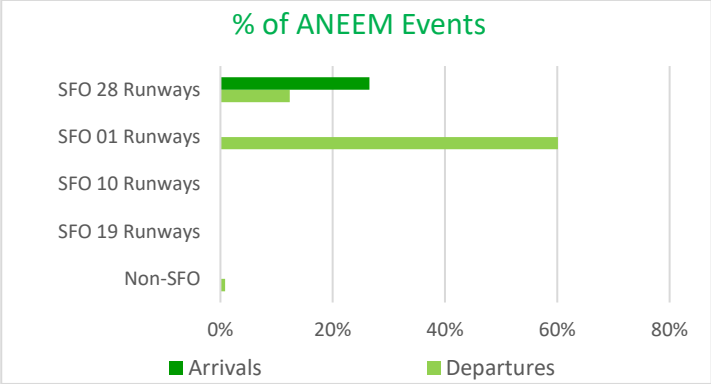
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

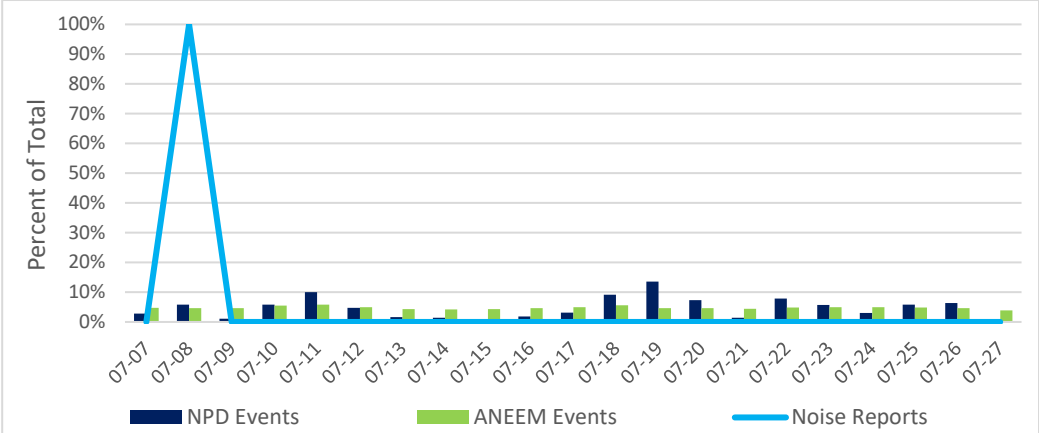




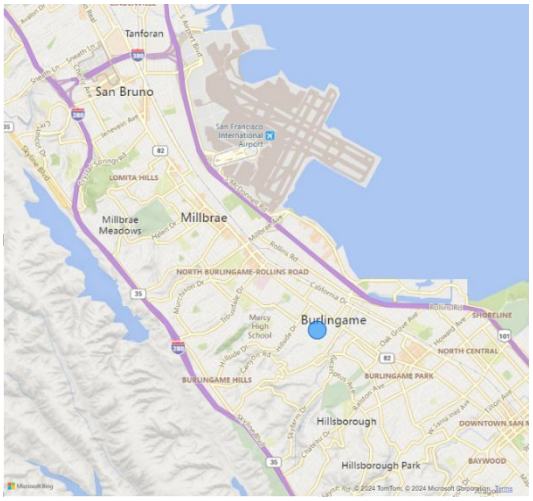
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	0	0
07-08	1	1
07-09	0	0
07-10	0	0
07-11	0	0
07-12	0	0
07-13	0	0
07-14	0	0
07-15	0	0
07-16	0	0
07-17	0	0
07-18	0	0
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	0	0
07-24	0	0
07-25	0	0
07-26	0	0
07-27	0	0
Total	1	1

N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location

Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

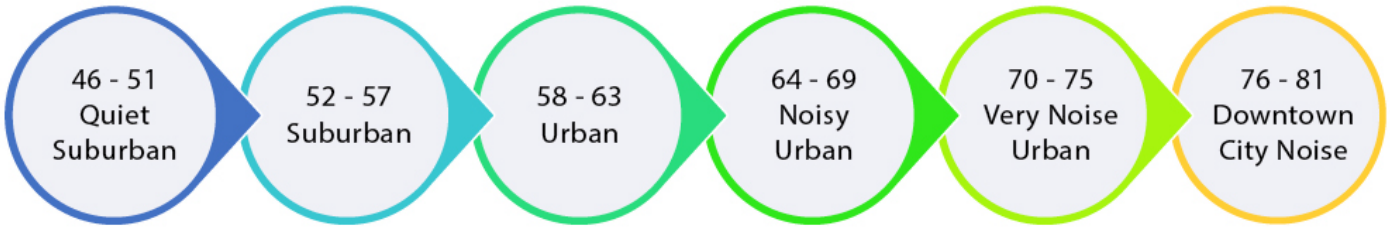
Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

C-Weighted Noise Level – Denoted in dBC, is a different scale for loudness perception of sound pressure levels than A-weighted noise. A C-weight scale is used to measure sounds with approximately equal sensitivity at all frequencies. The C-weighted scale accounts for low-frequency ranges of sounds more than an A-weighted scale, often resulting in more of the overall noise energy to be included in the measurement.

California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).



Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Hillsborough Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
SFO Permanent Noise Monitoring Location – Site 13 in Hillsborough

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae, Burlingame, and Hillsborough are situated adjacent to SFO, with Millbrae sitting to the southwest, Burlingame to the south, and Hillsborough further south. Much of the aircraft noise that reaches Millbrae, Burlingame, and Hillsborough is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs (takeoff thrust) and landings (reverse thrust from jet engine thrust reverser), generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may be logically correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD threshold for the total monitoring period was 58 dBA. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 555 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 99% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily departing aircraft from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using thrust reversers to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's west-facing runways, Runways 28L and 28R. In addition to noise from airfield operations, there was also noise from aircraft overflights, majority of which were aircraft from Oakland International Airport (OAK) headed south/southeast utilizing the CNDEL departure procedure. Approximately 1% of all aircraft noise events were from OAK aircraft.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 53 dBA and the Aircraft CNEL and Community CNEL using NPD were 51 dBA and 42 dBA, respectively. This noise monitor was located in a suburban area with daily ambient noise ranging between 36 and 45 dba. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

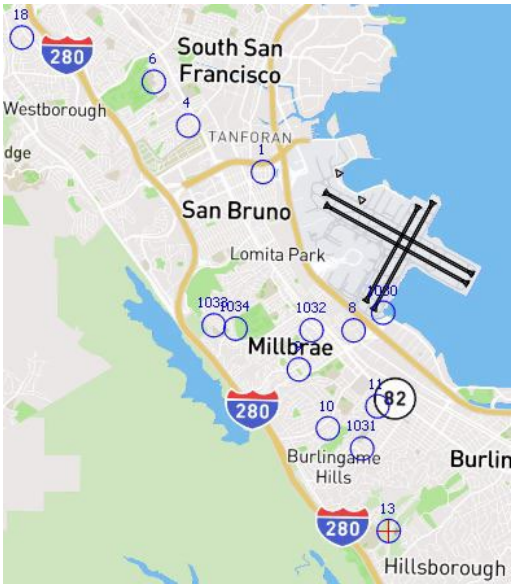
During the monitoring period, the SFO Aircraft Noise Office received 13 noise reports from 4 Hillsborough residents. Most of the noise reports were generated between 8AM and 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 7AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Site 13, Hillsborough
Monitoring Site Elevation (ft)	427
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	42
NPD Community (non-aircraft) CNEL (dBA)	42
NPD Aircraft CNEL (dBA)	51
NPD Avg Daily SFO Noise Events	57
ANEEM Aircraft CNEL (dBA)	53
ANEEM Avg Aircraft SEL (dBA)	70
ANEEM Avg Aircraft SEL (dBC)	85
ANEEM Avg Aircraft Lmax (dBA)	56
ANEEM Avg Aircraft Lmax (dBC)	69
ANEEM Avg Daily SFO Noise Events	555
SFO West Flow	100%
SFO Southeast Flow	0%

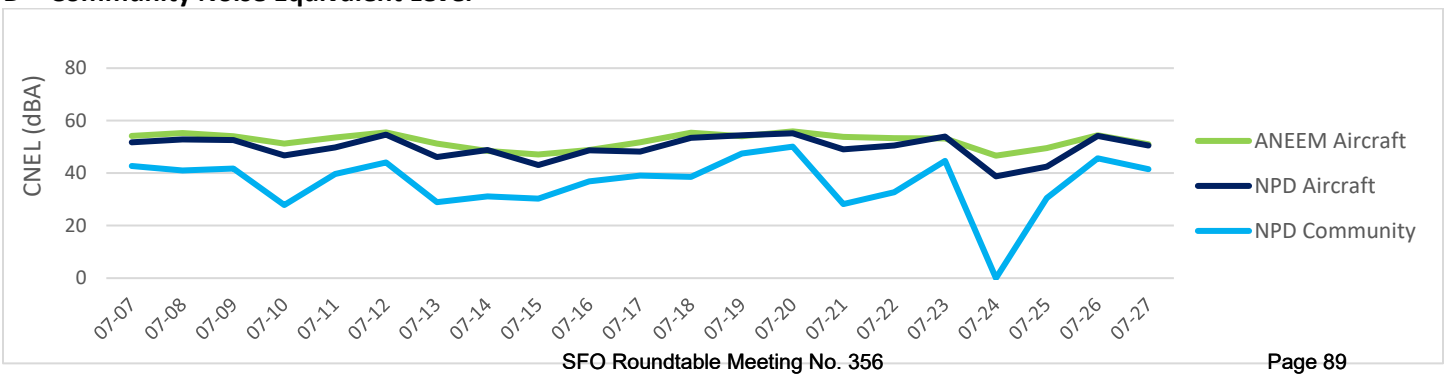
B – Monitoring Location



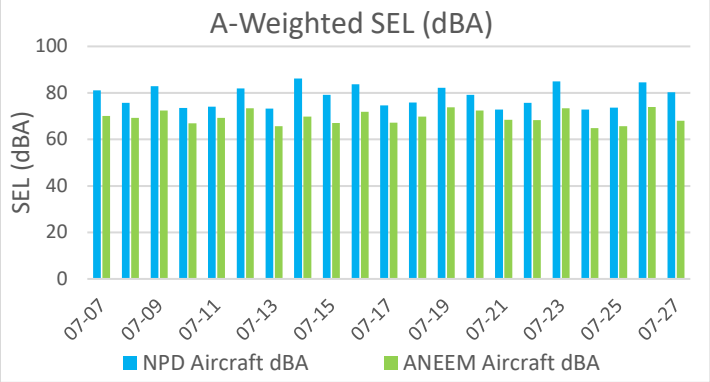
C – Daily Noise Event Averages

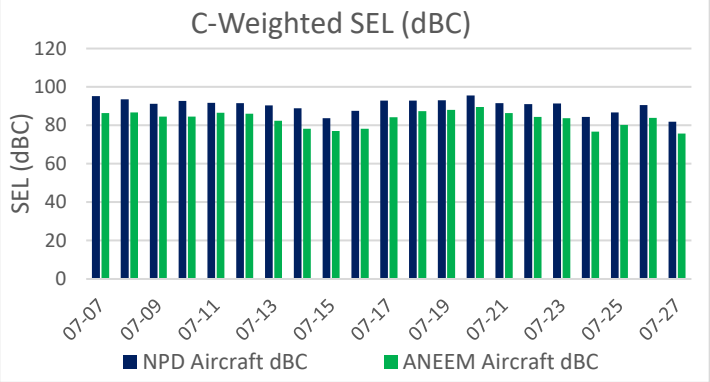
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	44	81	65	585	70	55	44	95	82	585	86	71	8	79	67
07-08	79	76	65	691	69	57	79	93	81	691	87	71	12	73	63
07-09	56	83	66	565	72	56	56	91	77	565	85	70	9	81	65
07-10	38	74	63	648	67	55	38	93	82	648	85	69	3	70	61
07-11	93	74	64	594	69	57	93	92	79	594	87	72	17	73	63
07-12	103	82	66	615	73	57	103	92	79	615	86	71	14	82	64
07-13	18	73	64	555	66	54	18	90	80	555	82	68	2	72	65
07-14	14	87	72	426	70	53	14	89	75	426	78	66	2	78	68
07-15	20	79	68	458	67	55	20	84	71	458	77	65	3	75	67
07-16	26	84	68	350	72	55	26	88	73	350	78	65	5	79	66
07-17	41	75	63	680	67	55	41	93	81	680	84	69	3	79	67
07-18	123	76	64	760	70	57	123	93	80	760	87	71	12	75	65
07-19	120	82	66	532	74	58	120	93	81	532	88	72	27	83	64
07-20	125	79	64	535	72	58	125	95	83	535	90	74	17	87	67
07-21	59	73	62	616	68	56	59	92	81	616	86	72	2	67	61
07-22	54	76	65	599	68	56	54	91	79	599	84	69	3	77	66
07-23	58	85	68	487	73	56	58	91	78	487	84	69	11	83	66
07-24	7	73	64	424	65	54	7	84	73	424	77	65	0	-	-
07-25	28	74	64	636	66	54	28	87	75	636	80	66	3	74	64
07-26	70	85	67	614	74	56	70	91	77	614	84	69	20	81	65
07-27	11	80	70	276	68	55	11	82	72	276	76	64	3	77	67
Daily Average	**57**	**80**	**65**	**555**	**70**	**56**	**57**	**93**	**79**	**555**	**85**	**69**	**8**	**82**	**65**
Total Count	**1,187**			**11,646**			**1,187**			**11,646**			**176**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



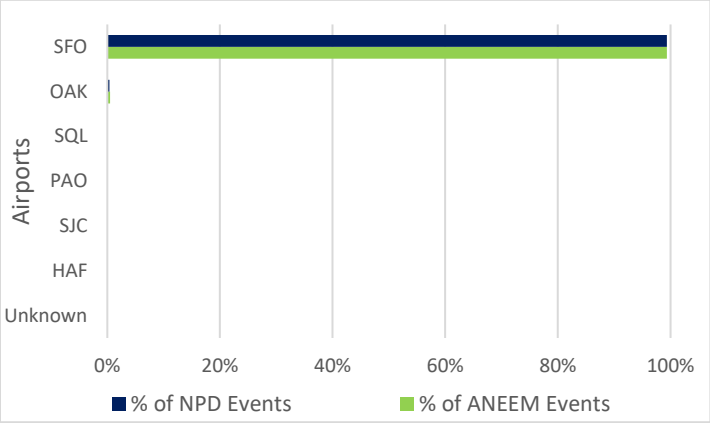


F – SFO ANEEM Aircraft Noise Events by Time of Day

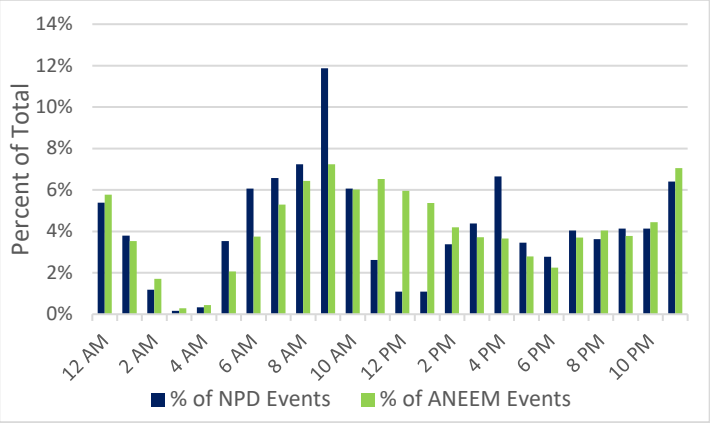
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	6,922	59%	71	52	95	57	45	87	14	4	99
Evening (7pm-10pm)	1,342	12%	69	52	85	56	47	81	16	4	99
Night (10pm-7am)	3,382	29%	68	45	86	54	37	78	19	4	98

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	6,922	59%	84	62	104	69	55	97	14	4	99
Evening (7pm-10pm)	1,342	12%	86	62	102	71	55	92	16	4	99
Night (10pm-7am)	3,382	29%	87	52	103	71	46	94	19	4	98

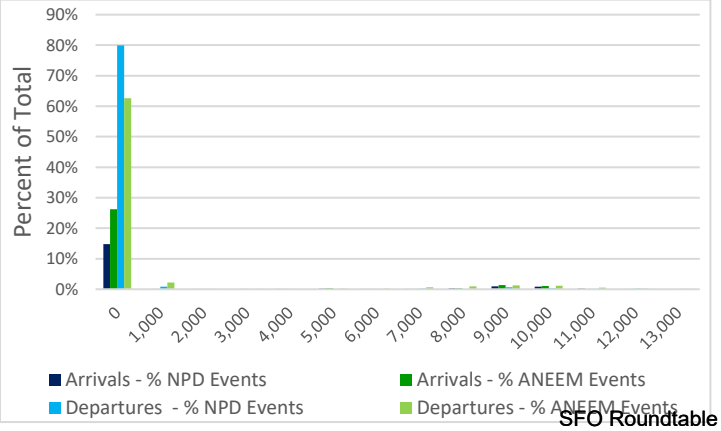
G – Percentage of Events by Airports



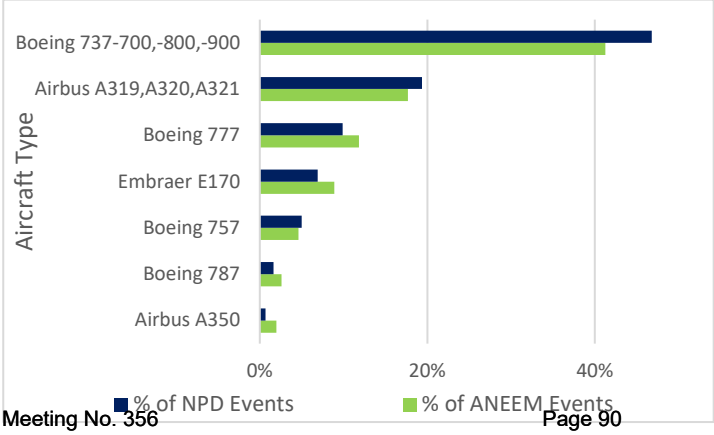
H – SFO Noise Events by Hour of the Day



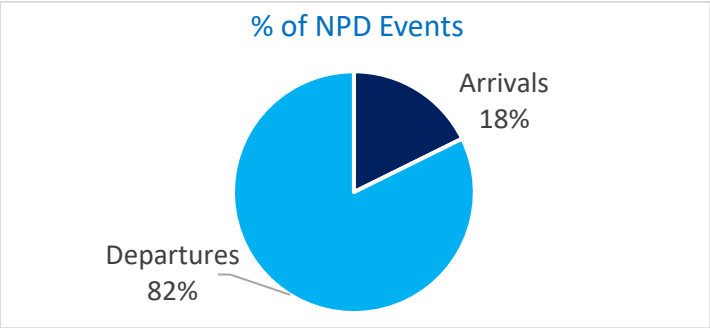
I – SFO Events by Altitude (ft) over Site

