CAlifornians for Renewable Energy, Inc. (CARE)
821 Lakeknoll Dr.
Sunnyvale, CA 94089

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821 Lakeknoll Dr.
Sunnyvale, CA 94089
(408) 325-4690

STATE OF CALIFORNIA
Energy Resources Conservation
and Development Commission

In the Matter of:	) Docket No. 99-AFC-3
	) **Dr. Smallwood's Request for**
Application for Certification for the	) **Continuance of the Evidentiary Hearing**
Metcalf Energy Center [Calpine	) **on Biological Resources or in the**
Corporation and Bechtel Enterprises, Inc.]	) **Alternative CARE's Prehearing Brief**

CARE provides the following letter from Dr. Shawn Smallwood requesting a continuance until a later date of the evidentiary hearing on biological resources scheduled for February 15, 2001. In the alternative, CARE resubmits the following submissions from CARE's expert witness Dr. Smallwood. CARE further requests that the administrative record in this case remain open in regards to biological resources until such time as the final USFWS biological opinion is issued and concurred with by EPA Region IX. In order to preserve CARE's meager resources to participate CARE will maintain Dr. Smallwood's services in regards to the USFWS biological opinion.

Michael E. Boyd

President-CARE 2-08-01

CAlifornians for Renewable Energy, Inc. (CARE)
821 Lakeknoll Dr.
Sunnyvale, CA 94089

Due to a previous commitment, I will not be available for the Metcalf Energy Center (MEC) Biological Resources Evidentiary Hearing scheduled for February 15, 2001. For this reason and for the reasons discussed below, I hereby request a continuance on these Hearings. Please change the date so that I can attend the Hearing, and please provide me sufficient advance notice so that I can schedule the Hearing into my work plans.

Acting on behalf of my client, Californians for Renewable Energy, I have submitted several reports to the California Energy Commission (CEC), and these reports are now part of the administrative record for the MEC. Many of the substantial issues I have raised have not yet been addressed by the CEC. For example, monitoring and adaptive management plans have yet to be described. The process of document release is inconsistent with CEQA by piecemealing the analyses and disabling many of the public from participating (i.e., it is too costly and too confusing). The proposed mitigation measures are grossly inadequate to offset the impacts, which have yet to be honestly and thoroughly assessed. For these reasons, in addition to my inability to attend the February 15 meeting, I request a continuance of the Evidentiary Hearing on Biological Resources.

Furthermore, the US Fish and Wildlife Service has yet to release its Biological Opinion. What is the point of having an Evidentiary Hearing in advance of this most critical step? The Biological Opinion could render the Evidentiary Hearing moot, which would prove to be a waste of time and money on the parts of my client as well as the taxpayer-funded CEC. For this reason, as well as those already presented, I hereby request a continuance of the MEC Biological Resources Evidentiary Hearing to a later date.

Sincerely,

Shawn Smallwood, Ph.D.

CAlifornians for Renewable Energy, Inc. (CARE)
821 Lakeknoll Dr.
Sunnyvale, CA 94089

Comments on the California Energy Commission's Final Staff Assessment of the MEC

K. Shawn Smallwood, Ph.D.

I have reviewed the California Energy Commission's (CEC) Final Staff Assessment (FSA) of the Application for Certification 99-AFC-3, Metcalf Energy Center. My comments on the CEC's Preliminary Staff Assessment (PSA) were ignored in the FSA, and all but one of my comments to the US Fish and Wildlife Service (USFWS) on July 18 were ignored in the FSA. Not only were my recommended changes and comments not addressed, but my comments were given no responses in the Response to Public and Agency Comments section, and my comment letter was not cited and did not appear in the References section of the FSA. I have never before been so utterly ignored when I have commented on proposed projects requiring federal or state permits.

The FSA was prepared without the benefit of the biological resources mitigation implementation and monitoring plan (BRMIMP). The BRMIMP did not appear in the References section. The FSA presents a protocol for the final BRMIMP, which needs to be turned into the CEC at least 45 days prior to groundbreaking activities (pages 499-500). The CEC clearly intends to bypass public input on the mitigation and monitoring plan, and has rendered conclusions about the adequacy of the mitigation and monitoring without even having considered the BRMIMP. It appears that the CEC has already decided to certify the MEC regardless of what mitigation and monitoring is proposed by Calpine/Bechtel, and in the absence of legitimate public participation. A well-prepared, effective mitigation and monitoring plan is critical to CEQA's foremost principle of maximizing environmental protection while avoiding or minimizing environmental harm. The FSA foregoes this principle.

Minimization of impacts

In my comments on the PSA, I pointed out that the CEC staff minimized the likely impacts of the MEC. The minimization of the potential significance of impacts on irreplaceable biological resources, whether intentional, accidental, or due to institutional bias, violates CEQA's foremost principle. The FSA continues to minimize the impacts of the MEC, but as I will demonstrate below, the FSA more flagrantly minimizes environmental impacts than did the PSA. The conclusions in the FSA are based on red herrings, false causes, and other logical fallacies that were not used in the PSA.

For example, the FSA introduces a new false cause to minimize impacts on California Red-legged Frogs. According to the FSA (page 473), "The site supports elderberry savanna that *may be* considered *potential* upland habitat for red-legged frogs" (italics added for emphasis). Staff then suggests that the potential habitat value is reduced due to overgrazing, litter, and penned roosters (page 473). Staff does not explain why penned roosters and litter would reduce habitat suitability. Overgrazing favors California ground squirrels, which excavate the burrows that are used as refugia by California Red-legged Frogs and California Tiger Salamanders. To minimize impacts on California Red-legged Frogs, the PSA claimed that dogs at the proposed MEC site chase off ground squirrels (the dogs there are either penned or chained up), and now the FSA

switches to penned roosters, litter and grazing goats as factors that somehow discourage California Red-legged Frogs.

In another example, Coyote Creek is described in the FSA as a migration corridor for neotropical bird species (page 472), then later "the MEC site is not known to be an optimal flight path" (page 481). A migration corridor need not be an "optimal flight path," which appears as a red herring used to minimize the significance of the narrow northern end of the Santa Clara Valley to neotropical migrants. The MEC would occur at a choke point for neotropical migrants, as the low elevation plain of the San Francisco Bay Area severely narrows between Tulare Hill and Coyote Ridge, as does the Santa Clara Valley from the south. Neotropical migrants are funneled into this narrow strip of lower elevation terrain. Therefore, staff minimizes impacts to neotropical migrants when they say, "collisions would be rare" with the 240-foot long electric transmission lines and "unlikely or minimal" with the 145-foot tall HRSG stacks (page 481). If staff are correct to conclude that migrating song birds rarely fly at low heights, usually only during poor weather conditions (page 481), then staff should be concerned about mass fatalities due to collision with MEC's tall structures during poor weather conditions, which are fairly common during migrations of neotropical birds. Furthermore, focusing only on neotropical migrants minimizes the impacts of these structures on other avian species (see my comment on the PSA, Photo 11), some of which were discussed in the PSA but not discussed in the FSA. These latter species were expected to increase their flights to the MEC project site due to Calpine/Bechtel's proposed expansion of the riparian forest on Fisher Creek (see the PSA).

Under direct impacts (page 481), the FSA lists *potential* bird collisions with 240-foot transmission line and 145-foot tall HRSG stacks (italics added for emphasis). As I pointed out in my PSA comment (photo 11), at least one collision already occurred with existing transmission lines on Tulare Hill. There will be collisions with the additional tall structures. This direct impact is not just potential; it is real. It is a minimization of impacts to label collisions as potential.

In another example, the CEC staff concludes that Coyote Ridge and Kirby Canyon are core areas supporting high enough numbers to sustain the Bay Checkerspot Butterfly population (page 485), implying that this species will do just fine without its host plants on Tulare Hill. This conclusion minimizes impacts to Tulare Hill, lacks foundation, and contradicts the earlier conclusion that Tulare Hill's serpentine-based grassland "serves as a stepping stone connection between the serpentine habitats of the Santa Cruz Mountains and Diablo Range" (page 471). Staff's conclusion that core areas are enough to sustain the Bay Checkerspot Butterfly ignores my comment on the PSA, in which I described the importance of metapopulation dynamics and habitat fragmentation. Staff's focus on only the Bay Checkerspot Butterfly in this case, and ignoring impacts to several other endangered species occurring on Tulare Hill, further minimizes impacts caused by NOx pollution. The Santa Clara Valley Dudleya occurs only in the immediate vicinity of the Santa Clara Valley. If Santa Clara County's remaining serpentine-based grassland has really been reduced to 4,537 acres (page 485), then the MEC's impacts on Tulare Hill alone would take more than 7.5% of the remaining habitat of the Santa Clara Valley Dudleya. Considering cumulative impacts, including current ambient NOx levels and the additional NOx due to the Coyote Valley Research Park, the Santa Clara Valley Dudleya is in jeopardy of being driven to extinction.

The CEC staff relies on yet another impact analysis performed by Calpine/Bechtel (I have lost track of how many have been done, and which one I am supposed to rely upon), and based on using "worst-case results" (page 485). However, the worst-case results were not used. In the very same paragraph, staff admits that Calpine/Bechtel assumed an ambient NOx level of 12.5 kg/ha/yr, which is 10 kg/ha/yr less than Weiss (1999) estimated as an upper confidence limit. A worst-case result would have assumed 22.5 kg/ha/yr, which is more than twice the upper range of the NOx loading needed to cause adverse ecosystem effects. Next, staff says that Calpine/Bechtel provided a revised calculation of nitrogen deposition, which included a revised background annual NOx loading, reducing it from 12.5 to 8.4 kg/ha/yr (page 486). Staff accepts Calpine/Bechtel's dramatically reduced estimates of impacts, but this continued reduction in assumed ambient NOx loading is contrary to using worst-case results, as would be expected using the Precautionary Principle in risk assessment (O'Brien 2000), as well as CEQA's foremost principle. Using worst-case results, or even more realistic results based on the estimated NOx loading in Weiss (1999), which was peer-reviewed and published, the estimated cumulative values of NOx loading would have more than *approached* or *exceeded* the high range of NOx loading considered sufficient to affect ecosystem structure and diversity – they would have *greatly exceeded* this high range. Considering the NOx loads to be added by the Coyote Valley Research Park, which as been approved by the City of San Jose, the worst-case and best-case cumulative NOx values likely would have been unacceptable to the EPA and USFWS. Staff and Calpine/Bechtel have together minimized the impacts caused by MEC-borne NOx pollution.

The CEC staff claims that nitrogen will be effectively removed by the 16-100 feet of riparian forest that is transitional between the upland and wetland areas (page 486). However, this constructed forest will occur immediately adjacent to the MEC. I expect that the effluent from the 145-foot tall HRSG stacks will travel right over the tops of this constructed forest, which will have little opportunity to remove nitrogen from the NOx load. Staff minimizes impacts with this conclusion.

The CEC staff considered only one of my concerns expressed in my letter to the USFWS on July 18, 2000. Staff concludes that this concern of mine is unwarranted because the salt pollution levels from the HRSG stacks will increase salinity concentrations in Coyote Creek far below the levels needed to kill California Red-legged Frog eggs or larvae (pages 486-487). The level needed to kill eggs is 4.5 parts per thousand (USFWS 2000), but staff conservatively estimates that the level will be 4.446 parts per million (no uncertainty range was specified). However, staff offers no details of the methods used to come to this point estimate, nor do they consider existing salt concentrations or those that might be added by the Coyote Valley Research Park. Until a convincing risk assessment is provided, my concern remains that the MEC will contribute enough salt to the Santa Clara Valley watershed to kill California Red-legged Frog eggs or larvae, which would extend the spatial area of extirpation of this threatened species from the region.

