180 El Camino Real Residences

South San Francisco, California

ALUC ENVIRONMENTAL NOISE ANALYSIS

28 February 2022

Prepared for: Bridget Metz
Steelwave
101 California Street, Suite 800
San Francisco, CA 94111
bmetz@steelwavellc.com

Prepared by: **Salter**
Skyler Carrico – Consultant scarrico@salter-inc.com
Valerie Smith, PE – Vice President vsmith@salter-inc.com

Salter Project: 22-0062

1.0 INTRODUCTION

We have conducted an Airport Land-Use Commission (ALUC) environmental noise analysis for the proposed multi-family housing project at 180 El Camino Real in South San Francisco.

This report is broken into the following sections:

- Section 1.0 – Introduction
- Section 2.0 – Acoustical Criteria
- Section 3.0 – Noise Environment
- Section 4.0 – Recommendations
- Appendix A – Fundamentals of Environmental Acoustics
- Appendix B – SFO ALUCP 2020 Contours, with Project Site Indicated
- Appendix C – 2019 SFO Noise Contour Map, with Project Site Indicated
- Appendix D – 2021 3rd Quarter Noise Contour Overlay, December 2019 Airport Director's Report, with Project Site and Nearby Monitors Indicated

Those readers not familiar with the fundamental concepts of environmental noise may refer to Appendix A and **Figure A1** for additional information.

1.1 Executive Summary

The proposed project at 180 El Camino Real will consist of four buildings (three Research & Development buildings and one multi-family residential building). The site is located along South Spruce Avenue, between El Camino Real and Huntington Avenue. This ALUC study only addresses the residential building. In summary:

- The project site is located near the CNEL[1] 65 to 70 dB contours for airport noise for the three available site noise contour maps (See **Section 3.2** and **Appendices B, C, and D** for further information).
- Per the South San Francisco Noise Element, the ALUC uses the "latest quarterly noise contour report to determine the compatibility of land use plans". This quarterly noise contour is shown in **Appendix D**. The 2021 3rd Quarter contours indicate the site is outside of the CNEL 65 dB contour for airport noise.

1 CNEL (Community Noise Equivalent Level) – A descriptor for a 24-hour A-weighted average noise level. CNEL accounts for the increased acoustical sensitivity of people to noise during the evening and nighttime hours. CNEL penalizes sound levels by 5 dB during the hours from 7 PM to 10 PM and by 10 dB during the hours from 10 PM to 7 AM. For practical purposes, the CNEL and DNL are usually interchangeable.

- The project can achieve the State Building Code standard of CNEL 45 dB indoors with the use of commercially-available windows and conventional wood-frame construction.

2.0 ACOUSTICAL CRITERIA

2.1 State Noise Standards

The 2019 California Building Code requires that the indoor noise level in residential units of multi-family projects not exceed DNL[2] 45 dB.

2.2 City Noise Standards

The City also has the following related policies:

- Policy 9-I-1: Work to adopt a pass-by (single event) noise standard to supplement the current 65 dB CNEL average noise level standard as the basis for aircraft noise abatement programs.
- Policy 9-I-2: Work to adopt a lower average noise standard for aircraft-based mitigation and land use controls.
- Policy 9-I-4: Ensure that project applications for all new noise-sensitive land uses (plans and specifications), including hospitals and residential units proposed within the CNEL 60 dB to CNEL 69 dB aircraft noise contour include an acoustical study prepared by a professional acoustic engineer, that specifies the appropriate noise mitigation features to be included in the design and construction of these uses, to achieve an interior noise level of not more than CNEL 45 dB in any habitable room, based on the latest official SFIA noise contours[3] and on-site noise measurement data.
- Policy 9-I-6: Require that applicants for new noise-sensitive development in areas subject to noise generators producing noise levels greater than 65 dB CNEL, obtain the services of a professional acoustical engineer to provide a technical analysis and design of mitigation measures.
- Policy 9-I-7: Where site conditions permit, require noise buffering for all noise-sensitive development subject to noise generators producing noise levels greater than 65 dB CNEL. This noise attenuation method should avoid the use of visible sound walls, where practical.
- Policy 9-I-10: Do not allow new residential or noise sensitive development in the CNEL 70 dB+ areas impacted by SFO operations, as required by Airport Land Use Commission infill criteria, with

2 DNL (Day-Night Average Sound Level) – A descriptor for a 24-hour A-weighted average noise level. DNL accounts for the increased acoustical sensitivity of people to noise during the nighttime hours. DNL penalizes sound levels by 10 dB during the hours from 10 PM to 7 AM. For practical purposes, the DNL and CNEL are usually interchangeable. DNL is sometimes written as Ldn.

3 We understand the latest noise contours are the 2021 3rd Quarter noise contours. See Appendix D.

the exception of projects deemed appropriate by the City Council and to the extent necessary, approved through the local agency override process.[4]

- Policy 9-I-11: Require new residential development in area between the most recent FAA-accepted 65 and 70 dB CNEL aircraft noise contours for San Francisco International Airport (SFO), or those projects deemed appropriate by the City Council and, to the extent necessary, approved through the local agency override process[4], to grant an avigation easement to the City and County of San Francisco, as proprietor of SFO.

The City of South San Francisco's Noise Element notes that the San Mateo County ALUC will need to approve new development prior to permit issuance. The Noise Element identifies the following ALUC land-use compatibility guidelines for residential land use:

Table 1: Land Use Criteria for Noise-Impacted Areas

CNEL Range	General Land Use Criteria
Less than 65 dB	Satisfactory; no special insulation requirements
65 to 70 dB	Development requires analysis of noise reduction requirements and noise insulation as needed
Over 70 dB	Development should not be undertaken

To determine if a site is in an aircraft noise-impacted area, the ALUC determines the CNEL 65 dB boundary using the following resources:

- The federal CNEL 65 dB boundary is determined using the most recent noise exposure map (NEM) as accepted by the FAA under the Federal Aviation Regulation (FAR) Part 150 Noise Compatibility Program. At this time, the latest accepted NEM is the Final 2019 Noise Exposure Map[5]. This map is included in **Appendix C** with the project site indicated.
- The state CNEL 65 dB boundary is determined from the quarterly noise contours, based on the required airport noise monitoring system. **Appendix D** contains the 2021 3rd Quarter noise contour overlay, as well as the directors report with the approximate location of the project site indicated.

Per the Noise Element, the ALUC uses the latest quarterly noise contour to determine the compatibility of land use plans. **Appendix D** contains the 2021 3rd Quarter Noise Contour overlay.

4 Per the General Plan Amendment Resolution #20-870, which was passed on 1 December 2020. Amendment information provided by Genna Yarkin on 28 February 2022.

5 Per www.flysfo.com, this NEM was submitted for approval in July 2018. The Final 2019 map is dated 13 August 2015.

2.3 SFO Comprehensive Airport Land Use Compatibility Plan

Table IV-I of the November 2012 *Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport* contains the following polices and compatibility criteria for evaluating multi-family residential land uses.

- Policy NP-1 Noise Compatibility Zones: For the purposes of ALUC, the projected 2020 CNEL noise contour map from the Draft Environmental Assessment for the Proposed Runway Safety Area Program shall define the boundaries within which noise compatibility policies described in this Section shall apply.
- Policy NP-2 Airport Noise/Land Use Compatibility Criteria: The compatibility of proposed land uses located in the Airport noise compatibility zones shall be determined according to the noise/land use compatibility criteria shown in Table IV-1 [excepts shown below as Table 2]. The criteria indicate the maximum accepted airport noise levels, described in terms of CNEL, for the indicated land uses. The compatibility criteria indicate whether a proposed land use is “compatible”, “conditionally compatible”, or “not compatible” within each zone, designated by the identified CNEL ranges.

Table 2: ALUCP Noise/Land Use Compatibility Criteria

CNEL Range	Land Use
Less than 65 dB	Land use and related structures compatible without restrictions.
65 to 70 dB	Land use and related structures are permitted, provided that sound insulation is provided to reduce interior noise levels from exterior sources to CNEL 45 dB or lower and that an avigation easement is granted to the City and County of San Francisco as operator of SFO.
70 dB to 75 dB	Land use and related structures are not compatible. However, use is conditionally compatible only on an existing lot of record zoned only for residential use as of the effective date of the ALUCP. Use must be sound-insulated to achieve an indoor noise level of CNEL 45 dB or less from exterior sources.
Over 75 dB	Land use and related structures are not compatible

- Policy NP-4 Residential Uses Within CNEL 70 dB Contour: As described in Table IV-1, residential uses are not compatible in areas exposed to noise above CNEL 70 dB and typically should not be allowed in high noise areas.
  - Policy NP-4.1 Situations Where Residential Use is Conditionally Compatible: Residential uses are considered conditionally compatible in areas exposed to noise above CNEL 70 dB only if the proposed use is on a lot of record zoned exclusively for residential use as of the effective date of the ALUCP. In such a case, the residential use must be sound-insulated to achieve an indoor noise level of CNEL 45 dB or less from exterior sources. The property owner also shall grant an

avigation easement to the City and County of San Francisco in accordance with Policy NP-3 prior to issuance of a building permit for the proposed building or structure.