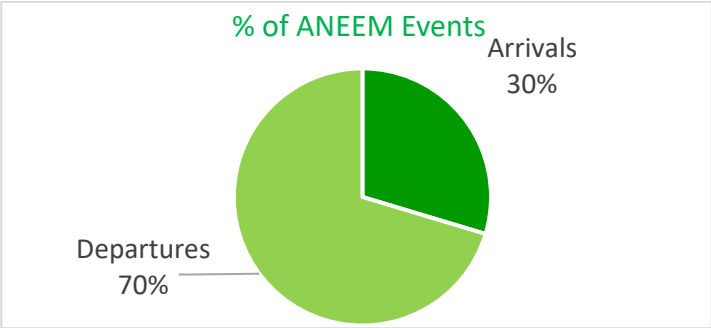


J – Percentage of Events by Aircraft Types

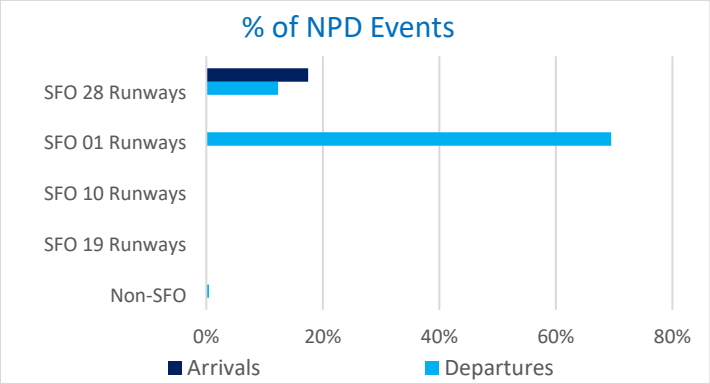


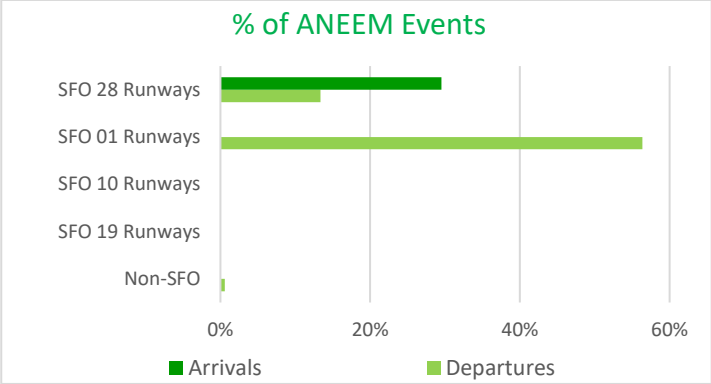
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

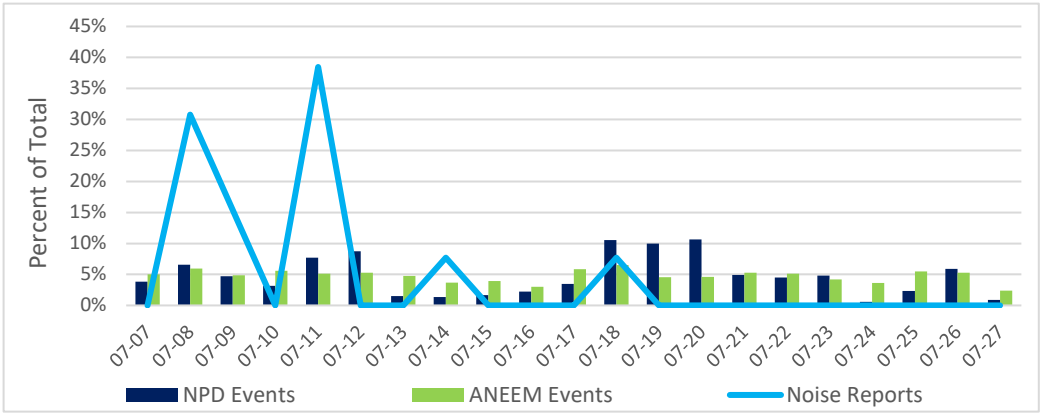




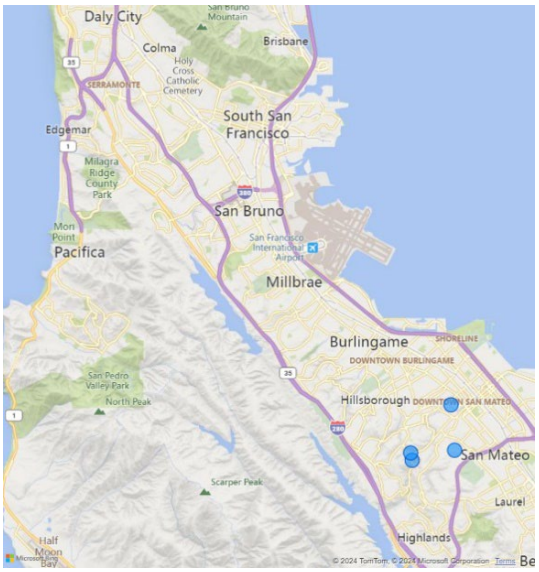
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	0	0
07-08	1	4
07-09	1	2
07-10	0	0
07-11	2	5
07-12	0	0
07-13	0	0
07-14	1	1
07-15	0	0
07-16	0	0
07-17	0	0
07-18	1	1
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	0	0
07-24	0	0
07-25	0	0
07-26	0	0
07-27	0	0
Total	**4**	**13**

N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location

Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

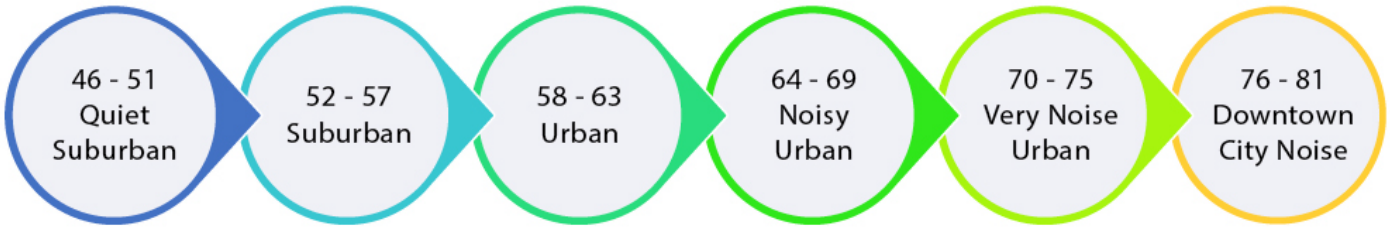
Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

C-Weighted Noise Level – Denoted in dBC, is a different scale for loudness perception of sound pressure levels than A-weighted noise. A C-weight scale is used to measure sounds with approximately equal sensitivity at all frequencies. The C-weighted scale accounts for low-frequency ranges of sounds more than an A-weighted scale, often resulting in more of the overall noise energy to be included in the measurement.

California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).



Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Daly City Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
SFO Permanent Noise Monitoring Location – Site 18 in Daly City

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

San Bruno, South San Francisco, and Daly City are situated adjacent to SFO, with San Bruno sitting directly to the west, South San Francisco to the northwest, and Daly City further northwest. Much of the aircraft noise that reaches San Bruno, South San Francisco, and Daly City is caused by departing aircraft traveling overhead at low altitudes from the west facing runways, Runways 28L and 28R. But, because of their proximity to the airport, they may also receive noise from takeoffs and landings that do not directly overfly them. Aircraft operations on the airfield, takeoffs (takeoff thrust) and landings (reverse thrust from jet engine thrust reverser), generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may be logically correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD threshold for the total monitoring period was 63 dBA. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 337 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 100% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily direct overflights from departing aircraft from SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included noise from departing aircraft from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using thrust reversers to assist with slowing down after touching-down on SFO's West-facing runways, Runways 28L and 28R.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 62 dBA and the Aircraft CNEL and Community CNEL using NPD were 62 dBA and 53 dBA, respectively. This noise monitor was located in a busy suburban area with daily ambient noise ranging between 40 and 49 dba. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

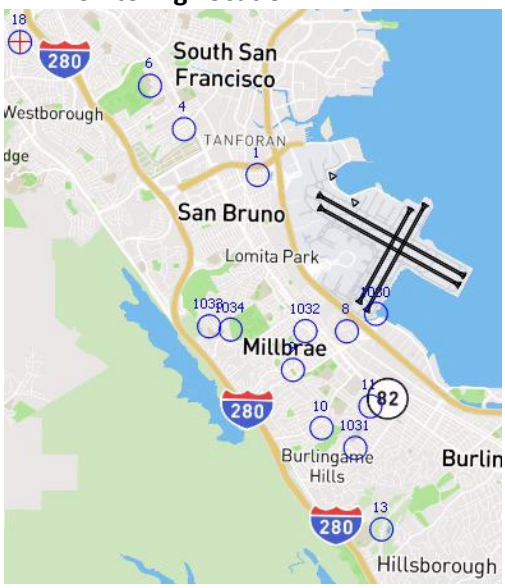
During the monitoring period, the SFO Aircraft Noise Office received 399 noise reports from 6 Daly City residents. Most of the noise reports were generated between 1AM and 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 9AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Site 18, Daly City
Monitoring Site Elevation (ft)	554
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	46
NPD Community (non-aircraft) CNEL (dBA)	53
NPD Aircraft CNEL (dBA)	62
NPD Avg Daily SFO Noise Events	118
ANEEM Aircraft CNEL (dBA)	62
ANEEM Avg Aircraft SEL (dBA)	81
ANEEM Avg Aircraft SEL (dBC)	97
ANEEM Avg Aircraft Lmax (dBA)	67
ANEEM Avg Aircraft Lmax (dBC)	85
ANEEM Avg Daily SFO Noise Events	337
SFO West Flow	100%
SFO Southeast Flow	0%

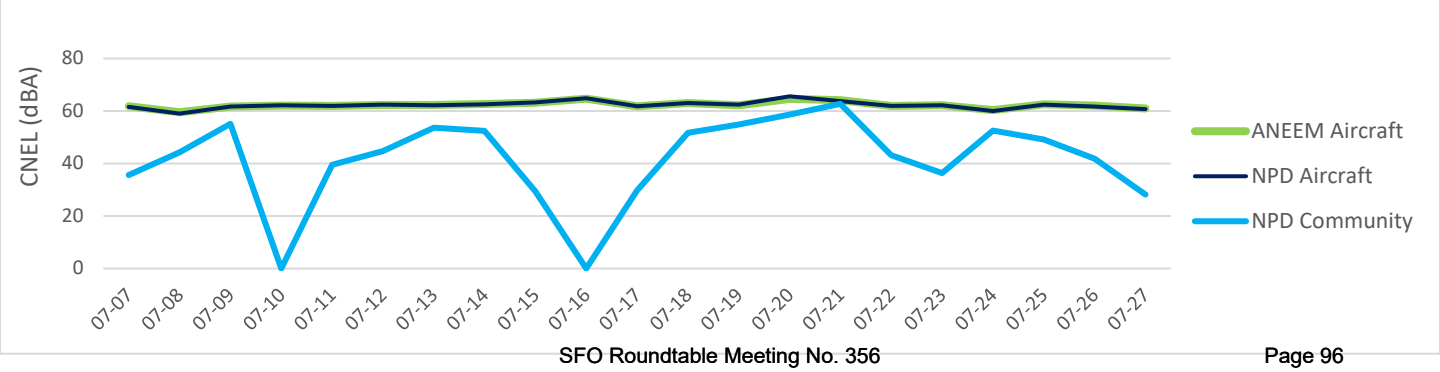
B – Monitoring Location



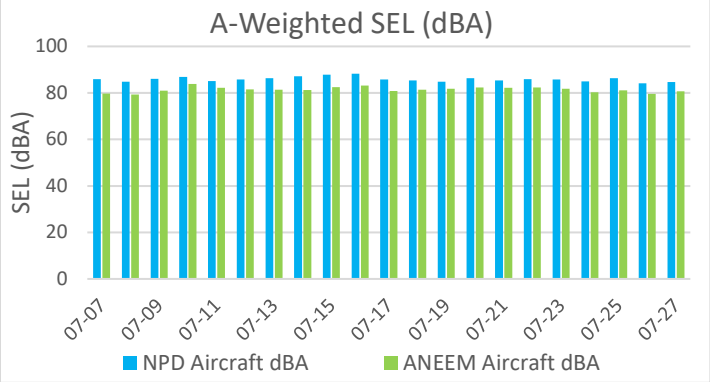
C – Daily Noise Event Averages

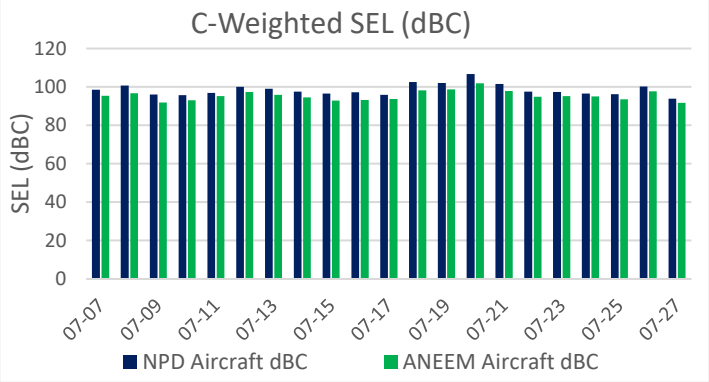
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	94	86	75	432	80	65	94	99	87	432	95	85	5	78	71
07-08	105	85	74	414	79	66	105	101	89	414	97	86	22	80	72
07-09	95	86	75	286	81	63	95	96	84	286	92	80	56	87	70
07-10	88	87	76	170	84	68	88	96	84	170	93	80	0	-	-
07-11	108	85	75	220	82	69	108	97	85	220	95	83	8	78	70
07-12	118	86	75	325	82	68	118	100	88	325	97	87	24	79	72
07-13	113	86	75	365	81	67	113	99	87	365	96	85	25	80	71
07-14	96	87	76	400	81	65	96	98	86	400	95	83	12	81	72
07-15	99	88	77	330	82	64	99	97	85	330	93	81	1	79	72
07-16	94	88	77	301	83	64	94	97	85	301	93	81	0	-	-
07-17	105	86	75	339	81	65	105	96	85	339	94	83	1	79	70
07-18	152	85	75	377	81	69	152	103	90	377	98	87	59	81	72
07-19	149	85	74	301	82	70	149	102	91	301	99	89	63	80	72
07-20	269	86	76	503	82	71	269	107	95	503	102	92	137	82	73
07-21	131	85	75	425	82	66	131	102	88	425	98	87	136	81	71
07-22	114	86	75	266	82	68	114	98	86	266	95	82	14	78	71
07-23	92	86	75	238	82	67	92	97	86	238	95	83	8	77	69
07-24	109	85	74	336	80	66	109	97	85	336	95	84	27	88	73
07-25	89	86	75	304	81	65	89	96	85	304	94	83	9	89	76
07-26	144	84	73	471	80	67	144	100	88	471	98	88	20	78	71
07-27	109	85	74	273	81	65	109	94	82	273	92	80	1	78	73
Daily Average	**118**	**86**	**75**	**337**	**81**	**67**	**118**	**101**	**87**	**337**	**97**	**85**	**30**	**83**	**72**
Total Count	**2,473**			**7,076**			**2,473**			**7,076**			**628**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



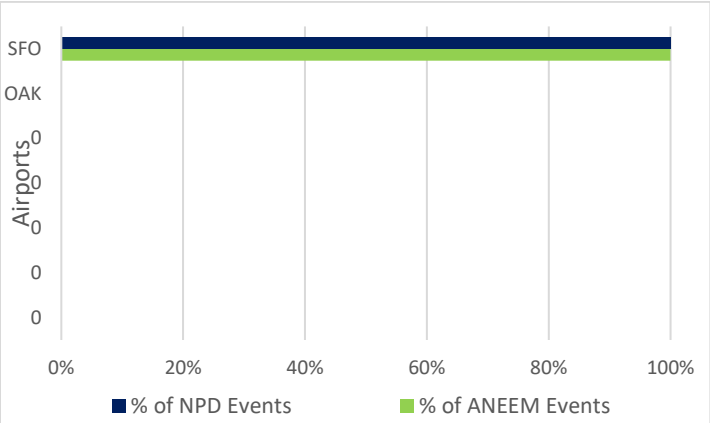


F – SFO ANEEM Aircraft Noise Events by Time of Day

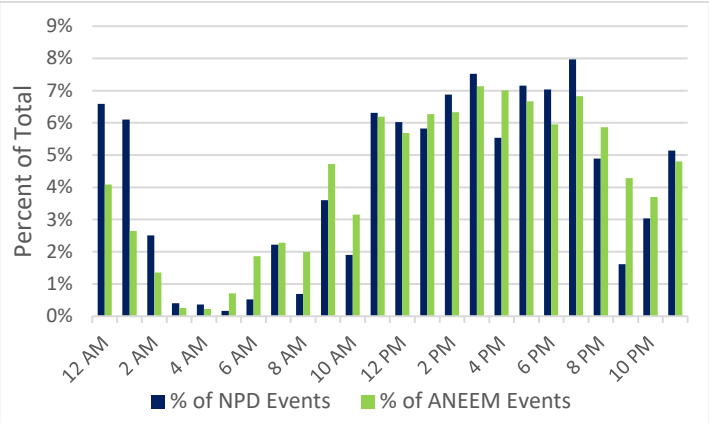
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	4,485	63%	82	57	104	67	50	102	14	4	84
Evening (7pm-10pm)	1,201	17%	79	58	95	66	49	85	13	4	80
Night (10pm-7am)	1,390	20%	82	50	95	66	43	87	17	4	76

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	4,485	63%	97	66	112	85	60	111	14	4	84
Evening (7pm-10pm)	1,201	17%	97	67	109	87	60	102	13	4	80
Night (10pm-7am)	1,390	20%	95	59	108	82	52	101	17	4	76

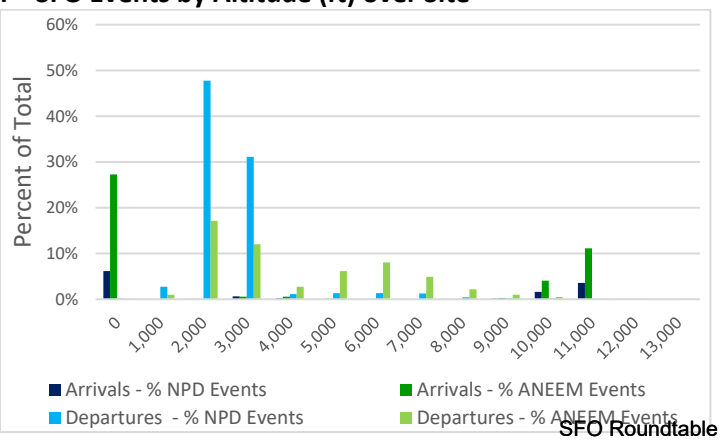
G – Percentage of Events by Airports



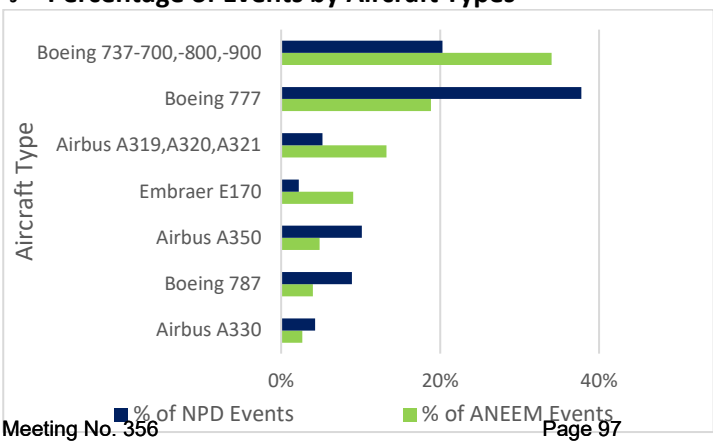
H – SFO Noise Events by Hour of the Day



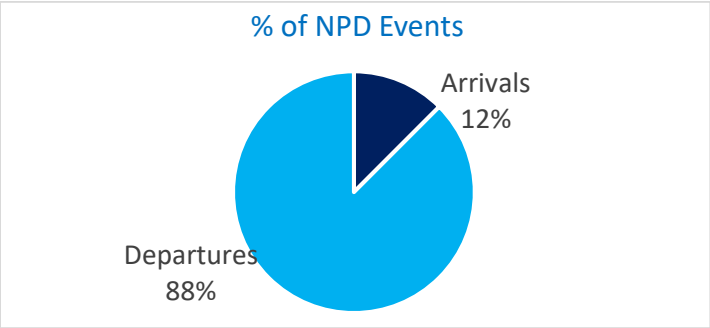
I – SFO Events by Altitude (ft) over Site

