Appendix B-4

2024 *Proposed Crescent Gardens Cemetery Project Crotch's Bumble Bee Summary Report*,
Riverside County, California
August 22, 2024
prepared by Huffman Environmental, LLC

August 22, 2024

Ms. Heather Schmalbach
Senior Environmental Scientist
California Department of Fish and Wildlife
3883 Ruffin Road
San Diego, CA 92123

RE: **2024 Proposed Crescent Gardens Cemetery Project Crotch's Bumble Bee Summary Report, Riverside County, California**

Dear Ms. Schmalbach:

Huffman Environmental and ELMT Consulting submits this letter report summarizing the results of the focused surveys conducted to determine the presence or absence of the California Department of Fish an Wildlife (CDFW) candidate endangered Crotch's bumble bee (*Bombus crotchii,* CBB) for the proposed Crescent Gardens Cemetery Project (proposed Project; Figure 1). Surveys were conducted by Huffman Environmental on behalf of ELMT Consulting.

The survey methodology follows the 2023 CDFW guidance document, Survey Considerations for California Endangered Species Act (CESA) Candidate Bumble Bee Species (CDFW, 2023). The letter report includes further explanation of the survey methodology and recommended reporting suggested in the guidance document.

Biologist(s) were considered qualified to survey for CBB by meeting the following requirements:

- A minimum of 40 hours experience performing protocol-level surveys for CBB on previous projects
- completion of a CBB identification workshop; and
- successful completion of an aerial invertebrate identification exam approved by CDFW and designed by entomologist Kendall Osborne.

Mr. Osborne, with assistance from entomologist's Rick Rogers and David Faulkner, developed the workshop. Mr. Osborne led the workshop discussing *Bombus* biology and ecology through the use of photographs, videos, and specimens. Surveyors were taught to identify *Bombus* species that potentially occur within coastal southern California. Additional identification of other insects, that could be misidentified as a *Bombus*, and field photography identification methods, were also taught. The practical exam focused on identification of females of the five local species most likely to be encountered: CBB, Sonoran bumble bee *(B. sonorus*), yellow-faced bumble bee (*B. vosnesenskii*), black-tailed bumble bee (*B. melanopygus*), and California bumble bee (*B. californicus*). The exam included photographic, video, and

specimen identification sections. To pass the exam, the surveyors could not misidentify CBB on any portion of the test.

Project Description

The proposed Project is located between the Meadowbrook and Quail Valley communities within Riverside County and the Lake Elsinore USGS 7.5-Minute Quad. It is west of Canyon Lake, between Robert Street and Storyhill Drive. The cemetery facility would occupy approximately 27 acres of 84.99 gross acres and is designed anticipating 20,000 graves with an estimated 10 to 15 burials per month. No crematorium is proposed as a part of this project (Figure 2).

Site Description

The Project elevation is around 1,600 feet, with flat to moderate topographic changes. Dirt access roads occur throughout the site and are among various vegetation community types. Most of the site's vegetation communities consist of California buckwheat scrub and non-native grassland. Smaller portions of the site consist of riparian and disturbed/developed habitats. The site's eastern boundary encounters steeper topography as it borders the foothills near Canyon Lake. The western boundary borders sparse residential property while beyond the north and south boundaries are an extension of the undeveloped, vegetation community composition found within the site.

Background Information

Historically, CBB have been known to occupy two-thirds of California (Hatfield et al., 2014) extending from northern California near the Oregon border down to Mexico in Baja California and Baja California Sur Observations have also been documented in southwestern Nevada near the California border (Williams et al., 2014) An analysis conducted by Hatfield reported CBB range and occurrences over a 10-year period (2002-2012) concluded that CBB range had decreased by approximately 25 percent between the study period and historically (pre-2002), while current relative abundance has decreased by approximately 98 percent relative to historical data (Xerces et al., 2018) In 2018, the Xerces Society for Invertebrate Conservation (Xerces) filed a petition with the California Fish and Game Commission to list CBB, along with four other native bumble bee species as endangered under the California Endangered Species Act (CESA).