The CEC staff concluded that Fisher Creek will dry up for extended periods of time due to the cumulative water needs of both the MEC and Coyote Valley Research Park, but they deem this impact as insignificant because Fisher Creek supports no special status species (page 488). This

conclusion is wrong for several reasons. First, Mt. Hamilton Thistle (SC [1]; California Native Plant Society 1B) occurs along Fisher Creek (FSA Table 1). Second, staff acknowledges Fisher Creek as potential dispersal habitat for California Red-legged Frog (FT) and California Tiger Salamander (C) (page 472; Table 1). California Red-legged Frogs were observed in Fisher Creek historically (Table 1, page 478), and CH2MHILL (2000) conservatively assumes these species to be present in Fisher Creek. Third, I have observed Great Blue Herons (CSC) using Fisher Creek. Fourth, staff acknowledges Fisher Creek as potential habitat for Tricolored Blackbird (CSC), Western Pond Turtle (CSC), and San Francisco Dusky-footed Woodrat (SC, CSC) (Table 1). Fifth, staff concluded (Table 1) that Coyote Creek is potential habitat for Fringed Myotis (SC), Greater Western Mastiff Bat (SC, CSC), Long-eared Myotis (SC), Long-legged Myotis (SC), Pacific Western Big-eared Bat (SC, CSC), Small-footed Myotis (SC), Yuma Myotis (SC), Riparian Brush Rabbit (FE, SE), and White-tailed Kite (SC, FP), but for unspecified reasons did not make the obvious conclusion that Fisher Creek also serves as potential habitat for these species, especially after Calpine/Bechtel expands the riparian forest as a mitigation strategy. Expanding the riparian forest of Fisher Creek, only to starve it of water, seems counter-productive and may transform the Fisher Creek mitigation into an ecological sink for multiple special status species. Staff are also wrong to base their significance determination only on projected impacts on special status species. Other species live in and along Fisher Creek, including Arboreal Salamander, Western Skink, Tree Swallow, Common Merganser, Mallard, and many others. To conclude that the extended dry-down of Fisher Creek will have insignificant environmental impacts, the CEC staff claimed there are *no* special status species in Fisher Creek, when there could be as many as 16 special status species, including 2 threatened and endangered species, and many others relying upon Fisher Creek.

Although California Red-legged Frogs, California Tiger Salamanders, and Western Pond Turtles were considered present despite not being seen at the MEC site (Table 1), Coast Horned Lizards (SC) were given no such benefit of conservatism. Coast Horned Lizards occur on Coyote Ridge (Fig. 2a of BRMIMP) and the prey base certainly occurs on Tulare Hill (see my comment on the PSA, Photo 2). Calpine/Bechtel also admits that Coast Horned Lizards may be present on Tulare Hill (Set 7, Attachment BR 1: 3, responses to comments on the PSA). Considering this species as absent on Tulare Hill minimizes impacts. Additionally, the FSA claims that no suitable habitat of the Foothill Yellow-legged Frog occurs in the project area (Table 1), but I found this species only 5 km away in Cherry Creek (adjacent to Calero Reservoir) and I doubt that Coyote Creek is devoid of Foothill Yellow-legged Frog habitat. I doubt that Foothill Yellow-legged Frog habitat is absent from the zone of NOx pollution from the MEC. Even CH2MHILL (1999) considers Fisher Creek to be potential Foothill Yellow-legged Frog habitat.

Formulation of mitigation and monitoring plans deferred to later date

According to the FSA, the mitigation and monitoring plan (BRMIMP) will be submitted by Calpine/Bechtel at least 45 days prior to ground-breaking for the MEC. The preliminary BRMIMP states "It is anticipated that this draft Management Plan will be modified during CEC Workshops and further discussions with the USFWS, California Department of Fish and Game,

[1] Special status codes used in this comment include the following: FE = federal Endangered; FT = federal Threatened; SC = federal species of concern; C = federal candidate species for listing; SE = California Endangered; ST = California Threatened; CSC = California species of special concern; FP = California fully protected.

Stanford University Center for Conservation Biology, and local cattle ranchers …" (CH2MHILL 2000: G-11). To be consistent with CEQA, the BRMIMP should have presented a complete formulation of the mitigation and monitoring plan, and it should have done so in a single document that includes all the other analyses and issues typically presented in an EIR. Under CEQA, the applicant is not supposed to defer the formulation of the mitigation and monitoring plans to a later date, because the public has a right to comment on these plans before they are finalized and certified by the lead agency. In the FSA, the CEC staff exacerbates Calpine/Bechtel's violation of CEQA by allowing the applicant to defer the formulation of the mitigation and monitoring plan to a later date – long after the FSA and staff conclusions and recommendations.

In another ironic twist caused by this deferring the formulation of the mitigation and monitoring plan to a later date, the FSA claims that Calpine/Bechtel (CH2MHILL 2000) will conduct an avian collision monitoring program under the electrical transmission lines and HRSG stacks, but the BRMIMP (page F-2) claims that the number of birds allowed to be killed by the electric transmission line and HRSG stacks (i.e., significance criteria) will be determined by the California Energy Commission CPM. The CEC was expecting the applicant to describe a monitoring program in the BRMIMP, but the applicant says the CEC will design the monitoring program. Who is really going to design this monitoring program? When? And, how is the public going to have any chance to participate with designing this program?

Mitigation

NOx pollution

The CEC staff present a red herring when relating Stuart Weiss's testimony at the CEC workshop on biological resources (page 491). According to staff, Weiss stated that management of Tulare Hill alone would not secure the Bay Checkerspot Butterfly population. Nobody has proposed that Tulare Hill be managed alone. My concern, based partly on Weiss (1999), is that the serpentine-based grassland on Tulare Hill is critical for the continued existence of Bay Checkerspot Butterfly, along with the other remaining serpentine-based grasslands in the area. The CEC's red herring argument is used to rationalize a compensatory mitigation consisting of a 30-year endowment fund to manage and administer the 116 acres of Tulare Hill purchased by Calpine/Bechtel. In essence, this red herring argument rationalizes non-mitigation for the impacts on the Bay Checkerspot Butterfly because the endowment fund changes nothing in terms of NOx pollution of the environment. This argument also fails to consider the several other threatened and endangered species that live on Tulare Hill.

Staff claimed that Calpine/Bechtel will provide an adaptive management strategy for cattle grazing on Tulare Hill (page 491). However, **the BRMIMP described no adaptive management strategy**. Furthermore, I cannot see how Calpine/Bechtel could possibly implement an adaptive management strategy for cattle grazing when Calpine/Bechtel will have no control over stocking rates because they will not fence out cattle from neighboring landholders. I cannot believe staff's claim that Calpine/Bechtel will implement an adaptive management strategy.

Staff used an inappropriate formulation of compensatory mitigation requirements due to MEC-caused NOx pollution. Staff developed weightings to be multiplied against areas of impact in order to calculate the areas needed to be "conserved" (page 491). These weightings are based on the percentage increase in ambient NOx loads due to MEC pollution levels, as if Calpine/Bechtel should be held accountable only for their share of the cumulative NOx load rather than the actual environmental damage that their added NOx pollution will cause. MEC contributions of NOx loading renders the cumulative NOx loading as significant in terms of adverse effects on the ecosystem. The MEC's activities will add sufficient nitrogen to adversely affect at least 2,667 acres of serpentine-based grasslands, which support multiple threatened and endangered species. The appropriate mitigation, as I pointed out I my comment on the PSA, is to compensate for the take of the habitats within the outer contour of projected NOx deposition. Just focusing on serpentine-based grasslands, rather than the entire area of NOx deposition, 2,667 acres of out-of-area serpentine-based grassland would need to be protected using a 1:1 mitigation ratio. This more appropriate compensatory mitigation would still fail to prevent the severe take of Santa Clara Valley Dudleya, which only occurs in the vicinity of the Santa Clara Valley, and would experience a ≥84% loss of remaining habitat area. (A compensatory mitigation ratio of 7:1 would be even more appropriate, as I will discuss below.)

Because staff believes Tulare Hill is only marginal butterfly habitat, they reduced the compensatory mitigation ratio to 0.5:1. However, Tulare Hill "serves as a stepping stone connection between the serpentine habitats of the Santa Cruz Mountains and Diablo Range" (page 471), which was also recognized in the BRMIMP (page 1-2) and the recovery plan for serpentine grasslands (USFWS 1998). It is inappropriate to minimize impacts to the Bay Checkerspot Butterfly by concluding that the habitat on Tulare Hill is marginal. Making this conclusion is analogous to claiming that the hallway of your house provides only marginal living quarters, and so is a good place to stack your garbage. Such a conclusion ignores the context of the hallway in your house. Even though you probably spend little time in the hallway, it connects the important rooms of your house, making it one of the most functionally important aspects of your house. It is not the place to toss your garbage!

Furthermore, the reduced mitigation ratio was rationalized by the CEC's perception of the quality of Tulare Hill's habitat for the Bay Checkerspot Butterfly. The CEC's rationalization completely ignored the importance of Tulare Hill for sustaining several endangered species, as well as multiple other special status species. Tulare Hill supports >7.5% of the remaining habitat area of Santa Clara Valley Dudleya. It is identified as a priority protection site for Opler's Longhorn Moth (USFWS 1998). It either is known or suspected to support the Metcalf Canyon Jewelflower, Most Beautiful Jewelflower, Smooth Lessingia, Tiburon Indian Paintbrush, Mt. Hamilton Thistle, Edgewood Blind Harvestman, Coast Horned Lizard (see my comment on the PSA), California Red-legged Frog (FSA page 481), California Tiger Salamander (FSA page 481), American Peregrine Falcon, Ferruginous Hawk, White-tailed Kite, Western Burrowing Owl, and Golden Eagle. In how many locations in California can we find 17 special status species, 6 of which are state or federally listed as threatened or endangered? **Tulare Hill helps sustain one of the most impressive lists of special status species occurring at any site in the USA.** Losing the health and integrity of Tulare Hill's serpentine-based grassland cannot be functionally mitigated. Rather than the 0.5:1 ratio that the CEC seems to be satisfactory, a compensatory mitigation ratio should be more in the neighborhood of 7:1, which is composed of,

for every acre taken, one acre conserved for each of the threatened and endangered species, and another one for the other 11 special status species. Using this more appropriate compensatory mitigation approach, 18, 669 acres of serpentine-based grassland would need to be protected, which is a much greater area than all of the serpentine-based grassland remaining in Santa Clara County.

According to the FSA (page 481), providing compensation habitat on Tulare Hill and Coyote Ridge would mitigate any loss of potential upland habit for the California Red-legged Frog. The BRMIMP linked the 116 acres on Tulare Hill and the 15 acres on Coyote Ridge to impacts caused by NOx deposition. Thus, it appears that these areas on Tulare Hill and Coyote Ridge are compensatory mitigation for both California Red-legged Frog habitat loss *and* NOx deposition on Tulare Hill. It appears that these two mitigation sites are going to pull double duty, and as I pointed out in the last paragraph, it appears these two sites are intended to mitigate for the take of up to 17 special status species. However, the compensation formula on page 491 of the FSA does not address impacts to California Red-legged Frogs, but only Bay Checkerspot Butterfly, and the mitigation sites themselves are vulnerable to NOx deposition and other forms of pollution from the MEC.

Lighting and noise

I disagree that low-pressure sodium illumination and shielding "will reduce *any* adverse impacts to nocturnal wildlife (page 483; italics added for emphasis). The evidence is overwhelming that impacts are likely (see my comment on the PSA). I also disagree with the CEC's decision that no mitigation is required for noise (page 484). The CEC staff used selective referencing (i.e. Bowles 1995) to conclude that noise from MEC operations will not adversely affect hearing or other physiological functions of wildlife.

Staff Recommendations

Staff concluded that the mitigation proposed by Calpine/Bechtel for direct impacts are sufficient to reduce these impacts to less than significant levels. However, few of Calpine/Bechtel's mitigation strategies involve avoidance. For example, Calpine/Bechtel proposes to mark electric transmission lines if they cause a bird collision problem (described in the BRMIMP, but not the FSA). Birds should have the opportunity to recognize the transmission lines before they run into them and die, not after. In one example of new, but flawed mitigation, Calpine/Bechtel proposes to conduct preconstruction surveys for California Red-legged Frog, California Tiger Salamander, and Western Pond Turtle, then translocate them out of the project zone. Calpine/Bechtel does not offer to move these animals beyond the deposition zone of NOx and other pollutants; they are not avoiding or minimizing environmental impacts to the maximum extent feasible.

