3.12 NOISE

Noise is defined as any unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive, stationary or transient. The ROI for noise includes those areas associated with military training airspace and land areas used by the military services for other activities that could result in the exposure of specific land areas to elevated noise levels.

The physical characteristics of noise, or sound, include its intensity, frequency, and duration. Because noise events have a range of characteristics, and the human ear does not respond to sounds of varying frequency and intensity in a linear fashion, various "weighting" factors are applied to noise measurements to produce measured values that correspond to human response. The most commonly used weighting scales are the "A" and "C" scales.

The normal human ear can usually detect sounds that range in frequency from about 20 hertz (Hz) to 20,000 Hz. However, all sounds throughout this range are not heard equally well. Therefore, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted." The "A-weighted" scale is normally used to describe noise arising from transportation and human activities. Values of A-weighted noise are shown in terms of A-weighted decibels (dBA).

In contrast, when describing large amplitude, impulsive sounds such as explosions and weapons noise, the actual total amount of acoustic energy created by the event is an important consideration. Sounds of this nature are normally measured on the "C-weighted" scale, which gives nearly equal emphasis to sounds of most frequencies. Mid-range frequencies approximate the actual (unweighted) sound level, while the very low and very high frequency bands are significantly affected by C-weighting. Values of C-weighted noise are shown in terms of C-weighted decibels (dBC).

The noise metrics (measurements) used to assess noise are the maximum sound level (L_{max}), the sound exposure level (SEL), the A-weighted/C-weighted Day-Night Average Sound Level (ADNL/ CDNL), and the Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Each of these metrics represents a "tier" for quantifying the noise environment. Further discussions of these metrics are presented in Appendix F, *Noise*.

Sound levels calculated for aviation activities in the special use airspace associated with McGregor Range are all L_{dnmr}. The noise levels associated with the detonation of high explosives are all in terms of CDNL. Day-Night Average Noise Level metrics are the preferred noise metrics of the U.S. Department of Housing and Urban Development (HUD), the U.S. Department of Transportation (DOT), the FAA, the EPA, and the Veteran's Administration (American National Standards Institute [ANSI], 1980, 1988; EPA, 1974; Federal Interagency Committee on Urban Noise [FICUN], 1980; Federal Interagency Committee on Noise [FICON], 1992).

Ambient background noise is not considered in the noise calculations that are presented below. In the case of A-weighted noise, there are several reasons for this. First, ambient background noise, even in wilderness areas, varies widely, depending on location and other conditions. For example, studies conducted in an open pine forest in the Sierra National Forest in California have measured up to a 10 dBA variance in sound levels simply due to an increase in wind velocity (Harrison, 1973). Therefore, assigning a value to background noise would be arbitrary. Secondly, and probably most important, is that it is reasonable to assume that ambient background noise in the ROI would have little or no effect on the calculated Day-Night Average Sound Levels. Since noise levels are calculated logarithmically, louder sounds dominate the calculations, and overall, aircraft noise would be expected to be the dominant noise

source characterizing the acoustic conditions in the region. In the case of C-weighted noise, thunder would probably be the only naturally occurring exposure to this noise, and it would be impossible to predict or estimate values for such events.

To assess noise effects, the Army has defined three noise zones to be considered in land use planning. These zones are described by the noise levels to which they are exposed, and, based on sociological considerations, compatible land uses are recommended. These zones are summarized in Table 3.12-1. In general, within Zone I, where very few people will be bothered by noise levels, unrestricted land use is indicated. In Zone II, as outdoor noise levels increase and more people become annoyed at the noise, restrictions or qualifications are placed on certain land uses, specifically regarding residential development. In Zone III, as noise levels escalate, fewer and fewer compatible land uses are indicated.