3.0 NOISE ENVIRONMENT

3.1 Project Description

The project site is located in South San Francisco, and is bounded by El Camino Real, Huntington Street, and South Spruce Avenue. It is also near San Francisco International Airport (SFO). The major noise source at the project site is traffic along these roads, and flyovers from SFO.

To quantify the existing noise environment, we conducted three long-term noise measurements between 19 and 21 January 2022 (see **Figure 1** for measurement locations and measured noise levels). The long-term noise monitors were installed at a height of approximately 12 feet above grade.

A future traffic analysis was not provided for this project. Therefore, we have added 1 dB to the calculated noise levels to account for general future traffic increases[6].

3.2 Noise from SFO

Per the published resources, the site is exposed to the following noise levels from SFO airport:

- *November 2012 Comprehensive Airport Land Use Compatibility Plan:* Exhibit IV-6 shows the site within or directly on the CNEL 70 dB contour. This exhibit references noise contours provided in 2011. See **Appendix B** for the project site location.
- *Final 2019 Noise Exposure Map:* **Appendix C** contains the Part 150 map generated by the San Francisco International Airport. Per the exhibit, it was submitted on 13 August 2015. This exhibit references sources from 2014 for the creation of the noise contours.

  Salter has added an overlay of the project site to the Part 150 map to clarify the project location. Per this map, the majority of the project site is located within the CNEL 65 to 70 dB contour.
- *December 2019 Airport Director's Report[7]:* See **Appendix D** for the approximate site location. Per this overlay[8], the project site is fully beyond the CNEL 65 contour. This information is based on 2021 noise monitoring.

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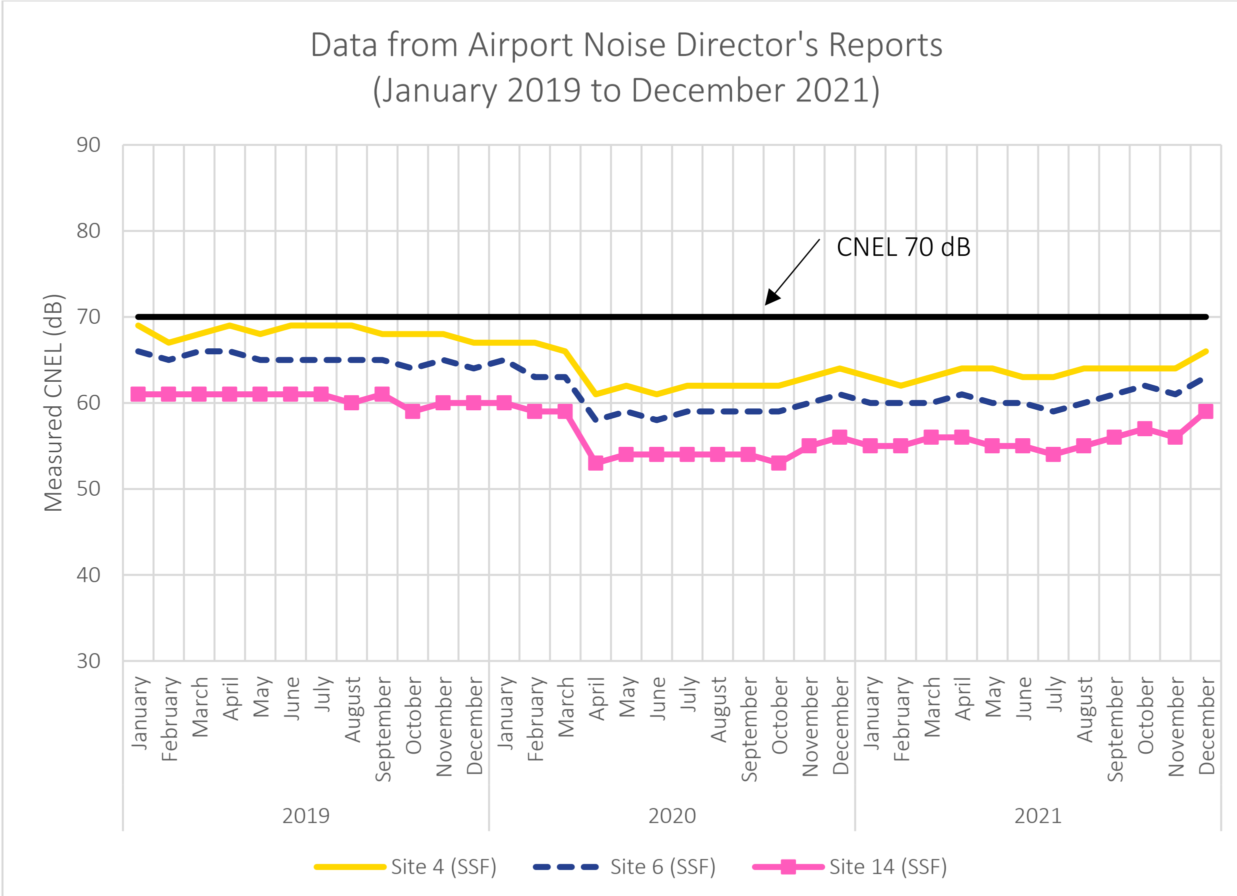
6 The California Department of Transportation assumes a traffic volume increase of three-percent per year, which corresponds to a 1 dB increase in DNL over a ten-year period.

7 Due to decreased noise levels from March 2020 onward due to the pandemic, we have used the December 2019 Airport Director's Report.

8 SFO 2021 3rd Quarter CNEL Overlay



GIS maps of historical quarterly noise reports are not available at this time. We have reviewed the noise levels provided in the monthly Airport Director's Reports dating back to January 2019. For the three noise monitors closest to the project site, noise levels are generally below CNEL 69 dB. The graph below shows the monthly measured noise levels since January 2019. Detailed information is provided in **Appendix D**, along with information on the noise monitor locations.

3.3 Site Noise Context

The main noise sources at the project site include vehicle passbys on the nearby roadways and aircraft overflights from SFO. We conducted noise measurements at the project site (see **Figure 1**), which collected noise data from both the car passbys and the aircraft overflights. We measured on-site noise levels of CNEL 71 to 75 dB at roads surrounding the project site (see **Figure 1**).

Since both car and aircraft noise exist at the site, we have referenced the Airport Director's Report to determine the aircraft contribution to noise at the site. The Airport Director's Report summarizes the noise data from 29 noise monitors managed by the airport that continuously collect noise data. In general, these airport noise monitors are located away from major roadways, reducing the amount of traffic noise that is collected (see data for aircraft noise presented in **Appendix D**), so that the airport contribution can be determined.

Using the 2019 December Airport Director's Report[9], the contribution of airport noise at the site is expected to approximately CNEL 69 dB[10]. Logarithmically, subtracting the aircraft contribution from our noise measurements would result in a noise level of approximately CNEL 69 dB from traffic:

CNEL **75**[a] dB [from aircraft+traffic] **–** CNEL **69**[b] dB [from aircraft] **=** CNEL **74**[c] dB [from traffic]

a = measured at project site, see Figure 1
b = determined from 2019 December Airport Director's Report
c = calculated

See **Appendix A** for additional information on decibel mathematics.

Individual aircraft flyovers from SFO are significantly louder than individual car passbys, but the flyovers occur at a lower frequency than the car passbys, resulting in similar average overall noise levels (CNEL).

For reference, CNEL above 70 dB are common along large roadways and rail lines. Figure 9-2 of the South San Francisco Noise Element indicates that noise levels in South San Francisco were estimated to be above CNEL 70 dB in 2006 in the vicinity of I-280, I-380, US 101, and along the Caltrain line. Recent noise measurements indicate that noise levels are above CNEL 70 dB along El Camino Real.