Despite its relatively narrow natural range CBB, is a generalist pollinator that is known to occupy a wide variety of natural and disturbed habitat types. CBB have historically been observed foraging on plants from a wide array of plant families but show preference for Fabaceae, Apocynaceae, Asteraceae, Boraginaceae, Ericaceae, Hydrophyllaceae, Lamiaceae, Plumbaginaceae, and Polygonaceae species (Thorp et al., 1983; Richardson, 2017; Osborne, 2020). Observations have been recorded in native and nonnative grasslands, disturbed habitat, coastal sage scrub, Great Basin sage scrub, pinon-juniper woodlands, and chaparral. CBB nectar on a wide range of flowering species

dependent on the abundance of desirable nectar sources. Due to their short tongue length, CBB favor flowers with short corollas (Xerces et al., 2018) CBB nest within abandoned rodent burrows within open scrub or grassland habitat dominated by annual grasses and forbs (Williams et al., 2014)

The annual bumble bee life-cycle begins between February or March when a foundress queen emerges from hibernation and leaves her overwintering location (CDFW, 2023). Over the next few weeks the foundress queen will search for a suitable nest location to establish a new colony. Once she identifies a nesting site she will spend the next month building waxen pots filling them with collected pollen and nectar and laying the first brood of female worker eggs (Xerces, 2023a). After another 4 to 5 weeks the female workers will metamorphose and take over pollen foraging and nest maintenance responsibilities from the foundress queen. The foundress queen continues to produce additional female workers allowing the colony to grow until a substantial worker caste is established and the foundress queen no longer needs to leave the nest to forage (Xerces, 2023a). Each worker has a life span of 1 to 2 months.

The foundress queen switches to laying two sets of eggs: gynes, fertilized eggs that will become next season's foundress queens, and unfertilized male eggs (Britannica, 2023). Once matured, the gynes leave the colony to mate but will return to the nest for protection and to contribute pollen (Xerces, 2023a). The colony will continue to grow through late spring, at which point the female workers may begin to lay unfertilized eggs that will become males. Males do not collect pollen and do not return to their natal colony once they leave to mate; they rest on vegetation through the end of summer and die a few weeks after leaving the nest. The newly mated queens, formerly known as gynes, continue to nectar on any remaining blooms to build up fat reserves for the winter. These future foundress queens identify sites to overwinter and retreat into abandoned rodent burrows or burrow into suitable soil where they enter a hibernation-like state until the following spring (Xerces, 2023b; CDFW, 2023a) Like most bumble bee species, CBB displays strong sexual dimorphism relative to coloration and body size. Queens are 22 to 25 millimeters (mm) in length and characterized by their black face and yellow vertex (top of the head). The dorsal thorax is usually black between and posterior to the wings. The dorsal abdominal is divided into five segments known as tergites. Tergite 2 (T2) has a broad, yellow stripe distinct to the species. Tergite 3 through 5 (T3, T4, and T5) are typically black, while some variations can occur with T3 being lightly red and T4/T5 being light to fully red. Workers have the same coloration as queens but are smaller and range from 12 to 20 mm in length. Males are 14 to 19 mm and display different coloration. The head and face are yellow which extends to both the anterior and posterior dorsal thorax with a black band straddling between the wings. Male T1 and T2 are yellow, which may extend posterior to T3 and taper off on the sides of the body. T4 through T7 may be either black or red (Xerces et al., 2018).

The 2018 Xerces Society for Invertebrate Conservation Petition considered multiple factors that have likely contributed to the rangewide decline of CBB Considered to be the among the primary drivers of CBB population decline is

habitat loss. Rapid urban development, widespread agriculture, and the use of herbicides have led to habitat destruction and fragmentation that has narrowed the range of suitable habitat for CBB to forage and nest. Further the use of glyphosate herbicides may have led to declines in fitness of bees (Motta et al., 2018) and increasing use on systemic neonicotinoid insecticides (Whitehorn et al., 2012; Muth and Leonard, 2019) has also likely impacted bumble bee colony growth and ability for collecting pollen and nectar in the agricultural settings. As suitable habitat with pollen and nectar sources becomes scarce the highly abundant nonnative European honeybee (*Apis mellifera*) continues to compete with CBB and other Bombus species within their native range. Additionally European honeybees may pass on pathogens to native CBB populations (Parveen et al., 2022). Beyond habitat loss, pesticide use poses a direct threat to CBB and may amplify the impacts of disease and pathogens spread among bumble bee populations. Anthropogenic climate change has the potential to impact CBB populations in a multitude of ways by influencing temperature precipitation and seasonal cycles among other natural processes intrinsically linked to the life cycles of CBB and their nectar sources. Generally there is no one identifiable cause for the decline of CBB, but many synergistic factors that have gradually impacted this once abundant species

