NOISE
TECHNICAL REPORT

High Plains Shooting Sports Center
Shasta County, California

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Executive Summary

This report analyzes the potential noise impacts associated with the construction and operation of High Plains Shooting Sports Center. The shooting facility would include pistol and rifle ranges, a Clay Sports Shooting Area, and Law Enforcement Range. The site is approximately 159.6 acres, and is zoned Limited Residential (R-L). It is located adjacent to large parcels that include rural residences. The distance to the nearest residence would be approximately 1,400 feet from the Clay Sports Shooting Area, approximately 1,600 feet from the pistol and rifle ranges, and approximately 2,600 feet from the Law Enforcement Range.

Noise level performance standards for new projects and maximum allowable noise exposure levels established in the Noise Element of the Shasta County General Plan were used to analyze noise impacts from the proposed project.

RCH conducted noise measurements at the project site on March 12, 2014 to evaluate existing noise conditions as well as the likely noise levels that would be experienced by residences adjacent to the shooting sports center. The measured sound levels were used to estimate sound levels from the project at the nearest residences adjacent to the project site. The test shooting was towards the north similar to the proposed project configuration and noise measurement locations were located to estimate noise levels that would occur at the nearest residences with noise reduction (attenuation) only from distance and also noise reduction (attenuation) from distance and topography.

Review of the three proposed ranges found that no additional attenuation would be required for the law enforcement range, but some noise reduction mitigation would be needed to reduce off-site noise from the pistol and rifle ranges and the Clay Sports Shooting Area. Both the pistol and rifle ranges and the Clay Sports Shooting Area require noise reduction mitigation of 6 dB to meet the county 1-hour average noise level standard of 50 dB at the nearest off-site residences. The most effective means for the mitigation would probably be barriers that block the direct line of sight between the shooter locations and the off-site residences. Noise barriers that block the line of sight typically provide at least 5 dB of noise reduction, so the barrier would need to be slightly higher than the minimum height to block the direct line of sight. Noise barriers work best when they are in close proximity to the noise source or the noise receiver, for this project the best location would be behind the shooters locations in the direction of the closest off-site residences. These mitigations would reduce 1-hour noise levels at the closest off-site residences below the 50 decibel County limit. There would still be audible and sometimes loud impact noise from the gunfire from the range, however, the additional barriers would reduce the decibel level at off-site residences to levels consistent with County standards.

Other than the operational impacts identified above, all of the other potential noise impacts in the CEQA checklist were determined to be "no impact" or less-than-significant impacts.

Introduction

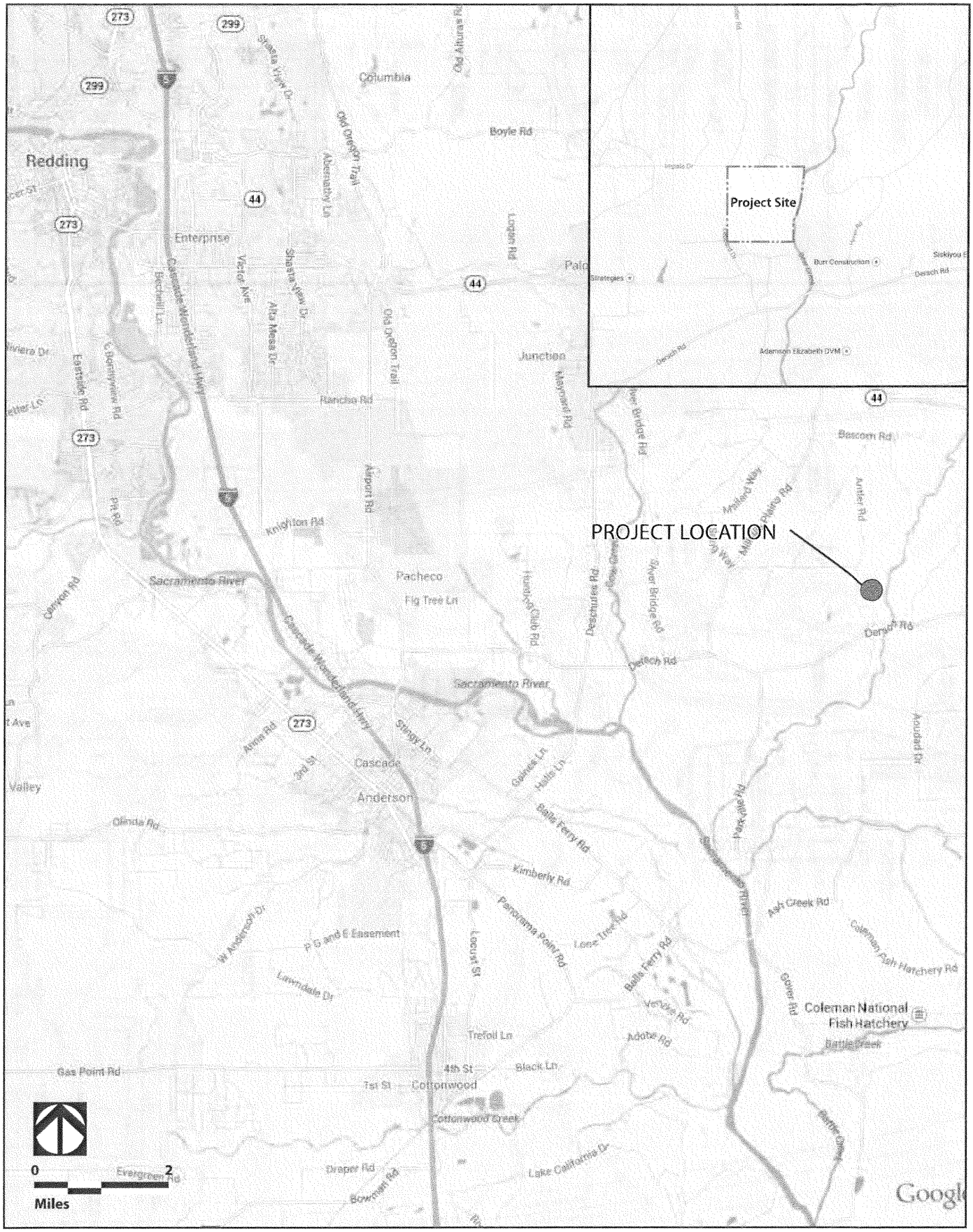
RCH Group (RCH) has conducted an environmental noise assessment for the proposed High Plains Shooting Sports Center (the project). The project would include the construction and operation of an outdoor shooting facility in Shasta County. In order to construct and operate this shooting facility, the project site would need to be rezoned from Limited Residential (L-R) to Commercial Recreation (C-R) District.