4.0 RECOMMENDATIONS

To meet the Code criterion of CNEL 45 dB inside residences, it will be necessary for the windows and exterior doors to have STC[11] ratings. Our calculations are based on preliminary drawings dated 6 January 2022 and the following assumptions and understandings of the current design:

- Living rooms are 12 by 15 feet
- Bedrooms are 10 by 12 feet
- Glazing is 50% of the facade
- Flooring is hard surfaced in all rooms, including bedrooms
- Residences have 9-foot-tall ceilings

9 Due to decreased noise levels from March 2020 onward due to the pandemic, we have used the December 2019 Airport Director's Report.

10 The project site is near Airport Noise Monitors 04, 06, and 14. We have referenced Monitor 04 for this CNEL level.

11 STC (Sound Transmission Class) – A single-number rating defined in ASTM E90 that quantifies the airborne sound insulating performance of a partition under laboratory conditions. Increasing STC ratings correspond to improved airborne sound insulation.

Based on the above, the following is a summary of our initial analysis:

- Rooms along Spruce: STC ratings up to 43
- Rooms along the east and west facades: STC ratings up to 38
- Rooms along the south facade: STC ratings up to 35

The recommended STC ratings are for full window assemblies (glass and frame) rather than just the glass itself. Tested sound-rated assemblies should be used. For reference, typical construction-grade assemblies achieve an STC rating of 28. Where STC ratings above 32 are required, at least one pane will need to be laminated. STC ratings above 38 typically require IGU greater than one-inch thick. This will vary depending on the window manufacturer.

Since the windows need to be closed to achieve an indoor DNL of 45 dB, an alternative method of supplying fresh air (e.g., mechanical ventilation) should be provided. This issue should be discussed with the project mechanical engineer.

STEELWAVE (180 ECR) RESIDENTIAL
MEASUREMENT LOCATIONS AND MEASURED
NOISE LEVELS

FIGURE 1

Salter #
22-0009

VCS/EBM
01.26.22

APPENDIX A: FUNDAMENTAL CONCEPTS OF ENVIRONMENTAL NOISE

This section provides background information to aid in understanding the technical aspects of this report.

Three dimensions of environmental noise are important in determining subjective response. These are:

- The intensity or level of the sound
- The frequency spectrum of the sound
- The time-varying character of the sound

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB), with 0 dB corresponding roughly to the threshold of hearing.

The "frequency" of a sound refers to the number of complete pressure fluctuations per second in the sound. The unit of measurement is the cycle per second (cps) or hertz (Hz). Most of the sounds, which we hear in the environment, do not consist of a single frequency, but of a broad band of frequencies, differing in level. The name of the frequency and level content of a sound is its sound spectrum. A sound spectrum for engineering purposes is typically described in terms of octave bands, which separate the audible frequency range (for human beings, from about 20 to 20,000 Hz) into ten segments.

Many rating methods have been devised to permit comparisons of sounds having quite different spectra. Surprisingly, the simplest method correlates with human response practically as well as the more complex methods. This method consists of evaluating all of the frequencies of a sound in accordance with a weighting that progressively de-emphasizes the importance of frequency components below 1000 Hz and above 5000 Hz. This frequency weighting reflects the fact that human hearing is less sensitive at low frequencies and at extreme high frequencies relative to the mid-range.

The weighting system described above is called "A"-weighting, and the level so measured is called the "A-weighted sound level" or "A-weighted noise level." The unit of A-weighted sound level is sometimes abbreviated "dB." In practice, the sound level is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting characteristic. All U.S. and international standard sound level meters include such a filter. Typical sound levels found in the environment and in industry are shown in **Figure A1.**

Although a single sound level value may adequately describe environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise is a conglomeration of distant noise sources, which results in a relatively steady background noise having no identifiable source. These distant sources may include traffic, wind in trees, industrial activities, etc. and are relatively constant from moment to moment. As natural forces change or as human activity follows its daily cycle, the sound level may vary slowly from hour to hour. Superimposed on this slowly varying background is a succession of identifiable noisy events of brief duration. These may include nearby activities such as single vehicle passbys, aircraft flyovers, etc. which cause the environmental noise level to vary from instant to instant.

To describe the time-varying character of environmental noise, statistical noise descriptors were developed. "L10" is the A-weighted sound level equaled or exceeded during 10 percent of a stated time period. The L10 is considered a good measure of the maximum sound levels caused by discrete noise events. "L50" is the A-weighted sound level that is equaled or exceeded 50 percent of a stated time period; it represents the median sound level. The "L90" is the A-weighted sound level equaled or exceeded during 90 percent of a stated time period and is used to describe the background noise.

As it is often cumbersome to quantify the noise environment with a set of statistical descriptors, a single number called the average sound level or "L_{eq}" is now widely used. The term "L_{eq}" originated from the concept of a so-called equivalent sound level which contains the same acoustical energy as a varying sound level during the same time period. In simple but accurate technical language, the L_{eq} is the average A-weighted sound level in a stated time period. The L_{eq} is particularly useful in describing the subjective change in an environment where the source of noise remains the same but there is change in the level of activity. Widening roads and/or increasing traffic are examples of this kind of situation.

In determining the daily measure of environmental noise, it is important to account for the different response of people to daytime and nighttime noise. During the nighttime, exterior background noise levels are generally lower than in the daytime; however, most household noise also decreases at night, thus exterior noise intrusions again become noticeable. Further, most people trying to sleep at night are more sensitive to noise. To account for human sensitivity to nighttime noise levels, a special descriptor was developed. The descriptor is called the L_{dn} (Day/Night Average Sound Level), which represents the 24-hour average sound level with a penalty for noise occurring at night. The L_{dn} computation divides the 24-hour day into two periods: daytime (7:00 am to 10:00 pm); and nighttime (10:00 pm to 7:00 am). The nighttime sound levels are assigned a 10 dB penalty prior to averaging with daytime hourly sound levels.

For highway noise environments, the average noise level during the peak hour traffic volume is approximately equal to the L_{dn}.

The effects of noise on people can be listed in three general categories:

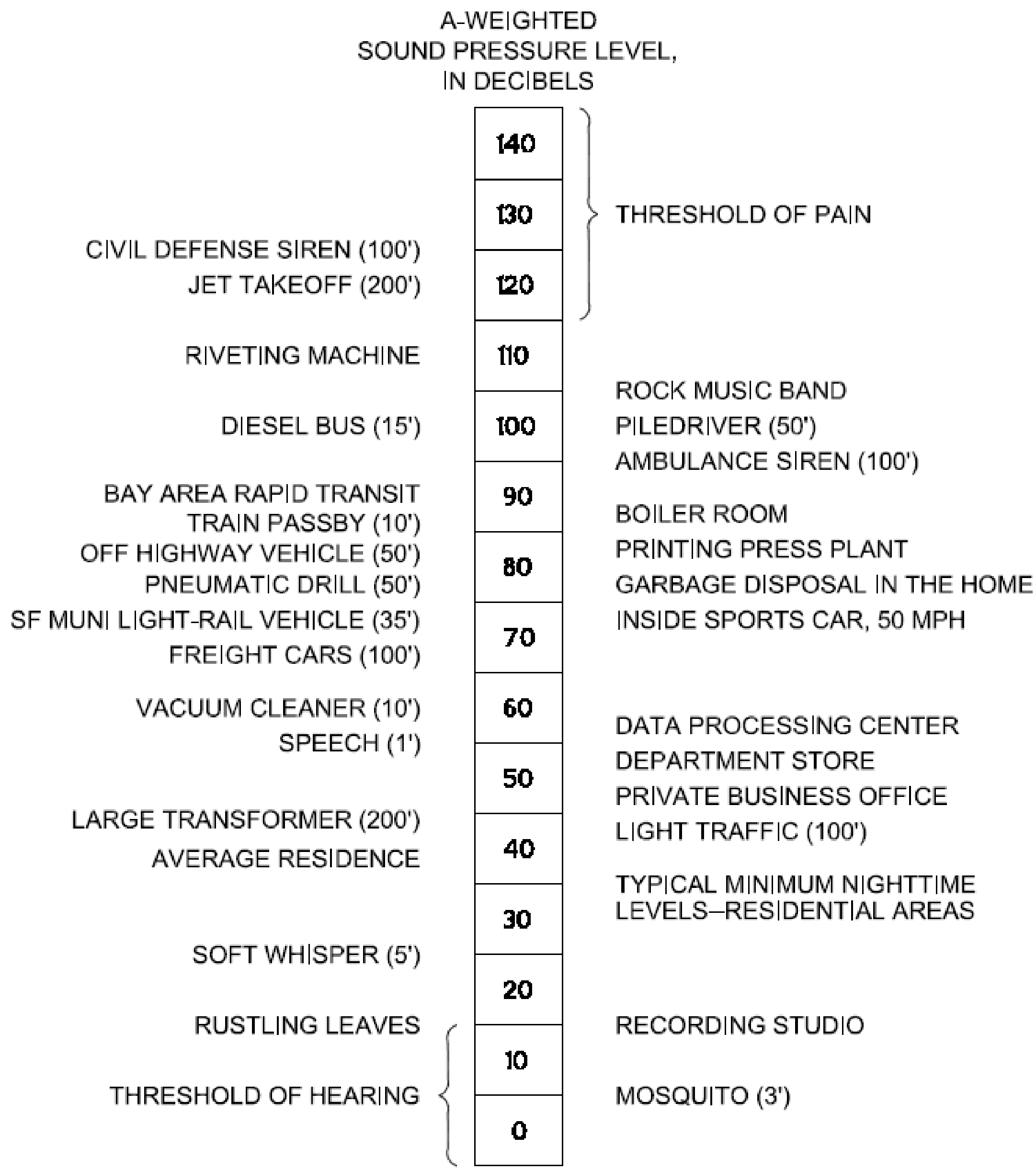
- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as startle, hearing loss

The sound levels associated with environmental noise usually produce effects only in the first two categories. Unfortunately, there has never been a completely predictable measure for the subjective effects of noise nor of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over time.