Habitat Assessment and Nectar Source Mapping

A habitat assessment was conducted by approved CBB biologists and surveyor, Ryan Meszaros on June 6, 2024. The assessment focused on identifying optimal nectar sources where surveyors would have the greatest chance of encountering CBB. The identified nectar patches were delineated based on the relatively high concentration of CBB preferred nectar sources that were in bloom, or will bloom at a later survey visit. These mapped nectar sources comprised of the CBB Survey Area.

Excluded habitat types were defined based on nectar availability. Examples of habitat types that would not support CBB foraging or present low detectability opportunities onsite were disturbed/developed areas such as access roads, riparian communities with little nectar opportunities, and non-native grasslands with invasive species that have already senesced.

Survey areas were mapped by recording a global positioning system (GPS) polygon using Fields Map by ArcGIS. Dominant nectar species were recorded on digital data sheets through the Fulcrum mobile app. Nectar sources were continuously reevaluated during each survey round to determine where to allocate survey efforts. Once potential nectar sources in a patch had senesced, the nectar source was visited briefly to confirm low suitability or not revisited in subsequent rounds.

Survey Methodology

Three surveys rounds were conducted from June 6 through July 17, with a minimum of two weeks between each survey. Efforts were made to survey during the most active flight and peak blooming periods of potential nectar

and pollen sources. Biologists focused their survey efforts within areas with high-quality nectar source areas commonly associated with CBB. The rate of survey speed's goal was to maintain coverage at a minimum of three acres per hour, but would deviate from that average at the discretion of the biologist. Examples of factors considered when evaluating survey speed is nectar availability and density, overall vegetation density and topography, and invertebrate activity. Surveys consisted of a combination of physical, meandering transects and passive surveying with the aid of binoculars. When *Bombus* encountered, the specimen would be observed and identified by using a combination of binoculars and photography. Protocol survey weather was defined as temperatures between 60 to 90 degrees Fahrenheit (°F), wind speeds less than eight mph, and absent of fog or precipitation (CDFW, 2023).

CBB individuals were only identified visually and were captured. Individuals detected were photographed to the extent feasible to confirm identification.

Results

Nectar Survey Area

Upon completion of the initial habitat assessment, 34.73 acres of habitat was initially defined as the CBB Survey Area for the first survey round. As detailed in the methods, high-quality nectar sources varied over the survey season and allocation of survey efforts was adjusted during subsequent surveys. Surveys were discontinued in a high-quality nectar patch once nectar source senesced. The nectar survey area consisted of primarily California buckwheat scrub habitat patches. The dominant nectar sources within these patches consisted of California buckwheat (*Eriogonum fasciculatum)*, white sage (*Salvia apiana)*, Acton encelia (*Encelia actonii*), and bull thistle (*Cirsium vulgarea*).

Focused CBB Surveys

CBB approved surveyor, Ryan Meszaros, conducted surveys on June 6, June 26, and July 6, 2024 during CBB's peak Colony Active Period (CDFW, 2023). Out of three survey rounds, a total of one CBB were observed within the delineated survey area during survey round 1.

The male CBB was observed foraging and nectaring on *Salvia apiana.* CBB was documented and identify confirmed through multiple photos (Appendix A). After observing the CBB initially, surveyor completed their transects in the remaining suitable habitat then returned to the location after 3 hours surpassed where CBB was originally observed and detected CBB still foraging on the same *S. apiana*. The remaining survey rounds 2 and 3 were negative for CBB detection.

With the exception of CBB, *Bombus* was detected during survey round 2, but none in survey round 3. The quantity and species observed during each survey round is documented in Table 1.

