3.3 NOISE

3.3.1 Introduction

3.3.1.1 Definition of Resource

Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, diminishes the quality of the environment, or is otherwise annoying. Response to noise varies by the type and characteristics of the noise source, distance between source and receptor, receptor sensitivity, and time of day. Noise may be intermittent or continuous, steady or impulsive, and may be generated by stationary sources such as industrial plants or by transient sources such as automobiles and aircraft. Noise receptors can include humans as well as terrestrial and marine animals. Of specific concern to this EIS/OEIS are potential noise effects on humans, marine mammals, birds, and fish (to the extent that noise introduced to the sea can affect catchability). Each receptor has higher or lower sensitivities to sounds of varying characteristics. Information specific to the noise receptors of concern (e.g., fish, marine mammals, etc.) is provided in other sections of this EIS/OEIS as appropriate. This section focuses primarily on noise from airborne sources.

Due to the complex characteristics of sound, a variety of metrics (or units) are necessary to describe the noise environment in specific conditions. A description of the characteristics of airborne and underwater noise, as well as the noise metrics used in this EIS/OEIS, is provided in Appendix D, Overview of Airborne and Underwater Acoustics. Noise metrics used in the impact analyses are referenced as appropriate within the resource sections of Chapter 4.

3.3.1.2 Regional Setting

A - Point Mugu Sea Range

Noise sources in the Point Mugu Sea Range are transitory and widely dispersed. The Sea Range covers very little land area (refer to Figure 1-2). Few structures occur within areas encompassed by the range (primarily located on San Nicolas Island), and no public communities are established beneath Sea Range airspace that are subject to routine aircraft overflight. Airborne noise sources include civilian and military aircraft, both of which fly at altitudes ranging from hundreds of feet to tens of thousands of feet above the surface.

B - Point Mugu

NAS Point Mugu is surrounded by lands designated generally as residential, commercial, industrial, community services, open space, agriculture, and undeveloped. These surrounding areas are subject to noise from civilian and military aircraft operations, automobile traffic, and construction activities. Aircraft noise tends to be the dominant noise source in areas immediately adjacent to airfields and beneath primary flight corridors. Noise levels and land use compatibility in these areas are addressed in the Air Installation Compatible Use Zone (AICUZ) program. NAS Point Mugu released the installation's original study in 1977. Since that time, land development in surrounding communities has continued, and NAS Point Mugu has reevaluated its contribution to the noise environment by conducting aircraft noise surveys and land use studies. An update to the AICUZ study was conducted in 1992 (U.S. Navy 1992). Subsequently, an EIS prepared for the realignment of E-2 squadrons to NAS Point Mugu characterized noise levels associated with airfield operations. The resulting noise contours are based on 1996 operational data plus the additional E-2 operations (about 20,767 aircraft operations per year).

3.3.1.3 Region of Influence

The ROI for airborne noise includes all areas of the Sea Range where aircraft or aero-vehicle noise is emitted, especially areas where concentrated or routine aircraft activity occurs. This includes areas at and surrounding NAS Point Mugu that are exposed to noise from aircraft activity associated with the NAS Point Mugu airfield. Portions of the City of Oxnard, Ventura County, and the City of Camarillo lie within the ROI. Noise levels have been estimated for all range areas to provide a basis for comparison to standards typically used in characterizing a land-based noise environment that is typified by infrequent, but potentially loud, overflights.

3.3.2 Point Mugu Sea Range

Airborne noise in the Sea Range is created by subsonic and supersonic flight activity of aircraft, aerial targets, and missiles. Airborne noise introduced by surface vessels is negligible compared to noise introduced by low-flying aircraft and targets. Consequently, airborne noise levels calculated for the Sea Range are addressed with respect to aircraft, aerial targets, and missiles only.

Aircraft assigned to NAWCWPNS are the most prevalent noise sources operating in the Sea Range. Although the Sea Range hosts nearly every type of aircraft in the DoD aircraft inventory, more than 90 percent of annual aircraft activity is accounted for by aircraft affiliated with the test squadrons. Table 3.3-1 lists aircraft using the Sea Range most often.

Table 3.3-1. Typical Sea Range Aircraft

Aircraft	No. at NAS Point Mugu	Type	Flight Speeds
QF-4	12	Fixed-wing jet + A/B	Subsonic and supersonic
F-14	7	Variable sweep-wing jet + A/B	Subsonic and supersonic
F/A-18	0	Fixed-wing jet + A/B	Subsonic and supersonic
EA-6B	0	Fixed-wing jet	Subsonic
AV-8B	0	Fixed-wing jet	Subsonic
S-3	0	Fixed-wing jet	Subsonic
NP-3D	5	Fixed-wing turboprop	Subsonic
Helicopters	5	Rotary-wing turboshaft	Subsonic

Source: NAWCWPNS Point Mugu 1996m, 1998d.