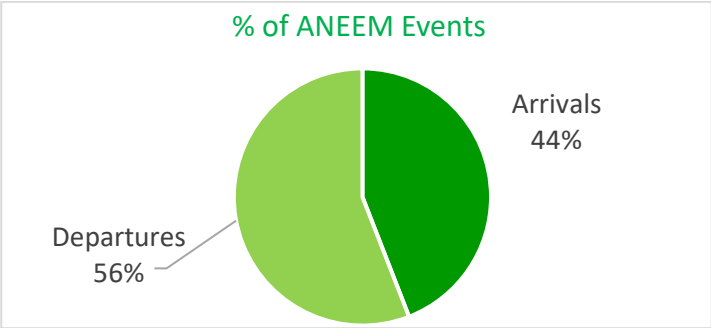


J – Percentage of Events by Aircraft Types

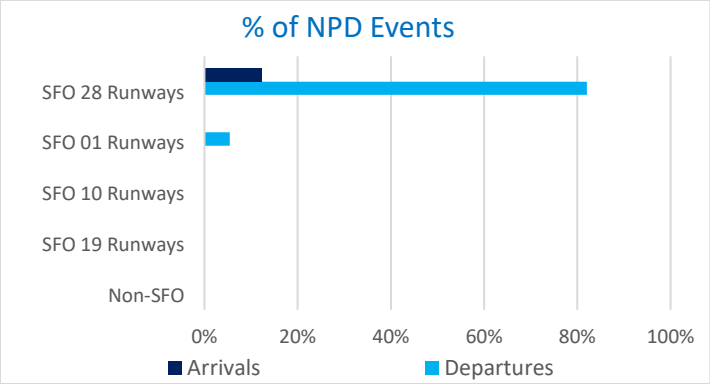


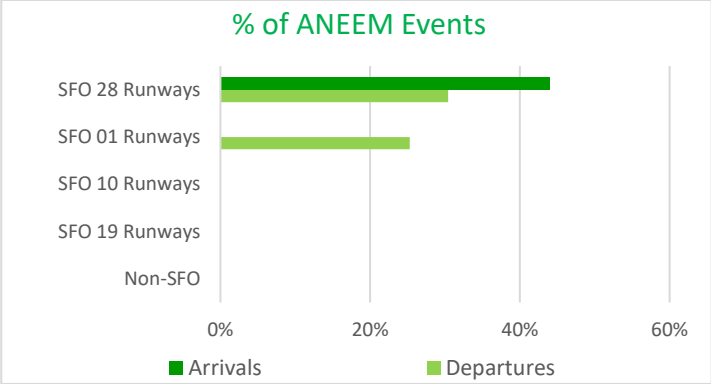
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

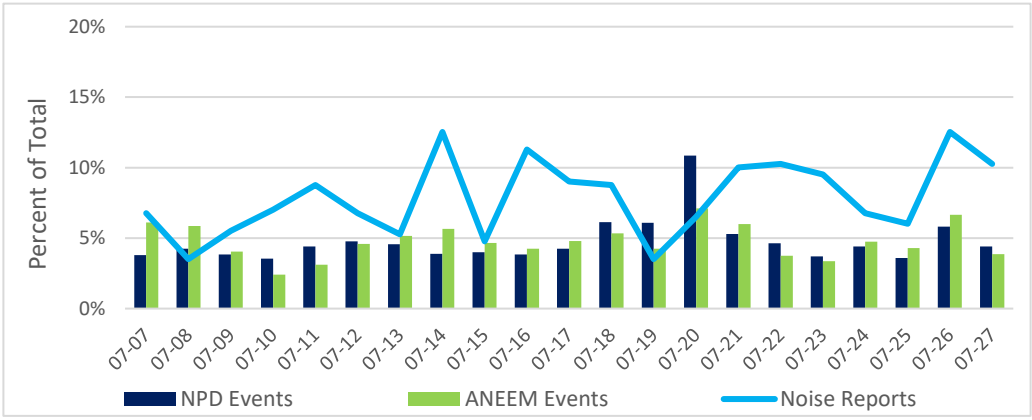




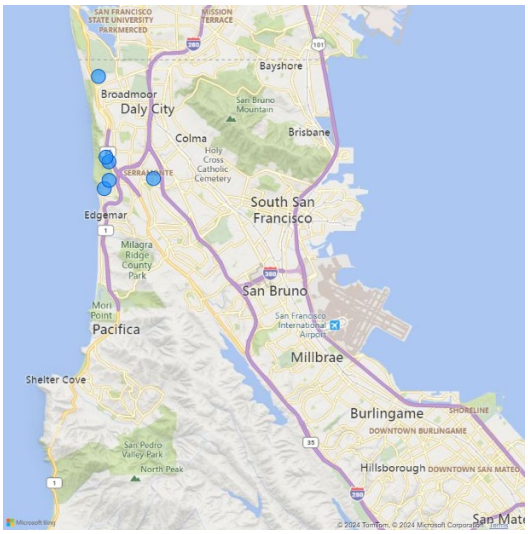
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	2	27
07-08	2	14
07-09	2	22
07-10	2	28
07-11	2	35
07-12	2	27
07-13	2	21
07-14	2	50
07-15	2	19
07-16	3	45
07-17	2	36
07-18	1	35
07-19	1	14
07-20	3	26
07-21	3	40
07-22	2	41
07-23	2	38
07-24	2	27
07-25	2	24
07-26	2	50
07-27	2	41
Total	**6**	**399**

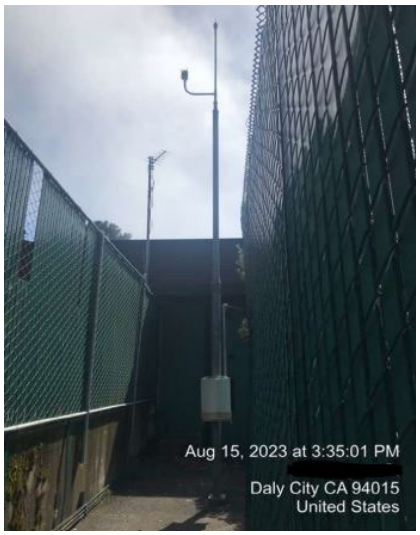
N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location



Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

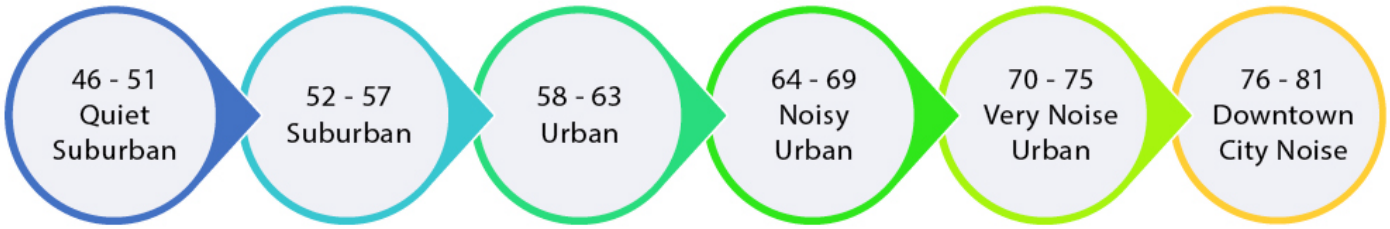
Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

C-Weighted Noise Level – Denoted in dBC, is a different scale for loudness perception of sound pressure levels than A-weighted noise. A C-weight scale is used to measure sounds with approximately equal sensitivity at all frequencies. The C-weighted scale accounts for low-frequency ranges of sounds more than an A-weighted scale, often resulting in more of the overall noise energy to be included in the measurement.

California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).



Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Millbrae Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
One-Time Monitoring Location 1: SFO Retention Pond

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae and Burlingame are situated directly adjacent SFO, with Millbrae sitting to the southwest and Burlingame to the south. Much of the aircraft noise that reaches Millbrae and Burlingame is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs and landings, generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may logically be correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD thresholds for the total monitoring period was 80 dBA. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 475 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 100% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily takeoffs from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using reverse thrust to assist with slowing down after touching-down on SFO's West-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's west-facing runways, Runways 28L and 28R.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 81 dBA and the Aircraft CNEL and Community CNEL using NPD were 81 dBA and 67 dBA, respectively. This noise monitor was located next to the start of SFO's Runway 01R, with daily ambient noise ranging between 50 and 55 dBA.

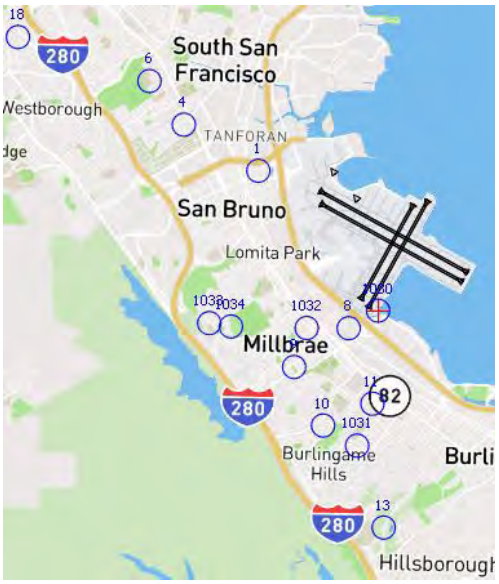
During the monitoring period, the SFO Aircraft Noise Office received 11 noise reports from 4 Burlingame and Millbrae residents. Most of the noise reports were generated between the hours of 5AM and 12AM. Likewise, Most of the SFO Aircraft noise events using ANEEM occurred between 8AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SFO Retention Pond
Monitoring Site Elevation (ft)	26
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	53
NPD Community (non-aircraft) CNEL (dBA)	67
NPD Aircraft CNEL (dBA)	81
NPD Avg Daily SFO Noise Events	313
ANEEM Aircraft CNEL (dBA)	81
ANEEM Avg Aircraft SEL (dBA)	98
ANEEM Avg Aircraft SEL (dBC)	0
ANEEM Avg Aircraft Lmax (dBA)	84
ANEEM Avg Aircraft Lmax (dBC)	0
ANEEM Avg Daily SFO Noise Events	474
SFO West Flow	100%
SFO Southeast Flow	0%

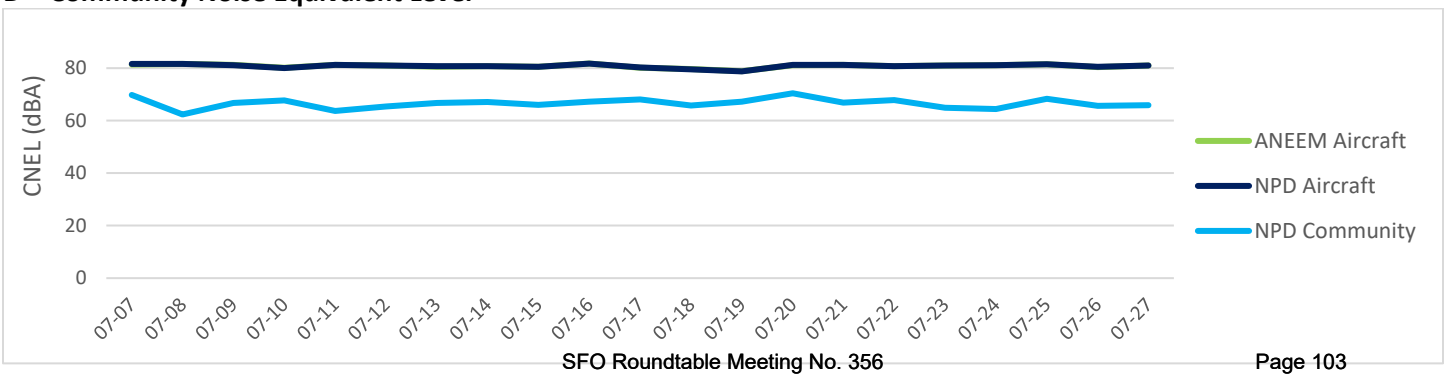
B – Monitoring Location



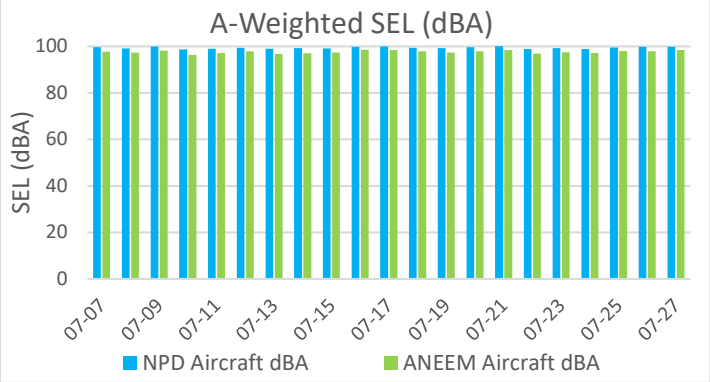
C – Daily Noise Event Averages

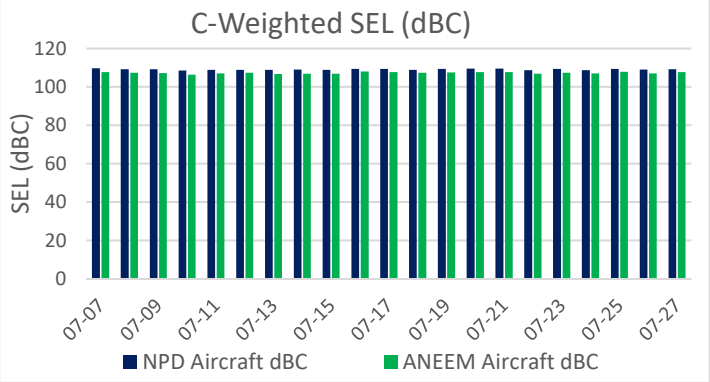
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	315	100	90	480	98	84	315	110	98	480	108	93	61	96	84
07-08	323	99	89	490	97	84	323	109	98	490	107	93	21	92	84
07-09	326	100	90	510	98	85	326	109	98	510	107	93	29	94	85
07-10	273	99	89	488	96	83	273	109	98	488	106	92	27	94	84
07-11	299	99	89	464	97	84	299	109	97	464	107	92	19	96	85
07-12	353	99	89	502	98	85	353	109	98	502	107	93	25	95	85
07-13	288	99	89	475	97	83	288	109	97	475	107	91	29	95	83
07-14	282	99	89	478	97	84	282	109	98	478	107	92	32	96	84
07-15	325	99	90	509	97	84	325	109	98	509	107	92	25	95	84
07-16	347	100	90	470	99	86	347	109	98	470	108	94	40	94	84
07-17	322	100	90	453	98	85	322	109	98	453	108	94	39	96	85
07-18	326	99	90	460	98	86	326	109	97	460	107	93	29	93	85
07-19	249	99	89	389	97	84	249	109	98	389	108	93	35	95	84
07-20	304	100	90	456	98	85	304	110	98	456	108	94	32	96	84
07-21	305	100	90	461	98	85	305	110	98	461	108	93	30	94	85
07-22	280	99	89	440	97	83	280	109	97	440	107	92	34	94	83
07-23	308	99	89	486	97	84	308	109	98	486	107	92	23	94	84
07-24	336	99	89	505	97	84	336	109	97	505	107	92	18	95	85
07-25	346	99	89	472	98	86	346	109	98	472	108	94	34	96	85
07-26	335	100	90	516	98	85	335	109	97	516	107	93	29	94	85
07-27	324	100	90	457	98	85	324	109	98	457	108	93	36	94	84
Daily Average	**313**	**99**	**89**	**474**	**98**	**84**	**313**	**109**	**98**	**474**	**107**	**93**	**31**	**95**	**84**
Total Count	**6,566**			**9,961**			**6,566**			**9,961**			**647**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



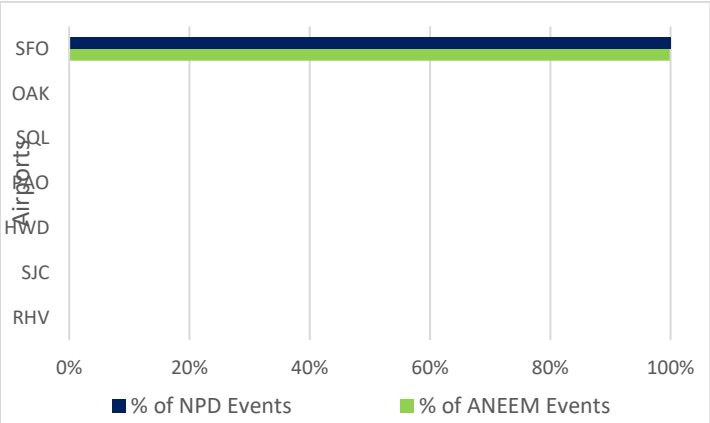


F – SFO ANEEM Aircraft Noise Events by Time of Day

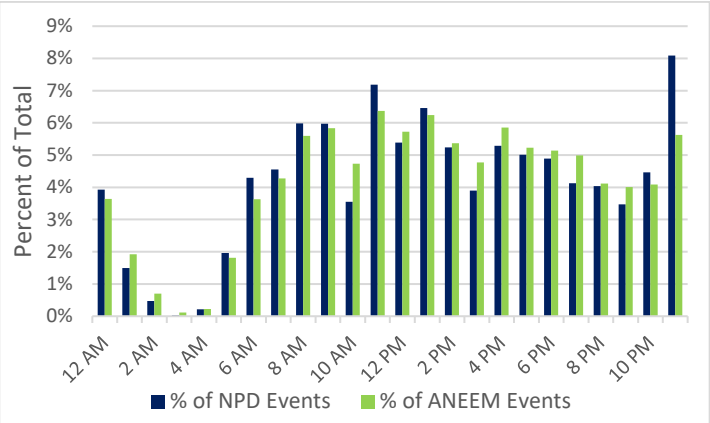
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	6488	65%	97	65	108	84	60	101	15	5	72
Evening (7pm-10pm)	1306	13%	97	69	108	84	61	100	16	5	70
Night (10pm-7am)	2167	22%	99	66	110	86	57	103	16	5	70

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	6488	65%	107	75	119	92	69	113	15	5	72
Evening (7pm-10pm)	1306	13%	107	77	119	91	69	110	16	5	70
Night (10pm-7am)	2167	22%	109	76	119	94	69	110	16	5	70