The purpose of commercial recreation (C-R) district in Shasta County is for the development of privately owned land for commercial recreational activities which need or utilize, and provide for the enjoyment of, the natural environment (Shasta County 2003). A gun club is listed in the Shasta County Zoning Plan as one of the types of commercial recreation uses that can be permitted in a C-R district.

The project site is located near the census designated place of Millville on one parcel of land (APN 060-010-016-000). The parcel is 159.6 acres and is bordered by Impala Drive on the north, a neighbor to the south, Leopard Drive on the west, and Bear Creek on the east side. **Figure 1** shows the regional location of the project site. The existing zoning designations for the site are Limited Residential (R-L) District, Mobile Home (T) District, and Building Site (B) District.

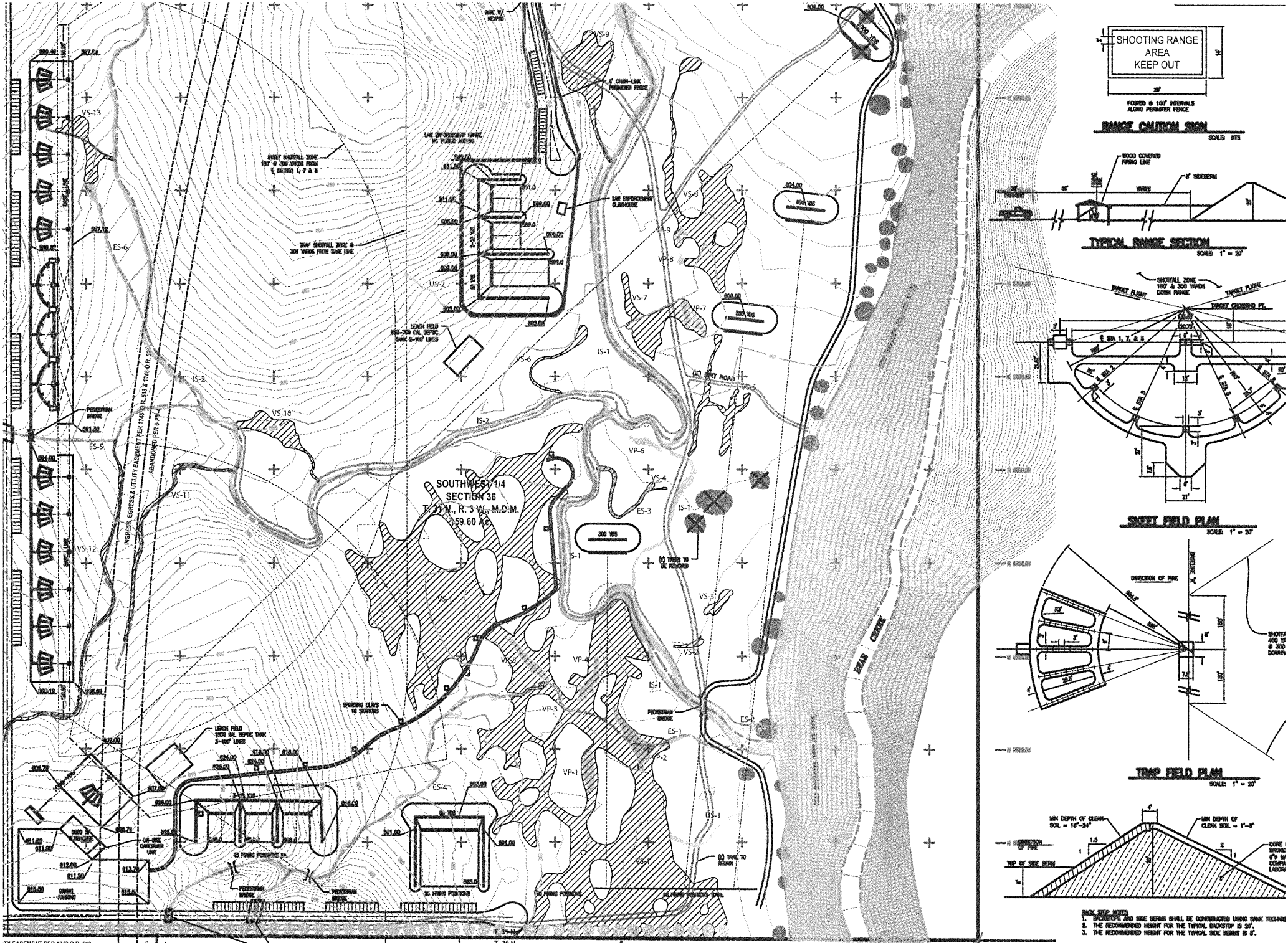
The site plan of the project is shown in **Figure 2**. The facility would include clay pigeon shooting as well as rifle and pistol ranges. The trap and skeet shooting fields would be located at the western edge of the project site, with shooters aiming to the east. In the southern portion of the project site there would be three 25 yard pistol ranges, a 50-yard rifle range and a firing location for targets up to 600 meters away. There is a firing location west of the clubhouse for targets 1,000 yards away. The shooting center would also include a law enforcement range located on the northern portion of the project site.

This report analyzes the noise impacts from the proposed project and is prepared in a format to answer the noise questions in the Initial Study Environmental Checklist Form in Appendix G of the 2012 State CEQA Guidelines.



SOURCE: Google Maps; RCH Group, 2017

High Plains Shooting Sports Center
Noise Technical Report
Figure 1
Regional Location Map


SOUTHWEST 1/4
SECTION 36
T. 31 N., R. 3 W., M.D.M.
59.60 Ac.
SHOOTING RANGE AREA KEEP OUT
RANGE CAUTION SIGN
SCALE: NTS
TYPICAL RANGE SECTION
SCALE: 1" = 20'
SKEET FIELD PLAN
SCALE: 1" = 20'
TRAP FIELD PLAN
SCALE: 1" = 20'
PROPOSED SITE PLAN
SCALE: 1" = 100'
TYPICAL BACKSTOP CONSTRUCTION
SCALE: 1" = 10'
BACK STOP NOTES
1. BACKSTOPS AND SIDE BERMS SHALL BE CONSTRUCTED USING SAME TECHNIQ
2. THE RECOMMENDED HEIGHT FOR THE TYPICAL BACKSTOP IS 20'.
3. THE RECOMMENDED HEIGHT FOR THE TYPICAL SIDE BERMS IS 6'.
INGRESS, EGRESS & UTILITY EASEMENT PER 1748 O.R. 513 & 1746 O.R. 85
ABANDONED PER 6 PM
T. 30 N.