In responding to public and agency comments on the PSA, staff says it believes that the compensatory mitigation they require will reduce the impacts to serpentine soils from nitrogen deposition to less than significant levels. In the Conclusions and Recommendations section, staff concludes that the proposed compensation package will *fully mitigate* indirect and cumulative impacts caused by the MEC to serpentine-based grasslands and all of their associated special status species. However, the compensatory mitigation described in the Mitigation section falls

far short of providing roughly proportional mitigation for the adverse impacts to serpentine-based grasslands due to NOx pollution from the MEC. The compensatory mitigation sites occur within the NOx pollution zone, and the measly 131 acres of serpentine-based grassland at these sites will be just as degraded by the NOx pollution as the several thousand acres of surrounding serpentine-based grassland. Staff's conclusions regarding the adequacy of the compensatory mitigation package is a startling reversal of the conclusions reached in the PSA, because the compensatory mitigation package has not changed one little bit between the releases of the PSA and the FSA. In fact, by the time the FSA was released, Calpine/Bechtel had dropped mitigation measures that were proposed earlier, resulting in a net loss of compensatory mitigation. The only revelation from the FSA is that staff has disregarded public input on the MEC and has relied solely on the input from Calpine/Bechtel as they developed a rationalization for changing their conclusions and recommendations regarding the MEC.

Summary

Most of the issues I raised in my earlier comment letters remain unresolved. The FSA did not address the threats to the California Red-legged Frog posed by SOx, boron, chloride, formaldehyde, acetaldehyde, acrolein, $PM_{2.5}$, ozone, and ammonia, all of which are projected to be released into the environment via the MEC HRSG stacks. In my letter to the USFWS, I asked that these recognized threats to the California Red-legged Frog (USFWS 2000) be considered, along with the multiple Superfund and other hazardous waste sites occurring in the vicinity of the proposed MEC. Almost all of the issues I raised in my PSA comment letter were not addressed in any manner. The applicant's intended meaning of adaptive management has yet to be described, but the CEC staff continue to claim that Calpine/Bechtel will implement adaptive management strategies.

As I indicated in my earlier comment letters, I have many other issues that I would like to raise. However, this piece-meal release of environmental documents, which is nothing like the release of an EIR pursuant to CEQA, has strained the resources of my client and the amount of time that I can devote to this project. I am responding to the FSA in only a cursory manner. Much more work needs to be done to assess the impacts of the MEC, as well as the adequacy of the mitigation and monitoring. Much more work needs to be done to assess the environmental impacts of the alternative sites, as well. However, given the large number of special status species occurring on Tulare Hill and the Santa Clara Valley watershed, I cannot imagine that the impacts would be nearly as great at some of the alternative sites.

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29 October, 2000

Shawn Smallwood, Ph.D. Date

CAlifornians for Renewable Energy, Inc. (CARE)
821 Lakeknoll Dr.
Sunnyvale, CA 94089

Comments on the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP)

K. Shawn Smallwood, Ph.D.

At a Metcalf Energy Center (MEC) Public Workshop on June 22, 2000, I raised concerns about inadequate mitigation and monitoring for biological impacts caused by the proposed MEC. I was assured that my concerns would be addressed in a biological resources mitigation implementation and monitoring plan (BRMIMP) due to be released by July 31, 2000. This release date likely would have given me the opportunity to respond to the plan with any lingering concerns prior to the California Energy Commission's (CEC) release of the Final Staff Assessment (FSA). In my July 18 letter to the US Fish and Wildlife Service (USFWS), I again expressed my concern about the scheduled release of the FSA and the Service's Biological Opinion, which appeared imminent in spite of the BRMIMP not having been released. The FSA was posted on the CEC's web site on October 10th, only 14 days after the BRMIMP was finally released on September 27th, 2000. As I earlier had feared would happen, I had no opportunity to review and comment on the BRMIMP before the CEC released its FSA.

I have to assume that one of the following scenarios took place: (1) The CEC had access to the BRMIMP before it was released to the public; (2) It quickly reviewed and analyzed the BRMIMP during the time 14 days between when it was released and when the CEC issued its FSA; or (3) The CEC prepared the FSA without having considered the BRMIMP. I have to assume the third scenario was most likely because Linda Spiegel made no reference to a completed BRMIMP in her FSA contribution, and the BRMIMP did not appear in her list of referenced documents. However the CEC considered the BRMIMP, public participation with formulating the mitigation and monitoring plan has been stifled by the late release date of the BRMIMP by Calpine/Bechtel and the subsequently quick release of the FSA by the CEC.

I hereby request a public workshop focused on the BRMIMP. The mitigation and monitoring plan is one of the critical features of a proposed project like the MEC, in addition to the alternatives analysis and the assessment of impacts. A well-prepared, effective mitigation and monitoring plan is critical to CEQA's foremost principle of maximizing environmental protection while avoiding or minimizing environmental harm. This BRMIMP is so ill prepared and so unlikely to be effective that a public workshop on it is warranted.

Minimization of impacts

In my comments on the Preliminary Staff Assessment (PSA), I pointed out that Calpine/Bechtel minimized the likely impacts of the MEC, and this minimization of impacts pervaded their environmental documents. The minimization of the potential significance of impacts on irreplaceable biological resources, whether intentional, accidental, or due to institutional bias, violates CEQA's foremost principle, which makes it impossible to perform an adequate, meaningful review, which makes it impossible to avoid or mitigate the impacts on biological (and other environmental) resources. Also, providing inaccurate or incomplete data in an effort

to minimize project impacts is not only contrary to the scientific method but is misleading to the public. The BRMIMP continued to minimize the impacts of the MEC, as I will demonstrate below.

For example, the BRMIMP claimed that none of the emissions of NOx, SOx, and PM_{10} are at levels that produce direct adverse effects on the physical aspects or physiological function of vegetation or soils in the area. In other words, Calpine/Bechtel is claiming the impacts will be *de minimus*, consistent with Calpine/Bechtel's claim that the MEC could be moved 10-15 miles north without changing the NOx pollution levels on the ridges surrounding the Coyote Valley (comments on the PSA, Set 3, page 13). This minimization of impacts contradicts the evidence (Weiss 1999), statements made elsewhere in the BRMIMP (e.g., the last sentence of the very same paragraph on page 9 of App. G, the fist sentence of page 11, and on page 6), and made previously by Calpine/Bechtel (e.g., CH2MHILL 2000a: 4-2). The fact that the South Bay Area already exceeds federal air quality standards, coupled with Calpine/Bechtel's projected nitrogen pollution of 70% of Santa Clara County's remaining serpentine-based grassland (CH2MHILL 2000b), forces the conclusion that any additional emissions of these pollutants would exacerbate an already intolerable situation. Therefore, under CEQA not only must these potential impacts be deemed significant, but also they must be carefully analyzed with regard to mitigation. Whereas Calpine/Bechtel has estimated the amounts and deposition rates of NOx due to the MEC, it has made no estimate of the effects on serpentine-based grasslands. Changes in species composition in these grasslands can and should be estimated. As I pointed out in my comment on the PSA, the responses of serpentine-based grasslands to NOx loads are known (Weiss 1999), and the methods are available to estimate impacts within the entire zone of MEC-caused NOx pollution (Zhang et al. 1998).

On page 4-14, the BRMIMP minimized the impacts of NOx on Coyote Ridge by claiming that "an extremely small increase in nitrogen deposition from MEC may occur there." As Linda Speigel pointed out in her contribution to the PSA, 10% of the floral species in California occur on serpentine soils, which compose 1% of California's geological base. Multiple endangered and special status species occur on these soils, the plant communities of which are highly sensitive to nitrogen pollution (USFWS 1998, Weiss 1999). The proposed MEC is unique in that it is the only proposed or existing power plant, to my knowledge, that (1) threatens a serpentine-based grassland that also serves to connect larger tracts of serpentine-based grasslands, and (2) composes a substantial portion of the last remaining habitat of Santa Clara Valley Dudleya, Bay Checkerspot Butterfly, and Opler's Longhorn Moth (see my comment on the PSA). Calpine/Bechtel may deem the level of nitrogen pollution on Coyote Ridge as "extremely small," but any amount adds to the other sources of nitrogen pollution from the region, such as from the Coyote Valley Research Park, which was just approved by the San Jose City Council. The cumulative impacts at this unique site are unmitigable, especially considering the fact that Calpine-Bechtel proposes to mitigate for impacts by "protecting" serpentine soils on the very same Coyote Ridge that will be polluted by NOx from the MEC.

The BRMIMP stated that the Santa Clara Valley Dudleya is susceptible to habitat disturbance from development and overgrazing (page 4-10). Although previous documents prepared by Calpine/Bechtel acknowledged NOx pollution as a threat to Santa Clara Valley Dudleya (CH2MHILL 2000a), as was supported by scientific research (Weiss 1999), NOx pollution was

not identified as a threat to Dudleya on page 4-10 of the BRMIMP. Turning the page to 4-11 reveals the dislocated acknowledgement that NOx deposition fertilizes serpentine soils and encourages exotic plants to the detriment of the native plants (reference to Santa Clara Valley Dudleya was conspicuously missing from this section, however). On page 4-13, the BRMIMP stated that increased nitrate availability "*could potentially* impact the native serpentine vegetation community on Tulare Hill" (italics added for emphasis). On page 4-14, the BRMIMP listed multiple measures "for *potential* serpentine habitat losses" (italics added for emphasis) due to atmospheric nitrogen pollution from MEC. Given the evidence of NOx effects on serpentine-based grasslands, it would be more accurate to state that the increased NOx pollution *will* degrade the native serpentine plant community. In risk assessments, statements of uncertainty, which are expected in many types of scientific conclusions involving real hypothesis-testing, are supposed to be conservative in their application to environmental impacts, consistent with the Precautionary Principle (O'Brien 2000). Calpine/Bechtel violated this principle in what appears to be an effort to minimize the impacts of MEC. Also on page 4-13, the BRMIMP stated that the amounts of NOx and ammonia added to the Santa Clara Valley Air Basin from the MEC project are "insignificant by air quality standards." This additional violation of the Precautionary Principle again minimizes the impacts of the MEC on serpentine-based grasslands of Tulare Hill and Coyote Ridge.

Calpine/Bechtel recognizes Tulare Hill as "an important 'stepping stone' connector between the serpentine habitats of the Santa Cruz Mountains to the west and the Diablo Range to the east" (page 1-2). It is considered in the BRMIMP as a "stepping stone" for Bay Checkerspot Butterfly between the Santa Teresa Hills and the much superior Coyote Ridge (page 4-11). However, Tulare Hill is more than a stepping-stone – it is one of the last remaining habitat areas of Bay Checkerspot Butterfly, Opler's Longhorn Moth, and Santa Clara Valley Dudleya. It is one of the last remnants of serpentine-based grassland in the region. Its loss or degradation caused by NOx-induced proliferation of exotic weeds cannot be replaced or mitigated. At this point in time, due to the cumulative actions of people living and working in the San Francisco Bay area, as well as the soon-to-be constructed Coyote Valley Research Park, the serpentine-based grassland on Tulare Hill is irreplaceable.

The impacts of NOx on the local plant and animal communities is again minimized on page 4-14 when Calpine/Bechtel claims that development and grazing currently threaten much of Coyote Ridge, Tulare Hill, and the Santa Teresa Hills. Any development proposal at these locations would be subject to Section 7 Consultation or Section 10 negotiations, so the threat from development is not as great as from Basin-wide deposition of NOx and other pollutants from MEC.

In another example of minimization, the California Red-legged Frog and California Tiger Salamander are said to typically use riparian habitats for dispersal (page 4-2), which ignores the importance of overland dispersal (USFWS 2000). The habitat of California Red-legged Frog is described as "ponds and permanent pools in streams and marshes …" (page 4-6), but there is no mention in this habitat description of the importance of upland refugia in mammal burrows (USFWS 2000; California Department of Fish and Game survey protocol; also see my comment on the PSA) or of upland areas for dispersal (USFWS 2000). As a consequence of attempting to minimize the impacts, the BRMIMP contradicts its California Tiger Salamander habitat

description by later stating that California Tiger Salamander travel 1/2 mile or more from aestivation sites to breeding ponds (page 4-6) and that an occupied breeding pond was found within 1/2 mile east of the MEC site (page C-2). It also contradicts its California Red-legged Frog habitat description by presuming that California Red-legged Frogs were only able to reach the portion of Coyote Creek within the MEC gas pipeline area by dispersing overland from breeding habitats (page 4-17). This contradiction also implies that the California Red-legged Frogs in this portion of Coyote Creek do not breed, which reads like another minimization of impacts. Since claiming that the presence of bullfrogs in Fisher Creek excludes California Red-legged Frog (CH2MHILL 2000a), the BRMIMP minimizes the impacts to California Red-legged Frog in a new, more convoluted way by claiming that California Red-legged Frog do indeed occur nearby in Coyote Creek, but only as non-breeding individuals that inadvertently dispersed into an ecological sink. CH2MHILL continues to go out of its way to minimize the impacts to California Red-legged Frog.

