than significant on a cumulative level. Moreover, the species not covered by the MSHCP cannot be expected to benefit from the conservation strategy of the MSHCP, and therefore the cumulative impacts to these species remain unmitigated. (*Id.*)

Second, Dr. Smallwood explains that the map of habitat gains and losses in the 2023 MSHCP Annual Report shows only losses in the area around the Project, indicating the MSHCP is not successfully mitigating cumulative impacts to species covered by the MSHCP. (*Id.* at 36.) Indeed, through 2023, the monitoring objectives have not been achieved for most of the covered species of terrestrial vertebrate wildlife covered by the MSHCP. (*Id.*) Dr. Smallwood concludes that "[b]ecause the MSHCP has performed poorly relative to its conservation objectives, it should not be relied upon to avoid cumulative impacts on covered species. In fact, through 2023 the monitoring objectives have not been achieved for most of the covered species of terrestrial vertebrate wildlife. That is, the performance of the MSHCP remains unknown for most of its covered species." (*Id.*) Without more, there is no evidence that reliance on the MSHCP will effectively or certainly mitigate cumulative impacts on covered species.

Third, CEQA Guidelines section 15064(h)(3) provides that, "When relying on a plan, regulation or program, the lead agency should explain how implementing the particular requirements in the plan, regulation or program ensure that the project's incremental contribution to the cumulative effect is not cumulatively considerable." Dr. Smallwood explains that the EIR "does not do this for any of the covered species potentially adversely affected by the proposed project." (*Id.*) The EIR fails to support its finding that the Project's cumulative impact on biological resources will be mitigated.

II. The EIR Failed to Mitigate and Respond to Comments on the Project's Significant Tribal Cultural Resource Impacts.

The County failed to require additional mitigation measures proposed by the Soboba Band of Luiseño Indians and the Pechanga Band of Indians. There is no evidence demonstrating that these additional mitigation measures are infeasible. Therefore, the County was obligated to adopt these measures to further mitigate the Project's significant impact on tribal resources. By not adopting these measures, the County has not required all feasible mitigation to reduce significant impacts, and thus cannot properly adopt a statement of overriding considerations.

A. The County must adopt additional mitigation to reduce significant impacts to tribal cultural resources.

CEQA prohibits a lead agency from approving a project with significant environmental effects if there are feasible mitigation measures or alternatives that can substantially lessen or avoid those effects. (PRC §21002; *Mountain Lion Found. v. Fish & Game Comm'n* (1997) 16 Cal.4th 105, 134; *Laurel Heights*, 47 Cal.3d at 403 ["The chief goal of CEQA is mitigation or avoidance of environmental harm"].) "The core of an EIR is the mitigation and alternatives sections." (*Goleta II*, 52 Cal.3d at 564.) When an EIR concludes that a project will have significant impacts, the lead agency has two duties: to meaningfully consider feasible mitigation measures and alternatives, and to identify mitigation measures and alternatives rejected as

infeasible. (*See*, *Preservation Action Council v. City of San Jose* (2006) 141 Cal.App.4th 1336, 1353.)

The lead agency may not approve a project with significant impacts unless it makes one or more of three findings:

(1) that changes or alternations have been required in, or incorporated into, the project that mitigate or avoid the significant effects on the environment;

(2) that the agency making the findings lacks jurisdiction to make the change, but that another agency does have such authority, and either has made or can and should make, the change; and/or

(3) that specific economic, legal, social, technological, or other considerations … make infeasible the mitigation measures or project alternatives identified in the EIR.

(PRC §21081(a); 14 CCR §15091(a.)

When an EIR has identified significant environmental effects that have not been mitigated or avoided, the agency may not approve the project unless it first finds that "[s]pecific economic, legal, social, technological, or other considerations . . . make infeasible the mitigation measures or alternatives identified in the environmental impact report." (PRC §21081(a)(3); *see* 14 CCR §15091(a)(3).) Rejected alternatives and mitigation measures must be "truly infeasible." (*City of Marina v. Bd. of Trustees of Cal. State Univ.* (2006) 39 Cal.4th 341, 369.) Infeasibility findings must be supported by substantial evidence in the record. (PRC §21081.5; 14 CCR §15091(b).) "The required findings constitute the principal means chosen by the Legislature to enforce the state's declared policy 'that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects…" (*City of Marina*, 39 Cal.4th at 350 [quoting PRC §21002].)

If, after all feasible mitigation measures and alternatives have been imposed, a project still has significant environmental impacts, the project may be approved only if the lead agency makes an express written statement "that specific overriding economic, legal, social, technological, or other benefits of the project outweigh the significant effects on the environment." (PRC §21081(b).)

On February 5, 2025, both the Soboba Band of Luiseño Indians and the Pechanga Band provided the County with extensive mitigation measures intended to avoid or minimize impacts to tribal cultural resources ("TCRs") that would result from the Project. According to the Soboba Band's April 23, 2025 comment on the DEIR, the inclusion of these mitigation measures "would avoid damaging effects to Tribal Cultural Resources located both adjacent and within the boundary of the Arroyo Vista Project." In response, the County agreed to incorporate the TCR mitigation measures into the DEIR. However, according to comments on the DEIR from the Soboba Band and the Pechanga Band, the DEIR failed to incorporate the mitigation measures.

In response to the Tribes' comments, the FEIR dismisses the need to adopt additional mitigation measures because it "considers consultation under AB 52 to be concluded." (FEIR, p. F-16.) The FEIR goes on to state that, pursuant to PRC section 21080.3.2(b)(2), "mutual agreement is not required for the conclusion of consultation." Regardless of whether consultation is concluded or not, the County was required to adequately respond to the Soboba Band's comment and incorporate all feasible measures to mitigate the Project's significant TCR impact. The FEIR and County failed to do so. There is no evidence that any of the suggested mitigation measures are infeasible. Without requiring all feasible mitigation measures to reduce the Project's significant TCR impact, the County cannot make the required findings to adopt a statement of overriding considerations. Approving the Project without requiring all feasible mitigation to reduce the Project's significant TCR impact would violate CEQA.

B. The FEIR failed to adequately respond to comments on the DEIR.

The Final EIR's response to comments from the Tribes is inadequate. When a comment suggests "better ways to avoid or mitigate significant environmental impacts" (see 14 CCR §§15088(c), 15204(a)), the lead agency must respond by either explaining why further consideration of the alternative or mitigation was rejected, or by providing an evaluation of the alternative. (*Marin Mun. Water Dist. v. KG Land Cal. Corp.* (1991) 235 Cal.App.3d 1652, 1666; *see Cal. Native Plant Soc'y v. City of Santa Cruz* ("*CNPS*") (2009) 177 Cal.App.4th 957, 992.) "'[A]n adequate EIR must respond to specific suggestions for mitigating a significant environmental impact unless the suggested mitigation is facially infeasible.' [citation omitted] 'While the response need not be exhaustive, it should evince good faith and a reasoned analysis.'" (*CNPS*, 177 Cal.App.4th at 992, citing *L.A. Unified School Dist. v. City of L.A.* (1997) 58 Cal.App.4th 1019, 1029; *see also, Citizens for Quality Growth v. City of Mount Shasta* (1988) 198 Cal.App.3d 433, 442, fn. 8.) The FEIR's response to the Tribes' comments dismissed the additional mitigation measures suggested based on the need for consultation rather than providing a substantive and good faith reasoned response as to why the measures could not be adopted.

III. The EIR Failed to Analyze and Mitigate the Project's Significant Indoor Air Quality Impact.

Certified Industrial Hygienist Francis Offerman conducted a review project plans and other relevant project documents. Mr. Offermann is one of the world's leading experts on indoor air quality, in particular emissions of formaldehyde, and has published extensively on the topic. Formaldehyde is a known human carcinogen, as well as a TAC. As discussed below and set forth in Mr. Offermann's comment, the Project's emissions of formaldehyde to air may result in significant cancer risks to future residents of the Project's homes. Mr. Offermann's expert opinion and conclusions are substantial evidence that the Project may have significant air quality and health risk impacts as a result of these indoor air pollution emissions. As a result of this

potentially significant air quality impact and the County's lack of substantial evidence to the contrary, the EIR was required to analyze and mitigate this impact.

Mr. Offerman explains that the primary source of indoor formaldehyde emissions in indoor air is composite wood products, which are commonly used in building construction for flooring, cabinetry, baseboards, window shades, interior doors, and window and door trims. (Ex. B, pp. 2-3.)

Mr. Offerman found that the Project's future residential occupants will be exposed to a cancer risk from formaldehyde of approximately 120 per million, even assuming that all materials are compliant with the California Air Resources Board's formaldehyde airborne toxics control measure. (Ex. A, p. 4.) This is more than 12 times Southern California Air Quality Management District's CEQA significance threshold of 10 per million and constitutes a significant human health impact that the EIR must analyze and mitigate. (*Id.*)

In addition, the average pre-existing airborne cancer risk in California from formaldehyde in outdoor air is 1.85 per million. The Project's indoor air formaldehyde exposures will exacerbate this preexisting risk from outdoor air exposures to formaldehyde. (*Id.*) Further, the SCAQMD's Multiple Air Toxics Exposure Study ("MATES V") identified an existing cancer risk at the Project site of 331 per million based on ambient air contaminant concentrations as a result of high levels of vehicle traffic. (*Id.*) "These impacts would further exacerbate the pre-existing cancer risk to the building occupants, which result from exposure to formaldehyde in both indoor and outdoor air." (*Id.*) The EIR must analyze and mitigate this significant cumulative human health impact.

When a Project exceeds a duly adopted CEQA significance threshold, as here, this alone establishes substantial evidence that the project will have a significant adverse environmental impact. Indeed, in many instances, such air quality thresholds are the only criteria reviewed and treated as dispositive in evaluating the significance of a project's air quality impacts. (See, e.g. *Schenck v. County of Sonoma* (2011) 198 Cal.App.4th 949, 960 [County applies Air District's "published CEQA quantitative criteria" and "threshold level of cumulative significance"]; see also *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 110-11 ["A 'threshold of significance' for a given environmental effect is simply that level at which the lead agency finds the effects of the project to be significant"].) The California Supreme Court made clear the substantial importance that an air district significance threshold plays in providing substantial evidence of a significant adverse impact. (*Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 327 [estimated emissions in excess of air district's significance thresholds "constitute substantial evidence supporting a fair argument for a significant adverse impact"].) Since expert evidence demonstrates that the Project will exceed the SCAQMD's CEQA significance threshold, there is substantial evidence that an "unstudied, ***potentially significant environmental effect[]***" exists. (See *Friends of Coll. of San Mateo Gardens v. San Mateo Cty. Cmty. Coll. Dist.* (2016) 1 Cal.5th 937, 958 [emphasis added].)

The failure of the County to address the Project's formaldehyde emissions is contrary to the California Supreme Court's decision in *California Building Industry Ass'n v. Bay Area Air Quality Mgmt. Dist.* (2015) 62 Cal.4th 369, 386 (*CBIA*). In that case, the Supreme Court expressly holds that potential adverse impacts to future users and residents from pollution generated by a proposed project ***must be addressed*** under CEQA. At issue in *CBIA* was whether the Air District could enact CEQA guidelines that advised lead agencies that they must analyze the impacts of adjacent environmental conditions on a project. The Supreme Court held that CEQA does not generally require lead agencies to consider the environment's effects on a project. (*CBIA*, 62 Cal.4th at 800-01.) However, to the extent a project may exacerbate existing environmental conditions at or near a project site, those would still have to be considered pursuant to CEQA. (*Id.* at 801.) In so holding, the Court expressly held that CEQA's statutory language required lead agencies to disclose and analyze "impacts on ***a project's users or residents*** that arise ***from the project's effects*** on the environment." (*Id.* at 800 [emphasis added].)

The carcinogenic formaldehyde emissions identified by Mr. Offermann are not an existing environmental condition. Those emissions to the air will be from the Project. People will be residing in and using the Project homes once they are built and begin emitting formaldehyde. Once built, the homes will begin to emit formaldehyde at levels that pose significant direct and cumulative health risks. The Supreme Court in *CBIA* expressly finds that this type of air emission and health impact by the project on the environment and a "project's users and residents" must be addressed in the CEQA process. The existing background health risks from formaldehyde and ambient air pollution sources near the Project site also need to be considered in evaluating the cumulative effect on the Project's future residents.

The Supreme Court's reasoning is well-grounded in CEQA's statutory language. CEQA expressly includes a project's effects on human beings as an effect on the environment that must be addressed in an environmental review. "Section 21083(b)(3)'s express language, for example, requires a finding of a 'significant effect on the environment' (§ 21083(b)) whenever the 'environmental effects of a project will cause substantial adverse effects *on human beings,* either directly or indirectly.'" (*CBIA*, 62 Cal.4th at 800 [emphasis in original].) Likewise, "the Legislature has made clear—in declarations accompanying CEQA's enactment—that public health and safety are of great importance in the statutory scheme." (*Id.*) It goes without saying that the thousands of future residents of the Project are human beings and the health and safety of those residents must be subjected to CEQA's safeguards.

The EIR failed to evaluate this significant impact and the EIR therefore provides no substantial evidence regarding the significant health risks posed by the Project from indoor emissions of formaldehyde. The County has a duty to investigate issues relating to a project's potential environmental impacts. (See *County Sanitation Dist. No. 2 v. County of Kern*, (2005) 127 Cal.App.4th 1544, 1597–98. ["[U]nder CEQA, the lead agency bears a burden to investigate potential environmental impacts."].) The proposed houses will have significant impacts on air quality and health risks by emitting cancer-causing levels of formaldehyde that will expose future residents to cancer risks potentially in excess of SCAQMD's threshold of significance for cancer health risks of 10 in a million. The EIR must be revised to analyze and disclose this significant Project impact.

CONCLUSION

For the forgoing reasons, SAFER respectfully requests that Project's environmental impact report be revised to adequately analyze and mitigate significant impacts and ensure compliance with CEQA. The County should issue a recirculated draft EIR to analyze and mitigate the Project's impacts so that the public will have a full opportunity to review and comment on the analysis. Thank you for your attention to these comments.

Sincerely,

Victoria Yundt

Victoria Yundt
Lozeau | Drury LLP

EXHIBIT A

Shawn Smallwood, PhD
3108 Finch Street
Davis, CA 95616

Riverside County
Planning Department
4080 Lemon Street, 12th Floor
Riverside, CA 92501

2 October 2025

RE: Arroyo Vista Project

To Whom It May Concern,

I write to comment on potential impacts to biological resources that would result from development of the proposed Arroyo Vista Project. I understand the project would add 231 single-family dwelling units on 140.8 acres north of Iris Ave and west of Chicago Ave in Riverside, California. My comments that follow address my concerns that the Draft Environmental Impact Report (DEIR), supported by ELMT Consulting (ELMT 2025) and Kidd Biological (2024), mischaracterizes the existing environmental setting, and that its impacts analysis is flawed and its mitigation measures are inadequate.

My qualifications for preparing expert comments are the following. I hold a Ph.D. degree in Ecology from University of California at Davis, where I also worked as a post-graduate researcher in the Department of Agronomy and Range Sciences. My research has been on animal density and distribution, habitat selection, wildlife interactions with the anthrosphere, and conservation of rare and endangered species. I authored many papers on these and other topics. I served as Chair of the Conservation Affairs Committee for The Wildlife Society – Western Section. I am a member of The Wildlife Society and Raptor Research Foundation, and I've lectured part-time at California State University, Sacramento. I was Associate Editor of wildlife biology's premier scientific journal, The Journal of Wildlife Management, as well as of Biological Conservation, and I was on the Editorial Board of Environmental Management. I have performed wildlife surveys in California for thirty-seven years. My CV is attached.

THE WILDLIFE COMMUNITY AS A BIOLOGICAL RESOURCE

Most environmental reviews pursuant to the California Environmental Quality Act (CEQA) focus on special-status species because CEQA's Checklist Evaluation of Environmental Impacts specifies that such evaluation includes potential impacts to special-status species. However, an important policy of CEQA is "to prevent the elimination of fish or wildlife species due to man's activities, insure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities and examples of the major periods of California history." Pub. Res. Code § 21001(c). This policy is not restricted to special-status species, but it also applies to wildlife populations and plant and animal communities. In fact, the CEQA Guidelines Section 21155.1 defines wildlife habitat as "the ecological communities upon which wild animals, birds, plants, fish,

amphibians, and invertebrates depend for their conservation and protection." This definition is consistent with the scientific definition of habitat, which is that portion of the environment that is used by members of a species for survival and reproduction (Hall et al. 1997). An essential portion of the environment used by any special-status species is composed of the collection of other species of plants and wildlife, because these species are forage, provisioners of refugia and nest substrates, and ecological mutualists; no special-status species can exist in a vacuum of other wildlife. The CEQA Checklist Evaluation assigns priority to special-status species to balance information and cost, but it does not exclude the need to evaluate environmental impacts to other species, which, after all, are members of the very communities within which special-status species inter-depend for survival and reproduction.

All wildlife species should be of concern in a CEQA review, but the CEQA prioritizes special-status species. The species I consider to be special-status species are those listed in California's Special Animals List inclusive of threatened and endangered species under the California and federal Endangered Species Acts, candidates for listing under CESA and FESA, California's Fully Protected Species, California species of special concern, and California's Taxa to Watch List (https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406), continental and region-specific US Fish and Wildlife Service Birds of Conservation Concern (https://www.fws.gov/sites/default/files/documents/birds-of-conservation-concern-2021.pdf), and naturally rare species such as raptors protected by California's Birds of Prey laws, Fish and Game Code Sections 3503, 3503.5, 3505 and 3513 (see https://wildlife.ca.gov/Conservation/ Birds/Raptors).

What follows is a summary of a site visit to detect as many of the species of wildlife as possible within the short time available. The survey was also intended to detect as many of the special-status species as possible, but with the understanding that most special-status species are less readily detectable due to rarity and crypticity. Nonetheless, the species detected can indicate the ecological integrity of the site and thus the likelihood of occurrence of special-status species not yet detected.

SITE VISIT

On my behalf, Noriko Smallwood, a wildlife biologist with a Master of Science Degree from California State University Los Angeles, visited the site of the proposed project for 3.12 hours of diurnal survey from 06:29 to 09:36 hours on 10 September 2025, and for 2 hours of diurnal survey from 17:12 to 19:12 hours and for 2 hours of nocturnal survey from 18:50 to 20:50 hours on 11 September 2025. During daylight, Noriko walked the site's perimeter where accessible, stopping to scan for wildlife with use of binoculars. At night, Noriko strapped a Pettersson M500 acoustic bat detector to a 30-foot pole, and cabled the detector to her computer, which ran Sonobat Live. Sonobat Live identifies bats to species based on the bats' sonograms that are detected by the M500. Noriko recorded all species of vertebrate wildlife she detected, including those whose members flew over the site or were seen just off the site. Animals of uncertain species identity were either recorded to the Genus or higher taxonomic level.

On 10 September 2025, conditions were cloudy to mostly cloudy with 4 MPH south wind and temperatures of 61-67° F. On 11 September 2025, conditions were sunny with 10 MPH west wind and temperatures of 77-72° F during the diurnal survey, and clear with 8 MPH west wind and temperatures of 72-67° F during the nocturnal survey. The site is primarily annual grassland, sage scrub, and riparian (Photos 1 and 2).

Noriko saw turkey vulture and Cooper's hawk (Photos 3, 4, and 5), red-tailed hawk (Photo 6), Anna's hummingbird and Allen's hummingbird (Photos 7 and 8), California thrasher (Photo 9), California horned lark and California scrub-jay (Photos 10 and 11), California gnatcatcher (Photo 12), American crow and killdeer (Photos 13 and 14), Cassin's kingbird and Say's phoebe (Photos 15 and 16), mourning dove (Photo 17), Bell's sparrow and song sparrow (Photos 18 and 19), savannah sparrow and California towhee (Photos 20 and 21), house finch (Photo 22), granite spiny lizard and western side-blotched lizard (Photos 23 and 24), desert cottontail and black-tailed jackrabbit (Photos 25 and 26), California ground squirrel (Photo 27), Mexican free-tailed bat, canyon bat, and western mastiff bat (Photos 28, 29, and 30), among the other species listed in Table 1. Noriko detected 49 species of vertebrate wildlife at or adjacent to the project site, including 16 species with special status and one additional species covered by the MSHCP (Table 1).



Photos 1 and 2. *Views of the project site, 10 September 2025. Photos by Noriko Smallwood.*



Photo 3. *Turkey vulture on the project site, 11 September 2025. Photo by Noriko Smallwood.*



Photos 4 and 5. *Cooper's hawks on the project site, 11 and 10 September 2025. Photos by Noriko Smallwood.*



Photo 6. *Red-tailed hawk just off the project site, 10 September 2025. Photo by Noriko Smallwood.*



Photos 7 and 8. *Anna's hummingbird (left), and Allen's hummingbird (right) on the project site, 10 September 2025. Photos by Noriko Smallwood.*



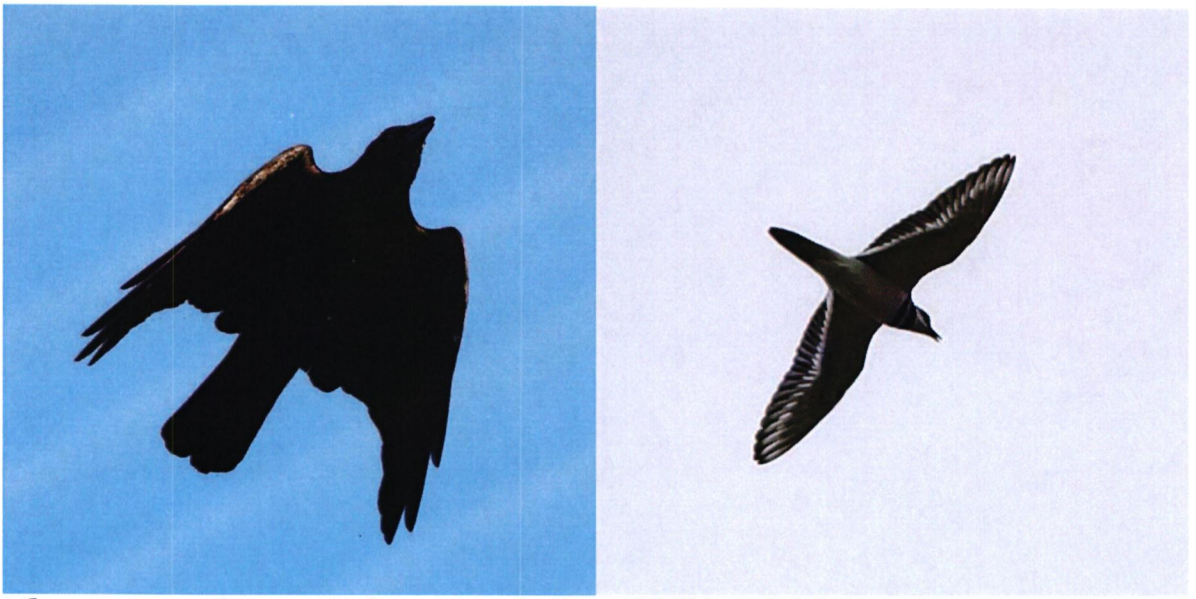
Photo 9. *California thrasher on the project site, 10 September 2025. Photo by Noriko Smallwood.*



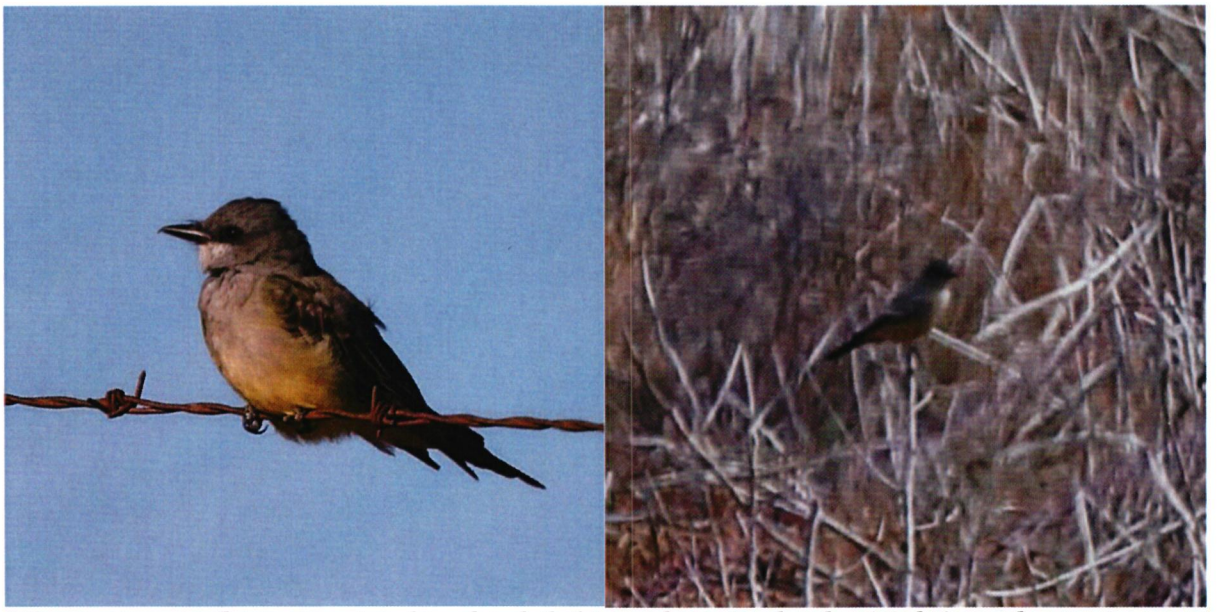
Photos 10 and 11. *California horned lark (left), and California scrub-jay (right) on the project site, 11 and 10 September 2025. Photos by Noriko Smallwood.*



Photo 12. *California gnatcatcher on the project site, 10 September 2025. Photo by Noriko Smallwood.*



Photos 13 and 14. *American crow (left), and killdeer (right) on the project site, 11 and 10 September 2025. Photos by Noriko Smallwood.*



Photos 15 and 16. *Cassin's kingbird (left), and Say's phoebe (right) on the project site, 11 and 10 September 2025. Photos by Noriko Smallwood.*



Photo 17. *Mourning dove on the project site, 11 September 2025. Photo by Noriko Smallwood.*



Photos 18, 19, 20, and 21. *Bell's sparrow (top left), song sparrow (top right), savannah sparrow (bottom left), and California towhee (bottom right) on the project site, 10 and 11 September 2025. Photos by Noriko Smallwood.*



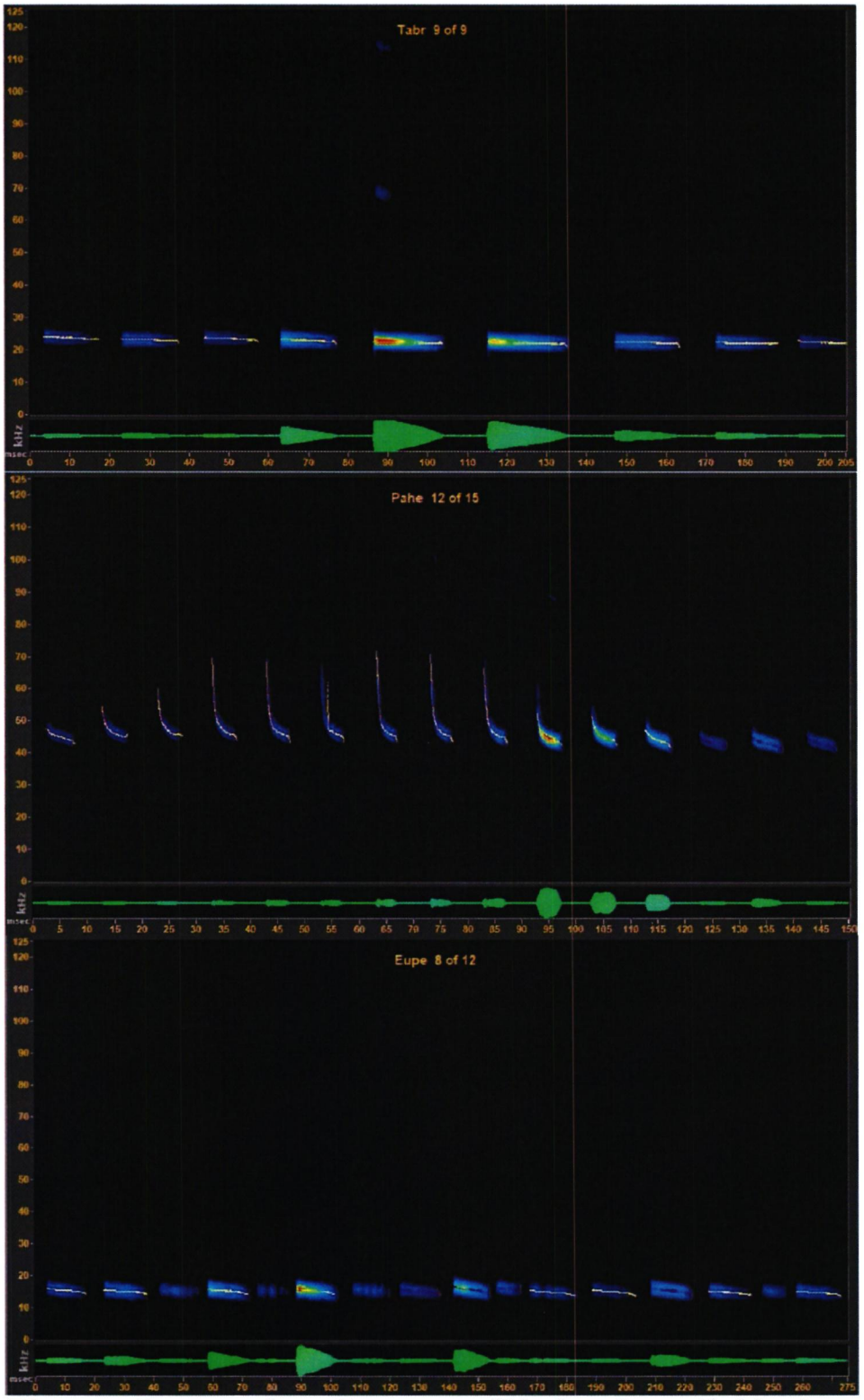
Photo 22. *House finches on the project site, 11 September 2025. Photo by Noriko Smallwood.*



Photos 23 and 24. *Granite spiny lizard (left), and western side-blotched lizard (right) the project site, 11 September 2025. Photos by Noriko Smallwood.*



Photo 25, 26, and 27. *Desert cottontail (top left), black-tailed jackrabbit (top right), and California ground squirrel (bottom) on the project site, 10 and 11 September 2025. Photos by Noriko Smallwood.*



Photos 28, 29, and 30. *Sonogram of Mexican free-tailed (top) canyon bat (middle), and western mastiff bat (bottom) detected on site using Sonobat Live and a Pettersson M500, 11 September 2025.*

Noriko Smallwood certifies that the foregoing and following survey results are true and accurately reported.

