Date:	August 12, 2022
Prepared For:	Matthew Sharp Chaney Midpeninsula Regional Open Space District 5050 El Camino Real Los Altos, CA 94022
Re:	Hawthorns Property and Historic Structure Complex Project – Habitat Assessment and Focused Surveys for Roosting Bats, and San Francisco Dusky-footed Woodrat Colony Mapping (MIG Project No. 16160.09)

Dear Matthew Sharp Chaney:

MIG completed a habitat assessment and focused surveys for roosting bats and mapping of woodrat colonies and individual middens at the Hawthorns Area of Windy Hill Open Space Preserve (Hawthorns Area) located near the intersection of Alpine Road and Portola Road in Portola Valley, California (Figure 1). It is our understanding that the Midpeninsula Regional Open Space District (Midpen) is evaluating the disposition options for the structures, which could include reroofing, rehabilitation, or demolition, and seeks a survey to determine if the structures provide bat roosting habitat. The property includes a cluster of residential buildings and farm structures near Los Trancos Creek, which is informally called the Hawthorns Historic Complex (Figure 2). As requested, the focus of this survey for the bat surveys was the following buildings in the historic complex:

- Upper barn
- Hawthorns House
- Cottage
- Garage
- Lower barn
- Carriage shed
- North and south coachman's quarters
- East and west racoon sheds
- Silo

Additional structures not listed above are present on the site but were not included in this assessment because they are in various states of disrepair (e.g., lacking walls or roofs, or collapsed) and are unlikely to support roosting bats.

The entire site including all structures on the site were the focus of woodrat colonies and individual nests.

Methods

Daytime Surveys

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On April 25, 2022, I conducted an initial daytime habitat assessment and was accompanied by Midpen Intern Hannah Liu. During the daytime survey, I inspected the interiors and exteriors of each of the structures, searching for suitable bat roost habitat (e.g., cracks and crevices), bats, and evidence of bat presence (e.g., guano and urine staining). I used 8 x 42-power binoculars and a 700-lumen LED flashlight to examine potential roost habitat.

Evening Emergence Surveys

Because suitable day roost habitat was present on and within many of the structures, evening emergence surveys were conducted to determine if any bats could be observed emerging/existing from the structures. MIG biologists David Gallagher, Alex Broskoff, Megan Kalyankar, and I conducted follow-up evening surveys on June 1, 2, 6 and 7. We were assisted with these surveys by Midpen staff Ariel Star (June 1 and 6), Hannah Liu (June 2), Bernard Fahey (June 2 and 6), Karin Tokatlian (June 6 and 7), and Chris Perry (June 6). During the evening surveys, each observer was stationed on one side of a building to watch for bats emerging from the structure. Each observer also used a handheld Elekon BATSCANNER bat detector to aid in bat detection. The surveys were conducted from 30 minutes prior to sunset (approximately 7:50 p.m.) until one hour after sunset (approximately 9:15p.m.).

Acoustic Surveys

Based on the presence of moderately suitable roosting habitat, acoustic surveys were conducted inside a subset of the buildings to assess activity levels and confirm what species, if any, were present. Acoustic surveys were conducted in the Hawthorns House from April 25 to 27, 2022; in the cottage and garage from May 23 – 25, 2022, and in the lower barn from June 9 to June 11, 2022. An additional survey was also conducted at one location outside the buildings for a general assessment of what species were present on the site. This survey was conducted on in the field between the Hawthorn House, garage, and cottage.

Surveys were conducted using Song Meter SM4 BAT FS (Wildlife Acoustics, Inc., Maynard, MA) bat detectors. Data were processed and analyzed using SonoBat 4.4.5 (Sonobat, Arcata, CA). A subset of calls were also manually vetted for identification accuracy. Whenever possible, we identified call files to species based on the acoustic parameters of shape, minimum frequency, duration, and characteristic frequency. Because sound behaves differently in enclosed spaces, the resulting calls can be distorted and difficult to identify, but still of use in assessing the presence or absence of a bat. Additionally, there is some overlap of call characteristics among some species. Calls of the Mexican free-tailed bat (*Tadarida brasiliensis mexicana*), silver-haired bat (*Lasiurus noctivagans*), and big brown bat (*Eptesicus fuscus*) have similar call characteristics in the 25 to 30kHz frequency range. Similarly, the California myotis (*Myotis californicus*), and Yuma myotis (*Myotis yumanensis*) both echolocate in the 50 kHz range. Some calls of these species are diagnostic, but many are difficult to differentiate. Thus, some calls were labeled as “25-30kHz” for the former group and “50 kHz” for the latter group. Social calls, which have a great deal of variability within and among species, were tallied, but not identified to species. Additional calls or recordings that were of extremely poor quality were labeled as “bat”.