Relevant facts about California Red-legged Frog and California Tiger Salamander are scattered throughout the BRMIMP, which appears to be an attempt to minimize impacts. A search of the entire BRMIMP is required to collect these facts, which often also contradict each other and are thus confusing. Making it even more difficult for the reviewer to understand the impacts to California Tiger Salamander, Jennings (2000) is cited on page 4-6, but lacks a reference in the Literature Cited section of the BRMIMP.

The BRMIMP minimized the presence of ground squirrel burrows occurring within the riparian corridor and adjacent upland areas of Fisher and Coyote Creeks. Ground squirrel burrows are important aestivation sites of California Tiger Salamander and California Red-legged Frog. I saw more than "several" ground squirrel burrows there (page C-1). CH2MHILL (2000a) claimed that dogs at the MEC site keep away ground squirrels, which was not true. In the BRMIMP, ground squirrel presence is minimized to "several," which is just as untrue.

Although California Red-legged Frog, California Tiger Salamander, and Western Pond Turtles were considered present despite not being seen at the MEC site (page C-2), coast horned lizards were given no such benefit of conservatism. Coast Horned Lizards occur on Coyote Ridge (Fig. 2a, BRMIMP) and the prey base certainly occurs on Tulare Hill (see my comment on the PSA, Photo 2), so considering this species as absent on Tulare Hill appears to minimize impacts. The BRMIMP contradicts Calpine/Bechtel's Set 7 (Attachment BR 1: 3) responses to comments on the PSA, in which Calpine/Bechtel admits that Coast Horned Lizards may be present on Tulare Hill.

The BRMIMP minimized impacts when it claimed that the placement of the electric transmission lines could have a "slight" increase in the chance for birds to collide with the top ground wires, and the 145-foot tall HRSG stacks "could" also present a collision hazard to birds (page 4-7, F-2). Based on the Precautionary Principle, and the empirical evidence (e.g., my comment on the PSA, Photo 11), it would be more appropriate to assume that collisions *will* occur. The added transmission line and 145-foot tall HRSG stacks will, with no uncertainty, present hazards to birds. The BRMIMP minimized these certain impacts, but this time using a different approach than appeared in CH2MHILL (2000a). Whereas CH2MHILL (2000a) argued that the elevation of Tulare Hill will somehow prevent migratory birds from flying through Santa Clara Valley at

the altitude of the electric transmission lines and HRSG stacks, thereby minimizing collision hazards, this time the BRMIMP simply states that the hazards are "slight" and "potential."

Formulation of mitigation and monitoring plans deferred to later date

On page, G-11, the BRMIMP states "It is anticipated that this draft Management Plan will be modified during CEC Workshops and further discussions with the USFWS, California Department of Fish and Game, Stanford University Center for Conservation Biology, and local cattle ranchers …" It also states that the "final Management Plan for Tulare Hill will be complete in November, 1999" (I assume it was meant November, 2000). To be consistent with CEQA, the BRMIMP should have presented a complete formulation of the mitigation and monitoring plan, and it should have done so in a single document that includes all the other analyses and issues typically presented in an EIR. Under CEQA, the applicant is not supposed to defer the formulation of the mitigation and monitoring plans to a later date, because the public has a right to comment on these plans before they are finalized and certified by the lead agency.

Similarly, the BRMIMP (App. G, page 16) claims that a detailed monitoring plan for preserved habitats will be developed with professors and research graduate students from the Center for Conservation Biology at Stanford University. In other words, Calpine/Bechtel clearly intends to shut out public participation with the formulation of a monitoring plan. Again, it is a violation of CEQA to defer the formulation of a mitigation plan to a later date. The monitoring plan is a critical component of a mitigation plan such as should be provided by the proponents of a project like MEC.

The BRMIMP (page F-2) claims that the number of birds allowed to be killed by the electric transmission line and HRSG stacks (i.e., significance criteria) will be determined by the California Energy Commission CPM. Again, this is deferring the formulation of the mitigation and monitoring to a later date, out of compliance with CEQA, and shutting out the public from participation.

Mitigation effectiveness

Goals

The BRMIMP claims to "protect biological resources from project impacts to the maximum extent feasible" (page 3-2). With protection measures, the BRMIMP claims that "the MEC project will have little or no adverse affects on Bay Checkerspot Butterfly" (page 4-11) and will also protect Opler's Longhorn Moth (page 4-12). Based on the premise that grazing has not yet wiped out Santa Clara Valley Dudleya, the BRMIMP claims that managed cattle grazing will maintain the population of Santa Clara Valley Dudleya (page 4-10). The BRMIMP seeks to minimize impacts to California Red-legged Frog, California Tiger Salamander, and Western Pond Turtles by conducting preconstruction surveys and relocating individuals to safe areas (page G-2). The BRMIMP claims that preserving 116 acres of Tulare Hill will minimize the potential impacts on Burrowing Owls (page 4-14). In the following text, I will explain why the goals and objectives of the BRMIMP cannot be realized.

The BRMIMP offers absolutely no protection measures for Bay Checkerspot Butterfly, and falls far short of protecting biological resources to the maximum extent feasible. Only one impact is offered as roughly proportional mitigation, which is required under CEQA, and even this mitigation is not sustainable over the life of the project. In my comment on the PSA, I recommended mitigation measures for the various impacts, but the BRMIMP offers no explanation for not selecting my recommended, alternative mitigation measures, which again violates CEQA.

MEC Implementation area

According to the BRMIMP, the MEC implementation area will consist of 14 acres, although the FSA identifies 20 acres as the implementation area where construction will take place. I recommended a 1:1 mitigation-to-take ratio for this upland area, which is possible California Red-legged Frog and California Tiger Salamander aestivation habitat, and is habitat for many other species. The BRMIMP offers no mitigation for the loss of these 14 acres (20 acres in the FSA). In other words, the mitigation ratio for the loss of this habitat is 0:1.

No additional compensatory mitigation measures were proposed for impacts in the MEC implementation area. There is no compensatory mitigation for indirect impacts due to increased lighting and noise. Also, in preparing to relocate special status species to "safe areas" outside the construction zone limits (pages C-2, C-4, C-5), the BRMIMP does not indicate that these animals will be relocated to outside the deposition zone of NOx and other pollutants produced by the MEC. I consider this mitigation inadequate until the animals are relocated outside the MEC impact area. In my comment on the PSA, I recommended that there be mitigation for all of these impacts. The BRMIMP offered no explanation as to why my recommendations were rejected.

Fisher Creek riparian corridor

The BRMIMP proposes to mitigate impacts to Fisher Creek riparian habitat by planting new trees and doubling the spatial extent of riparian vegetation at the MEC site from 4.3 to 8.6 acres. However, no performance standards were specified in the BRMIMP. There are no consequences for half of the trees dying within 5 years, for example. Also, the BRMIMP does not explain how NOx, ammonia, SOx, PM_{10}, salt, formaldehyde, and other pollutants will affect the expanded riparian vegetation and the organisms that might reside within. Therefore, the mitigation ratio starts off at 2:1, but there is no means described in the BRMIMP to sustain this ratio.

Electric transmission line

The BRMIMP proposes no compensatory mitigation for the impacts of the 240-foot electric transmission line on Tulare Hill. The adequacy of the monitoring and remedial actions is discussed below under *Bird collisions with tall structures*.

Bird collisions with tall structures

As I stated in my comment on the PSA, to thoroughly assess the impacts of the tall MEC structures on birds, the applicant should monitor for evidence of collisions during the entire life of the project. The BRMIMP ignores my recommendation and presents a flawed monitoring plan for bird collisions with the new electric transmission lines and the 145-foot tall HRSG stacks (page 4-7 and F-3). It proposes to monitor impacts for three years, which is too brief to characterize the role of weather on bird movement and migration behavior because the weather cycle in California is much longer than three years. Periods intervening peaks or troughs in rainfall, for example, span 10-12 years. The BRMIMP defers the formulation of the monitoring plan for tall structure impacts to a later date, which prevents the public from participating with the planning process for the MEC and is contrary to the spirit and language of CEQA.

In my comment on the PSA, I recommended that the collision hazard be reduced to the extent possible and that it be factored into the formulation of the mitigation plan. The BRMIMP ignores my recommendation. The remedial actions for bird collisions that are listed on page F-6 should be offered as mitigation right now, at the start of the project. Why wait until birds die on the electric transmission line and HRSG stacks before marking these hazards so that birds can see them? It would be prudent, as well as consistent with the intent of CEQA, to mark these structures prior to getting proof of injury.

NOx pollution

Calpine/Bechtel proposes to mitigate for "potential" serpentine habitat losses, and to minimize the "potential" impacts of Burrowing Owls, by acquiring and preserving 116 acres of the south side of Tulare Hill. It is important to note that the serpentine grassland community *already resides* on these 116 acres, and so far *remains unpolluted* by MEC. However, NOx pollution will increase vegetation height on Tulare Hill (Weiss 1999), and tall vegetation is avoided by Burrowing Owls (Coulombe 1971, Haug and Oliphant 1990, Rogriguez-Estrella and Ortega-Rubio 1993). Purchasing 116 acres of Tulare Hill and grazing one cow for every 10 acres cannot mitigate the impacts to Burrowing Owls.
Furthermore, this parcel is where a Burrowing Owl and a Golden Eagle nest were sighted, whereas the endangered species locations were recorded on the remaining portion of Tulare Hill, which was not acquired as mitigation. Even if such a land acquisition were to be considered as compensatory mitigation, I would expect the northern half of Tulare Hill to be more appropriate for serving this purpose because that is where the endangered species records occur.

Calpine/Bechtel's goal for managing Tulare Hill is to maintain the serpentine habitat in its current condition through managed cattle grazing (App. G, page 11). The BRMIMP then lists cattle grazing prescriptions that are claimed will maintain the serpentine habitats on Tulare Hill in current condition *or better* (App. G, page 12). However, this goal cannot be achieved because cattle grazing harms Santa Clara Valley Dudleya (Weiss 1999), and cattle grazing, and all the prescriptions listed in App. G, in no way changes the amount of NOx and other pollutants that will deposit upon Tulare Hill due to stack emissions from MEC. Cattle grazing will not substantially reduce, avoid, or compensate for impacts caused by NOx pollution of serpentine-based grassland, especially considering the low stocking rate proposed. However, the FSA

makes clear that Calpine/Bechtel has no intention of fencing their 116 acres, thereby giving up control of stocking rates to neighboring owners of Tulare Hill. Calpine/Bechtel offers no control on stocking rates, which therefore threaten Santa Clara Valley Dudleya. Cattle grazing already occurs on Tulare Hill, so Calpine/Bechtel offers nothing new there except increased pollution by NOx and other hazardous waste.

Furthermore, the success criteria to be determined in the monitoring plan cannot indicate *better* conditions because these criteria consist of maintaining populations of Santa Clara Valley Dudleya, Opler's Longhorn Moth, and Bay Checkerspot Butterfly in currently occurring numbers. There is no way to detect better conditions when the success criteria do not exceed the status quo. If the monitoring shows the success criteria are not being achieved, then Calpine/Bechtel says it will fund research to determine the cause (App. G, page 14). However, research is not a solution, and should in no way be considered as mitigation. Also, App. G did not present a plan to protect the Opler's Longhorn Moth, as was promised on page 4-12.

These flaws in the mitigation of impacts to Tulare Hill's serpentine-based grassland are especially troubling because Tulare Hill was identified as a high priority protection site for the Opler's Longhorn Moth (page 4-12, USFWS 1998). If Tulare Hill is a priority site for protection, and other alternative sites are available for the Calpine/Bechtel project with many fewer impacts, then I fail to see why MEC is even being considered.

The BRMIMP refers the reader to App. G, which is said to include a description of an adaptive management strategy on Tulare Hill (page 4-14). App. G includes no description of any adaptive management strategy, nor does the term "adaptive management" appear anywhere in the text of App. G. **No place in the BRMIMP is adaptive management described**. I have to assume that Calpine/Bechtel is continuing to rely on the erroneous description of adaptive management that appeared in CH2MHILL (2000a), and in its response to my PSA comments (Set 7, Attachment BR-1: 4).