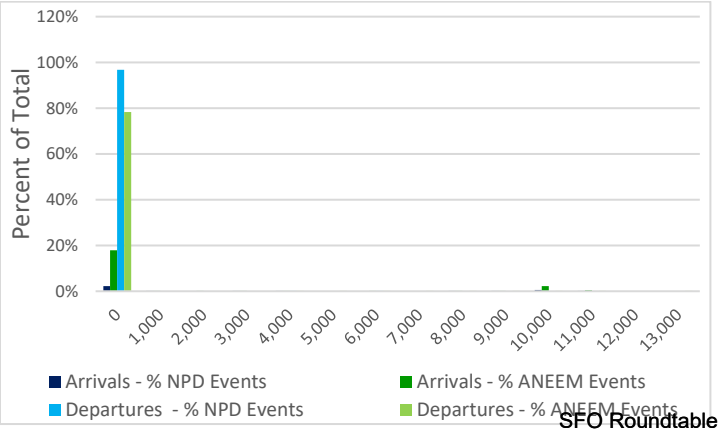
G – Percentage of Events by Airports



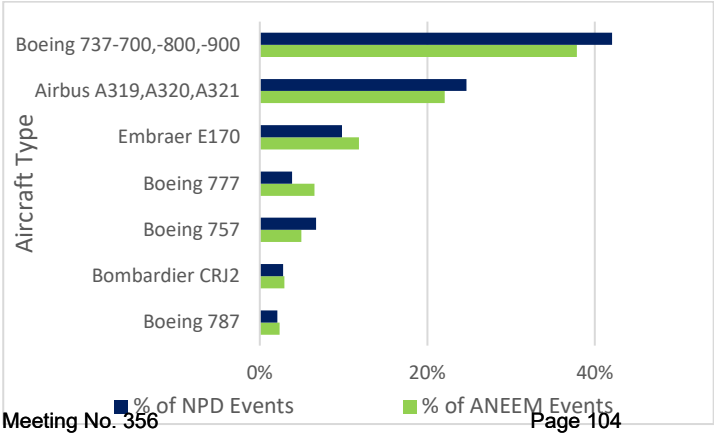
H – SFO Noise Events by Hour of the Day



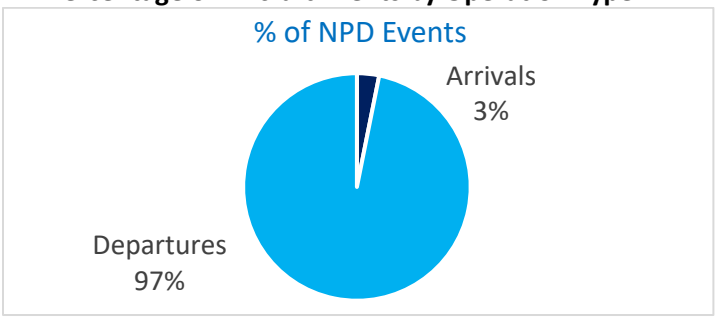
I – SFO Events by Altitude (ft) over Site

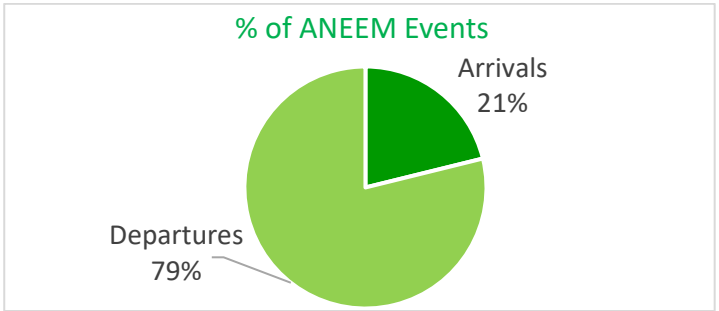


J – Percentage of Events by Aircraft Types

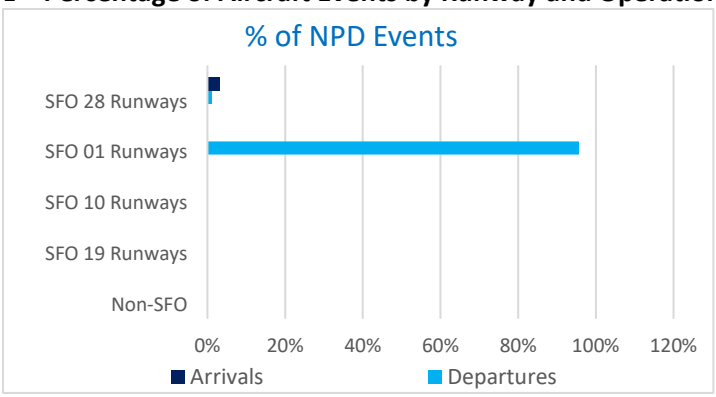


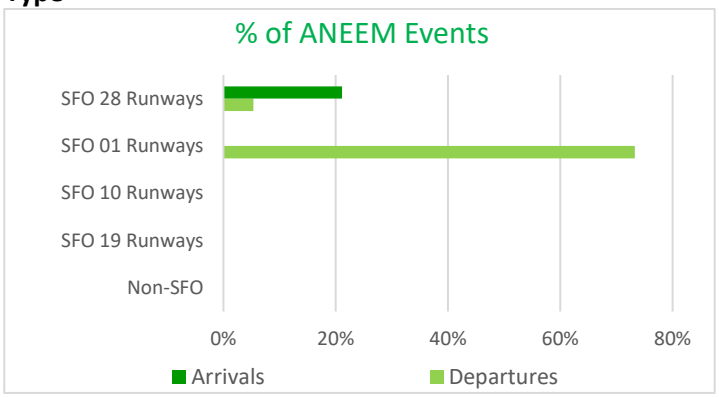
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

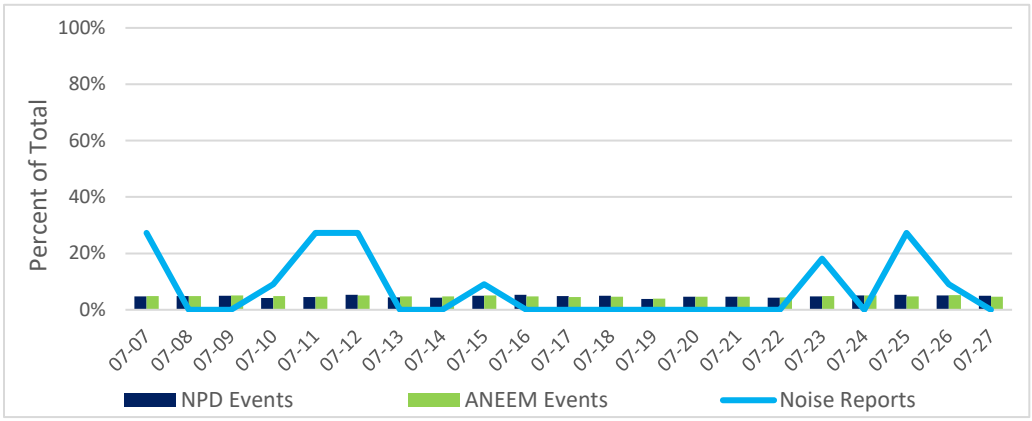




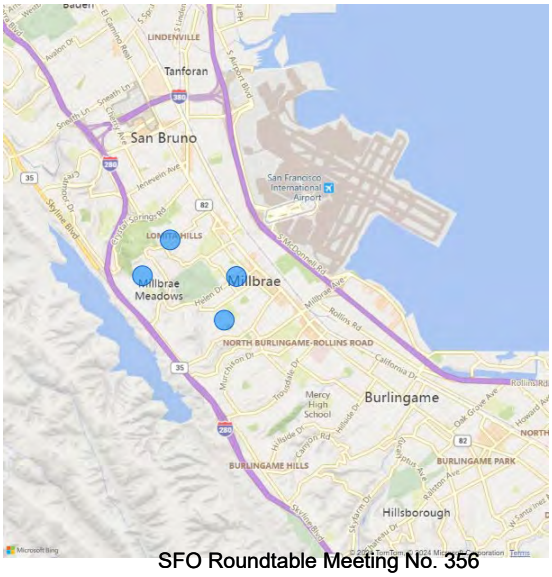
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	1	3
07-08	0	0
07-09	0	0
07-10	1	1
07-11	1	3
07-12	2	3
07-13	0	0
07-14	0	0
07-15	1	1
07-16	0	0
07-17	0	0
07-18	0	0
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	2	2
07-24	0	0
07-25	1	3
07-26	1	1
07-27	0	0
Total	**4**	**11**

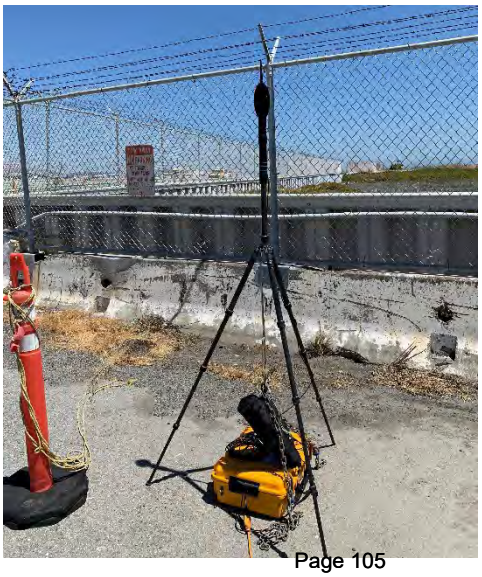
N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location



Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

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California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).

Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Burlingame Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
One-Time Monitoring Location 2: Central County Fire Department Sta. 35

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae and Burlingame are situated directly adjacent SFO, with Millbrae sitting to the southwest and Burlingame to the south. Much of the aircraft noise that reaches Millbrae and Burlingame is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs and landings, generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may logically be correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD thresholds for the total monitoring period were 55 dBA for daytime and 50 dBA for nighttime. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 766 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 95% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily takeoffs from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using reverse thrust to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's west-facing runways, Runways 28L and 28R. In addition to noise from airfield operations, there were also noise from aircraft overflights, majority of which were departing aircraft from OAK headed south/southeast utilizing the CNDEL departure procedure. Approximately 3% of all aircraft noise events were from OAK aircraft.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 52 dBA and the Aircraft CNEL and Community CNEL using NPD were 52 dBA and 42 dBA, respectively. This noise monitor was located in a quiet suburban area with daily ambient noise ranging between 32 and 40 dba. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

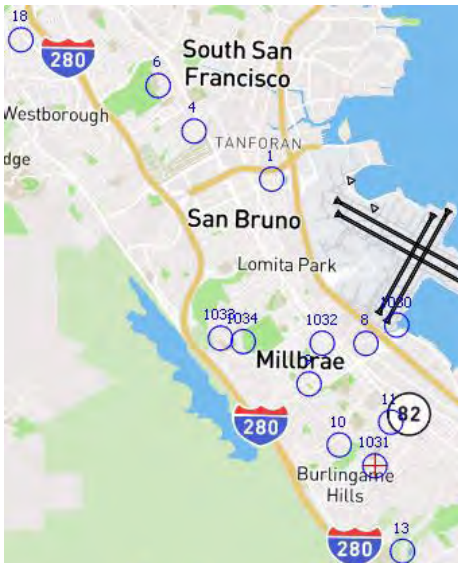
During the monitoring period, the SFO Aircraft Noise Office received 1 noise report from 1 Burlingame resident. The noise report was generated in the 2AM hour. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 8AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	Central County Fire Department Sta. 35
Monitoring Site Elevation (ft)	15
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	37
NPD Community (non-aircraft) CNEL (dBA)	42
NPD Aircraft CNEL (dBA)	52
NPD Avg Daily SFO Noise Events	149
ANEEM Aircraft CNEL (dBA)	52
ANEEM Avg Aircraft SEL (dBA)	66
ANEEM Avg Aircraft SEL (dBC)	85
ANEEM Avg Aircraft Lmax (dBA)	51
ANEEM Avg Aircraft Lmax (dBC)	68
ANEEM Avg Daily SFO Noise Events	740
SFO West Flow	100%
SFO Southeast Flow	0%

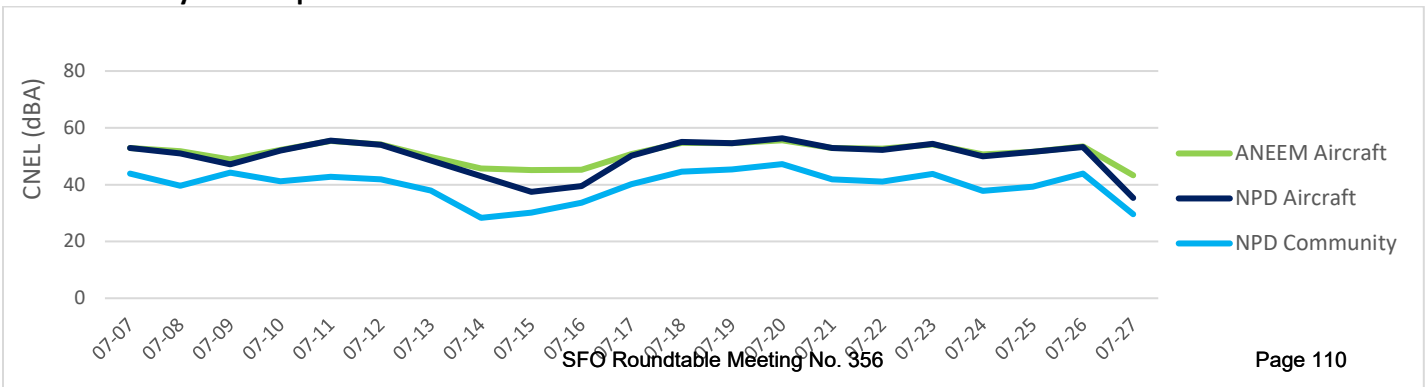
B – Monitoring Location



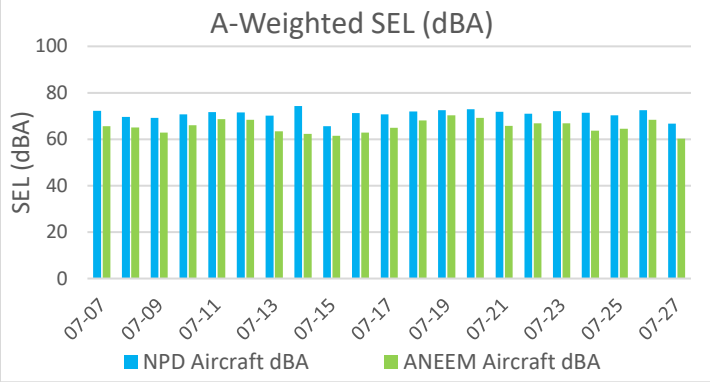
C – Daily Noise Event Averages

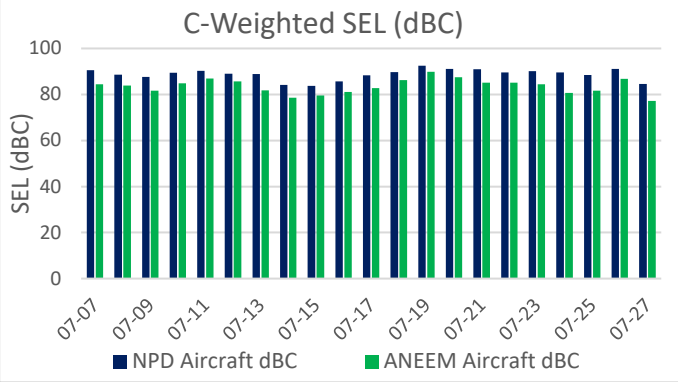
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	112	72	58	681	66	51	112	91	77	681	85	68	50	67	55
07-08	143	70	58	739	65	52	143	89	76	739	84	68	25	66	55
07-09	79	69	58	755	63	49	79	88	75	755	82	67	35	70	58
07-10	163	71	58	756	66	52	163	89	75	756	85	69	44	66	56
07-11	283	72	59	781	69	55	283	90	76	781	87	71	62	66	55
07-12	285	71	60	769	68	55	285	89	74	769	86	70	78	68	58
07-13	75	70	58	699	63	49	75	89	76	699	82	66	15	68	57
07-14	31	75	59	737	62	48	31	84	75	737	79	64	3	65	58
07-15	27	66	57	750	61	48	27	84	73	750	80	65	7	66	58
07-16	37	71	60	703	63	49	37	86	73	703	81	67	15	69	60
07-17	95	71	58	756	65	51	95	88	75	756	83	67	15	69	57
07-18	264	72	60	777	68	54	264	90	76	777	86	71	59	67	56
07-19	334	73	60	687	70	56	334	93	77	687	90	73	99	68	56
07-20	263	73	59	684	69	54	263	91	76	684	88	71	80	68	56
07-21	129	72	59	752	66	51	129	91	77	752	85	69	30	67	55
07-22	178	71	59	723	67	53	178	90	76	723	85	70	40	67	57
07-23	174	72	58	765	67	52	174	90	75	765	85	67	43	67	56
07-24	71	71	59	775	64	50	71	90	75	775	81	64	20	66	55
07-25	123	70	58	747	64	51	123	89	74	747	82	66	33	66	56
07-26	251	72	59	791	68	53	251	91	78	791	87	71	110	69	57
07-27	11	67	58	722	60	47	11	85	73	722	77	63	4	69	60
Daily Average	**149**	**72**	**59**	**740**	**66**	**51**	**149**	**90**	**76**	**740**	**85**	**68**	**41**	**68**	**56**
Total Count	**3,128**			**15,549**			**3,128**			**15,549**			**867**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



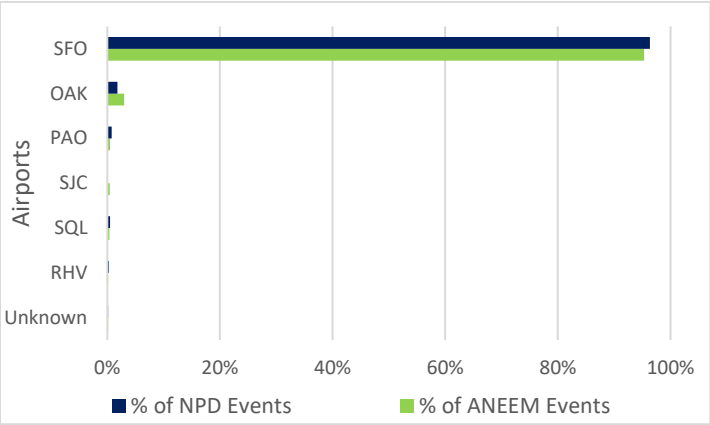


F – SFO ANEEM Aircraft Noise Events by Time of Day

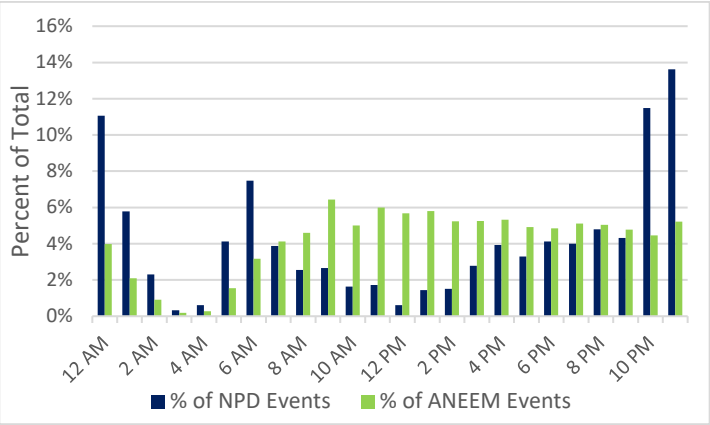
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	9831	63%	65	47	84	51	39	79	26	5	72
Evening (7pm-10pm)	2321	15%	67	47	82	52	39	73	27	5	72
Night (10pm-7am)	3397	22%	69	44	82	52	36	72	32	5	72

