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October 13, 2011

Mohammad Javanbakht
Director of Real Estate Development
Criswell Radovan LLC
1336-D Oak Avenue
St. Helena, CA 94574

Subject: Bat Roost Compensation Plan for Aetna Springs Retreat Project, Pope Valley Napa County, California

Dear Mr. Javanbakht

This letter provides a conceptual plan to replace the loss of bat roosting habitat resulting from the proposed rehabilitation of historic buildings at the former Aetna Springs Resort in Pope Valley, Napa County, California (Figures 1 and 2). The current proposed project is referred to as the Aetna Springs Retreat. The project site is located along the northwest edge of the Pope Valley in Napa County, California. The site is situated in T 9 and 10 N, R 6 W of the Mount Diablo Base and Meridian, on the USGS 7½ minute Aetna Springs California. quadrangle. The site is accessed by Aetna Springs Road via Pope Valley Road. A location map is provided in Figure 1 and 2.

INTRODUCTION

The compensation plan presented in this report is based on a review of pertinent literature and information gained from field surveys conducted by the Central Coast Bat Research Group (CCBRG) and LSA in 2007. An additional survey was conducted by LSA on September 2, 2011, to update available information and determine if any notable changes had occurred to the bat roosts since 2007.

Background

In 2007, the CCBRG conducted a bat survey, including acoustic monitoring and mist netting, of 22 historic structures at Aetna Springs to assess potential effects to bat roosts from rehabilitation of the structures (CCBRG 2007a). The CCBRG survey provided a detailed overview of bat use of the buildings. During June 2007, CCBRG also conducted a bat assessment of six additional structures not included in the initial assessment (CCBRG 2007b). The CCBRG reports are provided in Attachment. LSA provided additional independent review in 2007 of the biological issues (including bats) involved with the rehabilitation project and worked with CCBRG to recommend compensation measures for effects to bat roosts. Three artificial roost structures (i.e., bat houses) were designed by CCBRG and were constructed in 2007; however, monitoring plans were not implemented at the time. The LSA field survey conducted on September 2, 2011 concluded that there have not been any notable changes to project site conditions since 2007, and therefore the data on bat use of the historic structures at Aetna Springs provided in the CCBRG reports is likely still valid.

The CCBRG reports were prepared in consideration of a different potential plan for the project and the action items noted in CCBRG 2007a are not entirely consistent with the current plans for the proposed Retreat project. Therefore, LSA has prepared this bat compensation plan that better reflects the current proposed project.

Bat Use of Historic Buildings

The CCBRG report documented the presence of a diverse bat assemblage in the area of Aetna Springs consisting of eleven (possibly twelve) species. Six of these bat species were documented using historic buildings or were considered likely to use buildings at the resort. These buildings are identified on Figure 3. Various buildings provide night, day, and maternity roosting habitat. Seven buildings are identified by CCBRG as very high/high value habitat: Dining Hall (1), York (29) and/or Dewey (28), Hartson (21), Owl's Nest (22), Main House (11), Living Quarters (13), and Linen Room/Bunk House (15). Two other buildings, Winship (17) and Social Hall (2) were determined to have medium use; all the other buildings at the resort were considered as having low to no value to bats (CCBRG 2007a and b).

Both Townsend's big-eared bat and pallid bat are considered species of special concern by the California Department of Fish and Game (CDFG). Effects to their roosts would not be considered significant under CEQA so long as the project incorporates measures to provide new bat roosting space and protect bats. The applicant has included such measures in its plans to rehabilitate and operate Aetna Springs Resort.

A maternity roost of Townsend's big-eared bat (*Corynorhinus townsendii*) was documented in either Dewey or York (CCBRG 2007a); however, which building the colony was located in is unclear based on the information in the report. The Hartson and Owl's nest buildings were identified as possible maternity roost locations for Townsend's big-eared bat (CCBRG 2007a). The Aetna Springs Resort has long been known as a maternity roost location for Townsend's big-eared bat (Pearson et al., 1952), but a state-wide assessment of this species conducted in the 1990s identified no adult females at the Aetna Springs site (Pierson and Rainey 1998). A pallid bat (*Antrozous pallidus*) maternity roost was identified in the attic of the Living Quarters (13). The Winship and Social Hall buildings are identified as medium value day roosting and night roosting habitat for many species including Townsend's big-eared and pallid bats.

Other species of bats using the historic buildings at the resort include Yuma myotis (*Myotis yumanensis*), California myotis (*Myotis californicus*), big brown bat (*Eptesicus fuscus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*). These species are not considered species of special concern, but effects to maternity roosts of these bats could be considered significant under Napa County CEQA criteria unless the project were designed as it is, so as not to "impede the use of native wildlife nursery sites."

Many of the historic buildings at the Aetna Springs Resort are unsuitable for bat roosts because they have deteriorated to the point where they do not offer interior spaces attractive to bats. For example, a number of the buildings have collapsed roofs that expose attic space to sun and wind. In time, all the historic buildings at the resort will be degraded by wind, rain, and or fire to the point where they do not provide suitable bat habitat. Many of the buildings currently being used by bats appear to be rapidly deteriorating and will not provide bat habitat in the near future.

Bat Use of Existing Houses

As noted above, the previously constructed artificial roost structures have never been monitored to determine their success as bat roosts. LSA biologist, Eric Lichtwardt, inspected all three artificial roost structures during the 2011 survey. No bats were observed in the structures but small amounts of bat guano were seen on the floor of all three structures. The small amount of guano suggests that the structures are being used occasionally as night roots by small numbers of bats. The structures were originally designed to provide 1 inch crevices (considered preferable for bat roost sites) between the 2 x 6 inch roof supports, but the crevices as constructed are about 2 inches wide which may not provide suitable roosting space for most bat species.

COMPENSATION PLAN

The Bat Roost Compensation Plan proposes renovation of the existing artificial roost structures and construction of one or more new structures. The compensation plan also proposes monitoring of artificial roost structures to determine their success as bat roost compensation.

Success Criteria

Seven very high to high value structures (including five used as maternity roots) and two medium value structures for bats will be lost for bat use as a result of the proposed rehabilitation; however, the numbers of the various bat species using these structures is unavailable. Therefore, the goal of the compensation plan will be to replace the roost space being lost in the building rehabilitation. A successful compensation plan should provide a 1:1 ratio (roost space lost: roost space constructed). This may be accomplished by constructing a single large artificial roost structure with multiple interior and/or exterior roost chambers and open loft spaces to accommodate the roosting requirement of the various bat species using the historic structures. Alternatively, several smaller structures may be constructed (or the existing structures modified) with various combinations of open loft spaces and roost chambers. To determine the size/number of the artificial roost structures, an estimate of the amount of roost space being lost will be calculated. For example, 20 feet of liner crevice space in a historic structure could be compensated by constructing a roost chamber containing five chambers 4 feet wide, 20 inches high and ¾ to 1 ½ wide.

The following criteria for successful compensation are adopted from the *Bat Builder's Handbook* (Tuttle et al, 2004). *California Bat Mitigation Techniques, Solutions and Effectiveness* (H.T. Harvey & Associates 2004) provided additional information on bat houses. Constructing successful artificial roosts for bats is still an evolving science. Many factors need to be taken into consideration for an artificial roost to be successful: roost design, construction materials, wood treatment, sun exposure, internal temperature regime, surrounding habitat including water sources, and other factors. Artificial roosts will be tailored specifically to mimic the roosts being affected to the greatest extent feasible. Monitoring artificial roosts after construction to determine their use by bats is essential to assess compensation success and will be a part of the proposed project. Monitoring will include identification of the bat species using the artificial roost structures and in what capacity (e.g., maternity roosts, day roosts, night roosts, etc). Periodic maintenance of artificial roost structures may also be needed to insure they are in good working order.

Artificial roost structures will be located within areas set aside to ensure long-term protection of the roost sites. These areas will be fenced to minimize human disturbance. To ensure continued maintenance and monitoring of the artificial roost structures a program will be established in consultation with CDFG to accomplish of these activities.

Roost Design. One or more artificial roost structures to compensate for the loss of bat roosts at Aetna Springs will be designed to accommodate both crevice roosting bats (such as the pallid bat) and bats that prefer to roost in open cavities (such as the Townsend's big eared bat). This could be accomplished by constructing a structure that mimics a small barn with open semi-dark interior spaces interspaced with wooden bat nursery boxes attached to the ceiling of the structure. The nursery boxes could include multiple roosting chambers with ¾ and 1 to 1½ inch spaces. Several nursery boxes could be constructed, some with ¾ inch chambers for smaller bats such as Yuma myotis and other with larger 1 to 1½ inch chambers for large bats such as pallid bat or big brown bat.

Openings on one or two sides of the artificial roost structure will be incorporated into the design to allow access to bats. The openings will be designed to allow free access to bats, but minimize light exposure to the interior space. An exterior hood could be incorporated into the design of the opening to minimize light exposure.

The size of the artificial roost structure or structures will be large enough to accommodate bats of multiple species and provide maternity roost space for Townsend's big-eared bats and pallid bats.

Timing of Artificial Roost Construction. Artificial roost structures will be constructed and put in place between October 1 and March 30. The artificial roosts will be completed before bats are excluded from historic buildings.

Construction Materials and Wood Treatment. The artificial roost structure or structures will be constructed using ½ inch or thicker exterior plywood. The surface of the wood used to construct the interior chambers and the open ceilings will be roughened to provide a foothold for bats. The wood on the interior of the bat houses will also be protected with a dark water-based stain. Ideally, old sound wood recycled from existing bat roosts in the historic structures would be incorporated into the artificial roost structures.

Sun Exposure and Internal Temperature Regime. Sun exposure is an important consideration when locating an artificial roost structure. The structures will be located in an area where sun exposure heats the internal space of the structure to temperatures between 80 and 100 degrees Fahrenheit during the summer months. Important factors to consider include orientation of the structure relative to the arch of the sun, number of hours per day the structure is exposed to full sun, color (light, medium, or dark) of the structure (roof and sides), and placement of vents in the structure.

Surrounding Habitat. The artificial roosts will be placed near a water body in open forested habitat. The structure will be located in an area where human activity is low. A suitable area for a large artificial roost structure would be in the open oak woodland near the eastern end of Pond 1 just south of Aetna Springs Road. This location would provide bats easy access to water and a diversity of foraging habitats including the open wash along Schwartz Creek. If an artificial roost structure is placed in this area, human access would be restricted so as to not disturb bats that are present.

Existing Artificial Roost Structures. The existing artificial roosts constructed in 2007 are located just southeast of the vineyard access bridge at the western edge of the resort area, just south of the pond in the western portion of the resort area, and just south of the dam at the eastern end of the pond. These structures are being used by bats, but not at a level to fully replace the proposed loss of roosts from restoration of the resort. As noted above, these structures appear to be only occasionally used as night roosts. This is apparent by the small amount of bat guano that has accumulated over the four years that these structures have been in place. If these structures are incorporated into the compensation plan, they will be modified to make them more attractive to bats. Specifically, additional crevices will be constructed adjacent to the 2-inch gaps between the 2 x 6 inch roof supports. The surface of the wood within the gaps will be roughened to provide a foothold for bats. The wood on the interior will also be protected with a dark water-based stain. The bat house at the western corner of the project area in the Aetna Springs Vineyard will be relocated to an area with restricted human activity. Its location in an area of relatively high human activity is incompatible with its intended use as a bat roost.

If these structures are included in the compensation plan, their internal temperature will be monitored during the bat maternity season to determine if the range in temperature is within suitable limits for Townsend's big-eared bats (approximately 80 and 100 degrees Fahrenheit). The structures also may not be dark enough to provide optimal roost habitat for bats. As noted above, the existing structures could be modified by placing an exterior hood over the entrances that reduces interior light levels.

Monitoring Plan

Existing (if included in the plan) and new artificial roost structures will be monitored to determine their success in attracting roosting bats. The monitoring plan will include a list of criteria and goals so the success of the compensation plan can be evaluated. The plan will include at least two surveys per year for a period of at least five years. At least one monitoring survey will be conducted at the height of the bat maternity season (May to July). Monitoring will include identification of the species (to the extent feasible) using the roost and in what capacity (i.e., maternity, night, day, roost) and the approximate number of each species of bats using the structure. Data to be collected may include emergence counts of bats and acoustic monitoring. After the five-year monitoring period, an assessment of the artificial roost structures will be completed to determine if the initial compensation goals have been met. If the initial goals have not been met after the completion of the five-year monitoring program, remedial or corrective measures will be implemented to make the artificial roosts more attractive to bats. Such measures, if necessary, will be specified in the five year assessment. Any recommended remedial or corrective measures provided in the five-year assessment will be developed in consultation with California Department of Fish and Game (CDFG).

Agency Coordination

The Townsend's big-eared and pallid bats are considered California species of special concern by the CDFG. Therefore, the monitoring plan and the design of the artificial roost structures will be developed in consultation with CDFG before bats are excluded from the historical buildings at the resort. In addition, the proposed artificial roost locations and the associated program for maintenance and monitoring will we developed in consultation with the CDFG.

Bat Exclusion at Existing Buildings and Construction Monitoring

Bat exclusion will be conducted at all historic structures before construction activities begin. Bats can be excluded from structures by using netting or other devices that allow bats to leave the structure but not get back in. Netting or other exclusion devices may need to be designed for specific openings where bats are coming and going. Bat exclusion netting or other devices will be put in place during the season when buildings are not being used as maternity roosts. To ensure the least adverse affect on bats the exclusion will be conducted between October 1 and March 30. Buildings that have recently (within the last year) been used by bats as night or maternity roots will be deconstructed in phases. The first phase will involve making the roost sites (e.g., attics) unattractive to bats by removing parts of walls or roofs that enclose the roost site; thus exposing the roost to sunlight and drafts. This will be accomplished between October 1 and March 30.