Table 1. *Bombus* Species Detected During Each Survey

Date	Survey Round	*Bombus crotchii*	*Bombus melanopygus*	*Bombus vosnesenskii*	*Bombus sonorus*	*Bombus californicus*
6/6/24	1	1	0	0	0	6
6/26/24	2	0	0	0	0	6
7/6/24	3	0	0	0	0	0

Certification

All biologists working under Huffman Environmental for the 2024 Crescent Gardens Cemetery Project CBB Surveys were approved to survey for this species under the California Department of Fish and Wildlife.

We certify that the information in this survey report and attached exhibits fully and accurately represents our work.

.

Please feel free to contact me at garrett@huffmanenvironmental.com if you have any questions regarding the contents of this report.

Cordially,



Garrett Huffman

Principal Biologist
Huffman Environmental, LLC
(623) 238-1545
garrett@huffmanenvironmental.com

References

California Department of Fish and Wildlife (CDFW). 2023. *Survey Considerations for California Endangered Species Act* (CESA) Candidate Bumble Bee Species. June 6, 2023.

Hatfield, R., S. Colla, S. Jepsen, L. Richardson, R. Thorp, and S. Foltz Jordan. 2014. Draft IUCN Assessments for North American *Bombus* spp. for the North American IUCN Bumble Bee Specialist Group. The Xerces Society for Invertebrate Conservation, www.xerces.org, Portland, OR.

Motta E. V. S., K. Raymann, and N. A. Moran. 2018. Glyphosate Perturbs the Gut Microbiota of Honey Bees. Proc. Natl. Acad. Sci. USA. 115 (41).

Muth, F., and A. S. Leonard. 2019. A Neonicotinoid Pesticide Impairs Foraging, But Not Learning, in Free-flying Bumblebees. Sci. Rep. (9) 4764.

Osborne, K. H. 2020. Habitat Conditions for Crotch's Bumblebee on the 13.63-acre El Toro Road TTM 19035, Lake Forest, CA. Submitted to VCS Environmental, July 2020.

Parveen, N., R. Miglani, A. Kumar, et al. 2022. Honey Bee Pathogenesis Posing Threat to Its Global Population: A Short Review. Proc. Indian Natl. Sci. Acad. 88, 11–32. Available at https://doi.org/10.1007/s43538-022-00062-9.

Richardson, L. 2017. Unpublished database. Information on database and data contributors. Available at http://www.leifrichardson.org/bbna.html. Accessed 20 February 2023.

Thorp, R. W., D. S. Horning, Jr., and L. L. Dunning. 1983. Bumble bees and cuckoo bumble bees of California. Bulletin of the California Insect Survey 23:1–79.

Whitehorn, P. R., S. O'Connor, F. L. Wackers, and D. Goulson. 2012. Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production. Science. 336:351–352.

Williams, P. H., R. W. Thorp, L. L. Richardson, and S. R. Colla. 2014. Bumble Bees of North America: An Identification Guide. Princeton University Press, Princeton.

The Xerces Society for Invertebrate Conservation, Defenders of Wildlife, and Center for Food Safety. 2018. Petition to List the Crotch bumble bee (*Bombus crotchii*), Franklin's bumble bee (*Bombus franklini*), Suckley cuckoo bumble bee (*Bombus suckleyi*), and western bumble bee (*Bombus occidentalis occidentalis*) as Endangered Species. California

The Xerces Society for Invertebrate Conservation (Xerces). 2023a. Bumble Bees: Nesting and Overwintering. Available at https://xerces.org/bumblebeenests. Accessed July 25, 2023.

The Xerces Society for Invertebrate Conservation (Xerces). 2023b. About Bumble Bees. Available at https://xerces.org/bumblebees/about. Accessed July 25, 2023.