Noise Analysis

	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
XI. NOISE -- Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Impact Analysis:

a) Less-Than-Significant Impact with Mitigation. Potential noise impacts associated with the proposed project would be related to construction and operation of the noise from the project. The applicable noise guidelines as well as the potential impacts of the project, are discussed below.

Noise Descriptors

To describe noise environments and to assess impacts on noise–sensitive areas, a frequency weighting measure, which simulates human perception, is commonly used. It has been found that A–weighting of sound levels best reflects the human ear's reduced sensitivity to low frequencies, and correlates well with human perceptions of the annoying aspects of noise. The A–weighted decibel scale (dBA)[1] is cited

[1]A decibel (dB) is a unit of sound energy intensity. Sound waves, traveling outward from a source, exert a sound

in most noise criteria. Decibels are logarithmic units that conveniently compare the wide range of sound intensities to which the human ear is sensitive. **Table 1** identifies decibel levels for common sounds heard in the environment.

TABLE 1: TYPICAL NOISE LEVELS

Noise Level (dBA)	Outdoor Activity	Indoor Activity
90+	Gas lawn mower at 3 feet, jet flyover at 1,000 feet	Rock Band
80–90	Diesel truck at 50 feet	Loud television at 3 feet
70–80	Gas lawn mower at 100 feet, noisy urban area	Garbage disposal at 3 feet, vacuum cleaner at 10 feet
60–70	Commercial area	Normal speech at 3 feet
40–60	Quiet urban daytime, traffic at 300 feet	Large business office, dishwasher next room
20–40	Quiet rural, suburban nighttime	Concert hall (background), library, bedroom at night
10–20		Broadcast / recording studio
0	Lowest threshold of human hearing	Lowest threshold of human hearing

Source: Modified from Caltrans Technical Noise Supplement, 1998

Several time–averaged scales represent noise environments and consequences of human activities. The most commonly used noise descriptors are the equivalent A–weighted sound level over a given time period (L_{eq});[2] average day–night 24–hour average sound level (L_{dn})[3] with a nighttime increase of 10 dBA to account for sensitivity to noise during the nighttime; and community noise equivalent level (CNEL),[4] also a 24–hour average that includes both an evening and a nighttime sensitivity weighting.

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pressure level (commonly called "sound level") measured in dB. An A–weighted decibel (dBA) is a decibel corrected for the variation in frequency response to the typical human ear at commonly encountered noise levels.

[2]The Equivalent Sound Level (L_{eq}) is a single value of a constant sound level for the same measurement period duration, which has sound energy equal to the time–varying sound energy in the measurement period.

[3]L_{dn} is the day–night average sound level that is equal to the 24–hour A–weighted equivalent sound level with a 10–decibel penalty applied to night between 10:00 p.m. and 7:00 a.m.

[4]CNEL is the average A–weighted noise level during a 24–hour day, obtained by addition of 5 decibels in the evening from 7:00 to 10:00 p.m., and an addition of a 10–decibel penalty in the night between 10:00 p.m. and 7:00 a.m.

Noise Attenuation

Stationary point sources of noise, such as gunfire at a shooting range, attenuate (lessen) at a rate of 6 to 7.5 dBA per doubling of distance from the source, depending on ground absorption. Soft sites attenuate at 7.5 dBA per doubling because they have an absorptive ground surface such as soft dirt, grass, or scattered bushes and trees. Hard sites have reflective surfaces (e.g., parking lots or smooth bodies of water) and therefore have less attenuation (6.0 dBA per doubling). Widely distributed noise, such as a large industrial facility spread over many acres or a street with moving vehicles (known as a "line" source), would typically attenuate at a lower rate, approximately 3 to 4.5 dBA each time the distance doubles from the source, which also depends on ground absorption.[5] Noise from the proposed project event-related activities will exhibit characteristics of both "point" and "line" (e.g., gunfire and vehicles, respectively) sources and attenuation will therefore generally range between 4.5 and 7.5 dBA (depending on the noise source) each time the distance doubles. Physical barriers located between a noise source and the noise receptor, such as berms or sound walls or natural topography, will increase the attenuation that occurs by distance alone.