Table 3.12-1. Land Use Planning Guidelines

Noise Zone	*Population Highly Annoyed*	*Noise Limits*		
		Transportation ADNL	*Impulsive CDNL*	*Small Arms dBP*
I	<15%	<65 dBA	<62 dBC	<87 dBP
II	15-39%	65-75 dBA	62-70 dBC	87-104 dBP
III	>39%	>75 dBA	>70 dBC	>104 dBP

Notes: ADNL = A-weighted Day-Night Average Noise Level, CDNL = C-weighted Day-Night Average Noise Level, dBP = Peak unweighted sound pressure level.
Source: U.S. Army Center for Health, and Preventive Medicine, 1994.

Separate values are provided for A-weighted and C-weighted noise levels. Since these types of noise are measured on different scales, it is not appropriate to sum the noise levels. Therefore, each is measured and considered separately, applying its distinctive criteria for assessment. When applicable, noise associated with small-arms firing is assessed using actual dBP.

As part of the mission at Fort Bliss, Army and USAF aircraft conduct aviation activities within regional military training airspace associated with training ranges. Noise also results from detonation of high explosives and use of other ordnance on training ranges.

3.12.1 Current Noise Levels

3.12.1.1 A-Weighted Noise

Aviation activities associated with Fort Bliss operations occur over the areas designated as North McGregor and South McGregor. These operations involve Army and USAF rotary- and fixed-wing aircraft. These areas correspond to restricted airspace designated R-5103 B/C and R-5103 A/D, respectively. USAF fixed-wing fighter aircraft operating primarily out of HAFB also perform training in R-5103B, using the air-to-ground bombing range in the northern portion of McGregor Range.

Around airports, flight activities follow well-defined patterns. In military training airspace, however, flight activities are more apt to be intentionally random and dispersed, reflecting typical combat maneuvers. As a result of these random flight paths, sound levels in this type of airspace have been found to be uniformly distributed throughout the airspace. Therefore, sound levels in these regions consider not only the speeds, altitudes, and engine power settings of aircraft, but the overall size of the airspace and the time spent in the airspace element as well. Although some aircraft may adhere to specific tracks on a

specific mission (e.g., a C-130 at a drop zone or a helicopter flying an NOE training mission), over time, aircraft flight routes approach random distributions throughout the airspace.

Using the Air Force's Military Operations Area (MOA) Range Noise Assessment Program (MR_NMAP), which is specifically designed to consider these unique aspects of flight within these areas, the uniformly distributed sound levels in terms of L_{dnmr} were calculated for each airspace element. These values under current operations are shown in Table 3.12-2.

Table 3.12-2. Uniformly Distributed Noise Levels in Restricted Areas Under Current Operations

Airspace	*Current Noise Level (in L_{dnmr})*
R-5103B/C (North McGregor)	43
R-5103A/D (South McGregor)	40
North and South McGregor (Combined)	44

Source: Lucas and Calamia, 1994.