In addition, buildings that have been used by bats will be surveyed prior to construction activities. A qualified biologist will monitor the initial phases of work on buildings with history of high bat use. If bats are found during such work, they would be relocated by a qualified biologist to a predetermined site that provides suitable day roost habitat, such as an artificial roost structure. A construction-monitoring plan detailing the procedures discussed above will be developed in consultation with the CDFG before rehabilitation work on historic structures is started.

If you have any questions please contact me at (510) 376-5694 or e-mail eric.lichtwardt@lsa-assoc.com.

Sincerely,

LSA ASSOCIATES, INC.

Eric Lichtwardt
Senior Biologist

Encl: Attachments
Central Coast Bat Research Group (CCBRG) 2007a, 2007b

REFERENCES

Central Coast Bat Research Group. 2007a. Draft report for the bat assessment survey for the Aetna Springs Resort Property. Prepared for the Aetna Preserve, St. Helena, California. 37 pp.

Central Coast Bat Research Group. 2007b. Bat assessment of six additional buildings to be added to the bat assessment survey for the Aetna Springs Resort Property.

H.T. Harvey & Associates. 2004. California bat mitigation techniques, solutions and effectiveness. Prepared for the California Department of Transportation (Caltrans) and the California State University Sacramento Foundation.

Pearson, P., Mary R. Koford, and K. Pearson. 1952. Reproduction of the lump-nosed bat (*Corynorhinus rafinesquii*) in California. Journal of Mammalogy 13 (3): 273-319.

Pierson, E.D. and W.E. Rainey. 1998. Distribution, status, and management of Townsend's big-eared bat (*Corynorhinus townsendii*) in California. Submitted November 1994 to wildlife management division bird and mammal conservation program final report for contract number FG7129. BMCP (updated and finalized May 1998). Technical report number 96-7. California Department of Fish and Game. Sacramento, California.

Tuttle, M.D., and M. Kiser, and s. Kiser. 2004. The bat house builder's handbook. Bat Conservation International. Austin, Texas.

LSA

FIGURE 1

N

0 5 10

MILES

SOURCE: ©2006 DeLORME. STREET ATLAS USA®2006.

Aetna Springs Resort
Bat Roost Compensation Plan

Regional Location

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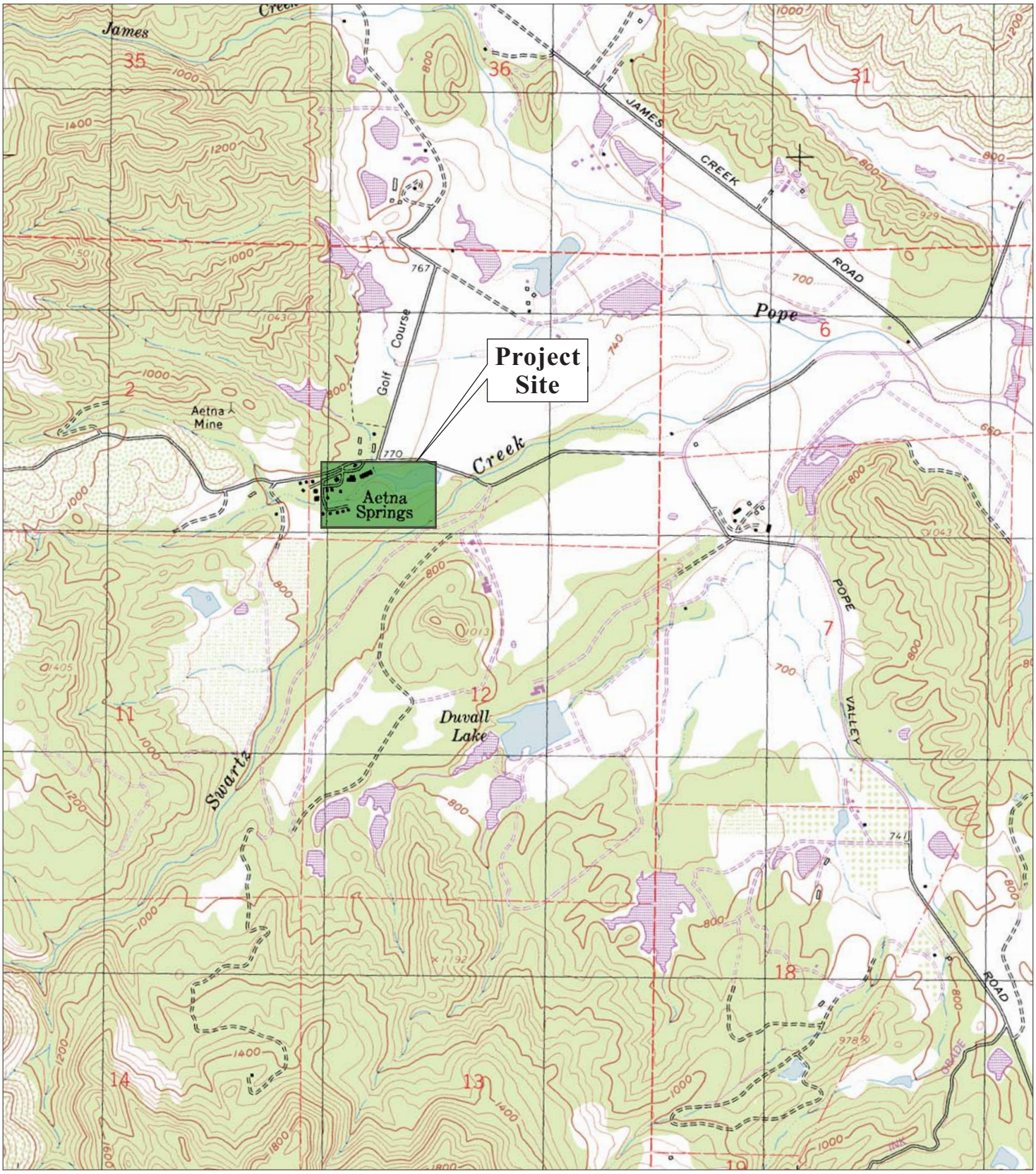

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FIGURE 2

SOURCE: USGS 7.5' QUAD - AETNA SPRINGS, CALIF.

Aetna Springs Resort
Bat Roost Compensation Plan
Project Location

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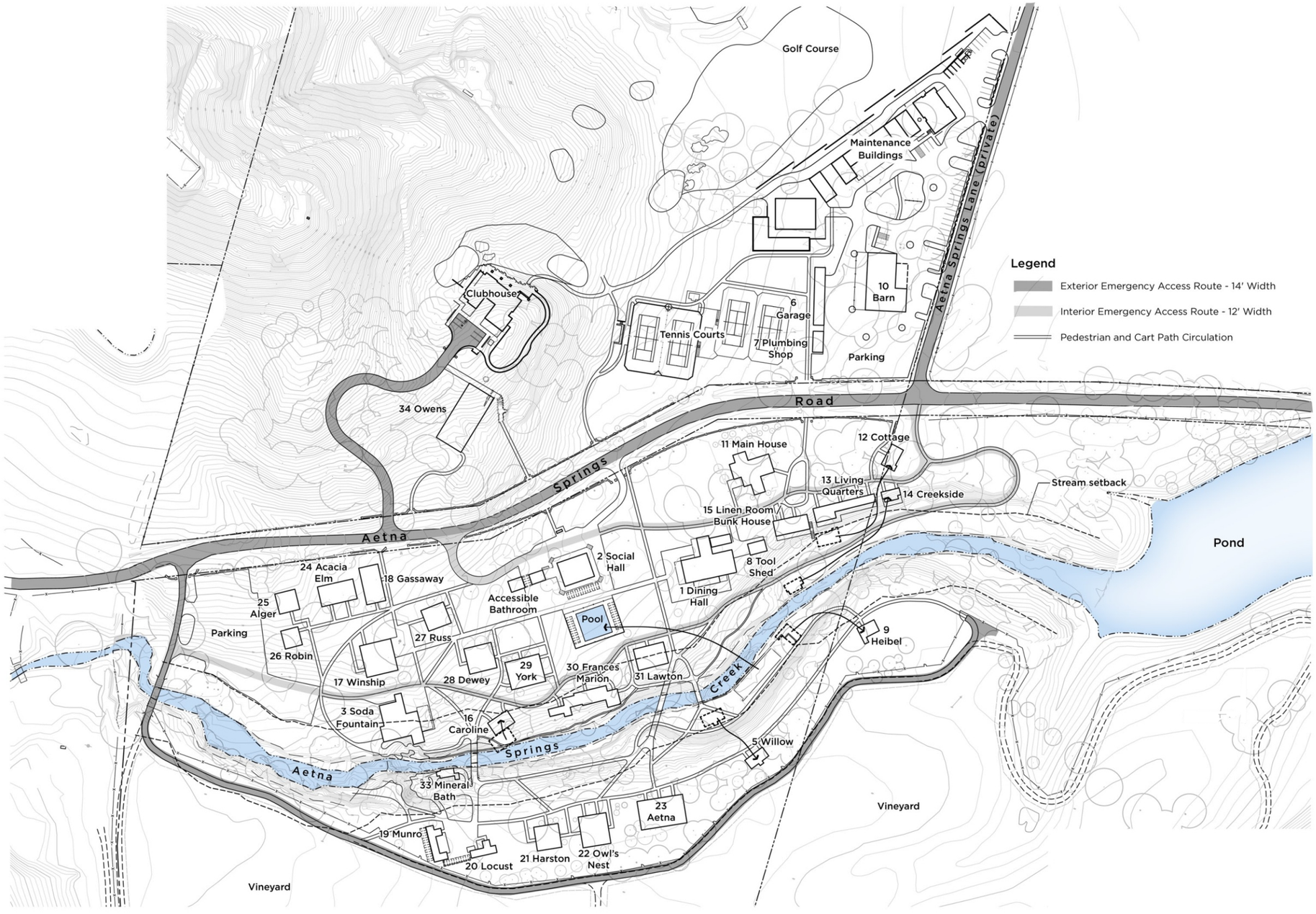

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FIGURE 3

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0 90 180

FEET

SOURCE: SMITH+SMITH

Aetna Springs Resort
Bat Roost Compensation Plan

Proposed Conceptual Site Plan

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Final Report for the Bat Assessment Survey for Aetna Springs Resort Property

Introduction

Special-status bat species

There are sixteen bat species known to occur in the Napa County area. Seven of these species have some level of special-status (see Table 1). The focus of bat surveys was on the Aetna Springs resort structures and out buildings. To best place the building habitat significance in context the surrounding area was surveyed to assess weather there exist alternative roosting habitat for the bat species found roosting in the buildings. Particular attention was given to the oak woodland habitat with an emphasis on bat use of the trees for roosting.

Roosts

Bats use structures, such as bridges and buildings, for roosting habitats, including day roosts, night roosts, and maternity roosts. Day roosts are areas where bats are able to spend the non-active period of the day resting or in torpor, depending on the weather conditions. Day roosts provide shelter from the elements and safety from predators. Night roosts are used by bats to rest between foraging bouts, to allow for digestion of prey, to escape from predators, as shelter from weather, and possibly for social purposes. Night roosts are typically sites that retain heat from the day to aid the bats in maintaining the higher metabolism necessary for digestion. Maternity roosts are sites that provide protection from the elements and predators and provide the correct thermal environment for reproduction. Maternity roost sites tend to be warmer in temperature because breeding females need to maintain a high metabolism to aid in lactation and juvenile bats need to keep warm to maintain a metabolic rate that allows for rapid growth. Winter roosts are usually areas that have a stable low temperature suitable for hibernating or prolonged periods of torpor.

METHODS

Building surveys

All of the buildings in the project were visually investigated to determine if bats are using the structure for day roosting, night roosting, or maternity roosts. Buildings were surveyed during the day for day and maternity roost assessment. All bats were identified to species and any sign such as guano, staining, or culled insect parts, were identified and quantified when possible. Structures thought to provide roosting habitat but it was not

feasible to visually identify the species or the number of bats required emergence watches and or acoustic monitoring.
Due to the large number of buildings and the complexity of the structures the initial survey period is focused on determining the suitability and level of bat use of each building. This allowed for efficient and accurate observation of bat use during the maternity season June through August.

BUILDING SURVEY SCHEDULE

Survey period	Number of days	Number of buildings surveyed
March 18-24	3	23
July 2-5	2	12
August 22-26	2	12

Mist-net and acoustic surveys for habitat assessment
Mist nets were placed to capture bats in the project area to assess species diversity. Bats captured in mist-nets were identified to species and assessed for reproductive condition, sex, and age. Mist net sites were placed in selected sites that are both suitable for netting and likely to have high bat activity. Four nights of mist netting were conducted, four nights mid June through August and.

MIST NETTING SURVEY SCHEDULE

Survey period	Number of Nights	Number of nets deployed
March 18-24	0	4
July 2-5	2	4
August 22-26	1	4

Acoustic monitoring was done with six Anabat II bat detector and storage zero crossing analyzers to collect acoustic files of the echolocation calls of the bats. The Anabat systems use a bat detector to detect bat ultrasonic echolocation calls in the field and use a zero-crossing unit to convert the detected signals into frequency/time graphs to be viewed on a laptop computer. The graphs allow for bat species identification. Species are identified by their vocal signature graphs by comparing calls recorded during previous mist-netting activities, calls recorded from bats that are visually identified at the time of recording, and by comparing calls with existing bat vocal signature library databases. The Anabat system is commonly used for the survey of bats and is effective at identifying many species in the bat fauna assemblage (Table 3). Six acoustic detector units were deployed around the project area and ran consecutive nights for five nights in late March, two five night periods mid June through August and five nights in October to assess bat activity and bat diversity. In addition, active acoustic monitoring using the AnaPocket software will be used to assess bat emergence patterns in the area.