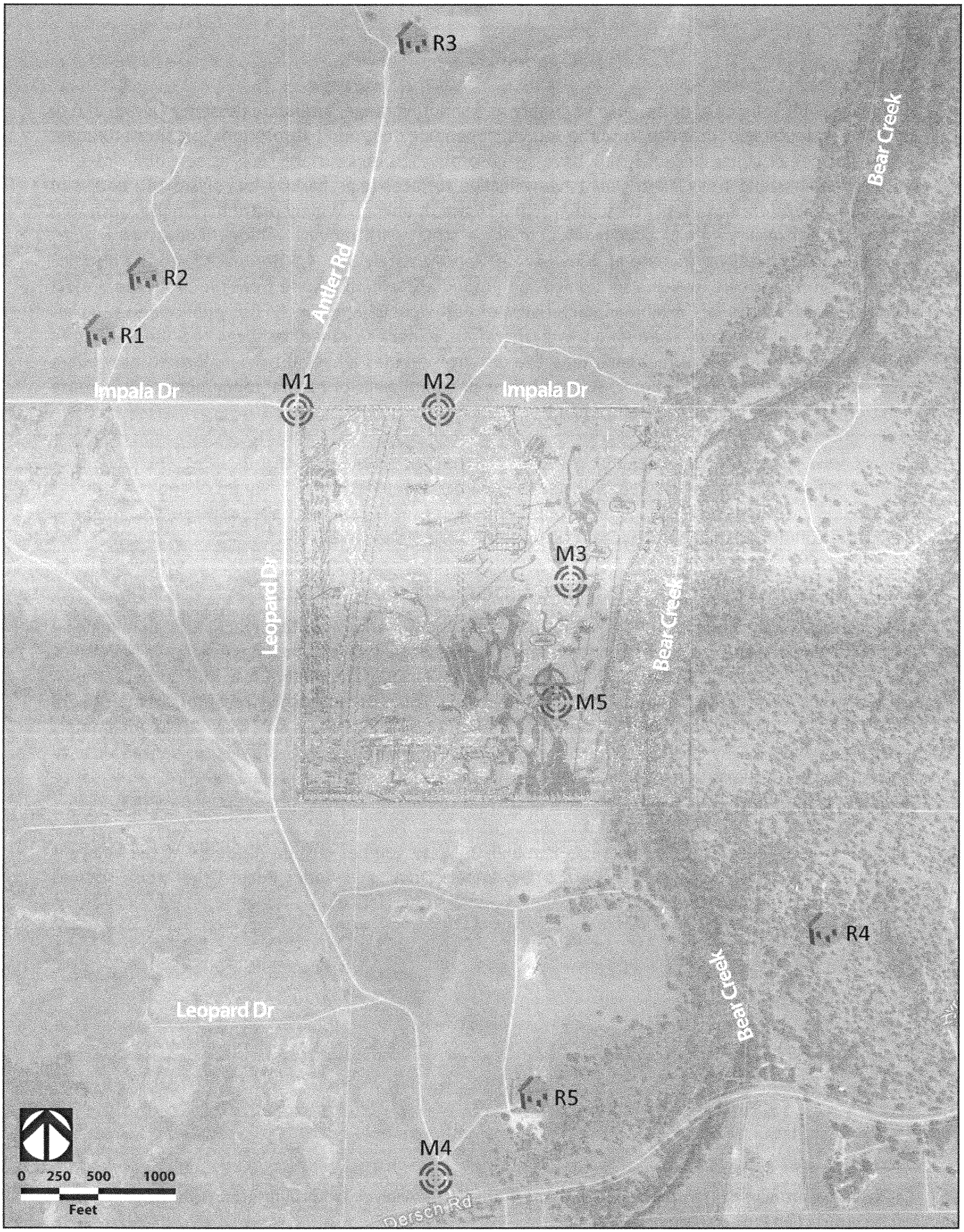
Exterior noise levels from onsite stationary noise sources (i.e., gunfire from pistols, rifles, or shotguns) at the High Plains Shooting Sports Center Project would be attenuated by a minimum of about 7.5 dB for each doubling of the reference distance from the noise source. The project site is surrounded primarily by soft site conditions (such as the vacant fields at the project site).

Existing Sensitive Receptors and Noise Sources/Levels

Noise sensitive receptors (land uses associated with indoor and/or outdoor activities that may be subject to stress and/or significant interference from noise) typically include residential dwellings, hotels, motels, hospitals, nursing homes, educational facilities, and libraries. The project site is surrounded by land that is zoned Limited Residential (R-L). The nearest sensitive receptors to the site are single family residences northwest of the project site (R1 and R2 shown on **Figure 3**), approximately 1,400 feet from the Clay Sports Shooting Area. There are a few other single family residences close to the project site including a residence 1,580 feet to the southeast of the project site (R4), a residence 1,790 feet to the south (R5), and a residence 2,500 feet to the north of the project boundary (R3).

Existing ambient noise at the project site is minimal. Noise sources include residents of the adjacent properties as well as vehicles on Leopard Drive, Impala Drive, and Antler Road. Other noise sources include cattle, birds, and other wildlife.

[5] California Department of Transportation (Caltrans), Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects, October 1998.



= Residence (R) = Sound Measurement Locations (M) = Gun Firing Location

SOURCE: Google Maps; RCH Group, 2017

High Plains Shooting Sports Center
Noise Technical Report
Figure 3
Sensitive Receptor Locations

Noise Standards

Shasta County General Plan

Shasta County does not have a noise ordinance, however the Noise Element of the Shasta County General Plan serves as a guideline in the development of a noise-compatible land uses (Shasta County, 2004). The Noise Element contains the following three objectives:

1. To protect County residents from the harmful and annoying effects of exposure to excessive noise
2. To protect the economic base of the County by preventing incompatible land uses from encroaching upon existing or programmed land uses likely to create significant noise impacts
3. To encourage the application of state-of-the-art land use planning methodologies in the area of managing and minimizing potential noise conflicts.

The Shasta County Noise Element contains noise level performance standards for new projects affected by or including non-transportation sources (**Table 2**). The criteria contained in the table have been established for determining potential noise conflicts between various land uses and noise sources, and are based upon an hourly L_{eq}; the hourly noise level for an hour (Shasta County, 2004). Since the proposed project will result in recurring impulsive noises, the noise level performance standard would be lowered by 5dB, to 50dB during the daytime and 45dB during nighttime hours. The General Plan also contains maximum allowable noise exposure levels from transportation noise sources (**Table 3**). For residential land uses, transportation noise sources should not exceed 60 dB in outdoor activity areas and 45 dB in interior spaces.

Applicable Policies

The following policies from the Shasta County General plan are also relevant to the proposed project.

N-b Noise likely to be created by a proposed non-transportation land use shall be mitigated so as not to exceed the noise level standards of Table N–IV (**Table 2** of this report) as measured immediately within the property line of adjacent lands designated as noise-sensitive. Noise generated from existing or proposed agricultural operations conducted in accordance with generally accepted agricultural industry standards and practices is not required to be mitigated.

N-c Where proposed non-residential land uses are likely to produce noise levels exceeding the performance standards of Table N–IV (**Table 2** of this report) upon existing or planned noise-sensitive uses, an acoustical analysis shall be required as part of the environmental review process so that appropriate noise mitigation may be included in the project design.

N-d The feasibility of proposed projects with respect to existing and future transportation noise levels shall be evaluated by comparison to Table N–VI (**Table 3** of this report).

N-f Noise created by new transportation sources shall be mitigated to satisfy the levels specified in Table N–VI (**Table 3** of this report) at outdoor activity areas and/or interior spaces of existing noise-sensitive land uses. Transportation noise shall be compared with existing and projected noise levels shown in Tables N-I and N-II (**Table 4** of this report).

N-g Existing noise-sensitive uses may be exposed to increased noise levels due to future roadway improvement projects as a result of increased traffic capacity and volumes and increases in travel speeds. In these instances, it may not be practical to reduce increased traffic noise levels consistent with those contained in Table N-VI (**Table 3** of this report). Therefore, as an alternative, the following criteria may be used as a test of significance for increases in the ambient outdoor activity areas of the noise level of noise-sensitive uses created as a result of a new roadway improvement project:

- Where existing traffic noise levels are less than 60 dB Ldn, a +5 dB Ldn increase will be considered significant; and
- Where existing traffic noise levels range between 60 and 65 dB Ldn, a +3 dB Ldn Increase will be considered significant; and
- Where existing traffic noise levels are greater than 65 dB Ldn, a + 1.5 dB Ldn increase will be considered significant.