Aerial targets available to Sea Range users include full-scale (fixed-wing and rotary-wing aircraft) and sub-scale subsonic and supersonic targets. Targets are powered by rocket motors, jet engines, or a combination of both. Noise characteristics of the targets or target launch platforms are discussed below for subsonic and supersonic flight conditions.

3.3.2.1 Subsonic Noise

The L_{dn} noise metric is best suited for predicting noise levels in areas where noise-generating activities occur routinely and are part of the daily community noise environment (refer to Appendix D). Aircraft activities in special use airspace generally tend to be random and sporadic. To account for the unique nature of military aircraft operations in these areas (e.g., high speed, low-altitude), the USAF developed the L_{dnmr} sound measurement. Like the L_{dn} noise metric, L_{dnmr} incorporates a 10 dB penalty for those noise events occurring between 10:00 p.m. and 7:00 a.m., and represents average noise levels dominated by the loudest noise events occurring throughout the averaging period.

The Point Mugu Sea Range has been divided into range areas to facilitate tracking, planning, and coordination of range activities. Noise levels were calculated separately for each airspace element, or range area. The range activities vary from one range area to another, even for adjacent airspaces. Therefore, calculations of noise levels may yield differing results for adjacent airspace elements, depending on the type, level, and frequency of test and training events in each airspace unit.

Noise levels resulting from aircraft operating in the Sea Range were calculated with the DoD noise modeling program MR_NMAP using the L_{dnmr} metric. Resulting noise levels were calculated based on the number of sorties, time of day the sorties occurred, altitudes of the aircraft during the sorties, and power settings of the aircraft. Nearly 4,000 baseline aircraft sorties were modeled, based on aircraft activity documented in Sea Range scheduling reports (refer to Section 3.0, Current Activities). Scheduling reports detail the range areas that an aircraft may enter during an exercise. Since one sortie can involve an aircraft flying through many range areas, assumptions were made regarding the amounts of time an aircraft would spend in each airspace area during any given sortie.

Throughout a given year, aircraft and targets are involved in air-to-air and air-to-surface tests and exercises. During air-to-air exercises, aircraft and targets tend to operate at higher altitudes; lower altitudes are used most often for air-to-surface events. For noise modeling purposes, aircraft are assigned to specified altitudes for varying time periods reflecting the changes in altitude an aircraft may require to complete an exercise.

Table 3.3-2 presents the average operational parameters reflected in the noise modeling effort for those aircraft whose contributions to the existing noise environment on the Sea Range are clearly dominant. The altitude bands are given with the assumption that the upper and lower boundaries of an airspace encompass the range of altitudes expected to be flown by each aircraft. Based on these assumptions, Table 3.3-3 presents the existing noise levels under each range area. These noise levels are shown graphically in Figure 3.3-1.

Table 3.3-2. Typical Aircraft Operating Parameters

Aircraft	Time/Sortie (minutes)	% of Time at Altitudes in Sea Range				
		0 - 1,000 feet AGL	1,000 - 5,000 feet AGL	5,000 - 10,000 feet AGL	10,000 - 20,000 feet AGL	20,000+ feet AGL
F-4	120	10	35	15	25	15
F-14	120	10	35	15	25	15
F/A-18	120	10	35	15	25	15
EA-6B	120	10	35	15	25	15
AV-8B	120	10	35	15	25	15
S-3	120	10	35	15	25	15
P-3	120	10	60	30	0	0
Helicopters	120	10	60	30	0	0

AGL = Above Ground Level

Subsonic targets operating within the Sea Range are powered by small non-afterburning jet engines producing about 240 pounds (1,100 newtons) of thrust for a BQM-74E, and about 2,000 pounds (8,900 newtons) of thrust for a BQM-34S. In comparison, an F-14 has two afterburner-equipped jet engines, each producing about 21,000 to 27,000 pounds (93,000 to 120,000 newtons) of thrust. The smaller BQM-74E is generally used at altitudes lower than 1,000 feet (300 m). The larger, more powerful BQM-34S is used most often above 10,000 feet (3,000 m), and used about one third of the time at altitudes

Table 3.3-3. Existing Average Subsonic Sound Levels by Range Area[1]