Thus, an important factor in assessing a person's subjective reaction is to compare the new noise environment to the existing noise environment. In general, the more a new noise exceeds the existing, the less acceptable the new noise will be judged.

With regard to increases in noise level, knowledge of the following relationships will be helpful in understanding the quantitative sections of this report:

Except in carefully controlled laboratory experiments, a change of only 1 dB in sound level cannot be perceived. Outside of the laboratory, a 3 dB change is considered a just-noticeable difference. A change in level of at least 5 dB is required before any noticeable change in community response would be expected. A 10 dB change is subjectively heard as approximately a doubling in loudness, and would almost certainly cause an adverse community response.



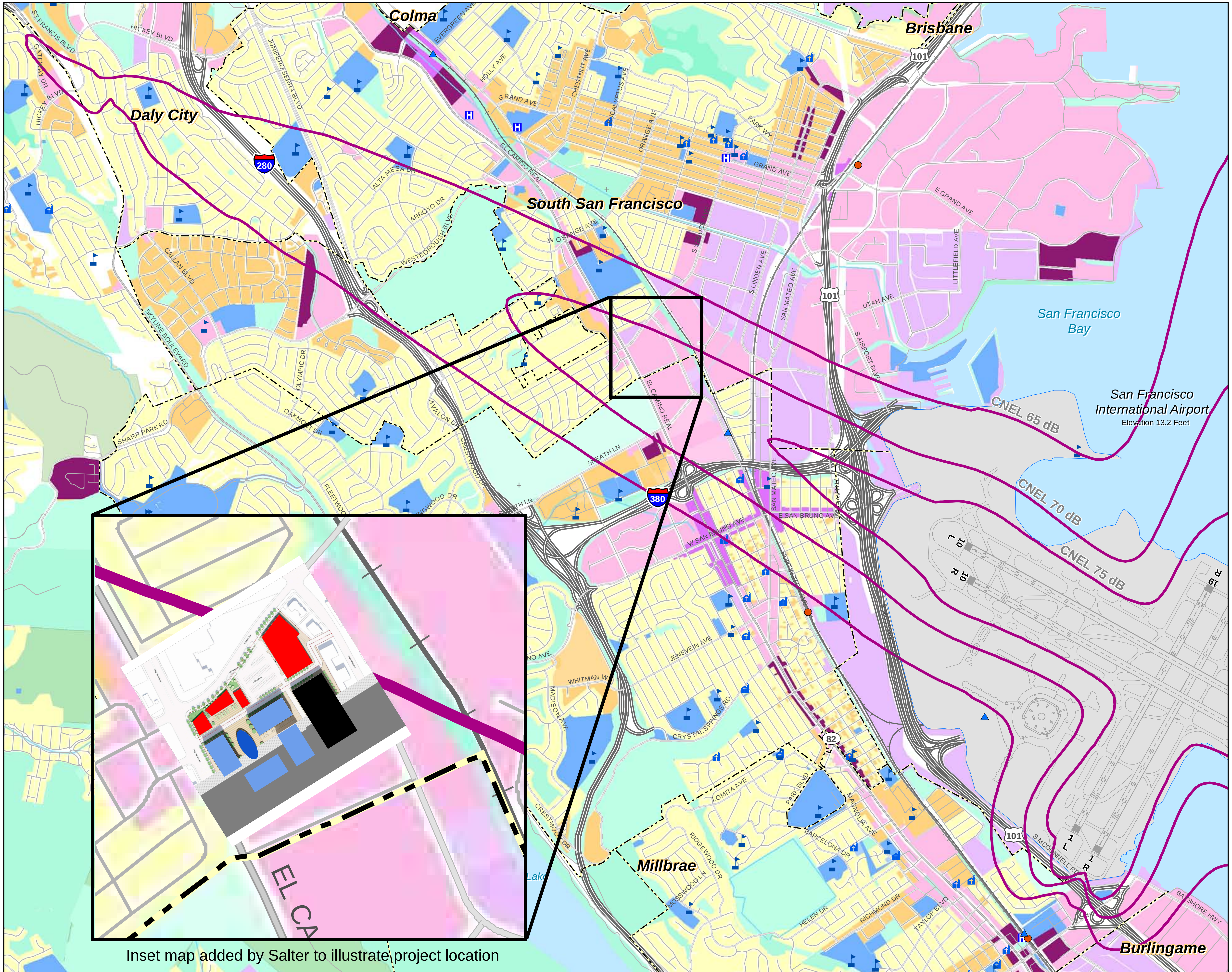
(100') = DISTANCE IN FEET BETWEEN SOURCE AND LISTENER

TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT AND INDUSTRY

FIGURE A1

1107 C 11.25.03

APPENDIX B: SFO ALUCP 2020 CONTOURS, WITH PROJECT SITE INDICATED



Inset map added by Salter to illustrate project location

LEGEND

- CNEL Contour, 2020 Forecast
- Airport Property
- BART Station
- CALTRAIN Station
- School
- Place of Worship
- Hospital
- Municipal Boundary
- Railroad
- Freeway
- Road

Planned Land Use Per General Plans:

- Public
- Multi-Family Residential
- Single Family Residential
- Mixed Use
- Transit Oriented Development
- Commercial
- Industrial, Transportation, and Utilities
- Local Park, Golf Course, Cemetery
- Regional Park or Recreation Area
- Open Space
- Planned use not mapped

Sources:

Noise Contour Data:
- Draft Environmental Assessment, Proposed Runway Safety Area Program, San Francisco International Airport. URS Corporation and BridgeNet International, June 2011

County Base Maps:
- San Mateo County Planning & Building Department, 2007

Local Plans:
- Burlingame Bayfront Specific Area Plan, August 2006
- Burlingame Downtown Specific Plan, January 2009
- Burlingame General Map, September 1984
- North Burlingame/ Rollins Road Specific Plan, February 2007
- Colma Municipal Code Zoning Maps, December 2003
- Daly City General Plan Land Use Map, 1987
- Hillsborough General Plan, March 2005
- Millbrae Land Use Plan, November 1998
- Pacifica General Plan, August 1996
- San Bruno General Plan, December 2008
- San Mateo City Land Use Plan, March 2007
- San Mateo County Zoning Map, 1992
- South San Francisco General Plan, 1998

NORTH

0 0.1 0.2 0.4 Miles

Exhibit IV-6

NOISE COMPATIBILITY ZONES -- DETAIL

Comprehensive Airport Land Use Plan for the Environs of San Francisco International Airport

C/CAG

City/County Association of Governments of San Mateo County, California

APPENDIX C: 2019 SFO PART 150 NOISE CONTOUR MAP, WITH PROJECT SITE INDICATED

2019 Noise Exposure Map

The Noise Exposure Maps and accompanying documentation, including the description of consultation and opportunity for public involvement, for San Francisco International Airport are submitted in accordance with 14 CFR Part 150 and are hereby certified as true and complete under penalty of 18 U.S.C. 1001. It is hereby certified that interested persons were afforded adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the Noise Exposure Maps and descriptions of forecast aircraft operations.