N-i Where noise mitigation measures are required to achieve the standards of Tables N-IV (**Table 2** of this report) and N-VI (**Table 3** of this report), the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving compliance with the noise standards only after all other practical design-related noise mitigation measures have been integrated into the project. Note: Existing dwellings and new single-family dwellings are not subject to County review with respect to satisfaction of the standards of the Noise Element. As a consequence, such dwellings may be constructed in areas where noise levels exceed the standards of the Noise Element. It is not the responsibility of the County to ensure that such dwellings meet the noise standards of the Noise Element, or the noise standards imposed by lending agencies such as HUD, FHA and Cal Vet. If homes are located and constructed in accordance with the Noise Element, it is expected that the resulting exterior and interior noise levels will conform to the HUD/FHA/Cal Vet noise standards.

Table 2: (Table N-IV of the Shasta County General Plan)

Noise Level Performance Standards for New Projects Affected by or Including Non-Transportation Sources

Noise Level Descriptor	Daytime (7a.m. to 10p.m.)	Nighttime (10p.m. to 7a.m.)
Hourly Leq, dB	55	50

The noise levels specified above shall be lowered by 5 dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

The County can impose noise level standards which are more restrictive than those specified above based upon determination of existing low ambient noise levels.

In rural areas where large lots exist, the exterior noise level standard shall be applied at a point 100'away from the residence.

Industrial, light industrial, commercial, and public service facilities which have the potential for producing objectionable noise levels at nearby noise-sensitive uses are dispersed throughout the County. Fixed-noise sources which are typically of concern include, but are not limited to, the following:

HVAC Systems	Cooling Towers/Evaporative Condensers
Pump Stations	Lift Stations
Emergency Generators	Boilers
Steam Valves	Steam Turbines
Generators	Fans
Air Compressors	Heavy Equipment
Conveyor Systems	Transformers
Pile Drivers	Grinders
Drill Rigs	Gas or Diesel Motors
Welders	Cutting Equipment
Outdoor Speakers	Blowers

The types of uses which may typically produce the noise sources described above include, but are not limited to: industrial facilities including lumber mills, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields.

Note: For the purposes of the Noise Element, transportation noise sources are defined as traffic on public roadways, railroad line operations, and aircraft in flight. Control of noise from these sources is preempted by Federal and State regulations. Other noise sources are presumed to be subject to local regulations, such as a noise control ordinance. Non-transportation noise sources may include industrial operations, outdoor recreation facilities, HVAC units, loading docks, etc.

Source: Shasta County, 2004

Table 3: (Table N-VI from the Shasta County General Plan)
Maximum Allowable Noise Exposure
Transportation Noise Sources

Land Use	Outdoor Activity Areas[1] L_{dn}/CNEL, dB	Interior Spaces	
		L_{dn}/CNEL, dB	L_{eq}, dB[2]
Residential	60[3]	45	--
Transient Lodging	60[4]	45	--
Hospitals, Nursing Homes	60[3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls	60[3]	--	40
Office Buildings	--	--	45
Schools, Libraries, Museums	--	--	45
Playgrounds, Neighborhood Parks	70	--	--

[1]Where it is not practical to mitigate exterior noise levels at patio or balconies of apartment complexes, a common area such as a pool or recreation area may be designated as the outdoor activity area.

[2]As determined for a typical worst-case hour during periods of use.

[3]Where it is not possible to reduce noise in outdoor activity areas to 60 dB Ldn/CNEL or less using a practical application of the best-available noise reduction measures, exterior noise levels of up to 65 dB Ldn/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.

[4]In the case of hotel/motel facilities or other transient lodging, outdoor activity areas such as pool areas may not be included in the project design. In these cases, only the interior noise level criterion will apply

Source: Shasta County, 2004

Table 4: (Data from Tables N-I and N-II of the Shasta County General Plan)
Noise Contour Data Distance (Feet) From Center of Roadway to L_{dn} Contours
Dersch Road: East of Deschutes Road to State Route 44

Existing (1996)		Future (Year 2020)	
60 dB	65 dB	60 dB	65 dB
101	47	152	70

Source: Shasta County, 2004

Noise Impacts from Construction

The proposed project includes the construction of a 5,000 square foot clubhouse, clay sports shooting fields, pistol and rifle ranges, a law enforcement shooting range, as well as roads and parking areas. The rifle and pistol shooting areas would require the construction of earthen backstops. A six foot chain link perimeter fence would also be installed, and the road to the project site would be paved.

Construction would last for approximately four to five months and this analysis assumes that all construction would occur in the daytime hours between 7 a.m. and 7 p.m. Construction activities would require the use of numerous pieces of noise-generating equipment, such as excavating machinery (e.g., backhoes, bulldozers, excavators, trenchers, front loaders, etc.) and road building equipment (e.g., compactors, scrapers, graders, etc.). Construction-related material haul trips would raise ambient noise levels along local haul routes, depending on the number of haul trips made and types of vehicles used. Construction activities would occur primarily during the daytime, increasing the ambient noise levels above existing conditions, which could be annoying to people at sensitive receptor locations in the area.

The noise levels generated by construction equipment would vary greatly depending upon factors such as the type and specific model of the equipment, the operation being performed, the condition of the equipment and the prevailing wind direction. The highest noise levels associated with construction typically occur with earth moving equipment, which includes excavating machinery (e.g., backhoes, bulldozers, excavators, trenchers, front loaders, etc.) and road building equipment (e.g., compactors, scrapers, graders, etc.). Construction traffic would include worker traffic and delivery of delivery of materials and equipment needed for construction.

The maximum noise levels for various types of construction equipment that would be required to build the proposed shooting facility are provided in **Table 5**, Typical Noise Levels from Construction Equipment. The maximum noise levels from most of the Proposed Project construction equipment at 50 feet would be in the mid to high 80 dBA range. However, the average sound level of the construction activity would also depend upon the amount of time that the equipment would operate and the intensity of the construction activity. It is estimated that the average noise level that would occur during proposed construction activities would be approximately 85 dBA at 50 feet.