Woodrat Colony Mapping

On April 25, June 14, and June 30, 2022, MIG biologist Alex Broskoff conducted a focused survey of the site for areas supporting woodrat midden colonies and individual, isolated middens. During the survey, Alex walked meandering transects looking for active middens and mapped

polygons around concentrations of middens. Due to the large number of middens that were observed, identifying the limits of actual woodrat colonies was difficult to ascertain; thus, the polygons that were mapped represent the physical limits of closely situated nests rather than actual colony limits. Additionally, he noted areas of importance to woodrats based on the presence of large numbers of nests and suitable habitat attributes including vegetation structure, cover, and food plants.

Results

Daytime Surveys

Upper Barn

The upper barn is a single-story wooden barn with a corrugated metal roof (Photo 1). This structure supports one main room and several horse stalls. Crevice-roosting habitat is present inside the barn in places where wood panels and walls meet, and there is potential for open-roosting species (e.g., Townsend's big-eared bat [*Corynorhinus townsendii*]). Marginal crevice roosting habitat is present on the exterior of the barn between the corrugated metal roof and wooden roof panels. Crevice-roosting species occasionally roost under metal roofs but are unlikely to do so here due to the direct sun exposure that this roof receives. While it is possible that small maternity colonies could occupy this structure, there is very little potential habitat present, and there is no evidence of current or past use by colonies such as large amounts of guano. Additionally, open windows and doors provide easy ingress and egress into this building, making it attractive to night-roosting bats. Again, no large accumulations of bat sign were present to suggest that this structure has ever supported large numbers of bats. Based on the absence of large concentrations of bats and sign, this structure only appears to be used by small numbers of bats. One Townsend's big-eared bat was observed day-roosting in the northern-most room of the barn (Photos 2 and 3).

Hawthorns House

The Hawthorns House is a 4-story house, including a basement and attic. The interior of this structure supports many rooms on the top three floors and one large room in the basement. Crevice-roosting habitat was observed only in a few locations inside the house where bats could roost and go unnoticed, such as the crawl space in the attic, ceiling crevices in an add-on room on the south first floor, and throughout the basement. Small, scattered amounts of bat guano were observed throughout the interior, but no distinct guano piles or urine staining that would indicate regular roosting or maternity colony use was observed in any areas inside the house. The house also provides ostensibly suitable roosting habitat for the Townsend's big-eared bat, and one was observed day-roosting behind an open door in an attic room (Photo 4). No other bats were observed roosting inside this structure.

Although warm and stable thermal conditions are present inside the house, and there is some evidence of bat use, there is limited suitable roosting substrate for large numbers of bats and maternity colonies due to extensive smooth-textured walls and ceilings that are present throughout much of the house. That said, cooler conditions and crevices in the basement make this portion of the building a potentially suitable winter hibernaculum. Characterizing the significance of the removal of winter hibernacula is challenging due to the lack of information about the use and availability of this habitat in the Bay Area. While natural hibernacula (e.g., tree hollows) is likely more common in redwood forests on the coast, such habitat is rare in the mixed oak forest and woodland such as is present in the site vicinity. Human-made structures that

support suitable roosting habitat are likely more common, but also more at risk to disturbance or removal. If potential hibernacula would be removed, Townsend's big-eared bats would have to travel further to areas where more habitat is present on the coast or use other potentially available, though unprotected, human-made structures. Thus, the removal of potential hibernacula could be significant.

The exterior of the house supports several crevices where bats may roost and crevices/cavities leading to potential roosting habitat in interstitial spaces in the walls of the building (Photos 5–8). These features may also provide access into the building. Another access point is a slot located on the south basement door. This appears to be an entrance point created specifically for bats. Overall, the Hawthorns House provides suitable habitat for day-roosting bats and maternity colonies (in exterior crevices), and potential winter-roosting habitat. However, based on the absence of large concentrations of bats and sign, this structure only appears to be used by small numbers of bats.