Noriko Smallwood

Table 1. *Species of wildlife Noriko observed during 3.12 hours of diurnal survey on 10 September 2025, 2 hours of diurnal survey and 2 hours of nocturnal survey on 11 September 2025.*

Common name	***Species name***	**Status[1]**	**Notes**
Granite spiny lizard	*Sceloporus orcutti*	MSHCP	
Great Basin fence lizard	*Sceloporus occidentalis longipes*		Just off site
Western side-blotched lizard	*Uta stansburiana elegans*		
Mallard	*Anas platyrhynchos*		Just off site
Rock pigeon	*Columba livia*	Non-native	Flew over
Eurasian collared-dove	*Streptopelia decaocto*	Non-native	
Mourning dove	*Zenaida macroura*		Many
Anna's hummingbird	*Calypte anna*		
Allen's hummingbird	*Selasphorus sasin*	BCC	
Killdeer	*Charadrius vociferus*		Many
Turkey vulture	*Cathartes aura*	BOP, MSHCP	
Cooper's hawk	*Accipiter cooperii*	WL, BOP, MSHCP	
Red-tailed hawk	*Buteo jamaicensis*	BOP	
American barn owl	*Tyto furcata*	BOP	Flew over and called during evening survey
Nuttall's woodpecker	*Picoides nuttallii*	BCC	
American kestrel	*Falco sparverius*	BOP	Perched on fence
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE, CE, MSHCP	Foraged in riparian
Cassin's kingbird	*Tyrannus vociferans*		
Black phoebe	*Sayornis nigricans*		
Say's phoebe	*Sayornis saya*		
Least Bell's vireo	*Vireo bellii pusillus*	FE, CE, MSHCP	Sang from riparian
California scrub-jay	*Aphelocoma californica*		
American crow	*Corvus brachyrhynchos*		Many
Common raven	*Corvus corax*		
California horned lark	*Eremophila alpestris actia*	WL, MSHCP	
Barn swallow	*Hirundo rustica*		Flew over
Cliff swallow	*Petrochelidon pyrrhonota*		Flew over
Bushtit	*Psaltriparus minimus*		Foraged in riparian
California gnatcatcher	*Polioptila c. californica*	FT, SSC2, MSHCP	Pair

Common name	*Species name*	Status[1]	Notes
Bewick's wren	*Thryomanes bewickii*		
California thrasher	*Toxostoma redivivum*	BCC	
Northern mockingbird	*Mimus polyglottos*		
House finch	*Haemorphous mexicanus*		
Lesser goldfinch	*Spinus psaltria*		Many
Bell's sparrow	*Amphispiza b. belli*	WL, MSHCP	
Savannah sparrow	*Passerculus sandwichensis*		
Song sparrow	*Melospiza melodia*		
California towhee	*Melozone crissalis*		
Spotted towhee	*Pipilo maculatus*		
Common yellowthroat	*Geothlypis trichas*		
Canyon bat	*Parastrellus hesperus*	WBWG:M	
Mexican free-tailed bat	*Tadarida brasiliensis*	WBWG:L	
Western mastiff bat	*Eumops perotis*	SSC, WBWG:H	
Black-tailed jackrabbit	*Lepus californicus*		Just off site
Desert cottontail	*Sylvilagus audubonii*		
California ground squirrel	*Otospermophilus beecheyi*		
Coyote	*Canis latrans*	MSHCP	Called during evening survey, tracks and scat
Kangaroo rat or pocket mouse	*Heteromyidae*		Burrows
California vole	*Microtus californicus*		Burrows

[1] Listed on CDFW's Special Animals List (https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406) as FT or FE = federal threatened or endangered; CT or CE = California threatened or endangered; SSC = California Species of Special Concern, and SSC1, SSC2 and SSC3 = California Bird Species of Special Concern priorities 1, 2 and 3, respectively); WL = CDFW's Taxa to Watch List; WBWG = Western Bat Working Group with priority rankings, of low (L), moderate (M), and high (H); BCC = U.S. Fish and Wildlife Service's Bird of Conservation Concern (https://www.fws.gov/sites/default/files/ documents/birds-of-conservation-concern-2021.pdf); BOP = protected by Birds of Prey (California Fish and Game Code 3503.5, see https://wildlife.ca.gov/Conservation/Birds/ Raptors), and MSHCP = covered by the Western Riverside Multiple Species Habitat Conservation Plan.

All the species in Table 1 would lose habitat as the result of the project. Even the species associated with riparian environments would be adversely affected, because they would lose access to forage sourced from surrounding uplands, and because they would be vulnerable to the intrusive effects of artificial light and noise from neighboring homes, and from house cats, dogs and people.

ANALYSIS OF RECONNAISSANCE SURVEY DATA

Noriko detected 49 species of vertebrate willdife, which was a large number for the brevity of her survey effort. However, the species of wildlife Noriko detected at the project site were not the only species that were present during her surveys, as there are always species that are not detected. To demonstrate this, I fit nonlinear regression models to Noriko's cumulative numbers of vertebrate species detected with time into her daytime surveys to predict the number of species that she would have detected with longer surveys or perhaps with additional biologists available to assist her. The type of model is a logistic growth model, which reaches an asymptote that corresponds with the theoretical maximum number of vertebrate wildlife species that could have been detected during the survey. The model fit to Noriko's survey data from the morning of 10 September predicts 51 species of vertebrate wildlife were available to be detected, or 10 more species than she detected that morning (Figure 1). The model fit to Noriko's survey data from the evening of 11 September predicts 59 species of vertebrate wildlife were available to be detected, or 31 more species than she detected that evening (Figure 1). The patterns in her species detection rates were otherwise very similar between her daylight surveys, and both exceeded the upper bound of the 95% confidence interval estimated from morning surveys we completed throughout the region.

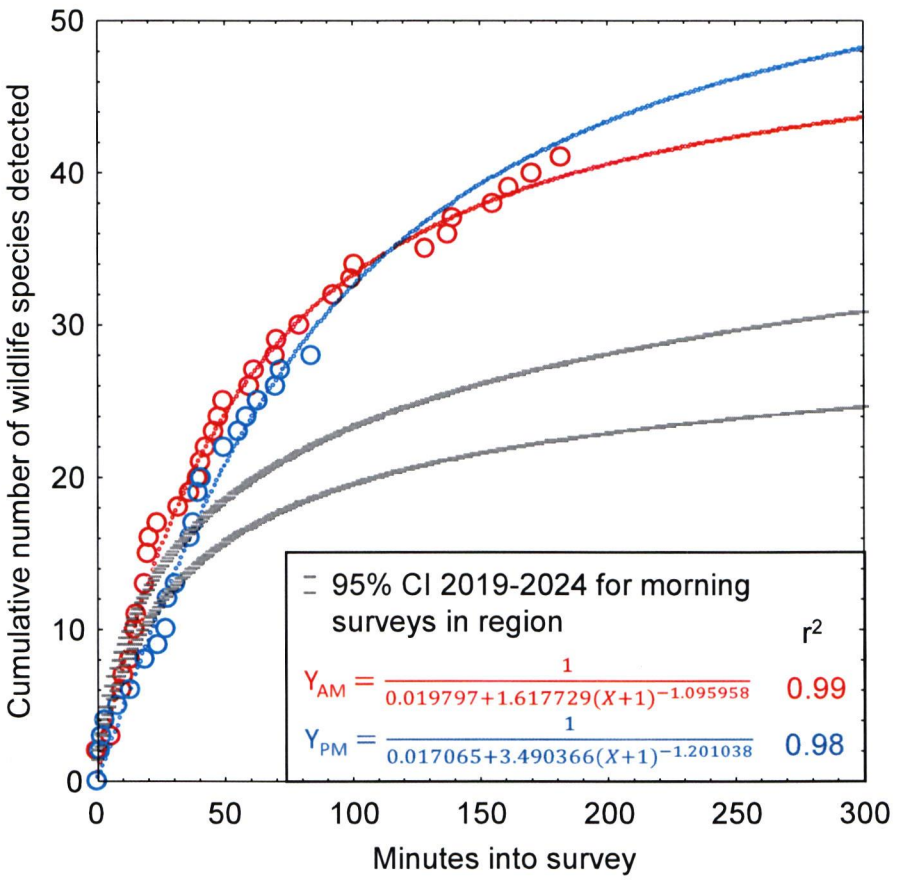


Figure 1. *Actual and predicted relationships between the numbers of vertebrate wildlife species detected and the elapsed survey time based on Noriko's visual-scan surveys on 10 and 11 September 2025.*

Unknown are the identities of the species Noriko missed, but the species that Noriko did and did not detect on 10 and 11 September 2025 composed only a fraction of the species that would occur at the project site over the period of a year or longer. This is because many species are seasonal in their occurrence, some require more survey effort because they are highly cryptic, and the members of other species would visit the site only periodically while patrolling large home ranges. Surveys on only two days cannot possibly detect all of the species of the local wildlife community.

At least a year's worth of surveys would be needed to more accurately report the number of vertebrate species that occur at the project site, but I only have Noriko's two surveys. However, by use of an analytical bridge, a modeling effort applied to a large, robust data set from a research site can predict the number of vertebrate wildlife species that likely make use of the site over the longer term. This analytical bridge draws inference from the pattern of species detections more than it does from the research site, and I note that the pattern, i.e., rate, of species detections is consistent from site to site.

As part of my research, I completed a much larger survey effort across 167 km^2 of annual grasslands of the Altamont Pass Wind Resource Area, where from 2015 through 2019 I performed 721 1-hour visual-scan surveys, or 721 hours of surveys, at 46 stations. I used binoculars and otherwise the methods were the same as the methods I and other consulting biologists use for surveys at proposed project sites. At each of the 46 survey stations, I tallied new species detected with each sequential survey at that station, and then related the cumulative species detected to the hours (number of surveys, as each survey lasted 1 hour) used to accumulate my counts of species detected. I used combined quadratic and simplex methods of estimation in Statistica to estimate least-squares, best-fit nonlinear models of the number of cumulative species detected regressed on hours of survey (number of surveys) at the station: $\hat{R} = \frac{1}{1/a+b\times(Hours)^c}$, where $\hat{R}$ represented cumulative species richness detected. The coefficients of determination, r^2, of the models ranged 0.88 to 1.00, with a mean of 0.97 (95% CI: 0.96, 0.98); or in other words, the models were excellent fits to the data.

I projected the predictions of each model to thousands of hours to find predicted asymptotes of wildlife species richness. The mean model-predicted asymptote of species richness was 57 after 11,857 hours of visual-scan surveys among the 46 stations of my research site. I also averaged model predictions of species richness at each incremental increase of number of surveys, i.e., number of hours (Figure 2). On average I would have detected 17.5 species over my first 5.12 hours of diurnal surveys at my research site in the Altamont Pass (5.12 hours to match the 5.12 hours Noriko surveyed during daylight hours at the project site), which composed 30.7% of the predicted total number of species I would detect with a much larger survey effort at the research site. Given the example illustrated in Figure 2, the 45 diurnally active species Noriko detected after her 5.12 hours of daylight survey at the project site likely represented 30.7% of the species to be detected after many more visual-scan surveys over another year or longer. With many more repeat surveys through the year, Noriko would likely detect $45/0.307 = 147$ species of diurnally active vertebrate wildlife at the site. Assuming Noriko's ratio of special-status to non-special-status species was to hold through the detections of all 147

predicted species, then continued surveys would eventually detect 39 special-status species of diurnally active vertebrate wildlife.

Because my prediction of 147 species of vertebrate wildlife, including 39 special-status species, is derived from daytime visual-scan surveys, and would detect few nocturnal mammals such as bats, the true number of species composing the wildlife community of the site must be larger. Noriko's reconnaissance surveys should serve only as a starting point toward characterization of the site's wildlife community, but it certainly cannot alone inform of the inventory of species that use the site. More surveys are needed than her two surveys to produce an inventory the project site's wildlife community. Nevertheless, the large number of species I predict at the project site is indicative of a relatively species-rich wildlife community that warrants a serious survey effort.

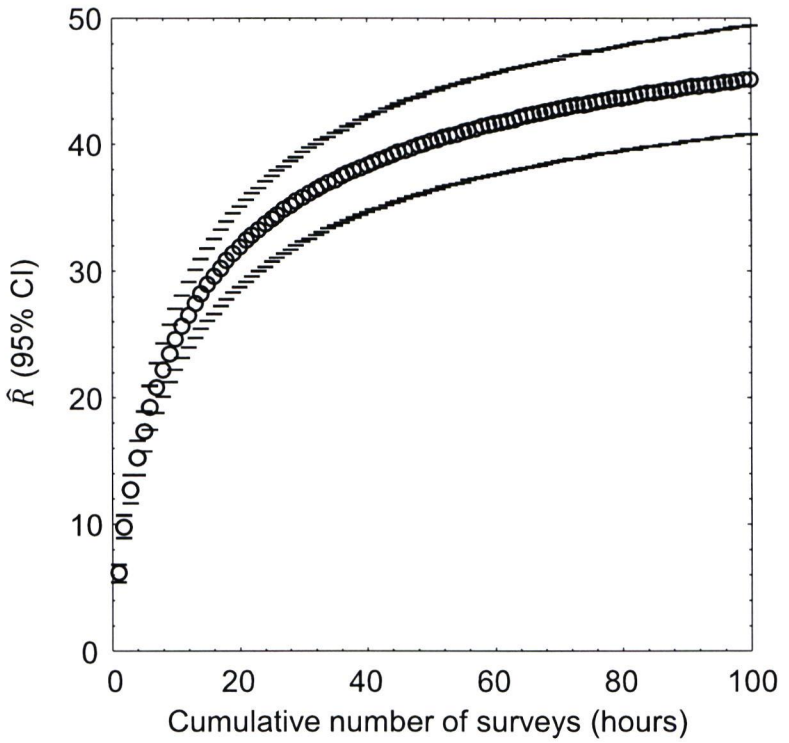


Figure 2. *Mean (95% CI) predicted wildlife species richness, $\hat{R}$, as a nonlinear function of hour-long survey increments across 46 visual-scan survey stations across the Altamont Pass Wind Resource Area, Alameda and Contra Costa Counties, 2015–2019. Note that the location of the study is largely irrelevant to the utility of the graph to the interpretation of survey outcomes at the project site. It is the pattern in the data that is relevant, because the pattern is typical of the pattern seen elsewhere.*

EXISTING ENVIRONMENTAL SETTING

The first step in analysis of potential project impacts to biological resources is to accurately characterize the existing environmental setting, including the wildlife community and any key ecological relationships and known and ongoing threats to special-status species. A reasonably accurate characterization of the environmental setting can provide the baseline against which to analyze potential project impacts. For these reasons, characterization of the environmental setting, including the project site's regional setting, is one of the CEQA's essential analytical steps. Methods to achieve this first step typically include (1) surveys of the site for biological resources, and (2) reviews of literature, databases and local experts for documented occurrences of special-status

species. In the case of the proposed project, these steps were taken, though not with sufficient rigor and not interpreted in furtherance of an accurate characterization of the wildlife community.

Environmental Setting informed by Field Surveys

To the CEQA's primary objective to disclose potential environmental impacts of a proposed project, the analysis should be informed of which biological species are known to occur at the proposed project site, which special-status species are likely to occur, as well as the limitations of the survey effort directed to the site. Analysts need this information to characterize the environmental setting as a basis for opining on, or predicting, potential project impacts to biological resources. In the case of this project, however, more surveys were needed.

To inventory and evaluate the condition of the habitat, and to assess the site for burrowing owl habitat, two ELMT biologists surveyed the project site, one on 1 November 2021, and the other on 9 February 2023. ELMT (2025) does not report essential attributes of the survey methods needed to interpret ELMT's findings. Two of these unreported attributes include survey start time and survey duration. Reporting of these attributes could have helped the reader understand why these surveys detected only 20 species of vertebrate wildlife, none of which are special-status species. IN comparison, in only 7.12 hours of survey, Noriko detected 49 species of vertebrate wildlife, including 16 special-status species of wildlife.

ELMT performed four breeding-season burrowing owl surveys in 2024, but ELMT (2025) does not report the species that were detected during these surveys. Considering that these surveys totaled 32 person-hours, the biologists performing the surveys must have detected numerous species of vertebrate wildlife. Unfortunately, these species detections are unreported unless they are some portion of the 20 species the report leaves the reader to believe were detected during the two reconnaissance surveys. Even assuming all 20 of these species were detected during the burrowing owl surveys, these are not many species resulting from 32 person-hours of survey effort.

Kidd Biological (2024) performed detection surveys for southwestern willow flycatcher and Least Bell's vireo in 2024. Kidd Biological's biologists were focused on only two objectives, and those were to determine presence or absence of southwestern willow flycatcher and least Bell's vireo. Kidd Biological (2024) reports the date, start tim and duration of each survey. Person-hours totaled 25.33. Though Kidd' Biological's biologists spent less survey time on site, they found nearly three times the number of vertebrate wildlife species, and they found 16 special-status species of wildlife where ELMT found none.

Altogether, Kidd Biological, ELMT and Noriko detected 74 species of vertebrate wildlife, including 20 special-status species. Of the 74 species detected, 4 were uniquely detected by ELMT, 20 by Kidd Biological, and 13 by Noriko. The accumulation of vertebrate wildlife species detected was 20 through ELMT's surveys, 61 through Kidd Biological's

surveys and 74 through Noriko's surveys, indicating that more species would be detected by additional surveys.

Environmental Setting informed by Desktop Review

The purpose of literature and database reviews and of consulting with local experts is to inform the field survey, and to augment interpretation of its outcome. Analysts need this information to identify which species are known to have occurred at or near the project site, and to identify which other special-status species could conceivably occur at the site due to geographic range overlap and migration flight paths. In the case of this project, the desktop review was incomplete, and the review that was completed was distorted to minimalize the likelihoods of occurrence of special-status species.

For the purpose of establishing the pool of special-status species for assessment of occurrence likelihoods, ELMT (2025) makes no mention of iNaturalist or eBird. I assume these databases were not used. If my assumption is correct, then the step of establishing the pool of species to be analyzed for occurrence likelihoods was incomplete. Even had iNaturalist and eBird been used for this purpose, it would have been inappropriate to rule out species based on absences of occurrence records. Positive-sighting databases are useful for conforming presence, but not for confirming absence of species.

To establish the pool of special-status species for assessment of occurrence likelihoods, ELMT (2025) queried CNDDB for occurrence records within four USGS Quadrangles inclusive of the project site. By querying the CNDDB to establish the pool of special-status species for analysis of occurrence likelihoods, ELMT (2025) screened out many special-status species from further consideration in the characterization of the wildlife community as part of the existing environmental setting. The CNDDB is not designed to support absence determinations or to screen out species from characterization of a site's wildlife community. As noted by the CNDDB, "*The CNDDB is a positive sighting database. It does not predict where something may be found. We map occurrences only where we have documentation that the species was found at the site. There are many areas of the state where no surveys have been conducted and therefore there is nothing on the map. That does not mean that there are no special status species present.*" ELMT (2025) and hence the DEIR misuse the CNDDB.

The CNDDB relies entirely on volunteer reporting from biologists who were allowed access to whatever properties they report from. Many properties have never been surveyed by biologists. Many properties have been surveyed, but the survey outcomes never reported to the CNDDB. Many properties have been surveyed multiple times, but not all survey outcomes reported to the CNDDB. Furthermore, the CNDDB is interested only in the findings of special-status species, which means that species more recently assigned special status will have been reported many fewer times to the CNDDB than were species assigned special status since the inception of the CNDDB. Therefore, occurrence records in the CNDDB are most abundant for species assigned special status decades ago, but fewest for species only recently assigned special status. And because negative findings are not reported to the CNDDB, the CNDDB is also inappropriate as a

basis for weighting occurrence likelihoods such as absent, not expected, unlikely, low, moderate or high. Whereas the CNDDB can be confirmatory of species presence, it cannot support absence determinations or assignments of low likelihood of occurrence. And again, the screening out of a species due to lack of occurrence records in the CNDDB is the same as an absence determination, and this step is being taken without adequate support of field surveys.

In my assessment based on a database review and site visits, 154 special-status species of wildlife are known to occur near enough to the site to warrant analysis of occurrence potential (Table 2). Not all these species should be expected to occur at the project site, but each of them should be given a closer look to determine occurrence likelihoods and whether additional surveys are needed, or implementation of detection surveys, or whether it would be reasonable to assume presence. Of these 154 species, 22 (14%) were recorded on or just off the project site, and another 19 (12%) species have been documented within 1.5 miles of the site (Very close), another 38 (25%) within 1.5 and 4 miles (Nearby), and another 70 (45%) within 4 to 30 miles (In region). Half (51%) of the species in Table 2 have been reportedly seen within 4 miles of the project site. The site therefore supports at least 22 special-status species of wildlife, and it carries the potential for supporting many more special-status species of wildlife based on the proximities of recorded occurrences. Evidence certainly suggests that habitat assessments are needed for these species.

ELMT (2025) considers the occurrence likelihoods of 71 (46%) of the special-status species listed in Table 2, which means that 83 (54%) of the special-status species in Table 2 were screened out of the analysis in the first step of the desktop review. ELMT (2025) determines six (3%) of the 71 special-status species to have high or moderate likelihood to occur. Indeed, three of these six are documented on site, two within 1.5 miles, and one between 1.5 and 4 miles. ELMT (2025) determines sixteen (3%) of the 71 special-status species in Table 2 to have low likelihood to occur. Of these 16 species, two are documented on site, two within 1.5 miles, and four between 1.5 and 4 miles of the site. ELMT (2025) assumes 49 special-status species in Table 2 are absent, and this assumption is effectively the same as an absence determination. Of these 49 species determined to be absent, four are documented on the project site, nine within 1.5 miles, and 17 between 1.5 and 4 miles from the project site. In summary, ELMT's determinations of occurrence likelihoods comport only poorly with survey results and with available occurrence records in the region.

Without any supporting evidence of appropriate surveys, ELMT (2025) presumes western mastiff bat is absent. Noriko detected western mastiff bat on the project site. ELMT's inaccurate determination of the occurrence likelihood of western mastiff bat represents a major mistake. The same is true of Bell's sparrow and California gnatcatcher, which ELMT (2025) presumes absent, but which Noriko found on the project site. And the same is true of Southern California rufous-crowned sparrow, which ELMT (2025) presumes absent, but which Kidd Biological (2024) found on the project site. Similarly, ELMT (2025) determines yellow warbler to have a low likelihood of occurrence even though Kidd Biological (2024) detected yellow warbler on the project site. These are all major errors in the analysis. Moreover, these errors are readily

avoidable by implementing the precautionary principle in risk analysis, and that is to err on the side of caution as recommended by the National Research Council (1986) when addressing rare or precious resources.

ELMT's (2025) inaccurate determination of low likelihood of occurrence of southwestern willow flycatcher is supported by survey evidence, because even though Kidd Biological (2024) satisfactorily performed the detection surveys according to protocol, it still failed to detect the species. Nevertheless, Noriko detected this species on the project site, thus reinforcing the notion that even protocol detection surveys are imperfect. Negative findings do not always mean the species are absent.

Of the special-status species listed in Table 2, 62 are covered by the MSHCP, but 92 are not. Of the 92 species that lack coverage, 12 were detected on the project site, six have been documented within 1.5 miles of the site, 18 between 1.5 and 4 miles, and 51 between 4 and 30 miles. The takings of all these species would not be mitigated by participation with the MSHCP.

On the Presence of Special-status Species of Wildlife

There is no doubt that at least 22 special-status species of wildlife occur on the project site, including multiple listed species. Modeling the rate of species detections during Noriko's survey, and analytically bridging Noriko's survey results to a larger research effort, predicts 39 diurnally active special-status species of vertebrate wildlife should be detectable on the project site after a larger survey effort conducted over the period of a year or longer. Indeed, species occurrence records reveal that 19 special-status species of vertebrate wildlife have been detected within 1.5 miles of the site, and 38 special-status species of vertebrate wildlife have been detected within four miles of the site. The evidence is overwhelming that the project site provides habitat to multiple special-status species of wildlife.

Considering on-site observations of at least 22 special-status species, and the occurrence records of multiple other special-status species very close to the project site, it is reasonable to conclude that the project site is habitat as defined in the scientific literature (Hall et al. 1997). These species are using the site for migration stopover, survival, and reproduction. These species are members of a larger wildlife community, the entire composition of which has yet to be characterized but which undoubtedly adds to the habitat value of the project site.

All these species would be adversely affected by the project. All benefit from the juxtaposition of riparian vegetation and upland environments. Lee and Rotenberry (2015) found that whereas the occurrences of some bird species in riparian forests correlated with local variables defined by percent tree cover versus percent shrub cover, the occurrences of twice as many bird species correlated with landscape variables such as adjacency and extent of upland land uses such as agriculture, shrubland or forest. Much of the functionality of the riparian environment as a concentrator of wildlife is lost when this environment is isolated from natural upland environments.