Range Area	Distributed Sound Level (L_{dnmr})
3A (W-289)	52.8
3B (W-289)	54.5
3D (W-289)	52.2
3E (W-289)	58.5
3F (W-289)	58.6
4A (W-289)	60.6
4B (W-289)	63.3
5A (W-289)	60.3
5B (W-289)	60.1
5C (W-532)	57.4
5D (W-532)	55.5
6A (W-289)	56.6
6B (W-289)	56.6
6C (W-532)	58.4
6D (W-532)	55.3
7A (W-289)	48.2
7B (W-289)	48.5
7C (W-532)	59.1
7D (W-532)	52.6
8A (W-532)	56.1
M1 (W-532)	57.1
M2 (W-532)	58.0
M5 (W-289)	60.9
W-289 W-412	57.0
W-289N	61.5
W-290	52.6
W-537	49.1
W-60	58.8
W-61	48.0

[1]Based on assumptions presented in Table 3.3-2 and data in Table 3.0-11.

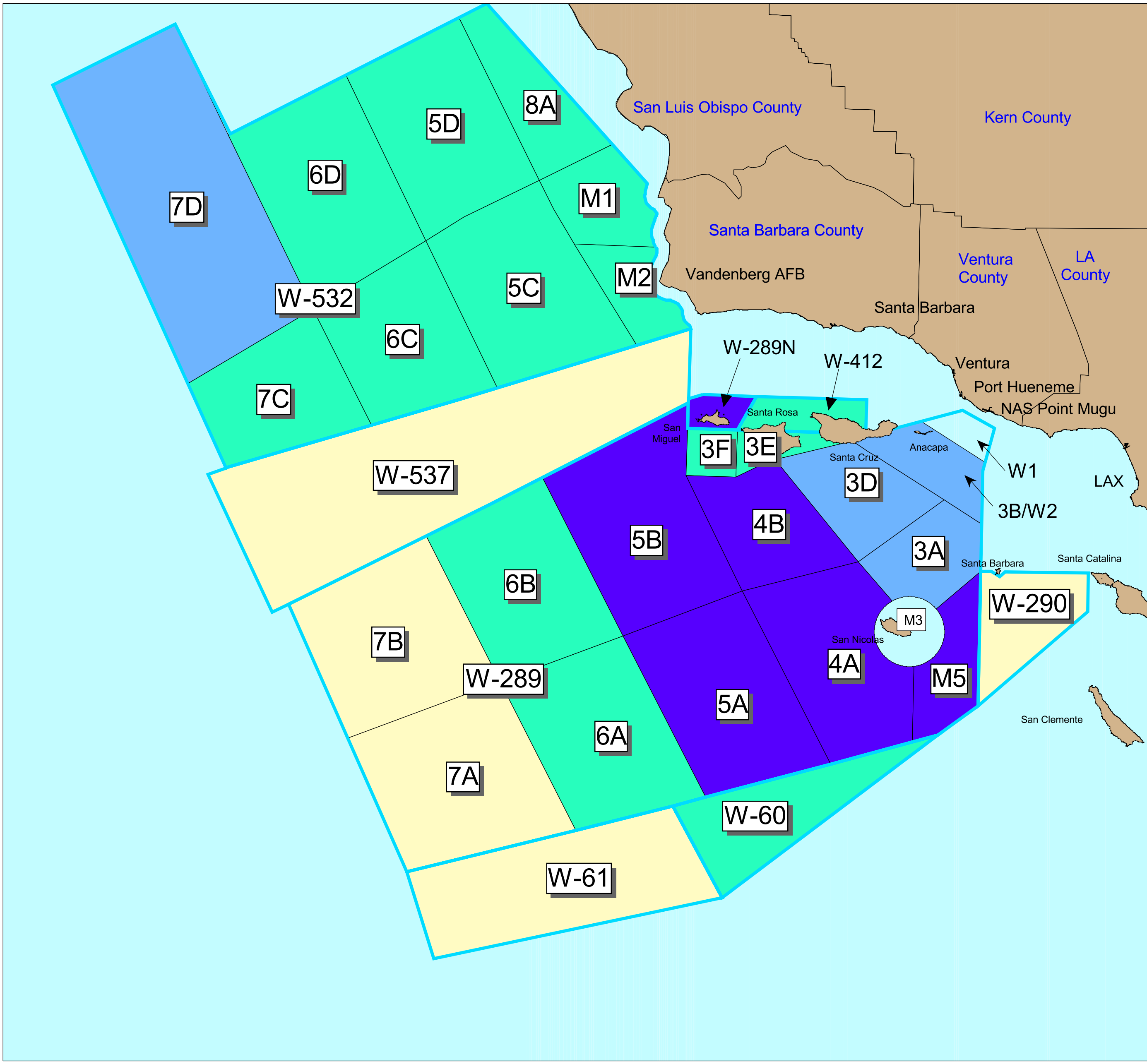
below 1,000 feet (300 m). Sound exposure level (SEL) values (refer to Appendix D) for aerial targets are unavailable. However, given the limited engine size and lack of afterburner, SEL values are considerably less for subsonic targets than those for aircraft commonly using the Sea Range. Further, aerial targets are airborne for a maximum of about 90 minutes during an exercise whereas full-scale aircraft can remain in flight for several hours. Thus, noise introduced to the Sea Range from targets would add negligible fractions to the noise levels calculated for full-scale aircraft.