Cottage

The cottage is a 3-story house, including a basement and attic. This structure supports cavernous and crevice-roosting habitat that could support Townsend's big-eared bat and crevice-roosting species. The entirety of the house, including the basement, supports cavernous habitat. Crevice roosting habitat is primarily located in the attic behind sheet wall panels and roof sheathing (Photo 9). Access into the structure may be gained by several openings in the attic roof. Although we did not enter the basement during the survey, this portion of the building may also support crevice roosting habitat. Access into the basement is primarily through a small basement opening on the east side of the building (Photo 10). During the daytime inspection, one Townsend's big-eared bat was observed day-roosting on the first floor of the building (Photo 11). No other bats were observed inside the building. Scattered amounts of bat guano were observed throughout the interior of the building, but no guano piles or urine staining that would indicate regular roosting or maternity colony use was observed in any areas inside the house. Due the presence of several large roof openings providing easy access, the cottage may also support night-roosting bats. Based on the presence of cavernous and crevice roosting habitat, this structure may support day and night-roosting bats, maternity colonies. The basement may also support winter hibernacula.

The exterior of the house supports several crevices where bats may roost and crevices/cavities leading to potential roosting habitat in interstitial spaces in the walls (Photo 12). These features may also provide access into the building. However, based on the absence of large concentrations of bats and sign, this structure only appears to be used by small numbers of bats.

Garage

The garage is a 2-story structure with an attic. This structure primarily supports cavernous-roosting habitat; however, there is limited roosting substrate due to the smooth surfaces on the ceiling and walls. Although we did not enter it, crevice-roosting habitat may be present in the attic. The exterior of the building has several crevices on several sides of the structure where bats may day roost or gain access to interstitial spaces between the walls (Photos 13–15). During the daytime survey, no bats were observed roosting inside the garage. However, two small piles of guano, likely Townsend's big eared bat guano based on the size and color, were observed in two locations on the second floor of this structure (Photo 16). Based on the features that were observed, the garage supports day-roosting habitat for individuals and potentially for maternity colonies. However, the potential for maternity colonies inside the garage is low due to the limited amount of roosting substrate. Overall, based on the absence of large concentrations of bats and sign, this structure only appears to be used by small numbers of bats.

Lower Barn

The lower barn is a single-story structure with one main room, several side rooms, and stalls. The interior of the main barn and some of the side rooms provide potential cavernous roosting habitat. Crevice roosting habitat inside the barn primarily occurs behind roof sheathing on the ceiling and behind corrugated metal panels on some of the walls (Photo 17). The exterior of the barn also supports crevices on the roof and behind several corrugated metal panels on the exterior walls. However, because this structure is not shaded and the metal is thin, bats are unlikely to roost on the roof. There are multiple access points into the barn, including open windows and doors. During the daytime inspection, small amounts of guano were observed scattered on the floor, but no concentrations of guano or urine staining were observed. One Townsend's big-eared bat was observed day-roosting in the east side room of the barn (Photos 18 and 19), but no other bats were observed during the survey. Based on these surveys, the lower barn supports day and night-roosting habitat and could potentially support maternity colonies. However, based on the absence of large concentrations of bats and bat sign, this structure only appears to be used by small numbers of bats.

Carriage Shed

The carriage shed is a single-story structure located adjacent to the lower barn. This structure supports one room attached to a covered open area (Photo 20). The interior of the shed supports potential cavernous roosting habitat, but no crevice-roosting habitat is present in this room. The building exterior supports crevices between the roof panels and corrugated metal sheets. Although this structure is partially shaded, the roof is thermally unstable, and is not expected to support roosting bats. Because there is easy access into this structure, it may support night-roosting bats. During the daytime inspection, no bats or bat sign were observed in the carriage shed. Given that cavernous-roosting habitat is present and Townsend's big-eared bats are present on the site, this building has some potential to support day-roosting individuals, but maternity colonies are not expected to occur in this small structure.

Coachman's Quarters

The coachman's quarters include two small structures directly north of the corral area (Photo 21). The north structure is a small two-story structure with a single room on each level (Photo 22). The interior of this structure supports potential crevice-roosting habitat between the wood and corrugated metal ceiling panels, and cavernous roosting habitat. On the exterior of the structure, crevice roosting habitat is also present behind a wood panel crevice on the eastern side of the structure. During the daytime inspection no bats were observed, but small amounts of scattered guano were observed inside this structure. Given that cavernous-roosting habitat is present and Townsend's big-eared bats are present on the site, this building has some potential to support day-roosting individuals, but maternity colonies are not expected to occur in this small structure. The southernmost structure is dilapidated and subject to temperature fluctuations (Photo 23). No obvious crevices were observed in this structure, and due to the openness of the structure, it does not support cavernous roosting habitat. Additionally, no bats or signs of bats were observed in the southernmost structure during the daytime inspection.