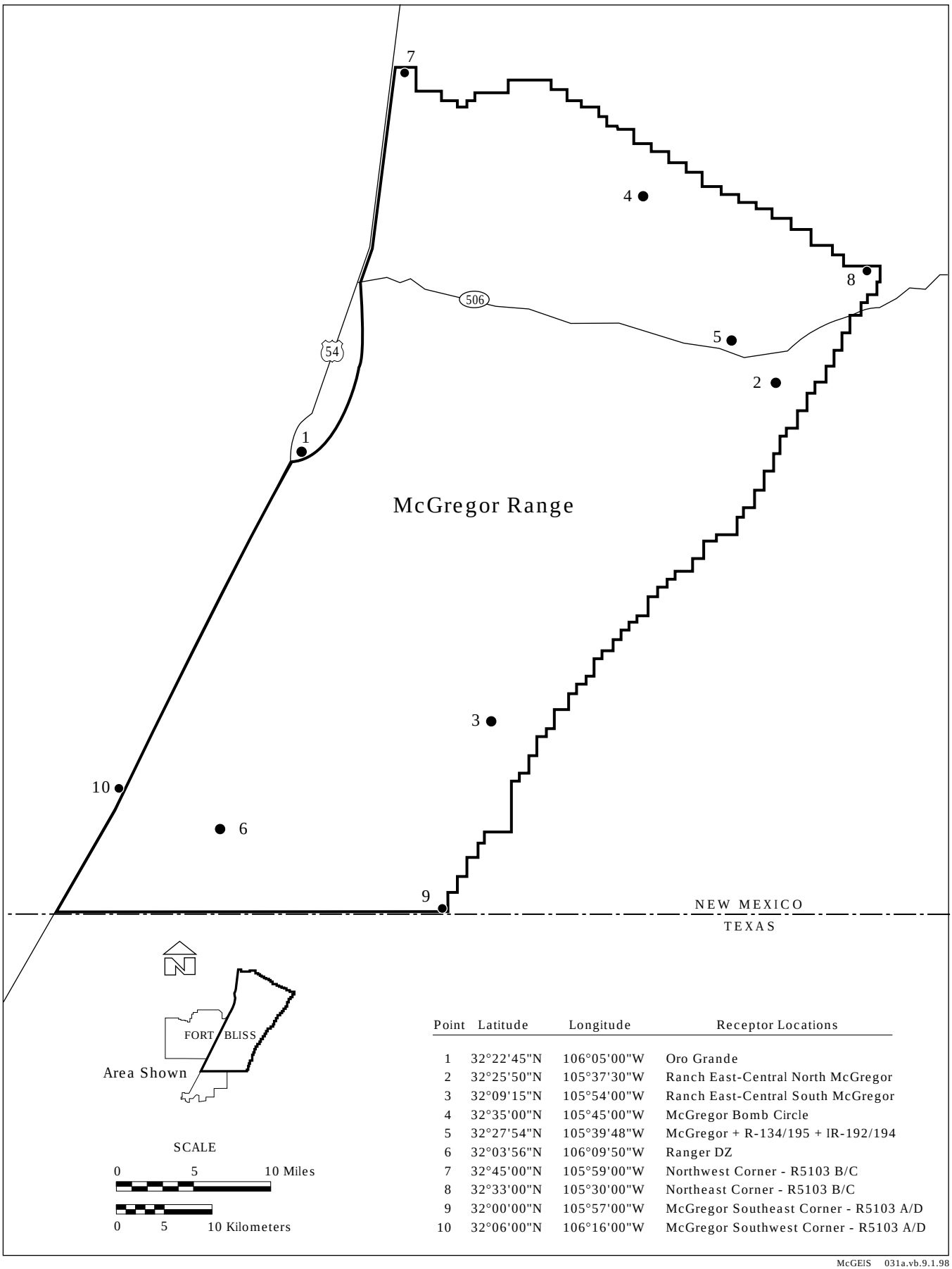
To further assess the noise levels occurring throughout the military training airspace, ten representative ground locations were selected for specific analysis. These specific ground locations represent potential noise receptors in the area, as well as locations where cumulative or concentrated military flight training may occur. These locations, and their noise exposure are addressed in Table 3.12-3. Their location on McGregor Range is illustrated in Figure 3.12-1.

Table 3.12-3. Noise Levels at Specific Points

Point	*Description*	*Noise Level (in L_{dnmr})*
1	Orogrande	39
2	Ranch East-Central North McGregor	47
3	Ranch East-Central South McGregor	46
4	McGregor Bomb Circle	51
5	McGregor Range + IR-134/195 + IR-192/194	52
6	Ranger Drop Zone	35
7	McGregor Northwest Corner Restricted Airspace	35
8	McGregor Northeast Corner Restricted Airspace	47
9	McGregor Southeast Corner Restricted Airspace	35
10	McGregor Southwest Corner Restricted Airspace	36

Source: Lucas and Calamia, 1994.

As shown, under current conditions, all noise levels are compatible with Noise Zone I criteria. No elevated noise levels that would create a Noise Zone II or III condition are expected to extend off the range.