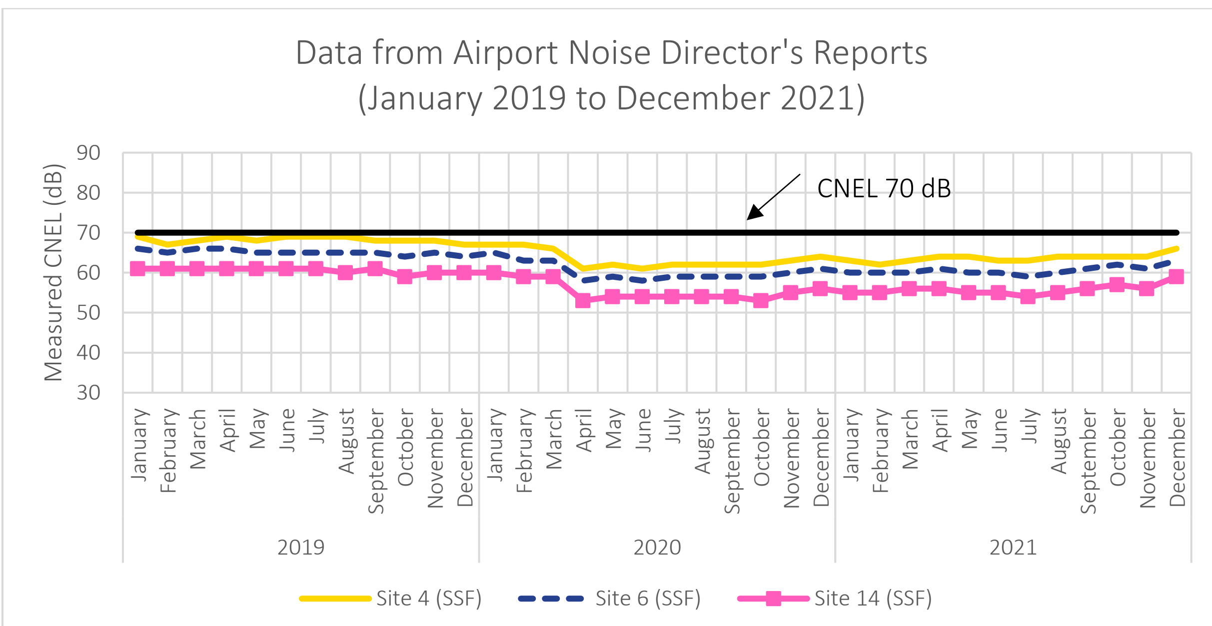
John L. Martin, Airport Director
San Francisco International Airport

AUG 1 3 2015
Date

APPENDIX D: DECEMBER 2019 AIRPORT DIRECTOR'S REPORT, WITH PROJECT SITE AND NEARBY MONITORS INDICATED

Monthly Noise Monitor Data from Historical Airport Director's Reports[12]

The following noise monitors (Monitors 4, 6, and 14) appear to be closest to the site at 180 El Camino Real.



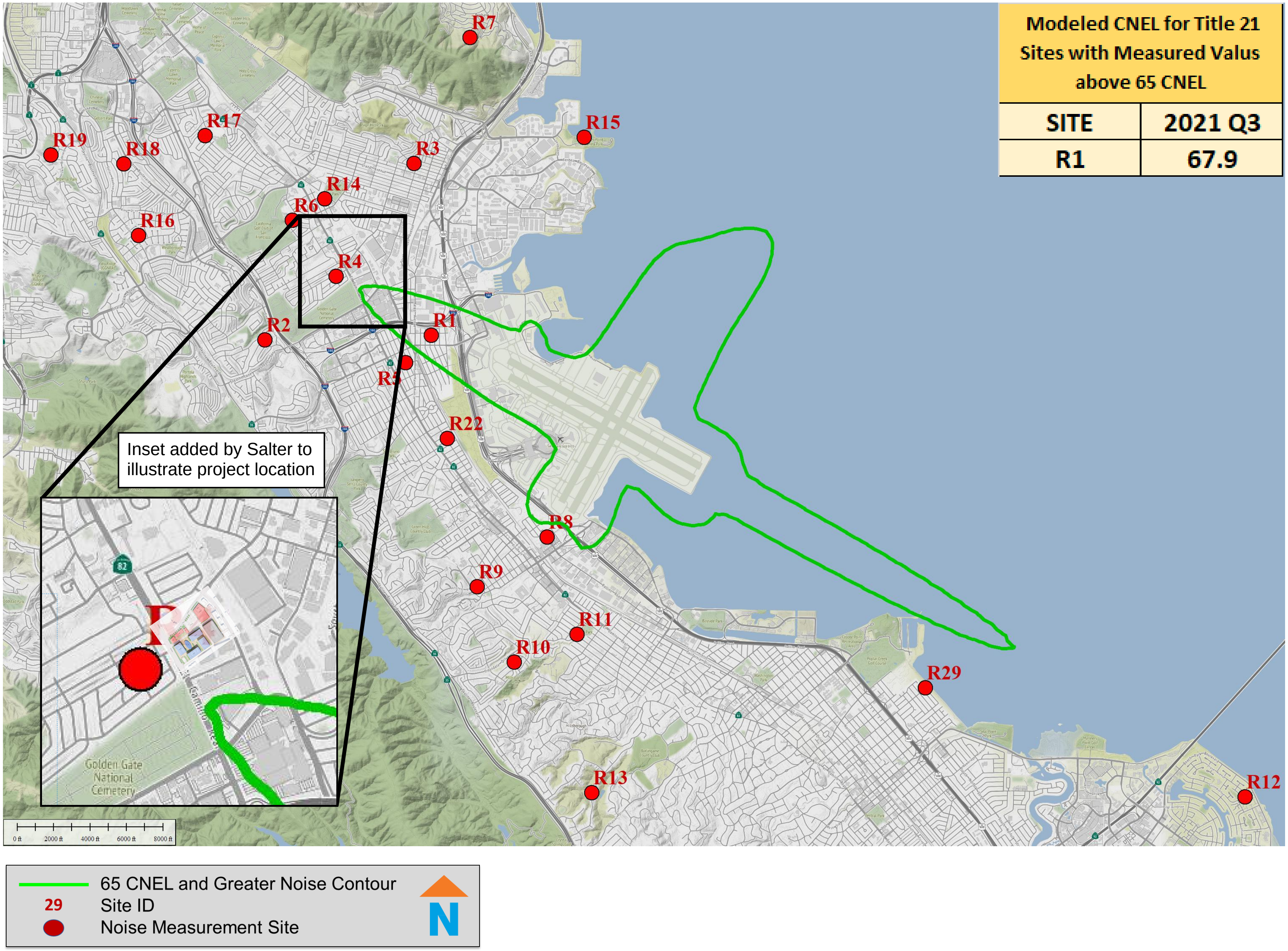
12 Accessed from https://www.flysfo.com/community/noise-abatement/reports-and-resources/airport-directors-report

The table below summarizes noise levels from December 2021 to January 2019 at the three locations closest to the 180 El Camino Real site. Noise levels were below 70 dB at all locations at all times.

Year	Month	Aircraft CNEL (dBA) from Directors Reports		
		Site 4 (SSF)	Site 6 (SSF)	Site 14 (SSF)
2021	December	69	66	61
	November	67	65	61
	October	68	66	61
	September	69	66	61
	August	68	65	61
	July	69	65	61
	June	69	65	61
	May	69	65	60
	April	68	65	61
	March	68	64	59
	February	68	65	60
	January	67	64	60
2020	December	67	65	60
	November	67	63	59
	October	66	63	59
	September	61	58	53
	August	62	59	54
	July	61	58	54
	June	62	59	54
	May	62	59	54
	April	62	59	54
	March	62	59	53
	February	63	60	55
	January	64	61	56
2019	December	63	60	55
	November	62	60	55
	October	63	60	56
	September	64	61	56
	August	64	60	55
	July	63	60	55
	June	63	59	54
	May	64	60	55
	April	64	61	56
	March	64	62	57
	February	64	61	56
	January	66	63	59

See the following figure for the 2021 3rd Quarter CNEL Project Site Overlay.