At the public workshop of June 22nd, I commented that adaptive management had been promised as a mitigation in previous Calpine/Bechtel documents related to the MEC, and I commented that Calpine/Bechtel needs to explain what they mean by adaptive management so that the public can understand it, as well as the USFWS and the CEC prior to the former issuing a Biological Opinion pursuant to ESA Section 7 consultation, and prior to the latter issuing its FSA. At that public workshop, Debra Crowe of CH2MHILL assured me that the BRMIMP would include a detailed description of the adaptive management plan for Tulare Hill, and that it would be released by July 31. Now that the BRMIMP has been released, two months later than July 31, page 4-14 refers the reader to App. G for a description of adaptive management that, in fact, is not provided.

The BRMIMP proposes to purchase and preserve 15 acres on Coyote Ridge as compensation for cumulative impacts of NOx deposition in the Valley (page 4-14). It also proposes to manage these 15 acres with cattle grazing (page 4-14). As I pointed out in my comment on the PSA, the area affected by NOx pollution is much greater than 15 acres. Fifteen acres is trivial compared to the outer contour of projected NOx pollution due to the MEC. The BRMIMP did not specify where the 15 acres would occur on Coyote Ridge, much of which will be polluted by the MEC.

If this mitigation site occurs within the zone of NOx pollution, then it will be within an area of impact rather than serving as mitigation.

The BRMIMP proposes to mitigate for impacts by providing an approximately 30-year long endowment fund for managing and monitoring the preserved habitats. Calpine/Bechtel apparently rejected Linda Spiegel's PSA request for an endowment fund in perpetuity. No explanation is provided for why Spiegel's alternative mitigation measure was rejected.

The BRMIMP also rejected my request for a rigorously described monitoring program to ensure that we learn about the impacts of the MEC on the serpentine-based grassland community. The 1-paragraph description of the monitoring plan on page 16 of App. G is fatally flawed and includes none of the design features I recommended in my PSA comment, and that Calpine/Bechtel claimed would be described in the BRMIMP (Set 7 response to PSA comments, Attachment BR-1). The monitoring design is psuedoreplicated (see Hurlbert 1984). Without concurrent offsite monitoring using identical methods, there is no means to compare the Tulare Hill monitoring results with changes in the conditions of serpentine-based grasslands that might be due to other environmental influences. Without any means to account for the effects of environmental factors other than pollution from MEC, it will be impossible for Calpine/Bechtel to attribute any trends in measured variables to the activities of the MEC (see my comment on the PSA). This plan includes no means to perform power analysis, which is important for proper interpretation of trend data (Gerrodette 1987), and it gives no consideration to the importance of avoiding Type II error (Shrader-Frechette and McCoy 1992). In responding to my PSA comments (Set 7 response to PSA comments, Attachment BR-1), Calpine/Bechtel claimed that the CEC was requiring a rigorous monitoring program as part of the BRMIMP, including out-of-area controls, BACI design, and other features that would qualify the monitoring program as scientifically defensible. The BRMIMP described none of these features, and is therefore grossly inadequate.

Designated Biologist

Calpine/Bechtel proposes to hire Debra Crowe as the Designated Biologist. In my comment on the PSA, I recommended that an outside employee should conduct the monitoring work. The BRMIMP did not explain why my recommendation was rejected. Ms. Crowe prepared many of Calpine/Bechtel's documents related to the MEC. To avoid any perception that the prospect of a future job might have biased the preparation of MEC documents, I again recommend that a non-CH2MHILL and non-Calpine/Bechtel biologist be hired as the Designated Biologist. Furthermore, if Ms. Crowe contributed substantially to the preparation of the BRMIMP, then the BRMIMP reflects poorly on the preparedness of Ms. Crowe to serve as the Designated Biologist.

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29 October, 2000

Shawn Smallwood, Ph.D. Date

CAlifornians for Renewable Energy, Inc. (CARE)
821 Lakeknoll Dr.
Sunnyvale, CA 94089

Shawn Smallwood, Ph.D.
puma@davis.com
109 Luz Place
Davis, CA 95616

Cecilia Brown
Cecilia_Brown@fws.gov
U.S. Fish and Wildlife Service
2800 Cottage Way
Sacramento, CA 95825

Dear Cecilia Brown,

I hereby request that the US Fish and Wildlife Service consider the following issues when conducting its Section 7 consultation with Calpine/Bechtel regarding the Metcalf Energy Center. I request that the Service delay the issuance of its biological opinion until these issues I raise have been adequately addressed. To adequately address these issues, it is my opinion that a lot more time will be needed than the California Energy Commission (CEC) has scheduled for issuance of its Final Staff Assessment (FSA), and for holding evidentiary hearings.

Due to a protracted, piece-meal release of environmental documents by the applicant, the public and the Service has not had the opportunity to coherently examine the applicant's description of the environmental setting, the projected impacts, and the proposed mitigation. The applicant has not disclosed its mitigation and monitoring plan, referred to as the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP). At this late date, if the BRMIMP is released prior to issuance of the CEC's FSA, the public cannot adequately assess the effectiveness of the BRMIMP prior to the CEC's intended date of release of the FSA. It is unfair to the public for the applicant to delay the release of the BRMIMP until the Section 7 consultation is completed. The Service and the public should have had this document months ago, prior to Section 7 consultation. I request that the Service delays its Section 7 consultation with the applicant until the public is given a reasonable preliminary description of the mitigation and monitoring plan.

I am concerned that certain important issues may not be part of the current Section 7 consultation. These issues are the following.

The NOx emissions from the proposed Metcalf Energy Center would create cumulative impacts to an already stressed ecosystem, and would jeopardize the California Red-legged Frog (Draft Recovery Plan for the California Red-legged Frog), as well as the habitat of the Bay Checkerspot Butterfly (see Stuart Weiss 1999, Conservation Biology 13:1-12). The fact that the South Bay

Area already approaches the federal air quality standard for NOx concentrations, and exceeds the federal air standard for ozone levels, forces the conclusion that any additional emissions of NOx would exacerbate an already intolerable situation. According to the Preliminary Determination of Compliance (Bay Area Air Quality Management District, Application 27215, April 20, 2000), the MEC will produce 186 tons per year of additional NOx into the environment of northern Coyote Valley and the surrounding serpentine hillsides. Buying pollution credits would do nothing to reduce the threats to the endangered species due to NOx emissions from the MEC.

Incredibly, the applicant recently claimed that moving the MEC 10-15 miles to the north would make no difference to the NOx deposition onto the ridges surrounding the Coyote Valley (Calpine/Bechtel's comments on the Metcalf Energy Center Preliminary Staff Assessment, Set 3:13). This claim calls into question the applicant's atmospheric modeling results; that is, will or will not the NOx deposit onto the surrounding soils in the amounts indicated by the various contour intervals predicted by the previous model runs? Is the applicant now claiming that the NOx contribution from MEC to the environment will be at *de minimus* levels? The Service and the public is going to need substantial time to re-evaluate the atmospheric modeling predictions, and the possible impacts on California Red-legged Frog, Bay Checkerspot Butterfly, and other special status species. This claim of the applicant is so deviant from previously acknowledged impacts of NOx deposition from the MEC that the credibility of all the applicant's previous claims needs to be seriously questioned.

According to the Draft Recovery Plan for the California Red-legged Frog, 100% of Red-legged Frog eggs die when exposed to salinity levels of >4.5 parts per thousand, and 100% of larvae die when exposed to salinity levels of >7 parts per thousand. Recently submitted documents by the applicant made it apparent to me that the MEC will increase the salinity of the waters in the local area. The salinity of the recycled water will increase by 3% (PSA: 402) and the discharge will include 780 mg/L of sodium (PSA: 403). According to the applicant's PSA response (set 5:1-9), the recycled water in the South Bay Reclamation Program currently has 166-mg/L sodium, but will increase to only 171 mg/L when returned. The applicant does not clarify where the balance of the sodium will go; that is, the balance between 171 and 780 mg/L. Since the cooling towers will be releasing >293 metric tons of water per hour (Applicant's PSA response Set 7, Attachment AQ-2: 1) and increasing local humidity levels by 1-2% at 0 to 5 km from the MEC (Set 7, Attachment AQ-2: 1), I have to assume that much of this excess sodium will also be released via the cooling towers. In fact, according to the Preliminary Determination of Compliance (Bay Area Air Quality Management District, Application 27215, April 20, 2000), the maximum total dissolved solids (TDS) measured at the base of the cooling towers could be as high as 5,438 mg/L.

The stack effluent will bear salts, which will deposit in the local environment and run-off into the local streams. The Service and the public need time to consider whether this increase in salinity levels poses a significant threat to the viability of California Red-legged Frogs in the region. It is especially important to accurately predict the increased salinity levels because Red-legged frogs have been nearly completely extirpated from nearby streams to the west of the proposed MEC site. Increasing salinity in local streams to toxic levels would constitute a significant cumulative impact, which has not yet been addressed by the applicant or the CEC.

In responding to the PSA (set 7:2), the applicant estimated that 100% of the particulate matter in the MEC airborne effluent would be $PM_{2.5}$. This fine particulate matter may pose increased risk to the California Red-legged Frog, because particulate matter was identified in the Draft Recovery Plan for the California Red-legged Frog as a threat to the species. The South Bay Area already exceeds the federal air standard for PM_{10} levels, so acknowledging that all the particulate matter contributed by MEC will be $PM_{2.5}$ is especially troubling. According to the Preliminary Determination of Compliance (Bay Area Air Quality Management District, Application 27215, April 20, 2000), the MEC will generate nearly 99 tons per year of PM_{10}.

According to the Set 5 response of the applicant to the PSA, chloride and boron levels will increase in the recycled water outflow relative to the inflow of the MEC. Large amounts of chloride and boron will be produced as waste (Table 2 of Set 5), but it is unclear where these waste products will go. At this point, I have to assume that a large amount, if not all of it, will be released from the stacks and will deposit into the local environment. Chlorine is identified as a threat to the California Red-legged Frog (Draft Recovery Plan for the California Red-legged Frog), and boron may be an important factor for the absence of Red-legged Frogs in Bear Creek, Colusa County.

The Set 7 response of the applicant acknowledges that the air effluent will include formaldehyde, acetaldehyde, and acrolein. These contaminants, along with ozone, ammonia, NOx, and SOx, pose increased threats to the California Red-legged Frog. Ozone and ammonia were identified as threats to the California Red-legged Frog (Draft Recovery Plan for the California Red-legged Frog). Their potential impacts need to be assessed, especially considering that the Bay Area Air Quality Management District (Preliminary Determination of Compliance, Application 27215, April 20, 2000) projects that the MEC will generate up to 114 tons per year of ammonia from the stacks.

Furthermore, Figure 3 in the Attachment LU/PSA-1 depicts the locations of Superfund sites, hazardous waste handlers, air releases, toxic releases and risk sites within 3 miles of MEC. These mapped sites are numerous within 3 miles of the MEC, and includes 3 Superfund sites! Also, I know that additional Superfund sites and toxic waste handlers and releasers occur within the region, beyond the 3-mile radius depicted in Fig. 3. Under contract with the US Fish and Wildlife Service, I searched for California Red-legged Frogs in Arroyo Calero, Los Alamitos, Almaden and Los Gatos Creek watersheds during 1997 and 1998. The Service suspected that the California Red-legged Frog might have declined in number as a result of mercury loading into these watersheds from the Almaden Quicksilver Mine Superfund Site, as well as multiple other mercury mines in the surrounding mountains. I found 3 California Red-legged Frogs in one location, nearby where Mark Jennings found one, and nearby where a Park Ranger found one dead frog on a boat dock in Calero Reservoir. Otherwise, the California Red-legged Frog appeared to be very nearly extirpated in these watersheds, which are just to the west of MEC. Adding another polluter into an area already crammed with polluters really increases the risk factors for the California Red-legged Frog in Coyote and Fisher Creeks. I recommend that the Service consider these cumulative impacts of MEC while undergoing section 7 consultations.