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	9831	63%	83	58	102	67	50	96	26	5	72
Evening (7pm-10pm)	2321	15%	85	58	101	68	52	91	27	5	72
Night (10pm-7am)	3397	22%	87	55	101	70	47	93	32	5	72

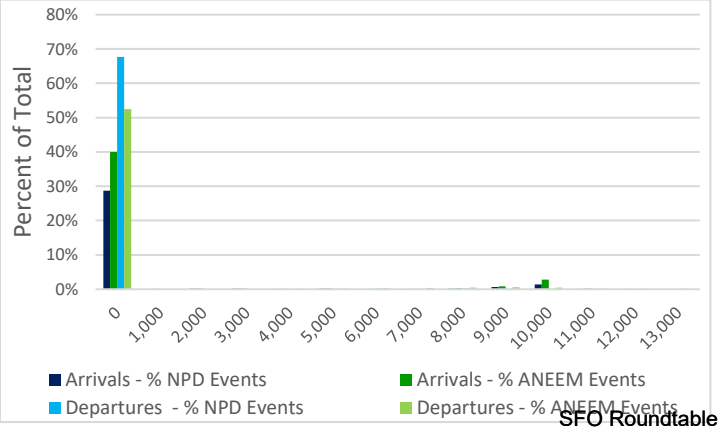
G – Percentage of Events by Airports



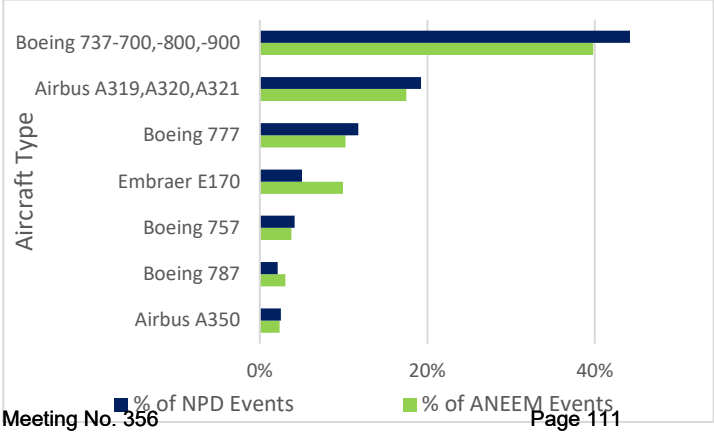
H – SFO Noise Events by Hour of the Day



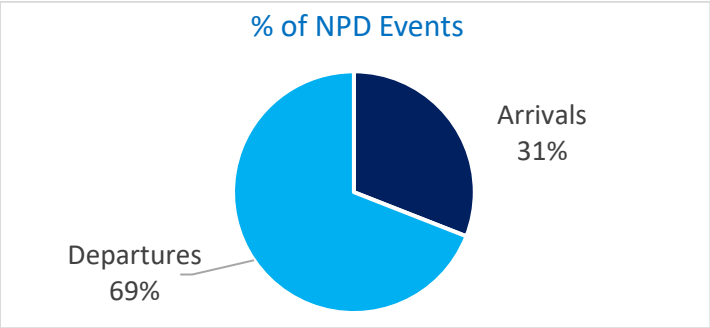
I – SFO Events by Altitude (ft) over Site

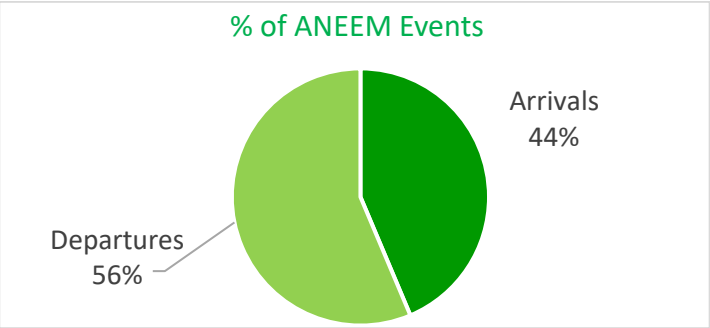


J – Percentage of Events by Aircraft Types

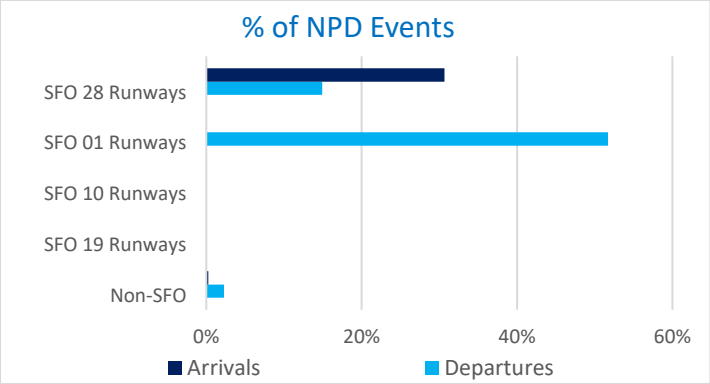


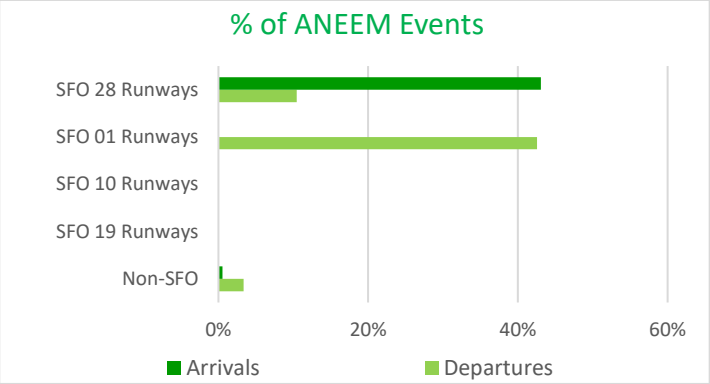
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

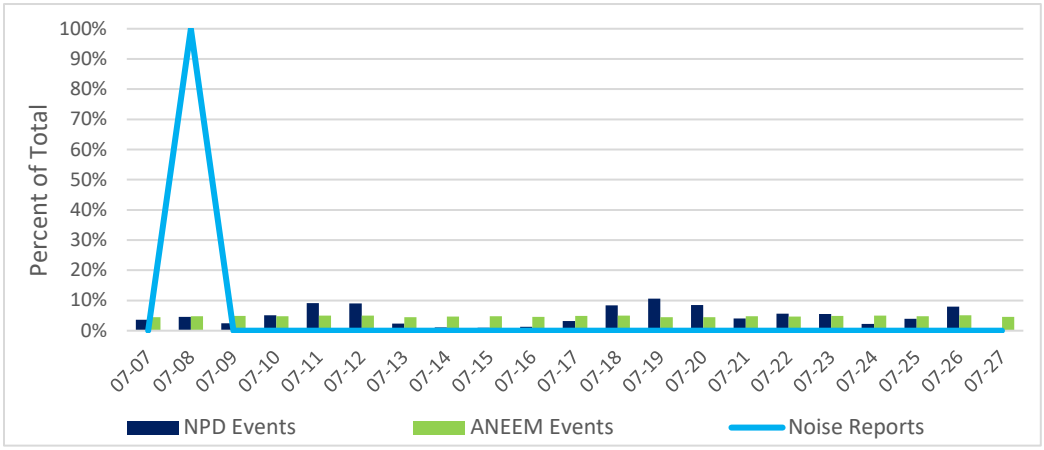




M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	0	0
07-08	1	1
07-09	0	0
07-10	0	0
07-11	0	0
07-12	0	0
07-13	0	0
07-14	0	0
07-15	0	0
07-16	0	0
07-17	0	0
07-18	0	0
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	0	0
07-24	0	0
07-25	0	0
07-26	0	0
07-27	0	0
Total	**1**	**1**

N – Noise Reports vs Aircraft Noise Events per Day



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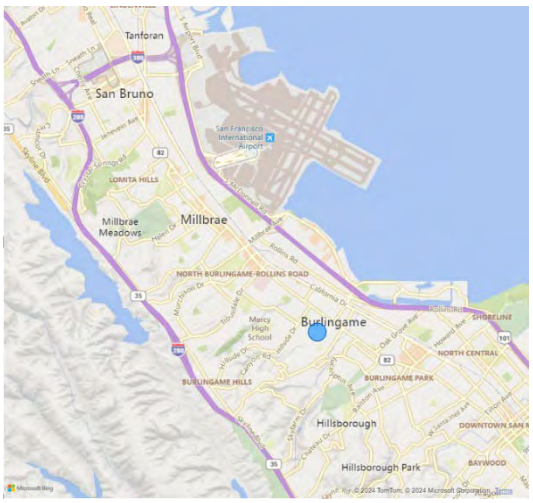

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Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).

Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Millbrae Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
One-Time Monitoring Location 3: Central County Fire Department Sta. 37

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae and Burlingame are situated directly adjacent SFO, with Millbrae sitting to the southwest and Burlingame to the south. Much of the aircraft noise that reaches Millbrae and Burlingame is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs and landings, generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may logically be correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD thresholds for the total monitoring period were 62 dBA for daytime and 57 dBA for nighttime. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 768 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 96% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily takeoffs from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using reverse thrust to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's west-facing runways, Runways 28L and 28R. In addition to noise from airfield operations, there were also noise from aircraft overflights, majority of which were departing aircraft from Oakland International Airport (OAK) headed south/southeast utilizing the CNDEL departure procedure. Approximately 3% of all aircraft noise events were from OAK aircraft.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 58 dBA and the Aircraft CNEL and Community CNEL using NPD were 57 dBA and 50 dBA, respectively. This noise monitor was located in a busy suburban area with daily ambient noise ranging between 66 and 84 dBA. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

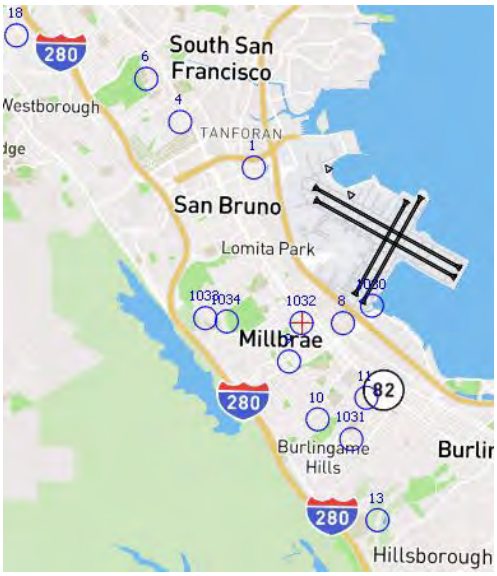
During the monitoring period, the SFO Aircraft Noise Office received 11 noise reports from 4 Millbrae residents. Most of the noise reports were generated between the hours of 5AM – 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 8AM – 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	Central County Fire Department Sta. 37
Monitoring Site Elevation (ft)	66
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	76
NPD Community (non-aircraft) CNEL (dBA)	50
NPD Aircraft CNEL (dBA)	57
NPD Avg Daily SFO Noise Events	133
ANEEM Aircraft CNEL (dBA)	58
ANEEM Avg Aircraft SEL (dBA)	73
ANEEM Avg Aircraft SEL (dBC)	89
ANEEM Avg Aircraft Lmax (dBA)	60
ANEEM Avg Aircraft Lmax (dBC)	75
ANEEM Avg Daily SFO Noise Events	742
SFO West Flow	100%
SFO Southeast Flow	0%

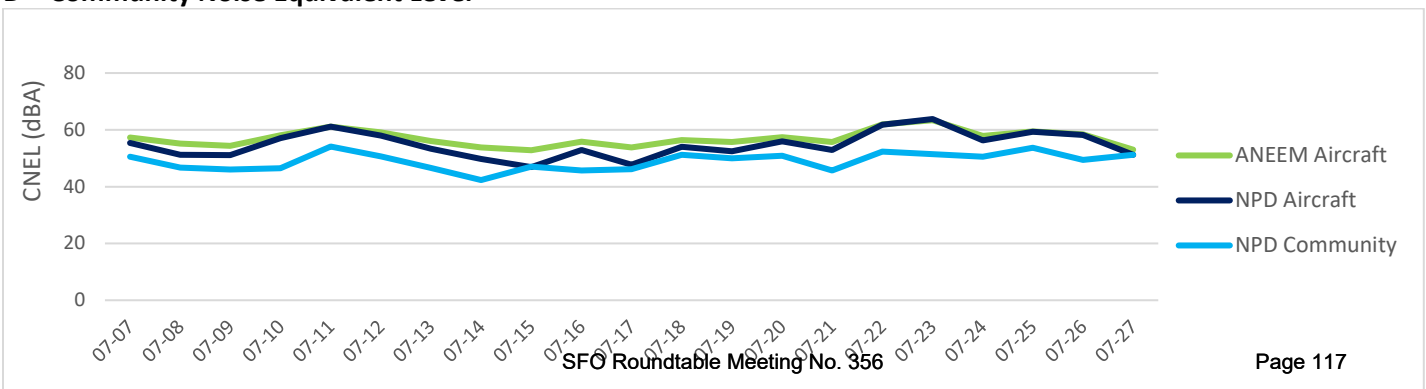
B – Monitoring Location



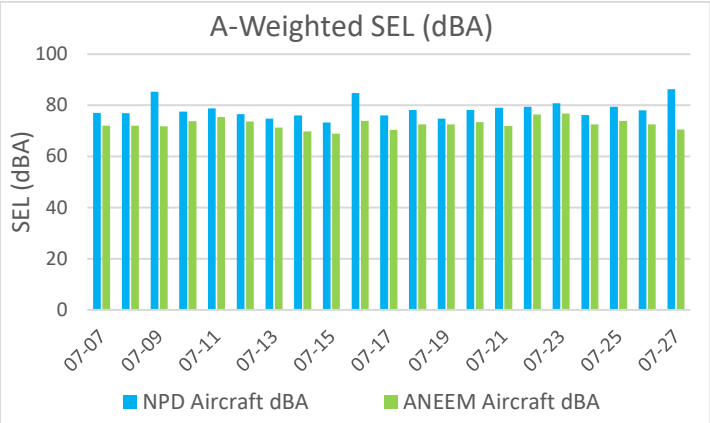
C – Daily Noise Event Averages

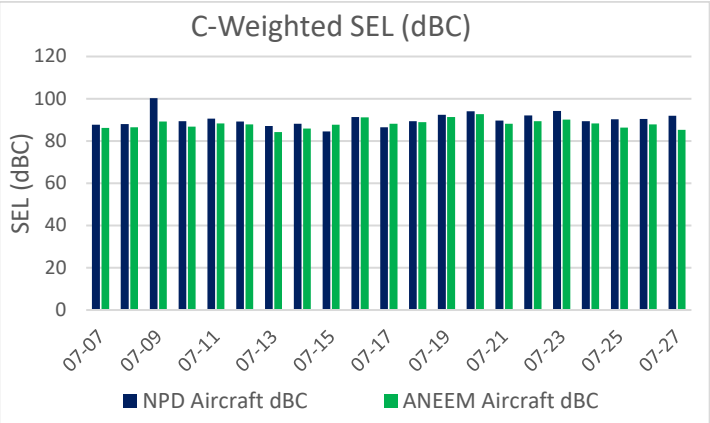
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	130	77	65	771	72	59	130	88	77	771	86	74	71	75	62
07-08	92	77	66	729	72	60	92	88	78	729	87	73	29	75	65
07-09	28	85	69	758	72	57	28	100	80	758	89	74	13	81	67
07-10	204	77	67	759	74	61	204	89	78	759	87	74	38	72	63
07-11	322	79	67	766	75	63	322	91	79	766	88	75	117	78	65
07-12	202	77	66	803	74	62	202	89	78	803	88	76	91	72	62
07-13	119	75	65	716	71	59	119	87	76	716	84	72	36	72	63
07-14	55	76	66	723	70	57	55	88	78	723	86	72	24	74	62
07-15	29	73	64	770	69	57	29	84	75	770	88	74	11	78	67
07-16	44	85	68	787	74	58	44	91	77	787	91	77	16	78	66
07-17	45	75	65	754	70	58	45	87	75	754	88	75	25	76	64
07-18	112	78	65	704	73	60	112	89	78	704	89	76	53	81	64
07-19	106	75	65	607	73	61	106	93	81	607	91	77	68	74	63
07-20	154	78	66	697	73	61	154	94	81	697	93	78	83	75	64
07-21	89	79	65	756	72	58	89	90	78	756	88	74	26	78	65
07-22	304	79	68	724	76	63	304	92	80	724	89	76	79	76	64
07-23	269	81	68	761	77	63	269	94	80	761	90	75	102	73	61
07-24	159	76	65	739	73	61	159	89	77	739	88	74	61	76	63
07-25	174	79	66	728	74	61	174	90	77	728	86	74	78	80	65
07-26	129	78	66	754	72	59	129	91	78	754	88	75	62	74	62
07-27	22	86	69	776	71	56	22	92	78	776	85	72	22	86	68
Daily Average	**133**	**79**	**66**	**742**	**73**	**60**	**133**	**91**	**78**	**742**	**89**	**75**	**53**	**77**	**64**
Total Count	**2,788**			**15,582**			**2,788**			**15,582**			**1,105**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



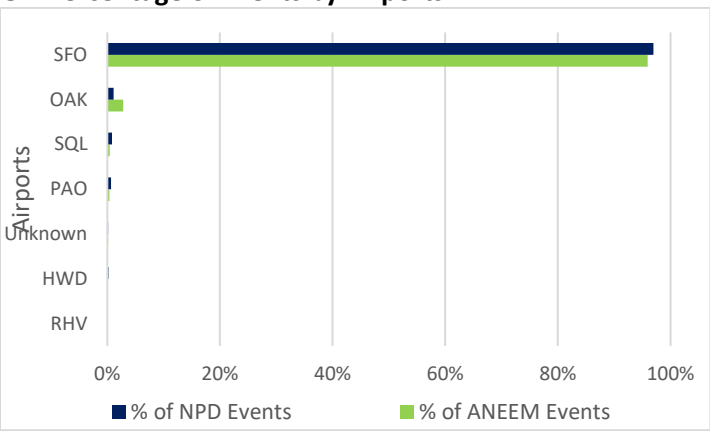


F – SFO ANEEM Aircraft Noise Events by Time of Day

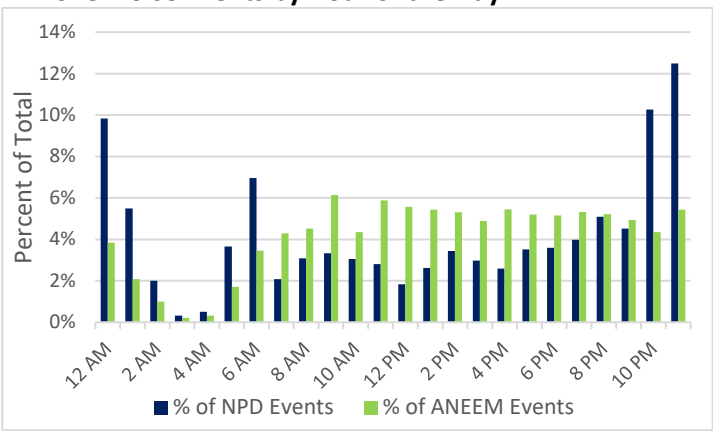
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	9,685	62%	73	57	100	60	49	98	21	5	72
Evening (7pm-10pm)	2,411	15%	73	56	86	60	48	78	23	5	71
Night (10pm-7am)	3,486	22%	74	52	90	59	44	81	27	5	72