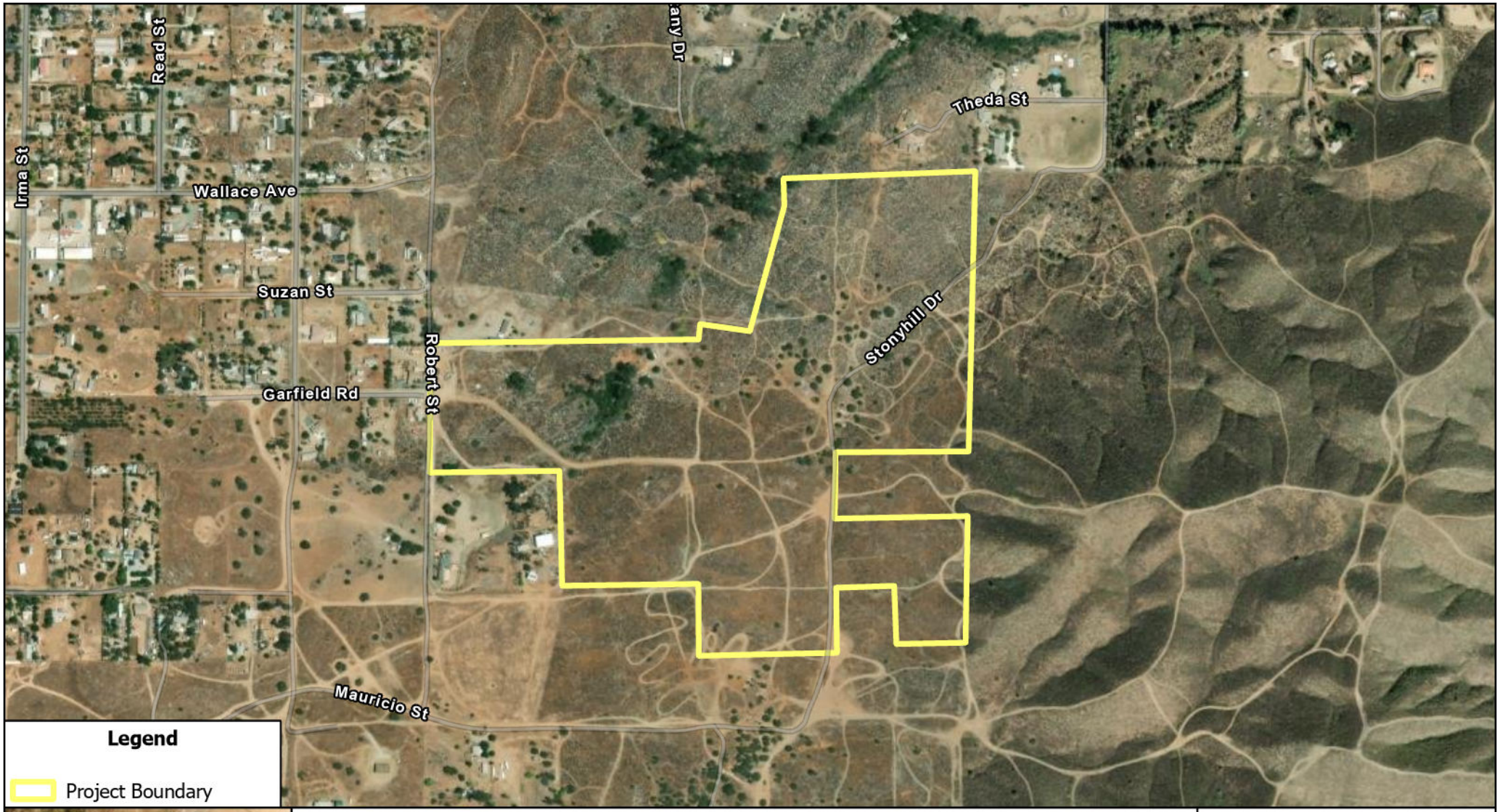


Figure 1: Project Location

Crescent Gardens Cemetery Project
Crotch's Bumble Bee (Bombus crotchii) Surveys

2024

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere

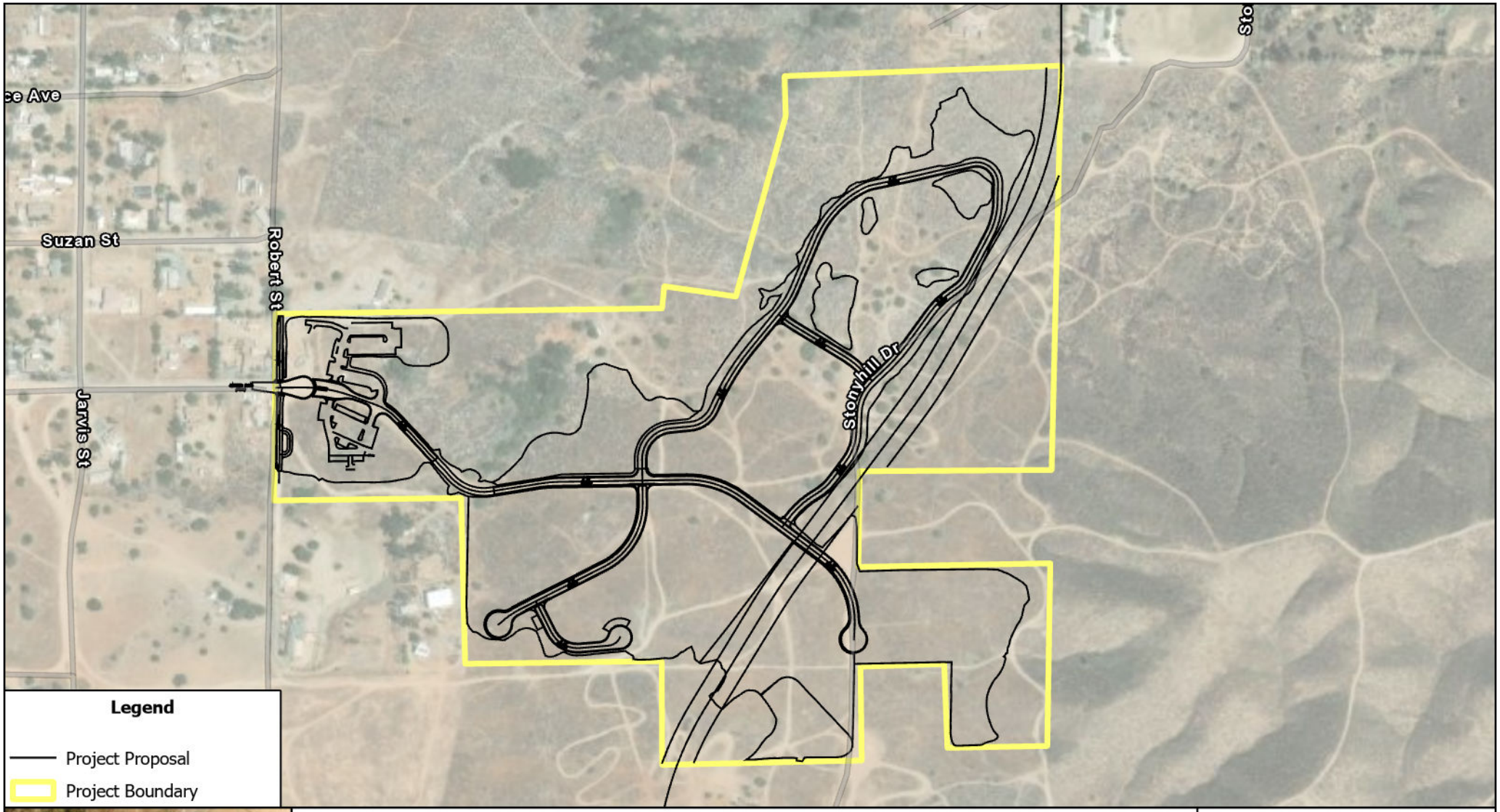


Figure 2: Project Proposal

Crescent Gardens Cemetery Project