The USAF aircraft noise database was used to obtain overall noise levels and SEL values for reception of noise just above the surface from aircraft overflights at 200 feet (60 m), rather than the standard altitude of 1,000 feet (300 m). The results are shown in Table 3.3-4.

3.3.2.2 Supersonic Noise

Supersonic aircraft flights on the Sea Range are usually limited to altitudes above 30,000 feet (9,100 m) and/or locations more than 30 NM (56 km) from shore. Supersonic, low-lying targets launched from San Nicolas Island fly west or northwest out over the Sea Range. Detailed data on locations of supersonic flights of aircraft on the Sea Range are unavailable. Therefore, supersonic activity is characterized based on single event parameters for F-4, F-14, and F/A-18 aircraft and supersonic missiles and targets.

Average Noise Levels on the Point Mugu Sea Range (Baseline)



Distributed Sound Level (L_{dnmr})

- 45 - 50 dB
- 50 - 55 dB
- 55 - 60 dB
- 60 - 65 dB

N
W E
S

50 0 50 Nautical Miles

Projection: Universal Transverse Mercator
North American Datum 1927
Zone 11

Figure 3.3-1

Table 3.3-4. Airborne Noise Parameters near Surface, in dB re 20 μPa, for Aircraft Overflight at 200 feet

Aircraft	Power Set.	Speed Kts	Max dB	Max dBA	F-SEL dB	A-SEL dB
F-4C	A/B 100%	300	133	130	134	131
F/A-18	A/B 96.7%	250	136	132	137	133
F-16	A/B 105%	450	135	131	134	130
F-14A	A/B 102%	510	129	125	128	124
F-14B	A/B 115%	570	131	127	131	127
A-6	100% RPM	250	127	125	127	125
AV-8B	96% RPM	445	116	114	121	119
P-3A	2000 ESHP	180	109	102	110	103
S-3A	97% RPM	250	115	115	115	115
C-130E	T/O	170	111	99	114	102
E-2[1]	2000 ESHP	180	NA	99	NA	NA
AH-1G	LND LITE	40	108	97	115	104
AH-1G	LFO LITE	100	102	93	112	103
OH-58	LND LITE	40	92	84	104	96
UH-1N	100% RPM	80	101	91	112	102

[1] The simulated dBA time histories for 2-engine E-2 aircraft were assumed to be 3 dBA lower than those for the 4-engine P-3 aircraft (Southwest Division 1998); P-3 and E-2 aircraft use the same engine model. This is consistent with general acoustical theory, in that doubling the number of collocated noise sources increases overall noise levels by 3 dBA.

Several factors influence sonic booms: weight, size, shape of aircraft or vehicle; altitude; flight paths; and weather or atmospheric conditions. A larger and heavier aircraft must displace more air and create more lift to sustain flight, compared with small, light aircraft. Therefore, larger aircraft create sonic booms that are stronger and louder than those of smaller, lighter aircraft. Consequently, the larger and heavier the aircraft, the stronger the shock waves will be.

Of all the factors influencing sonic booms, increasing altitude is the most effective method of reducing sonic boom intensity. The width of the boom "carpet," or area exposed to sonic boom beneath an aircraft, is about 1 mile (1.6 km) for each 1,000 feet (300 m) of altitude. For example, an aircraft flying supersonic at 50,000 feet (15,000 m) can produce a sonic boom carpet about 50 miles (80 km) wide. The sonic boom, however, will not be uniform. Maximum intensity is directly beneath the aircraft, and decreases as the lateral distance from the flight path increases until shock waves refract away from the ground and the sonic boom attenuates. The lateral spreading of the sonic boom depends only upon altitude, speed, and the atmosphere, and is independent of the vehicle's shape, size, and weight. The ratio of aircraft length to maximum cross sectional area also influences the intensity of the sonic boom. The longer and more slender the aircraft, the weaker the shock waves. The wider and more blunt the vehicle, the stronger the shock wave can be.