Racoon Sheds

The two racoon sheds are located directly south of the lower barn. Because these sheds are not fully enclosed, they do not support cavernous roosting habitat. Marginal crevice roosting habitat is present on the shaded roof of the eastern shed, but only a few individual bats may infrequently day roost there. No bats or bat sign were observed in either of the sheds.

Silo
The silo is located directly south of the lower barn. It is composed of concrete and supports a metal roof. This structure supports ostensibly suitable cavernous day-roosting habitat; however, because the texture of the walls is fairly smooth, there is limited roosting substrate. Additionally, several large openings near the top of the structure, increase airflow and reduce thermal stability in this structure. No roosting habitat is present in the structure. Furthermore, no bats or signs of bats were observed inside or outside this structure during the daytime inspection.

Evening Emergence Surveys

During evening emergence surveys, one bat was observed exiting from the south basement door opening of the Hawthorn House. Additionally, two bats were observed entering the south attic opening. These bats were not observed exiting from the structure. No other bats were observed exiting from any of the other structures during the evening surveys.

Acoustic Surveys

During the 3-day acoustic survey period a total of 1,677 call files were recorded in the lower barn, Hawthorn House, cottage, garage, and open field. Fourteen of these call files were noise files or mouse calls and were discarded. A summary of the number of call files that were recorded at each site is included in Table 1 below.

Lower Barn
A total of 884 bat call files were recorded inside the main room of the lower barn. The most abundant species detected was the California myotis and Yuma myotis (Myca/Myyu or 50kHz). Other species that were detected in the lower barn were the Townsends' big-eared bat, big brown bat, and fringed myotis (*Myotis thysanodes*), bats in the 20-30kHz range, and social calls.

Hawthorns House
A total of 14 call files were recorded in the Hawthorn House. This includes 12 Townsend's big-eared bat call files, and two call files in the 20-30kHz range.

Cottage
A total of 41 call files were recorded inside the cottage. This includes 24 call files of the Townsend's big-eared bat, and a small number of detections in the 20-30kHz range, 50kHz range, and one social call.

Garage
A total of 57 call files were recorded in the garage. All but four of these call files were identified as Townsend's big-eared bat. The remaining call files included calls in the 20-30kHz range, 50kHz range, and a social call.

Open Field
A total of 669 call files were recorded in the open field. This includes 538 call files of the Myca/Myyu species group, 9 Townsend's big-eared bat call files, 22 hoary bat (*Lasiurus cinerius*)

call files, 34 Mexican free-tailed bat call files, one western red bat (*Lasiurus blossevillii*) call file, and two social call files.

Table 1. Total Number of Acoustic Call Files at the Hawthorns Property and Historic Structure Complex.

Site	Coto	Epfu	Myca/Myyu	Myth	Labl	Laci	Tabr	20-30kHz	50kHz	Social Calls	Total Call Files/Site
Lower Barn	28	6	597	12	–	–	–	36	181	24	884
Hawthorn House	12	–	–	–	–	–	–	2			14
Cottage	24	–	–	–	–	–	–	2	13	1	40
Garage	53	–	–	–	–	–	–	1	1	1	56
Open Field	9	1	538	3	2	22	34	52	2	2	665
											Total Call Files 1659

*Species are as follows: Coto = *Corynorhinus townsendii*, Epfu = *Eptesicus fuscus*, Myca/Myyu = *Myotis californicus/Myotis yumanensis*, Myth = Myotis thysanodes, Labl = Lasiurus blossevilli, Laci = Lasiurus cinerius, Tabr = *Tadarida brasiliensis Mexicana*.

Woodrat Colony Mapping

The Hawthorns Area supports mixed oak woodland, grassland, and riparian habitats. Plant species in these habitats include coast live oak (*Quercus agrifolia*), valley oak (*Quercus lobata*), California bay (*Umbellularia californica*), poison oak (*Toxicodendron diversilobum*), black walnut (*Juglans nigra*), coyote bush (*Baccharis pilularis*), manroot (*Marah fabaceus*), and blackberry (*Rubus* sp.), among others. These species are suitable food plants for woodrats. While a majority of the site supports good cover and shade, some of these areas lack suitable understory structure, such as downed logs and other woody debris, which provide structure for middens. Those areas that lack abundant understory structure still support woodrat colonies and middens, but there are fewer middens present.