ACOUSTIC SURVEY SCHEDULE

Survey period	Number of Days	Number of detector systems deployed
March 18-24	7	9
July 2-5	4	6
August 22-26	5	6

Table 1. Bat Species Expected to Occur In the Napa County Region

Family VESPERTILIONIDAE (Plain-nosed or mouse-eared bats)

Myotis lucifugus	MYLU	Little brown myotis	
Myotis yumanensis	MYYU	Yuma myotis	
Myotis evotis	MYEV	Long-eared myotis	**FSC/BLMS**
Myotis thysanodes	MYTH	Fringed myotis	**FSC/ BLMS/WBWG**
Myotis volans	MYVO	Long-legged myotis	**FSC/ BLMS/WBWG**
Myotis californicus	MYCA	California myotis	
Myotis ciliolabrum	MYCI	W. small footed myotis	**FSC/BLMS**
Lasionycteris noctivagans	LANO	Silver-haired bat	
Pipistrellus hesperus	PIHE	Western pipistrelle	
Eptesicus fuscus	EPFU	Big brown bat	
Lasiurus blossevillii	LABL	Western red bat	**FSS/WBWG**
Lasiurus cinereus	LACI	Hoary bat	
Corynorhinus townsendii	COTO	Townsend's big-eared bat	**FSC/CSC/FSS/BLMS/WBWG**
Antrozous pallidus	ANPA	Pallid bat	**CSC/FSS/BLMS/WBWG**

Family MOLOSSIDAE (Free-tailed bats)

Tadarida brasiliensis	TABR	Mexican free-tailed bat	
Eumops perotus	EUPE	Western mastiff bat	**CSC/FSS/BLMS/WBWG**

FSC = Federal Special Concern species (former Category 2 candidates for ESA listing)
CSC = California Department of Fish and Game's California Special Concern species
FSS = Forest Service Sensitive species
BLMS = Bureau of Land Management Sensitive species
WBWG = Western Bat Working Group High Priority species

For more information on the meaning of these listings, please visit the Calif. Depart. of Fish and Game's California Natural Diversity Database website at www.dfg.ca.gov./whdab/assest/docs/spanim2001_Jan.pdf

Table 2. Species known to use structure roosts

Species	Structure Roost Type
M.yumanensis	DR, NR
M.evotis	DR,NR
M. thysanodes	DR, NR
M. volans	DR, NR
M. californicus	DR, NR
E. fuscus	DR, NR
C. townsendii	DR, NR
A. pallidus	DR, NR
L. noctivagans	NR
T. brasiliensis	DR, NR
Species not associated with structures	
L. cinereus	Trees
L. blossevilli	Trees

NR = night roost; DR = day roost;

Pierson, E.D., W.E. Rainey, and C.J. Corben. 2001. Seasonal patterns of bat distribution along an altitudinal gradient in the Sierra Nevada. Technical report for California Department of Transportation, California State University at Sacramento Foundation, The Yosemite Association, and The Yosemite Fund.

Table 3. Anabat Acoustic Analysis Capabilities

Species	Probability of detection	Probability of Identification	Phonic Group
M. lucifugus	high	low	M40 kHz
M.yumanensis	high	med	M50 kHz
M.evotis	med	high	
M. thysanodes	med	high	
M. volans	high	low	M40 kHz
M. californicus	high	med	M50 kHz
M. ciliolabrum	?	low	M40 kHz
E. fuscus	high	med	Q25 kHz
C. townsendii	low	high	
A. pallidus	med	med	Q25 kHz
P. hesperus	high	high	
L. cinereus	high	high	
L. blossevilli	high	high	
L. noctivagans	high	med	Q25 kHz
E. maculatum	audible by human ear (high)	high	
T. brasiliensis	high	med	Q25 kHz
E. perotis	audible by human ear (high)	high	

Probability of detection refers to how readily the species is recorded by the acoustic equipment. This varies because species echolocate at different decibel ranges and different frequencies, which affect how far the echolocation pulse travels and thus their range of detection.

Probability of identification refers to how easily each species is recognizable at the species level from the time versus frequency graph. *Low* indicates that a species will always be grouped at the phonic level and is indistinguishable from other species in that group. *Medium* indicates that the species will often be grouped at the phonic level but can sometimes have a signature call that allows for specific identification. *High* indicates reliable species level identification. Active acoustic monitoring with a spot light to obtain a visual on the bat as it is being recorded can be used to increase the probability of identification for both low and medium species.

Phonic group refers to the grouping of species that have calls that are indistinguishable.

Table 4. Bat Species Detected in the project area

Family VESPERTILIONIDAE (Plain-nosed or mouse-eared bats)		
Myotis lucifugus	Little brown myotis	AC, 40Khz ***
Myotis yumanensis	Yuma myotis	AC, 50Khz, MN, V, DR, NR, MR
Myotis evotis	Long-eared myotis	AC, V, DR, NR
Myotis thysanodes	Fringed myotis	AC,
Myotis volans	Long-legged myotis	AC, 40Khz ***
Myotis californicus	California myotis	AC, 50Khz, MN, V, DR, NR
Myotis ciliolabrum	W. small footed myotis	AC, 40Khz ***
Lasionycteris noctivagans	Silver-haired bat	AC Q25
Pipistrellus hesperus	Western pipistrelle	AC
Eptesicus fuscus	Big brown bat	AC, MN, V, DR, NR
Lasiurus blossevillii	Western red bat	AC
Lasiurus cinereus	Hoary bat	AC, MN
Corynorhinus townsendii	Townsend's big-eared bat	AC, MN, V, DR, NR, MR
Antrozous pallidus	Pallid bat	AC, MN, V, DR, NR, MR
Family MOLOSSIDAE (Free-tailed bats)		
Tadarida brasiliensis	Mexican free-tailed bat	AC, V

AC = Detected acoustically
AC XXKhz = Possibly detected in a phonic group
MN = Captured in mist nets
V = Observed Visually during building surveys
DR = Observed Day Roosting, NR= Observed Night Roosting, MR=Maternity Roost observed
***=Possible but not confirmed

Results

Building Surveys

Twenty two buildings or building remains were surveyed during the project. Surveys were conducted March 18-24, July 2-5, and August 22-26. No official names or numbers were given to the structures. Structures are given names or numbers for the purposes of this report, location and description is used to provide clarification.

Building survey results

Building Name or Number	Species	Type of use	Value to bats
Chapel/Kitchen	Tabr, Myyu, Anpa, Coto	DR, NR, MR	Very High
Russ	No	No Use	
Gassaway	Coto, Mysp	NR, DR	Low
Elm	No	No Use	
Acacia	Coto, Mysp	NR, DR	Low
#2			
#3	Coto, Mysp	NR, DR	Low
Winship	Epfu, Myvo, Coto	NR, DR	Med
Log Style Mess Hall	Coto, Mysp	NR, DR	Low
Large Residence	Coto, Mysp	DR, NR, MR	Very High
Gutted Residence Structure	No	No Use	
Caroline	No	No Use	
Francis Marion	Coto, Mysp	NR, DR	Low
Headquarters	Tabr, Myyu, Anpa, Coto	NR, DR	Med
Golf Cart Barn	Tabr, Myyu, Anpa, Coto, Epfu	DR, NR, MR	Very High
South Side of the Creek			
First structure on the road	No	No Use	
Locust	No	No Use	
Hartson	Coto, Mysp	DR, NR, MR	Very High
Building immidiately east of Hartson	Coto, Mysp	DR, NR, MR	Very High
Aetna	Coto, Mysp	NR, DR	Low
Bath House	No	No Use	
Hot Spring Pools	No	No Use	

Main Office/Chapel

This is the large yellow chapel style building with the functional kitchen attached. This structure is used by multiple species for day roosting, night roosting and maternity roosts. This structure was surveyed during all three sample periods. Bat activity was low during the March visit but very high during the July and August visits. Day roosting and probable maternity roosting in the hollow eves on the north side of the building is evidenced by the abundant staining around, and guano under, access holes. Mexican free-tailed bats were observed emerging from these holes. Townsend's big-eared bat was observed visually and acoustically in and around this structure at and shortly after emergence.

Heavy guano deposition throughout the interior of the "chapel" area and visual observations indicate high night roost use. Crevices in and around the ceiling and structural beams of the "chapel" area are used as day roosts for multiple species.

Russ
This structure had a name plate with "Russ" painted on it. This structure is collapsing. There was no evidence of bat use observed.

Gassaway
This structure had a sign with the name Gassaway. The building is relatively sound. There is evidence of light night roosting in the interior and day roosting under the siding on the exterior. Interior night roosting was evidenced by guano from a myotis species and Townsend's big-eared bat. Exterior day roosting by a myotis species was evidenced by guano in the crevices around windows and doors at the siding and trim interface.

Elm
This structure had a sign with the name elm. This building is quite dilapidated. No sign of bat use was observed.

Acacia
This structure had a sign with the name acacia. This building is in need of repair. Some cleaning and renovation appears to have taken place. There is evidence of light night roosting in the interior and day roosting under the siding on the exterior. Interior night roosting was evidenced by guano from a myotis species and Townsend's big-eared bat. Exterior day roosting by a myotis species was evidenced by guano in the crevices around windows and doors at the siding and trim interface.

#2
This structure is collapsed and does not provide bat roosting habitat.

#3
There is evidence of light night roosting in the interior and day roosting under the siding on the exterior. Interior night roosting was evidenced by guano from a myotis species and Townsend's big-eared bat. Exterior day roosting by a myotis species was evidenced by guano in the crevices around windows and doors at the siding and trim interface.

Winship
This structure had a sign with the name Winship. This is a very large two story building. Extensive renovation efforts have taken place prior to the bat survey making assessment of the historic bat use difficult. Much of the interior and attic space has been gutted. Bat use of the cupola is moderate and big brown bats were observed day roosting in the cupola. Evidence of night roosting in the form of moderate to heavy guano deposition was observed. Species associated with structure are big brown bats, Western long-eared myotis, and townsend's big-eared bat.

Log style mess hall
This a large mess hall style structure near the creek. This structure is very open and has large decks with shingled awnings. The enclosed portion of the building has evidence of light night roost use by myotis species and townsend's big eared bat.

Large residence
This structure had no name. It is in the center of the developed area. This building has had extensive work done in the interior. All interior walls have been removed and the frame work is all that remains. All lathe and plaster has been removed and swept out removing any historic bats sign such as guano. The attic was occupied with a large maternity colony of townsend's big-eared bats during the July survey period. The colony was not evident during the March and August surveys.

Gutted residence structure
This building has no interior walls and the attic is completely open. No sign of bat use was observed.

Caroline
This structure is at the creek edge and is appears to be falling into the creek. There is no evidence of bat roosting in the interior of this structure.

Francis Marion
This structure is at the creek edge. The building is sound, some interior walls have been removed. There is light guano deposition indicating night roosting by myotis species and townsend's big-eared bat.

Headquarters
This structure appears to be the headquarters. The main hall style room appears to get regular human activity. Light guano scattered throughout the interior indicates occasional night roost use by myotis species, Mexican free-tailed bats and townsend's big eared bats. The entrance to the mens restroom is a regular day roost for an individual townsend's big eared bat. The exterior of the building provides multiple night roost sites.

South side of the Creek

#1 The first structure as you go through the gate.

This structure has been completely gutted and has no walls only studs. There is no roosting habitat for bats.

Locust
This structure is a dilapidated house and no sign of roosting was observed at the time of survey.

Hartson
This structure is very sound. In March heavy night roosting was observed throughout the building. The attic provides night roosting, day roosting and possible maternity roosting. Day roosting by townsend's big-eared bat was observed in the attic during the July and August surveys. The building appears to be a valuable resource for the bats of the area.

The building immediately East of Hartson
This structure is very sound. In March heavy night roosting was observed throughout the building. The attic provides night roosting, day roosting and possible maternity roosting. Day roosting by townsend's big-eared bat was observed in the attic during the July and August surveys. The building appears to be a valuable resource for the bats of the area. The attic space above the front porch provides excellent roosting habitat. This area is closed and internal observations were not possible. Night observations were preformed in July and August no bats were observed emerging.

Aetna
This structure is the very dilapidated building at the end of the row of buildings on the south side of the creek. Signs of light night roosting by townsend's big-eared bat and myotis species were observed in this building.

Bath House
This structure is at the creek's edge and had recently been flooded. No signs of bat use were observed.

Hot spring pools
This open structure does not provide roosting habitat for bats.

Golf cart barn
The golf cart barn provides day roosting, night roosting and maternity roosting habitat for mexican free-tailed bats, pallid bats, yuma myotis, big brown bats and townsend's big eared bats. This building is an important resource for the bat species of the area.

Mist Net Surveys

Mist Net Captures

Mist net surveys were conducted three nights in 2006. During the July 2-5 survey period two nights of mist netting were conducted. Four nets were set each night. July 5 four nets were set along the creek and on the road accessing the south side cabins. July 3 four nets were set amongst the buildings on the North side of the creek, five *Antrozous pallidus* were captured. July 5 four nets were set along the creek and on the road accessing the south side cabins. Two bats were captured July 5, one *Myotis yumanensis,* and one *Antrozous pallidus.* August 26, four mist nets were set among the buildings on the North side of the creek, six *Antrozous pallidus,* four *Eptesicus fuscus,* and one *Myotis californicus* were captured.

During the July mist netting surveys lactating female pallid bats were captured and post lactating individuals were captured in August indicating that the species is reproducing in the area and may have maternity roosts in the structures. A newly volant juvenile big brown bat eas captured during the August mist netting indicating that big brown bats are also breeding in the area and may have maternity roost in the buildings.