Sonic booms are generated as aircraft reach Mach 1.0 and increase in intensity as the Mach number increases. Increasing speeds above Mach 1.3 result in only small changes in shock wave strength. The direction of travel and strength of shock waves are influenced by wind, speed, direction, air temperature, and pressure. At speeds slightly greater than Mach 1.0, the effect of these factors can be significant, but their influence is small at speeds greater than Mach 1.3. Therefore, supersonic flight activity has been characterized for Sea Range aircraft capable of supersonic flight at a fixed speed of Mach 1.3 and at various altitudes in standard atmospheric conditions. Supersonic activity was modeled using PCBOOM3 (AAMRL 1996), a DoD single-event sonic boom program that calculates sonic boom signatures. Results of supersonic activity modeling efforts are presented in Table 3.3-5 for both maximum and minimum

Table 3.3-5. Maximum and Minimum Overpressures on the Sea Range

Airframe	Boom Overpressure (psf) Altitude (MSL)									
	10,000 feet		5,000 feet		1,000 feet		500 feet		100 feet	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
F-4	5.5	2.1	9.8	3.1	31.1	6.0				
F-14	5.7	2.2	10.0	3.2	32.0	6.1				
F/A-18	5.2	2.0	9.1	2.9	28.8	5.5				
Missile Target							19.5	3.6	51.7	7.2

Source: Ogden 1997.

overpressures. Maximum values represent sonic boom characteristics directly beneath the flight trajectory and minimum values represent the lateral sonic boom boundary.