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	9,685	62%	89	67	111	76	58	102	21	5	72
Evening (7pm-10pm)	2,411	15%	89	66	104	74	58	99	23	5	71
Night (10pm-7am)	3,486	22%	88	62	104	72	55	98	27	5	72

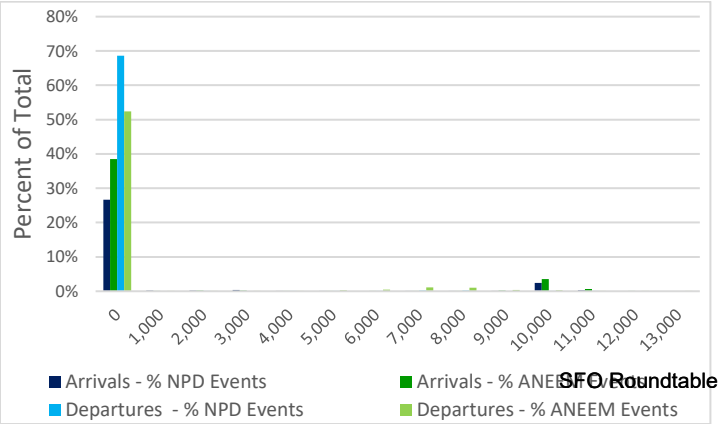
G – Percentage of Events by Airports



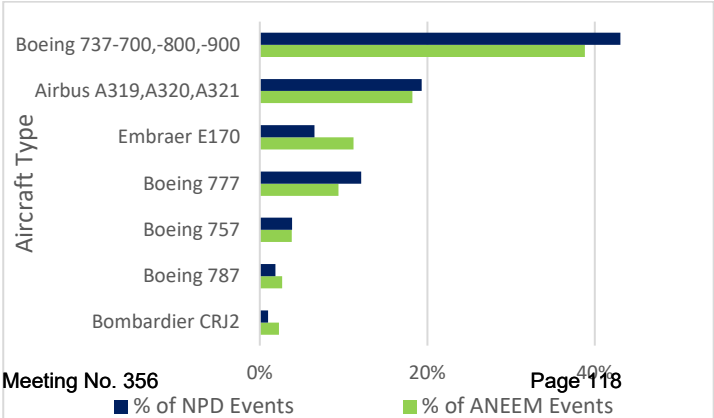
H – SFO Noise Events by Hour of the Day



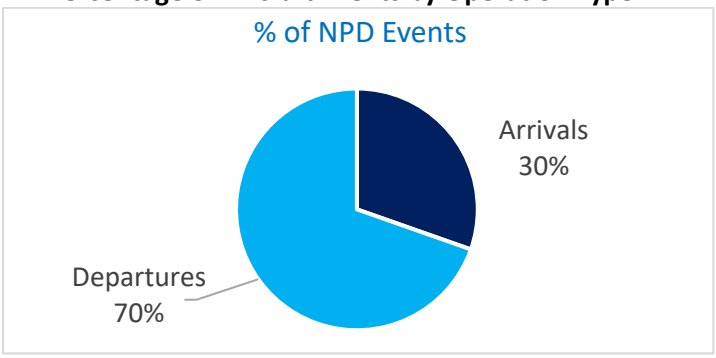
I – SFO Events by Altitude (ft) over Site

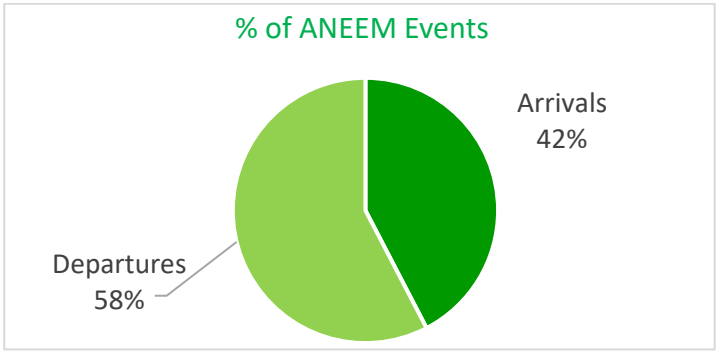


J – Percentage of Events by Aircraft Types

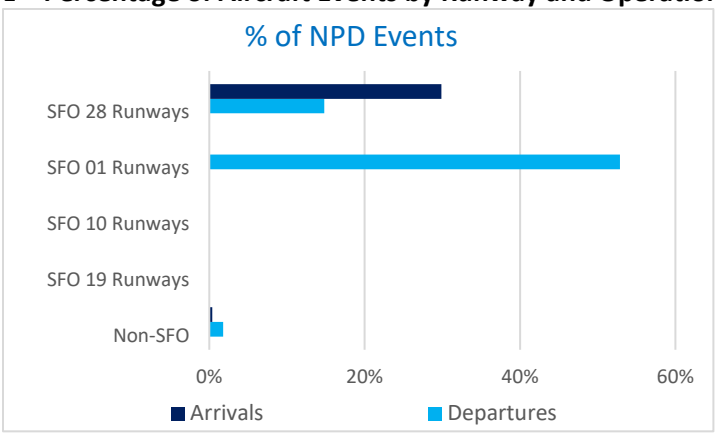


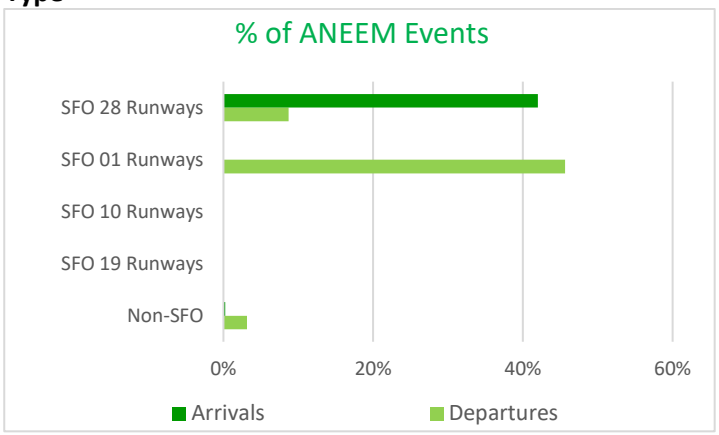
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

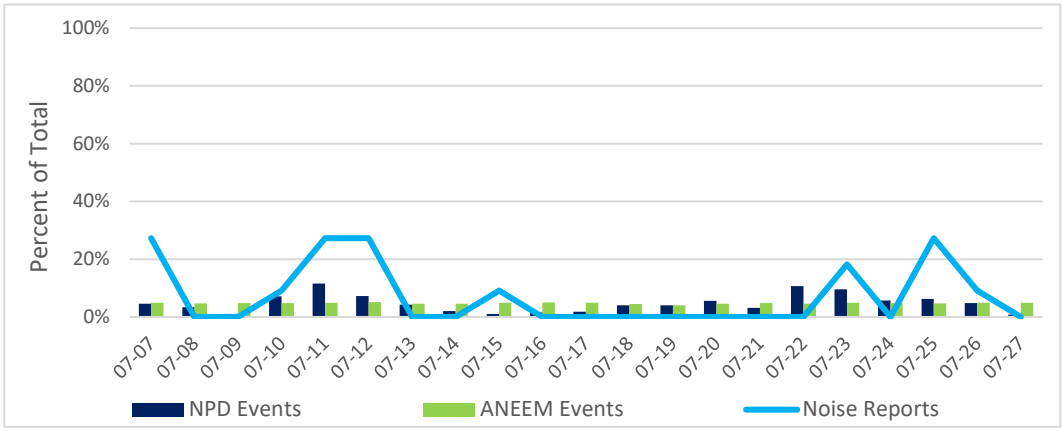




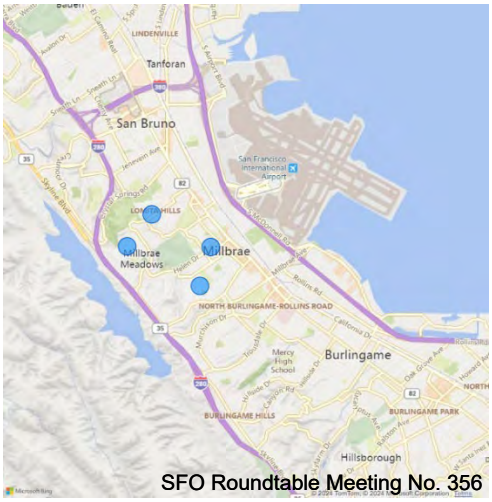
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	1	3
07-08	0	0
07-09	0	0
07-10	1	1
07-11	1	3
07-12	2	3
07-13	0	0
07-14	0	0
07-15	1	1
07-16	0	0
07-17	0	0
07-18	0	0
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	2	2
07-24	0	0
07-25	1	3
07-26	1	1
07-27	0	0
Total	4	11

N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location

Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

C-Weighted Noise Level – Denoted in dBC, is a different scale for loudness perception of sound pressure levels than A-weighted noise. A C-weight scale is used to measure sounds with approximately equal sensitivity at all frequencies. The C-weighted scale accounts for low-frequency ranges of sounds more than an A-weighted scale, often resulting in more of the overall noise energy to be included in the measurement.

California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

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Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Millbrae Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
One-Time Monitoring Location 4: SF Public Utilities Commission

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae and Burlingame are situated directly adjacent SFO, with Millbrae sitting to the southwest and Burlingame to the south. Much of the aircraft noise that reaches Millbrae and Burlingame is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs and landings, generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may logically be correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD thresholds for the total monitoring period were 55 dBA for daytime and 50 dBA for nighttime. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 750 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 94% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily takeoffs from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using reverse thrust to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's West-facing runways, Runways 28L and 28R. In addition to noise from airfield operations, there were also noise from aircraft overflights, majority of which were departing aircraft from OAK headed south/southeast utilizing the CNDEL departure procedure. Approximately 5% of all aircraft noise events were from OAK aircraft.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 57 dBA and the Aircraft CNEL and Community CNEL using NPD were 58 dBA and 48 dBA, respectively. This noise monitor was located in a suburban area with daily ambient noise ranging between 33 and 46 dBA. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

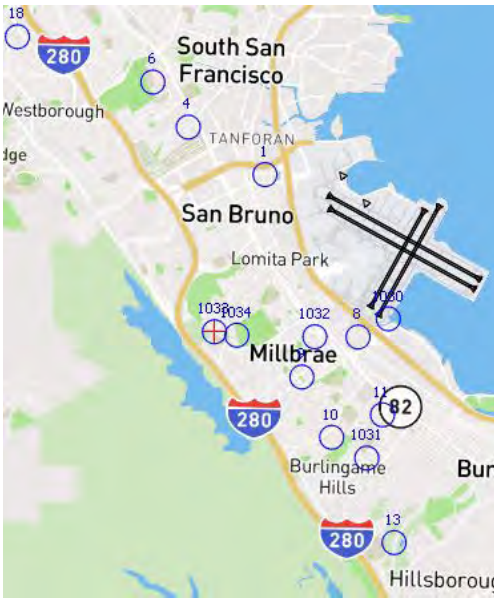
During the monitoring period, the SFO Aircraft Noise Office received 11 noise reports from 4 Burlingame and Millbrae residents. Most of the noise reports were generated between the hours of 5AM and 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 8AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	SF Public Utilities Commission
Monitoring Site Elevation (ft)	466
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	41
NPD Community (non-aircraft) CNEL (dBA)	48
NPD Aircraft CNEL (dBA)	58
NPD Avg Daily SFO Noise Events	346
ANEEM Aircraft CNEL (dBA)	57
ANEEM Avg Aircraft SEL (dBA)	72
ANEEM Avg Aircraft SEL (dBC)	87
ANEEM Avg Aircraft Lmax (dBA)	57
ANEEM Avg Aircraft Lmax (dBC)	72
ANEEM Avg Daily SFO Noise Events	718
SFO West Flow	100%
SFO Southeast Flow	0%

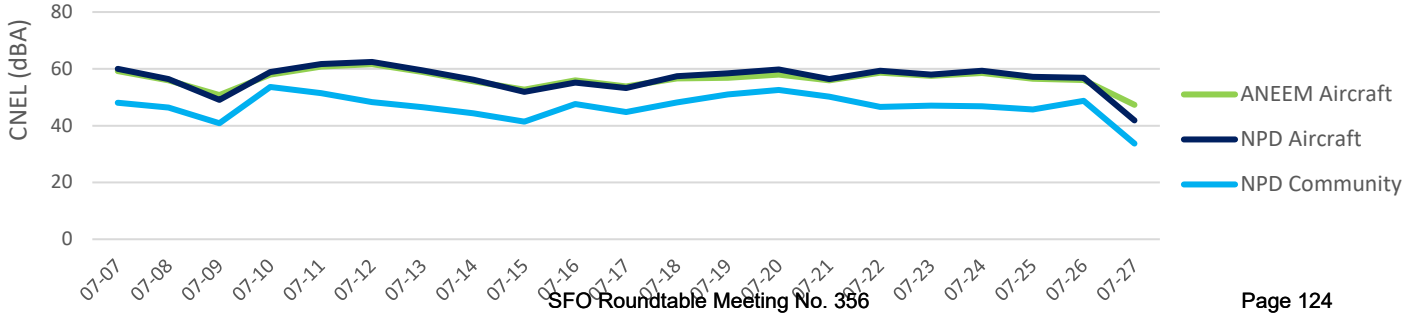
B – Monitoring Location



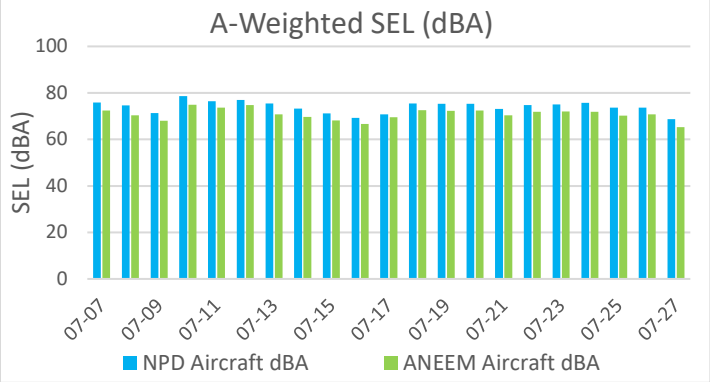
C – Daily Noise Event Averages

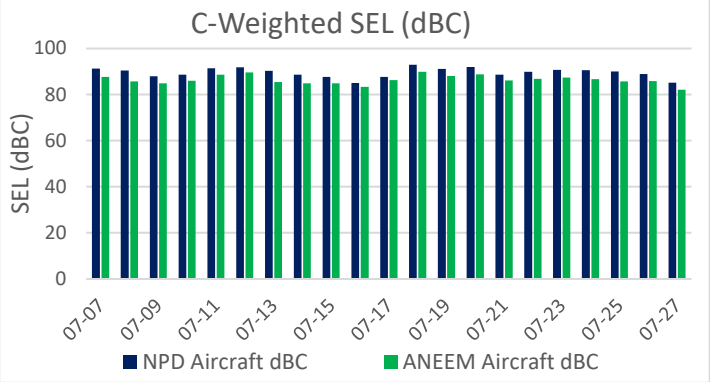
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	389	76	63	795	73	57	389	91	76	795	88	72	91	69	57
07-08	270	75	61	752	71	56	270	90	76	752	86	70	91	68	57
07-09	229	71	59	713	68	54	229	88	76	713	85	71	48	69	58
07-10	445	79	62	826	75	59	445	89	75	826	86	72	112	82	58
07-11	481	76	63	818	74	59	481	91	77	818	89	73	142	70	56
07-12	549	77	64	815	75	61	549	92	77	815	90	74	107	69	56
07-13	252	76	63	777	71	56	252	90	76	777	86	69	78	68	56
07-14	315	73	61	797	70	56	315	89	75	797	85	71	99	67	57
07-15	255	71	59	796	68	55	255	88	75	796	85	71	62	67	57
07-16	14	69	58	30	67	52	14	85	74	30	83	69	5	66	56
07-17	261	71	59	446	70	57	261	88	76	446	86	74	82	67	57
07-18	507	75	62	798	73	59	507	93	78	798	90	74	128	73	59
07-19	451	75	61	661	72	58	451	91	78	661	88	74	247	71	57
07-20	547	75	61	736	73	59	547	92	79	736	89	76	202	72	58
07-21	368	73	60	767	70	56	368	89	75	767	86	73	192	68	56
07-22	400	75	62	786	72	58	400	90	76	786	87	72	88	68	55
07-23	389	75	62	787	72	58	389	91	76	787	88	71	104	68	55
07-24	363	76	62	817	72	57	363	91	75	817	87	70	73	69	55
07-25	341	74	61	801	70	57	341	90	76	801	86	71	78	69	56
07-26	382	74	61	762	71	56	382	89	75	762	86	71	136	68	56
07-27	55	69	58	605	65	51	55	85	74	605	82	69	15	66	56
Daily Average	**346**	**75**	**61**	**718**	**72**	**57**	**346**	**91**	**76**	**718**	**87**	**72**	**104**	**72**	**57**
Total Count	**7,263**			**15,085**			**7,263**			**15,085**			**2,180**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



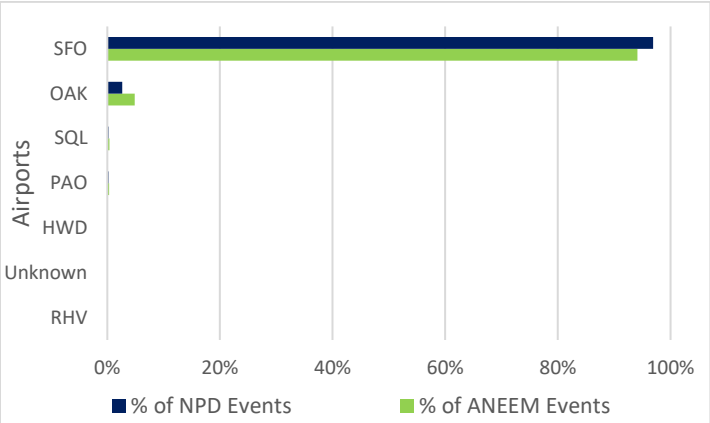


F – SFO ANEEM Aircraft Noise Events by Time of Day

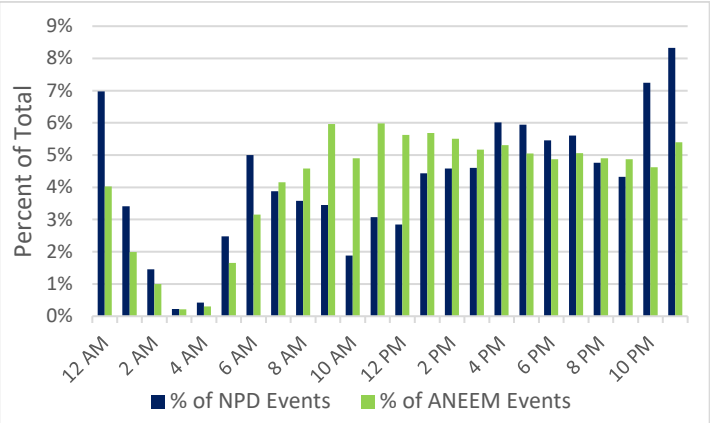
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	9475	63%	71	48	97	57	40	86	26	5	72
Evening (7pm-10pm)	2238	15%	71	52	85	57	43	76	26	5	71
Night (10pm-7am)	3372	22%	73	43	88	58	37	79	29	5	71