The applicant's set 7 response to my PSA comments claimed that the Bay Checkerspot Butterflies on Tulare Hill contribute little to the viability of the larger metapopulation, even

though their expert, Stuart Weiss, concludes that the Bay Checkerspot Butterfly exhibits a metapopulation structure (Conservation Biology 13:1-12). This discrepancy between the expert's opinion and his client's latest claim needs to be resolved. If Tulare Hill is inconsequential to the Bay Checkerspot Butterfly, then what role does Tulare Hill play in the metapopulation dynamics? What type of metapopulation structure does the Bay Checkerspot Butterfly express?

The applicant's Set 7 response to my comments on the PSA prompted me to examine their map of ground squirrel burrows at the MEC site (Draft Riparian Corridor biotic Assessment for the Metcalf Energy Center, October 1, 1999). The applicant is incorrect to conclude that the power plant, lay down area, and access roads is so disturbed by dogs that California ground squirrels do not occur in abundance there. I found that the applicant's map of ground squirrel burrows did not represent the distribution of ground squirrel burrows that I observed at the site this past spring. California ground squirrels occupy the extent of the upland area at this location. The widespread distribution of California ground squirrels is significant because their burrows serve as habitat for California tiger salamanders and California red-legged frogs. Both the California ground squirrel and the red-legged frog *require* animal burrows, principally ground squirrel burrows, in upland areas away from the aquatic environment of streams such as Fisher Creek. If California tiger salamanders or red-legged frogs aestivate in those burrows, then they will be destroyed as well, and their habitat will be taken.

It appears that the ground squirrels have expanded onto the upland areas during the 6 months intervening the applicant's map production and my site visits. This spread of squirrels also may help make my point that the environmental conditions and the constituent biological species are cyclic, and that the environmental setting described by the applicant is inadequate by not considering this inherent cyclic nature of conditions. I recommend to the Service that they determine whether ground squirrels are spreading across a larger area around Fisher Creek, and whether the burrow systems of these squirrels provide aestivation habitat for the California red-legged frog.

The issues I just raised are some of those that I have been thinking about. I intend to bring up additional issues as my articulation of them matures.

7-18-00

Shawn Smallwood, Ph.D. Date

CAlifornians for Renewable Energy, Inc. (CARE)
821 Lakeknoll Dr.
Sunnyvale, CA 94089

Michael Boyd, President
Californians for Renewable Energy
(CARE)
821 Lakeknoll Drive
Sunnyvale, CA 94089
(408) 325-4690

STATE OF CALIFORNIA
State Energy Resources
Conservation and Development Commission

In the Matter of:	)	
	)	Docket No. 99- AFC-3
	)	
	)	Comments on the Preliminary
	)	Staff Assessment of the Metcalf
	)	Energy Center by K. Shawn
_____	)	Smallwood, Ph.D.

Michael E. Boyd

June 30, 2000 Michael E. Boyd, President CARE

(Proof of Service Attached)

CAlifornians for Renewable Energy, Inc. (CARE)
821 Lakeknoll Dr.
Sunnyvale, CA 94089

Comments on the Preliminary Staff Assessment of the Metcalf Energy Center

K. Shawn Smallwood, Ph.D.

I have reviewed the CEC Preliminary Staff Assessment (PSA) of the Application for Certification 99-AFC-3, Metcalf Energy Center. I applaud Linda Spiegel for what appears to be a commendable effort to deal comprehensively with many of the issues related to biological resources. Many of her conclusions and recommendations appear sound, or at least provide an excellent start for further investigation and analysis. There are some issues that remain for me, however, and I would like to address these issues herein and in the Public Workshop on Biological Resources to be held in San Jose on June 22, 2000. In addition, my work on this project is only in its preliminary phase. I am sure there will be a significant number of additional issues that will need to be addressed, or addressed differently.

My qualifications for responding to the PSA are summarized in my short biography and Curriculum Vitae, which area attached.

Environmental Setting

The reconnaissance-level biological surveys at the proposed project site by CH2MHILL and CEC biologists appear to be fairly thorough. However, there are significant shortfalls. Some of them are the absence of bat surveys, small mammal trapping, and use of camera traps. I saw no evidence of netting or acoustical sampling for bats. Since multiple bat species are considered Species of Special Concern by our state and federal governments, I regard this shortfall as significant. I also saw no attempt to sample the small mammal species using traps, which severely constrains an understanding of which species are present. I recommend that proper sampling be implemented for bats and small mammals.

I want to point out a couple of findings I made at the site during my visits of 11 April and 2 May, 2000. My findings are significant because, as is typical with CEQA or CEQA-equivalent document preparation and assessment, the biologists of the lead agency are expected to limit their examination of any changes in existing physical conditions in the affected area since they occurred at the time of the notice of preparation (NOP). However, this baseline may not be the appropriate one from a scientific, biological standpoint, nor from the standpoint of maximizing environmental protection while avoiding or minimizing environmental harm, which constitutes CEQA's foremost principle. Biologists are familiar with natural changes in physical conditions and with periodic changes in site occupancy by species (Taylor and Taylor 1979). That is, if a species appears absent from a site at the time of the NOP, it could easily have been there prior to the NOP and it could very well be there again in the near future so long as the site supports suitable habitat. I want to present certain of my findings that demonstrate the need for prudent caution in determining which species exist at Tulare Hill, Fisher Creek and the adjacent upland area (proposed MEC site).

For example, I found an arboreal salamander on the west side of Fisher Creek downhill from the large spring on Tulare Hill (Photo 1), a western skink on the east side of Fisher Creek, a

deer mouse on Tulare Hill, western fence lizards, pocket gophers, Tree Swallows, and Western Kingbirds. These species apparently were not found by CH2MHILL (2000: Table B-1, page 9-3). These species have no special status under California and federal laws and policies, but my finding them after other biologists visited the site on numerous occasions demonstrates the frustrating reality that animal species are always missed during site visits, no matter how exhausting.

As another example, the PSA concludes that California Horned Lizards are unlikely to occur on Tulare Hill or the proposed project site, because the habitat is unsuitable. However, I found numerous harvester ant colonies on Tulare Hill (Photo 2), and harvester ants are the major prey of California Horned Lizards. I recommend that the likelihood of California Horned Lizard presence be reconsidered, and I recommend that some assessment be made of the possible impacts of NOx deposition on harvester ants. The California Horned Lizard is a California Species of Special Concern. To meet CEQA's foremost principle, this type of enhanced examination is absolutely essential.

Also, I acquired photographs taken by one of the former land holders during 1992. These photographs of Tulare Hill and the upland area next to Fisher Creek show that this site was not as degraded as it is today (Photos 3-10). The junk piles were not there as they are today, and the vegetation was more lush on both Tulare Hill and the upland area next to Fisher Creek. These photographs were taken approximately the same time of year as my site visits, so the vegetation conditions should have been comparable with respect to phenology. The reduced plant height and density on Tulare Hill might indicate an impact from atmospheric pollutants since 1992, or part of a cyclic change in vegetation conditions with local climate variables. Whatever the reason for the apparent change in vegetation conditions, the biological species we see there today might not compose the same assemblage of species that was there in 1992, and it might not be the same assemblage that will be there in 10 years from now.

CH2MHILL prepared a summary of their biological surveys, entitled "Biological assessment for the Metcalf Energy Center Project, Santa Clara County, California." Overall, this document was well prepared and served as useful source material for Linda Spiegel's PSA. However, I found some problems with the CH2MHILL document. For example, California ground squirrels are reported to occur primarily on the western bank of Fisher Creek (page 1-12), and to not occur on the center portion of the site (page 2-11). This is not the case. Contrary to the claim made on page 2-11, construction of the MEC will not avoid potential aestivation habitat for California tiger salamander. California ground squirrels occupy the entire upland area where the applicant proposes to build Metcalf Energy Center, and these squirrels are abundant to the top of Tulare Hill. The widespread distribution of California ground squirrels is significant because their burrows serve as habitat for California tiger salamanders and red-legged frogs. In Table 1 (page 2-4), the potential impacts to these two species are downplayed because the impacts avoid aquatic habitat. Both the California ground squirrel and the red-legged frog *require* animal burrows, principally ground squirrel burrows, in upland areas away from the aquatic environment of streams such as Fisher Creek. Contrary to the claim made on page 2-11, construction of the MEC will not avoid potential aestivation habitat for California tiger salamander.

The likelihood of red-legged frogs occurring in Fisher Creek is downplayed on page 2-11 because bullfrogs occur there. Bullfrogs do not necessarily exclude red-legged frogs, even though they prey on tadpoles of red-legged frogs. The minimization of the potential significance of impacts on irreplaceable biological resources, whether intentional, accidental, or due to institutional bias, violates the spirit as well as the letter of CEQA's foremost principle. To comply with CEQA, this minimization must be avoided.

I disagree with the conclusion on page 4-4 that because the effluent stacks of the MEC would be below the elevation of Tulare Hill, and because transmission lines already exist in the area, migrating birds would be unlikely to collide with these stacks. This is a perfect example of the tendency to minimize the potential significance of the project's impacts. It is also an example of going out of one's way to come up with creative ideas to minimize that significance, which is directly opposite to the foremost principle of the CEQA statutory scheme. Under CEQA, it is far more appropriate to creatively ideate in the areas of thoroughness in assessing potential impacts and coming up with effective measures capable of avoiding or mitigating those impacts. For example, during my visit of May 2, 2000, I found an injured Common Raven at the base of one of the transmission towers on Tulare Hill (Photo 11). I draw the reasonable inference that this raven was injured by colliding with the tower or the wires. Just because this raven was removed from the candidate pool of birds that can collide with the MEC's stacks does not preclude other individuals or other avian species from doing so. Manville (2000) and Hoving and Sealy (1987) report disturbing fatality rates due to avian collisions with tall, lit towers. I recommend that CH2MHILL not downplay the significant threat posed by MEC's stacks to nocturnally migrating birds. I also recommend that the collision hazard be reduced to the extent possible and that it be factored into the formulation of mitigation.

Direct Impacts

At this early stage, I generally agree with Linda Spiegel's assessment of direct impacts, but I would add impacts that include the following. The power plant, laydown area, and access roads will destroy the ground squirrel burrows there. CH2MHILL (2000) is incorrect to conclude that this area is so disturbed by dogs that California ground squirrels do not occur in abundance there. Again, this is another example of taking the wrong perspective aimed at trivializing the severity of impacts, rather than maximizing environmental protection, as CEQA requires. California ground squirrels occupy the extent of the upland area at this location. If California tiger salamanders or red-legged frogs aestivate in those burrows, then they will be destroyed as well, and their habitat will be taken.

Indirect Impacts

At this early stage, I generally agree with Linda Spiegel's assessment, although I suspect, among other things, that noise and light levels will be more disruptive to wildlife than has been expected by the CH2MHILL and CEC biologists. Artificial light levels can interfere with dispersal movements of mammalian carnivores (Beier 1995), the mating-related singing behaviors of birds (Derrickson 1988, Bergen and Abs 1997), the behavior of nocturnal frogs (Buchanan 1993), the nocturnal emergence and foraging activity of salmonids (Contor and Griffith 1995), the activities and predation risk of moths (Frank 1988, Rydell and Baagoe 1996), the congregatory behavior and distribution of certain species such as American Crows (Gorenzel and Salmon 1995), the orientation and mobility of nocturnal, non-volant insects such as ants

(Klotz and Reid 1993) and crawlers (Summers 1997), and all of these documented effects are relevant to the environmental conditions at the proposed MEC site. Far more work is needed before CEQA's stringent standards are met.

Cumulative Impacts

I agree with Linda Spiegel's conclusion that the NOx emissions from the proposed Metcalf Energy Center would create cumulative impacts to an already stressed ecosystem. The fact that the South Bay Area already exceeds federal air quality standards forces the conclusion that any additional emissions of these pollutants would exacerbate an already intolerable situation. Therefore, under CEQA not only must these potential impacts be deemed significant, but they must be carefully analyzed with regard to mitigation. I agree with Spiegel's recommendation that the applicant produce an cumulative impacts assessment. The cumulative impacts assessment performed by CH2MHILL (2000: page 7-1) is entirely inadequate. An adequate cumulative impacts assessment is absolutely essential, and failing to perform one would, in my opinion, violate CEQA. I also recommend that the applicant perform this assessment according to the standards described by McCold and Holman (1995). The preferred approach under CEQ is an identifiable, quantitative as well as qualitative, or performance-level assessment of a particular, potential environmental effect, which I think would be appropriate for assessments of cumulative impacts, and direct and indirect effects. Such performance levels of environmental effect also need to be built into adaptive management and monitoring (discussed below).