3.3.3 Point Mugu

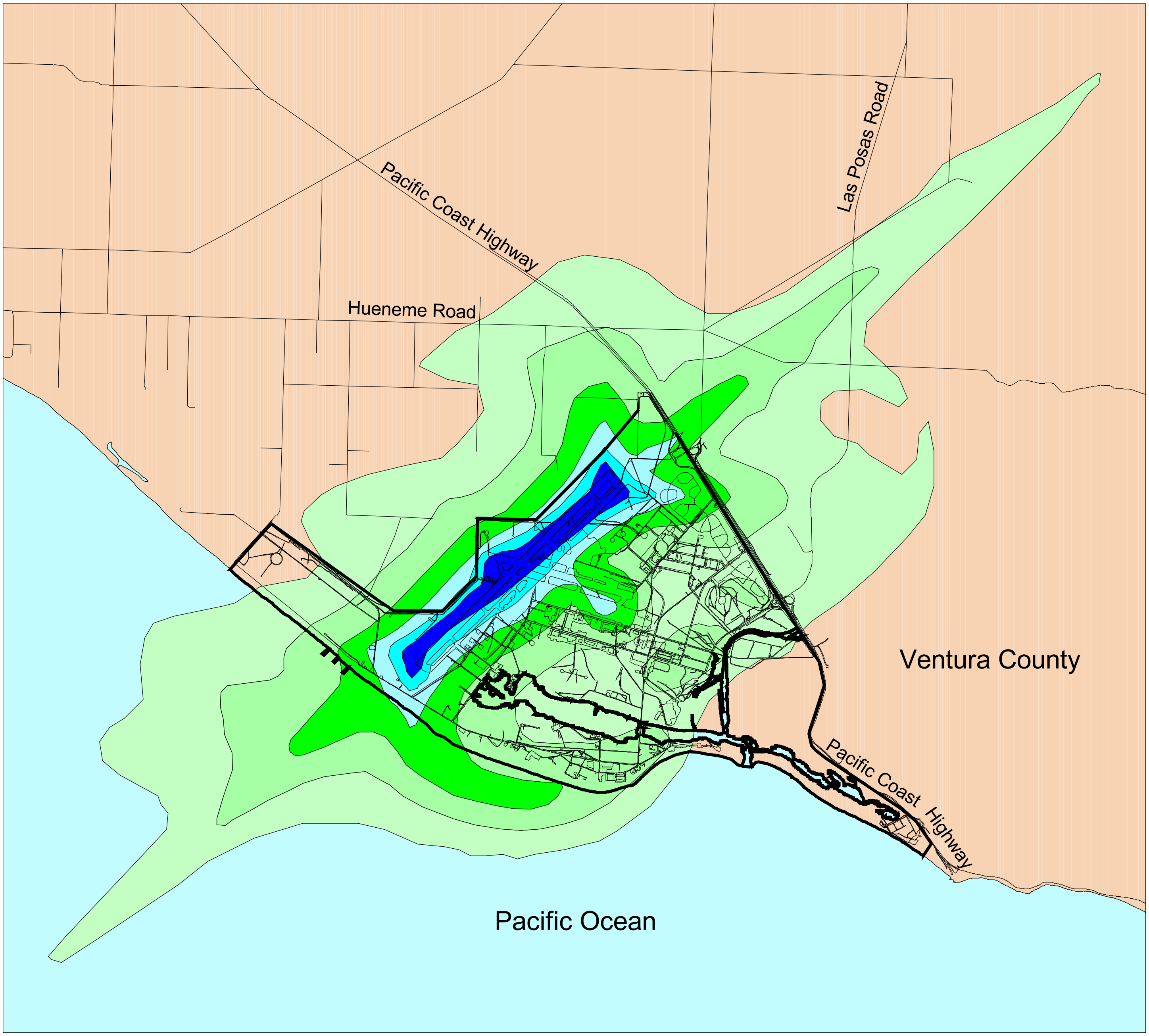
3.3.3.1 Noise from Aircraft Operations

NAS Point Mugu has supported nearly every type of aircraft in the DoD aircraft inventory. It has served as a home station for a wide variety of attack, fighter, surveillance, transport, and training aircraft in addition to several types of helicopters. In 1977, an AICUZ Study was conducted to characterize the noise environment surrounding NAS Point Mugu. Since 1977, the types of aircraft using NAS Point Mugu have remained nearly constant. However, the tempo (rate) of use by individual aircraft types has fluctuated. In 1992, a second AICUZ Study was prepared to address new missions, increased land development in areas near the base, construction of engine testing cells, modifications of flight tracks, and collocation of a California Air National Guard aircraft squadron. Subsequently, an EIS prepared for the realignment of E-2 squadrons to NAS Point Mugu characterized noise levels associated with airfield operations. The resulting noise contours are based on 1996 operational data plus the additional E-2 operations (about 20,767 aircraft operations per year).

At NAS Point Mugu, noise levels from flight operations exceeding ambient background noise typically occur only beneath main approach and departure corridors and in areas immediately adjacent to parking ramps and aircraft staging areas. As aircraft take off and gain altitude, their contribution to the noise environment drops to levels indistinguishable from the ambient background. The height at which the noise becomes indistinguishable varies depending on the aircraft and meteorological conditions.

Land use guidelines help determine acceptable levels of human noise exposure for various types of land use surrounding airports; 65 CNEL noise contours are frequently used to help determine compatibility of aircraft operations with local land use. Figure 3.3-2 presents the 60 CNEL to 80 CNEL noise contours in 5 dB increments at NAS Point Mugu and the surrounding areas. The offbase acreage exposed to CNEL values above 65 is about 1,800 acres (730 hectares). Most of this area is located under the approach and departure routes to the north (onshore) and south (offshore) of the base; a portion also occurs along the western base boundary.

Existing Noise Contours at NAS Point Mugu



Legend
NAS Point Mugu
Noise Contours
60 - 65 CNEL
65 - 70 CNEL
70 - 75 CNEL
75 - 80 CNEL
80 - 85 CNEL
85 + CNEL

N
W E
S

Projection: Universal Transverse Mercator
North American Datum of 1927
Zone 11
Scale shown is 1:75,000
Source: Southwest Division 1998.

2 0 2 Statute Miles

Figure
3.3-2

3.3.3.2 Noise from Missile and Target Launches

Missile and target launches at NAS Point Mugu are conducted at the Building 55 Launch Complex (refer to Figure 2-3a). Sound measurements were recorded for a BQM-34 target launch from Building 55 (NAWCWPNS Point Mugu 1998c). The results are shown in Table 3.3-6. This target is typical of the aerial targets and some of the surface-to-surface missiles launched from NAS Point Mugu. Of the 50 launches that occurred in the baseline year, nearly half (22) were BQM-34s. The remainder were BQM-74s, which is a smaller target – about half the size of a BQM-34 (refer to Figure 3.0-8). The closest points of approach (CPAs) for the measurements ranged from as close as 50 feet (15 m) near Building 55 to as far as 1,200 feet (370 m) along Beach Road. The A-weighted sound pressure levels (SPLs) observed for the BQM-34 ranged from 92 dB re 20 µPa at the 1,200-foot (370-m) CPA to 145 dB re 20 µPa at the 50-foot (15-m) CPA.