Figure 1
Noise Contour Map (2021 Q3)
Source: AEDT version 3c



Modeled CNEL for Title 21 Sites with Measured Valus above 65 CNEL

SITE	2021 Q3
R1	67.9

Airport Director's Report

Presented at the August 5, 2020
Airport Community Roundtable Meeting

Aircraft Noise Abatement Office
December 2019

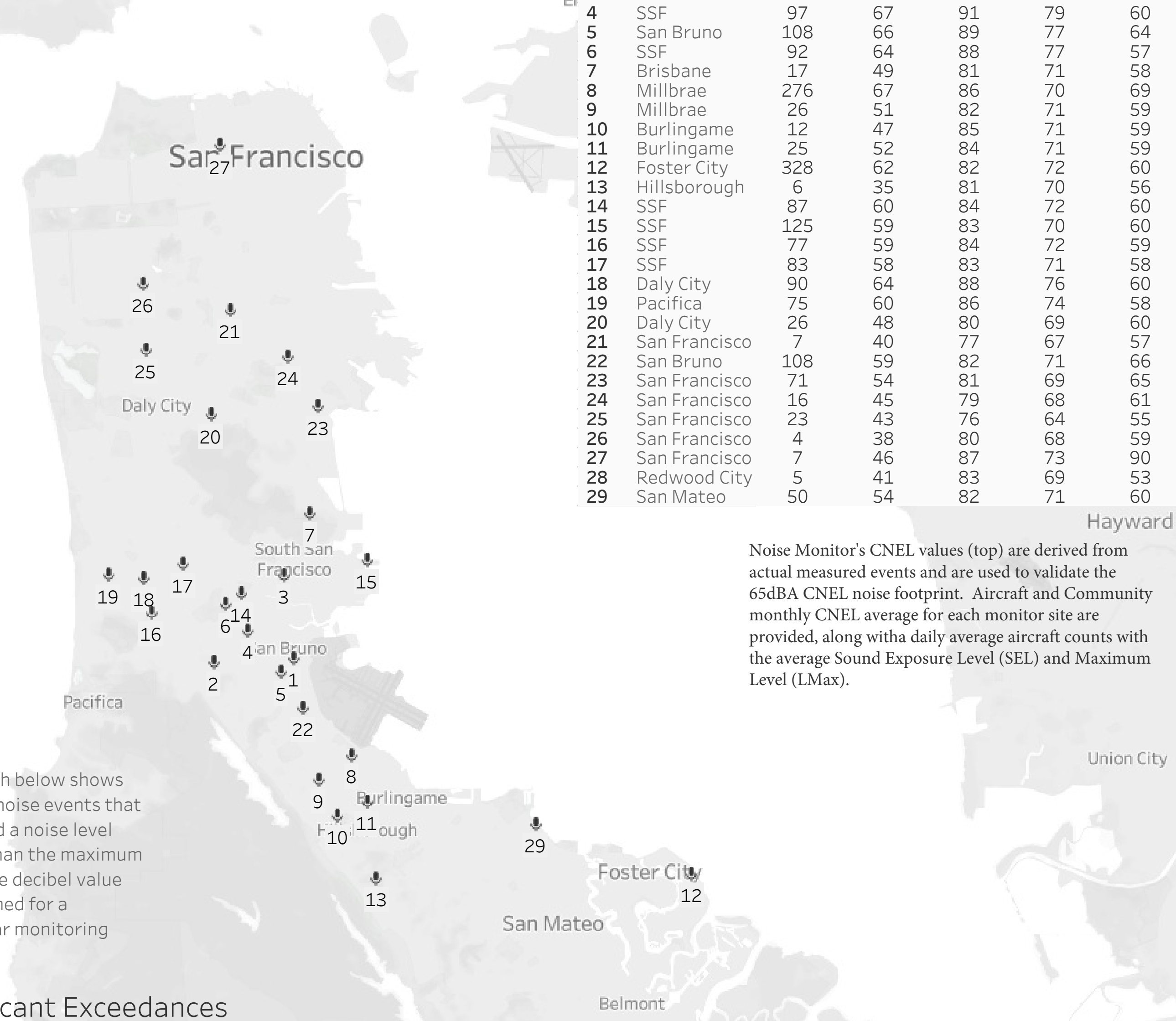
San Francisco International Airport

Aircraft Noise Levels

December 2019

The map shows 29 aircraft noise monitoring locations that keep track of noise levels in the communities around the airport. Image centered on SFO airport shows quarterly aircraft noise levels (dBA) exposure. The green zone marks 65dBA Community Noise Exposure Level (CNEL). The CNEL metric is used to assess and regulate aircraft noise exposure in communities surrounding the airport.

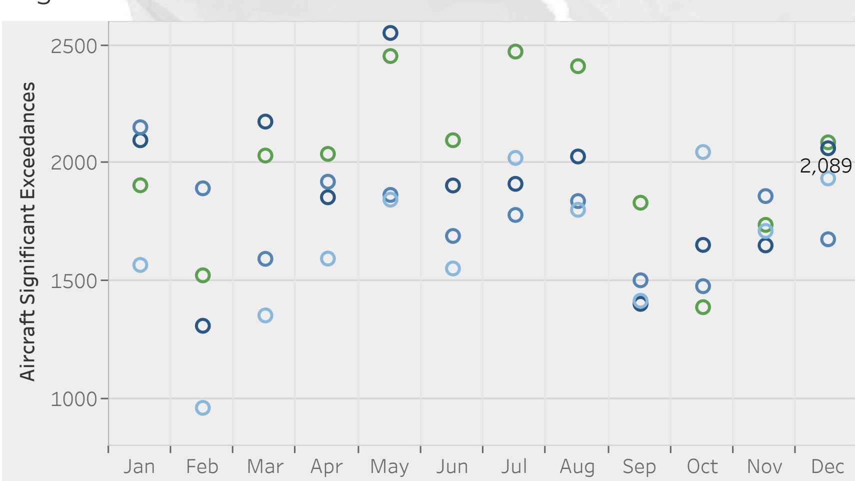
Site	City	Noise Events (AVG Day)	Aircraft CNEL (dBA)	Aircraft SEL (dBA)	Community LMax (dBA)	Community CNEL (dBA)
1	San Bruno	145	72	94	79	69
2	San Bruno	40	53	82	71	64
3	SSF	28	52	81	69	64
4	SSF	97	67	91	79	60
5	San Bruno	108	66	89	77	64
6	SSF	92	64	88	77	57
7	Brisbane	17	49	81	71	58
8	Millbrae	276	67	86	70	69
9	Millbrae	26	51	82	71	59
10	Burlingame	12	47	85	71	59
11	Burlingame	25	52	84	71	59
12	Foster City	328	62	82	72	60
13	Hillsborough	6	35	81	70	56
14	SSF	87	60	84	72	60
15	SSF	125	59	83	70	60
16	SSF	77	59	84	72	59
17	SSF	83	58	83	71	58
18	Daly City	90	64	88	76	60
19	Pacifica	75	60	86	74	58
20	Daly City	26	48	80	69	60
21	San Francisco	7	40	77	67	57
22	San Bruno	108	59	82	71	66
23	San Francisco	71	54	81	69	65
24	San Francisco	16	45	79	68	61
25	San Francisco	23	43	76	64	55
26	San Francisco	4	38	80	68	59
27	San Francisco	7	46	87	73	90
28	Redwood City	5	41	83	69	53
29	San Mateo	50	54	82	71	60



Noise Monitor's CNEL values (top) are derived from actual measured events and are used to validate the 65dBA CNEL noise footprint. Aircraft and Community monthly CNEL average for each monitor site are provided, along witha daily average aircraft counts with the average Sound Exposure Level (SEL) and Maximum Level (LMax).

The graph below shows aircraft noise events that produced a noise level higher than the maximum allowable decibel value established for a particular monitoring site.