Sixty-six woodrat colonies and 72 individual middens were mapped throughout the site (Figure 3). Within the colonies it is estimated that over 400 woodrat middens are present. All woodrat colonies and individual middens are located in the wooded habitats including the oak woodland habitat across most of the site and along the riparian habitat associated with Los Trancos Creek. Additionally, 16 woodrat middens are present in several of the structures including one each in the silo, carriage shed, north coachman's quarters structure, cottage shed, upper barn, dog shed, and north racoon shed; two each in south raccoon shed, south coachman's quarters structure, and western horse shed; and three in the lower barn (Figure 3). No woodrat colonies or individual middens are present in the grassland habitat on the site.

Discussion

Suitable day roost habitat is present in the upper barn, Hawthorns House, cottage, garage, and lower barn. The carriage shed, coachman's quarters, and eastern racoon shed also support potential roosting habitat, but it is of a marginal quality. No suitable bat roosting habitat is present in or on the west racoon shed or silo. Despite the presence of suitable roosting habitat in/on these structures, only small numbers of bats were visually observed during the daytime and evening

surveys. No obvious signs of use by maternity colonies, large congregations of bats, or long-term use by bats were observed inside or outside any of the structures, nor were large numbers of bats detected during evening emergence surveys.

Townsend's big eared bats are present on the site and individuals were detected visually and/or acoustically in the upper barn, Hawthorns House, cottage, garage, and lower barn. It is presumed that these individuals were solitary males, which are known to roost alone in the summer months (Pierson and Rainey 1998). There is also some evidence that males roost in proximity to maternity roost sites (Fellers and Pierson 2002). However, no maternity colonies were identified in any of the buildings. Given the sparsely developed conditions in the surrounding area, it's possible that a Townsend's big-eared bat maternity colony is present nearby, but none that are documented that we are aware of.

With exception of the lower barn, the acoustic data results and visual observations in those structures that support day-roosting habitat (i.e., upper barn, Hawthorns House, cottage, garage, carriage shed, coachman's quarters, and east racoon shed) have relatively low amounts of bat activity. Even so, Townsend's big-eared bats, a California Species of Special Concern, is present on the site, and may utilize most of these structures as non-reproductive roosts, although other species occasionally enter these structures and may also roost in any of the structures providing suitable habitat. The lower barn was an exception in that this structure had the greatest diversity of species detections. This structure has numerous openings including open windows, crevices, and gaps allowing easy ingress and egress; and open roosting habitat on the tall ceilings offers protection from predators. These features may attract night-roosting by numerous species, which may explain the higher diversity of species detections. However, based on these surveys, there is no indication of congregations of bats day or night roosting in the lower barn.

While evening emergence surveys are a way to assess the presence of day-roosting bats, these surveys are limited by the time when bats exit the structures and the observers' ability to see bats exiting the structures in dim light conditions. For those species that emerge right around sunset, they are relatively easy to observe, but later emerging bats such as those that emerge 30 to 45 minutes after sunset will be harder to detect as it becomes darker. Thus, it is possible that bats can be missed during these surveys. This may explain why some bats were observed entering the garage, but never observed leaving the garage. Additionally, these surveys are only a snapshot in time. Because day roosting habitat is present inside and outside of some of the structures, there is the possibility that bats can move into areas where they were not detected during our surveys. Even so, in our opinion, the visual observations and acoustic data are a good indication of general building use and bat activity on the site and suggest that large numbers of bats are not currently utilizing or occupying any of the buildings but are present in small numbers.

Due to the presence of moderately dense woodland, understory cover and structure, and the presence of a variety of food plants across the site, most of the Hawthorns Area supports highly suitable habitat for the San Francisco dusky-footed woodrat. As a result, the Hawthorns Area supports a large woodrat population and middens are found in nearly every wooded area on the site. However, wooded areas along the northwestern portion of the site, the eastern portion of the site, support lower quality habitat primarily due to the sparse understory vegetation and structure.

Please contact me at (408) 204-6602 or kbriones@migcom.com if you have any questions about this report.