Table 3.3-6. BQM-34 Measured Launch and Overflight Noise (A-Weighted)

Location	Range (feet)	Duration (sec)	Peak (dB re 20 µPa)	SPL (dB re 20 µPa)	SEL (dB re $[20\ \mu Pa]^2 \cdot s$)
JATO Bottle Noise (from launch)					
Bldg. 55 (launch pad)	50	0.56	161.36	144.70	142.19
940 feet SW of launch	200	2.11	126.27	109.50	112.75
2,400 feet SW of launch	2,600	1.38	111.14	97.88	99.27
3,000 feet SW of launch	2,800	1.30	115.38	100.69	101.84
Jet Engine Noise (from flyover)					
2,400 feet SW of launch	300	3.80	108.31	93.36	99.16
3,000 feet SW of launch	1,200	6.68	100.25	83.95	92.20

Source: NAWCWPNS Point Mugu 1998c.

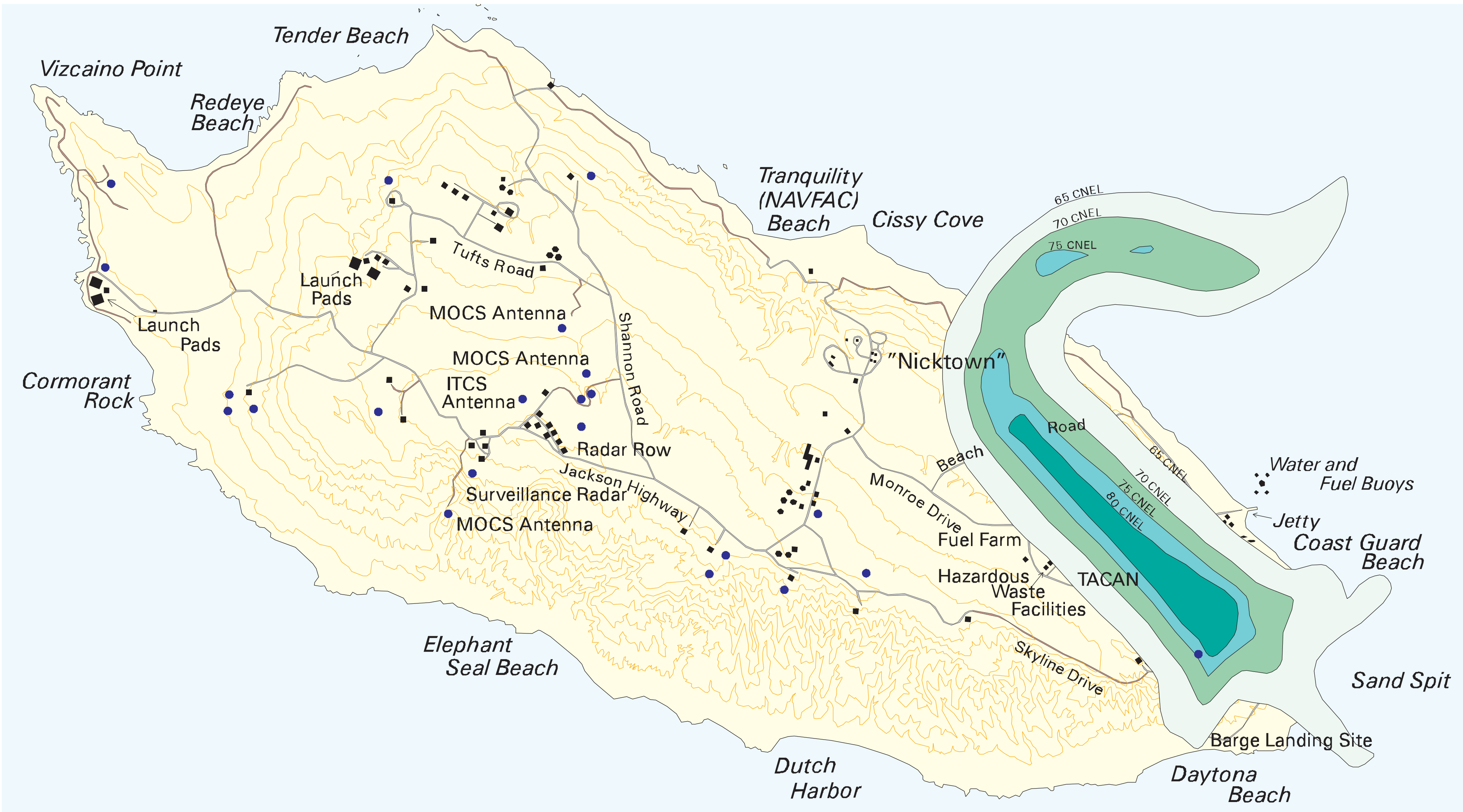
3.3.4 San Nicolas Island

3.3.4.1 Noise from Aircraft Operations

The San Nicolas Island airfield is owned, operated, and maintained by the Navy. It serves as a primary staging area for remote controlled flights conducted by F-4 aircraft. Commuter-type aircraft use the airfield several times each day, transporting personnel to and from NAS Point Mugu. Since no year-round human residents occupy areas near the airfield, AICUZ studies have not been performed. Without performing a rigorous AICUZ noise analysis, baseline noise conditions were assumed to be dominated by F-4 aircraft activity. Any noise contour produced for the airfield would show high noise levels on or immediately adjacent to the runway. These maximum noise levels would be consistent with the noise contours developed for NAS Point Mugu; however, each contour area would be much smaller considering the limited numbers of flights occurring at San Nicolas Island. Maximum noise levels experienced at the island would depend on the proximity of aircraft during an overflight and would be consistent with SEL values calculated for the specific aircraft. Figure 3.3-3 shows estimates of baseline average noise levels at San Nicolas Island, based on the average busy day estimate presented in Table 3.3-7.

Aircraft overflights in support of test operations occur at various locations away from the airfield at San Nicolas Island (NAWCWPNS Point Mugu 1998b). Measurements were conducted for F/A-18 overflight sounds at San Nicolas Island on 5 November 1997. The flights simulated "captive carry" sorties with the Standoff Land Attack Missile (SLAM) AGM-84E, typically flown at airspeeds of 300 to 500 knots (560 to 930 km per hour). ("Captive carry" refers to flights on which the SLAM missile is carried over the