Table 5: Typical Noise Levels from Construction Equipment

Construction Equipment	Noise Level (dBA at 50 feet)
Dump Truck	88
Portable Air Compressor	81
Concrete Mixer (Truck)	85
Scraper	88
Jackhammer	88
Dozer	87
Paver	89
Generator	76
Backhoe	85

Source: Cunniff, Environmental Noise Pollution, 1977

Construction activities associated with the project would result in noise impacts to the residents of the adjacent properties. Noise from construction activities generally attenuate at a rate of 6.0 to 7.5 dBA per doubling of distance from the source. Where topography or physical structures obstruct the line of sight from the noise-producing equipment to the receptor location, noise levels would be further reduced (generally by at least 5 dBA).

Table 6 provides the estimated outdoors and indoors noise levels at the sensitive receptor locations in the project vicinity given the noise attenuation rate of 7.5 dBA, the estimated average construction noise level of 85 dBA at 50 feet, and the ability for residences with closed windows to attenuate indoor noise levels by at least an additional 25 dBA.

Table 6: Estimated Construction Noise Levels at Sensitive Receptor Locations

Sensitive Receptor	Distance (Feet)	Noise Level (dBA Outdoors)	Noise Level (dBA Indoors)
R5 -South Residence (Road Construction)	685	57	32
R5 - South Residence (Project site boundary)	1,800	46	21
R2 - Northwest Residence	1,230	50	25
R1 - Northwest Residence	1,270	50	25
R4 - Southeast Residence	1,550	48	23
R3 - North Residence	2,440	43	18

Source: RCH Group 2014

Note: All references are to from the residences to the nearest place of potential construction at the project site. In addition road construction noise is also estimated for Residence R5 because road construction would be closer to R5 than construction occurring at the project site.

These noise level estimates are conservative because they do not account for any additional noise attenuation from topography. As indicated in **Table 6**, outdoor construction daytime noise levels would be as high as 57 dBA at the residence south of the project site (R5 on **Figure 3**). Because normal residential structures with closed windows would attenuate noise levels by at least 25 dBA, proposed construction activity noise levels within this residence would be an estimated 32 dBA. It should be noted that this maximum average noise level would occur for a minimum of time at this location, while the roadway construction activities would be at the closest distance to residence R5. As the linear road construction would proceed along the route and away from receptor R5, noise levels would decrease. For the purposes of this noise analysis, indoor average noise levels of 45 dBA (see **Table 3**, maximum allowable noise exposure for interior spaces) or higher would constitute a significant short-term nuisance to sensitive receptors. Therefore, the all project construction would be less than significant.

Noise Impacts from Operations

The shooting sports center would be open five days a week (Wednesday- Sunday) from 7:30 a.m. until dark. Noise impacts from the project would be generated by traffic traveling to and from the facility as well as gunfire at the shooting sports center.

Noise from the Shooting Sports Range

RCH conducted noise measurements at the project site on March 12, 2014 to evaluate existing noise conditions as well as the likely noise levels that would be experienced by residences adjacent to the shooting sports center. RCH collected noise measurements using Metrosonics dB308 Sound Level Meters. Sound levels were recorded at five locations simultaneously while a shooter fired several types of guns representative of those that would be used at the proposed shooting sports center. The guns included a .22 rifle, 12 gauge shotgun, 9 mm handgun and a 4570 rifle. The measured sound levels were used to estimate sound levels from the project at the nearest residences adjacent to the project site. The locations of the sound level meters during the testing are shown on **Figure 3**. The noise meters were

in locations to assess noise levels behind the shooter, unmitigated noise in front of the shooter, and noise levels north, northwest and south of the shooter. The shooter changed guns each five minutes and fired twenty rounds of the .22 rifle the first five minutes, then 10 rounds with the 12 gauge, then 10 rounds of the 9 mm handgun, then 10 rounds with the 4570 rifle. The shooting was towards the north similar to the proposed project configuration. During the tests, RCH staff monitored sound level meters at noise measurement test locations M1, M4 and M5 and recorded L_{max} levels seen on the sound level meters during the tests. Sound level meters at locations M2 and M3 recorded automatically and therefore were not affected by any inadvertent noise potentially caused by the RCH staff observers at the other locations.

Noise measurements at locations M2 and M3 were used as reference distance points to the off-site locations.[6] Location M3 was not affected by any terrain on the site and provided the best reference data to estimate the maximum noise levels at the off-site receptors based only on attenuation of noise levels by distance alone. Location M2 was affected by existing natural topography and provides data for estimating the noise levels at receptors R1 – R3. Measurement location M1 was used as a quality check on location M2 as both locations should have similar noise measurement results (and they did). Measurement location M4 was used to check the noise levels near residence R5 to the south. Although the RCH staff observer at location M4 could hear the faint noise of distant gunfire, the noise levels were below the lower detection level of the noise meter (41 dBA). All measurements at location M4 (both the Lmax and the Leq) were dominated by traffic from Dersch Road.

Noise from the Rifle Range

The Rifle Range is shown in Figure 2 at the southern portion of the property with firing directed to the north. The estimates of noise from the rifle range are presented in Tables 7 and 8. Table 7 estimates the noise level based upon distance attenuation only. Table 8 estimates the noise levels based on distance attenuation and topographic attenuation from the natural hills on the north end of the project site that provided attenuation to noise meter location M2.

[6] As mentioned earlier (see Attenuation discussion), stationary point sources of noise, such as gunfire at a shooting range, attenuate (lessen) at a rate of 6 to 7.5 dBA per doubling of distance from the source, depending on ground absorption. Location M2 and M3 were used as locations for the reference distance and corresponding reference noise levels for each gun tested.

Table 7: Estimated Noise Levels from Gunfire at Rifle Range (No Intervening Topography)

Residence	Distance (Feet)	.22 Rifle		9mm Handgun		Distance (Feet)	4570 Rifle	
		Lmax	Leq	Lmax	Leq		Lmax	Leq
R1	3280	37	27	54	31	3570	70	44
R2	3480	37	26	53	30	3710	70	44
R3	4770	33	23	50	27	4770	67	41
R4	1610	45	34	62	39	1610	79	53
R5	1870	43	33	60	37	1870	77	51

Source: RCH Group 2014

Notes: Estimated noise levels in this table are based on the reference noise levels and distances measured at location M3, which was not shielded by topography; an attenuation rate of 7.5 decibels per doubling of the distance was assumed.

Distances were measured 100 feet from each residence to closest point on rifle range where each firearm would be fired. Leq is based on 240 rounds per hour for the .22 rifle and 120 rounds per hour for the 9mm handgun and 4570 rifle.

Estimates were based on reference noise levels at M3. The 22 Rifle was 54 dB Lmax and 43 dB Leq. 9mm handgun was 71 dB Lmax and 48 dB Leq. 4570 Rifle was 88 dB Lmax and 62 dB Leq.