Sincerely,

Kim Briones
Senior Biologist

References

Fellers, G. M. and E. D. Pierson. 2002. Habitat use and foraging behavior of Townsend's big-eared bat (*Corynorhinus townsendii*) in coastal California. Journal of Mammalogy, 83(1):167–177.

Pierson, E.D., and W. E. Rainey. 1998. Distribution, status, and management of Townsend's big-eared bat (*Corynorhinus townsendii*) in California. Prepare for the California Department of Fish and Game. BMCP Technical Report Number 96-7.

Pierson, E. D., M. C. Wackenhut, J. S. Altenbach, P. Bradley, P. Call, D. L. Genter, C. E. Harris, B. L. Keller, B. Lengus, L. Lewis, B. Luce, K. W. Navo, J. M. Perkins, S. Smith, and L. Welch. 1999. Species conservation assessment and strategy for Townsend's big-eared bat (*Corynorhinus townsendii townsendii* and *Corynorhinus townsendii pallescens*). Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, Idaho.

Attachment A. Project Photos

Photo 1. East side of the upper barn. Roof crevices under corrugated metal roof.

Photo 2. Townsend's big-eared bat roost location in the upper barn.

Photo 3. Townsend's big-eared bat day-roosting in the upper barn.

Photo 4. Townsend's big-eared bat day roosting in the Hawthorn House attic.

Photo 5. Crevices on the south side of the Hawthorn House.

Photo 6. Crevices on the south/southwest exterior of the Hawthorn House.

Photo 7. Cavity on the front porch ceiling of the Hawthorn House.

Photo 8. Crevice on the northwest corner of the Hawthorn House.

Photo 9. Potential crevice roosting habitat is present behind sheet wall panels and spaces behind roof sheathing in the cottage attic. Roof openings provide easy ingress and egress.

Photo 10. Cottage basement opening.

Photo 11. Townsend's big-eared bat day-roosting inside the cottage.

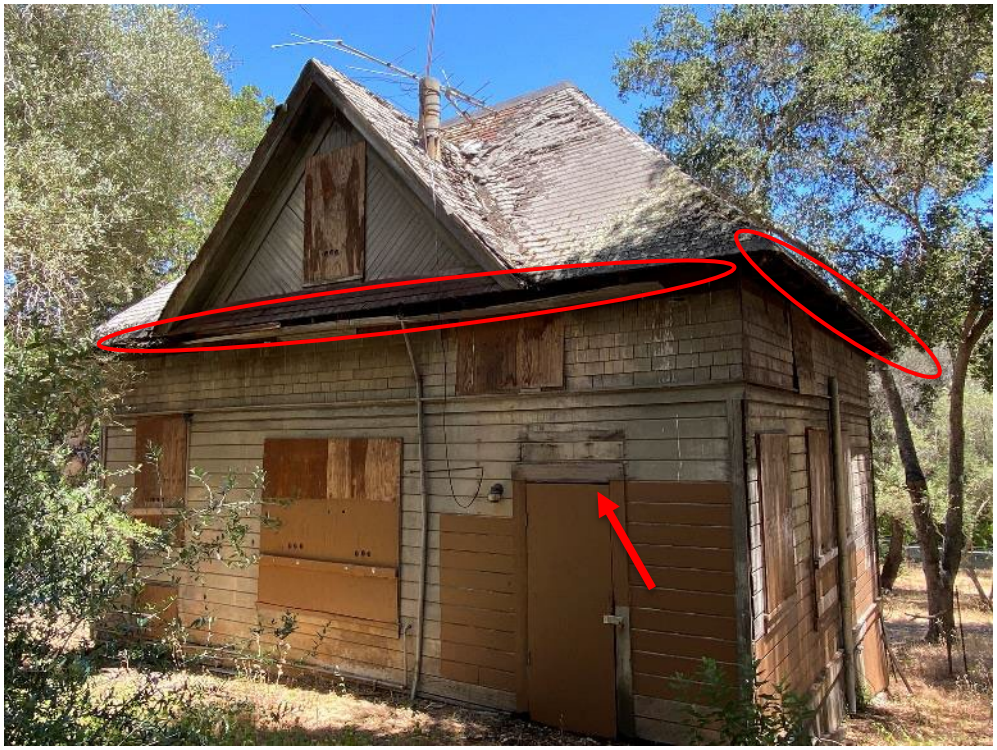

Photo 12. Potential access into the cottage interior and to interstitial spaces in the walls.