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	9475	63%	87	61	107	72	54	100	26	5	72
Evening (7pm-10pm)	2238	15%	87	61	104	72	53	100	26	5	71
Night (10pm-7am)	3372	22%	88	58	105	72	51	97	29	5	71

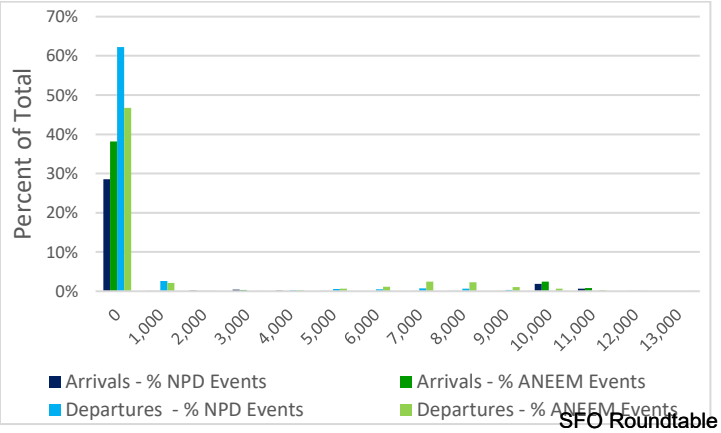
G – Percentage of Events by Airports



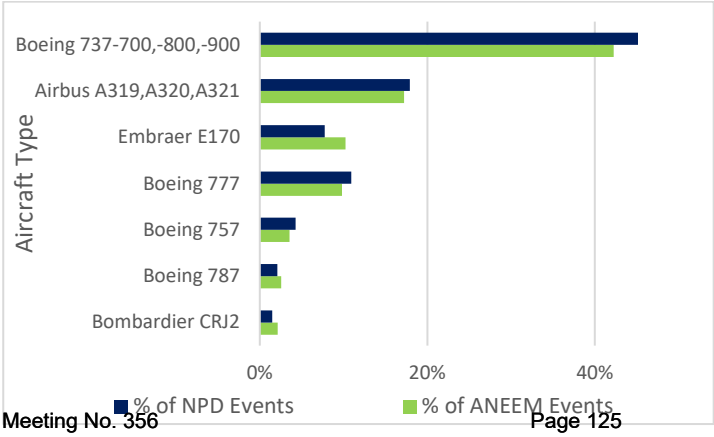
H – SFO Noise Events by Hour of the Day



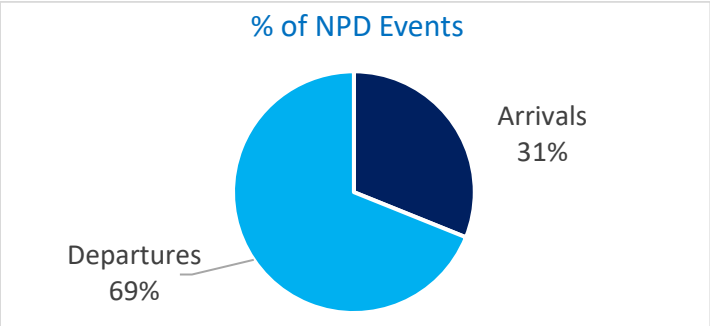
I – SFO Events by Altitude (ft) over Site

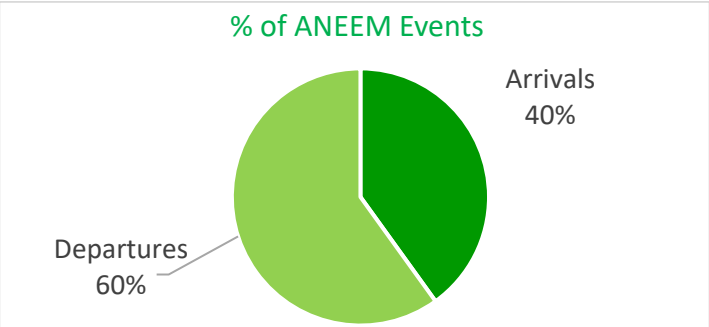


J – Percentage of Events by Aircraft Types

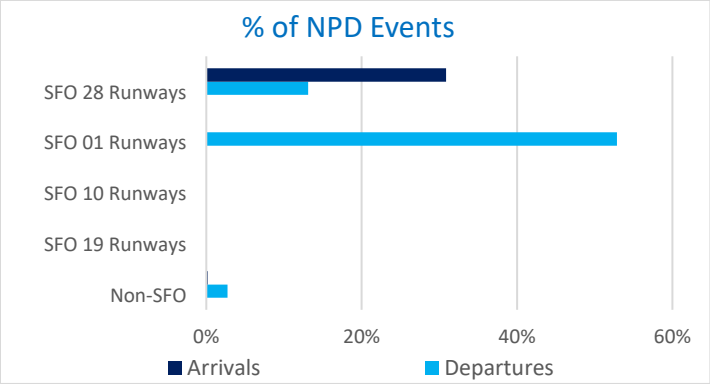


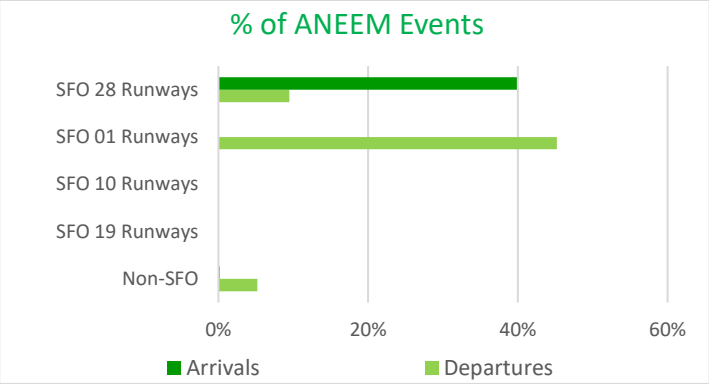
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

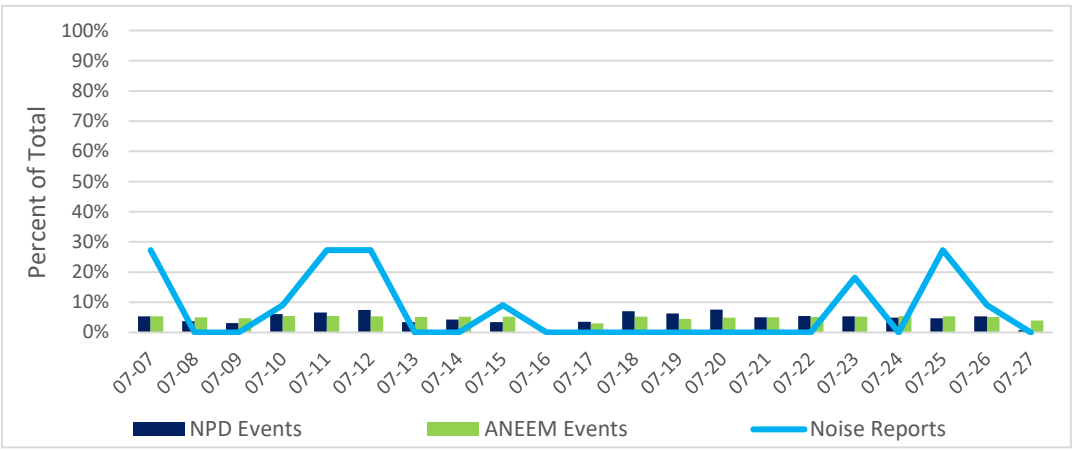




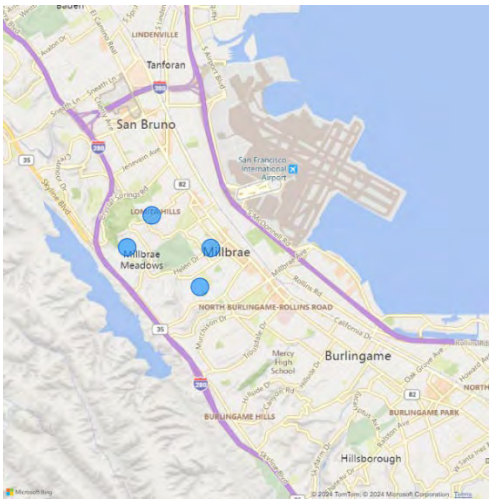
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	1	3
07-08	0	0
07-09	0	0
07-10	1	1
07-11	1	3
07-12	2	3
07-13	0	0
07-14	0	0
07-15	1	1
07-16	0	0
07-17	0	0
07-18	0	0
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	2	2
07-24	0	0
07-25	1	3
07-26	1	1
07-27	0	0
Total	**4**	**11**

N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location

Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

C-Weighted Noise Level – Denoted in dBC, is a different scale for loudness perception of sound pressure levels than A-weighted noise. A C-weight scale is used to measure sounds with approximately equal sensitivity at all frequencies. The C-weighted scale accounts for low-frequency ranges of sounds more than an A-weighted scale, often resulting in more of the overall noise energy to be included in the measurement.

California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).

Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.

SAN FRANCISCO INTERNATIONAL AIRPORT
CITY & COUNTY OF SAN FRANCISCO

MEMORANDUM

TO: Millbrae Community

FROM: SAN FRANCISCO INTERNATIONAL AIRPORT AIRCRAFT NOISE OFFICE

SUBJECT: SFO Roundtable *Up-The-Hill* Noise Monitoring Study – July 2024
One-Time Monitoring Location 5: Ridgewood Drive

DATE: November 5, 2024

The San Francisco International Airport (SFO) Aircraft Noise Office conducted aircraft noise monitoring in Millbrae and Burlingame to determine the noise levels within the community from aircraft operations at SFO. This noise monitoring was conducted as part of a SFO Airport/Community Roundtable "Up-the-Hill" noise study researching the effects of takeoff and landing noise on communities situated next to the airport. This monitoring lasted for 21 days, occurring between July 7 and July 27, 2024, across 5 one-time monitoring locations and 9 permanent monitoring locations.

Millbrae and Burlingame are situated directly adjacent SFO, with Millbrae sitting to the southwest and Burlingame to the south. Much of the aircraft noise that reaches Millbrae and Burlingame is caused by takeoff and landing noise rather than by direct overflights. Aircraft operations on the airfield, takeoffs and landings, generate noise that travels across the landscape, and it is expected that weather and topography may amplify this noise to nearby communities.

SFO uses both Aircraft Noise Event Extraction Methodology (ANEEM) and Noise Power Distance (NPD) event classification methods and both A-weighted (dBA) and C-weighted (dBC) noise levels to generate this report. ANEEM is newer technology that looks at aircraft in the surrounding area to determine if any spikes in noise based on a floating threshold level may logically be correlated to them. Historically, ANEEM's correlation logic used AEDT modeled noise to classify if the increase in noise was logically generated by an aircraft, but this had to be modified to also look at thrust and timing to effectively correlate noise spikes to aircraft landing and taking off on or very close to ground level. NPD uses static noise thresholds to determine if spikes in noise qualify as noise events, then looks to see if there are any aircraft in the surrounding area that could be the cause of the noise. The noise monitor NPD thresholds for the total monitoring period were 53 dBA for daytime and 48 dBA for nighttime. Both ANEEM and NPD first generated events based on A-weighted noise levels, then used the time window of the A-weighted noise events to identify the C-weighted noise events.

During this study, there were approximately 774 noise events per day caused by SFO airfield operations using the ANEEM method. Approximately 94% of all aircraft noise events were from SFO aircraft. Aircraft noise events sources include primarily takeoffs from SFO's north-facing runways, Runways 01L and 01R, and from landing aircraft using reverse thrust to assist with slowing down after touching-down on SFO's west-facing runways, Runways 28L and 28R. Other airfield operations which could be heard at the monitor included take-offs from SFO's west-facing runways, Runways 28L and 28R. In addition to noise from airfield operations, there were also noise from aircraft overflights, majority of which were departing aircraft from Oakland International Airport (OAK) headed south/southeast utilizing the CNDEL departure procedure. Approximately 5% of all aircraft noise events were from OAK aircraft.

During the monitoring period, the overall Aircraft Community Noise Equivalent Level (CNEL) using ANEEM was 58 dBA and the Aircraft CNEL and Community CNEL using NPD were 59 dBA and 48 dBA, respectively. This noise monitor was located in a quiet suburban area with daily ambient noise ranging between 31 and 42 dBA. Aircraft noise above ambient levels may have been perceptible by residents. Additionally, the frequency of flights due to the proximity of the Airport may have increased annoyance levels.

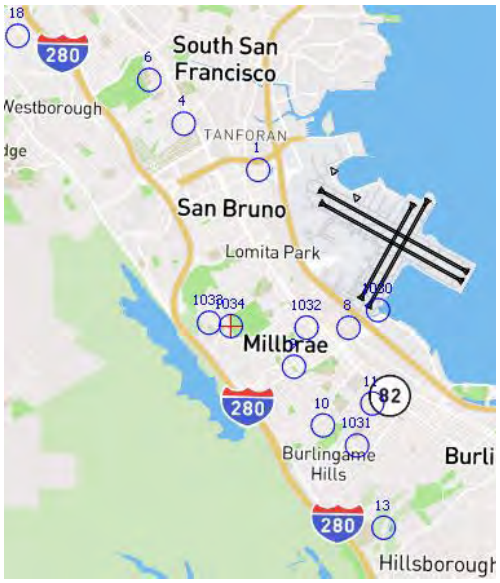
During the monitoring period, the SFO Aircraft Noise Office received 11 noise reports from 4 Millbrae residents. Most of the noise reports were generated between the hours of 5AM and 12AM. Likewise, most of the SFO Aircraft noise events using ANEEM occurred between 8AM and 12AM.

This report includes one evaluation of a 21-day period including 16 parts (charts and graphics) that represent summaries of the aircraft noise-related data (values are subject to rounding) collected during the monitoring period. Each part and key terms used in this report are described in the Appendix and Glossary, respectively.

A – Monitoring Summary

Monitoring Site	Ridgewood Dr
Monitoring Site Elevation (ft)	316
Monitoring Period	July 7 – July 27, 2024
Average Ambient Noise (dBA)	39
NPD Community (non-aircraft) CNEL (dBA)	48
NPD Aircraft CNEL (dBA)	59
NPD Avg Daily SFO Noise Events	387
ANEEM Aircraft CNEL (dBA)	58
ANEEM Avg Aircraft SEL (dBA)	71
ANEEM Avg Aircraft SEL (dBC)	90
ANEEM Avg Aircraft Lmax (dBA)	56
ANEEM Avg Aircraft Lmax (dBC)	73
ANEEM Avg Daily SFO Noise Events	742
SFO West Flow	100%
SFO Southeast Flow	0%

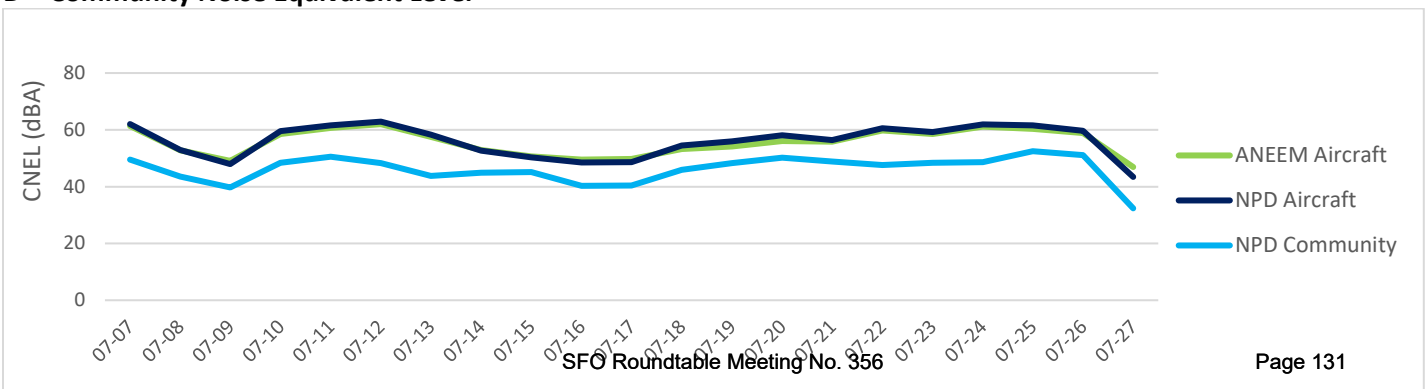
B – Monitoring Location



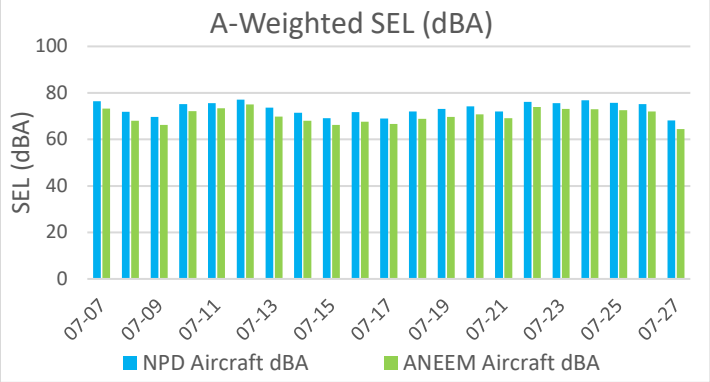
C – Daily Noise Event Averages

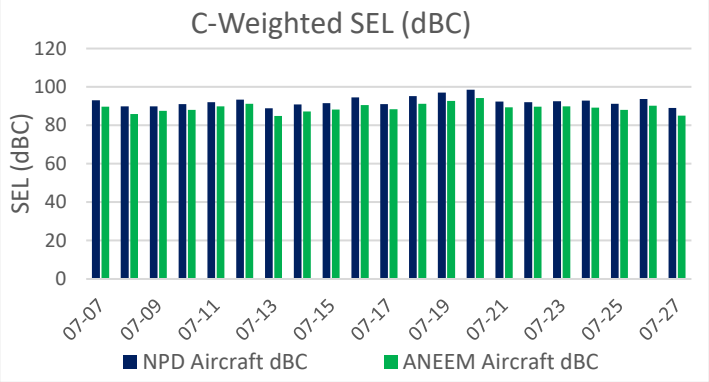
Day	SFO Aircraft A-Weighted Noise						SFO Aircraft C-Weighted Noise						Community A-Weighted Noise		
	NPD			ANEEM			NPD			ANEEM			NPD		
	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax	Noise Events	Avg SEL	Avg Lmax
07-07	418	77	62	798	73	56	418	93	77	798	90	72	120	69	55
07-08	282	72	58	733	68	54	282	90	75	733	86	70	91	66	55
07-09	232	70	57	670	66	53	232	90	77	670	88	74	69	68	56
07-10	449	75	61	792	72	57	449	91	76	792	88	72	128	70	57
07-11	570	76	62	813	74	59	570	92	76	813	90	74	164	69	55
07-12	606	77	63	816	75	60	606	93	77	816	91	75	162	68	55
07-13	318	74	60	759	70	55	318	89	74	759	85	70	84	65	54
07-14	308	72	59	778	68	54	308	91	76	778	87	72	122	66	55
07-15	260	69	57	722	66	53	260	92	78	722	88	74	85	68	56
07-16	255	72	57	682	68	53	255	95	81	682	91	75	121	67	55
07-17	298	69	57	726	66	53	298	91	77	726	88	73	95	65	55
07-18	482	72	59	770	69	56	482	95	78	770	91	74	161	68	55
07-19	440	73	59	649	70	57	440	97	82	649	93	77	191	69	55
07-20	532	74	60	717	71	58	532	99	83	717	94	79	197	71	57
07-21	337	72	58	688	69	55	337	93	77	688	89	74	207	66	55
07-22	516	76	62	745	74	59	516	92	76	745	90	73	184	68	55
07-23	486	76	61	779	73	58	486	93	76	779	90	72	166	67	54
07-24	383	77	62	813	73	56	383	93	76	813	89	71	127	68	53
07-25	423	76	61	758	73	57	423	91	76	758	88	72	100	72	55
07-26	448	75	60	755	72	56	448	94	78	755	90	75	177	70	55
07-27	90	68	57	625	64	51	90	89	75	625	85	70	16	67	56
Daily Average	**387**	**75**	**60**	**742**	**71**	**56**	**387**	**94**	**77**	**742**	**90**	**73**	**132**	**69**	**55**
Total Count	**8,133**			**15,588**			**8,133**			**15,588**			**2,767**		