Significant Exceedances



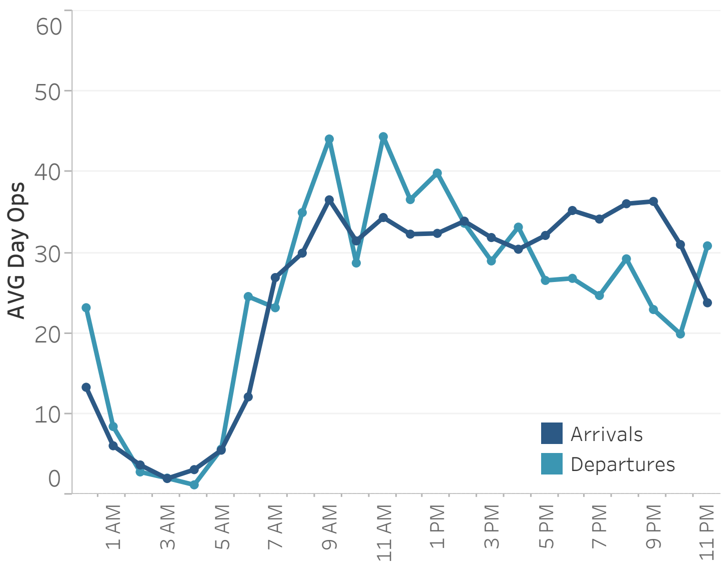
Note: Site 2 online starting 11/20/2019

Operations

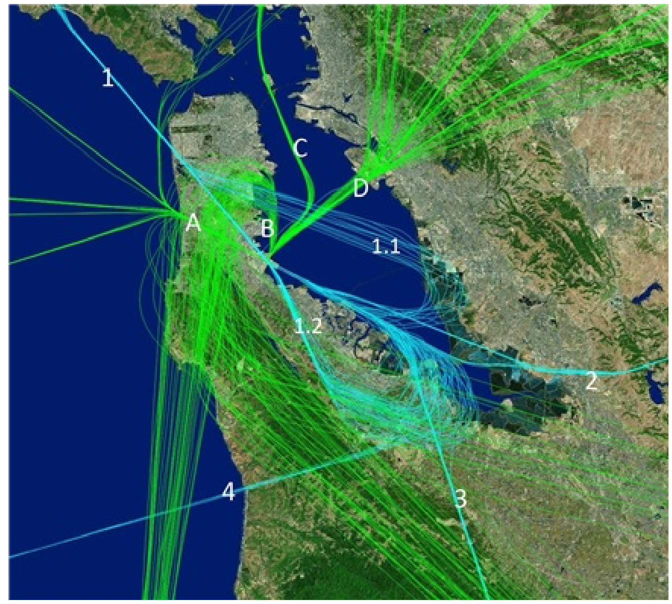
December 2019

Monthly Ops	AVG Daily Ops	12 Month AVG	YOY Growth
36,814	1,188	37,764	

December 2019 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.

Top Destinations

Los Angeles	Seattle	Las Vegas
7%	4%	4%

Down the Bay vs Peninsula

1.1 BDEGA East	25%
1.2 BDEGA West	75%

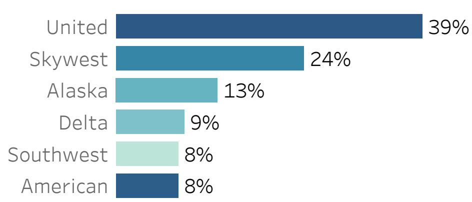
Arrival Route

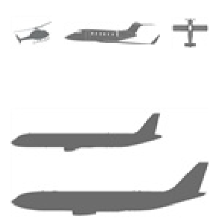
1. BDEGA
2. DYAMD
3. SERFR
4. OCEANIC

Departure Route

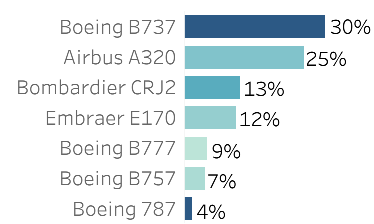
A. GAP	
B. SSTIK	
C. NIITE	8%
D. TRUKN RWY 01	41%
D. TRUKN RWY 28	0%

Airlines with the Most Operations

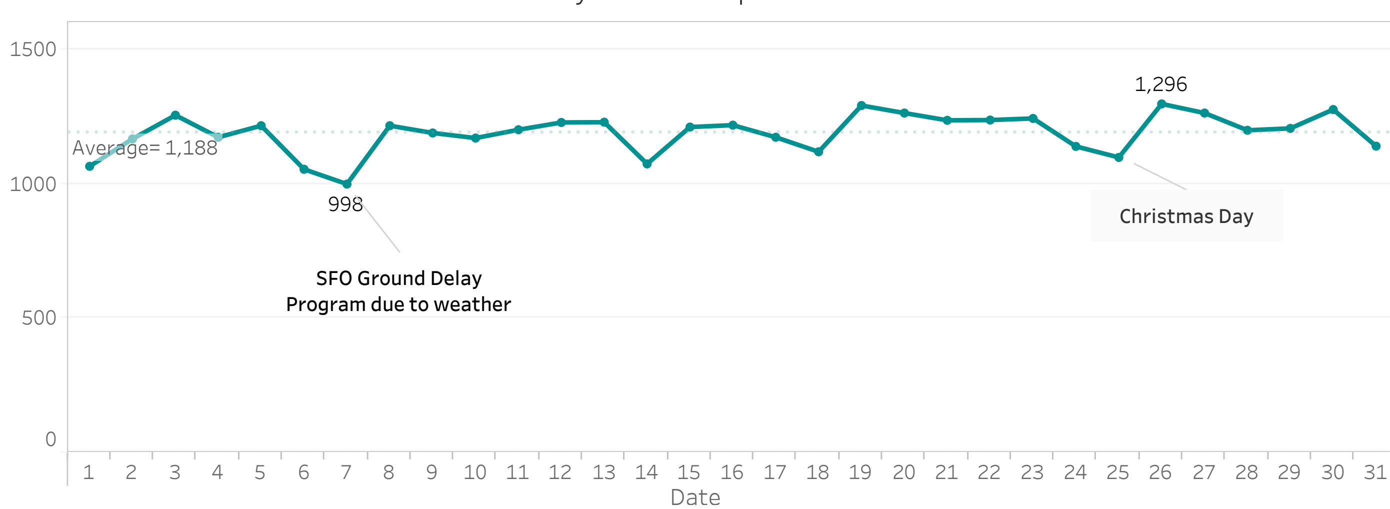




Most Utilized Aircraft Types



Daily Aircraft Operations



Runway Usage and Nighttime Operations

Monthly Runway usage is shown for arrivals and departures, futher categorized by all hours and nighttime hours. Graph at the bottom of the page shows hourly nighttime operations for each day. Power Runup locations are depicted on the airport map with airlines nighttime power runup counts shown below. Percent [%] is rounded to the nearest whole number.

Runway Utilization

	Arrivals	Departures
01 L/R		66% 11,705
10 L/R	1% 194	19% 3,407
19 L/R	18% 3,261	1% 150
28 L/R	80% 14,188	13% 2,373

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

	Departures
10 L/R	39% 200
01 L/R	41% 208
28 L/R	20% 99

Runway Utilization

Arrivals

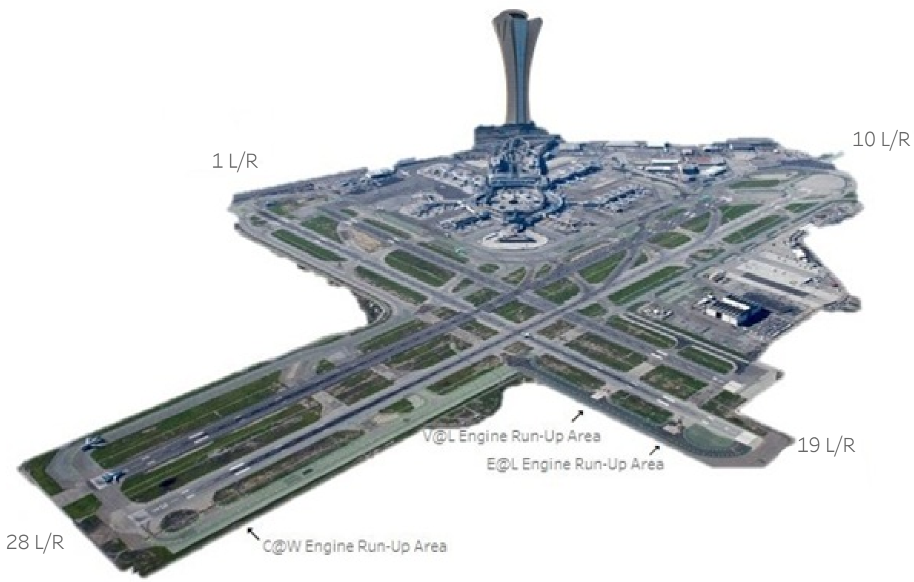
	28L	28R
	45%	55%
Night (10pm-7am)	32%	68%