Table 5 Number of mist net captures for bat species in the Project Area

Number of mist net captures for bat species in the Project Area, 2006

DATE	ANPA	EPFU	LABL	LACI	LANO	MYCA	MYEV	MYTH	MYVO	MYYU	PIHE	TABR
3-Jul-06	4											
5-Jul-06	1									1		
26-Aug-06	6	4				1						
	ANPA	**EPFU**	**LABL**	**LACI**	**LANO**	**MYCA**	**MYEV**	**MYTH**	**MYVO**	**MYYU**	**PIHE**	**TABR**
	6*	**4***				**1**				**1**		

* indicates reproductive or juvenile individuals were captured

Acoustic surveys

Acoustic monitoring was conducted sixteen nights, seven nights in March, four nights in July and 5 nights in August. More than 40,000 acoustic files were recorded and analyzed. Nine species and three phonic groups were recorded during all three survey periods. July survey period recorded three times as many call sequences as that of the March survey period, and the August survey recorded four times as many call sequences as that of the March survey period.

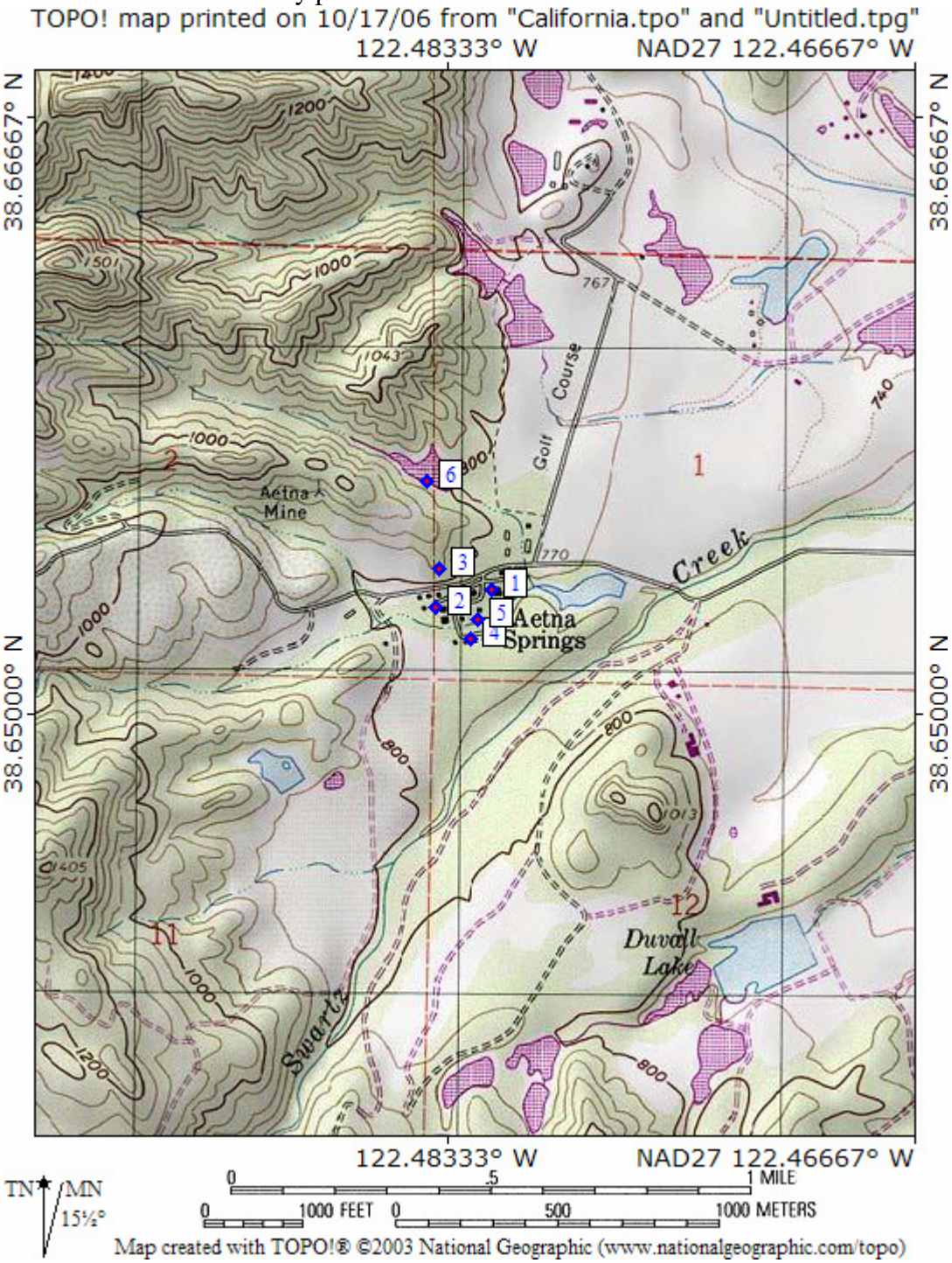

Table 6 Results of acoustic surveys conducted on Aetna Springs Resort Project Area.

Q25 = LANO, EPFU, or TABR; M40 = MYCI, MYLU or MYVO; M50 = MYCA or MYYU

	SPECIES												
DATE LOCALITY	**ANPA**	**COTO**	**EPFU**	**LABL**	**LACI**	**MYEV**	**MYTH**	**PIHE**	**TABR**	**MY40**	**MY50**	**Q25**	**Files per night**
3/24/2006													
1 Chapel	X	X	X						X		X	X	39
2 West end	X						X		X	X	X	X	51
3 Oak Habitat	X	X	X	X	X				X	X	X	X	112
4 South Side		X	X	X					X		X	X	95
5 Creek	X		X		X	X			X	X	X	X	78
6 Pond			X		X				X		X	X	371
7 Old Mine						X					X		18
8 In Winship										X	X	X	13
9 In Hartson	X	X	X	X		X	X		X	X	X	X	172
7/5/2006													
1 Chapel	X	X	X		X				X	X	X	X	870
2 West end	X	X				X			X	X	X	X	225
3 Oak Habitat	X		X	X	X	X			x		X	X	141
4 South Side	X	X	X	X	X	X			X	X	X	X	137
5 Creek	X	X	X		X	X			X		X	X	233
6 Pond	X	X	X	X			X	X	X	X	X	X	1553
8/26/2006													
1 Chapel	X	X							X		X	X	1486
2 West end	X		X		X				X	X	X	X	103
3 Oak Habitat	X	X	X		X	X	X		X	X	X	X	97
4 South Side	X		X	X	X	X			X	X	X	X	57
5 Creek	X	X	X		X				X	X	X	X	390
6 Pond			X		X			X	X		X	X	1851

Discussion

SPECIES ACCOUNTS

Yuma myotis *(Myotis yumanensis)*

Yuma myotis were observed foraging over the reservoir in fairly high numbers and over the creek. Acoustic monitoring at the reservoir detected 1,016 50Khz passes which were most likely to be *M. yumanensis*. Mist nets over pools near the Creek captured *M. yumanensis*. The bats seem to be abundant where open water provides foraging for emergent insects. Yuma myotis have ample roosting habitat in 12 of the 22 buildings surveyed.

Western long-eared myotis ***(Myotis evotis)***

Forest Service Sensitive species Bureau of Land Management Sensitive species

Myotis evotis call sequences were detected at six of the acoustic sample sites although in low numbers. No captures of *M. evotis* occurred during the surveys. One juvenile *M. evotis* was observed night roosting in Winship. This species is not typically difficult to capture and the low number of call sequences indicates that *M. evotis* is not overly abundant. There is plenty of roosting habitat provided by the buildings. The oak woodlands of the area should also provide abundant roosting habitat

Fringed Myotis *(Myotis thysanodes)*

Forest Service Sensitive species Bureau of Land Management Sensitive species Western Bat Working Group High Priority species

Myotis thysanodes call sequences were detected at four of the acoustic monitoring stations no captures occurred at any of the mist netting sites. The oak woodlands of the area provide excellent roosting habitat for this species.

California myotis *(Myotis californicus)*

50Khz call sequences were detected at all of the acoustic monitoring stations and could represent *M. californicus* activity. California myotis were captured at one of the mist netting sites. The mixed oak and riparian forest provide excellent roosting habitat for this species. The 13 of the 22 buildings have features that could provide roosting habitat for this species.

Western small-footed myotis *(Myotis ciliolabrum)*

Forest Service Sensitive species Bureau of Land Management Sensitive species

Forty Khz call sequences were detected at all but one acoustic monitoring site and could represent *M. ciliolabrum* activity. *M. ciliolabrum* was not captured or otherwise positively identified during the surveys.

Western Pipistrelle *(Pipistrellus hesperus)*

Pipistrelles were only detected at the reservoir and were not otherwise observed during the surveys. This species is not likely to be roosting in the buildings

Big brown bat *(Eptesicus fuscus)*
Call sequences with distinct big brown bat characteristics were recorded at all acoustic monitoring stations. *E. fuscus* was captured at one of the mist netting sites a total of four individuals. *E. fuscus* was observed in the Winship and the Golf Club Barn. This species appears to be abundant in the project area.

Western red bat *(Lasiurus blossevillii)*

Forest Service Sensitive species
Western Bat Working Group High Priority species

Red bats call sequences were detected at three sites during the surveys. These bats are easily detected with acoustic monitoring and the low number of calls and few sites with detections suggests that red bats are not abundant in the area. No Western red bats were captured in the mist nets. Western red bats do not roost in man made structures.

Hoary bat *(Lasiurus cinereus)*
Hoary bats call sequences were detected at all of the exterior sites during the surveys but were not captured in mist nets. Although they were detected at seven sites there were not high numbers of call sequences. These bats are easily detected with acoustic monitoring and the low number of calls suggests that hoary bats are not abundant in the area. Hoary bats do not roost in man made structures.

Townsend's big-eared bat *(Corynorhinus townsendii)*

Federal Special Concern species (former Category 2 candidates for ESA listing)
California Department of Fish and Game's California Special Concern species
Forest Service Sensitive species
Bureau of Land Management Sensitive species
Western Bat Working Group High Priority species

Corynorhinus Townsendii is the high profile bat species in the area. The Aetna Springs colony is well known and monitored population (Pearson et all 1952). All six regularly monitored acoustic monitoring stations recorded *C. townsendii* calls, which is rather remarkable given that this species has a very low intensity echo location call. The chapel/kitchen, the large residence, Hartson, and the cabin immediately east of Hartson all provide maternity roosting habitat and are important resources for this species.

Pallid Bat *(Antrozous pallidus)*

California Department of Fish and Game's California Special Concern species
Forest Service Sensitive species
Bureau of Land Management Sensitive species
Western Bat Working Group High Priority species

Pallid bat calls were detected at all six of the regularly monitoredt acoustic sample sites. All of the acoustic sites seem to be foraging areas for pallid bats. Pallid bats were captured at all of the mist netting sites. There is abundant roosting habitat for pallid bats in the buildings. The mature oak woodland should provide roosting habitat for pallid bats.

Mexican free-tailed bat *(Tadarida brasilensis)*
Call sequences in the 25khz range were recorded at all of the acoustic monitoring sites. These calls were likely Mexican free-tailed bats. *T. brasiliensis* were observed in three of the buildings. This species forages high and is difficult to capture except when drinking over open water. The rock buildings provide excellent roosting habitat for Mexican free-tailed bats.

50kHz Myotis
This group includes California myotis (*Myotis californicus*) and Yuma myotis (*Myotis yumanensis*). Neither of these species have any special status. They are common throughout California. Calls in the 50 Khz range were detected at all acoustic sites. Both species were captured in mist nets confirming their presence. Large numbers of 50 Khz bats were observed foraging low over the reservoir suggesting that high numbers of *Myotis yumanensis* are present at the reservoir.

40kHz Myotis
This group includes Little brown myotis (*Myotis lucifugus*), long-legged myotis (*Myotis volans*), and the small footed myotis (*Myotis ciliolabrum*). These calls were detected at all acoustic sites. No 40khz species were captured in mist nets or otherwise observed during the surveys.

Q25
This group includes silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), and Mexican free-tailed bat (*Tadarida brasiliensis*). None of these species have any special status. The later two are common throughout California. These bats have high intensity and low frequency calls and are easily detected at long distances. Calls of this type were detected during the survey period at five of the eight acoustic sites. Calls with distinctive characteristics were detected for big brown bat and Mexican free-tailed bat.

Recommendations

Fourteen of the structures surveyed had visible signs of bat use. Seven structures had medium, high, or very high value to the bats of the area. The five structures considered to be very valuable to the bats of the area all provide maternity roosting habitat. Alteration, restoration or demolition of these structures could have major impact on the sensitive bat species *Corynorhinus townsendii*, and *Antrozous pallidus* as well as the bat fauna of the area.
Mitigation measures should be implemented to lessen the impacts. These measures should include proper timing of construction efforts, exclusion of bats prior to construction, monitoring during construction, and construction or preservation of roosting habitat for bats.

Proper Timing of Construction
Construction must be timed to have the least impact on bats. The period of least impact would be during time that the structures are not being used for reproduction. The maternity season for the species detected during the surveys is April 15 through September 15. Construction must be limited to the time period October 1 through March 30. All exclusion efforts must be implemented prior to March 1 and after November 1 to minimize impacts.

Exclusion of bats Prior to Construction
Bats must be excluded from all buildings subject to restoration, alteration or demolition. One way bat doors designed to allow bats to leave a roost but not return can be designed to implement exclusion for most structures. Other exclusions can be preformed during the time that no bats are using the structure and after a thorough survey has determined that no bats are present.

Pre-Construction surveys and Monitoring
Structures that showed sign of bat use during the initial surveys must be surveyed immediately prior to any construction efforts. Those structures that were assessed as high or very high value to bats should have a qualified bat biologist present during the commencement of any construction to handle bats and direct efforts to prevent take of sensitive species.