The County General Plan Noise Element indicates that non-transportation impulsive noise should not result in a 1-hour average noise level greater than 50 dBA.

Table 8: Estimated Noise Levels from Gunfire at Rifle Range (Mitigated by Hillside Topography)

Residence	Distance (Feet)	.22 Rifle		9mm Handgun		Distance (Feet)	4570 Rifle	
		Lmax	Leq	Lmax	Leq		Lmax	Leq
R1	3280	45	39	45	39	3570	46	38
R2	3480	44	38	45	38	3710	45	37
R3	4770	41	35	41	34	4770	43	35
R4	1610	52	46	53	46	1610	54	46
R5	1870	51	45	51	45	1870	53	45

Source: RCH Group 2014

Notes: Estimated noise levels in this table are based on the reference noise levels and distances measured at location M2, which was shielded by existing topography; an attenuation rate of 7.5 decibels per doubling of the distance was assumed.

Distances were measured 100 feet from each residence to closest point on rifle range where each firearm would be fired. Leq is based on 240 rounds per hour for the .22 rifle and 120 rounds per hour for the 9mm handgun and 4570 rifle.

Estimates were based on reference noise levels at M2. The 22 Rifle was 50 dB Lmax and 44 dB Leq. 9mm handgun was 51 dB Lmax and 44 dB Leq. 4570 Rifle was 52 dB Lmax and 44 dB Leq.

The County General Plan Noise Element indicates that non-transportation impulsive noise should not result in a 1-hour average noise level greater than 50 dBA.

The County General Plan Noise Element indicates that non-transportation impulsive noise should not result in a 1-hour average noise level greater than 50 dBA (see Table 2, daytime, 5 dB reduction for impulsive noises). The Lmax in the above tables is an indication of the unshielded peak noise (Table 7) and the shielded peak noise (Table 8) at the nearest receptors (R1 – R5). The hourly Leq is affected by the Lmax for each gun, sound energy in each gunfire, and the number of rounds that would be fired in an hour.

The noise level attenuations are seen most clearly in the comparison of the 4570 rifle between Tables 7 and 8. The reductions in Table 8 are not as obvious for the .22 rifle and the 9 mm handgun as the levels were more similar at location M2. This was probably because the noise levels were not as loud for the .22 rifle and 9 mm handgun and background noise and the lower detection limit of the noise meter could have masked the differences in estimated attenuations for these guns. The Lmax levels are near or below 50 dBA. Although the Lmax exceeds 50 dB, when averaged over longer time spans the hourly average noise level would be much reduced.

Based on the estimates in Tables 7 and 8, the receptors to the north should be below the hourly Leq standard of 50 dBA with the attenuation provided by the natural topography to the north. The nearest residences to the south (R4 and R5) will need to have equivalent or better noise attenuation because the estimates include levels of attenuation from topography that currently do not exist to the south. Mitigation will need to be added between the rifle range and the receptors to the south. To be most effective, the barriers should probably be located immediately behind the shooters, so the noise is attenuated at the shooter location. Noise barriers work best when they are in close proximity to the noise source or the noise receiver. As seen in Table 7 (with attenuation by distance alone), residences R4 and R5 are only slightly above the 50 dBA standard. Table 7 shows an hourly level of 53, which is 3 dB above the standard. With more gunfire in an hour the average noise levels would be increased so attenuation by barriers would be needed at to mitigate noise at residences R4 and R5. This would require a noise barrier reduction (or sound absorption system) that would reduce noise by 6 decibels. With the 6- decibel reduction towards the off-site receptors to the south, the average noise would be less than the 1-hour average 50 dB limit.

Noise from the Law Enforcement Range

The Law Enforcement Range is shown on Figure 2 at the north central portion of the property with firing directed to the northwest. Tables 9 and 10 are noise level attenuations for the proposed Law Enforcement Range and are based upon the reference noise measurements for the 9mm handgun. Based on the unmitigated levels in Table 9, the hourly Leq levels should be less than the 50 dBA threshold (without any additional barriers). The unmitigated Lmax values in Table 9 are in the 50 dBA range and would be very obvious to surrounding residences. Table 10 considers the natural topographic attenuation that was measured and show that the Lmax levels would fall below 50 dBA (with the addition of topographic or other additional attenuation). Based on the estimates in Tables 9 and 10, all the receptors should be below the hourly Leq standard of 50 dBA. The range is planned to be built into the hill on the north but should still benefit from the topography on the north end of the project site. As shown on Figure 2, a berm or wall would be part of the southern end of the Law Enforcement Range. The southern berm or wall of the proposed Law Enforcement Range would block the line of site to the residences to the south. No additional noise mitigation would be needed.

Table 9: Estimated Noise Levels from Gunfire at Law Enforcement Range (No Intervening Topography)

Residence	Distance (Feet)	9 mm Handgun	
		Lmax	Leq
R1	2690	56	33
R2	2570	56	33
R3	2750	56	33
R4	3280	54	31
R5	3670	53	30

Source: RCH Group 2014

Notes:

Estimated noise levels in this table are based on the reference noise levels and distances measured at location M3, which was not shielded by topography; an attenuation rate of 7.5 decibels per doubling of the distance was assumed.

Distances were measured 100 feet from each residence to closest point where pistols would be fired. Leq is based on 120 rounds per hour.

Estimates were based on reference noise levels at M3. The 9mm handgun was 71 dB Lmax and 48 dB Leq.

The County General Plan Noise Element indicates that non-transportation impulsive noise should not result in a 1-hour average noise level greater than 50 dBA

Table 10: Estimated Noise Levels from Gunfire at Law Enforcement Range (Mitigated by Hillside Topography)

Residence	Distance (Feet)	9 mm Handgun	
		Lmax	Leq
R1	2690	47	41
R2	2570	48	41
R3	2750	47	40
R4	3280	45	39
R5	3670	44	37

Source: RCH Group 2014

Notes: Estimated noise levels in this table are based on the reference noise levels and distances measured at location M2, which was shielded by existing topography; an attenuation rate of 7.5 decibels per doubling of the distance was assumed.

Distances were measured 100 feet from each residence to closest point where pistols would be fired. Leq is based on 120 rounds per hour.

Estimates were based on reference noise levels at M2. The 9mm handgun was 51 dB Lmax and 44 dB Leq.