Photo 13. Exterior crevices on the west side of the garage.

Photo 14. Exterior crevices on the east side of the garage.

Photo 15. Exterior crevices and attic opening on the south side of the garage.

Photo 16. Townsend's big-eared bat guano pile on the second floor of the Garage.

Photo 17. Main room in the lower barn. Note roof sheathing and corrugated metal wall panels.

Photo 18. Townsend's big-eared bat day-roosting in the east side room of the lower barn.

Photo 19. East side room of the lower barn where Townsend's big-eared bat was day-roosting.

Photo 20. The carriage shed located adjacent to the lower barn.

Photo 21. Coachman's quarters structures.

Photo 22. North coachman's quarters structure.

Photo 23. South coachman's quarters structure.

Photo 24. Silo

Photo 25. Interior of silo.

Attachment B. Project Maps

Figure 1: Area Map

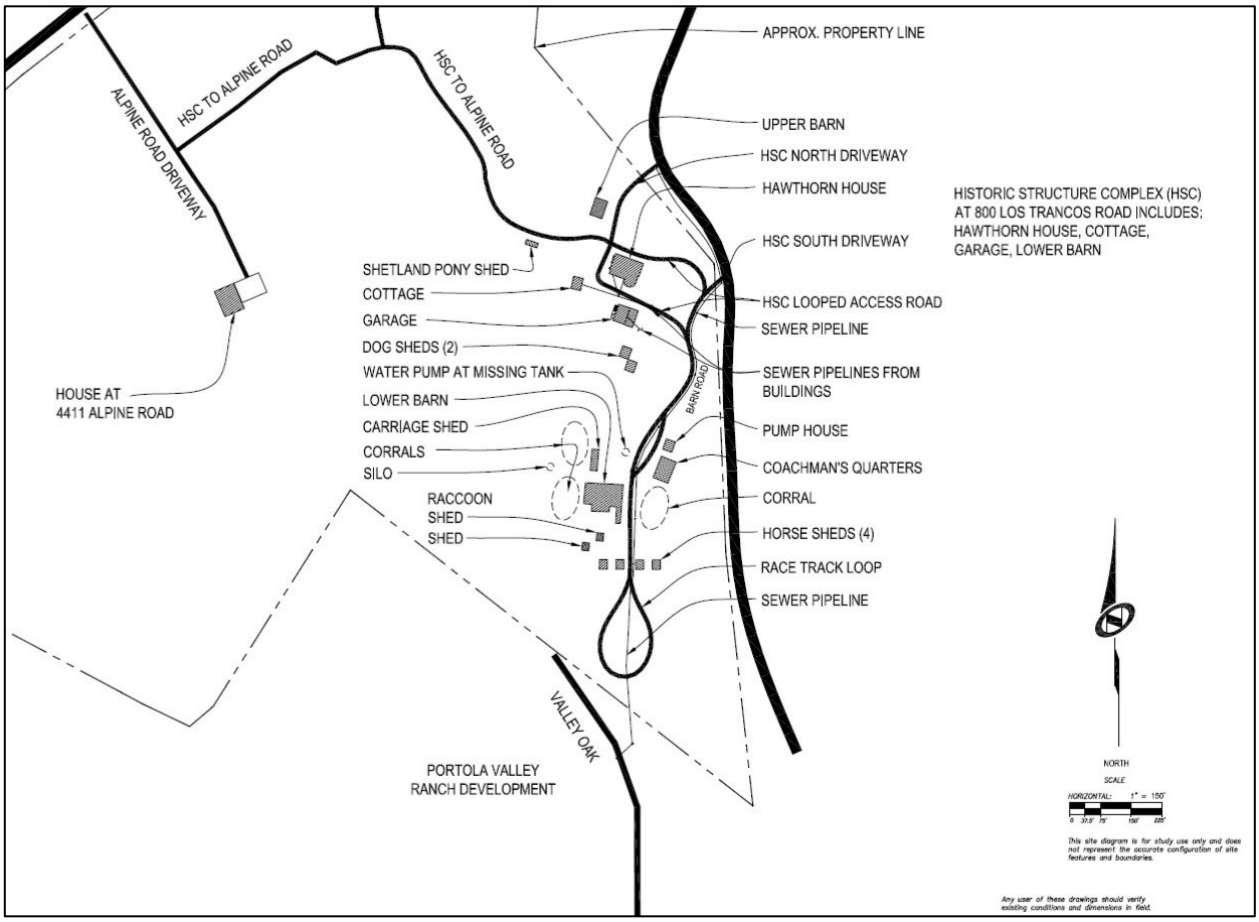

Figure 2: Structure Map

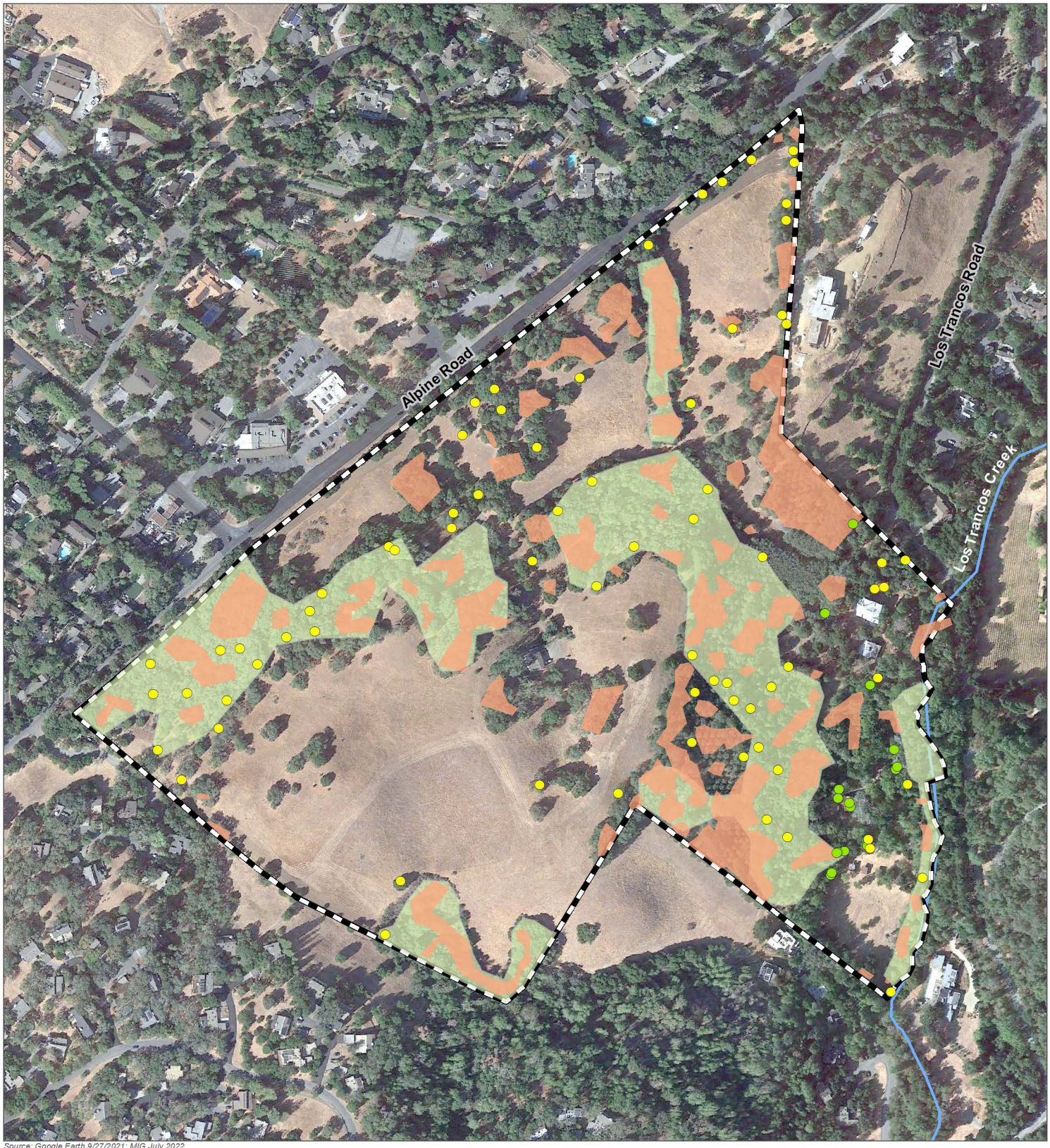

Figure 3. Hawthorns Open Space Preserve
San Francisco Dusky-footed Woodrat Colonies and Middens

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