Construction or preservation of roosting habitat for bats
Multiple large maternity roosts were found during the initial surveys. The removal of these roosts as a result of restoration, alteration or demolition would require the construction or preservation of adequate and sufficient alternate roosting habitat for the species impacted by the construction. No mines, caves or sufficiently large hollow trees that could provide alternate roosting habitat were located during the surveys. *Corynorhinus townsendii* (townsend's big-eared bat) require large cavernous roosting sites and are not known to utilize the typical multiple baffle bat house designed for crevice roosting bats. *C. townsendii* would benefit from the preservation of an attic space preferably one already in use by the species. The large barn used for golf cart storage has an extensive attic that may be quite suitable after minor alteration. Other out buildings could have attic spaces or other sections altered to provide appropriate roosting habitat.

NATURAL HISTORY OF SPECIES DETECTED AT AETNA SPRINGS RESORT PROJECT AREA

[***]**Little Brown Myotis** (*Myotis lucifugus*) ranges over most of North America from the Yukon to Mexico. In California this bat is found at most elevations, from the coast to high alpine settings. Day roosts are in buildings, trees, under rocks and even in woodpiles. Maternity roosts are more commonly found in buildings although they can be found in hollow trees or in crevices with the appropriate temperature regimes. Night roosts are in buildings, bridges and other structures that have confined spaces. Congregating in confined areas for night roosting is most likely to facilitate energy conservation. Mating takes place in the fall and sperm is stored over winter. Ovulation and fertilization takes place in the spring and a single young is born after a 50-60 day gestation. Young are capable of flight after 3 weeks and are weaned shortly thereafter. Parturition for this species is typically earlier than species of other bats within its range (Fenton and Barclay 1980). Aquatic insects such as midges, caddis flies and mayflies are the major prey of *Myotis lucifugus*, although moths, beetles and other insects are taken. Foraging takes place over water along edges of vegetation and in open areas (Nagorsen and Brigham 1993).

Long-eared Myotis *(Myotis evotis)* is a Federal Special Concern species. It is a year-round resident in California, occurring in mixed hardwood/conifer forest and montane conifer forest in northern California, and in pinyon-juniper, mesquite scrub, and pine/oak woodland in southern California (Manning and Jones 1989). Its distribution is broad, but long-eared myotis usually does not occur in large numbers. The long-eared myotis typically roosts singly or in small groups in hollow trees, under exfoliating bark, crevices in rock outcroppings, and occasionally in mines, caves, and buildings during the day. Roost sites in these structures tend to be cryptic (i.e., in crevices and fissures). Night roosts are in caves, mines, bridges, buildings and rock crevices (Nagorsen and Brigham 1993). It is presumed to be non-migratory, and thought instead to hibernate locally in caves (Manning and Jones 1989). A single young is born per year between June and July. Females may form small maternity colonies with less than 40 individuals in California (Manning and Jones 1989). The long-eared myotis feeds on moths, flies, and small beetles. It captures insects by gleaning vegetation and in aerial pursuits. It forages along rivers and streams, over ponds, and within cluttered forests (Nagorsen and Brigham 1993).

Fringed Myotis *(Myotis thysanodes)* is a Federal Special Concern species. This species is found in western North America from British Columbia to Veracruz and Chiapas. Over most of its range this species occurs at mid-elevations. It has been found at high elevations in New Mexico and was found in the Sequoia National Forest above 6000 feet. Along the west coast, this bat is found at low elevations (O' Farrell and Studier 1980) and is associated with redwood forests. Maternity colonies are large, up to 300 individuals (Nagorsen and Brigham 1993). These colonies are in caves, mines and buildings. Given this species association with redwood forests in coastal California it is likely to use redwood hollows. Males roost separate from the maternity colonies. Night roosts are in

[***] **Species is possible but not confirmed. Acoustic monitoring detected calls in the call phonic group but no distinct calls were recorded.**

similar features. In portions of its range, *Myotis thysanodes* migrates to lower elevations and/or more southern locations, where the bats can be active during the winter months (O' Farrell and Studier 1980). In coastal California, such migrations may not occur. Only one young per year is common for the Fringed Myotis. Little is known of the reproductive cycle of this species. Ovulation and fertilization occur in late spring (May 1 to May 15) with parturition occuring June 25 to July 7 (O' Farrell and Studier 1980). Young are capable of limited flight at 16 days and are adult size by 21 days. *Myotis thysanodes* primarily eats beetles (73% of its diet) moths, flies, leafhoppers, lacewings, crickets, and harvestmen (O' Farrell and Studier 1980). The presence of flightless insects in its diet suggest that some of its prey is gleaned from foliage (Nagorsen and Brigham 1993).

Yuma Myotis (*Myotis yumanensis*) is a year-round resident in a wide variety of habitats from coast to mid-elevation. It is very tolerant of human habitation and survives in urbanized environments. Day roosts occur in buildings, trees, mines, caves, bridges, and rock crevices. Night roosts occur in buildings, bridges, and other man-made structures. The Yuma myotis is presumed to be non-migratory and hibernates in winter, but no large winter aggregations have been reported. A single young is born per year between June and July. Females form large maternity colonies from two hundred to several thousand individuals. Males tend to roost singly or in small groups. The Yuma myotis forages by trawling with its large feet on open water surfaces for emergent aquatic insects, such as caddis flies and midges. Foraging occurs directly over the surface of still water ponds, reservoirs, or pools in streams and rivers.

California Myotis *(Myotis californicus)* is common in most habitats throughout its range, which stretches from the Alaskan panhandle to Mexico (Simpson 1993). Although this bat is common and can be regularly encountered flying along trails at dusk, it is rarely an abundant species in any one area. Maternity colonies are usually small, generally less than 10 individuals. Day roosts are in rock crevices, peeling bark, tree hollows, and on buildings (Simpson 1993). This bat is very flexible in its choice of night roost and will use any natural or man-made shelter (Nagorsen and Brigham 1993). The California myotis is non-migratory and undergoes extended torpor during the winter months in most of its California range. It will arouse from torpor to forage during winter months and has been observed foraging in temperatures as low as –8º C (Simpson 1993). California myotis usually produces one young per year and has a potential reproductive life span of 15 years. In California, mating takes place in early spring and young are born in late May and early June. The California myotis feeds primarily on moths and flies, with smaller amounts of beetles and bugs. Hunting takes place along edges of vegetation and the canopy, over water, and above open ground (Simpson 1993). This bat emerges in the evening and alternates foraging and roosting throughout the night.

[***]**Long-legged myotis** *(Myotis volans)* is a Federal Special Concern species. *Myotis volans* inhabits western North America from South-east Alaska to Central Mexico. It is found in an elevational range from sea level to 3,770 m. *Myotis volans* is primarily a coniferous forest bat although it may also be found in riparian and desert habitats (Warner and Czaplewski 1984). Maternity colonies can be up to 300 individuals. Maternity roosts are found in buildings, rock crevices, and under exfoliating bark. Males

[***] **Species is possible but not confirmed. Acoustic monitoring detected calls in the call phonic group but no distinct calls were recorded.**

roost singly or in small numbers in rock crevices, buildings and under tree bark. Night roosts are known to be found under bridges, in caves and mines, and in buildings (Nagorsen and Brigham 1993). In the northern portion of their range, *M. volans* commonly hibernates. It is unknown whether this bat migrates in the portion of its range where winters are less severe. Mating takes place in the fall and sperm is stored over winter. Ovulation and fertilization takes place from March to May and parturition occurs from May to August. There is extensive variation in the timing of reproductive activity in this species. *M. volans* is known to live 21 years in the wild (Warner and Czaplewski 1984). *M. volans* feeds primarily on moths, it is also know to feed on other soft bodied prey such as flies, termites, lacewings, wasps, bugs, leafhoppers, and small beetles. *M. volans* is a rapid, direct flier pursuing its prey over relatively long distances through, around, under and over forest canopy (Warner and Czaplewski 1984).

***Western small-footed myotis** (*Myotis ciliolabrum*) is a federal species of special concern. It occurs mainly in arid habitats across the western United States and appears to be uncommon throughout most of California (pers. obs.). This species is known to roost in rock crevices in rock faces and is associated with cliffs and talus fields. It has also been found roosting under bark crevices as well as in barns. Western small-footed myotis emerge at dusk and are most active between 2200 and 2300 and again between 0100 and 0200 (Harvey et al. 1999). It forages between 1 and 3 meters along cliffs, feeding on small insects, such as moths, beetles, and flies. One young, although twins may occur, is born in June.

Western pipistrelle (Pipistrellus hesperus) occurs throughout the southwestern United States and is associated with desert habitats. It generally day roosts in rock crevices, but can be found underneath rocks, in burrows, in mines, or in buildings (Harvey et al. 1999). It roosts in small groups or individually. The Western pipistrelle begins foraging before sunset and can often be identified by its slow, fluttery flight in the evening light. It is one of the smallest bats in North America. Most of the foraging activity takes places during evening and ceases 1-2 hours after sunset. Foraging takes place 2-25 meters above ground on swarming insects – and a single bat can consume 20% of its body weight per foraging bout (.6-.12 grams of insects) (Harvey et al. 1999). Prey includes a variety of insects, such as, mosquitos, flies, ants, wasps, caddisflies, stoneflies, moths, and small beetles. Western pipistrelles generally give birth to twins in June or July. Juveniles become volant after approximately one month.

[***]**Silver-haired bat** (*Lasionycteris noctivagans*) occurs throughout most of North America and is associated with forest habitats (Kunz 1982). In California, the silver haired bat is most common in the northwestern portions of the state and the Sierra Nevada. The California population appears to be sexually segregated, with breeding females found in the interior mountains. In coastal regions, only males have been observed. In California, maternity roosts have been documented in trees, such as ponderosa pine, Douglas fir, black oak, and big leaf maple (Rainey et al. 1994). Males have been documented roosting in bark fissures in coastal redwoods (Heady and Frick, *personal observation*). This species have also been known to hibernate in mines, caves, trees and buildings in colder portions of their range. The species is primarily a tree roosting bat and forestry practices have the potential to greatly affect its status (Nagorsen

[***] **Species is possible but not confirmed. Acoustic monitoring detected calls in the call phonic group but no distinct calls were recorded.**

and Brigham 1993). Mating takes place in the fall and sperm is stored until ovulation in the late spring. Gestation lasts 50-60 days and lactation is estimated at roughly 36 days (Kunz 1982). Twins are most common. Studies of relative seasonal abundance of the silver-haired bat suggest that this species migrates over most of its range, although the British Columbia population seems to be resident (Nagorsen and Brigham 1993). The silver-haired bat is a generalist forager, taking a wide variety of prey, including moths, midges, leafhoppers, caddis flies, flies, beetles, ants, and termites. It is particularly adept at exploiting large swarms of insects. Foraging typically occurs in or near coniferous and or mixed deciduous forest, adjacent to ponds, streams and other bodies of water (Kunz 1982).

Big Brown Bat *(Eptesicus fuscus)* occurs throughout most of North and Central America and reaches its southern limit in northwestern South America. Specimens are known from all the Canadian provinces bordering the US and from all the United States with the exception of Hawaii. This species decreases in numbers as one moves from a deciduous biome to a coniferous forest biome (Kurta and Baker 1990). Maternity colonies vary in size from small (ca. 5 individuals) to quite large (ca. 700 individuals) and are found in buildings, bridges, rocks and trees. The name *Eptesicus fuscus* means dusky house flier and refers to the species' preference for man-made structures. Males roost singly or in small bachelor groups in similar structures. In colder climates hibernacula are common in buildings and caves. In climates with less severe winters like California, migrations and/or periods of extended torpor take place (Nagorsen and Brigham 1993). In the west, big brown bat usually produce one offspring per year. Copulation occurs between September and March and sperm is stored until spring. Gestation is 60 days and young are born from May to July. Young become volant 18 to 35 days after birth. Recorded longevity in the wild is 19 years for a banded individual (Kurta and Baker 1990). Foraging occurs through the night with most of the activity in the first two hours after sunset. In terms of foraging, big brown bat is a generalist, showing no preference for over-water versus over-land sites, edge versus non-edge habitats, canopy versus open, and urban versus rural environments. Diet consists primarily of beetles. Other prey include moths, termites, carpenter ants, lacewings and various flies (Nagorsen and Brigham 1993).

Hoary Bat *(Lasiurus cinereus)* has the broadest range of any North American bat, ranging from Northern Canada to South America. This bat has even managed to colonize remote islands such as the Hawaiian Islands (Nagorsen and Brigham 1993) and is the only endemic mammal to Hawaii. The hoary bat roosts in the branches of deciduous and coniferous trees. In Oregon, the hoary bat prefers old-growth Douglas fir forests (Nagorsen and Brigham 1993). Males are solitary and females roost with their young, but do not form maternity colonies. The hoary bat is a migratory species and the Pacific Northwest population appears to winter in California and Mexico. Over a portion of its range, males and females occupy separate summer areas. Mating occurs in fall or winter and sperm is stored over winter. Fertilization occurs in early spring and gestation is 80 to 90 days. One to four young are born in late May to late June (Nowak 1994). Young are capable of sustained flight at six weeks and family groups stay together for several weeks after young are flying (Nagorsen and Brigham 1993). With its swift flight and low frequency echolocation calls, this bat is well adapted for capturing large prey. The primary prey of the hoary bat is moths, beetles, and dragonflies (Nagorsen and Brigham

1993). The hoary bat hunts above canopy level, in clearings, and over water. This species has been known to set up foraging territories at bright lights where insects congregate (Fenton 1997).