Table 2. *Occurrence likelihoods of special-status bird species at or near the proposed project site based on eBird/iNaturalist records (https://eBird.org, https://www.inaturalist.org) and survey findings, where 'Very close' indicates within 1.5 miles of the site, "nearby" indicates within 1.5 and 4 miles, and "in region" indicates within 4 and 30 miles, and 'in range' means the species' geographic range overlaps the site. Entries in bold font identify species detected by Noriko Smallwood during her site visit.*

Common name	***Species name***	**Status[1]**	**MSHCP cover**	**ELMT**	**Database records, Surveys**
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	Yes	Absent	In region
San Diego fairy shrimp	*Branchinecta sandiegonensis*	FE		Absent	In region
Riverside fairy shrimp	*Streptocephalus woottoni*	FE	Yes	Absent	In region
Delhi sands flower-loving fly	*Rhaphiomidas terminatus abdominalis*	FE	Yes		In region
Quino checkerspot butterfly	*Euphydryas editha quino*	FE	Yes	Absent	In region
Monarch	*Danaus plexippus*	FC			Very close
Crotch's bumble bee	*Bombus crotchii*	CCE		Absent	Nearby
Western spadefoot	*Spea hammondii*	FC, SSC	Yes	Low	In region
Southwestern pond turtle	*Actinemys pallida*	FC, SSC	Yes	Absent	In region
Granite spiny lizard	*Sceloporus orcutti*		Yes		Very close
Blainville's horned lizard	*Phrynosoma blainvillii*	SSC	Yes	Low	Nearby
Orange-throated whiptail	*Aspidoscelis hyperythra*	WL	Yes	Absent	Very close
Coastal whiptail	*Aspidoscelis tigris stejnegeri*	SSC	Yes	High	Nearby
San Diegan legless lizard	*Anniella stebbinsi*	SSC		Low	Very close
San Diego banded gecko	*Coleonyx variegatus abbotti*	SSC	Yes	Absent	In region
California glossy snake	*Arizona elegans occidentalis*	SSC		Absent	In region
Coast patch-nosed snake	*Salvadora hexalepis virgultea*	SSC		Low	In region
Two-striped gartersnake	*Thamnophis hammondii*	SSC		Absent	In region
South coast gartersnake	*Thamnophis sirtalis pop. 1*	SSC		Low	In region
Red-diamond rattlesnake	*Crotalus ruber*	SSC	Yes	Absent	Nearby
Brant	*Branta bernicla*	SSC2			In region
Cackling goose (Aleutian)	*Branta hutchinsii leucopareia*	WL			In region
Redhead	*Aythya americana*	SSC2			Nearby
Western grebe	*Aechmophorus occidentalis*	BCC			Nearby
Clark's grebe	*Aechmophorus clarkii*	BCC			In region

Common name	*Species name*	Status[1]	MSHCP cover	ELMT	Database records, Surveys
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FT, CE	Yes	Absent	In region
Black swift	*Cypseloides niger*	SSC3, BCC	Yes		In region
Vaux's swift	*Chaetura vauxi*	SSC2		Absent	Very close
Calliope hummingbird	*Selasphorus calliope*	BCC			Nearby
Rufous hummingbird	*Selasphorus rufus*	BCC		Low	Nearby
Allen's hummingbird	*Selasphorus sasin*	BCC			On site/**On site**
Mountain plover	*Charadrius montanus*	SSC2, BCC	Yes		In region
Snowy plover	*Charadrius nivosus*	BCC			In region
Western snowy plover	*Charadrius nivosus nivosus*	FT, SSC			In region
Long-billed curlew	*Numenius americanus*	WL			In region
Marbled godwit	*Limosa fedoa*	BCC			In region
Red knot (Pacific)	*Calidris canutus*	BCC			In region
Pectoral sandpiper	*Calidris melanotos*	BCC			In region
Short-billed dowitcher	*Limnodromus griseus*	BCC			In region
Lesser yellowlegs	*Tringa flavipes*	BCC			In region
Willet	*Tringa semipalmata*	BCC			In region
Laughing gull	*Leucophaeus atricilla*	WL			In region
Franklin's gull	*Leucophaeus pipixcan*	BCC			In region
Heermann's gull	*Larus heermanni*	BCC			In region
Western gull	*Larus occidentalis*	BCC			In region
California gull	*Larus californicus*	BCC, WL		Absent	Very close
California least tern	*Sternula antillarum browni*	FE, CE, CFP			In region
Black tern	*Chlidonias niger*	SSC2, BCC			In region
Elegant tern	*Thalasseus elegans*	BCC, WL			In region
Black skimmer	*Rynchops niger*	BCC, SSC3			In region
Common loon	*Gavia immer*	SSC			In region
Double-crested cormorant	*Phalacrocorax auritus*	WL	Yes	Absent	Very close
American white pelican	*Pelacanus erythrorhynchos*	SSC1		Absent	Nearby
Least bittern	*Ixobrychus exilis*	SSC2			In region
American bittern	*Botaurus lentiginosus*		Yes	Absent	In region

Common name	*Species name*	Status[1]	MSHCP cover	ELMT	Database records, Surveys
White-faced ibis	*Plegadis chihi*	WL	Yes	Absent	Nearby
Black-crowned night heron	*Nycticorax nycticorax*		Yes	Absent	Nearby
Great blue heron	*Ardea herodias*		Yes	High	Very close
Turkey vulture	*Cathartes aura*	BOP	Yes		Very close/**On site**
Osprey	*Pandion haliaetus*	WL, BOP	Yes	Absent	Nearby
White-tailed kite	*Elanus luecurus*	CFP, BOP	Yes	Absent	Very close
Golden eagle	*Aquila chrysaetos*	BGEPA, CFP, BOP, WL	Yes	Absent	Very close
Northern harrier	*Circus cyaneus*	BCC, SSC3, BOP	Yes	Low	Very close
Sharp-shinned hawk	*Accipiter striatus*	WL, BOP	Yes	High	Very close
Cooper's hawk	*Accipiter cooperii*	WL, BOP	Yes	High	On site/**On site**
Bald eagle	*Haliaeetus leucocephalus*	CE, BGEPA, BOP	Yes	Absent	Nearby
Red-shouldered hawk	*Buteo lineatus*	BOP			On site
Swainson's hawk	*Buteo swainsoni*	CT, BOP	Yes	Absent	Very close
Red-tailed hawk	*Buteo jamaicensis*	BOP			On site/**On site**
Ferruginous hawk	*Buteo regalis*	WL, BOP	Yes	Absent	Nearby
Zone-tailed hawk	*Buteo albonotatus*	BOP			In region
Harris' hawk	*Parabuteo unicinctus*	WL, BOP			Nearby
Rough-legged hawk	*Buteo lagopus*	BOP			In region
American barn owl	*Tyto furcata*	BOP			Very close/**On site**
Western screech-owl	*Megascops kennicotti*	BOP			Nearby
Great horned owl	*Bubo virginianus*	BOP			On site
Burrowing owl	*Athene cunicularia*	BCC, CCE, SSC2, BOP	Yes	Low	Nearby
Long-eared owl	*Asio otus*	BCC, SSC3, BOP		Low	In region
Short-eared owl	*Asia flammeus*	BCC, SSC3, BOP		Low	In region
Lewis's woodpecker	*Melanerpes lewis*	BCC			Nearby
Downy woodpecker	*Dryobates pubescens*		Yes		Nearby
Nuttall's woodpecker	*Picoides nuttallii*	BCC			On site/**On site**
American kestrel	*Falco sparverius*	BOP			On site/**On site**
Merlin	*Falco columbarius*	WL, BOP	Yes	Absent	Nearby
Peregrine falcon	*Falco peregrinus*	BOP	Yes	Absent	Very close

Common name	*Species name*	Status[1]	MSHCP cover	ELMT	Database records, Surveys
Prairie falcon	*Falco mexicanus*	WL, BOP	Yes	Absent	Nearby
Olive-sided flycatcher	*Contopus cooperi*	BCC, SSC2		Absent	Nearby
Willow flycatcher	*Empidonax trailii*	CE		Low	Nearby
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE, CE	Yes	Low	In region/**On site**
Vermilion flycatcher	*Pyrocephalus rubinus*	SSC2		Absent	Nearby
Least Bell's vireo	*Vireo bellii pusillus*	FE, CE	Yes	Moderate	On site/**On site**
Loggerhead shrike	*Lanius ludovicianus*	SSC2	Yes	Absent	Nearby
Oak titmouse	*Baeolophus inornatus*	BCC			Nearby
California horned lark	*Eremophila alpestris actia*	WL	Yes	High	On site/**On site**
Bank swallow	*Riparia riparia*	CT			Nearby
Tree swallow	*Tachycineta bicolor*		Yes		Very close
Purple martin	*Progne subis*	SSC2	Yes	Absent	In region
Wrentit	*Chamaea fasciata*	BCC			On site
California gnatcatcher	*Polioptila c. californica*	FT, SSC2	Yes	Absent	On site/**On site**
California thrasher	*Toxostoma redivivum*	BCC			On site/**On site**
Cassin's finch	*Haemorhous cassinii*	BCC			In region
Lawrence's goldfinch	*Spinus lawrencei*	BCC		Absent	Very close
Grasshopper sparrow	*Ammodramus savannarum*	SSC2	Yes	Low	In region
Black-chinned sparrow	*Spizella atrogularis*	BCC			Nearby
Gray-headed junco	*Junco hyemalis caniceps*	WL			In region
Bell's sparrow	*Amphispiza b. belli*	WL	Yes	Absent	Nearby/**On site**
Lincoln's sparrow	*Melospiza lincolnii*		Yes		Very close
Oregon vesper sparrow	*Pooecetes gramineus affinis*	SSC2			In range
Southern California rufous-crowned sparrow	*Aimophila ruficeps canescens*	WL	Yes	Absent	On site
Yellow-breasted chat	*Icteria virens*	SSC3	Yes	Absent	Nearby
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	SSC3		Absent	Nearby
Bullock's oriole	*Icterus bullockii*	BCC			Very close
Tricolored blackbird	*Agelaius tricolor*	CT, BCC, SSC1	Yes	Absent	Nearby

Common name	*Species name*	Status[1]	MSHCP cover	ELMT	Database records, Surveys
Prothonotary warbler	*Protonotaria citrea*	BCC			In region
Lucy's warbler	*Leiothlypis luciae*	SSC3			In region
Nashville warbler	*Vermivora ruficapilla*		Yes		Nearby
Virginia's warbler	*Leiothlypis virginiae*	WL, BCC			Nearby
MacGillivray's warbler	*Geothlypis tolmiei*		Yes		Nearby
Yellow warbler	*Setophaga petechia*	SSC2	Yes	Low	On site
Prairie warbler	*Setophaga discolor*	BCC			In region
Wilson's warbler	*Cardellina pusilla*		Yes		Very close
Summer tanager	*Piranga rubra*	SSC1			Nearby
Little brown bat	*Myotis lucifugus*	WBWG: M			In region
Yuma myotis	*Myotis yumanensis*	WBWG: LM		Absent	In region
Long-eared myotis	*Myotis evotis*	WBWG: M			In region
Fringed myotis	*Myotis thysanodes*	WBWG: H			In region
Long-legged myotis	*Myotis volans*	WBWG: H			In region
California myotis	*Myotis californicus*	WBWG:L			In region
Small-footed myotis	*Myotis ciliolabrum*	WBWG: M			In region
Canyon bat	*Parastrellus hesperus*	WBWG: M			Nearby/**On site**
Big brown bat	*Episticus fuscus*	WBWG: L			In region
Silver-haired bat	*Lasionycteris noctivagans*	WBWG: M			In range
Hoary bat	*Lasiurus cinereus*	WBWG: M			In region
Western red bat	*Lasiurus blossevillii*	SSC, WBWG: H			In region
Western yellow bat	*Lasiurus xanthinus*	SSC, WBWG: H		Absent	In region
Spotted bat	*Euderma maculatum*	SSC, WBWG: H			In range
Townsend's big-eared bat	*Corynorhinus townsendii*	SSC, WBWG: H			In region
Pallid bat	*Antrozous pallidus*	SSC, WBWG: H			In region
Mexican free-tailed bat	*Tadarida brasiliensis*	WBWG: L			In region/**On site**
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	SSC, WBWG: M		Absent	In range
Western mastiff bat	*Eumops perotis*	SSC, WBWG: H		Absent	In range/**On site**
San Diego black-tailed jackrabbit	*Lepus californicus bennettii*	SSC	Yes	Low	In region
Mountain lion	*Puma concolor*		Yes		In region

Common name	*Species name*	Status[1]	MSHCP cover	ELMT	Database records, Surveys
Bobcat	*Lynx rufus*		Yes		Nearby
Coyote	*Canis latrans*		Yes		Nearby/**On site**
Long-tailed weasel	*Mustela frenata*		Yes		Nearby
Northwestern San Diego pocket mouse	*Chaetodipus fallax fallax*	SSC	Yes	Absent	In region
Pallid San Diego pocket mouse	*Chaetodipus fallax pallidus*	SSC			In region
Dulzura kangaroo rat	*Dipodomys simulans*		Yes	Absent	Nearby
Stephens' kangaroo rat	*Dipodomys stephensi*	FE, CT	Yes	Absent	In region
Los Angeles pocket mouse	*Perognathus longimembris brevinasus*	SSC	Yes	Absent	In region
San Diego Bryant's woodrat	*Neotoma bryanti*	SSC	Yes	Low	In region
Southern grasshopper mouse	*Onychomys torridus ramona*	SSC		Absent	In range
American badger	*Taxidea taxus*	SSC		Absent	In region

[1] Listed on CDFW's Special Animals List (https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406) as FT or FE = federal threatened or endangered; FC = federal candidate for listing; BGEPA = Bald and Golden Eagle Protection Act; CT or CE = California threatened or endangered; CCT or CCE = Candidate California threatened or endangered; CFP = California Fully Protected (California Fish and Game Code 3511); SSC = California Species of Special Concern, and SSC1, SSC2 and SSC3 = California Bird Species of Special Concern priorities 1, 2 and 3, respectively); WL = CDFW's Taxa to Watch List; WBWG = Western Bat Working Group with priority rankings, of low (L), moderate (M), and high (H); BCC = U.S. Fish and Wildlife Service's Bird of Conservation Concern (https://www.fws.gov/sites/default/files/documents/birds-of-conservation-concern-2021.pdf); and BOP = protected by Birds of Prey (California Fish and Game Code 3503.5, see https://wildlife.ca.gov/Conservation/Birds/Raptors).

BIOLOGICAL IMPACTS ASSESSMENT

In the following, I analyze several types of impacts likely to result from the project, none of which are analyzed adequately or at all in the DEIR.

REDUCED PRODUCTIVE CAPACITY FROM HABITAT LOSS

Habitat loss results in a reduced productive capacity of affected wildlife species. The site is proven to serve as habitat to at least 23 species of vertebrate wildlife which Noriko observed on the site, but the number of avian nest sites remains unknown. Because Noriko's survey was only a reconnaissance survey and therefore unsuitable for detecting all bird nests on the site, estimating total nest density of birds was not possible. The alternative method would be to infer productive capacity from estimates of total nest density elsewhere. Noriko has completed several studies to estimate total avian nest density in similar environments in the local area.

Noriko estimated 5.56 nests/acre on a 3.6-acre site of ruderal grassland bordering a woodland strip in Murrieta, and 1.86 nests/acre on another 4.83-acre grassland site bordering a strip of woodland in Murietta. The average of the above two estimates is 3.71 nests/acre. This density applied to the 140.8 acres of the project site would predict 522 nest sites. Assuming 1.39 broods per nest site based on a review of 322 North American bird species, which averaged 1.39 broods per year, then I estimate 726 nest attempts per year on the project site. Assuming Young's (1948) study site typifies bird productivity of 2.9 fledged birds per nest attempt, then I predict 2,105 fledglings/year at the project site.

The loss of 522 nest sites and 726 nest attempts per year would qualify as significant impacts that have not been analyzed by the City of Fontana. But the impacts would not end with the immediate loss of nest sites. The reproductive capacity of the site would be lost. The project would prevent the production of 2,105 fledglings per year. Assuming an average bird generation time of 4 years, the lost capacity of both breeders and annual fledgling production can be estimated from an equation in Smallwood (2022): {(nests/year × chicks/nest × number of years) + (2 adults/nest × nests/year) × (number of years ÷ years/generation)} ÷ (number of years) = 2,366 birds per year denied to California.

The loss of 2,366 birds per year would be a loss of significant habitat value that is currently provided by the project site. Most if not all these birds are protected by the federal Migratory Bird Treaty Act and by California's Migratory Bird Protection Act, both of which are intended to most strongly protect breeding migratory birds. The loss of 2,366 birds would easily qualify as an unmitigated significant impact.

INTERFERENCE WITH WILDLIFE MOVEMENT

One of CEQA's principal concerns regarding potential project impacts is whether a proposed project would interfere with wildlife movement in the region. The species Noriko and ELMT and Kidd Biological detected on the project site had at some point

moved to the site, and in fact members of some of these species were in flight when Noriko detected them. At minimum, the project site provides wildlife with stopover opportunities during migration or dispersal of young. However, the DEIR focuses too much on the red-herring question of whether the site occurs within a movement corridor. The question is a red herring because the CEQA standard applies to all types of movement and not just the movement channeled by corridors.

However, ELMT (2025) and the DEIR also conclude without evidence that the project site is unimportant to all forms of wildlife movement. According ELMT (2025:16) and repeated on pp. 4.4-10 and 4.4-11 of the DEIR, "The project site has not been identified as occurring in a wildlife corridor or linkage. ... The arroyo and associated plant communities likely serve as linkages for wildlife species to move locally, but the site is isolated from regional wildlife corridors and linkages as there are no riparian corridors, creeks, or useful patches of steppingstone habitat (natural areas) within or connecting the site to any recognized wildlife corridor or linkage." The quoted statement is misleading. The site is not isolated from regional populations of wildlife. More than 44% of the site's perimeter is flush with wildlands, and the remainder of the perimeter is flush with very low-density rural use. Running through the site is a tributary to Goldenstar Creek, which connects wildlife that follow along riparian forests and scrub when they move for migration, dispersal or home range patrol. Moreover, the site is already documented to support 74 species of vertebrate wildlife, and it is expected that with additional surveys, the presence of many more species would be proven. The species known to the site include multiple listed species that would not occur on the site had they not been able to move across the region to get there.

ELMT (2025) eschews its claim that no corridor is known to the site by adding the caveat, "Project activities will be limited to former agricultural areas and are designed to avoid the arroyo and associated plant communities. As such, implementation of the proposed project is not expected to impact wildlife movement opportunities and no impacts to wildlife corridors or linkages are expected to occur." However, the arroyo, known as Goldenstar Creek, is not alone in supporting the listed species and many other special-status species, as wildlife that occur in such environments also depend on adjoining open space for forage, refugia, and opportunities for movement.

Finally, ELMT's and the DEIR's conclusory determinations that the project would not interfere with wildlife movement are based on no program of observation. There was no study design or specific field method implemented to quantify or characterize wildlife movement across the project site or beyond. A simple program of observation, for example, would be to perform timed surveys on stations located at intervals across the site, and to have observers plot wildlife flight paths on handheld maps. Another would be to use a thermal-imaging camera to track and record animal movements at night, including terrestrial mammals, birds and bats. But ELMT did nothing like this, and is therefore limited to speculation over whether the site is important to wildlife movement. Speculation is an unsound basis for making important determinations.

BIRD-WINDOW COLLISION MORTALITY

The project would introduce glass windows into an essential portion of avian habitat – that portion of the gaseous atmosphere that is referred to as the aerosphere (Davy et al. 2017, Diehl et al. 2017). The aerosphere is where birds and bats and other volant animals with wings migrate, disperse, forage, perform courtship and where some of them mate. Birds are some of the many types of animals that evolved wings as a morphological adaptation to thrive by moving through the medium of the aerosphere. The aerosphere is habitat, to which an entire discipline of ecology has emerged to study this essential aspect of habitat – the discipline of aeroecology (Kunz et al. 2008).

Many special-status species of birds have been recorded at or near the aerosphere of the project site. My database review and Noriko's site visit indicate there are 101 special-status species of birds with potential to use the site's aerosphere (Table 2). All the birds represented in Table 2 can quickly fly from wherever they have been documented to the project site, so they would all be within brief flights to the proposed project's windows. The consultants and Noriko have confirmed 74 vertebrate wildlife species on the project site, some of them flying across the site.

Window collisions are often characterized as either the second or third largest source or human-caused bird mortality. The numbers behind these characterizations are often attributed to Klem's (1990) and Dunn's (1993) estimates of about 100 million to 1 billion bird fatalities in the USA, or more recently by Loss et al.'s (2014) estimate of 365-988 million bird fatalities in the USA or Calvert et al.'s (2013) and Machtans et al.'s (2013) estimates of 22.4 million and 25 million bird fatalities in Canada, respectively. The proposed project would impose windows in the airspace normally used by birds.

Glass-façades of buildings intercept and kill many birds, but they are differentially hazardous to birds based on spatial extent, contiguity, orientation, and other factors. At Washington State University, Johnson and Hudson (1976) found 266 bird fatalities of 41 species within 73 months of monitoring of a three-story glass walkway (no fatality adjustments attempted). Prior to marking the windows to warn birds of the collision hazard, the collision rate was 84.7 per year. At that rate, and by not attempting to adjust the fatality estimate for the proportion of fatalities not found, 4,574 birds were likely killed over the 54 years since the start of their study, and that's at a relatively small building façade. Accounting for the proportion of fatalities not found in searches, the number of birds killed by this walkway over the last 54 years would have been about 14,270. And this is just for one 3-story, glass-sided walkway between two college campus buildings.

Klem's (1990) estimate was based on speculation that 1 to 10 birds are killed per building per year, and this speculated range was extended to the number of buildings estimated by the US Census Bureau in 1986. Klem's speculation was supported by fatality monitoring at only two houses, one in Illinois and the other in New York. Also, the basis of his fatality rate extension has changed greatly since 1986. Whereas his estimate served the need to alert the public of the possible magnitude of the bird-window collision issue, it was highly uncertain at the time and undoubtedly outdated

more than three decades hence. Indeed, by 2010 Klem (2010) characterized the upper end of his estimated range – 1 billion bird fatalities – as conservative. Furthermore, the estimate lumped species together as if all birds are the same and the loss of all birds to windows has the same level of impact.

By the time Loss et al. (2014) performed their effort to estimate annual USA bird-window fatalities, many more fatality monitoring studies had been reported or were underway. Loss et al. (2014) incorporated many more fatality rates based on scientific monitoring, and they were more careful about which fatality rates to include. However, they included estimates based on fatality monitoring by homeowners, which in one study were found to detect only 38% of the available window fatalities (Bracey et al. 2016). Loss et al. (2014) excluded all fatality records lacking a dead bird in hand, such as injured birds or feather or blood spots on windows. Loss et al.'s (2014) fatality metric was the number of fatalities per building (where in this context a building can include a house, low-rise, or high-rise structure), but they assumed that this metric was based on window collisions. Because most of the bird-window collision studies were limited to migration seasons, Loss et al. (2014) developed an admittedly assumption-laden correction factor for making annual estimates. Also, only two of the studies included adjustments for carcass persistence and searcher detection error, and it was unclear how and to what degree fatality rates were adjusted for these factors. Although Loss et al. (2014) attempted to account for some biases as well as for large sources of uncertainty mostly resulting from an opportunistic rather than systematic sampling data source, their estimated annual fatality rate across the USA was highly uncertain and vulnerable to multiple biases, most of which would have resulted in fatality estimates biased low.

In my review of bird-window collision monitoring, I found that the search radius around homes and buildings was very narrow, usually 2 meters. Based on my experience with bird collisions in other contexts, I would expect that a large portion of bird-window collision victims would end up farther than 2 m from the windows, especially when the windows are higher up on tall buildings. In my experience, searcher detection rates tend to be low for small birds deposited on ground with vegetation cover or woodchips or other types of organic matter. Also, vertebrate scavengers entrain on anthropogenic sources of mortality and quickly remove many of the carcasses, thereby preventing the fatality searcher from detecting these fatalities. Adjusting fatality rates for these factors – search radius bias, searcher detection error, and carcass persistence rates – would greatly increase nationwide estimates of bird-window collision fatalities.

Buildings can intercept many nocturnal migrants as well as birds flying in daylight. As mentioned above, Johnson and Hudson (1976) found 266 bird fatalities of 41 species within 73 months of monitoring of a four-story glass walkway at Washington State University (no adjustments attempted for undetected fatalities). Somerlot (2003) found 21 bird fatalities among 13 buildings on a university campus within only 61 days. Monitoring twice per week, Hager at al. (2008) found 215 bird fatalities of 48 species, or 55 birds/building/year, and at another site they found 142 bird fatalities of 37 species for 24 birds/building/year. Gelb and Delacretaz (2009) recorded 5,400 bird fatalities under buildings in New York City, based on a decade of monitoring only during migration periods, and some of the high-rises were associated with hundreds of

fatalities each. Klem et al. (2009) monitored 73 building façades in New York City during 114 days of two migratory periods, tallying 549 collision victims, nearly 5 birds per day. Borden et al. (2010) surveyed a 1.8 km route 3 times per week during 12-month period and found 271 bird fatalities of 50 species. Parkins et al. (2015) found 35 bird fatalities of 16 species within only 45 days of monitoring under 4 building façades. From 24 days of survey over a 48-day span, Porter and Huang (2015) found 47 fatalities under 8 buildings on a university campus. Sabo et al. (2016) found 27 bird fatalities over 61 days of searches under 31 windows. In San Francisco, Kahle et al. (2016) found 355 collision victims within 1,762 days under a 5-story building. Ocampo-Peñuela et al. (2016) searched the perimeters of 6 buildings on a university campus, finding 86 fatalities after 63 days of surveys. One of these buildings produced 61 of the 86 fatalities, and another building with collision-deterrent glass caused only 2 of the fatalities, thereby indicating a wide range in impacts likely influenced by various factors. There is ample evidence available to support my prediction that the proposed project would result in many collision fatalities of birds.

Project Impact Prediction

By the time of these comments, I had reviewed and processed results of bird collision monitoring at 213 buildings and façades for which bird collisions per m^2 of glass per year could be calculated and averaged (Johnson and Hudson 1976, O'Connell 2001, Somerlot 2003, Hager et al. 2008, Borden et al. 2010, Hager et al. 2013, Porter and Huang 2015, Parkins et al. 2015, Kahle et al. 2016, Ocampo-Peñuela et al. 2016, Sabo et al. 2016, Barton et al. 2017, Gomez-Moreno et al. 2018, Schneider et al. 2018, Loss et al. 2019, Brown et al. 2020, City of Portland Bureau of Environmental Services and Portland Audubon 2020, Riding et al. 2020). These study results averaged 0.073 bird deaths per m^2 of glass per year (95% CI: 0.042-0.102). This average and its 95% confidence interval provide a robust basis for predicting fatality rates at a proposed new project.

Assuming 1,900 sf per residential unit and 0.0147368 m^2 of glass window extent per s.f., then I predict 6,468 m^2 of windows among the 231 single-family dwelling units. The above-reported average of bird collision deaths per m^2 of glass per year applied to 6,468 m^2 of external glass in the project predicts 473 (95% CI: 281-665) bird collision fatalities per year.

The vast majority of these predicted deaths would be of birds protected under the Migratory Bird Treaty Act and under the California Migratory Bird Protection Act, thus causing significant unmitigated impacts. Given the predicted level of bird-window collision mortality, and the lack of any proposed mitigation, it is my opinion that the proposed project would result in potentially significant adverse biological impacts, including the unmitigated take of both terrestrial and aerial habitat of birds and other sensitive species. Not only would the project take habitat of rare and sensitive species of birds, but it would transform the project's airspace into a lethal collision trap to birds.

WILDLIFE DEPREDATION BY HOUSE CATS

Considering national trends, it is safe to assume that house cats would be introduced to the project area by residents of the proposed residential units. This is significant because house cats serve as one of the largest sources of avian mortality in North America (Dauphiné and Cooper 2009, Blancher 2013, Loss et al. 2013, Loyd et al. 2017). Loss et al. (2013) estimated 139 million cats in the USA in 2013 (range 114 to 164 million), which killed an estimated 16.95 billion vertebrate wildlife annually (range 7.6 to 26.3 billion). In 2012 there were 0.44 house cats per human in the USA, and 122 vertebrate animals were killed per cat, free-ranging members of which killed disproportionately larger numbers of vertebrate wildlife. The DEIR reports there would be 231 residential units in the project, and it predicts there would be 1,288 new residents. The above rates of cat ownership applied to this number of new residents would predict 567 new cats, which based on the findings of Loss et al. (2013) would kill 69,174 vertebrate wildlife per year.

House cats also contribute to downstream loading of *Toxoplasma gondii*. According to a UC Davis wildlife health research program, "*Toxoplasma gondii is a parasite that can infect virtually all warm-blooded animals, but the only known definitive hosts are cats – domesticated and feral house cats included. Cats catch the parasite through hunting rodents and birds and they offload it into the environment through their feces... and ...rain that falls on cement creates more runoff than rain that falls on natural earth, which contributes to increased runoff that can carry fecal pathogens to the sea*" (Thje original link is no longer active, but the quote came from the program described at: https://whc.vetmed.ucdavis.edu/programs-projects/ca-conservation/sea-otter).