Point	Latitude	Longitude	Receptor Locations
1	32°22'45"N	106°05'00"W	Oro Grande
2	32°25'50"N	105°37'30"W	Ranch East-Central North McGregor
3	32°09'15"N	105°54'00"W	Ranch East-Central South McGregor
4	32°35'00"N	105°45'00"W	McGregor Bomb Circle
5	32°27'54"N	105°39'48"W	McGregor + R-134/195 + lR-192/194
6	32°03'56"N	106°09'50"W	Ranger DZ
7	32°45'00"N	105°59'00"W	Northwest Corner - R5103 B/C
8	32°33'00"N	105°30'00"W	Northeast Corner - R5103 B/C
9	32°00'00"N	105°57'00"W	McGregor Southeast Corner - R5103 A/D
10	32°06'00"N	106°16'00"W	McGregor Southwest Corner - R5103 A/D

McGEIS 031a.vb.9.1.98

Figure 3.12-1. Location of Noise Receptors in the Vicinity of McGregor Range.

3.12.1.2 C-Weighted Noise

Impulsive noise caused by explosives occurs throughout McGregor Range. This includes impact points, ordnance firing points, and the small arms ranges. Noise at all locations has not been specifically modeled to determine noise zones. However, in most instances, the noise is sporadic, and relatively localized to specific areas on the range. Since the range area is designated for ordnance firing and impact, elevated noise levels are expected and are fully compatible with this type of land use.

In order to assess the relative sensitivity of areas off the range to noise occurring on the range, a specific scenario was considered. One range area capable of supporting a significant amount of high explosive is Demolition Area 2. This area is situated approximately 11 miles from U.S. Highway 54, and is approved for the detonation of up to 5,000 pounds of net explosive weight.

The Army's Noise Assessment Prediction System (NAPS) model was used to assess the results of such a detonation. NAPS is a single-event model that generates sound levels based on meteorological conditions. NAPS calculates sound pressure levels (SPLs) in dBP, based on the Trinitrotoluene (TNT)-equivalent weight of the explosive. The model uses a ray trace approach that takes into account spherical spreading, absorption, and refraction. Appendix F presents a more detailed discussion of impulsive noise associated with the detonation of high explosives.

The dBP metric used by NAPS does not reflect the cumulative effects from multiple noise events over time. The preferred metric is CDNL. However, by considering the mathematical relationships between dBP, C-weighted sound exposure level (CSEL), CDNL, and the number of events per day, CDNL values can be derived from the dBP values generated by NAPS.

The scenario was modeled with NAPS, using a U.S. Standard Atmosphere with no winds. For this evaluation, there are two levels of significance. Federal Occupational Safety and Health Administration (OSHA) standards prescribe that an individual should never be exposed to impulsive sounds greater than 140 dBP without hearing protection (29 CFR Ch. XVII § 1926.52[e]). The second is 136.4 dBP, which corresponds (at a rate of one explosion per day) to CDNL 62 dBC, the threshold for Noise Zone II (refer to Appendix F for additional information about the derivation of these values).

The detonation of 5,000 pounds of net explosive weight produces a SPL of 140 dBP or greater out to approximately 5,380 feet from the point of detonation. Safety requirements would preclude any human presence in this zone; therefore, there are no health or safety risks associated with this acoustic level.

Using output from the model, the SPL (in dBP) at 11.2 miles was determined. After converting the into a CSEL, the equation was solved for a single event, and the number of events required to equate that contour to CDNL 62. These calculations indicate that a single event results in CDNL 36 at the range boundary, and that approximately 371 day-equivalent detonations could occur at Demolition Area 2 per day, and the noise level of CDNL 62 (Noise Zone II) would not extend past the range boundary.

The capacity factor is expressed in terms of day-equivalent events. Due to the penalty associated with noise events at night, this equates to about 37 night-equivalent events per day. However, these events can also be combined. For example, 271 day events and 10 night events per day equals 371 day-equivalent events.

This example considered a worst-case scenario. Since all other locations are further removed from the range boundaries, their capacities would be proportionately greater. Furthermore, levels of operations are well below capacities. Based on the above, excessive impulsive noise levels associated with high explosives would not be expected to impact land areas off of McGregor Range.

This Page Intentionally Left Blank