Western Red Bat *(Lasiurus blossevillii)* is a Forest Service Sensitive species. Very little research has been done on the western red bat and little is known about this species. Much of the natural history is inferred from what is known about the Eastern red bat although the degree of similarity of the biology of these two species is unknown at present. The western red bat is a solitary foliage roosting bat. The western red bat is in the genus *Lasiurus*, the hairy-tailed bats. These bats are adapted for exposed roosting behavior with their hairy tail membrane and small ears. In California this species is known to roost in cottonwood trees and willows, but is commonly detected in a variety of habitats, including chaparral. Roost heights range from 3-15 meters (Pierson and Heady 1997). The range of the western red bat is from British Columbia to Central and South America. Migration occurs throughout its range and bats of Canada move into the coastal low lands of California, and the California population is thought to winter in Central America (Nagorsen and Brigham 1993). Mating takes place in late summer and fall, sperm is stored over winter and fertilization occurs in early spring. Gestation period is 80 to 90 days and one to four young are born in late May to early July. The young are born small, naked and underdeveloped (Nowak 1994). Females leave the young at the roosting site while foraging but will carry them when moving to a new roosting site. Young are capable of sustained flight at 6 weeks. Large moths are the primary prey of the western red bat. This bat is a fast flyer, foraging in straight flights or large circles (Nagorsen and Brigham 1993). The echolocation calls are highly variable depending on the terrain. Though variable, these calls are very distinct.

Townsend's big-eared bat (*Corynorhinus townsendii*)is a Federal Special Concern and California Special Concern species as well as a Forest Service Sensitive species. It is a year-round resident in California, occurring from low desert to mid-elevation montane habitats. It is found primarily in rural settings, from inland deserts to coastal redwoods, oak woodland of the inner Coast Ranges and Sierra Nevada foothills, and low to mid-elevation mixed coniferous-deciduous forests. It typically roosts during the day in caves and mines, but can roost in buildings that offer suitable conditions (Kunz and Martin 1982). Night roosts are in more open settings and include bridges. It hibernates in mixed sex aggregations of a few to several hundred individuals. Hibernation occurs for prolonged periods in colder areas and intermittently in non-freezing areas. Townsend's big-eared bat arouses periodically and moves to alternative roosts, and actively forages and drinks throughout the winter. A single young is born per year between May and July. Females form maternity colonies of 35 to 200 individuals, while males roost individually (Kunz and Martin 1982). Townsend's big-eared bat feeds primarily on small moths that are gleaned from vegetation

Pallid Bat (*Antrozous pallidus)* is a California Special Concern species and Forest Service Sensitive species. A year-round resident in California, the pallid bat is found in arid desert areas, grasslands and oak savanna, coastal forested areas, and coniferous forests of the mountain regions of California. Roost sites are typically rock outcroppings, caves, hollow trees, mines, buildings and bridges (Hermanson and O'Shea 1983). Pallid bats make use of similar structures for night roosting and will use more open sites such as eaves, awnings, and open areas under bridges for feeding roosts. Pallid bats are largely

inactive in the winter months and there is evidence for both hibernation and migration. Hibernation aggregations tend to be much smaller than summer aggregations. Pallid bats have been observed foraging during the winter when prey is available (Hermanson and O'Shea 1983). Copulation occurs in the fall, usually October through December, although in coastal California copulations have been observed as late as February. Females store the sperm and ovulation occurs the following spring. Parturition timing is determined by local climate and embryonic development usually takes about nine weeks with birth occurring in May or June. Twins are the norm in northern California but in other areas the pallid bat is known to have triplets. Maternity colonies range from 20 to 200 individual adult bats. Males roost in much smaller groupings (Hermanson and O'Shea 1983). The pallid bat feeds on large insects (20 to 70 mm in length). Prey is most often caught on the ground. Jerusalem crickets, scorpions and beetles make up most of the diet of pallid bats central California.

Mexican Free-Tailed Bat (*Tadarida brasiliensis)* is one of the most widely distributed mammalian species in the Western Hemisphere and is the famous bat of the Carlsbad Caverns in the southwest. Maternity roosts occur in bridges, buildings, culverts, hollow trees and caves. Maternity colonies vary in size from 20 individuals to millions. In general, maternity colonies in California do not reach the remarkable size of the southwestern cave roosts. The largest known colony in California consists of around 200,000 individuals in a cave. Although the Mexican free-tailed bat is a year round resident of Northern California, evidence indicates localized migrations and in other parts of its range migrations can be longer than 1,800 kilometers (Wilkins 1989). The Mexican free-tailed bat is found in many different habitats from sea level to over 3,600 meters. Mating takes place in late February and March and ovulation occurs in March. Gestation is 77 to 82 days and young are typically born in late June or July (Nowak 1994).

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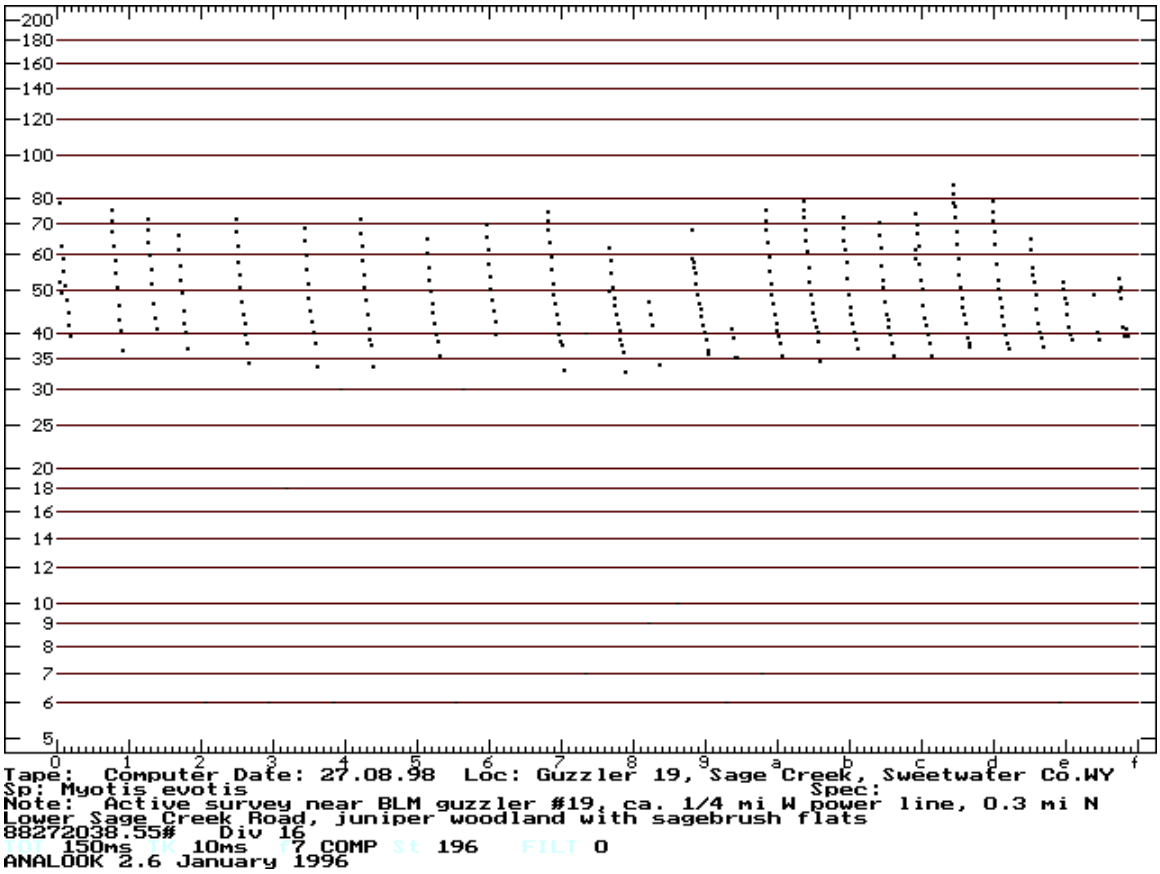
APPENDIX A:

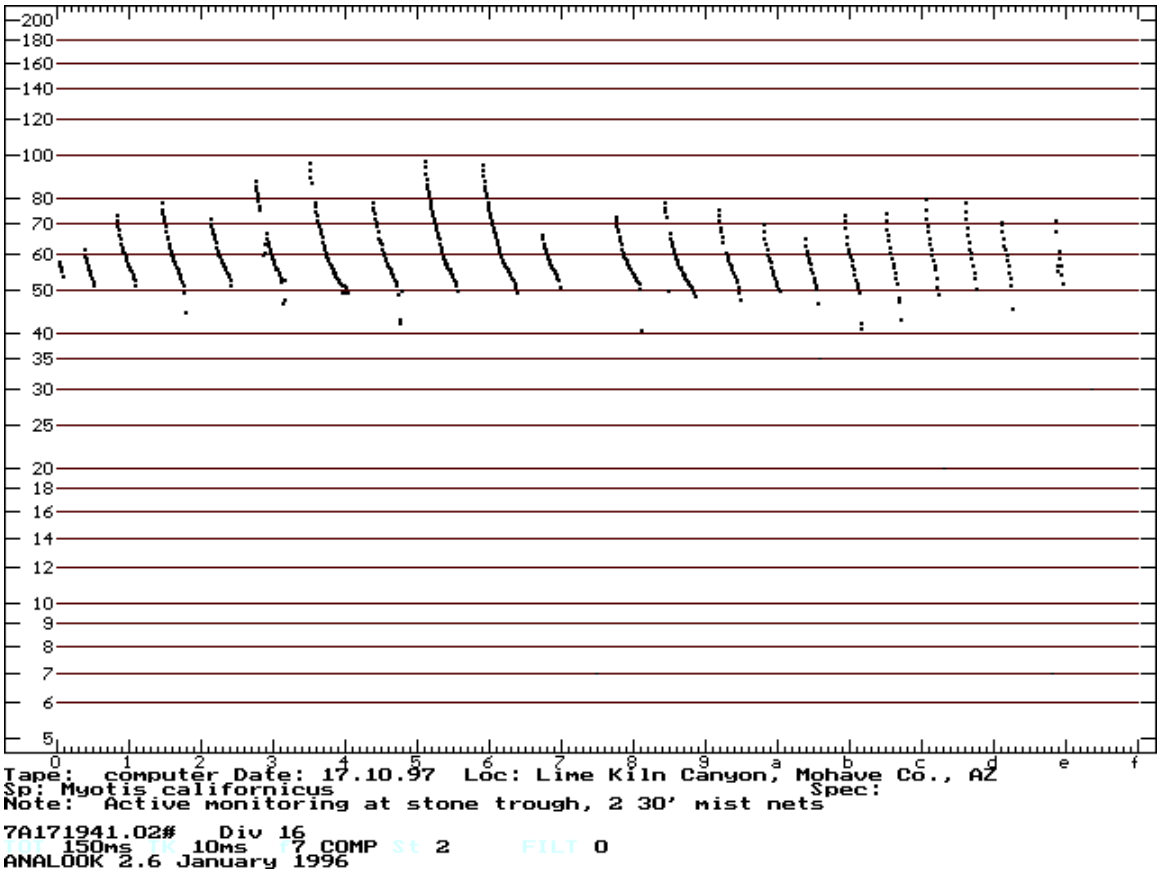
Anabat reference calls for bat species detected at Aetna Springs Resort Project Area

Anabat spectographs display time on the *x*-axis and frequency on the *y*-axis. Minimum frequency, pulse shape, slope, pulse duration, and interpulse duration are used to identify species and phonic groups. These reference calls were viewed from the University of New Mexico Bat Call Library available online at:

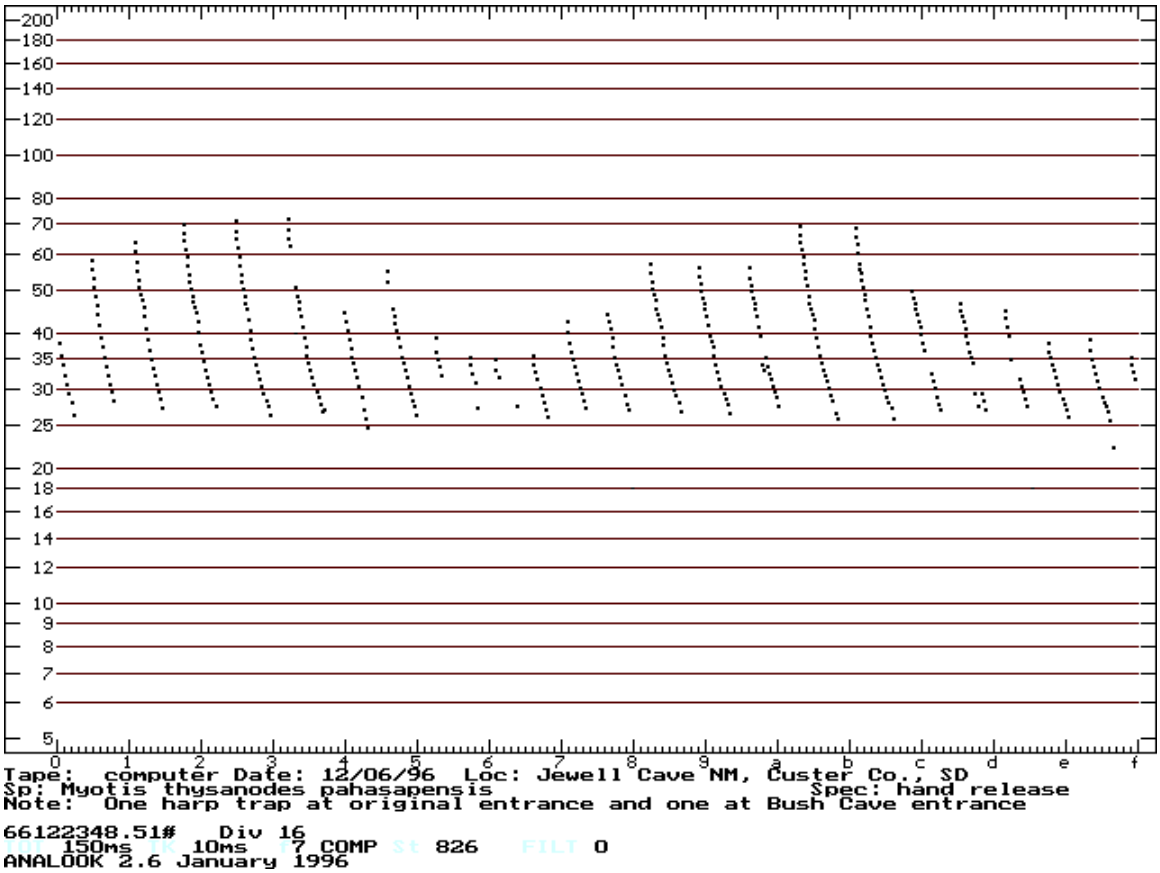
http://www.msb.unm.edu/mammals/batcall/html/referencelibrary.html