Impacts to wildlife from the introduction of house cats into the environment would be highly significant, and yet these impacts are not considered in the DEIR. An obvious mitigation measure would be to constrain house cat ownership such as requiring cats to remain indoors.

TRAFFIC IMPACTS ON WILDLIFE

The DEIR neglects to address one of the project's most obvious, substantial impacts to wildlife, and that is wildlife mortality and injuries caused by project-generated traffic. Project-generated traffic would endanger wildlife that must, for various reasons, cross roads used by the project's traffic (Photos 31–34), including along roads far from the project footprint but which would nevertheless by traversed by automobiles head to or from the project's building. Vehicle collisions have accounted for the deaths of many thousands of amphibian, reptile, mammal, bird, and arthropod fauna, and the impacts have often been found to be significant at the population level (Forman et al. 2003). Across North America traffic impacts have taken devastating tolls on wildlife (Forman et al. 2003). In Canada, 3,562 birds were estimated killed per 100 km of road per year (Bishop and Brogan 2013), and the US estimate of avian mortality on roads is 2,200 to 8,405 deaths per 100 km per year, or 89 million to 340 million total per year (Loss et al. 2014). Local impacts can be more intense than nationally.

Photo 31. *A white-tailed antelope squirrel runs across the road just in the Coachella Valley, 26 May 2022. Such road crossings are usually successful, but too often prove fatal to the animal.*

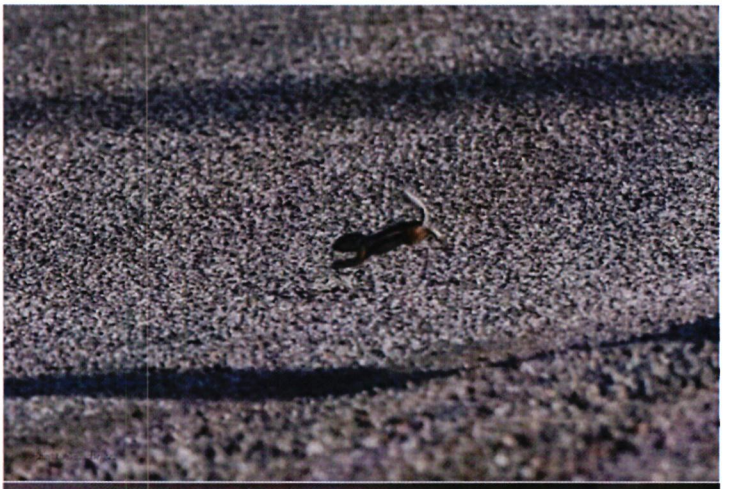
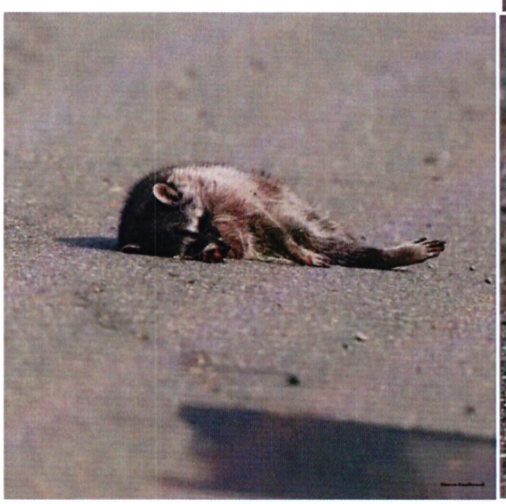


Photo 32. *A coyote uses the crosswalk to cross a road on 2 February 2023. Not all drivers stop, nor do all animals use the crosswalk. Too often, animals are injured or killed when they attempt to cross roads.*







Photos 33 and 34. *Raccoon killed on Road 31 just east of Highway 505 in Solano County (left; photo taken on 10 November 2018), and mourning dove killed by vehicle on a Bakersfield road (right; photo by Noriko Smallwood, 21 June 2020.)*

The nearest study of traffic-caused wildlife mortality was performed along a 2.5-mile stretch of Vasco Road in Contra Costa County, California. Fatality searches in this study

found 1,275 carcasses of 49 species of mammals, birds, amphibians and reptiles over 15 months of searches (Mendelsohn et al. 2009). This fatality number needs to be adjusted for the proportion of fatalities that were not found due to scavenger removal and searcher error. This adjustment is typically made by placing carcasses for searchers to find (or not find) during their routine periodic fatality searches. This step was not taken at Vasco Road (Mendelsohn et al. 2009), but it was taken as part of another study next to Vasco Road (Brown et al. 2016). Brown et al.'s (2016) adjustment factors for carcass persistence resembled those of Santos et al. (2011). Also applying searcher detection rates from Brown et al. (2016), the adjusted total number of fatalities was estimated at 9,462 animals killed by traffic on the road. This fatality number projected over 1.25 years and 2.5 miles of road translates to 3,028 wild animals per mile per year. In terms comparable to the national estimates, the estimates from the Mendelsohn et al. (2009) study would translate to 188,191 animals killed per 100 km of road per year, or 22 times that of Loss et al.'s (2014) upper bound estimate and 53 times the Canadian estimate. An analysis is needed of whether increased traffic generated by the project site would similarly result in local impacts on wildlife.

For wildlife vulnerable to front-end collisions and crushing under tires, road mortality can be predicted from the study of Mendelsohn et al. (2009) as a basis, although it would be helpful to have the availability of more studies like that of Mendelsohn et al. (2009) at additional locations. My analysis of the Mendelsohn et al. (2009) data resulted in an estimated 3,028 animals killed per mile along a county road in Contra Costa County. The estimated numbers of fatalities were 1.75% birds, 26.4% mammals (many mice and pocket mice, but also ground squirrels, desert cottontails, striped skunks, American badgers, raccoons, and others), 67.4% amphibians (large numbers of California tiger salamanders and California red-legged frogs, but also Sierran treefrogs, western toads, arboreal salamanders, slender salamanders and others), and 4.4% reptiles (many western fence lizards, but also skinks, alligator lizards, and snakes of various species). VMT is useful for predicting wildlife mortality because I was able to quantify miles traveled along the studied reach of Vasco Road during the time period of the Mendelsohn et al. (2009), hence enabling a rate of fatalities per VMT that can be projected to other sites, assuming similar collision fatality rates.

Predicting project-generated traffic impacts on wildlife

The DEIR predicts 8,735,466 annual VMT would be generated by the project. During the Mendelsohn et al. (2009) study, 19,500 cars traveled Vasco Road in Contra Costa County daily, so the vehicle miles that contributed to my estimate of non-volant fatalities was 19,500 cars and trucks × 2.5 miles × 365 days/year × 1.25 years = 22,242,187.5 vehicle miles per 9,462 wildlife fatalities, or 2,351 vehicle miles per fatality. This rate divided into the predicted annual VMT would predict 3,716 vertebrate wildlife fatalities per year due to project-generated traffic. This would still be a large number of animals killed by the project's traffic.

Based on my analysis, the project-generated traffic would cause substantial, significant impacts to wildlife. The EIR does not address this potential impact, let alone propose to mitigate it. Mitigation measures to improve wildlife safety along roads are available and

are feasible, and they need exploration for their suitability with the proposed project. Given the predicted level of project-generated traffic-caused mortality, and the lack of any proposed mitigation, it is my opinion that the proposed project would result in potentially significant adverse biological impacts, and that, as the EIR is currently written, these impacts would be unmitigated.

CUMULATIVE IMPACTS

The DEIR assumes that the project's contributions of cumulative impacts would not be significant due to the existence of the Western Riverside County MSHCP. According to the DEIR (p. 4.4-31), the Western Riverside County MSHCP "provides for the long-term protection of sensitive plant, animal, and plant communities throughout the MSHCP area," and "most cumulative development projects within the Project vicinity would be subject to the provisions of the MSHCP, and the general range of habitats, species, climate, etc. are fairly consistent throughout the MSHCP." However, the map of habitat gains and losses in the 2023 Annual Report shows nothing but losses in the areas of the proposed project, and an uneven distribution of gains across the MSHCP area. Moreover, the CEQA Guidelines §15064(h)(3) states, "When relying on a plan, regulation or program, the lead agency should explain how implementing the particular requirements in the plan, regulation or program ensure that the project's incremental contribution to the cumulative effect is not cumulatively considerable." The DEIR does not do this for any of the covered species potentially adversely affected by the proposed project. Moreover, most of the special-status species that actually or potentially occur on the project site are not covered by the MSHCP, and these species should therefore not be expected to benefit from the conservation strategy of the MSHCP.

Because the MSHCP has performed poorly relative to its conservation objectives, it should not be relied upon to avoid cumulative impacts on covered species. In fact, through 2023 the monitoring objectives have not been achieved for most of the covered species of terrestrial vertebrate wildlife. That is, the performance of the MSHCP remains unknown for most of its covered species.

Regarding burrowing owls specifically, the 2023 Annual Report of the MSHCP (p. 8-8) states, "The species objectives for Burrowing Owl (*Athene cunicularia hypugaea*) require the conservation of five Core Areas, plus interconnecting linkages, containing a breeding population of 120 Burrowing Owls with no fewer than five pairs in any one Core Area." (https://www.wrc-rca.org/document-library/annual-reports/) In 2022, there were 7 pairs in one Core Area, 4 of which produced a total 4 fledglings (1 fledgling per successful nest attempt). In 2023, this Core Area was down to 5 pairs, of which one succeeded in producing a single fledgling. Another Core area contained 3 pairs in 2022, and 3 fledglings were recorded by one of these pairs. In 2023, this Core Area was down to 2 pairs, one of which produced 5 fledglings. The evidence shows a dismal failure of the MSHCP to conserve burrowing owls, as the documented breeding population was 20 (16.67% of the target) in 2022 and 14 (11.67% of the target) in 2023, and only one (20%) Core Area contained at least five pairs in either year. The MSHCP has failed, and its performance is declining. Relying on the MSHCP to mitigate project impacts on burrowing owls would be a mistake.

MITIGATION STRATEGY

MM 4.4-1 *Conservation easements "shall be placed over the 2.75 acres of riparian/riverine habitat onsite."*

Without the upland areas around these 2.75 acres, the riparian vegetation of these 2.75 acres would lose much of their functions as breeding opportunities, movement opportunities, and refugia for special-status species. House cats would readily invade this narrow reach of vegetation and prey on local wildlife. This measure would be not avoid significant impacts on multiple listed species including California gnatcatcher, southwestern willow flycatcher, and least Bell's vireo.

MM 4.4-2 *In order to mitigate impacts to riparian/riverine resources and least Bell's vireo, prior to final building inspection the Project Applicant shall preserve and enhance approximately 92% of the onsite drainage features. The Project Applicant shall install six-foot solid concrete masonry walls on an average of approximately 98 feet from the edge of the riparian habitat to act as a buffer between the riparian habitats within Drainage 1 and 2 and onsite development. Double picket tubular steel fencing with gaps no greater than 2" shall be installed along the backyards of Lots 87 through 90 as to prevent cats from crossing the fence line.*

At least house cats are mentioned as a threat to special-status species on the project site, but the proposed masonry wall and fending would not prevent house cat intrusion into the riparian area. House cats are notorious for finding their ways beyond intended barriers, and over time gaps are sure to form under and around walls.

MM 4.4-3 *In order to mitigate impacts to riparian/riverine resources and least Bell's vireo, prior to final building inspection the Project Applicant shall fence the onsite trail with a four-foot high wood split rail fence with wire mesh covering the entire width and height of the fence to deter pedestrians and dogs from entering into the riparian riverine habitat. The trail shall have posted signs at all trail entrances reflecting limited hours of use to the trail, signage to enforce dogs on leash at all times, as well as cautionary signage of rattlesnakes to deter residents from entering into the riparian habitat. ...*

For this measure and the previous two measures, the DEIR fails to cite evidence of its efficacy where it has been applied elsewhere.

MM 4.4-4 *A series of best management practices, including worker awareness training, use of Exclusionary fencing and signs, restriction against running machines near flowing water, and biological monitoring during construction.*

Should the project go forward, all these measures should be implemented, but it needs to be understood that their conservation benefits to special-status species would be *de minimis* compared to project impacts. Most of these measures were required at most if not all the projects that my co-investigator and I surveyed before and after development to measure impacts on wildlife (Smallwood and Smallwood 2023). We revisited the sites

to repeat the survey methods at the same time of year, the same start time in the day, and the same methods and survey duration in order to measure the effects of mitigated development on wildlife. We structured the experiment in a before-after, control-impact experimental design, as some of the sites had been developed since our initial survey and some had remained undeveloped. All the developed sites had included mitigation measures to avoid, minimize or compensate for impacts to wildlife. Nevertheless, we found that mitigated development resulted in a 66% loss of species on site, and 48% loss of species in the project area. Counts of vertebrate animals declined 90%. We reported that "Development impacts measured by the mean number of species detected per survey were greatest for amphibians (-100%), followed by mammals (-86%), grassland birds (-75%), raptors (-53%), special-status species (-49%), all birds as a group (-48%), non-native birds (-44%), and synanthropic birds (-28%). Our results indicated that urban development substantially reduced vertebrate species richness and numerical abundance, even after richness and abundance had likely already been depleted by the cumulative effects of loss, fragmentation, and degradation of habitat in the urbanizing environment," and despite all the mitigation measures and existing policies, regulations, and habitat plans.

MM 4.4-5 *In order to preclude potential indirect impacts to on-site preserved riparian habitat and/or onsite mitigation areas, prior to issuance of building permits for lots abutting the on-site drainages Riverside County shall review the building plans to ensure that edge effects have been minimized through the planting of native landscaping on manufactured slopes within the conserved areas, and through the installation of fencing/signage near the top of slope adjacent to conserved areas to prevent unauthorized public access, vandalism, illegal dumping, and other adverse human disturbances.*

Parts of this measure are redundant with earlier measures, but the primary part of it – the planting of native species on manufactured slopes – lacks any performance standards, and it is therefore unenforceable.

MM 4.4-6 *Burrowing owl preconstruction survey and compliance with the CDFW (2012) mitigation guidelines*

To be consistent with CDFW (2012) guidelines now that the burrowing owl is a candidate for listing under the California Endangered Species Act, the applicant needs to consult with CDFW before the EIR is certified.

MM 4.4-7 *Preconstruction surveys for breeding birds, and establishment of no-disturbance buffers around nests.*

Should the project go forward, I concur with this measure. However, it needs to be understood that the conservation benefits of this measure would be de minimis compared to the project's potential impacts on breeding birds. This measure would not prevent the permanent loss of the avian productive capacity that I predict in my letter herein. Preconstruction, take-avoidance surveys consist of two steps, both of which are very difficult. First, the biologist(s) performing the survey must identify birds that are

breeding. Second, the biologist(s) must locate the breeding birds' nests. The first step is typically completed by observing bird behaviors such as food deliveries and nest territory defense. To be successful these types of observations typically require many surveys on many dates spread throughout the breeding season even for a single species. To identify and locate the birds of all species nesting on a site requires a much greater survey effort. Even assuming all the predicted 522 nest sites could be found (not likely), the mitigation measure would apply only to the breeding season of the survey. After the breeding season of the preconstruction survey, California would be denied the production of birds from the project site during every subsequent year. The project's impacts on birds would be permanent and of large magnitude.

MM 4.4-8 *As a condition of future grading permits, biological monitoring shall be required during all initial ground-clearing operations. ... Monitors shall also conduct Workers Environmental Awareness Program (WEAP) training to inform construction personnel of applicable mitigation measures and permit conditions. ... an avoidance buffer shall be established to protect the resource until this action has been completed. If common or special status wildlife is discovered, the biologist or biological monitor may move it out of harm's way or encourage it to move out of the work area prior to initiation of Project activities, if safe and feasible and permitted to do so.*

Regarding the WEAP, it should be remembered that construction workers are working with heavy machinery and moving vehicles, and therefore they need to focus on their work. The WEAP might help prevent a taking, but workers should not be expected to focus on anything but work safety and performance.

Regarding the avoidance buffer, the mitigation language allows a single individual to make a subjective decision, outside the public's view, to determine the buffer area for any given species. This measure lacks objective criteria, and it is unenforceable.

Regarding relocating animals found to be in harm's way, it must be remembered that animals likely already occupy areas into which the relocated animals are placed. It should be assumed that surrounding areas are already at carrying capacity for each species whose members might be relocated. Relocating animals into areas at carrying capacity would result in strife, and it is a rule that carrying capacity would be re-established by the deaths of either the original residents or the relocated animals. Relocating animals should not be viewed as a mitigation measure, but rather as the causing of additional project impacts.

NEEDED MITIGATION MEASURES

Habitat loss: Should the project go forward, compensatory mitigation is needed for the loss of habitat of species that are not covered by the MSHCP. Habitat of equal or greater area should be protected as close to the project site as feasible.

Bird-Window Collision Mortality: If the project goes forward, it should at a minimum adhere to available Bird-Safe Guidelines, such as those prepared by American Bird Conservancy and New York and San Francisco. The American Bird Conservancy

(ABC) produced an excellent set of guidelines recommending actions to: (1) Minimize use of glass; (2) Placing glass behind some type of screening (grilles, shutters, exterior shades); (3) Using glass with inherent properties to reduce collisions, such as patterns, window films, decals or tape; and (4) Turning off lights during migration seasons (Sheppard and Phillips 2015). The City of San Francisco (San Francisco Planning Department 2011) also has a set of building design guidelines, based on the excellent guidelines produced by the New York City Audubon Society (Orff et al. 2007). The ABC document and both the New York and San Francisco documents provide excellent alerting of potential bird-collision hazards as well as many visual examples. The San Francisco Planning Department's (2011) building design guidelines are more comprehensive than those of New York City, but they could have gone further. For example, the San Francisco guidelines probably should have also covered scientific monitoring of impacts as well as compensatory mitigation for impacts that could not be avoided, minimized or reduced.

New research results inform of the efficacy of marking windows. Whereas Klem (1990) found no deterrent effect from decals on windows, Johnson and Hudson (1976) reported a fatality reduction of about 69% after placing decals on windows. In an experiment of opportunity, Ocampo-Peñuela et al. (2016) found only 2 of 86 fatalities at one of 6 buildings – the only building with windows treated with a bird deterrent film. At the building with fritted glass, bird collisions were 82% lower than at other buildings with untreated windows. Kahle et al. (2016) added external window shades to some windowed façades to reduce fatalities 82% and 95%. Brown et al. (2020) reported an 84% lower collision probability among fritted glass windows and windows treated with ORNILUX R UV. City of Portland Bureau of Environmental Services and Portland Audubon (2020) reduced bird collision fatalities 94% by affixing marked Solyx window film to existing glass panels of Portland's Columbia Building. Many external and internal glass markers have been tested experimentally, some showing no effect and some showing strong deterrent effects (Klem 1989, 1990, 2009, 2011; Klem and Saenger 2013; Rössler et al. 2015).

Van Doren et al. (2021) found that nocturnal migrants contributed most of the collision fatalities in their study, and the largest predictors of fatalities were peak migration and lit windows. Van Doren et al. (2021) predicted that a light-out mitigation measure could reduce bird-window collision mortality by 60%.

Monitoring and the use of compensatory mitigation should be incorporated at any new building project because the measures recommended in the available guidelines remain of uncertain efficacy, and even if these measures are effective, they will not reduce collision fatalities to zero. The only way to assess mitigation efficacy and to quantify post-construction fatalities is to monitor the project for fatalities.

Fund Wildlife Rehabilitation Facilities: Compensatory mitigation ought also to include funding contributions to wildlife rehabilitation facilities to cover the costs of injured animals that will be delivered to these facilities for care. Many animals would likely be injured by collisions with windows of homes and with automobiles traveling to and from the project site, and by attempted predation by free-ranging house cats.

Landscaping: If the project goes forward, California native plant landscaping (i.e., grassland and locally appropriate scrub plants) should be considered to be used as opposed to landscaping with lawn and exotic shrubs and trees. Native plants offer more structure, cover, food resources, and nesting substrate for wildlife than landscaping with lawn and ornamental trees. Native plant landscaping has been shown to increase the abundance of arthropods which act as important sources of food for wildlife and are crucial for pollination and plant reproduction (Narango et al. 2017, Adams et al. 2020, Smallwood and Wood 2022.). Further, many endangered and threatened insects require native host plants for reproduction and migration, e.g., monarch butterfly. Around the world, landscaping with native plants over exotic plants increases the abundance and diversity of birds, and it is particularly valuable to native birds (Lerman and Warren 2011, Burghardt et al. 2008, Berthon et al. 2021, Smallwood and Wood 2022). Landscaping with native plants is a way to maintain or to bring back some of the natural habitat and lessen the footprint of urbanization by acting as interconnected patches of habitat for wildlife (Goddard et al. 2009, Tallamy 2020). Lastly, not only does native plant landscaping benefit wildlife, it requires less water and maintenance than traditional landscaping with lawn and hedges.

Thank you for your consideration,

Shawn Smallwood

Shawn Smallwood, Ph.D.

LITERATURE CITED

Adams, B. J., E. Li, C. A. Bahlai, E. K. Meineke, T. P. McGlynn, and B. V. Brown. 2020. Local and landscape-scale variables shape insect diversity in an urban biodiversity hot spot. Ecological Applications 30(4):e02089. 10.1002/eap.2089

Barton, C. M., C. S. Riding, and S. R. Loss. 2017. Magnitude and correlates of bird collisions at glass bus shelters in an urban landscape. Plos One 12. (6): e0178667. https://doi.org/10.1371/journal.pone.0178667

Basilio, L. G., D. J. Moreno, and A, J. Piratelli. 2020. Main causes of bird-window collisions: a review. Anais da Academia Brasileira de Ciências 92(1): e20180745 DOI 10.1590/0001-3765202020180745.

Berthon, K., F. Thomas, and S. Bekessy. 2021. The role of 'nativenes' in urban greening to support animal biodiversity. Landscape and Urban Planning 205:103959. https://doi.org/10.1016/j.landurbplan.2020.103959

Bishop, C. A. and J. M. Brogan. 2013. Estimates of avian mortality attributed to vehicle collisions in Canada. Avian Conservation and Ecology 8:2. http://dx.doi.org/10.5751/ACE-00604-080202.

Borden, W. C., O. M. Lockhart, A. W. Jones, and M. S. Lyons. 2010. Seasonal, taxonomic, and local habitat components of bird-window collisions on an urban university campus in Cleveland, OH. Ohio Journal of Science 110(3):44-52.

Bracey, A. M., M. A. Etterson, G. J. Niemi, and R. F. Green. 2016. Variation in bird-window collision mortality and scavenging rates within an urban landscape. The Wilson Journal of Ornithology 128:355-367.

Brown, B. B., L. Hunter, and S. Santos. 2020. Bird-window collisions: different fall and winter risk and protective factors. PeerJ 8:e9401 http://doi.org/10.7717/peerj.9401

Brown, K., K. S. Smallwood, J. Szewczak, and B. Karas. 2016. Final 2012-2015 Report Avian and Bat Monitoring Project Vasco Winds, LLC. Prepared for NextEra Energy Resources, Livermore, California.

Burghardt, K. T., D. W. Tallamy, and W. G. Shriver. 2008. Impact of native plants on bird and butterfly biodiversity in suburban landscapes. Conservation Biology 23:219-224.

Calvert, A. M., C. A. Bishop, R. D. Elliot, E. A. Krebs, T. M. Kydd, C. S. Machtans, and G. J. Robertson. 2013. A synthesis of human-related avian mortality in Canada. Avian Conservation and Ecology 8(2): 11. http://dx.doi.org/10.5751/ACE-00581-080211

City of Portland Bureau of Environmental Services and Portland Audubon. 2020. Collisions at the Columbia Building: A synthesis of pre- and post-retrofit monitoring. Environmental Services of City of Portland, Oregon.

Davy, C. M., A. T. Ford, and K. C. Fraser. 2017. Aeroconservation for the fragmented skies. Conservation Letters 10(6): 773–780.

Diehl, R. H., A. C. Peterson, R. T. Bolus, and D. Johnson. 2017. Extending the habitat concept to the airspace. USGS Staff -- Published Research. 1129. https://digitalcommons.unl.edu/usgsstaffpub/1129

Dunn, E. H. 1993. Bird mortality from striking residential windows in winter. Journal of Field Ornithology 64:302-309.

ELMT Consulting. 2025. Habitat Assessment and Western Riverside County Multiple Species Habitat Conservation Plan Consistency Analysis. Report to TTLC Riverside Chicago, LLC, Newport Beach, California.

Forman, T. T., D. Sperling, J. A. Bisonette, A. P. Clevenger, C. D. Cutshall, V. H. Dale, L. Fahrig, R. France, C. R. Goldman, K. Heanue, J. A. Jones, F. J. Swanson, T. Turrentine, and T. C. Winter. 2003. Road Ecology. Island Press, Covello, California.

Gelb, Y. and N. Delacretaz. 2009. Windows and vegetation: Primary factors in Manhattan bird collisions. Northeastern Naturalist 16:455-470.

Goddard, M. A., A. J. Dougill, and T. G. Benton. 2009. Scaling up from gardens: biodiversity conservation in urban environments. Trends in Ecology and Evolution 25:90-98. doi:10.1016/j.tree.2009.07.016

Gómez-Moreno, V. del C., J. R. Herrera-Herrera, and S. Niño-Maldonado. 2018. Bird collisions in windows of Centro Universitario Victoria, Tamaulipas, México. Huitzil, Revista Mexicana de Ornitología 19(2): 227-236. https://doi.org/10.28947/hrmo.2018.19.2.347

Hager, S. B., H. Trudell, K. J. McKay, S. M. Crandall, and L. Mayer. 2008. Bird density and mortality at windows. Wilson Journal of Ornithology 120:550-564.

Hager S. B., B. J. Cosentino, K J. McKay, C. Monson, W. Zuurdeeg, and B. Blevins. 2013. Window area and development drive spatial variation in bird-window collisions in an urban landscape. PLoS ONE 8(1): e53371. doi:10.1371/journal.pone.0053371

Hall, L. S., P. R. Krausman, and M. L. Morrison. 1997. The habitat concept and a plea for standard terminology. Wildlife Society Bulletin 25:173-82.

Johnson, R. E., and G. E. Hudson. 1976. Bird mortality at a glassed-in walkway in Washington State. Western Birds 7:99-107.

Kahle, L. Q., M. E. Flannery, and J. P. Dumbacher. 2016. Bird-window collisions at a west-coast urban park museum: analyses of bird biology and window attributes from Golden Gate Park, San Francisco. PLoS ONE 11(1):e144600 DOI 10.1371/journal.pone.0144600.

Kidd Biological. 2024. Results of 2024 Least Bell's Vireo & Southwestern Willow Flycatcher surveys, Riverside County, California: Surveys conducted May 11-July 11, 2024. Report to US Fish and Wildlife Service and ELMT Consulting.

Klem, D., Jr. 1989. Bird-window collisions. Wilson Bulletin 101:606-620.

Klem, D., Jr. 1990. Collisions between birds and windows: mortality and prevention. Journal of Field Ornithology 61:120-128.

Klem, D., Jr. 2009. Preventing bird-window collisions. The Wilson Journal of Ornithology 121:314-321.

Klem, D., Jr. 2011. Evaluating the effectiveness of Acopian Birdsavers to deter or prevent bird-glass collisions. Unpublished report.

Klem, D., Jr. and P. G. Saenger. 2013. Evaluating the effectiveness of select visual signals to prevent bird-window collisions. The Wilson Journal of Ornithology 125:406–411.

Kunz, T. H., S. A. Gauthreaux Jr., N. I. Hristov, J. W. Horn, G. Jones, E. K. V. Kalko, R. P. Larkin, G. F. McCracken, S. M. Swartz, R. B. Srygley, R. Dudley, J. K. Westbrook, and M. Wikelski. 2008. Aeroecology: probing and modelling the aerosphere. Integrative and Comparative Biology 48:1-11. doi:10.1093/icb/icn037

Lee, M. B. and J. T. Rotenberry. 2015. Effects of land use on riparian birds in a semiarid region. Journal of Arid Environments 119:61-69.

Lerman, S. B. and P. S. Warren. 2011. The conservation value of residential yards: linking birds and people. Ecological Applications 21:1327-1339.