The estimated contours of NOx deposition illustrate the areas of vulnerability of soil-vegetation complexes, as well as their associated faunal assemblages. However, it would be more helpful if the applicant would overlay these contours with a map depicting the various levels of sensitivity of soil-grassland complexes to pollutants. Such an overlay can be used to forecast spatially-explicit impacts, much like Zhang et al. (1998) provided for excess nitrogen concentrations in ground water. Zhang et al. (1998) compared the spatial distribution of nitrogen inputs for agricultural crops to the spatial distribution of soil leaching potential. The inputs increasing the vulnerability of groundwater to nitrogen contamination and the inherent attributes of the soils made them more or less sensitive to such inputs. Zhang et al. (1998) forecast impacts that closely matched the measured impacts (i.e., nitrogen concentration in ground water sampled from wellheads). CH2MHILL should have the spatial data, software, and expertise to make such overlays and forecasts of impacts. CEQA requires nothing less. I recommend that this type of impact analysis be performed for NOx deposition.

Mitigation

CEQA requires the mitigation measure to be *roughly proportional* to the project's impacts. Typically, proportional mitigation is estimated as a ratio of the area to be taken to the area to be conserved. The area of the MEC, laydown area, and access roads is easy to calculate and it is easy to match with a conservation easement or fee title purchase of similar habitat conditions elsewhere. Not so easy to calculate is the roughly proportional mitigation for the impacts of pollutants from stack emissions. Which of the estimated contours of NOx deposition should the CEC use to determine the roughly proportional area that needs to be conserved as mitigation? I

recommend that, given the uncertainty of impacts, the entire area projected to receive NOx deposition should be considered when determining a roughly proportional mitigation. From the standpoint of maximizing environmental protection, and avoiding and minimizing environmental harm, this is the safest approach and thus the one that CEQA requires.

One of the mitigation options proposed by the applicant is to invest in a regional Habitat Conservation Plan (HCP). In so doing, the applicant defers the formulation of this portion of the mitigation to a later date when an HCP might be prepared. Under CEQA, the EIR should justify the choice of a particular mitigation measure, and with few exceptions it is improper to defer formulation of the mitigation to a later date. The mitigation measures need to be described explicitly and thoroughly in the EIR, along with the alternatives that were not chosen and an explanation as to why they were not chosen. The same should be done in the applicant's planning documents, in this case.

Additionally, HCPs are mitigation plans that facilitate the takings of endangered species more quickly and over larger areas than otherwise would be possible (Shilling 1997, Smallwood 2000, Smallwood et al. 1999). The applicant essentially would be investing in a vehicle to foster more land conversions to houses and commercial uses. An HCP would enable project proponents to destroy an even greater area of habitat than otherwise would occur. These land conversions would increase demand for electrical energy, and might possibly benefit Calpine-Bechtel. Therefore, I view this proposed mitigation as self-serving on the part of the applicant, but detrimental to the conservation of endangered and other species in the San Jose area. This is simply not allowed under CEQA, and the failure to correct this glaring deficiency will surely expose the environmental documentation to a successful legal challenge based on the EIR's inadequacy.

Adaptive Management

The applicant proposes to implement adaptive management based on habitat responses to cattle grazing on Tulare Hill. I encourage the CEC staff to demand more details of explicitly what this adaptive management would entail. Based on my professional experience, many project proponents have been proposing adaptive management strategies, without a proper understanding of what an adaptive management strategy entails. Adaptive management has been addressed in over 80 scientific publications, including several key papers and books (Holling 1978, Walters 1986, Lancia et al. 1996, McLain and Lee 1996). This literature describes a well thought-out step-by-step approach to learning about a managed environment while also provisioning the manager(s) with options to adopt alternative management practices. Management prescriptions, hypothesized environmental effects, and alternative management prescriptions are all specified prior to implementation. Many project proponents appear to think of adaptive management as a remedial, trial-and-error approach to problem-solving (see also CH2MHILL 2000: page 5-8). I encourage the CEC staff to determine whether the applicant really understands adaptive management. To be certain that the applicant does understand it, it should be described in detail in the application documents, along with the details of an integrated monitoring program.

Monitoring

Spiegel recommended that Calpine-Bechtel invest in an endowment fund to manage Tulare Hill in perpetuity, rather than settle for their proposed 30-year monitoring of impacts. However, if the NOx deposition, or some other contaminant borne in the stack effluent, destroys the existing ecological relationships of Tulare Hill, then an endowment to manage Tulare Hill in perpetuity may be badly spent in perpetuity. I encourage the CEC to consider recommending a more rigorously described monitoring program to ensure that we learn about the impacts of such an energy facility on the ecological community that is adapted to serpentine soils. We also need to learn about the impacts of the 145-foot-tall stacks. Monitoring their impacts on birds for three years will not be helpful if it turns out that intolerable numbers of migrating birds are colliding with the stacks. Something would need to be done about it (see my discussions of Adaptive Management and Changed Circumstances).

Spiegel points out that serpentine-based rock represents 1% of California's geologic base, yet contains 10% of California's floral species. The proposed Metcalf Energy Center is *unique* among energy facilities permitted by CEC in that it poses impacts to this serpentine-grassland complex that supports 10 times the average floral species richness across the other 99% of California. This proposed facility would also be unique for threatening the contiguity of habitat between the serpentine soils of the Santa Cruz Mountains and the Diablo Range. Tulare Hill is recognized as the site of a satellite population of Bay Checkerspot Butterfly (USFWS 1998), so its degradation as habitat would contribute to habitat fragmentation of Bay Checkerspot Butterfly (Wilcox and Murphy 1985, Weiss cf in CH2MHILL 2000). This is a serious problem, of which CEQA requires careful, in-depth analysis. Much more work is needed to meet CEQA standards.

Given the lack of empirically based knowledge on NOx and other pollutants on serpentine-based communities, it would be especially prudent, in accordance with CEQA's high standards, to establish a scientifically defensible monitoring program, including out-of-area control sites and both an impact-gradient design and before/after-control/impact (BACI) pairs design. In other words, I recommend that distance to source be factored into the sampling design, as well as before and after sampling at both Tulare Hill and the control sites. Without these types of designs, the monitoring program will be pseudoreplicated and unlikely to be informative (Hurlbert 1984). Data collected in an adequate monitoring program would likely include the following variables:

- Nitrogen deposition rates
- Soil chemistry
- Biological species composition
- Plant biomass
- Plant height
- Plant density
- Root depth
- Incidence of disease
- Numerical distributions of dependent fauna, including Bay Checkerspot Butterfly and Opler's Longhorn Moth.

Additional variables would likely also be important, but they all need to be identified and described now, not later. These variables would also need to be collected at elevations spanning the bottom to top of Tulare Hill and at locations spanning the north-south breadth of the Hill. This design would need to be repeated on the comparison, control sites. This type of a rigorous sampling design would cost more than $30,000/year. Outside (non Calpine-Bechtel) employees should conduct the monitoring work.

CEC Staff Proposed Mitigation

I recommend that staff consider a 1:1 conservation-to-take ratio of the upland area to be converted to the power plant, laydown area and access roads. This area may be disturbed, but upland areas next to water channels, disturbed or not, are important dispersal areas for wildlife. This upland area could be used for aestivation and dispersal by California tiger salamander and red-legged frog. Another nearby upland area that is adjacent to a stream should be conserved in equal area and in perpetuity (or until the hydrological system has changed locations and relief).

Similar to the recommended endowment fund, I recommend that the CEC require a fund to be available for *changed circumstances*. Alternative management strategies might be needed to mitigate the impacts of NOx depositions onto Tulare Hill. For example, if exotic weeds colonize Tulare Hill in response to nitrogen augmentation, then Calpine-Bechtel might need to perform weed management in support of the food plants of Bay Checkerspot Butterfly and Opler's Longhorn Moth. In another example, if the MEC's stacks cause an intolerable number of migratory bird collisions, then additional mitigation would be needed, or changes to the stacks might be needed.

Conclusions

Although it is far too early for any final conclusions, generally speaking we have gotten off to a good start in this preliminary phase. But a lot more hard, thorough, and unbiased (or biased in favor of the environment) work is necessary.

Tables 1 and 2 summarize my comments and recommendations on this Preliminary Staff Assessment and on the applicant's documents.

6-29-00

Shawn Smallwood, Ph.D. Date

CAlifornians for Renewable Energy, Inc. (CARE)
821 Lakeknoll Dr.
Sunnyvale, CA 94089

Table 1. Status of PSA, and some of the consequence of existing shortfalls.

Defect of PSA and applicant documents	Evidence	Consequence
1. Biological surveys are incomplete	No sampling methods were described for bats and small, non-volant mammals	The environmental setting remains incompletely described, thus the project impacts remain incompletely described
2. Baseline environmental conditions are too recent and narrowly described	Photos of the site from 1992 depict a more lush vegetation on Tulare Hill and the MEC site; I found species that CH2MHILL and CEC biologists did not find	The environmental setting remains incompletely described, and the impacts are assumed smaller than they will really be
3. The numerical/spatial distribution of ground squirrels was inaccurately described	Contrary to CH2MHIlLL (2000), I saw ground squirrels across the upland area and the extent of Tulare Hill	Ground squirrels are keystone species, and their burrows are used by California red-legged frog and California tiger salamander. Therefore, the PSA underestimates potential impacts
4. The likelihood of California red-legged frogs occurring in Fisher Creek is underestimated	Ample scientific reports exist that refute the claim of CH2MHILL (2000) that the presence of bullfrogs negates the presence of California red-legged frogs	The PSA and supporting applicant documents downplay the potential of red-legged frogs to occur at this site
5. The hazards of the MEC stacks and new power lines to birds are underestimated	During one of two site visits I found an injured Common Raven under a transmission tower; Scientific reports are available to refute the claim that the stacks and transmission lines will not be a hazard because they will be below the highest elevation of Tulare Hill	The impacts to nocturnally migratory birds are downplayed and trivialized
6. Indirect impacts are inadequately assessed	The effects of increased lighting and noise are mentioned, but the scientific evidence of their relative effects are is not	The impacts of increased lighting and noise are downplayed and underestimated
7. Cumulative impacts are inadequately assessed	The standards of McCold and Holman (1995) and Smallwood et al. (1999) were unmet	Cumulative impacts are downplayed and underestimated
8. The mitigation measures are misdirected and will be ineffective	The upland area next to Fisher Creek is not included in the conservation-to-take ratio, nor is the entire area of NOx deposition; HCPs are mitigation plans	The types of land being conserved do not match the lands being effected; Funding an HCP promotes more environmental impacts

	for take permits and defer formulation of mitigation measures to a later date	
9. Adaptive management is improperly described	>80 scientific publications describe adaptive management as a structured process designed to enable learning of manipulated environments, and to respond with planned alternative prescriptions; Adaptive management described by the applicant appears to be remedial trial-and-error	The applicant's plan will not enlighten the CEC about the effects of cattle management on Tulare Hill, so appropriate alternative management strategies will be unlikely applied
10. The proposed monitoring plan is inadequate	The applicant describes no design attributes of the monitoring	Little will be learned from the monitoring and the lack of thresholds of significance will likely preclude any remedial actions to disturbing trends

Table 2. My recommendations for amending the PSA and applicant documents prior to approval of the MEC.