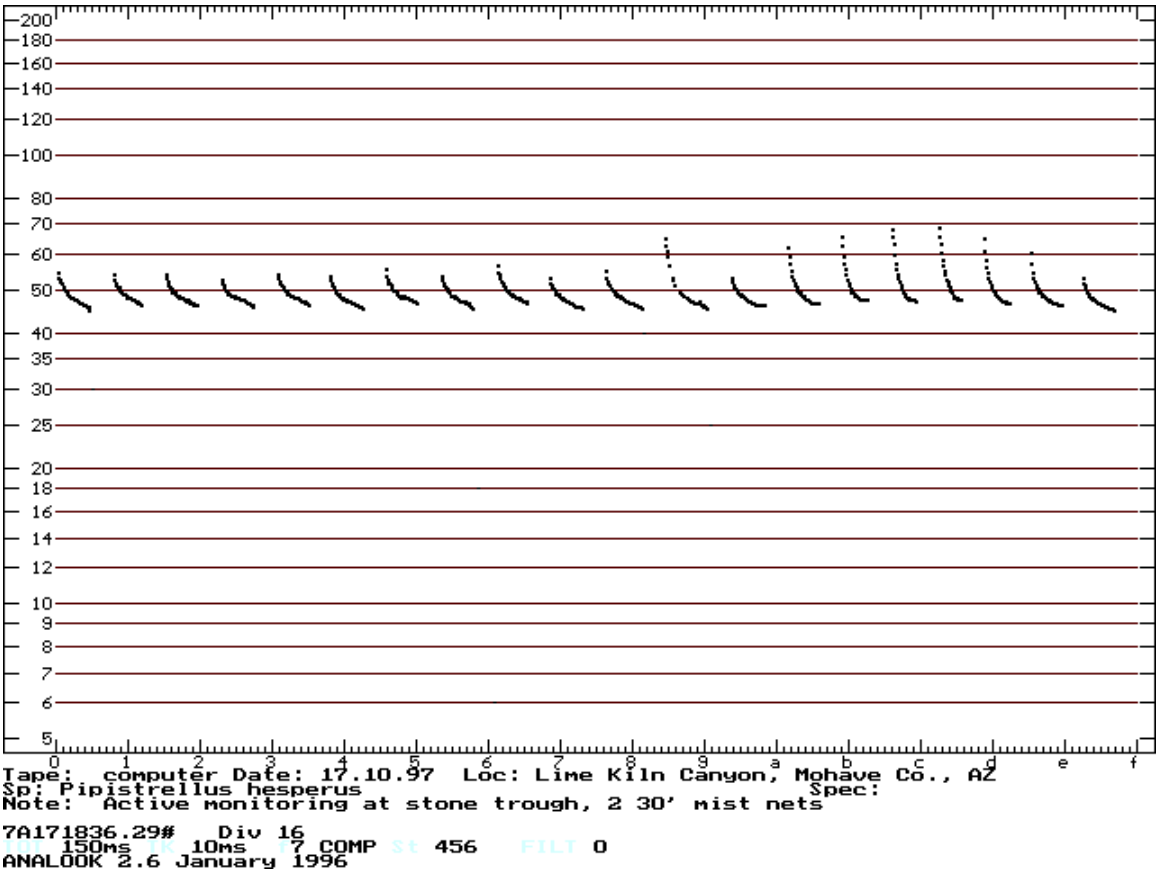
Western long-eared myotis (*Myotis evotis*)



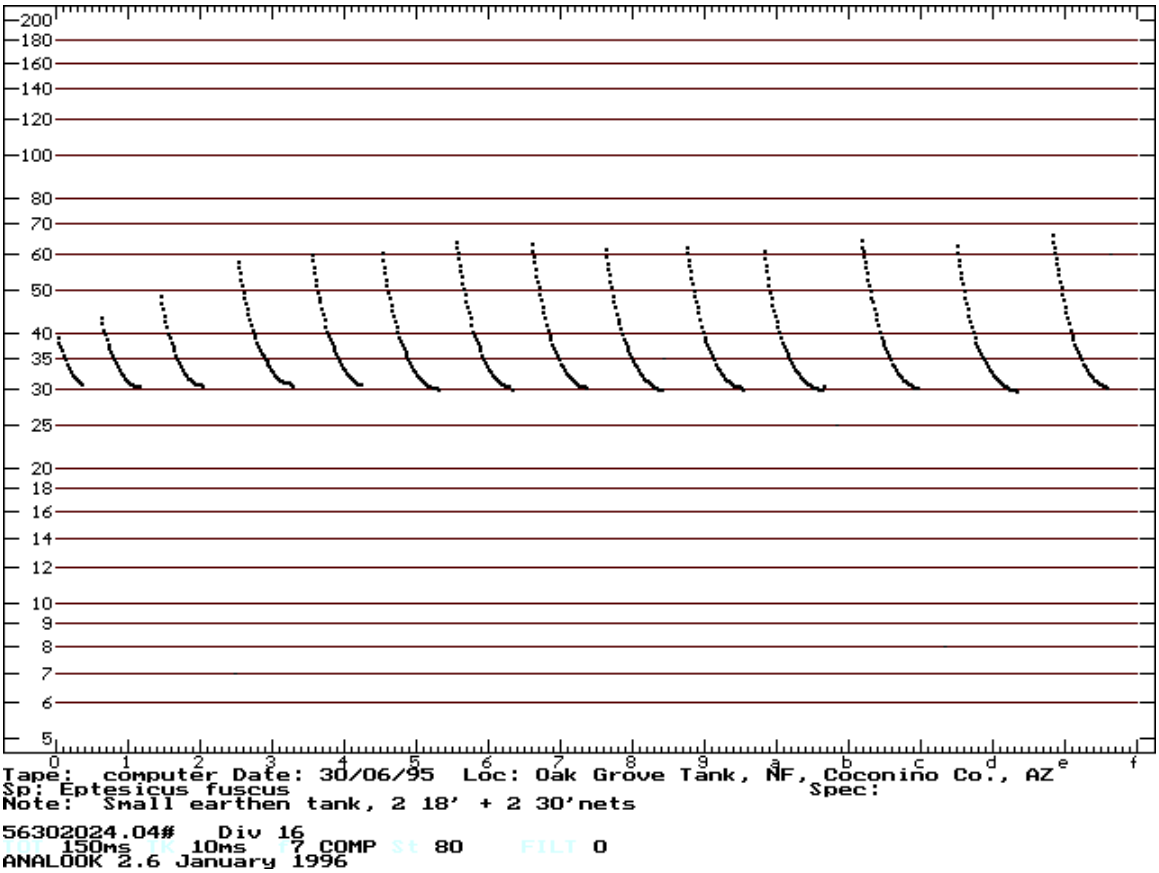
California Myotis *(Myotis californicus)*



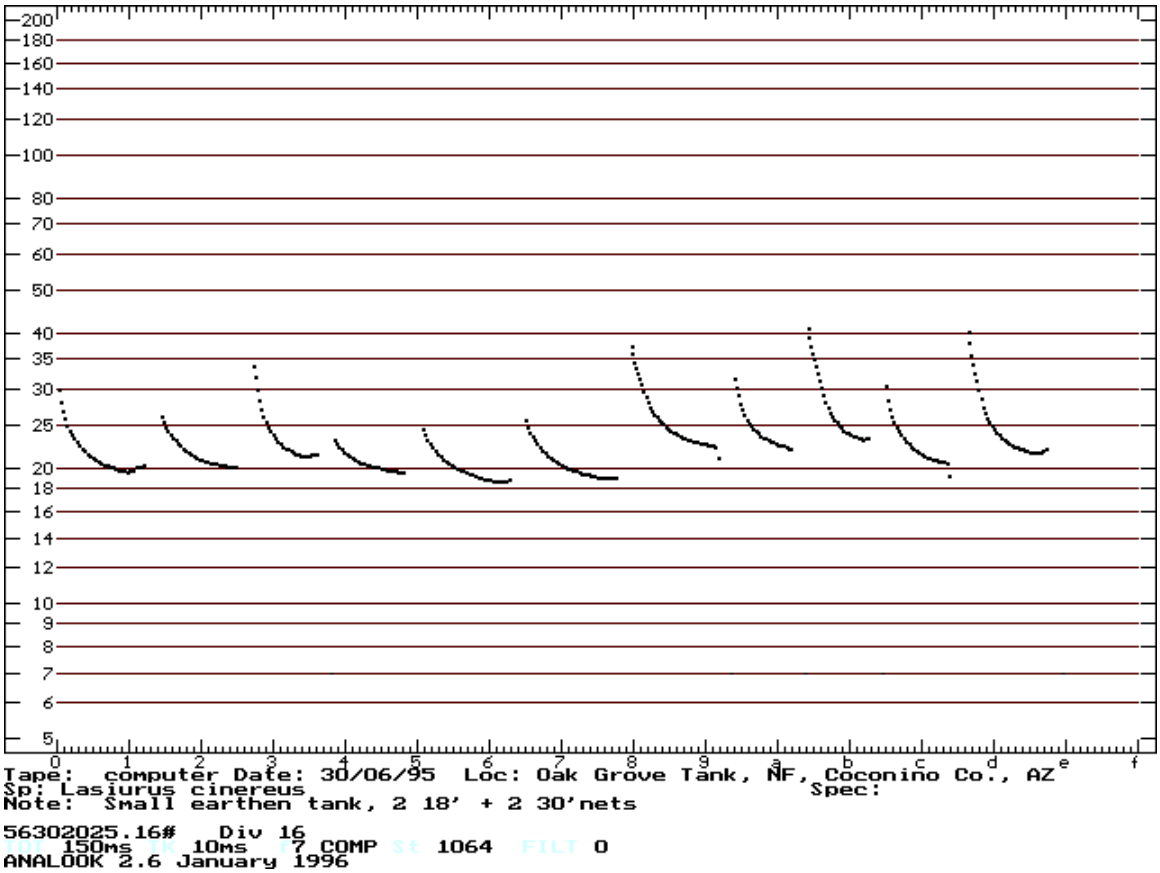
Fringed myotis (*Myotis thysanodes*)
yotis ciliolabrum)



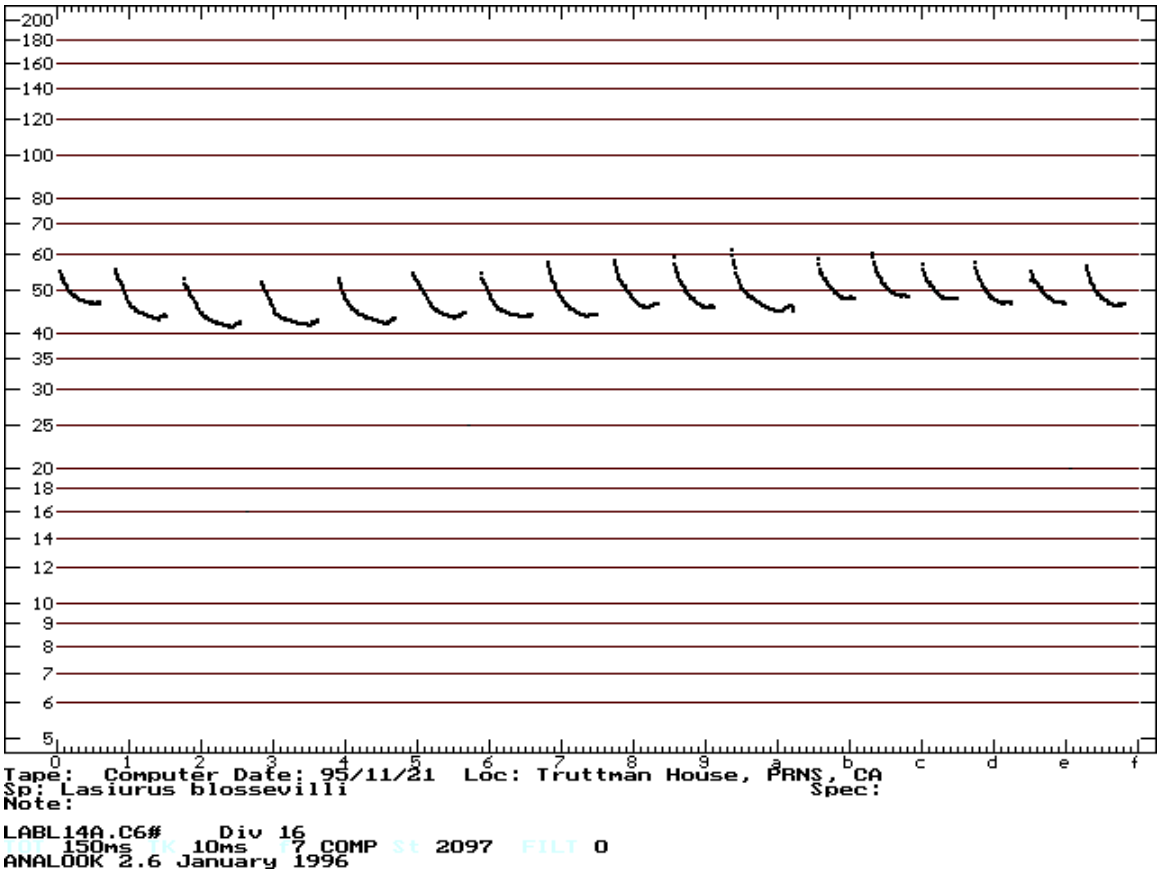
Western pipistrelle (Pipistrellus hesperus)