Loyd, K. A. T., S. M. Hernandez, and D. L. McRuer. 2017. The role of domestic cats in the admission of injured wildlife at rehabilitation and rescue centers. Wildlife Society Bulletin 41:55-61.

Loss, S. R., T. Will, and P. P. Marra. 2013. The impact of free-ranging domestic cats on wildlife of the United States. Nature Communications 2380. DOI: 10.1038/ncomms2380

Loss, S. R., T. Will, and P. P. Marra. 2014. Estimation of bird-vehicle collision mortality on U.S. roads. Journal of Wildlife Management 78:763-771.

Loss, S. R., T. Will, S. S. Loss, and P. P. Marra. 2014. Bird–building collisions in the United States: Estimates of annual mortality and species vulnerability. The Condor: Ornithological Applications 116:8-23. DOI: 10.1650/CONDOR-13-090.1

Loss, S. R., S. Lao, J. W. Eckles, A. W. Anderson, R. B. Blair, and R. J. Turner. 2019. Factors influencing bird-building collisions in the downtown area of a major North American city. PLoS ONE 14(11): e0224164. https://doi.org/10.1371/journal.pone.0224164

Machtans, C. S., C. H. R. Wedeles, and E. M. Bayne. 2013. A first estimate for Canada of the number of birds killed by colliding with building windows. Avian Conservation and Ecology 8(2):6. http://dx.doi.org/10.5751/ACE-00568-080206

Mendelsohn, M., W. Dexter, E. Olson, and S. Weber. 2009. Vasco Road wildlife movement study report. Report to Contra Costa County Public Works Department, Martinez, California.

Narango, D. L., D. W. Tallamy, and P. P. Marra. 2017. Native plants improve breeding and foraging habitat for an insectivorous bird. Biological Conservation 213:42-50.

National Research Council. 1986. Ecological knowledge and environmental problem-solving: concepts and case studies. National Academy Press, Washington, D.C.

Ocampo-Peñuela, N., R. S. Winton, C. J. Wu, E. Zambello, T. W. Wittig and N. L. Cagle . 2016. Patterns of bird-window collisions inform mitigation on a university campus. PeerJ4:e1652;DOI10.7717/peerj.1652

O'Connell, T. J. 2001. Avian window strike mortality at a suburban office park. The Raven 72:141-149.

Orff, K., H. Brown, S. Caputo, E. J. McAdams, M. Fowle, G. Phillips, C. DeWitt, and Y. Gelb. 2007. Bird-safe buildings guidelines. New York City Audubon, New York.

Parkins, K. L., S. B. Elbin, and E. Barnes. 2015. Light, glass, and bird–building collisions in an urban park. Northeastern Naturalist 22:84-94.

Porter, A., and A. Huang. 2015. Bird collisions with glass: UBC pilot project to assess bird collision rates in Western North America. UBC Social Ecological Economic Development Studies (SEEDS) Student Report. Report to Environment Canada, UBC SEEDS and UBC BRITE.

Riding, C. S., T. J. O'Connell, and S. R. Loss. 2020. Building façade-level correlates of bird–window collisions in a small urban area. The Condor: Ornithological Applications 122:1–14.

Sabo, A. M., N. D. G. Hagemeyer, A. S. Lahey, and E. L. Walters. 2016. Local avian density influences risk of mortality from window strikes. PeerJ 4:e2170; DOI 10.7717/peerj.2170

San Francisco Planning Department. 2011. Standards for bird-safe buildings. San Francisco Planning Department, City and County of San Francisco, California.

Santos, S. M., F. Carvalho, and A. Mira. 2011. How long do the dead survive on the road? Carcass persistence probability and implications for road-kill monitoring surveys. PLoS ONE 6(9): e25383. doi:10.1371/journal.pone.0025383

Schneider, R. M., C. M. Barton, K. W. Zirkle, C. F. Greene, and K. B. Newman. 2018. Year-round monitoring reveals prevalence of fatal bird-window collisions at the Virginia Tech Corporate Research Center. *PeerJ* 6:e4562 https://doi.org/10.7717/peerj.4562

Sheppard, C., and G. Phillips. 2015. Bird-friendly building design, 2nd Ed., American Bird Conservancy, The Plains, Virginia.

Somerlot, K. E. 2003. Survey of songbird mortality due to window collisions on the Murray State University campus. Journal of Service Learning in Conservation Biology 1:1–19.

Smallwood, K. S. 2022. Utility-scale solar impacts to volant wildlife. Journal of Wildlife Management: e22216. https://doi.org/10.1002/jwmg.22216

Smallwood, K. S., and N. L. Smallwood. 2023. Measured effects of anthropogenic development on vertebrate wildlife diversity. Diversity 15, 1037. https://doi.org/10.3390/d15101037.

Smallwood, N.L. and E.M. Wood. 2022. The ecological role of native plant landscaping in residential yards to urban wildlife. Ecosphere 2022;e4360.

Tallamy, D.W. 2020. Nature's Best Hope: A New Approach to Conservation that Starts in Your Yard. Timber Press.

Van Doren, B. M., D. E. Willardb, M. Hennenb, K. G. Hortonc, E. F. Stubera, D. Sheldond, A. H. Sivakumare, J. Wanga, A. Farnswortha, and B. M. Winger. 2021. Drivers of fatal bird collisions in an urban center. Proceedings of the National Academy of Sciences 118 (24). e2101666118

Wood, E. M., and S. Esaian. 2020. The importance of street trees to urban avifauna. Ecological Applications. 0:e02149.

Young, H. 1948. A comparative study of nesting birds in a five-acre park. The Wilson Bulletin 61:36-47.

Kenneth Shawn Smallwood
Curriculum Vitae

3108 Finch Street
Davis, CA 95616
Phone (530) 756-4598
Cell (530) 601-6857
puma@dcn.org

Born May 3, 1963 in
Sacramento, California.
Married, father of two.

Ecologist

Expertise

- Finding solutions to controversial problems related to wildlife interactions with human industry, infrastructure, and activities;
- Wildlife monitoring and field study using GPS, thermal imaging, behavior surveys;
- Using systems analysis and experimental design principles to identify meaningful ecological patterns that inform management decisions.

Education

Ph.D. Ecology, University of California, Davis. September 1990.
M.S. Ecology, University of California, Davis. June 1987.
B.S. Anthropology, University of California, Davis. June 1985.
Corcoran High School, Corcoran, California. June 1981.

Experience

- 762 professional reports, including:
- 90 peer reviewed publications
- 24 in non-reviewed proceedings
- 646 reports, declarations, posters and book reviews
- 8 in mass media outlets
- 92 public presentations of research results

Editing for scientific journals: Guest Editor, *Wildlife Society Bulletin*, 2012-2013, of invited papers representing international views on the impacts of wind energy on wildlife and how to mitigate the impacts. Associate Editor, *Journal of Wildlife Management*, March 2004 to 30 June 2007. Editorial Board Member, *Environmental Management*, 10/1999 to 8/2004. Associate Editor, *Biological Conservation*, 9/1994 to 9/1995.

Member, Alameda County Scientific Review Committee (SRC), August 2006 to April 2011. The five-member committee investigated causes of bird and bat collisions in the Altamont Pass Wind Resource Area, and recommended mitigation and monitoring measures. The SRC reviewed the science underlying the Alameda County Avian Protection Program, and advised

the County on how to reduce wildlife fatalities.

Consulting Ecologist, 2004-2007, California Energy Commission (CEC). Provided consulting services as needed to the CEC on renewable energy impacts, monitoring and research, and produced several reports. Also collaborated with Lawrence-Livermore National Lab on research to understand and reduce wind turbine impacts on wildlife.

Consulting Ecologist, 1999-2013, U.S. Navy. Performed endangered species surveys, hazardous waste site monitoring, and habitat restoration for the endangered San Joaquin kangaroo rat, California tiger salamander, California red-legged frog, California clapper rail, western burrowing owl, salt marsh harvest mouse, and other species at Naval Air Station Lemoore; Naval Weapons Station, Seal Beach, Detachment Concord; Naval Security Group Activity, Skaggs Island; National Radio Transmitter Facility, Dixon; and, Naval Outlying Landing Field Imperial Beach.

Part-time Lecturer, 1998-2005, California State University, Sacramento. Instructed Mammalogy, Behavioral Ecology, and Ornithology Lab, Contemporary Environmental Issues, Natural Resources Conservation.

Senior Ecologist, 1999-2005, BioResource Consultants. Designed and implemented research and monitoring studies related to avian fatalities at wind turbines, avian electrocutions on electric distribution poles across California, and avian fatalities at transmission lines.

Chairman, Conservation Affairs Committee, The Wildlife Society--Western Section, 1999-2001. Prepared position statements and led efforts directed toward conservation issues, including travel to Washington, D.C. to lobby Congress for more wildlife conservation funding.

Systems Ecologist, 1995-2000, Institute for Sustainable Development. Headed ISD's program on integrated resources management. Developed indicators of ecological integrity for large areas, using remotely sensed data, local community involvement and GIS.

Associate, 1997-1998, Department of Agronomy and Range Science, University of California, Davis. Worked with Shu Geng and Mingua Zhang on several studies related to wildlife interactions with agriculture and patterns of fertilizer and pesticide residues in groundwater across a large landscape.

Lead Scientist, 1996-1999, National Endangered Species Network. Informed academic scientists and environmental activists about emerging issues regarding the Endangered Species Act and other environmental laws. Testified at public hearings on endangered species issues.

Ecologist, 1997-1998, Western Foundation of Vertebrate Zoology. Conducted field research to determine the impact of past mercury mining on the status of California red-legged frogs in Santa Clara County, California.

Senior Systems Ecologist, 1994-1995, EIP Associates, Sacramento, California. Provided consulting services in environmental planning, and quantitative assessment of land units for their conservation and restoration opportunities basedon ecological resource requirements of 29 special-status species. Developed ecological indicators for prioritizing areas within Yolo County

to receive mitigation funds for habitat easements and restoration.

Post-Graduate Researcher, 1990-1994, Department of Agronomy and Range Science, *U.C. Davis*. Under Dr. Shu Geng's mentorship, studied landscape and management effects on temporal and spatial patterns of abundance among pocket gophers and species of Falconiformes and Carnivora in the Sacramento Valley. Managed and analyzed a data base of energy use in California agriculture. Assisted with landscape (GIS) study of groundwater contamination across Tulare County, California.

Work experience in graduate school: Co-taught Conservation Biology with Dr. Christine Schonewald, 1991 & 1993, UC Davis Graduate Group in Ecology; Reader for Dr. Richard Coss's course on Psychobiology in 1990, UC Davis Department of Psychology; Research Assistant to Dr. Walter E. Howard, 1988-1990, UC Davis Department of Wildlife and Fisheries Biology, testing durable baits for pocket gopher management in forest clearcuts; Research Assistant to Dr. Terrell P. Salmon, 1987-1988, UC Wildlife Extension, Department of Wildlife and Fisheries Biology, developing empirical models of mammal and bird invasions in North America, and a rating system for priority research and control of exotic species based on economic, environmental and human health hazards in California. Student Assistant to Dr. E. Lee Fitzhugh, 1985-1987, UC Cooperative Extension, Department of Wildlife and Fisheries Biology, developing and implementing statewide mountain lion track count for long-term monitoring.

Fulbright Research Fellow, Indonesia, 1988. Tested use of new sampling methods for numerical monitoring of Sumatran tiger and six other species of endemic felids, and evaluated methods used by other researchers.

Projects

Repowering wind energy projects through careful siting of new wind turbines using map-based collision hazard models to minimize impacts to volant wildlife. Funded by wind companies (principally NextEra Renewable Energy, Inc.), California Energy Commission and East Bay Regional Park District, I have collaborated with a GIS analyst and managed a crew of five field biologists performing golden eagle behavior surveys and nocturnal surveys on bats and owls. The goal is to quantify flight patterns for development of predictive models to more carefully site new wind turbines in repowering projects. Focused behavior surveys began May 2012 and continue. Collision hazard models have been prepared for seven wind projects, three of which were built. Planning for additional repowering projects is underway.

Test avian safety of new mixer-ejector wind turbine (MEWT). Designed and implemented a before-after, control-impact experimental design to test the avian safety of a new, shrouded wind turbine developed by Ogin Inc. (formerly known as FloDesign Wind Turbine Corporation). Supported by a $718,000 grant from the California Energy Commission's Public Interest Energy Research program and a 20% match share contribution from Ogin, I managed a crew of seven field biologists who performed periodic fatality searches and behavior surveys, carcass detection trials, nocturnal behavior surveys using a thermal camera, and spatial analyses with the collaboration of a GIS analyst. Field work began 1 April 2012 and ended 30 March 2015 without Ogin installing its MEWTs, but we still achieved multiple important scientific advances.

Reduce avian mortality due to wind turbines at Altamont Pass. Studied wildlife impacts caused by 5,400 wind turbines at the world's most notorious wind resource area. Studied how impacts are perceived by monitoring and how they are affected by terrain, wind patterns, food resources, range management practices, wind turbine operations, seasonal patterns, population cycles, infrastructure management such as electric distribution, animal behavior and social interactions.

Reduce avian mortality on electric distribution poles. Directed research toward reducing bird electrocutions on electric distribution poles, 2000-2007. Oversaw 5 founds of fatality searches at 10,000 poles from Orange County to Glenn County, California, and produced two large reports.

Cook *et al.* v. Rockwell International *et al.*, No. 90-K-181 (D. Colorado). Provided expert testimony on the role of burrowing animals in affecting the fate of buried and surface-deposited radioactive and hazardous chemical wastes at the Rocky Flats Plant, Colorado. Provided expert reports based on four site visits and an extensive document review of burrowing animals. Conducted transect surveys for evidence of burrowing animals and other wildlife on and around waste facilities. Discovered substantial intrusion of waste structures by burrowing animals. I testified in federal court in November 2005, and my clients were subsequently awarded a $553,000,000 judgment by a jury. After appeals the award was increased to two billion dollars.

Hanford Nuclear Reservation Litigation. Provided expert testimony on the role of burrowing animals in affecting the fate of buried radioactive wastes at the Hanford Nuclear Reservation, Washington. Provided three expert reports based on three site visits and extensive document review. Predicted and verified a certain population density of pocket gophers on buried waste structures, as well as incidence of radionuclide contamination in body tissue. Conducted transect surveys for evidence of burrowing animals and other wildlife on and around waste facilities. Discovered substantial intrusion of waste structures by burrowing animals.

Expert testimony and declarations on proposed residential and commercial developments, gas-fired power plants, wind, solar and geothermal projects, water transfers and water transfer delivery systems, endangered species recovery plans, Habitat Conservation Plans and Natural Communities Conservation Programs. Testified before multiple government agencies, Tribunals, Boards of Supervisors and City Councils, and participated with press conferences and depositions. Prepared expert witness reports and court declarations, which are summarized under Reports (below).

Protocol-level surveys for special-status species. Used California Department of Fish and Wildlife and US Fish and Wildlife Service protocols to search for California red-legged frog, California tiger salamander, arroyo southwestern toad, blunt-nosed leopard lizard, western pond turtle, giant kangaroo rat, San Joaquin kangaroo rat, San Joaquin kit fox, western burrowing owl, Swainson's hawk, Valley elderberry longhorn beetle and other special-status species.

Conservation of San Joaquin kangaroo rat. Performed research to identify factors responsible for the decline of this endangered species at Lemoore Naval Air Station, 2000-2013, and implemented habitat enhancements designed to reverse the trend and expand the population.

Impact of West Nile Virus on yellow-billed magpies. Funded by Sacramento-Yolo Mosquito and Vector Control District, 2005-2008, compared survey results pre- and post-West Nile Virus epidemic for multiple bird species in the Sacramento Valley, particularly on yellow-billed magpie and American crow due to susceptibility to WNV.

Workshops on HCPs. Assisted Dr. Michael Morrison with organizing and conducting a 2-day workshop on Habitat Conservation Plans, sponsored by Southern California Edison, and another 1-day workshop sponsored by PG&E. These Workshops were attended by academics, attorneys, and consultants with HCP experience. We guest-edited a Proceedings published in Environmental Management.

Mapping of biological resources along Highways 101, 46 and 41. Used GPS and GIS to delineate vegetation complexes and locations of special-status species along 26 miles of highway in San Luis Obispo County, 14 miles of highway and roadway in Monterey County, and in a large area north of Fresno, including within reclaimed gravel mining pits.

GPS mapping and monitoring at restoration sites and at Caltrans mitigation sites. Monitored the success of elderberry shrubs at one location, the success of willows at another location, and the response of wildlife to the succession of vegetation at both sites. Also used GPS to monitor the response of fossorial animals to yellow star-thistle eradication and natural grassland restoration efforts at Bear Valley in Colusa County and at the decommissioned Mather Air Force Base in Sacramento County.

Mercury effects on Red-legged Frog. Assisted Dr. Michael Morrison and US Fish and Wildlife Service in assessing the possible impacts of historical mercury mining on the federally listed California red-legged frog in Santa Clara County. Also measured habitat variables in streams.

Opposition to proposed No Surprises rule. Wrote a white paper and summary letter explaining scientific grounds for opposing the incidental take permit (ITP) rules providing ITP applicants and holders with general assurances they will be free of compliance with the Endangered Species Act once they adhere to the terms of a "properly functioning HCP." Submitted 188 signatures of scientists and environmental professionals concerned about No Surprises rule US Fish and Wildlife Service, National Marine Fisheries Service, all US Senators.

Natomas Basin Habitat Conservation Plan alternative. Designed narrow channel marsh to increase the likelihood of survival and recovery in the wild of giant garter snake, Swainson's hawk and Valley Elderberry Longhorn Beetle. The design included replication and interspersion of treatments for experimental testing of critical habitat elements. I provided a report to Northern Territories, Inc.

Assessments of agricultural production system and environmental technology transfer to China. Twice visited China and interviewed scientists, industrialists, agriculturalists, and the Directors of the Chinese Environmental Protection Agency and the Department of Agriculture to assess the need and possible pathways for environmental clean-up technologies and trade opportunities between the US and China.

Yolo County Habitat Conservation Plan. Conducted landscape ecology study of Yolo County to spatially prioritize allocation of mitigation efforts to improve ecosystem functionality within the County from the perspective of 29 special-status species of wildlife and plants. Used a hierarchically structured indicators approach to apply principles of landscape and ecosystem ecology, conservation biology, and local values in rating land units. Derived GIS maps to help guide the conservation area design, and then developed implementation strategies.

Mountain lion track count. Developed and conducted a carnivore monitoring program throughout California since 1985. Species counted include mountain lion, bobcat, black bear, coyote, red and gray fox, raccoon, striped skunk, badger, and black-tailed deer. Vegetation and land use are also monitored. Track survey transect was established on dusty, dirt roads within randomly selected quadrats.

Sumatran tiger and other felids. Upon award of Fulbright Research Fellowship, I designed and initiated track counts for seven species of wild cats in Sumatra, including Sumatran tiger, fishing cat, and golden cat. Spent four months on Sumatra and Java in 1988, and learned Bahasa Indonesia, the official Indonesian language.

Wildlife in agriculture. Beginning as post-graduate research, I studied pocket gophers and other wildlife in 40 alfalfa fields throughout the Sacramento Valley, and I surveyed for wildlife along a 200 mile road transect since 1989 with a hiatus of 1996-2004. The data are analyzed using GIS and methods from landscape ecology, and the results published and presented orally to farming groups in California and elsewhere. I also conducted the first study of wildlife in cover crops used on vineyards and orchards.

Agricultural energy use and Tulare County groundwater study. Developed and analyzed a data base of energy use in California agriculture, and collaborated on a landscape (GIS) study of groundwater contamination across Tulare County, California.

Pocket gopher damage in forest clear-cuts. Developed gopher sampling methods and tested various poison baits and baiting regimes in the largest-ever field study of pocket gopher management in forest plantations, involving 68 research plots in 55 clear-cuts among 6 National Forests in northern California.

Risk assessment of exotic species in North America. Developed empirical models of mammal and bird species invasions in North America, as well as a rating system for assigning priority research and control to exotic species in California, based on economic, environmental, and human health hazards.

Peer Reviewed Publications

Smallwood, K. S. 2022. Utility-scale solar impacts to volant wildlife. Journal of Wildlife Management: e22216. https://doi.org/10.1002/jwmg.22216

Smallwood, K. S., and N. L. Smallwood. 2021. Breeding Density and Collision Mortality of Loggerhead Shrike (*Lanius ludovicianus*) in the Altamont Pass Wind Resource Area. Diversity 13, 540. https://doi.org/10.3390/d13110540.

Smallwood, K. S. 2020. USA wind energy-caused bat fatalities increase with shorter fatality search intervals. Diversity 12(98); https://doi.org/10.3390/d12030098

Smallwood, K. S., D. A. Bell, and S. Standish. 2020. Dogs detect larger wind energy impacts on bats and birds. Journal of Wildlife Management 84:852-864. DOI: 10.1002/jwmg.21863.

Smallwood, K. S., and D. A. Bell. 2020. Relating bat passage rates to wind turbine fatalities.

Diversity 12(84); doi:10.3390/d12020084.

Smallwood, K. S., and D. A. Bell. 2020. Effects of wind turbine curtailment on bird and bat fatalities. Journal of Wildlife Management 84:684-696. DOI: 10.1002/jwmg.21844

Kitano, M., M. Ino, K. S. Smallwood, and S. Shiraki. 2020. Seasonal difference in carcass persistence rates at wind farms with snow, Hokkaido, Japan. Ornithological Science 19: 63 – 71.

Smallwood, K. S. and M. L. Morrison. 2018. Nest-site selection in a high-density colony of burrowing owls. Journal of Raptor Research 52:454-470.

Smallwood, K. S., D. A. Bell, E. L. Walther, E. Leyvas, S. Standish, J. Mount, B. Karas. 2018. Estimating wind turbine fatalities using integrated detection trials. Journal of Wildlife Management 82:1169-1184.

Smallwood, K. S. 2017. Long search intervals under-estimate bird and bat fatalities caused by wind turbines. Wildlife Society Bulletin 41:224-230.

Smallwood, K. S. 2017. The challenges of addressing wildlife impacts when repowering wind energy projects. Pages 175-187 in Köppel, J., Editor, Wind Energy and Wildlife Impacts: Proceedings from the CWW2015 Conference. Springer. Cham, Switzerland.

May, R., Gill, A. B., Köppel, J. Langston, R. H.W., Reichenbach, M., Scheidat, M., Smallwood, S., Voigt, C. C., Hüppop, O., and Portman, M. 2017. Future research directions to reconcile wind turbine–wildlife interactions. Pages 255-276 in Köppel, J., Editor, Wind Energy and Wildlife Impacts: Proceedings from the CWW2015 Conference. Springer. Cham, Switzerland.

Smallwood, K. S. 2017. Monitoring birds. M. Perrow, Ed., Wildlife and Wind Farms - Conflicts and Solutions, Volume 2. Pelagic Publishing, Exeter, United Kingdom. www.bit.ly/2v3cR9Q

Smallwood, K. S., L. Neher, and D. A. Bell. 2017. Turbine siting for raptors: an example from Repowering of the Altamont Pass Wind Resource Area. M. Perrow, Ed., Wildlife and Wind Farms - Conflicts and Solutions, Volume 2. Pelagic Publishing, Exeter, United Kingdom. www.bit.ly/2v3cR9Q

Johnson, D. H., S. R. Loss, K. S. Smallwood, W. P. Erickson. 2016. Avian fatalities at wind energy facilities in North America: A comparison of recent approaches. Human–Wildlife Interactions 10(1):7-18.

Sadar, M. J., D. S.-M. Guzman, A. Mete, J. Foley, N. Stephenson, K. H. Rogers, C. Grosset, K. S. Smallwood, J. Shipman, A. Wells, S. D. White, D. A. Bell, and M. G. Hawkins. 2015. Mange Caused by a novel Micnemidocoptes mite in a Golden Eagle (*Aquila chrysaetos*). Journal of Avian Medicine and Surgery 29(3):231-237.

Smallwood, K. S. 2015. Habitat fragmentation and corridors. Pages 84-101 in M. L. Morrison and H. A. Mathewson, Eds., Wildlife habitat conservation: concepts, challenges, and solutions. John Hopkins University Press, Baltimore, Maryland, USA.

EXHIBIT B

IEE INDOOR ENVIRONMENTAL ENGINEERING IEE
1448 Pine Street, Suite 103 San Francisco, California 94109
Telephone: (415) 567-7700
E-mail: offermann@IEE-SF.com
http://www.iee-sf.com

Date: September 14, 2025

To: Rebecca Davis
Lozeau | Drury LLP
1939 Harrison Street, Suite 150
Oakland, California 94612

From: Francis J. Offermann PE CIH

Subject: Indoor Air Quality: Arroyo Vista Project, Riverside County, CA
(IEE File Reference: P-4897)

Pages: 19

Indoor Air Quality Impacts

Indoor air quality (IAQ) directly impacts the comfort and health of building occupants, and the achievement of acceptable IAQ in newly constructed and renovated buildings is a well-recognized design objective. For example, IAQ is addressed by major high-performance building rating systems and building codes (California Building Standards Commission, 2014; USGBC, 2014). Indoor air quality in homes is particularly important because occupants, on average, spend approximately ninety percent of their time indoors with the majority of this time spent at home (EPA, 2011). Some segments of the population that are most susceptible to the effects of poor IAQ, such as the very young and the elderly, occupy their homes almost continuously. Additionally, an increasing number of adults are working from home at least some of the time during the workweek. Indoor air quality also is a serious concern for workers in hotels, offices and other business establishments.

The concentrations of many air pollutants often are elevated in homes and other buildings relative to outdoor air because many of the materials and products used indoors contain and release a variety of pollutants to air (Hodgson et al., 2002; Offermann and Hodgson,

2011). With respect to indoor air contaminants for which inhalation is the primary route of exposure, the critical design and construction parameters are the provision of adequate ventilation and the reduction of indoor sources of the contaminants.

Indoor Formaldehyde Concentrations Impact. In the California New Home Study (CNHS) of 108 new homes in California (Offermann, 2009), 25 air contaminants were measured, and formaldehyde was identified as the indoor air contaminant with the highest cancer risk as determined by the California Proposition 65 Safe Harbor Levels (OEHHA, 2017a), No Significant Risk Levels (NSRL) for carcinogens. The NSRL is the daily intake level calculated to result in one excess case of cancer in an exposed population of 100,000 (i.e., ten in one million cancer risk) and for formaldehyde is 40 μg/day. The NSRL concentration of formaldehyde that represents a daily dose of 40 μg is 2 $\mu g/m^3$, assuming a continuous 24-hour exposure, a total daily inhaled air volume of 20 m^3, and 100% absorption by the respiratory system. All of the CNHS homes exceeded this NSRL concentration of 2 $\mu g/m^3$. The median indoor formaldehyde concentration was 36 $\mu g/m^3$, and ranged from 4.8 to 136 $\mu g/m^3$, which corresponds to a median exceedance of the 2 $\mu g/m^3$ NSRL concentration of 18 and a range of 2.3 to 68.

Therefore, the cancer risk of a resident living in a California home with the median indoor formaldehyde concentration of 36 $\mu g/m^3$, is 180 per million as a result of formaldehyde alone. The CEQA significance threshold for airborne cancer risk is 10 per million, as established by the San Diego Air Quality Management District (SCAQMD).

Besides being a human carcinogen, formaldehyde is also a potent eye and respiratory irritant. In the CNHS, many homes exceeded the non-cancer reference exposure levels (RELs) prescribed by California Office of Environmental Health Hazard Assessment (OEHHA, 2017b). The percentage of homes exceeding the RELs ranged from 98% for the Chronic REL of 9 $\mu g/m^3$ to 28% for the Acute REL of 55 $\mu g/m^3$.

The primary source of formaldehyde indoors is composite wood products manufactured with urea-formaldehyde resins, such as plywood, medium density fiberboard, and

particleboard. These materials are commonly used in building construction for flooring, cabinetry, baseboards, window shades, interior doors, and window and door trims.

In January 2009, the California Air Resources Board (CARB) adopted an airborne toxics control measure (ATCM) to reduce formaldehyde emissions from composite wood products, including hardwood plywood, particleboard, medium density fiberboard, and also furniture and other finished products made with these wood products (California Air Resources Board 2009). While this formaldehyde ATCM has resulted in reduced emissions from composite wood products sold in California, they do not preclude that homes built with composite wood products meeting the CARB ATCM will have indoor formaldehyde concentrations below cancer and non-cancer exposure guidelines.