Crotch's Bumble Bee (Bombus crotchii) Surveys

2024

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere

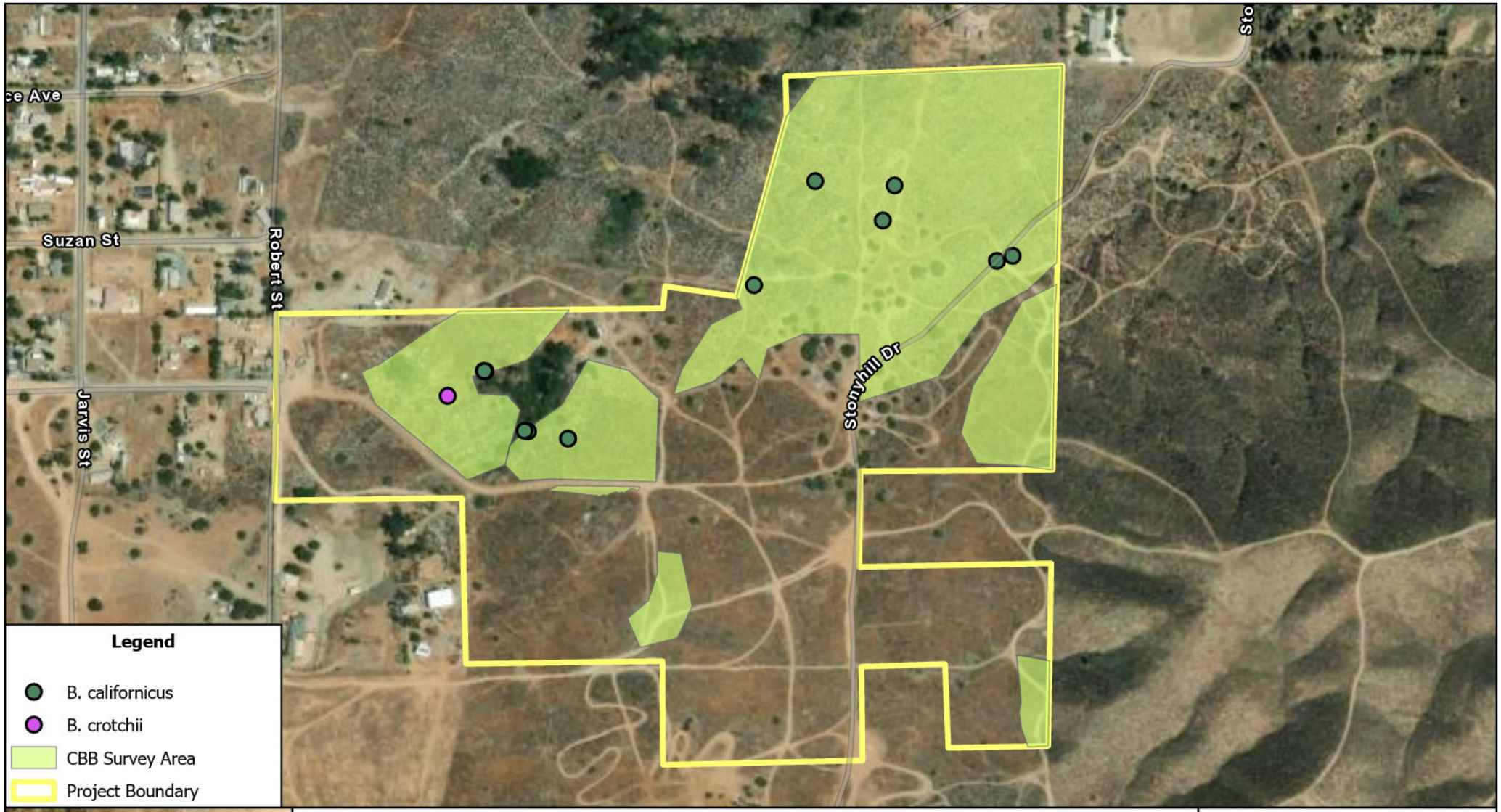


Figure 3: CBB Survey Results

Crescent Gardens Cemetery Project
Crotch's Bumble Bee (Bombus crotchii) Surveys

2024

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere

APPENDIX A
SITE PHOTOGRAPHS



Photo 1: Buckwheat scrub and suitable survey habitat.



Photo 2: Non-native grassland habitat.



Photo 3: Riparian habitat excluded from CBB surveys.



Photo 4: *Bombus crotchii* nectaring on white sage.



Photo 5: *Bombus californicus* nectaring on bull thistle.