Nighttime Power Run-Ups

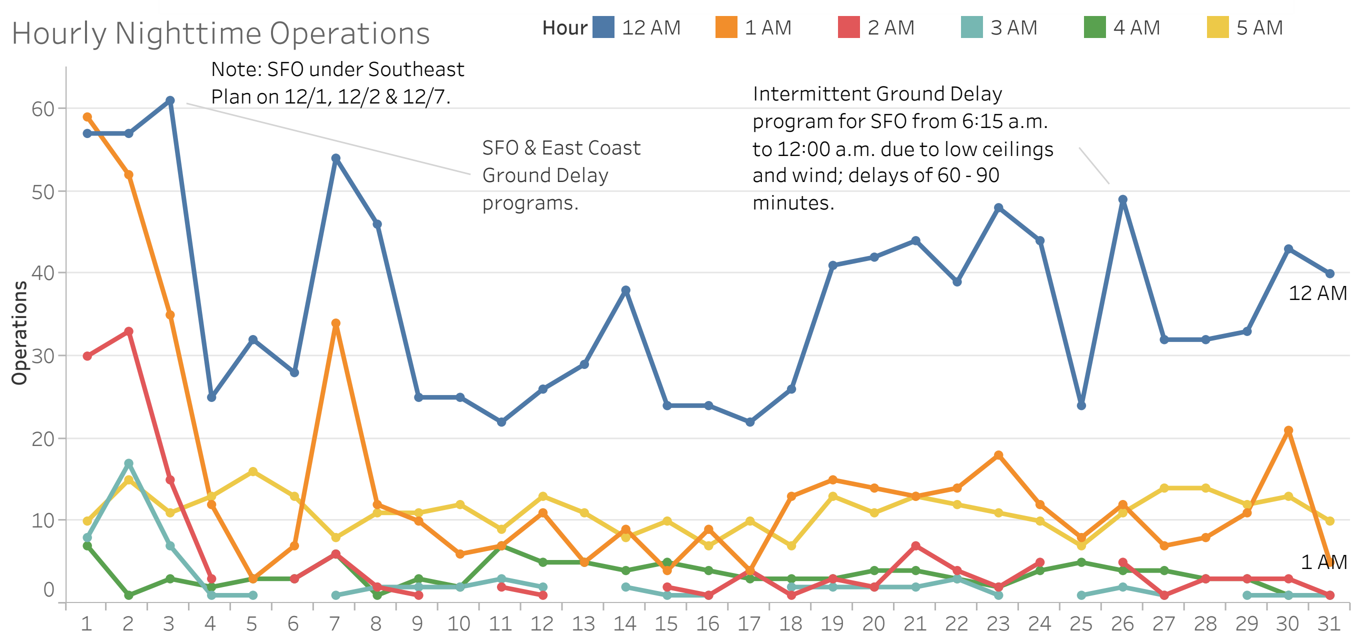
10pm-7am

Alaska Airlines	7
American Airlines	6
United Airlines	8

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 settingsrange from idle to full power and may vary in duration.



Hourly Nighttime Operations



Noise Reports

Noise Reporters / Noise Reports

	City	Noise Reporters	Noise Reports
Roundtable	Atherton	5	998
	Belmont	5	194
	Brisbane	24	1,468
	Burlingame	5	77
	Daly City	12	1,057
	El Granada	2	1,073
	Foster City	12	551
	Half Moon Bay	2	9
	Menlo Park	22	1,930
	Millbrae	7	39
	Montara	1	364
	Moss Beach	1	6
	Pacifica	25	3,205
	Portola Valley	26	6,994
	Redwood City	17	1,477
	San Bruno	7	113
	San Carlos	1	34
	San Francisco	44	5,593
	San Mateo	24	1,035
	South San Fra..	10	155
	Woodside	9	2,887
Other	Alameda	5	106
	Aptos	6	241
	Ben Lomond	3	16
	Berkeley	14	3,240
	Bonny Doon	2	27
	Boulder Creek	7	123
	Brookdale	1	1
	Capitola	14	1,361
	Carmel Valley	2	26
	Castro Valley	1	1
	Cupertino	1	1,536
	Danville	2	32
	East Palo Alto	2	47
	Emerald Hills	8	2,600
	Felton	7	370
	Fremont	1	309
	Hayward	1	355
	Kensington	1	3
	La Selva Beach	1	5
	Lafayette	1	1
	Los Altos	95	13,459
	Los Altos Hills	23	8,612
	Los Gatos	86	10,196
	Moraga	4	552
	Morgan Hill	2	27
	Mountain View	30	3,053
	Oakland	31	7,491
	Orinda	3	36
	Palo Alto	157	34,551
	Penngrove	1	11
	Richmond	6	4,037
	San Jose	1	1
	Santa Cruz	94	14,101
	Saratoga	2	218
	Scotts Valley	59	6,189
	Soquel	56	8,744
	Stanford	4	791
	Sunnyvale	8	788
	Watsonville	1	193
Grand Total		**1,004**	**152,709**

Reporters Annual AVG: 1,138

Reports Annual AVG: 177,683

New Reporters: 74

New Reporters Top City: San Francisco

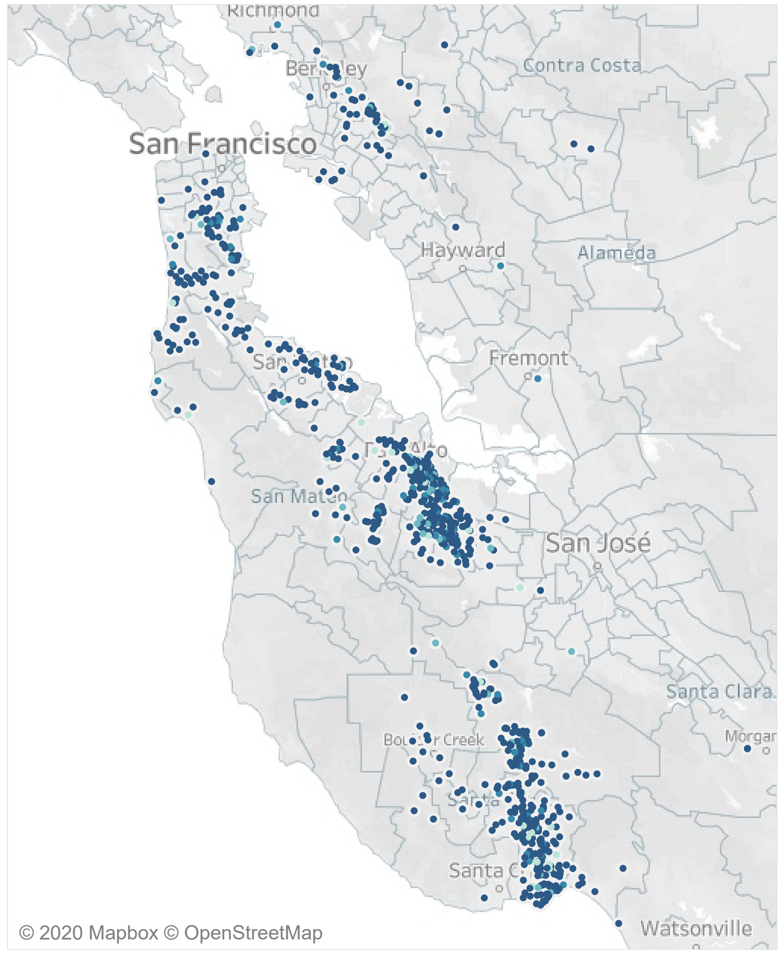
Furthest Report: 88 miles

Reports per SFO Operation: 4

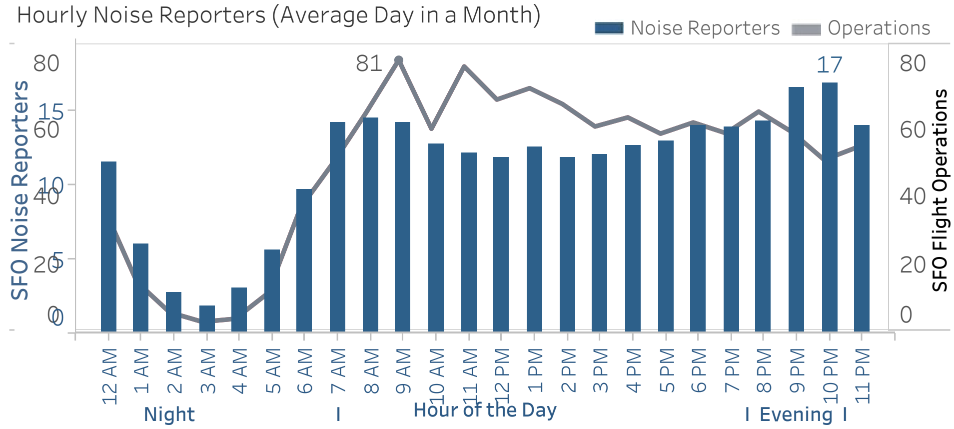
Top Aircraft Types: B737, A320, E75L

Top Flight Numbers: UAL2201, ASA945, ASA1969

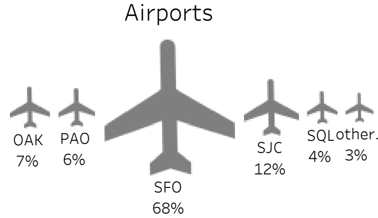
Noise Reporters Location Map



Hourly Noise Reporters (Average Day in a Month)



Airports



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

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

Source: SFO Intl Airport Noise Monitoring System