A follow up study to the California New Home Study (CNHS) was conducted in 2016-2018 (Singer et. al., 2019) and found that the median indoor formaldehyde in new homes built after 2009 with CARB Phase 2 Formaldehyde ATCM materials had lower indoor formaldehyde concentrations, with a median indoor concentration of 22.4 $\mu g/m^3$ (18.2 ppb) as compared to a median of 36 $\mu g/m^3$ found in the 2007 CNHS. Unlike in the CNHS study where formaldehyde concentrations were measured with pumped DNPH samplers, the formaldehyde concentrations in the HENGH study were measured with passive samplers, which were estimated to under-measure the true indoor formaldehyde concentrations by approximately 7.5%. Applying this correction to the HENGH indoor formaldehyde concentrations results in a median indoor concentration of 24.1 $\mu g/m^3$, which is 33% lower than the 36 $\mu g/m^3$ found in the 2007 CNHS.

Thus, while new homes built after the 2009 CARB formaldehyde ATCM have a 33% lower median indoor formaldehyde concentration and cancer risk, the median lifetime cancer risk is still 120 per million for homes built with CARB compliant composite wood products. This median lifetime cancer risk is more than 12 times the OEHHA 10 in a million-cancer risk threshold (OEHHA, 2017a).

With respect to the Arroyo Vista Project, Riverside County, CA, the buildings consist of residential spaces.

The residential occupants will potentially have continuous exposure (e.g. 24 hours per day, 52 weeks per year). These exposures are anticipated to result in significant cancer risks resulting from exposures to formaldehyde released by the building materials and furnishing commonly found in residential construction.

Because these residences will be constructed with CARB Phase 2 Formaldehyde ATCM materials and be ventilated with the minimum code required amount of outdoor air, the indoor residential formaldehyde concentrations are likely similar to those concentrations observed in residences built with CARB Phase 2 Formaldehyde ATCM materials, which is a median of 24.1 $\mu g/m^3$ (Singer et. al., 2020)

Assuming that the residential occupants inhale 20 m^3 of air per day, the average 70-year lifetime formaldehyde daily dose is 482 µg/day for continuous exposure in the residences. This exposure represents a cancer risk of 120 per million, which is more than 12 times the CEQA cancer risk of 10 per million. For occupants that do not have continuous exposure, the cancer risk will be proportionally less but still substantially over the CEQA cancer risk of 10 per million (e.g. for 12/hour/day occupancy, more than 6 times the CEQA cancer risk of 10 per million).

In addition, we note that the average outdoor air concentration of formaldehyde in California is 3 ppb, or 3.7 $\mu g/m^3$, (California Air Resources Board, 2004), and thus represents an average pre-existing background airborne cancer risk of 1.85 per million. Thus, the indoor air formaldehyde exposures describe above exacerbate this pre-existing risk resulting from outdoor air formaldehyde exposures.

Additionally, the SCAQMD's Multiple Air Toxics Exposure Study ("MATES V") identifies an existing cancer risk at the Project site of 331 per million due to the site's elevated ambient air contaminant concentrations, which are due to the area's high levels of vehicle traffic. These impacts would further exacerbate the pre-existing cancer risk to the building occupants, which result from exposure to formaldehyde in both indoor and outdoor air.

Appendix A, Indoor Formaldehyde Concentrations and the CARB Formaldehyde ATCM, provides analyses that show utilization of CARB Phase 2 Formaldehyde ATCM materials will not ensure acceptable cancer risks with respect to formaldehyde emissions from composite wood products.

Even composite wood products manufactured with CARB certified ultra-low emitting formaldehyde (ULEF) resins do not ensure that the indoor air will have concentrations of formaldehyde the meet the OEHHA cancer risks that substantially exceed 10 per million. The permissible emission rates for ULEF composite wood products are only 11-15% lower than the CARB Phase 2 emission rates. Only use of composite wood products made with no-added formaldehyde resins (NAF), such as resins made from soy, polyvinyl acetate, or methylene diisocyanate can ensure that the OEHHA cancer risk of 10 per million is met.

The following describes a method that should be used, prior to construction in the environmental review under CEQA, for determining whether the indoor concentrations resulting from the formaldehyde emissions of specific building materials/furnishings selected exceed cancer and non-cancer guidelines. Such a design analyses can be used to identify those materials/furnishings prior to the completion of the City's CEQA review and project approval, that have formaldehyde emission rates that contribute to indoor concentrations that exceed cancer and non-cancer guidelines, so that alternative lower emitting materials/furnishings may be selected and/or higher minimum outdoor air ventilation rates can be increased to achieve acceptable indoor concentrations and incorporated as mitigation measures for this project.

Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment

This formaldehyde emissions assessment should be used in the environmental review under CEQA to assess the indoor formaldehyde concentrations from the proposed loading of building materials/furnishings, the area-specific formaldehyde emission rate data for building materials/furnishings, and the design minimum outdoor air ventilation rates. This assessment allows the applicant (and the City) to determine, before the conclusion of the

environmental review process and the building materials/furnishings are specified, purchased, and installed, if the total chemical emissions will exceed cancer and non-cancer guidelines, and if so, allow for changes in the selection of specific material/furnishings and/or the design minimum outdoor air ventilations rates such that cancer and non-cancer guidelines are not exceeded.

1.) Define Indoor Air Quality Zones. Divide the building into separate indoor air quality zones, (IAQ Zones). IAQ Zones are defined as areas of well-mixed air. Thus, each ventilation system with recirculating air is considered a single zone, and each room or group of rooms where air is not recirculated (e.g. 100% outdoor air) is considered a separate zone. For IAQ Zones with the same construction material/furnishings and design minimum outdoor air ventilation rates. (e.g. hotel rooms, apartments, condominiums, etc.) the formaldehyde emission rates need only be assessed for a single IAQ Zone of that type.

2.) Calculate Material/Furnishing Loading. For each IAQ Zone, determine the building material and furnishing loadings (e.g., m^2 of material/m^2 floor area, units of furnishings/m^2 floor area) from an inventory of all potential indoor formaldehyde sources, including flooring, ceiling tiles, furnishings, finishes, insulation, sealants, adhesives, and any products constructed with composite wood products containing urea-formaldehyde resins (e.g., plywood, medium density fiberboard, particleboard).

3.) Calculate the Formaldehyde Emission Rate. For each building material, calculate the formaldehyde emission rate (µg/h) from the product of the area-specific formaldehyde emission rate (µg/m^2-h) and the area (m^2) of material in the IAQ Zone, and from each furnishing (e.g. chairs, desks, etc.) from the unit-specific formaldehyde emission rate (µg/unit-h) and the number of units in the IAQ Zone.

NOTE: As a result of the high-performance building rating systems and building codes (California Building Standards Commission, 2014; USGBC, 2014), most manufacturers of building materials furnishings sold in the United States conduct chemical emission rate tests using the California Department of Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers," (CDPH, 2017), or other equivalent chemical emission rate

testing methods. Most manufacturers of building furnishings sold in the United States conduct chemical emission rate tests using ANSI/BIFMA M7.1 Standard Test Method for Determining VOC Emissions (BIFMA, 2018), or other equivalent chemical emission rate testing methods.

CDPH, BIFMA, and other chemical emission rate testing programs, typically certify that a material or furnishing does not create indoor chemical concentrations in excess of the maximum concentrations permitted by their certification. For instance, the CDPH emission rate testing requires that the measured emission rates when input into an office, school, or residential model do not exceed one-half of the OEHHA Chronic Exposure Guidelines (OEHHA, 2017b) for the 35 specific VOCs, including formaldehyde, listed in Table 4-1 of the CDPH test method (CDPH, 2017). These certifications themselves do not provide the actual area-specific formaldehyde emission rate (i.e., $\mu g/m^2$-h) of the product but rather provide data that the formaldehyde emission rates do not exceed the maximum rate allowed for the certification. Thus, for example, the data for a certification of a specific type of flooring may be used to calculate that the area-specific emission rate of formaldehyde is less than 31 $\mu g/m^2$-h, but not the actual measured specific emission rate, which may be 3, 18, or 30 $\mu g/m^2$-h. These area-specific emission rates determined from the product certifications of CDPH, BIFA, and other certification programs can be used as an initial estimate of the formaldehyde emission rate.

If the actual area-specific emission rates of a building material or furnishing is needed (i.e. the initial emission rates estimate from the product certifications are higher than desired), then that data can be acquired by requesting from the manufacturer the complete chemical emission rate test report. For instance if the complete CDPH emission test report is requested for a CDHP certified product, that report will provide the actual area-specific emission rates for not only the 35 specific VOCs, including formaldehyde, listed in Table 4-1 of the CDPH test method (CDPH, 2017), but also all of the cancer and reproductive/developmental chemicals listed in the California Proposition 65 Safe Harbor Levels (OEHHA, 2017a), all of the toxic air contaminants (TACs) in the California Air Resources Board Toxic Air Contamination List (CARB, 2011), and the 10 chemicals with the greatest emission rates.

Alternatively, a sample of the building material or furnishing can be submitted to a chemical emission rate testing laboratory, such as Berkeley Analytical Laboratory (https://berkeleyanalytical.com), to measure the formaldehyde emission rate.

4.) Calculate the Total Formaldehyde Emission Rate. For each IAQ Zone, calculate the total formaldehyde emission rate (i.e. µg/h) from the individual formaldehyde emission rates from each of the building material/furnishings as determined in Step 3.

5.) Calculate the Indoor Formaldehyde Concentration. For each IAQ Zone, calculate the indoor formaldehyde concentration (µg/m^3) from Equation 1 by dividing the total formaldehyde emission rates (i.e. µg/h) as determined in Step 4, by the design minimum outdoor air ventilation rate (m^3/h) for the IAQ Zone.

$$C_{in} = \frac{E_{total}}{Q_{oa}} \quad \text{(Equation 1)}$$

where:

C_{in} = indoor formaldehyde concentration (µg/m^3)

E_{total} = total formaldehyde emission rate (µg/h) into the IAQ Zone.

Q_{oa} = design minimum outdoor air ventilation rate to the IAQ Zone (m^3/h)

The above Equation 1 is based upon mass balance theory and is referenced in Section 3.10.2 "Calculation of Estimated Building Concentrations" of the California Department of Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers", (CDPH, 2017).

6.) Calculate the Indoor Exposure Cancer and Non-Cancer Health Risks. For each IAQ Zone, calculate the cancer and non-cancer health risks from the indoor formaldehyde concentrations determined in Step 5 and as described in the OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines; Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2015).

7.) Mitigate Indoor Formaldehyde Exposures of exceeding the CEQA Cancer and/or Non-Cancer Health Risks. In each IAQ Zone, provide mitigation for any formaldehyde exposure

risk as determined in Step 6, that exceeds the CEQA cancer risk of 10 per million or the CEQA non-cancer Hazard Quotient of 1.0.

Provide the source and/or ventilation mitigation required in all IAQ Zones to reduce the health risks of the chemical exposures below the CEQA cancer and non-cancer health risks.

Source mitigation for formaldehyde may include:

1.) reducing the amount materials and/or furnishings that emit formaldehyde
2.) substituting a different material with a lower area-specific emission rate of formaldehyde

Ventilation mitigation for formaldehyde emitted from building materials and/or furnishings may include:

1.) increasing the design minimum outdoor air ventilation rate to the IAQ Zone.

NOTE: Mitigating the formaldehyde emissions through use of less material/furnishings, or use of lower emitting materials/furnishings, is the preferred mitigation option, as mitigation with increased outdoor air ventilation increases initial and operating costs associated with the heating/cooling systems.

Further, we are not asking that the builder "speculate" on what and how much composite materials be used, but rather at the design stage to select composite wood materials based on the formaldehyde emission rates that manufacturers routinely conduct using the California Department of Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers," (CDPH, 2017), and use the procedure described earlier above (i.e. Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment) to insure that the materials selected achieve acceptable cancer risks from material off gassing of formaldehyde.

Outdoor Air Ventilation Impact. Another important finding of the CNHS, was that the outdoor air ventilation rates in the homes were very low. Outdoor air ventilation is a very

important factor influencing the indoor concentrations of air contaminants, as it is the primary removal mechanism of all indoor air generated contaminants. Lower outdoor air exchange rates cause indoor generated air contaminants to accumulate to higher indoor air concentrations. Many homeowners rarely open their windows or doors for ventilation as a result of their concerns for security/safety, noise, dust, and odor concerns (Price, 2007). In the CNHS field study, 32% of the homes did not use their windows during the 24-hour Test Day, and 15% of the homes did not use their windows during the entire preceding week. Most of the homes with no window usage were homes in the winter field session. Thus, a substantial percentage of homeowners never open their windows, especially in the winter season. The median 24-hour measurement was 0.26 air changes per hour (ach), with a range of 0.09 ach to 5.3 ach. A total of 67% of the homes had outdoor air exchange rates below the minimum California Building Code (2001) requirement of 0.35 ach. Thus, the relatively tight envelope construction, combined with the fact that many people never open their windows for ventilation, results in homes with low outdoor air exchange rates and higher indoor air contaminant concentrations.

The Arroyo Vista Project, Riverside County, CA is close to roads with moderate to high traffic (e.g., Van Buren Boulevard, Chicago Avenue, Iris Avenue, Gamble Avenue, Hibiscus Avenue etc.), and thus the Project site is a sound impacted site.

According to Table 4.13-16 in the Draft Environmental Impact Report – Arroyo Vista, Tentative Tract Map No. 38510, Riverside County, CA (Riverside County, 2025), the 2027 ambient noise levels will range from 40.0 to 77.8 dBA CNEL and according to Table 4.13-17 the 2045 ambient noise levels will range from 41.5 to 78.6 dBA CNEL. These ambient noise levels are modeled levels based on just five 24-hour measurements on Wednesday, March 23, 2022.

In order to design the building for this Project such that interior noise levels are acceptable, an acoustic study of the existing and future ambient noise levels needs to be conducted. An acoustic study should be conducted to assess the local ambient sound levels (i.e., dBA CNEL or Ldn) over a one-week period so that the building envelope and windows can be designed with a sufficient STC such that the indoor noise levels are acceptable.

As a result of the high outdoor noise levels, the current project will require a mechanical supply of outdoor air ventilation to allow for a habitable interior environment with closed windows and doors. Such a ventilation system would allow windows and doors to be kept closed at the occupant's discretion to control exterior noise within building interiors.

$PM_{2.5}$ Outdoor Concentrations Impact. An additional impact of the nearby motor vehicle traffic associated with this project, are the outdoor concentrations of $PM_{2.5}$. According to the Draft Environmental Impact Report – Arroyo Vista, Tentative Tract Map No. 38510, Riverside County, CA (Riverside County, 2025), the Project is located in the South Coast Air Basin, which is a State and Federal non-attainment area for $PM_{2.5}$.

Additionally, the SCAQMD's MATES V study cites an existing cancer risk of 331 per million at the Project site due to the site's high concentration of ambient air contaminants resulting from the area's high levels of motor vehicle traffic.

An air quality analyses should be conducted to determine the concentrations of $PM_{2.5}$ in the outdoor and indoor air that people inhale each day. This air quality analyses needs to consider the cumulative impacts of the project related emissions, existing and projected future emissions from local $PM_{2.5}$ sources (e.g. stationary sources, motor vehicles, and airport traffic) upon the outdoor air concentrations at the Project site. If the outdoor concentrations are determined to exceed the California and National annual average $PM_{2.5}$ exceedence concentration of 12 $\mu g/m^3$, or the National 24-hour average exceedence concentration of 35 $\mu g/m^3$, then the buildings need to have a mechanical supply of outdoor air that has air filtration with sufficient removal efficiency, such that the indoor concentrations of outdoor $PM_{2.5}$ particles is less than the California and National $PM_{2.5}$ annual and 24-hour standards.

It is my experience that based on the projected high traffic noise levels, the annual average concentration of $PM_{2.5}$ will exceed the California and National $PM_{2.5}$ annual and 24-hour standards and warrant installation of high efficiency air filters (i.e. MERV 13 or higher) in all mechanically supplied outdoor air ventilation systems.

Indoor Air Quality Impact Mitigation Measures

The following are recommended mitigation measures to minimize the impacts upon indoor quality:

Indoor Formaldehyde Concentrations Mitigation. Use only composite wood materials (e.g. hardwood plywood, medium density fiberboard, particleboard) for all interior finish systems that are made with CARB approved no-added formaldehyde (NAF) resins (CARB, 2009). CARB Phase 2 certified composite wood products, or ultra-low emitting formaldehyde (ULEF) resins, do not ensure indoor formaldehyde concentrations that are below the CEQA cancer risk of 10 per million. Only composite wood products manufactured with CARB approved no-added formaldehyde (NAF) resins, such as resins made from soy, polyvinyl acetate, or methylene diisocyanate can ensure that the OEHHA cancer risk of 10 per million is met.

Alternatively, conduct the previously described Pre-Construction Building Material/Furnishing Chemical Emissions Assessment, to determine that the combination of formaldehyde emissions from building materials and furnishings do not create indoor formaldehyde concentrations that exceed the CEQA cancer and non-cancer health risks.

It is important to note that we are not asking that the builder "speculate" on what and how much composite materials be used, but rather at the design stage to select composite wood materials based on the formaldehyde emission rates that manufacturers routinely conduct using the California Department of Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers", (CDPH, 2017), and use the procedure described above (i.e. Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment) to insure that the materials selected achieve acceptable cancer risks from material off gassing of formaldehyde.

Outdoor Air Ventilation Mitigation. Provide each habitable room with a continuous mechanical supply of outdoor air that meets or exceeds the California 2016 Building Energy

Efficiency Standards (California Energy Commission, 2015) requirements of the greater of 15 cfm/occupant or 0.15 cfm/ft^2 of floor area. Following installation of the system conduct testing and balancing to insure that required amount of outdoor air is entering each habitable room and provide a written report documenting the outdoor airflow rates. Do not use exhaust only mechanical outdoor air systems, use only balanced outdoor air supply and exhaust systems or outdoor air supply only systems. Provide a manual for the occupants or maintenance personnel, that describes the purpose of the mechanical outdoor air system and the operation and maintenance requirements of the system.

$PM_{2.5}$ Outdoor Air Concentration Mitigation. Install air filtration with sufficient $PM_{2.5}$ removal efficiency (e.g. MERV 13 or higher) to filter the outdoor air entering the mechanical outdoor air supply systems, such that the indoor concentrations of outdoor $PM_{2.5}$ particles are less than the California and National $PM_{2.5}$ annual and 24-hour standards. Install the air filters in the system such that they are accessible for replacement by the occupants or maintenance personnel. Include in the mechanical outdoor air ventilation system manual instructions on how to replace the air filters and the estimated frequency of replacement.

References

BIFA. 2018. BIFMA Product Safety and Performance Standards and Guidelines. www.bifma.org/page/standardsoverview

California Air Resources Board. 2004. Formaldehyde in the Home. https://ww3.arb.ca.gov › research › indoor › formaldgl08-04.pdf

California Air Resources Board. 2009. Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products. California Environmental Protection Agency, Sacramento, CA. https://www.arb.ca.gov/regact/2007/compwood07/fro-final.pdf

California Air Resources Board. 2011. Toxic Air Contaminant Identification List. California Environmental Protection Agency, Sacramento, CA. https://www.arb.ca.gov/toxics/id/taclist.htm

California Building Code. 2001. California Code of Regulations, Title 24, Part 2 Volume 1, Appendix Chapter 12, Interior Environment, Division 1, Ventilation, Section 1207: 2001 California Building Code, California Building Standards Commission. Sacramento, CA.

California Building Standards Commission (2014). 2013 California Green Building Standards Code. California Code of Regulations, Title 24, Part 11. California Building Standards Commission, Sacramento, CA http://www.bsc.ca.gov/Home/CALGreen.aspx.

California Energy Commission, PIER Program. CEC-500-2007-033. Final Report, ARB Contract 03-326. Available at: www.arb.ca.gov/research/apr/past/03-326.pdf.

California Energy Commission, 2015. 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, California Code of Regulations, Title 24, Part 6. http://www.energy.ca.gov/2015publications/CEC-400-2015-037/CEC-400-2015-037-CMF.pdf

CDPH. 2017. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers, Version 1.1. California Department of Public Health, Richmond, CA. https://www.cdph.ca.gov/Programs/CCDPHP/ DEODC/EHLB/IAQ/Pages/VOC.aspx. Environmental Impact Report. SCH No. 2018011001.

EPA. 2011. Exposure Factors Handbook: 2011 Edition, Chapter 16 – Activity Factors. Report EPA/600/R-09/052F, September 2011. U.S. Environmental Protection Agency, Washington, D.C.

Hodgson, A. T., D. Beal, J.E.R. McIlvaine. 2002. Sources of formaldehyde, other aldehydes and terpenes in a new manufactured house. Indoor Air 12: 235–242.

OEHHA (Office of Environmental Health Hazard Assessment). 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines; Guidance Manual for Preparation of Health Risk Assessments.

OEHHA (Office of Environmental Health Hazard Assessment). 2017a. Proposition 65 Safe Harbor Levels. No Significant Risk Levels for Carcinogens and Maximum Allowable Dose Levels for Chemicals Causing Reproductive Toxicity. Available at: http://www.oehha.ca.gov/prop65/pdf/safeharbor081513.pdf

OEHHA - Office of Environmental Health Hazard Assessment. 2017b. All OEHHA Acute, 8-hour and Chronic Reference Exposure Levels. Available at: http://oehha.ca.gov/air/allrels.html

Offermann, F. J. 2009. Ventilation and Indoor Air Quality in New Homes. California Air Resources Board and California Energy Commission, PIER Energy-Related Environmental Research Program. Collaborative Report. CEC-500-2009-085. https://www.arb.ca.gov/research/apr/past/04-310.pdf

Offermann, F. J. and A. T. Hodgson. 2011. Emission Rates of Volatile Organic Compounds in New Homes. Proceedings Indoor Air 2011 (12th International Conference on Indoor Air Quality and Climate 2011), June 5-10, 2011, Austin, TX.

Riverside County Planning Department. 2025. Draft Environmental Impact Report – Arroyo Vista, Tentative Tract Map No. 38510, Riverside County, CA.

Singer, B.C, Chan, W.R, Kim, Y., Offermann, F.J., and Walker I.S. 2020. Indoor Air Quality in California Homes with Code-Required Mechanical Ventilation. Indoor Air, Vol 30, Issue 5, 885-899.

USGBC. 2014. LEED BD+C Homes v4. U.S. Green Building Council, Washington, D.C. http://www.usgbc.org/credits/homes/v4

APPENDIX A

INDOOR FORMALDEHYDE CONCENTRATIONS
AND THE
CARB FORMALDEHYDE ATCM

With respect to formaldehyde emissions from composite wood products, the CARB ATCM regulations of formaldehyde emissions from composite wood products, do not assure healthful indoor air quality. The following is the stated purpose of the CARB ATCM regulation - *The purpose of this airborne toxic control measure is to "reduce formaldehyde emissions from composite wood products, and finished goods that contain composite wood products, that are sold, offered for sale, supplied, used, or manufactured for sale in California".* In other words, the CARB ATCM regulations do not "assure healthful indoor air quality", but rather "reduce formaldehyde emissions from composite wood products".

Just how much protection do the CARB ATCM regulations provide building occupants from the formaldehyde emissions generated by composite wood products? Definitely some, but certainly the regulations do not "*assure healthful indoor air quality*" when CARB Phase 2 products are utilized. As shown in the Chan 2019 study of new California homes, the median indoor formaldehyde concentration was of 22.4 $\mu g/m^3$ (18.2 ppb), which corresponds to a cancer risk of 112 per million for occupants with continuous exposure, which is more than 11 times the CEQA cancer risk of 10 per million.

Another way of looking at how much protection the CARB ATCM regulations provide building occupants from the formaldehyde emissions generated by composite wood products is to calculate the maximum number of square feet of composite wood product that can be in a residence without exceeding the CEQA cancer risk of 10 per million for occupants with continuous occupancy.

For this calculation I utilized the floor area (2,272 ft^2), the ceiling height (8.5 ft), and the number of bedrooms (4) as defined in Appendix B (New Single-Family Residence Scenario) of the Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers, Version 1.1, 2017, California Department of Public Health,

Richmond, CA. https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/VOC.aspx.

For the outdoor air ventilation rate, I used the 2019 Title 24 code required mechanical ventilation rate (ASHRAE 62.2) of 106 cfm (180 m^3/h) calculated for this model residence. For the composite wood formaldehyde emission rates, I used the CARB ATCM Phase 2 rates.

The calculated maximum number of square feet of composite wood product that can be in a residence, without exceeding the CEQA cancer risk of 10 per million for occupants with continuous occupancy are as follows for the different types of regulated composite wood products.

Medium Density Fiberboard (MDF) – 15 ft^2 (0.7% of the floor area), or
Particle Board – 30 ft^2 (1.3% of the floor area), or
Hardwood Plywood – 54 ft^2 (2.4% of the floor area), or
Thin MDF – 46 ft^2 (2.0 % of the floor area).

For offices and hotels the calculated maximum amount of composite wood product (% of floor area) that can be used without exceeding the CEQA cancer risk of 10 per million for occupants, assuming 8 hours/day occupancy, and the California Mechanical Code minimum outdoor air ventilation rates are as follows for the different types of regulated composite wood products.

Medium Density Fiberboard (MDF) – 3.6 % (offices) and 4.6% (hotel rooms), or
Particle Board – 7.2 % (offices) and 9.4% (hotel rooms), or
Hardwood Plywood – 13 % (offices) and 17% (hotel rooms), or
Thin MDF – 11 % (offices) and 14 % (hotel rooms)

Clearly the CARB ATCM does not regulate the formaldehyde emissions from composite wood products such that the potentially large areas of these products, such as for flooring, baseboards, interior doors, window and door trims, and kitchen and bathroom cabinetry, could be used without causing indoor formaldehyde concentrations that result in CEQA

cancer risks that substantially exceed 10 per million for occupants with continuous occupancy.

Even composite wood products manufactured with CARB certified ultra-low emitting formaldehyde (ULEF) resins do not ensure that the indoor air will have concentrations of formaldehyde the meet the OEHHA cancer risks that substantially exceed 10 per million. The permissible emission rates for ULEF composite wood products are only 11-15% lower than the CARB Phase 2 emission rates. Only use of composite wood products made with no-added formaldehyde resins (NAF), such as resins made from soy, polyvinyl acetate, or methylene diisocyanate can ensure that the OEHHA cancer risk of 10 per million is met.

If CARB Phase 2 compliant or ULEF composite wood products are utilized in construction, then the resulting indoor formaldehyde concentrations should be determined in the design phase using the specific amounts of each type of composite wood product, the specific formaldehyde emission rates, and the volume and outdoor air ventilation rates of the indoor spaces, and all feasible mitigation measures employed to reduce this impact (e.g. use less formaldehyde containing composite wood products and/or incorporate mechanical systems capable of higher outdoor air ventilation rates). See the procedure described earlier (i.e. Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment) to ensure that the materials selected achieve acceptable cancer risks from material off gassing of formaldehyde.

Alternatively, and perhaps a simpler approach, is to use only composite wood products (e.g. hardwood plywood, medium density fiberboard, particleboard) for all interior finish systems that are made with CARB approved no-added formaldehyde (NAF) resins.

Francis (Bud) J. Offermann III PE, CIH

Indoor Environmental Engineering
1448 Pine Street, Suite 103, San Francisco, CA 94109
Phone: 415-567-7700
Email: Offermann@iee-sf.com
http://www.iee-sf.com

Education

M.S. Mechanical Engineering (1985)
Stanford University, Stanford, CA.

Graduate Studies in Air Pollution Monitoring and Control (1980)
University of California, Berkeley, CA.

B.S. in Mechanical Engineering (1976)
Rensselaer Polytechnic Institute, Troy, N.Y.

Professional Experience

President: Indoor Environmental Engineering, San Francisco, CA. December, 1981 - present.

Direct team of environmental scientists, chemists, and mechanical engineers in conducting State and Federal research regarding indoor air quality instrumentation development, building air quality field studies, ventilation and air cleaning performance measurements, and chemical emission rate testing.