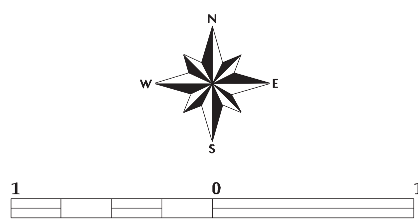
Estimated Existing Noise Contours at San Nicolas Island (Baseline)



Legend

San Nicolas Island
Pacific Ocean
Structures
Instrumentation

Existing Noise Contours
65 - 70 CNEL
70 - 75 CNEL
75 - 80 CNEL
80 - 85 CNEL



Projection: Universal Transverse Mercator, Zone 11
North American Datum of 1927
Scale shown is 1:60,000
Source: Ogden 1997.

sninoise.aml

Figure 3.3-3

Table 3.3-7. Average Busy Day at San Nicolas Island Airfield[1]

Aircraft	Arrivals	Departures	Closed Loop Patterns
CV-440 commuter	3	3	0
CV-580 commuter	1	1	0
C-130	1	1	2
F-4	1	1	2
UH-1 helicopter	1	1	0

Notes:
Runway split = 95% RW 30 and 5% RW 12
All patterns on RW 12 are left hand.
All patterns on RW 30 are right hand.
[1]Average busy day aircraft activity at San Nicolas Island forms the basis for the noise contours shown in Figure 3.3-3.

target by the F/A-18 rather than released.) The A-weighted SPL for the loudest flyover (500 knots [930 km per hour] at 500 feet [150 m]) was 107 dB re 20 µPa. The A-weighted SEL was 109 dB re (20 µPa)^2·s.

3.3.4.2 Noise from Target Launches

Many types of missiles and targets are launched from San Nicolas Island. The largest target currently launched at the island is the Vandal missile (MQM-8). Sound measurements were conducted for two Vandal missile target launches from the Alpha Launch Complex at San Nicolas Island (NAWCWPNS Point Mugu 1998c). The A-weighted SPL observed for the Vandals ranged from 87 dB re 20 µPa at a CPA of 5,500 feet (1,700 m) to 133 dB re 20 µPa at a CPA of 230 feet (70 m). The results of these measurements are shown in Table 3.3-8.

Table 3.3-8. Vandal Target Launch Noise

Location	Range (feet)	Duration (sec)	Peak (dB re 20 µPa)	SPL (dB re 20 µPa)	SEL (dB re [20 µPa]^2·s)
Near launch pad	230	0.76	153.68	133.13	131.75
Redeye Beach	2,900	2.06	148.84	119.45	122.59
Vizcaino South[1]	3,100	0.17	140.04	118.74	110.96
Vizcaino South[2]	1,100	0.62	149.06	120.94	118.86
Bachelor Beach	5,500	4.58	109.70	87.20	93.89

[1] Measured 2 July 1997.
[2] Measured 2 December 1997.
Source: NAWCWPNS Point Mugu 1998c.

Other aerial targets are also launched from San Nicolas Island. The sound levels of these launches are similar to those described earlier for target launches at NAS Point Mugu (see Section 3.3.3.2).

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