The County General Plan Noise Element indicates that non-transportation impulsive noise should not result in a 1-hour average noise level greater than 50 dBA.

Noise from the Clay Sports Shooting Area

The Clay Sports Shooting Area is shown on Figure 2 at the western boundary of the property with firing directed to the east. Tables 11 and 12 are noise level attenuations for the proposed Clay Sports Shooting Area and are based upon the reference noise measurements for the 12 gauge shotgun.

There are factors for the Clay Sports Shooting Area that will cause unmitigated noise levels to fall between the level shown in Tables 11 and 12. The noise levels will be less than in Table 11 because there will be some excess attenuation from topography at the off-site receptors and because in most cases the direction of the shooting is away from the off-site receptors and gun noise is loudest in the direction of the target. Firearms do not emit equal sound energy in all directions, but, rather, have a directivity property. Sound is loudest on-axis (directly ahead) with the muzzle and quietest directly behind the firearm. However, the noise levels may not be as low as shown in Table 12 because the topographic attenuation will not be as great as was experienced in the shooting tests and applied to Table 12. With increased shooting levels (above 120 rounds per hour) the average noise levels could exceed the 1-hour 50 dB noise level at receptors, using estimates in either Table 11 or 12. Assuming that the shooting rate could go to 480 rounds per hour or higher, the predicted Leq noise levels in the tables would rise by 6 dBA and approximately 6 dBA of attenuation would be needed to stay below the 1-hour average 50 dB noise level. Noise barriers that block the line of sight typically provide at least 5 dB of noise reduction, so the barrier would need to be slightly higher than the minimum height to block the direct line of sight. With the addition of a mitigation barrier (that would be slightly higher than the minimum height to block the direct line of sight from the shooters to the off-site receptors), the average noise would be less than the 1-hour average 50 dB limit.

Table 11: Estimated Noise Levels from Gunfire at Clay Sports Shooting Area (No Intervening Topography)

Residence	Distance (Feet)	12 Gauge Shotgun	
		Lmax	Leq
R1	1410	78	50
R2	1440	78	49
R3	2690	71	43
R4	3540	68	40
R5	2850	71	42

Source: RCH Group 2014

Notes:

Estimated noise levels in this table are based on the reference noise levels and distances measured at location M3, which was not shielded by topography; an attenuation rate of 7.5 decibels per doubling of the distance was assumed.

Distances were measured 100 feet from each residence to closest point where shotguns would be fired. Leq is based on 120 rounds per hour.

Estimates were based on reference noise levels at M3. The 12 gauge shotgun was 88 dB Lmax and 57 dB Leq.

The County General Plan Noise Element indicates that non-transportation impulsive noise should not result in a 1-hour average noise level greater than 50 dBA

Table 12: Estimated Noise Levels from Gunfire at Clay Sports Shooting Area (Mitigated by Hillside Topography)

Residence	Distance (Feet)	12 Gauge Shotgun	
		Lmax	Leq
R1	1410	62	48
R2	1440	61	48
R3	2690	55	41
R4	3540	52	38
R5	2850	54	40

Source: RCH Group 2014

Notes:

Estimated noise levels in this table are based on the reference noise levels and distances measured at location M2, which was shielded by existing topography; an attenuation rate of 7.5 decibels per doubling of the distance was assumed.

Distances were measured 100 feet from each residence to closest point where shotguns would be fired. Leq is based on 120 rounds per hour.

Estimates were based on reference noise levels at M2. The 12 gauge shotgun was 58 dB Lmax and 44 dB Leq.

The County General Plan Noise Element indicates that non-transportation impulsive noise should not result in a 1-hour average noise level greater than 50 dBA.

Noise from Traffic

Existing traffic noise in the vicinity of the site is generated primarily by vehicles traveling on Dersch Road. The project would result in an increase of traffic on Dersch Road as well as Leopard Drive. RCH used noise contour distances (for Dersch Road) from the Shasta County General Plan in combination with the Federal Highway Administration (FHWA) Traffic Noise Model FHWA-RD-77-108 to estimate noise level increases from the project. The analysis assumed 200 vehicle trips per day going to the shooting range with 50 percent of the trips coming from the east[7], to identify noise increases that could occur at residence R5, which is the closest residence to Dersch Road (see **Figure 3**). All 200 daily trips would travel on Leopard Drive from Dersch Road to the shooting range. The analysis showed that the noise from traffic would be increased by about 0.5 dBA at residence R5, based on the new traffic on Dersch Road and Leopard Drive (from 49.3 to 49.8 dBA). The traffic noise levels at residences R1 – R4 were all less than 40 dBA. At all receptor location the potential increases in noise from traffic would be less than significant.

b) Less-than-Significant Impact.
Groundborne vibration or groundborne noise levels are only an impact with there is major construction within 25 feet of any building or 100 feet of a historic building (Caltrans, 2002 and Caltrans, 2004).

Construction on the roadways and project site would be the only sources of groundborne vibration or groundborne noise levels. The closest residence to the construction of the roadways or improvements at the project site is the residence to the South (R5) that would be approximately 685 feet from the entry road project boundary. At this distance, project construction would not expose persons to or generate excessive groundborne vibration or groundborne noise levels. Therefore, this would not be a significant impact.

c) Less-than-Significant Impact with Mitigation. As discussed above in a), the proposed project would potentially increase the noise levels above the County 1-hour average noise level of 50 dB. The barrier mitigation measures identified in a) would reduce the noise levels at off-site residences to comply with County noise standards in the General Plan.

d) Less-than-Significant Impact. As discussed above in a), the proposed project would result in an incremental increase in periodic noise levels in the area due to construction of the proposed project. The noise increase would be a less-than-significant impact.

e) No Impact. The proposed project site would not be located within an area covered by an airport land use plan or within two miles of a public or public use airport. The closest airport is Redding Municipal Airport which is 6.4 miles to the West of the project site. Development on the site would not expose people working or visiting in the project area to excessive airport noise levels and no impact would occur.

[7] It is assumed that most trips to the shooting range would arrive from west, however, since R5 is to the east of the entrance on Dersch Road, a conservative approach was to use 50 percent of the traffic from the east in the noise model to assure that any noise increase would not be underestimated.

f) No Impact. There are no private airstrips located near the proposed project site and therefore would not expose future employees and visitors of the proposed project site to excessive aircraft noise levels. The proposed project would not increase onsite exposure to aircraft noise. Thus, no impact would occur.

References

California Department of Transportation (Caltrans), *Technical Noise Supplement*, 1998.

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