Provide design side input to architects regarding selection of building materials and ventilation system components to ensure a high quality indoor environment.

Direct Indoor Air Quality Consulting Team for the winning design proposal for the new State of Washington Ecology Department building.

Develop a full-scale ventilation test facility for measuring the performance of air diffusers; ASHRAE 129, Air Change Effectiveness, and ASHRAE 113, Air Diffusion Performance Index.

Develop a chemical emission rate testing laboratory for measuring the chemical emissions from building materials, furnishings, and equipment.

Principle Investigator of the California New Homes Study (2005-2007). Measured ventilation and indoor air quality in 108 new single family detached homes in northern and southern California.

Develop and teach IAQ professional development workshops to building owners, managers, hygienists, and engineers.

Air Pollution Engineer: Earth Metrics Inc., Burlingame, CA, October, 1985 to March, 1987.

Responsible for development of an air pollution laboratory including installation a forced choice olfactometer, tracer gas electron capture chromatograph, and associated calibration facilities. Field team leader for studies of fugitive odor emissions from sewage treatment plants, entrainment of fume hood exhausts into computer chip fabrication rooms, and indoor air quality investigations.

Staff Scientist: Building Ventilation and Indoor Air Quality Program, Energy and Environment Division, Lawrence Berkeley Laboratory, Berkeley, CA. January, 1980 to August, 1984.

Deputy project leader for the Control Techniques group; responsible for laboratory and field studies aimed at evaluating the performance of indoor air pollutant control strategies (i.e. ventilation, filtration, precipitation, absorption, adsorption, and source control).

Coordinated field and laboratory studies of air-to-air heat exchangers including evaluation of thermal performance, ventilation efficiency, cross-stream contaminant transfer, and the effects of freezing/defrosting.

Developed an *in situ* test protocol for evaluating the performance of air cleaning systems and introduced the concept of effective cleaning rate (ECR) also known as the Clean Air Delivery Rate (CADR).

Coordinated laboratory studies of portable and ducted air cleaning systems and their effect on indoor concentrations of respirable particles and radon progeny.

Co-designed an automated instrument system for measuring residential ventilation rates and radon concentrations.

Designed hardware and software for a multi-channel automated data acquisition system used to evaluate the performance of air-to-air heat transfer equipment.

Assistant Chief Engineer: Alta Bates Hospital, Berkeley, CA, October, 1979 to January, 1980.

Responsible for energy management projects involving installation of power factor correction capacitors on large inductive electrical devices and installation of steam meters on physical plant steam lines. Member of Local 39, International Union of Operating Engineers.

Manufacturing Engineer: American Precision Industries, Buffalo, NY, October, 1977 to October, 1979.

Responsible for reorganizing the manufacturing procedures regarding production of shell and tube heat exchangers. Designed customized automatic assembly, welding, and testing equipment. Designed a large paint spray booth. Prepared economic studies justifying new equipment purchases. Safety Director.

Project Engineer: Arcata Graphics, Buffalo, N.Y. June, 1976 to October, 1977.

Responsible for the design and installation of a bulk ink storage and distribution system and high speed automatic counting and marking equipment. Also coordinated material handling studies which led to the purchase and installation of new equipment.

PROFESSIONAL ORGANIZATION MEMBERSHIP

American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

- Chairman of SPC-145P, Standards Project Committee - Test Method for Assessing the Performance of Gas Phase Air Cleaning Equipment (1991-1992)
- Member SPC-129P, Standards Project Committee - Test Method for Ventilation Effectiveness (1986-97)
  - Member of Drafting Committee
- Member Environmental Health Committee (1992-1994, 1997-2001, 2007-2010)
  - Chairman of EHC Research Subcommittee
  - Member of Man Made Mineral Fiber Position Paper Subcommittee
  - Member of the IAQ Position Paper Committee
  - Member of the Legionella Position Paper Committee
  - Member of the Limiting Indoor Mold and Dampness in Buildings Position Paper Committee
- Member SSPC-62, Standing Standards Project Committee - Ventilation for Acceptable Indoor Air Quality (1992 to 2000)
  - Chairman of Source Control and Air Cleaning Subcommittee
- Chairman of TC-4.10, Indoor Environmental Modeling (1988-92)
  - Member of Research Subcommittee
- Chairman of TC-2.3, Gaseous Air Contaminants and Control Equipment (1989-92)
  - Member of Research Subcommittee

American Society for Testing and Materials (ASTM)

- D-22 Sampling and Analysis of Atmospheres
  - Member of Indoor Air Quality Subcommittee
- E-06 Performance of Building Constructions

American Board of Industrial Hygiene (ABIH)

American Conference of Governmental Industrial Hygienists (ACGIH)

- Bioaerosols Committee (2007-2013)

American Industrial Hygiene Association (AIHA)

Cal-OSHA Indoor Air Quality Advisory Committee

International Society of Indoor Air Quality and Climate (ISIAQ)

- Co-Chairman of Task Force on HVAC Hygiene

U. S. Green Building Council (USGBC)
- Member of the IEQ Technical Advisory Group (2007-2009)
- Member of the IAQ Performance Testing Work Group (2010-2012)

Western Construction Consultants (WESTCON)

PROFESSIONAL CREDENTIALS

Licensed Professional Engineer - Mechanical Engineering

Certified Industrial Hygienist - American Board of Industrial Hygienists

SCIENTIFIC MEETINGS AND SYMPOSIA

Biological Contamination, Diagnosis, and Mitigation, Indoor Air'90, Toronto, Canada, August, 1990.

Models for Predicting Air Quality, Indoor Air'90, Toronto, Canada, August, 1990.

Microbes in Building Materials and Systems, Indoor Air '93, Helsinki, Finland, July, 1993.

Microorganisms in Indoor Air Assessment and Evaluation of Health Effects and Probable Causes, Walnut Creek, CA, February 27, 1997.

Controlling Microbial Moisture Problems in Buildings, Walnut Creek, CA, February 27, 1997.

Scientific Advisory Committee, Roomvent 98, 6th International Conference on Air Distribution in Rooms, KTH, Stockholm, Sweden, June 14-17, 1998.

Moisture and Mould, Indoor Air '99, Edinburgh, Scotland, August, 1999.

Ventilation Modeling and Simulation, Indoor Air '99, Edinburgh, Scotland, August, 1999.

Microbial Growth in Materials, Healthy Buildings 2000, Espoo, Finland, August, 2000.

Co-Chair, Bioaerosols X- Exposures in Residences, Indoor Air 2002, Monterey, CA, July 2002.

Healthy Indoor Environments, Anaheim, CA, April 2003.

Chair, Environmental Tobacco Smoke in Multi-Family Homes, Indoor Air 2008, Copenhagen, Denmark, July 2008.

Co-Chair, ISIAQ Task Force Workshop; HVAC Hygiene, Indoor Air 2002, Monterey, CA, July 2002.

Chair, ETS in Multi-Family Housing: Exposures, Controls, and Legalities Forum, Healthy Buildings 2009, Syracuse, CA, September 14, 2009.

Chair, Energy Conservation and IAQ in Residences Workshop, Indoor Air 2011, Austin, TX, June 6, 2011.

Chair, Electronic Cigarettes: Chemical Emissions and Exposures Colloquium, Indoor Air 2016, Ghent, Belgium, July 4, 2016.

SPECIAL CONSULTATION

Provide consultation to the American Home Appliance Manufacturers on the development of a standard for testing portable air cleaners, AHAM Standard AC-1.

Served as an expert witness and special consultant for the U.S. Federal Trade Commission regarding the performance claims found in advertisements of portable air cleaners and residential furnace filters.

Conducted a forensic investigation for a San Mateo, CA pro se defendant, regarding an alleged homicide where the victim was kidnapped in a steamer trunk. Determined the air exchange rate in the steamer trunk and how long the person could survive.

Conducted *in situ* measurement of human exposure to toluene fumes released during nailpolish application for a plaintiffs attorney pursuing a California Proposition 65 product labeling case. June, 1993.

Conducted a forensic *in situ* investigation for the Butte County, CA Sheriff's Department of the emissions of a portable heater used in the bedroom of two twin one year old girls who suffered simultaneous crib death.

Consult with OSHA on the 1995 proposed new regulation regarding indoor air quality and environmental tobacco smoke.

Consult with EPA on the proposed Building Alliance program and with OSHA on the proposed new OSHA IAQ regulation.

Johnson Controls Audit/Certification Expert Review; Milwaukee, WI. May 28-29, 1997.

Winner of the nationally published 1999 Request for Proposals by the State of Washington to conduct a comprehensive indoor air quality investigation of the Washington State Department of Ecology building in Lacey, WA.

Selected by the State of California Attorney General's Office in August, 2000 to conduct a comprehensive indoor air quality investigation of the Tulare County Court House.

Lawrence Berkeley Laboratory IAQ Experts Workshop: "Cause and Prevention of Sick Building Problems in Offices: The Experience of Indoor Environmental Quality Investigators", Berkeley, California, May 26-27, 2004.

Provide consultation and chemical emission rate testing to the State of California Attorney General's Office in 2013-2015 regarding the chemical emissions from e-cigarettes.

PEER-REVIEWED PUBLICATIONS :

F.J.Offermann, C.D.Hollowell, and G.D.Roseme, "Low-Infiltration Housing in Rochester, New York: A Study of Air Exchange Rates and Indoor Air Quality," *Environment International*, *8*, pp. 435-445, 1982.

W.W.Nazaroff, F.J.Offermann, and A.W.Robb, "Automated System for Measuring Air Exchange Rate and Radon Concentration in Houses," *Health Physics*, *45*, pp. 525-537, 1983.

F.J.Offermann, W.J.Fisk, D.T.Grimsrud, B.Pedersen, and K.L.Revzan, "Ventilation Efficiencies of Wall- or Window-Mounted Residential Air-to-Air Heat Exchangers," *ASHRAE Annual Transactions*, *89-2B*, pp 507-527, 1983.

W.J.Fisk, K.M.Archer, R.E Chant, D. Hekmat, F.J.Offermann, and B.Pedersen, "Onset of Freezing in Residential Air-to-Air Heat Exchangers," *ASHRAE Annual Transactions*, *91-1B*, 1984.

W.J.Fisk, K.M.Archer, R.E Chant, D. Hekmat, F.J.Offermann, and B.Pedersen, "Performance of Residential Air-to-Air Heat Exchangers During Operation with Freezing and Periodic Defrosts," *ASHRAE Annual Transactions*, *91-1B*, 1984.

F.J.Offermann, R.G.Sextro, W.J.Fisk, D.T.Grimsrud, W.W.Nazaroff, A.V.Nero, and K.L.Revzan, "Control of Respirable Particles with Portable Air Cleaners," *Atmospheric Environment*, Vol. 19, pp.1761-1771, 1985.

R.G.Sextro, F.J.Offermann, W.W.Nazaroff, A.V.Nero, K.L.Revzan, and J.Yater, "Evaluation of Indoor Control Devices and Their Effects on Radon Progeny Concentrations," *Atmospheric Environment, 12*, pp. 429-438, 1986.

W.J. Fisk, R.K.Spencer, F.J.Offermann, R.K.Spencer, B.Pedersen, R.Sextro, "Indoor Air Quality Control Techniques," *Noyes Data Corporation*, Park Ridge, New Jersey, (1987).

F.J.Offermann, "Ventilation Effectiveness and ADPI Measurements of a Forced Air Heating System," *ASHRAE Transactions* , Volume 94, Part 1, pp 694-704, 1988.

F.J.Offermann and D. Int-Hout "Ventilation Effectiveness Measurements of Three Supply/Return Air Configurations," *Environment International* , Volume 15, pp 585-592 1989.

F.J. Offermann, S.A. Loiselle, M.C. Quinlan, and M.S. Rogers, "A Study of Diesel Fume Entrainment in an Office Building," *IAQ '89*, The Human Equation: Health and Comfort, pp 179-183, ASHRAE, Atlanta, GA, 1989.

R.G.Sextro and F.J.Offermann, "Reduction of Residential Indoor Particle and Radon Progeny Concentrations with Ducted Air Cleaning Systems," submitted to *Indoor Air*, 1990.

S.A.Loiselle, A.T.Hodgson, and F.J.Offermann, "Development of An Indoor Air Sampler for Polycyclic Aromatic Compounds", *Indoor Air* , Vol 2, pp 191-210, 1991.

F.J.Offermann, S.A.Loiselle, A.T.Hodgson, L.A. Gundel, and J.M. Daisey, "A Pilot Study to Measure Indoor Concentrations and Emission Rates of Polycyclic Aromatic Compounds", *Indoor Air* , Vol 4, pp 497-512, 1991.

F.J. Offermann, S. A. Loiselle, R.G. Sextro, "Performance Comparisons of Six Different Air Cleaners Installed in a Residential Forced Air Ventilation System," *IAQ'91*, Healthy Buildings, pp 342-350, ASHRAE, Atlanta, GA (1991).

F.J. Offermann, J. Daisey, A. Hodgson, L. Gundell, and S. Loiselle, "Indoor Concentrations and Emission Rates of Polycyclic Aromatic Compounds", *Indoor Air,* Vol 4, pp 497-512 (1992).

F.J. Offermann, S. A. Loiselle, R.G. Sextro, "Performance of Air Cleaners Installed in a Residential Forced Air System," *ASHRAE Journal*, pp 51-57, July, 1992.

F.J. Offermann and S. A. Loiselle, "Performance of an Air-Cleaning System in an Archival Book Storage Facility," *IAQ'92*, ASHRAE, Atlanta, GA, 1992.

S.B. Hayward, K.S. Liu, L.E. Alevantis, K. Shah, S. Loiselle, F.J. Offermann, Y.L. Chang, L. Webber, "Effectiveness of Ventilation and Other Controls in Reducing Exposure to ETS in Office Buildings," Indoor Air '93, Helsinki, Finland, July 4-8, 1993.

F.J. Offermann, S. A. Loiselle, G. Ander, H. Lau, "Indoor Contaminant Emission Rates Before and After a Building Bake-out," *IAQ'93*, Operating and Maintaining Buildings for Health, Comfort, and Productivity, pp 157-163, ASHRAE, Atlanta, GA, 1993.

L.E. Alevantis, Hayward, S.B., Shah, S.B., Loiselle, S., and Offermann, F.J. "Tracer Gas Techniques for Determination of the Effectiveness of Pollutant Removal From Local Sources," *IAQ '93*, Operating and Maintaining Buildings for Health, Comfort, and Productivity, pp 119-129, ASHRAE, Atlanta, GA, 1993.

L.E. Alevantis, Liu, L.E., Hayward, S.B., Offermann, F.J., Shah, S.B., Leiserson, K. Tsao, E., and Huang, Y., "Effectiveness of Ventilation in 23 Designated Smoking Areas in California Buildings," *IAQ '94*, Engineering Indoor Environments, pp 167-181, ASHRAE, Atlanta, GA, 1994.

L.E. Alevantis, Offermann, F.J., Loiselle, S., and Macher, J.M., "Pressure and Ventilation Requirements of Hospital Isolation Rooms for Tuberculosis (TB) Patients: Existing Guidelines in the United States and a Method for Measuring Room Leakage", Ventilation and Indoor air quality in Hospitals, M. Maroni, editor, Kluwer Academic publishers, Netherlands, 1996.

F.J. Offermann, M. A. Waz, A.T. Hodgson, and H.M. Ammann, "Chemical Emissions from a Hospital Operating Room Air Filter," *IAQ'96*, Paths to Better Building Environments, pp 95-99, ASHRAE, Atlanta, GA, 1996.

F.J. Offermann, "Professional Malpractice and the Sick Building Investigator," *IAQ'96*, Paths to Better Building Environments, pp 132-136, ASHRAE, Atlanta, GA, 1996.

F.J. Offermann, "Standard Method of Measuring Air Change Effectiveness," *Indoor Air*, Vol 1, pp.206-211, 1999.

F. J. Offermann, A. T. Hodgson, and J. P. Robertson, "Contaminant Emission Rates from PVC Backed Carpet Tiles on Damp Concrete", Healthy Buildings 2000, Espoo, Finland, August 2000.

K.S. Liu, L.E. Alevantis, and F.J. Offermann, "A Survey of Environmental Tobacco Smoke Controls in California Office Buildings", *Indoor Air*, Vol 11, pp. 26-34, 2001.

F.J. Offermann, R. Colfer, P. Radzinski, and J. Robertson, "Exposure to Environmental Tobacco Smoke in an Automobile", Indoor Air 2002, Monterey, California, July 2002.

F. J. Offermann, J.P. Robertson, and T. Webster, "The Impact of Tracer Gas Mixing on Airflow Rate Measurements in Large Commercial Fan Systems", Indoor Air 2002, Monterey, California, July 2002.

M. J. Mendell, T. Brennan, L. Hathon, J.D. Odom, F.J.Offermann, B.H. Turk, K.M. Wallingford, R.C. Diamond, W.J. Fisk, "Causes and prevention of Symptom Complaints

in Office Buildings: Distilling the Experience of Indoor Environmental Investigators", submitted to Indoor Air 2005, Beijing, China, September 4-9, 2005.

F.J. Offermann, "Ventilation and IAQ in New Homes With and Without Mechanical Outdoor Air Systems", Healthy Buildings 2009, Syracuse, CA, September 14, 2009.

F.J. Offermann, "ASHRAE 62.2 Intermittent Residential Ventilation: What's It Good For, Intermittently Poor IAQ", IAQVEC 2010, Syracuse, CA, April 21, 2010.

F.J. Offermann and A.T. Hodgson, "Emission Rates of Volatile Organic Compounds in New Homes", Indoor Air 2011, Austin, TX, June, 2011.

P. Jenkins, R. Johnson, T. Phillips, and F. Offermann, "Chemical Concentrations in New California Homes and Garages", Indoor Air 2011, Austin, TX, June, 2011.

W. J. Mills, B. J. Grigg, F. J. Offermann, B. E. Gustin, and N. E. Spingarm, "Toluene and Methyl Ethyl Ketone Exposure from a Commercially Available Contact Adhesive", Journal of Occupational and Environmental Hygiene, 9:D95-D102 May, 2012.

F. J. Offermann, R. Maddalena, J. C. Offermann, B. C. Singer, and H, Wilhelm, "The Impact of Ventilation on the Emission Rates of Volatile Organic Compounds in Residences", HB 2012, Brisbane, AU, July, 2012.

F. J. Offermann, A. T. Hodgson, P. L. Jenkins, R. D. Johnson, and T. J. Phillips, "Attached Garages as a Source of Volatile Organic Compounds in New Homes", HB 2012, Brisbane, CA, July, 2012.

R. Maddalena, N. Li, F. Offermann, and B. Singer, "Maximizing Information from Residential Measurements of Volatile Organic Compounds", HB 2012, Brisbane, AU, July, 2012.

W. Chen, A. Persily, A. Hodgson, F. Offermann, D. Poppendieck, and K. Kumagai, "Area-Specific Airflow Rates for Evaluating the Impacts of VOC emissions in U.S. Single-Family Homes", Building and Environment, Vol. 71, 204-211, February, 2014.

F. J. Offermann, A. Eagan A. C. Offermann, and L. J. Radonovich, "Infectious Disease Aerosol Exposures With and Without Surge Control Ventilation System Modifications", Indoor Air 2014, Hong Kong, July, 2014.

F. J. Offermann, "Chemical Emissions from E-Cigarettes: Direct and Indirect Passive Exposures", Building and Environment, Vol. 93, Part 1, 101-105, November, 2015.

F. J. Offermann, "Formaldehyde Emission Rates From Lumber Liquidators Laminate Flooring Manufactured in China", Indoor Air 2016, Belgium, Ghent, July, 2016.

F. J. Offermann, "Formaldehyde and Acetaldehyde Emission Rates for E-Cigarettes", Indoor Air 2016, Belgium, Ghent, July, 2016.

OTHER REPORTS:

W.J.Fisk, P.G.Cleary, and F.J.Offermann, "Energy Saving Ventilation with Residential Heat Exchangers," a Lawrence Berkeley Laboratory brochure distributed by the Bonneville Power Administration, 1981.

F.J.Offermann, J.R.Girman, and C.D.Hollowell, "Midway House Tightening Project: A Study of Indoor Air Quality," Lawrence Berkeley Laboratory, Berkeley, CA, Report LBL-12777, 1981.

F.J.Offermann, J.B.Dickinson, W.J.Fisk, D.T.Grimsrud, C.D.Hollowell, D.L.Krinkle, and G.D.Roseme, "Residential Air-Leakage and Indoor Air Quality in Rochester, New York," Lawrence Berkeley Laboratory, Berkeley, CA, Report LBL-13100, 1982.

F.J.Offermann, W.J.Fisk, B.Pedersen, and K.L.Revzan, Residential Air-to-Air Heat Exchangers: A Study of the Ventilation Efficiencies of Wall- or Window- Mounted Units," Lawrence Berkeley Laboratory, Berkeley, CA, Report LBL-14358, 1982.

F.J.Offermann, W.J.Fisk, W.W.Nazaroff, and R.G.Sextro, "A Review of Portable Air Cleaners for Controlling Indoor Concentrations of Particulates and Radon Progeny," An interim report for the Bonneville Power Administration, 1983.

W.J.Fisk, K.M.Archer, R.E.Chant, D.Hekmat, F.J.Offermann, and B.S. Pedersen, "Freezing in Residential Air-to-Air Heat Exchangers: An Experimental Study," Lawrence Berkeley Laboratory, Berkeley, CA, Report LBL-16783, 1983.

R.G.Sextro, W.W.Nazaroff, F.J.Offermann, and K.L.Revzan, "Measurements of Indoor Aerosol Properties and Their Effect on Radon Progeny," Proceedings of the American Association of Aerosol Research Annual Meeting, April, 1983.

F.J.Offermann, R.G.Sextro, W.J.Fisk, W.W. Nazaroff, A.V.Nero, K.L.Revzan, and J.Yater, "Control of Respirable Particles and Radon Progeny with Portable Air Cleaners," Lawrence Berkeley Laboratory, Berkeley, CA, Report LBL-16659, 1984.

W.J.Fisk, R.K.Spencer, D.T.Grimsrud, F.J.Offermann, B.Pedersen, and R.G.Sextro, "Indoor Air Quality Control Techniques: A Critical Review," Lawrence Berkeley Laboratory, Berkeley, CA, Report LBL-16493, 1984.

F.J.Offermann, J.R.Girman, and R.G.Sextro, "Controlling Indoor Air Pollution from Tobacco Smoke: Models and Measurements,", Indoor Air, Proceedings of the 3rd International Conference on Indoor Air Quality and Climate, Vol 1, pp 257-264, Swedish Council for Building Research, Stockholm (1984), Lawrence Berkeley Laboratory, Berkeley, CA, Report LBL-17603, 1984.

R.Otto, J.Girman, F.Offermann, and R.Sextro,"A New Method for the Collection and Comparison of Respirable Particles in the Indoor Environment," Lawrence Berkeley Laboratory, Berkeley, CA, Special Director Fund's Study, 1984.

A.T.Hodgson and F.J.Offermann, "Examination of a Sick Office Building," Lawrence Berkeley Laboratory, Berkeley, CA, an informal field study, 1984.

R.G.Sextro, F.J.Offermann, W.W.Nazaroff, and A.V.Nero, "Effects of Aerosol Concentrations on Radon Progeny," Aerosols, Science, & Technology, and Industrial Applications of Airborne Particles, editors B.Y.H.Liu, D.Y.H.Pui, and H.J.Fissan, p525, Elsevier, 1984.

K.Sexton, S.Hayward, F.Offermann, R.Sextro, and L.Weber, "Characterization of Particulate and Organic Emissions from Major Indoor Sources, Proceedings of the Third International Conference on Indoor Air Quality and Climate, Stockholm, Sweden, August 20-24, 1984.

F.J.Offermann, "Tracer Gas Measurements of Laboratory Fume Entrainment at a Semi-Conductor Manufacturing Plant," an Indoor Environmental Engineering R&D Report, 1986.

F.J.Offermann, "Tracer Gas Measurements of Ventilation Rates in a Large Office Building," an Indoor Environmental Engineering R&D Report, 1986.

F.J.Offermann, "Measurements of Volatile Organic Compounds in a New Large Office Building with Adhesive Fastened Carpeting," an Indoor Environmental Engineering R&D Report, 1986.

F.J.Offermann, "Designing and Operating Healthy Buildings", an Indoor Environmental Engineering R&D Report, 1986.

F.J.Offermann, "Measurements and Mitigation of Indoor Spray-Applicated Pesticides", an Indoor Environmental Engineering R&D Report, 1988.

F.J.Offermann and S. Loiselle, "Measurements and Mitigation of Indoor Mold Contamination in a Residence", an Indoor Environmental Engineering R&D Report, 1989.

F.J.Offermann and S. Loiselle, "Performance Measurements of an Air Cleaning System in a Large Archival Library Storage Facility", an Indoor Environmental Engineering R&D Report, 1989.

F.J. Offermann, J.M. Daisey, L.A. Gundel, and A.T. Hodgson, S. A. Loiselle, "Sampling, Analysis, and Data Validation of Indoor Concentrations of Polycyclic Aromatic Hydrocarbons", Final Report, Contract No. A732-106, California Air Resources Board, March, 1990.

L.A. Gundel, J.M. Daisey, and F.J. Offermann, "A Sampling and Analytical Method for Gas Phase Polycyclic Aromatic Hydrocarbons", Proceedings of the 5th International Conference on Indoor Air Quality and Climate, Indoor Air '90, July 29-August 1990.

A.T. Hodgson, J.M. Daisey, and F.J. Offermann "Development of an Indoor Sampling and Analytical Method for Particulate Polycyclic Aromatic Hydrocarbons", Proceedings of the 5th International Conference on Indoor Air Quality and Climate, Indoor Air '90, July 29-August, 1990.

F.J. Offermann, J.O. Sateri, "Tracer Gas Measurements in Large Multi-Room Buildings", Indoor Air '93, Helsinki, Finland, July 4-8, 1993.

F.J.Offermann, M. T. O'Flaherty, and M. A. Waz "Validation of ASHRAE 129 - Standard Method of Measuring Air Change Effectiveness", Final Report of ASHRAE Research Project 891, December 8, 1997.

S.E. Guffey, F.J. Offermann et. al., "Proceedings of the Workshop on Ventilation Engineering Controls for Environmental Tobacco smoke in the Hospitality Industry", U.S. Department of Labor Occupational Safety and Health Administration and ACGIH, 1998.

F.J. Offermann, R.J. Fiskum, D. Kosar, and D. Mudaari, "A Practical Guide to Ventilation Practices & Systems for Existing Buildings", *Heating/Piping/Air Conditioning Engineering* supplement to April/May 1999 issue.

F.J. Offermann, P. Pasanen, "Workshop 18: Criteria for Cleaning of Air Handling Systems", Healthy Buildings 2000, Espoo, Finland, August 2000.

F.J. Offermann, Session Summaries: Building Investigations, and Design & Construction, Healthy Buildings 2000, Espoo, Finland, August 2000.

F.J. Offermann, "The IAQ Top 10", Engineered Systems, November, 2008.

L. Kincaid and F.J. Offermann, "Unintended Consequences: Formaldehyde Exposures in Green Homes, AIHA Synergist, February, 2010.

F.J. Offermann, " IAQ in Air Tight Homes", ASHRAE Journal, November, 2010.

F.J. Offermann, "The Hazards of E-Cigarettes", ASHRAE Journal, June, 2014.

PRESENTATIONS :

"Low-Infiltration Housing in Rochester, New York: A Study of Air Exchange Rates and Indoor Air Quality," Presented at the International Symposium on Indoor Air Pollution, Health and Energy Conservation, Amherst, MA, October 13-16,1981.

"Ventilation Efficiencies of Wall- or Window-Mounted Residential Air-to-Air Heat Exchangers," Presented at the American Society of Heating, Refrigeration, and Air Conditioning Engineers Summer Meeting, Washington, DC, June, 1983.

"Controlling Indoor Air Pollution from Tobacco Smoke: Models and Measurements," Presented at the Third International Conference on Indoor Air Quality and Climate, Stockholm, Sweden, August 20-24, 1984.

"Indoor Air Pollution: An Emerging Environmental Problem", Presented to the Association of Environmental Professionals, Bar Area/Coastal Region 1, Berkeley, CA, May 29, 1986.

"Ventilation Measurement Techniques," Presented at the Workshop on Sampling and Analytical Techniques, Georgia Institute of Technology, Atlanta, Georgia, September 26, 1986 and September 25, 1987.