APPENDIX B
DATA SHEETS

Survey Data

Project	Crescent Cemetary
Surveyor	Ryan Meszaros
Trainee	
Date	June 6, 2024
Survey Round	1
Survey Type	Crotch's Bumble Bee

Environmental Conditions

Survey Start Time	
Survey Start Time	08:30
Temperature	73
Wind	0-1
Cloud	0
Survey End Time	
End Start Time	14:30
Temperature	87
Wind	1-4
Cloud	0

Vegetation Communities Surveyed	
Dominant Flowering Species	

Crotch's Bumble Bee

Crotch's Bumble Bee (1 Item)

Crotch's Bumble Bee - 1. 09:30, 1

Type	Worker
Time	09:30
Quantity Observed	1
Behavior	Nectaring on Salvia apiana
Notes	Returned hours later and same bee was still nectaring on same Salvia.
Photos	

POWERED BY Fulcrum WWW.FULCRUMAPP.COM

Bombus Observed

B. melanopygus	0
B. vosnesenskii	0
B. sonorus	0
B. californicus	6

Other Wildlife

Other Wildlife Observations (2 Items)

Other Wildlife Observations - 1. Apis mellifera

Species Name	Apis mellifera

Other Wildlife Observations - 2. Pepsis sp.

Species Name	Pepsis sp.

Notes

Notes	

Site Photos

POWERED BY Fulcrum WWW.FULCRUMAPP.COM









POWERED BY Fulcrum WWW.FULCRUMAPP.COM

Survey Data

Project	Crescent Cemetary
Surveyor	Ryan Meszaros
Trainee	
Date	June 26, 2024
Survey Round	2
Survey Type	Crotch's Bumble Bee

Environmental Conditions

Survey Start Time	
Survey Start Time	08:00
Temperature	73
Wind	0-2
Cloud	0
Survey End Time	
End Start Time	13:30
Temperature	90
Wind	2-4
Cloud	0

Vegetation Communities Surveyed	Buckwheat scrub
Dominant Flowering Species	Eriogonum fasciculatum, Salvia apiana, Encelia actonii

Crotch's Bumble Bee

Crotch's Bumble Bee

Bombus Observed

B. melanopygus	0
B. vosnesenskii	0
B. sonorus	0
B. californicus	0

Other Wildlife

POWERED BY Fulcrum WWW.FULCRUMAPP.COM

Other Wildlife Observations (3 Items)

Other Wildlife Observations - 1. Apis mellifera

Species Name	Apis mellifera

Other Wildlife Observations - 2. Pepsis sp.

Species Name	Pepsis sp.

Other Wildlife Observations - 3. Xylocopa sp.

Species Name	Xylocopa sp.

Notes

Notes	Very little nectar other than Buckwheat

Site Photos

POWERED BY Fulcrum WWW.FULCRUMAPP.COM







POWERED BY Fulcrum WWW.FULCRUMAPP.COM

Survey Data

Project	Crescent Cemetary
Surveyor	Ryan Meszaros
Trainee	
Date	July 17, 2024
Survey Round	3
Survey Type	Crotch's Bumble Bee

Environmental Conditions

Survey Start Time	
Survey Start Time	07:30
Temperature	71
Wind	0-2
Cloud	40
Survey End Time	
End Start Time	13:00
Temperature	88
Wind	2-6
Cloud	10

Vegetation Communities Surveyed	Buckwheat scrub
Dominant Flowering Species	Eriogonum fasciculatum, Encelia actonii, Cirsium vulgare

Crotch's Bumble Bee

Crotch's Bumble Bee

Bombus Observed

B. melanopygus	0
B. vosnesenskii	0
B. sonorus	0
B. californicus	6

Other Wildlife

POWERED BY Fulcrum WWW.FULCRUMAPP.COM

Other Wildlife Observations (3 Items)

Other Wildlife Observations - 1. Apis mellifera

Species Name	Apis mellifera

Other Wildlife Observations - 2. Pepsis sp.

Species Name	Pepsis sp.

Other Wildlife Observations - 3. Xylocopa sp.

Species Name	Xylocopa sp.

Notes

Notes	Very little nectar other than Buckwheat. 5 out of 6 Bombus observed on Cirsium

Site Photos

POWERED BY Fulcrum WWW.FULCRUMAPP.COM







POWERED BY Fulcrum WWW.FULCRUMAPP.COM