D – Community Noise Equivalent Level



E – Average Sound Exposure Level



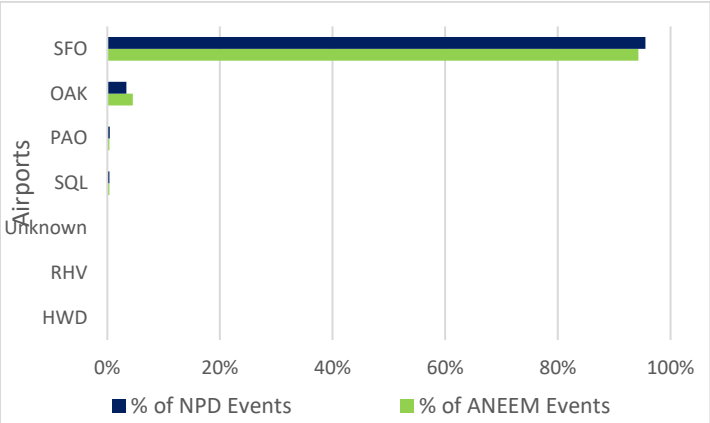


F – SFO ANEEM Aircraft Noise Events by Time of Day

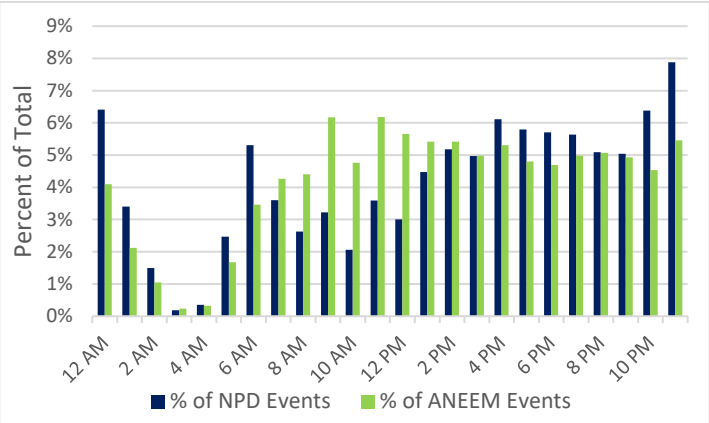
SFO Aircraft ANEEM A-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBA)	Min SEL (dBA)	Max SEL (dBA)	Avg Lmax (dBA)	Min Lmax (dBA)	Max Lmax (dBA)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	9676	62%	70	49	88	55	42	82	25	5	71
Evening (7pm-10pm)	2336	15%	72	51	89	57	44	80	24	5	72
Night (10pm-7am)	3576	23%	74	44	88	57	36	80	29	5	72

SFO Aircraft ANEEM C-Weighted Events											
Time of Day	Noise Events	Noise Events %	Daily Avg SEL (dBC)	Min SEL (dBC)	Max SEL (dBC)	Avg Lmax (dBC)	Min Lmax (dBC)	Max Lmax (dBC)	Avg Duration (sec)	Min Duration (sec)	Max Duration (sec)
Day (7am–7pm)	9676	62%	89	62	107	73	53	98	25	5	71
Evening (7pm-10pm)	2336	15%	91	60	110	74	53	98	24	5	72
Night (10pm-7am)	3576	23%	91	57	107	73	47	98	29	5	72

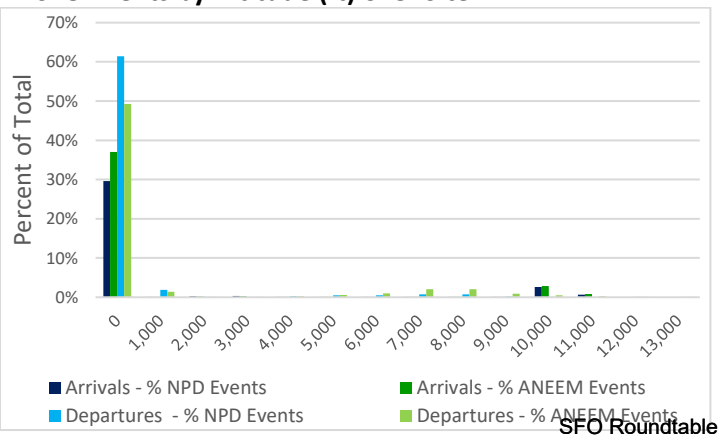
G – Percentage of Events by Airports



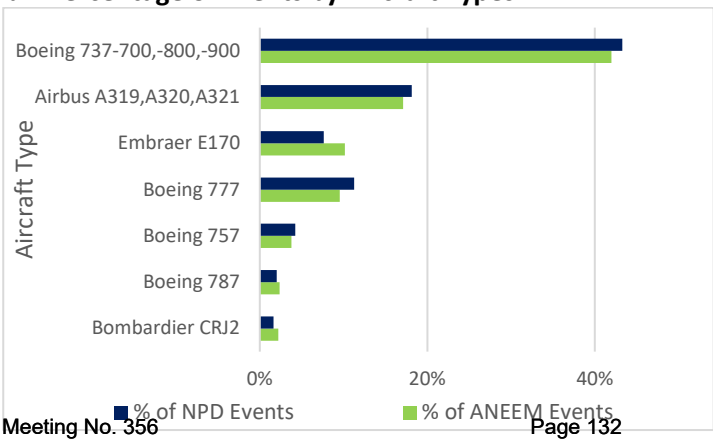
H – SFO Noise Events by Hour of the Day



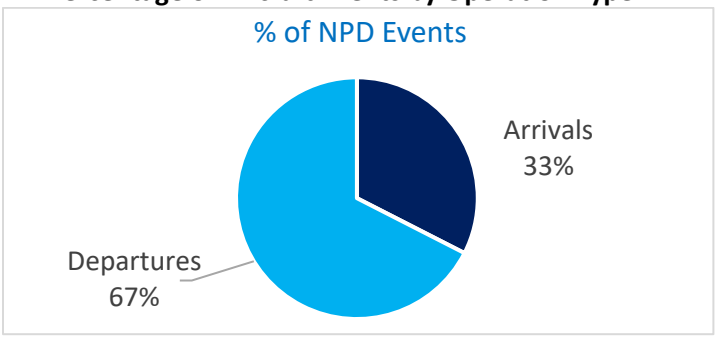
I – SFO Events by Altitude (ft) over Site

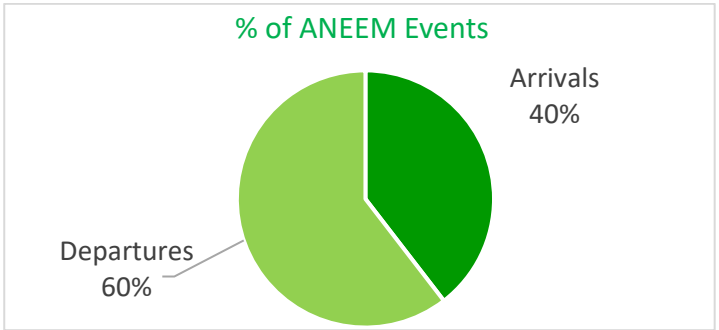


J – Percentage of Events by Aircraft Types

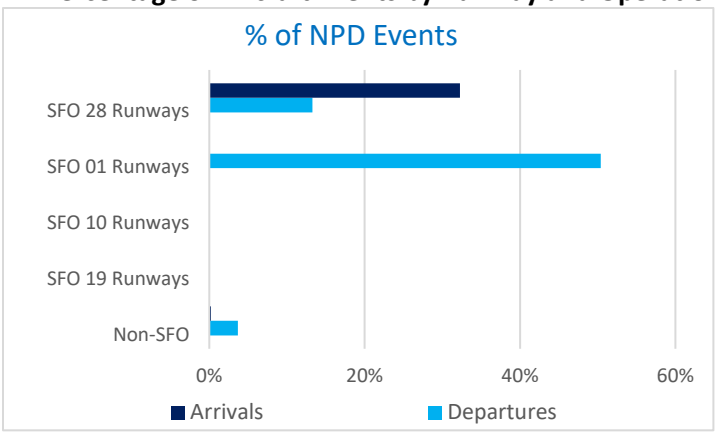


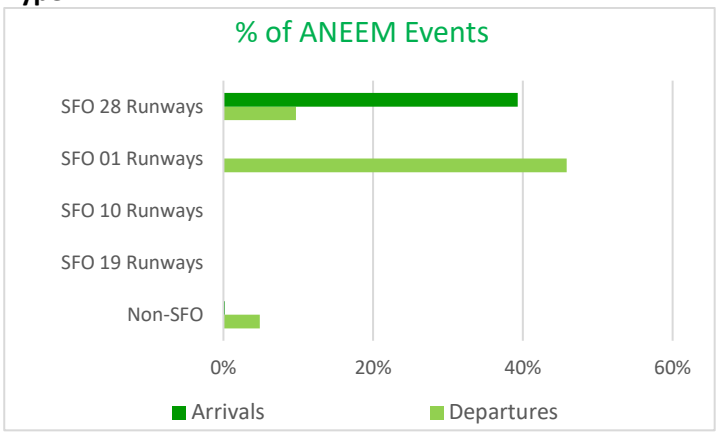
K – Percentage of Aircraft Events by Operation Type





L – Percentage of Aircraft Events by Runway and Operation Type

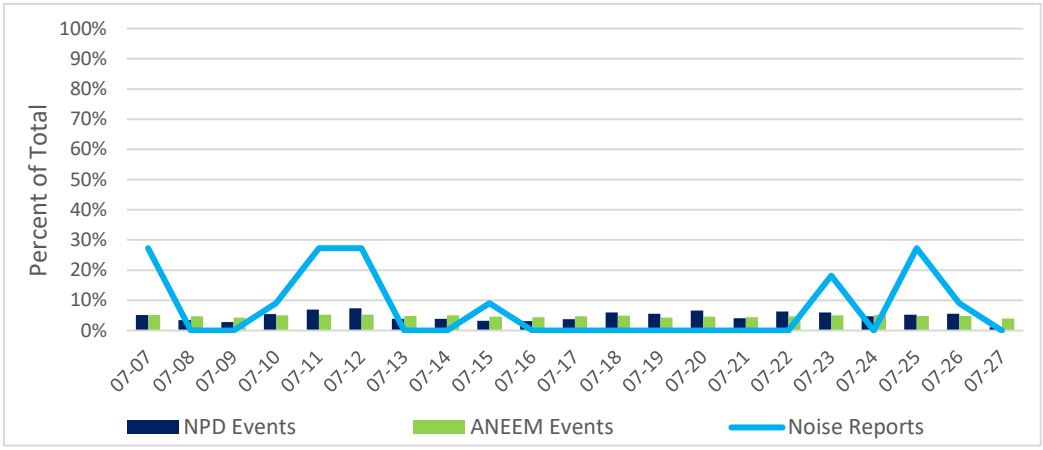




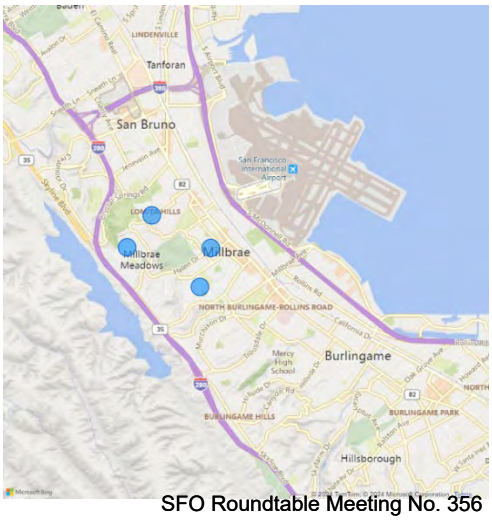
M – Noise Reporters

Date	Individual Noise Reporters	Noise Reports
07-07	1	3
07-08	0	0
07-09	0	0
07-10	1	1
07-11	1	3
07-12	2	3
07-13	0	0
07-14	0	0
07-15	1	1
07-16	0	0
07-17	0	0
07-18	0	0
07-19	0	0
07-20	0	0
07-21	0	0
07-22	0	0
07-23	2	2
07-24	0	0
07-25	1	3
07-26	1	1
07-27	0	0
Total	**4**	**11**

N – Noise Reports vs Aircraft Noise Events per Day



O – Noise Reporter Locations



P – Noise Monitor on Location

Appendix

This Appendix describes the sections of the noise monitoring report and a glossary of terms.

Part A – Monitoring Summary lists the monitoring location, elevation, the monitoring time period, and the key monitoring results including the ANEEM Aircraft, NPD Aircraft, and NPD Community Community Noise Equivalent level (CNEL), single event levels in both A and C noise weightings, and air traffic flow breakdown. The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport. California Title 21 Noise Regulations established an acceptable level of 65 dBA CNEL.

Part B – Monitoring Location illustrates the location of the portable noise monitor and examples of typical SFO flight operations that registered noise events at the portable noise monitor.

Part C – Daily Noise Event Averages lists the number of noise events registered at the noise monitor by SFO Aircraft for both A and C noise weightings using ANEEM (green) or NPD (blue) methods during each day of the noise monitoring period. NPD Community noise events by A-weighted noise levels are also included. The noise event levels are expressed as average Sound Exposure Level (SEL) and average peak noise level (Lmax).

Part D – Community Noise Equivalent Level shows a chart that compares the ANEEM Aircraft (SFO and non-SFO), NPD Aircraft, and NPD Community CNEL during each day of the monitoring period.

Part E – Average Sound Exposure Level (SEL) shows 2 charts comparing the ANEEM Aircraft (SFO and non-SFO) and NPD Aircraft average SEL for A and C-weighted noise levels during each day of the monitoring period.

Part F – SFO Aircraft Noise Events by Time of Day lists 2 tables including the daily minimum, maximum, and average SEL, Lmax, duration and number of SFO Aircraft noise events using ANEEM during the Daytime (7am to 7pm), Evening (7pm to 10pm), and Nighttime (10pm to 7am) for both A and C-weighted noise levels during the monitoring period.

Part G – Percentage of Events by Airports shows the percentage of aircraft events using ANEEM and NPD by the aircraft's nearest airport of origin or destination. The percentages for both methods each add up to 100%.

Part H – SFO Noise Event by Hour of the Day shows the percentage of total SFO Aircraft noise events using ANEEM and NPD by hour of the day. The percentages for both methods each add up to 100%.

Part I – SFO Departure Events by Altitude (ft) over Site shows the percentage of SFO Aircraft Departures and Arrivals that registered noise events at the noise monitor using ANEEM and NPD by altitude intervals. Altitudes are relative to mean sea level elevation. Excludes helicopters. The percentages for both methods each add up to 100%.

Part J – Percentage of Events by Aircraft Types shows the percentage of aircraft events using ANEEM and NPD by aircraft types. The percentages for both methods each add up to 100%.

Part K – Percentage of Events by Operation Type shows the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures.

Part L – Percentage of Aircraft Events by Runway and Operation Type compares the percentage of aircraft noise events registered using ANEEM and NPD by Arrivals and Departures per each SFO runway pair and to non-SFO overflights.

Part M – Noise Reporters lists the number of individual noise reporters and noise reports per day registered by individuals living in Millbrae or Burlingame.

Part N – Noise Reports vs Aircraft Noise Events per Day compares the number of noise reports to the number of aircraft noise events per day using ANEEM and NPD. The percentages for both methods each add up to 100%.

Part O – Noise Report Locations illustrates a map that shows the noise report locations.

Part P – Noise Monitor on Location shows photographs of the noise monitoring equipment on location.

Glossary

A-Weighted Noise Level – Denoted in dBA, is the most common unit used for measuring environmental sound levels. The human ear does not respond equally to different frequencies of sound. An A-weight adjusts the frequency components of sound to conform to your ear's normal response at conversational levels. The FAA and State of the California have adopted the A-weighted sound level for environmental analysis. Sound level meters have an A-weighting network for measuring noise in A-weighted decibels.

C-Weighted Noise Level – Denoted in dBC, is a different scale for loudness perception of sound pressure levels than A-weighted noise. A C-weight scale is used to measure sounds with approximately equal sensitivity at all frequencies. The C-weighted scale accounts for low-frequency ranges of sounds more than an A-weighted scale, often resulting in more of the overall noise energy to be included in the measurement.

California Code of Regulations Title 21, Subchapter 6 – This code describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO was one of the first airports in the state to achieve a zero impact area within the 65 dB CNEL (Community Noise Equivalent Level) noise contour.

Community Noise Equivalent Level (CNEL) – A noise metric required by the California Airport Noise Standards for use by airport proprietors to measure aircraft noise levels. CNEL includes an additional weighting for each event occurring during the evening (7:00 p.m. – 9:59 p.m.) and nighttime (10:00 p.m. – 6:59 a.m.) periods to account for increased sensitivity to noise during these periods. Evening events are treated as though there were three and nighttime events are treated as though there were ten. This results in a 4.77 and 10 dBA penalty for operations occurring in the evening and nighttime periods, respectively. For a more in-depth explanation of CNEL and other technical noise terms, please visit the Federal Aviation Administration (FAA) website. Below is a graphic illustrating types of metropolitan areas and their corresponding CNEL intervals (dBA).

Decibel (dB) – A unit used to measure the magnitude or intensity of sound. The decibel uses a logarithmic scale to cover the very large range of sound pressures that can be heard by the human ear. Decibels measure a scale from the threshold of human hearing, 0 dB, upward towards the threshold of pain, about 120-140 dB. Because decibels are such a small measure, they are computed logarithmically and cannot be added arithmetically. A10 dB increase will be perceived by most people to be a doubling in loudness, i.e., 80 dB seems twice as loud as 70 dB. Decibel measurements can be scaled by different frequency ranges, such as by A-Weighted (dBA) and C-Weighted (dBC) scales.

Maximum Sound Level (Lmax) – The maximum a-weighted sound level for a given noise event. The peak noise level reached by a single aircraft event.

Noise Event – A Noise Event is the measured sound produced by a single source of noise over a duration of time. An aircraft noise event begins when the sound level of a flight operation exceeds a noise threshold and ends when the level drops down below that threshold.

Sound Exposure Level (SEL) – SEL is a measure of a single aircraft noise event spread out over its entirety compressed into one second. It allows for a comparison of aircraft noise events of different durations and noise levels. For example, think of the moment you hear a plane from a quarter mile away; we measure from that moment, as the aircraft flies overhead, and until it can't be heard. This is the duration of sound we use and then compress it into one second for a measure. SEL measures noise energy above the threshold (normally 65 dBA for aircraft noise events). This way, any ambient noise is separated out from the measurement.