"Buildings That Make You Sick: Indoor Air Pollution", Presented to the Sacramento Association of Professional Energy Managers, Sacramento, CA, November 18, 1986.

"Ventilation Effectiveness and Indoor Air Quality", Presented to the American Society of Heating, Refrigeration, and Air Conditioning Engineers Northern Nevada Chapter, Reno, NV, February 18, 1987, Golden Gate Chapter, San Francisco, CA, October 1, 1987, and the San Jose Chapter, San Jose, CA, June 9, 1987.

"Tracer Gas Techniques for Studying Ventilation," Presented at the Indoor Air Quality Symposium, Georgia Tech Research Institute, Atlanta, GA, September 22-24, 1987.

"Indoor Air Quality Control: What Works, What Doesn't," Presented to the Sacramento Association of Professional Energy Managers, Sacramento, CA, November 17, 1987.

"Ventilation Effectiveness and ADPI Measurements of a Forced Air Heating System," Presented at the American Society of Heating, Refrigeration, and Air Conditioning Engineers Winter Meeting, Dallas, Texas, January 31, 1988.

"Indoor Air Quality, Ventilation, and Energy in Commercial Buildings", Presented at the Building Owners &Managers Association of Sacramento, Sacramento, CA, July 21, 1988.

"Controlling Indoor Air Quality: The New ASHRAE Ventilation Standards and How to Evaluate Indoor Air Quality", Presented at a conference "Improving Energy Efficiency and Indoor Air Quality in Commercial Buildings," National Energy Management Institute, Reno, Nevada, November 4, 1988.

"A Study of Diesel Fume Entrainment Into an Office Building," Presented at Indoor Air '89: The Human Equation: Health and Comfort, American Society of Heating, Refrigeration, and Air Conditioning Engineers, San Diego, CA, April 17-20, 1989.

"Indoor Air Quality in Commercial Office Buildings," Presented at the Renewable Energy Technologies Symposium and International Exposition, Santa Clara, CA June 20, 1989.

"Building Ventilation and Indoor Air Quality", Presented to the San Joaquin Chapter of the American Society of Heating, Refrigeration, and Air Conditioning Engineers, September 7, 1989.

"How to Meet New Ventilation Standards: Indoor Air Quality and Energy Efficiency," a workshop presented by the Association of Energy Engineers; Chicago, IL, March 20-21, 1989; Atlanta, GA, May 25-26, 1989; San Francisco, CA, October 19-20, 1989; Orlando, FL, December 11-12, 1989; Houston, TX, January 29-30, 1990; Washington D.C., February 26-27, 1990; Anchorage, Alaska, March 23, 1990; Las Vegas, NV, April 23-24, 1990; Atlantic City, NJ, September 27-28, 1991; Anaheim, CA, November 19-20, 1991; Orlando, FL, February 28 - March 1, 1991; Washington, DC, March 20-21, 1991; Chicago, IL, May 16-17, 1991; Lake Tahoe, NV, August 15-16, 1991; Atlantic City, NJ, November 18-19, 1991; San Jose, CA, March 23-24, 1992.

"Indoor Air Quality," a seminar presented by the Anchorage, Alaska Chapter of the American Society of Heating, Refrigeration, and Air Conditioning Engineers, March 23, 1990.

"Ventilation and Indoor Air Quality", Presented at the 1990 HVAC & Building Systems Congress, Santa, Clara, CA, March 29, 1990.

"Ventilation Standards for Office Buildings", Presented to the South Bay Property Managers Association, Santa Clara, May 9, 1990.

"Indoor Air Quality", Presented at the Responsive Energy Technologies Symposium & International Exposition (RETSIE), Santa Clara, CA, June 20, 1990.

"Indoor Air Quality - Management and Control Strategies", Presented at the Association of Energy Engineers, San Francisco Bay Area Chapter Meeting, Berkeley, CA, September 25, 1990.

"Diagnosing Indoor Air Contaminant and Odor Problems", Presented at the ASHRAE Annual Meeting, New York City, NY, January 23, 1991.

"Diagnosing and Treating the Sick Building Syndrome", Presented at the Energy 2001, Oklahoma, OK, March 19, 1991.

"Diagnosing and Mitigating Indoor Air Quality Problems" a workshop presented by the Association of Energy Engineers, Chicago, IL, October 29-30, 1990; New York, NY, January 24-25, 1991; Anaheim, April 25-26, 1991; Boston, MA, June 10-11, 1991; Atlanta, GA, October 24-25, 1991; Chicago, IL, October 3-4, 1991; Las Vegas, NV, December 16-17, 1991; Anaheim, CA, January 30-31, 1992; Atlanta, GA, March 5-6, 1992; Washington, DC, May 7-8, 1992; Chicago, IL, August 19-20, 1992; Las Vegas,

NV, October 1-2, 1992; New York City, NY, October 26-27, 1992, Las Vegas, NV, March 18-19, 1993; Lake Tahoe, CA, July 14-15, 1994; Las Vegas, NV, April 3-4, 1995; Lake Tahoe, CA, July 11-12, 1996; Miami, Fl, December 9-10, 1996.

"Sick Building Syndrome and the Ventilation Engineer", Presented to the San Jose Engineers Club, May, 21, 1991.

"Duct Cleaning: Who Needs It ? How Is It Done ? What Are The Costs ?" What Are the Risks ?, Moderator of Forum at the ASHRAE Annual Meeting, Indianapolis ID, June 23, 1991.

"Operating Healthy Buildings", Association of Plant Engineers, Oakland, CA, November 14, 1991.

"Duct Cleaning Perspectives", Moderator of Seminar at the ASHRAE Semi-Annual Meeting, Indianapolis, IN, June 24, 1991.

"Duct Cleaning: The Role of the Environmental Hygienist," ASHRAE Annual Meeting, Anaheim, CA, January 29, 1992.

"Emerging IAQ Issues", Fifth National Conference on Indoor Air Pollution, University of Tulsa, Tulsa, OK, April 13-14, 1992.

"International Symposium on Room Air Convection and Ventilation Effectiveness", Member of Scientific Advisory Board, University of Tokyo, July 22-24, 1992.

"Guidelines for Contaminant Control During Construction and Renovation Projects in Office Buildings," Seminar paper at the ASHRAE Annual Meeting, Chicago, IL, January 26, 1993.

"Outside Air Economizers: IAQ Friend or Foe", Moderator of Forum at the ASHRAE Annual Meeting, Chicago, IL, January 26, 1993.

"Orientation to Indoor Air Quality," an EPA two and one half day comprehensive indoor air quality introductory workshop for public officials and building property managers; Sacramento, September 28-30, 1992; San Francisco, February 23-24, 1993; Los Angeles, March 16-18, 1993; Burbank, June 23, 1993; Hawaii, August 24-25, 1993; Las Vegas, August 30, 1993; San Diego, September 13-14, 1993; Phoenix, October 18-19, 1993; Reno, November 14-16, 1995; Fullerton, December 3-4, 1996; Fresno, May 13-14, 1997.

"Building Air Quality: A Guide for Building Owners and Facility Managers," an EPA one half day indoor air quality introductory workshop for building owners and facility managers. Presented throughout Region IX 1993-1995.

"Techniques for Airborne Disease Control", EPRI Healthcare Initiative Symposium; San Francisco, CA; June 7, 1994.

"Diagnosing and Mitigating Indoor Air Quality Problems", CIHC Conference; San Francisco, September 29, 1994.

"Indoor Air Quality: Tools for Schools," an EPA one day air quality management workshop for school officials, teachers, and maintenance personnel; San Francisco, October 18-20, 1994; Cerritos, December 5, 1996; Fresno, February 26, 1997; San Jose, March 27, 1997; Riverside, March 5, 1997; San Diego, March 6, 1997; Fullerton, November 13, 1997; Santa Rosa, February 1998; Cerritos, February 26, 1998; Santa Rosa, March 2, 1998.

ASHRAE 62 Standard "Ventilation for Acceptable IAQ", ASCR Convention; San Francisco, CA, March 16, 1995.

"New Developments in Indoor Air Quality: Protocol for Diagnosing IAQ Problems", AIHA-NC; March 25, 1995.

"Experimental Validation of ASHRAE SPC 129, Standard Method of Measuring Air Change Effectiveness", 16th AIVC Conference, Palm Springs, USA, September 19-22, 1995.

"Diagnostic Protocols for Building IAQ Assessment", American Society of Safety Engineers Seminar: 'Indoor Air Quality – The Next Door'; San Jose Chapter, September 27, 1995; Oakland Chapter, 9, 1997.

"Diagnostic Protocols for Building IAQ Assessment", Local 39; Oakland, CA, October 3, 1995.

"Diagnostic Protocols for Solving IAQ Problems", CSU-PPD Conference; October 24, 1995.

"Demonstrating Compliance with ASHRAE 62-1989 Ventilation Requirements", AIHA; October 25, 1995.

"IAQ Diagnostics: Hands on Assessment of Building Ventilation and Pollutant Transport", EPA Region IX; Phoenix, AZ, March 12, 1996; San Francisco, CA, April 9, 1996; Burbank, CA, April 12, 1996.

"Experimental Validation of ASHRAE 129P: Standard Method of Measuring Air Change Effectiveness", Room Vent '96 / International Symposium on Room Air Convection and Ventilation Effectiveness"; Yokohama, Japan, July 16-19, 1996.

"IAQ Diagnostic Methodologies and RFP Development", CCEHSA 1996 Annual Conference, Humboldt State University, Arcata, CA, August 2, 1996.

"The Practical Side of Indoor Air Quality Assessments", California Industrial Hygiene Conference '96, San Diego, CA, September 2, 1996.

"ASHRAE Standard 62: Improving Indoor Environments", Pacific Gas and Electric Energy Center, San Francisco, CA, October 29, 1996.

"Operating and Maintaining Healthy Buildings", April 3-4, 1996, San Jose, CA; July 30, 1997, Monterey, CA.

"IAQ Primer", Local 39, April 16, 1997; Amdahl Corporation, June 9, 1997; State Compensation Insurance Fund's Safety & Health Services Department, November 21, 1996.

"Tracer Gas Techniques for Measuring Building Air Flow Rates", ASHRAE, Philadelphia, PA, January 26, 1997.

"How to Diagnose and Mitigate Indoor Air Quality Problems"; Women in Waste; March 19, 1997.

"Environmental Engineer: What Is It?", Monte Vista High School Career Day; April 10, 1997.

"Indoor Environment Controls: What's Hot and What's Not", Shaklee Corporation; San Francisco, CA, July 15, 1997.

"Measurement of Ventilation System Performance Parameters in the US EPA BASE Study", Healthy Buildings/IAQ'97, Washington, DC, September 29, 1997.

"Operations and Maintenance for Healthy and Comfortable Indoor Environments", PASMA; October 7, 1997.

"Designing for Healthy and Comfortable Indoor Environments", Construction Specification Institute, Santa Rosa, CA, November 6, 1997.

"Ventilation System Design for Good IAQ", University of Tulsa 10th Annual Conference, San Francisco, CA, February 25, 1998.

"The Building Shell", Tools For Building Green Conference and Trade Show, Alameda County Waste Management Authority and Recycling Board, Oakland, CA, February 28, 1998.

"Identifying Fungal Contamination Problems In Buildings", The City of Oakland Municipal Employees, Oakland, CA, March 26, 1998.

"Managing Indoor Air Quality in Schools: Staying Out of Trouble", CASBO, Sacramento, CA, April 20, 1998.

"Indoor Air Quality", CSOOC Spring Conference, Visalia, CA, April 30, 1998.

"Particulate and Gas Phase Air Filtration", ACGIH/OSHA, Ft. Mitchell, KY, June 1998.

"Building Air Quality Facts and Myths", The City of Oakland / Alameda County Safety Seminar, Oakland, CA, June 12, 1998.

"Building Engineering and Moisture", Building Contamination Workshop, University of California Berkeley, Continuing Education in Engineering and Environmental Management, San Francisco, CA, October 21-22, 1999.

"Identifying and Mitigating Mold Contamination in Buildings", Western Construction Consultants Association, Oakland, CA, March 15, 2000; AIG Construction Defect Seminar, Walnut Creek, CA, May 2, 2001; City of Oakland Public Works Agency, Oakland, CA, July 24, 2001; Executive Council of Homeowners, Alamo, CA, August 3, 2001.

"Using the EPA BASE Study for IAQ Investigation / Communication", Joint Professional Symposium 2000, American Industrial Hygiene Association, Orange County & Southern California Sections, Long Beach, October 19, 2000.

"Ventilation," Indoor Air Quality: Risk Reduction in the 21st Century Symposium, sponsored by the California Environmental Protection Agency/Air Resources Board, Sacramento, CA, May 3-4, 2000.

"Workshop 18: Criteria for Cleaning of Air Handling Systems", Healthy Buildings 2000, Espoo, Finland, August 2000.

"Closing Session Summary: 'Building Investigations' and 'Building Design & Construction', Healthy Buildings 2000, Espoo, Finland, August 2000.

"Managing Building Air Quality and Energy Efficiency, Meeting the Standard of Care", BOMA, MidAtlantic Environmental Hygiene Resource Center, Seattle, WA, May 23rd, 2000; San Antonio, TX, September 26-27, 2000.

"Diagnostics & Mitigation in Sick Buildings: When Good Buildings Go Bad," University of California Berkeley, September 18, 2001.

"Mold Contamination: Recognition and What To Do and Not Do", Redwood Empire Remodelers Association; Santa Rosa, CA, April 16, 2002.

"Investigative Tools of the IAQ Trade", Healthy Indoor Environments 2002; Austin, TX; April 22, 2002.

"Finding Hidden Mold: Case Studies in IAQ Investigations", AIHA Northern California Professionals Symposium; Oakland, CA, May 8, 2002.

"Assessing and Mitigating Fungal Contamination in Buildings", Cal/OSHA Training; Oakland, CA, February 14, 2003 and West Covina, CA, February 20-21, 2003.

"Use of External Containments During Fungal Mitigation", Invited Speaker, ACGIH Mold Remediation Symposium, Orlando, FL, November 3-5, 2003.

Building Operator Certification (BOC), 106-IAQ Training Workshops, Northwest Energy Efficiency Council; Stockton, CA, December 3, 2003; San Francisco, CA, December 9, 2003; Irvine, CA, January 13, 2004; San Diego, January 14, 2004; Irwindale, CA, January 27, 2004; Downey, CA, January 28, 2004; Santa Monica, CA, March 16, 2004; Ontario, CA, March 17, 2004; Ontario, CA, November 9, 2004, San Diego, CA, November 10, 2004; San Francisco, CA, November 17, 2004; San Jose, CA, November 18, 2004; Sacramento, CA, March 15, 2005.

"Mold Remediation: The National QUEST for Uniformity Symposium", Invited Speaker, Orlando, Florida, November 3-5, 2003.

"Mold and Moisture Control", Indoor Air Quality workshop for The Collaborative for High Performance Schools (CHPS), San Francisco, December 11, 2003.

"Advanced Perspectives In Mold Prevention & Control Symposium", Invited Speaker, Las Vegas, Nevada, November 7-9, 2004.

"Building Sciences: Understanding and Controlling Moisture in Buildings", American Industrial Hygiene Association, San Francisco, CA, February 14-16, 2005.

"Indoor Air Quality Diagnostics and Healthy Building Design", University of California Berkeley, Berkeley, CA, March 2, 2005.

"Improving IAQ = Reduced Tenant Complaints", Northern California Facilities Exposition, Santa Clara, CA, September 27, 2007.

"Defining Safe Building Air", Criteria for Safe Air and Water in Buildings, ASHRAE Winter Meeting, Chicago, IL, January 27, 2008.

"Update on USGBC LEED and Air Filtration", Invited Speaker, NAFA 2008 Convention, San Francisco, CA, September 19, 2008.

"Ventilation and Indoor air Quality in New California Homes", National Center of Healthy Housing, October 20, 2008.

"Indoor Air Quality in New Homes", California Energy and Air Quality Conference, October 29, 2008.

"Mechanical Outdoor air Ventilation Systems and IAQ in New Homes", ACI Home Performance Conference, Kansas City, MO, April 29, 2009.

"Ventilation and IAQ in New Homes with and without Mechanical Outdoor Air Systems", Healthy Buildings 2009, Syracuse, CA, September 14, 2009.

"Ten Ways to Improve Your Air Quality", Northern California Facilities Exposition, Santa Clara, CA, September 30, 2009.

"New Developments in Ventilation and Indoor Air Quality in Residential Buildings", Westcon meeting, Alameda, CA, March 17, 2010.

"Intermittent Residential Mechanical Outdoor Air Ventilation Systems and IAQ", ASHRAE SSPC 62.2 Meeting, Austin, TX, April 19, 2010.

"Measured IAQ in Homes", ACI Home Performance Conference, Austin, TX, April 21, 2010.

"Respiration: IEQ and Ventilation", AIHce 2010, How IH Can LEED in Green buildings, Denver, CO, May 23, 2010.

"IAQ Considerations for Net Zero Energy Buildings (NZEB)", Northern California Facilities Exposition, Santa Clara, CA, September 22, 2010.

"Energy Conservation and Health in Buildings", Berkeley High SchoolGreen Career Week, Berkeley, CA, April 12, 2011.

"What Pollutants are Really There ?", ACI Home Performance Conference, San Francisco, CA, March 30, 2011.

"Energy Conservation and Health in Residences Workshop", Indoor Air 2011, Austin, TX, June 6, 2011.

"Assessing IAQ and Improving Health in Residences", US EPA Weatherization Plus Health, September 7, 2011.

"Ventilation: What a Long Strange Trip It's Been", Westcon, May 21, 2014.

"Chemical Emissions from E-Cigarettes: Direct and Indirect Passive Exposures", Indoor Air 2014, Hong Kong, July, 2014.

"Infectious Disease Aerosol Exposures With and Without Surge Control Ventilation System Modifications", Indoor Air 2014, Hong Kong, July, 2014.

"Chemical Emissions from E-Cigarettes", IMF Health and Welfare Fair, Washington, DC, February 18, 2015.

"Chemical Emissions and Health Hazards Associated with E-Cigarettes", Roswell Park Cancer Institute, Buffalo, NY, August 15, 2014.

"Formaldehyde Indoor Concentrations, Material Emission Rates, and the CARB ATCM", Harris Martin's Lumber Liquidators Flooring Litigation Conference, WQ Minneapolis Hotel, May 27, 2015.

"Chemical Emissions from E-Cigarettes: Direct and Indirect Passive Exposure", FDA Public Workshop: Electronic Cigarettes and the Public Health, Hyattsville, MD June 2, 2015.

"Creating Healthy Homes, Schools, and Workplaces", Chautauqua Institution, Athenaeum Hotel, August 24, 2015.

"Diagnosing IAQ Problems and Designing Healthy Buildings", University of California Berkeley, Berkeley, CA, October 6, 2015.

"Diagnosing Ventilation and IAQ Problems in Commercial Buildings", BEST Center Annual Institute, Lawrence Berkeley National Laboratory, January 6, 2016.

"A Review of Studies of Ventilation and Indoor Air Quality in New Homes and Impacts of Environmental Factors on Formaldehyde Emission Rates From Composite Wood Products", AIHce2016, May, 21-26, 2016.

"Admissibility of Scientific Testimony", Science in the Court, Proposition 65 Clearinghouse Annual Conference, Oakland, CA, September 15, 2016.

"Indoor Air Quality and Ventilation", ASHRAE Redwood Empire, Napa, CA, December 1, 2016.

Flores, Kate

From: Acquia Mail
Sent: Tuesday, October 7, 2025 9:10 AM
To: lwestwood@ecorpconsulting.com
Cc: Clerk of the Board
Subject: Request to Speak Web Submission



Thank you for submitting your request to speak. The Clerk of the Board office has received your request and will be prepared to allow you to speak when your item is called. To attend the meeting, please call (669) 900-6833 and use **Meeting ID # 864 4411 6015 . Password is 20251007.** You will be muted until your item is pulled and your name is called. Please dial in at 9:00 am with the phone number you provided in the form so you can be identified during the meeting.

Submitted on October 7, 2025

Submitted values are:

First Name
Lisa

Last Name
Westwood

Address (Street, City and Zip)
ECORP Consulting, Inc., 111 Academy Way, Ste 210, Irvine, CA 92617

Phone
714-648-0630

Email
lwestwood@ecorpconsulting.com

Agenda Date
10/07/2025

Agenda Item # or Public Comment
Arroyo Vista

Comments

23.1

I am not a public commenter, but a technical member of the project proponent's consulting team. If there are questions that they wish me to answer, I need to be able to connect and speak. Otherwise, I am not providing comments on this project.

Riverside County Board of Supervisors
Request to Speak

Submit request to the Clerk of the Board (right of podium), Speakers are entitled to three (3) minutes, subject to Board Rules listed on the reverse side of this form. The Board may limit the public input on any item, based on the number of people requesting to speak and the business of the Board.

SPEAKER'S NAME: Debbie Yocum

Address: 16895 Evening Star Rd

City: Riverside Ca **Zip:** 92506

Phone #: 951 818 5914

Date: 10-8-25 **Agenda #** 23.1

PLEASE STATE YOUR POSITION BELOW:

Position on "Regular" (non-appealed) Agenda Item:

X **Support** _____ **Oppose** _____ **Neutral**

Note: If you are here for an agenda item that is filed for "Appeal", please state separately your position on the appeal below:

_____ **Support** _____ **Oppose** _____ **Neutral**

I give my 3 minutes to: _____

Parking validations available for speakers only – see Clerk of the Board.

(Revised: 04/23/2025)

BOARD RULES

Requests to Address Board on "Agenda" Items:
You may request to be heard on a published agenda item. Requests to be heard must be submitted to the Clerk of the Board before the scheduled meeting time.

Requests to Address Board on items that are "NOT" on the Agenda:
Notwithstanding any other provisions of these rules, member of the public shall have the right to address the Board during the mid-morning "Oral Communications" segment of the published agenda. Said purpose for address must pertain to issues which are under the direct jurisdiction of the Board of Supervisors. YOUR TIME WILL BE LIMITED TO THREE (3) MINUTES. The Board may limit the public input on any item, based on the number of people requesting to speak and the business of the Board.

Power Point Presentations/Printed Material:
Speakers who intend to conduct a formalized Power Point presentation or provide printed material must notify the Clerk of the Board's Office by 12 noon on the Monday preceding the Tuesday Board meeting, ensuring that the Clerk's Office has sufficient copies of all printed materials and at least one (1) copy of the Power Point CD. Copies of printed material given to the Clerk (by Monday noon deadline) will be provided to each Supervisor. If you have the need to use the overhead "Elmo" projector at the Board meeting, please ensure your material is clear and with proper contrast, notifying the Clerk well ahead of the meeting, of your intent to use the Elmo. Speakers are prohibited from bringing signs, placards, or posters into the hearing room.

Individual Speaker Limits:
Individual speakers are limited to a maximum of three (3) minutes. The Board may limit the public input on any item, based on the number of people requesting to speak and the business of the Board. Please step up to the podium when the Chair calls your name and begin speaking immediately. Pull the microphone to your mouth so that the Board, audience, and audio recording system hear you clearly. Once you start speaking, the "green" podium light will light. The "yellow" light will come on when you have one (1) minute remaining. When you have 30 seconds remaining, the "yellow" light will begin flash, indicating you must quickly wrap up your comments. Your time is up when the "red" light flashes. The Chair adheres to a strict three (3) minutes per speaker. ***Note: If you intend to give your time to a "Group/Organized Presentation", please state so clearly at the very bottom of the reverse side of this form.***

Group/Organized Presentations:
Group/organized presentations with more than one (1) speaker will be limited to nine (9) minutes at the Chair's discretion. The organizer of the presentation will automatically receive the first three (3) minutes, with the remaining six (6) minutes relinquished by other speakers, as requested by them on a completed "Request to Speak" form, and clearly indicated at the front bottom of the form.

Addressing the Board & Acknowledgement by Chair:
The Chair will determine what order the speakers will address the Board and will call on all speakers in pairs. The first speaker should immediately step to the podium and begin addressing the Board. The second speaker should take up a position in one of the chamber aisles to quickly step up to the podium after the preceding speaker. This is to afford an efficient and timely Board meeting, giving all attendees the opportunity to make their case. Speakers are prohibited from making personal attacks, and/or using course, crude, profane or vulgar language while speaking to the Board members, staff, the public and/or meeting participants. Such behavior, at the discretion of the Board Chair may result in removal from the Board Chambers by Sheriff Deputies.

Online

Riverside County Board of Supervisors
Request to Speak

Submit request to the Clerk of the Board (right of podium), Speakers are entitled to three (3) minutes, subject to Board Rules listed on the reverse side of this form. The Board may limit the public input on any item, based on the number of people requesting to speak and the business of the Board.

SPEAKER'S NAME: Victoria Yundt

Address: _____

City: _____ **Zip:** _____

Phone #: _____

Date: _____ **Agenda #** 23.1

PLEASE STATE YOUR POSITION BELOW:

Position on "Regular" (non-appealed) Agenda Item:

_____**Support** _____**Oppose** _____**Neutral**

Note: If you are here for an agenda item that is filed for "Appeal", please state separately your position on the appeal below:

_____**Support** _____**Oppose** _____**Neutral**

I give my 3 minutes to: _____

Parking validations available for speakers only – see Clerk of the Board.

(Revised: 04/23/2025)

BOARD RULES

Requests to Address Board on "Agenda" Items:
You may request to be heard on a published agenda item. Requests to be heard must be submitted to the Clerk of the Board before the scheduled meeting time.

Requests to Address Board on items that are "NOT" on the Agenda:
Notwithstanding any other provisions of these rules, member of the public shall have the right to address the Board during the mid-morning "Oral Communications" segment of the published agenda. Said purpose for address must pertain to issues which are under the direct jurisdiction of the Board of Supervisors. YOUR TIME WILL BE LIMITED TO THREE (3) MINUTES. The Board may limit the public input on any item, based on the number of people requesting to speak and the business of the Board.

Power Point Presentations/Printed Material:
Speakers who intend to conduct a formalized Power Point presentation or provide printed material must notify the Clerk of the Board's Office by 12 noon on the Monday preceding the Tuesday Board meeting, ensuring that the Clerk's Office has sufficient copies of all printed materials and at least one (1) copy of the Power Point CD. Copies of printed material given to the Clerk (by Monday noon deadline) will be provided to each Supervisor. If you have the need to use the overhead "Elmo" projector at the Board meeting, please ensure your material is clear and with proper contrast, notifying the Clerk well ahead of the meeting, of your intent to use the Elmo. Speakers are prohibited from bringing signs, placards, or posters into the hearing room.

Individual Speaker Limits:
Individual speakers are limited to a maximum of three (3) minutes. The Board may limit the public input on any item, based on the number of people requesting to speak and the business of the Board. Please step up to the podium when the Chair calls your name and begin speaking immediately. Pull the microphone to your mouth so that the Board, audience, and audio recording system hear you clearly. Once you start speaking, the "green" podium light will light. The "yellow" light will come on when you have one (1) minute remaining. When you have 30 seconds remaining, the "yellow" light will begin flash, indicating you must quickly wrap up your comments. Your time is up when the "red" light flashes. The Chair adheres to a strict three (3) minutes per speaker. ***Note: If you intend to give your time to a "Group/Organized Presentation", please state so clearly at the very bottom of the reverse side of this form.***

Group/Organized Presentations:
Group/organized presentations with more than one (1) speaker will be limited to nine (9) minutes at the Chair's discretion. The organizer of the presentation will automatically receive the first three (3) minutes, with the remaining six (6) minutes relinquished by other speakers, as requested by them on a completed "Request to Speak" form, and clearly indicated at the front bottom of the form.

Addressing the Board & Acknowledgement by Chair:
The Chair will determine what order the speakers will address the Board and will call on all speakers in pairs. The first speaker should immediately step to the podium and begin addressing the Board. The second speaker should take up a position in one of the chamber aisles to quickly step up to the podium after the preceding speaker. This is to afford an efficient and timely Board meeting, giving all attendees the opportunity to make their case. Speakers are prohibited from making personal attacks, and/or using course, crude, profane or vulgar language while speaking to the Board members, staff, the public and/or meeting participants. Such behavior, at the discretion of the Board Chair may result in removal from the Board Chambers by Sheriff Deputies.