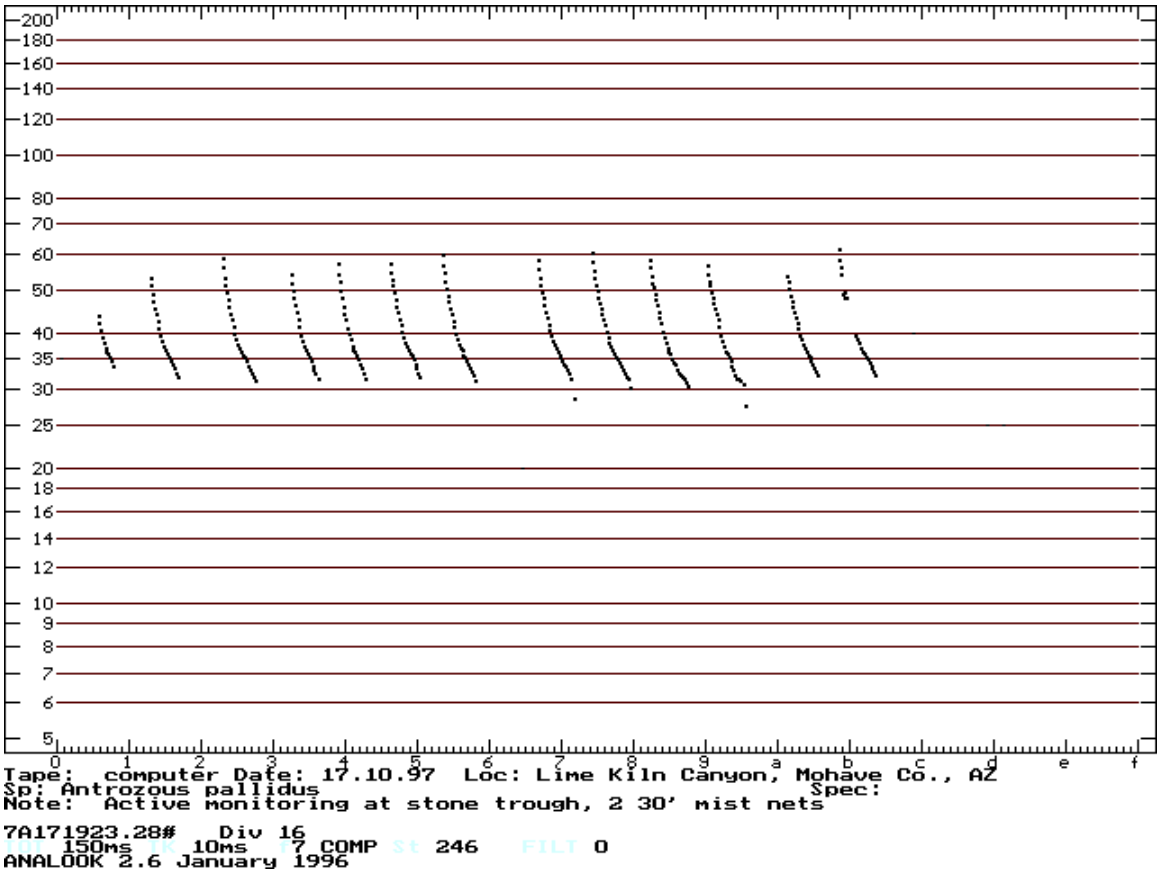
Big brown bat (*Eptesicus fuscus*)



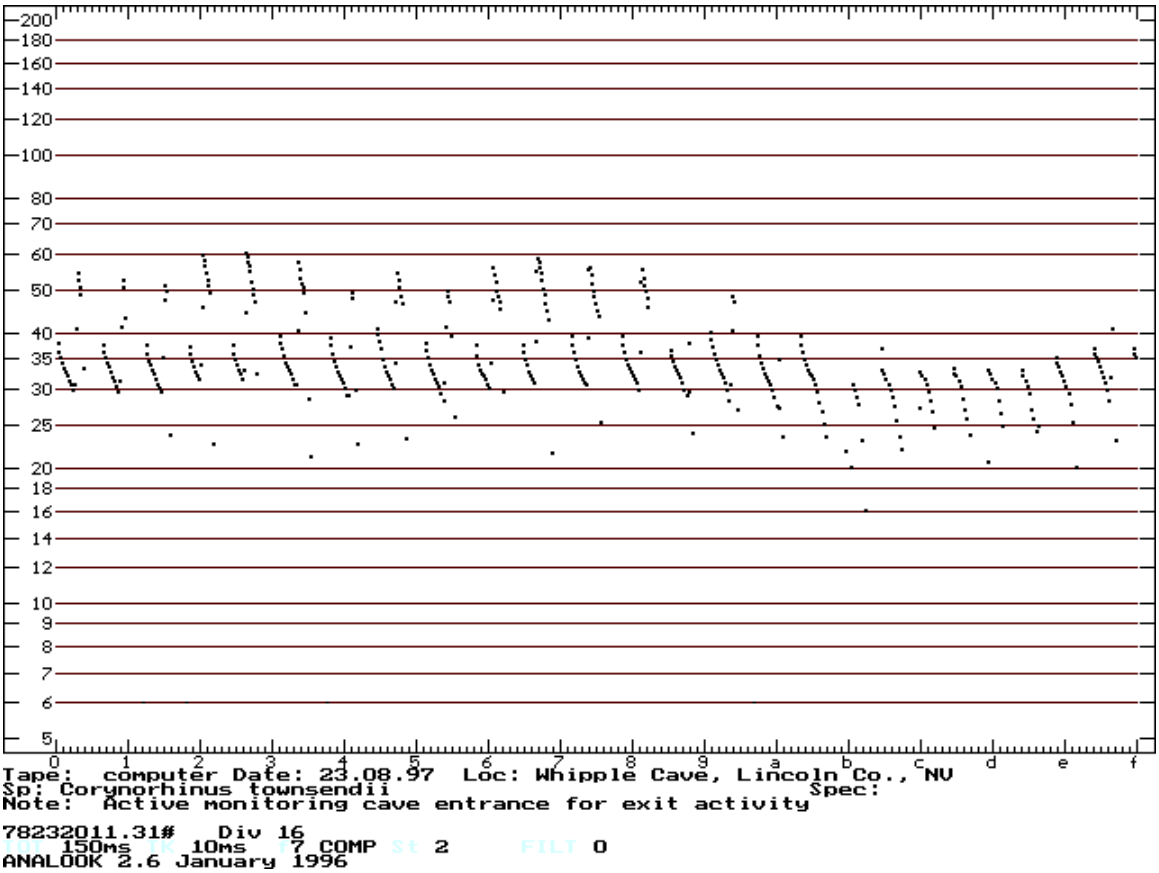
Hoary bat (*Lasiurus cinereus*)



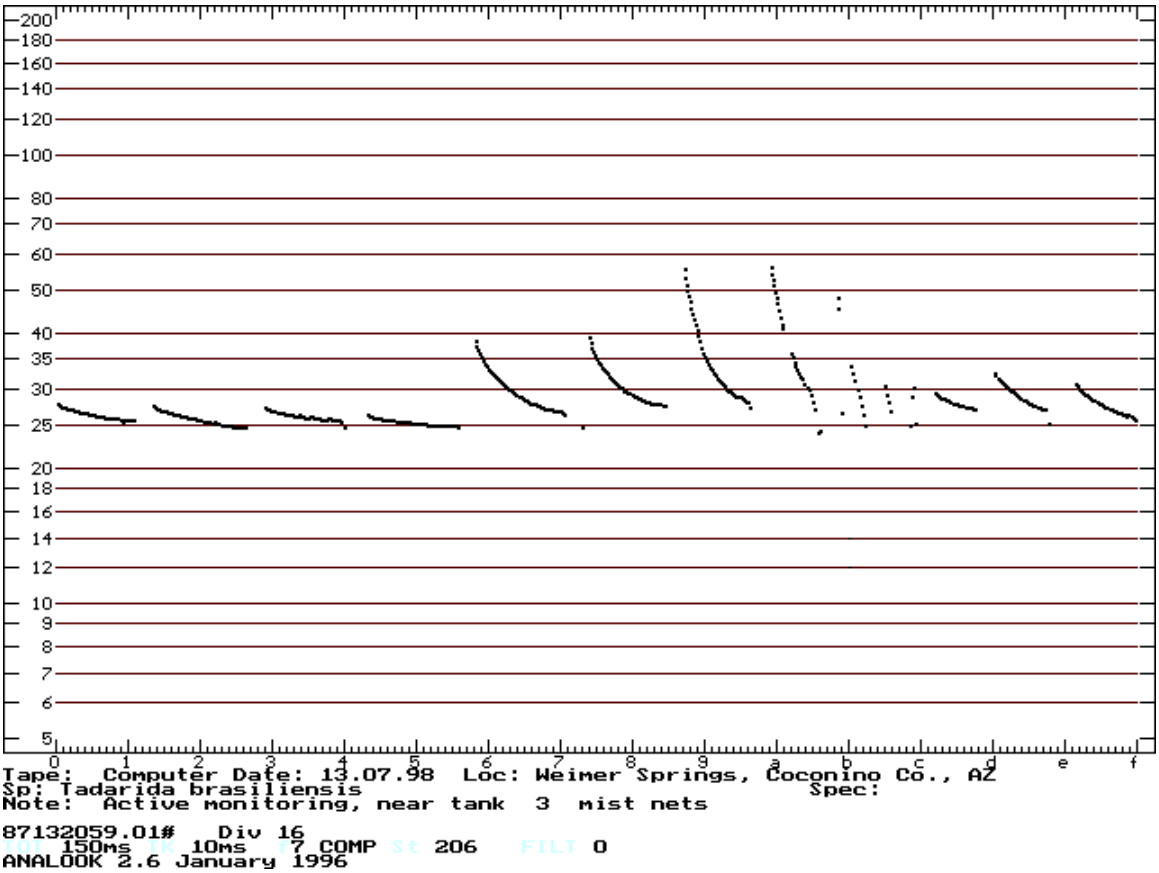
Western red bat (*Lasiurus blossevillii*)



Pallid Bat (*Antrozous pallidus*)



Townsend's big-eared bat (*Corynorhinus townsendii*)



Mexican free-tailed bat (*Tadarida brasilensis*)

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Bat Assessment Survey of Six Additional Buildings to be added to the Final Report for the Bat Assessment Survey for Aetna Springs Resort Property July 30, 2007

METHODS

Building surveys

Six buildings in the project were visually investigated to determine if bats are using the structure for day roosting, night roosting, or maternity roosts. Buildings were surveyed during the day for day and maternity roost assessment. All bats were identified to species and any sign such as guano, staining, or culled insect parts, were identified and quantified when possible. Surveys were conducted June 29, 2007.

Results

Building survey results

Building Name or Number	Species	Type of use	Value to bats
8 Storage	No	No Use	None
11 Main House	Coto Mysp	DR, NR	High
12 Cottage	P Mysp	DR	Low
13 Living Quarters	Anpa, Mysp	MR, DR, NR	Very High
14 Creekside Living Quarters	P Mysp	DR	Low
15 Linen and Living Quarters	Mysp, Coto, Anpa	DR, NR	High

8. Storage

This structure is wood siding with metal roofing. There was no evidence of bat use observed.

No mitigations necessary

11. Main House.

This structure has an expansive attic. Guano deposition throughout the attic is heavy. Multiple species use the structure as a day roost, night roost and possible winter roost. The predominant species using the attic is *Myotis yumanensis*.

Mitigation efforts for this structure will include exclusion of bats prior to the maternity season. The exclusion will be done by closing off access to attic areas during times of no use, and the use of one way exclusion devices.

Pre-construction surveys will be conducted to insure that bats are not present at the time of construction and a qualified bat biologist will be on hand during the initial construction process to handle any bats discovered during construction.

Timing of restoration efforts such as re-roofing during the maternity period, after bats have been excluded prior to maternity season, will make the attic space uninviting as a maternity site. This effort will help prevent bats from being present during construction efforts.

12. Cottage

There was no sign of bat use in the attic or interior of this structure. The metal roof provides roosting habitat.

Pre-construction surveys will be conducted to insure that bats are not present at the time of construction and a qualified bat biologist will be on hand during the initial construction process to handle any bats discovered during construction.

13. Living Quarters
The attic of this structure serves as a maternity roost for *Antrozous pallidus* as well as a night roost for pallid bats and other species. Evidence of bats roosting under the roofing was also observed. There is no evidence of bat use of the interior.

Mitigation efforts for this structure will include exclusion of bats prior to the maternity season. The exclusion will be done by closing off access to attic areas during times of no use, and the use of one way exclusion devices.

Pre-construction surveys will be conducted to insure that bats are not present at the time of construction and a qualified bat biologist will be on hand during the initial construction process to handle any bats discovered during construction.

Timing of restoration efforts such as re-roofing during the maternity period, after bats have been excluded prior to maternity season, will make the attic space uninviting as a maternity site. This effort will help prevent bats from being present during construction efforts.

14. Creekside Living Quarters
No sign of bat use in the interior of this structure. The metal roof appears to the only feature that may provide roosting habitat.

Pre-construction surveys will be conducted to insure that bats are not present at the time of construction and a qualified bat biologist will be on hand during the initial construction process to handle any bats discovered during construction.

15. Linen and Living Quarters.
The interior of this structure showed no sign of bat use. The attic space had signs of light current bat use and signs of heavy bat use in the past. Crevice features on the exterior of the structure provide excellent roost habitat and appear to be occupied buy multiple species including pallid bats and myotis species.

Pre-construction surveys will be conducted to insure that bats are not present at the time of construction and a qualified bat biologist will be on hand during the initial construction process to handle any bats discovered during construction.