Issue	Recommendation
1	Proper sampling methods should be implemented for bats and small, non-volant mammals, and at the appropriate spatial and temporal scales
2	The regional and temporal context of the site needs to be described more thoroughly and realistically, including the inter-annual cyclicity of the weather patterns, the likely former biological occupants of the site, and the possible future occupants after the site use is changed
3	Ground squirrel burrows should be counted and mapped, and a burrow probe used to view the interiors for special status species during repeat visits
4	The literature on California red-legged frogs and California tiger salamander should be reviewed for the impacts of bullfrogs on these species, and agency-protocol surveys should be made of Fisher Creek on site and up- and down-stream of the site
5	Monitoring of the avian impacts of existing power lines, maintained by PG&E, should be implemented immediately, or existing monitoring data examined (if they exist); The literature and experts on avian impacts with tall structures should be consulted and a more realistic impact assessment conducted; A reasonable mitigation plan should be formulated
6	The scientific literature on artificial noise and lighting should be thoroughly reviewed, and indirect impacts assessment conducted, and a reasonable mitigation plan formulated
7	A cumulative impacts assessment is needed, and should meet the standards of McCold and Holman (1995) and Smallwood et al. (1999); The ecological indicators approach

would be appropriate to assess the likely areas of impact from NOx deposition (see Zhang et al. 1998)

8 The proposal to fund an HCP as mitigation for this project should be rejected; An endowment fund should be established for long-term, scientifically defensible monitoring, as well as changed circumstances; Real adaptive management should be formulated and implemented; Conservation-to-take ratios should factor in the entire area of NOx deposition, as well as the type of physiography converted to the MEC

9 The scientific literature on adaptive management should be reviewed, and a real adaptive management plan formulated for cattle management on Tulare Hill

10 A detailed monitoring plan should be described prior to project approval, and should include attributes of impact-gradient design and before/after-control/impact (BACI) pairs, detailed descriptions of variables to be measured, out-of-area control sites, identification of who will conduct the monitoring (qualified expert[s] not employed by Calpine-Bechtel), thresholds of significance for making management adjustments, and integration into a well-described adaptive management plan

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Sunnyvale, CA 94089

Short Biography of Shawn Smallwood, Ph.D.

Dr. Shawn Smallwood is an ecologist with 15 years of professional experience with wildlife, ecosystems, and endangered species issues. He has authored 73 publications, more than half of which were peer-reviewed. He has served as Associate Editor and Editorial Board Member of two international scientific journals, and he has reviewed many professional papers. Dr. Smallwood understands what it takes to produce scientifically defensible research, survey and monitoring results, as well as impacts assessments.

Dr. Smallwood's work has focused on both endangered species conservation and animal damage control. He has worked to conserve such state or federally threatened species as red-legged frogs, giant garter snakes, Swainson's Hawks, and Northern Goshawks. He has also developed lethal and non-lethal methods to control pocket gophers and many other species. Since 1985, he has also conducted the California track count for monitoring the statewide numerical and spatial trends of mountain lions, bobcats, coyotes, gray fox, black bear, and other mammalian Carnivores, as well as for deer. Dr. Smallwood also developed quantitative methods to identify individual animals by their tracks, and he developed new monitoring and counting methods for pocket gophers and other fossorial animals. He developed a new quantitative measure of treatment effect for use in animal damage control efforts. He also conducted his Ph.D. thesis research on exotic species, particularly those that species of mammals and birds that invaded California and caused economic or environmental damage.

Dr. Smallwood also applies the tenets of landscape ecology to his work, and develops ecological indicators for use with GIS. Dr. Smallwood has integrated GPS into his field studies, and has developed new statistical procedures for analyzing spatial data. Dr. Smallwood is also one of the world's leading experts on animal density and spatial patterns of distribution, and he has an extensive collection of density and numerical estimates published for many species of mammal, bird, reptile and amphibian. He uses these estimates to predict patterns of spatial distribution for species with which he works in the field, and he uses them to interpret patterns observed in his field work. Dr. Smallwood also works on operationalizing the habitat concept, and focuses research on how to accurately quantify the selection and use of habitat by animal species.

Much of Dr. Smallwood's consulting work has centered on assessing the foundation of conclusions in environmental documents prepared by project proponents and their consultants. He works to protect the interests of stake-holder groups by assessing the impacts of completed, ongoing and proposed projects and he assesses the adequacy of related environmental documents. He has served as an expert witness in litigation against the nuclear weapons industry and the chemical manufacturing industry, as well as against ocean floor dredging and an airport expansion, for example. Dr. Smallwood has written numerous expert reports, declarations, and depositions, and has testified often before attorneys, City Councils, County Supervisors and other governmental bodies.

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Photo 1 arboreal salamander next to Fisher Creek. This species was not reported by the applicant or the applicant's consultants.

Photo 2 Harvester ant colonies were abundant on Tulare Hill, which is significant because harvester ants are the main prey of California horned lizards, a Species of

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Photo 3 Grass was taller on Tulare Hill in April 1992

Photo 4 compared to April 2000

Photo 5 The site of the proposed Metcalf Energy Center had less junk on it in 1992

Photo 6 compared to 2000, and the vegetation was more lush

Photo 7 In April 1992, the oaks and shrubs were more lush, and the grass taller, in this view from the east of the spring on Tulare Hill

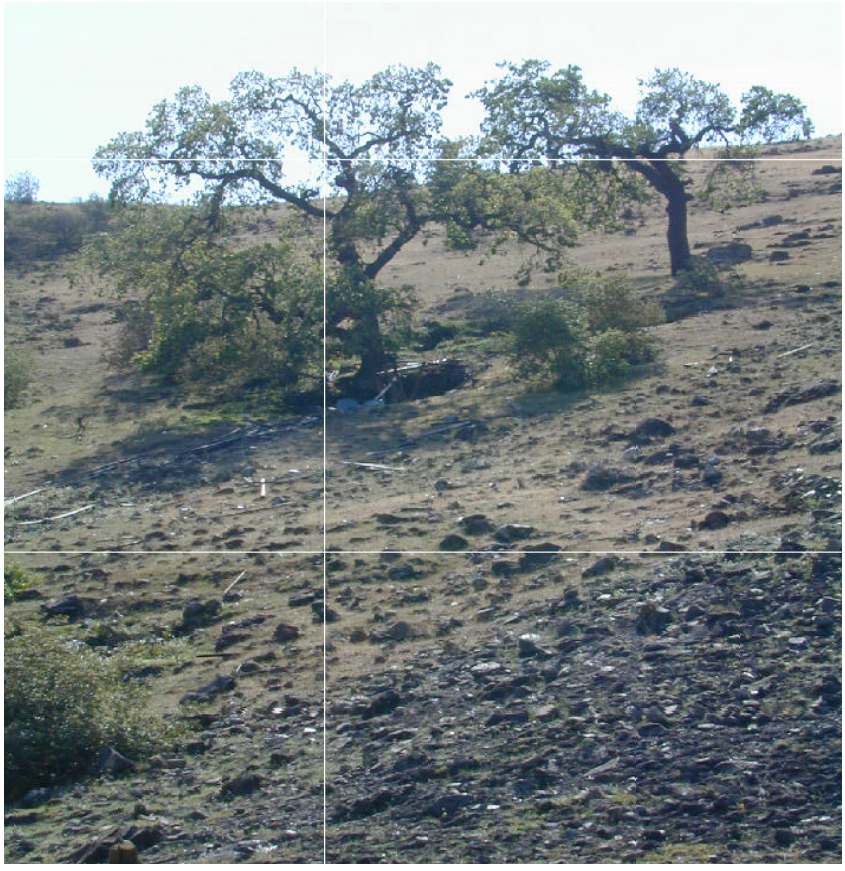

Photo 8 compared to April 2000

Photo 9 On the west side of Fisher Creek, the grass was taller and trees more lush in 1992.

Photo 10 In 2000, sow thistle dominates the ground cover.

Photo 11 Common Raven injured under a transmission tower on Tulare Hill, indicating that the risk of avian impact with the stacks and new transmission cables

Kenneth Shawn Smallwood
Curriculum Vitae

109 Luz Place
Davis, CA 95616
Phone (530) 756-4598
puma@davis.com

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

Affiliations:
Consulting in the Public Interest, www.cipi.com
Biological Sciences Department, California State University, Sacramento
Bioresources Consulting
Institute for Sustainable Development
Chairman, Conservation Affairs Committee, The Wildlife Society--Western Section

Disciplines:

Wildlife, ecosystem and landscape ecology; conservation biology; sampling methods and systems analysis; animal damage management.

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:

- 73 professional publications, 38 peer-reviewed
- 7 professional papers currently under peer-review
- 44 public presentations of research results at professional meetings

Part-time Faculty, 1/98 to present, California State University, Sacramento. I've taught Contemporary Environmental Issues, Natural Resources Conservation, Mammalogy, and Ornithology Lab.

Systems Ecologist, 7/96 to present, *Consulting in the Public Interest*. I am part of a multi-disciplinary consortium of scientists who facilitate large-scale, environmental planning projects and litigation. We provide risk assessments, assessments of management practices, and expert witness testimony.

Systems Ecologist, 1/95 to present, *Institute for Sustainable Development*. I head ISD's program on integrated resources management. I develop indicators of ecological integrity for large areas, using remotely sensed data, local community involvement and GIS.

Editorial Board Member, *Environmental Management*, 10/99 to present.

Lead Scientist, 6/96 to 6/99, *National Endangered Species Network*. I headed NESN's efforts to inform academic scientists and environmental activists about emerging issues regarding the Endangered Species Act and other environmental laws pertaining to legally rare species. I also testified at public hearings on behalf of environmental groups and endangered species.

Ecologist, 1/97 to 6/98, *Western Foundation of Vertebrate Zoology*. I conducted field research to determine the impact of past mercury mining on the status of red-legged frogs in Santa Clara County, California.

Associate Editor, *Biological Conservation*, 9/94 to 9/95. Administered independent scientific reviews of submitted, professional papers in ecology and conservation biology, and made recommendations to the Editors.

Senior Systems Ecologist, 7/94 to 12/95, *EIP Associates*, Sacramento, California. Provided consulting services in environmental planning. I also developed a quantitative assessment of land units for their conservation and restoration opportunities, using the ecological resource requirements of 29 legally rare species. I mapped vegetation and land use, and derived new spatial data from a GIS overlay of these variables with soil types, flood zones, roads, and other spatially referenced data. Using these derived data, I developed a set of indicators for prioritizing areas within Yolo County that will receive mitigation funds for habitat easements and restoration.

Post-Graduate Researcher, 10/90 to 6/94, with Dr. Shu Geng, *Department of Agronomy and Range Science, U.C. Davis*. 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. I also developed and analyzed a data base of energy use in California agriculture, and I assisted with a landscape (GIS) study of groundwater contamination across Tulare County, California.

Co-teacher, 1/91 to 6/91 and 1/93 to 6/93, *Graduate Group in Ecology, U.C. Davis*. Co-taught conservation biology with Dr. Christine Schonewald.

Reader, 3/90 to 6/90, *Department of Psychology, U.C. Davis*. Assisted students of Psychobiology (taught by Dr. Richard Coss) with research and writing term papers.

Research Assistant, 11/88 to 9/90, with Dr. Walter E. Howard, *Department of Wildlife and Fisheries Biology, U.C. Davis*. Tested durable baits for pocket gopher control in forest plantations, and developed gopher sampling methods.

Fulbright Research Fellow, Indonesia, 7/88 to 11/88. Tested use of new sampling methods for monitoring the number of Sumatran tigers, and evaluated methods used by other researchers.

Research Assistant, 7/87 to 6/88, with Dr. Terrell P. Salmon, *Wildlife Extension, Department of Wildlife and Fisheries Biology, U.C. Davis*. Developed 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, 3/85 to 6/87, with Dr. E. Lee Fitzhugh, *Wildlife Extension, Department of Wildlife and Fisheries Biology, U.C. Davis*. Developed and implemented a statewide mountain lion track count for long-term monitoring of numbers and distribution. Also developed quantitative techniques to identify individual mountain lions by their tracks, and to differentiate mountain lion and dog tracks.

Projects

Comments on environmental documents. I have been retained to comment on various environmental documents, including the Headwaters HCP, San Diego MSCP, Natomas Basin HCP, Giant Garter Snake Recovery Plan, Arroyo Southwestern Toad Recovery Plan, Peninsular Range Bighorn Sheep Recovery Plan, Ballona Wetlands Environmental Impact Report, Turn of the Century Environmental Impact Report, The California Board of Forestry's proposed amended Forest Practices Rules, the Negative Declaration for the Sunset Skyranch Airport Use Permit, and the California Energy Commission's Preliminary Staff Assessment of the proposed Metcalf Energy Center. I have testified before the California Coastal Commission, County Boards of Supervisors, and City Councils, and I have participated with press conferences.

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

Mapping of wind turbines and biological resources at Altamont Pass. Using GPS and GIS to map and study environmental impacts of 1,400 wind turbines.

Mapping of biological resources along Highways 46 and 41. Using GPS and GIS to delineate vegetation complexes and locations of special status species along 26 miles of highway in San Luis Obispo County, and in a large area north of Fresno.

Mercury effects on Red-legged Frog. Assisted Dr. Michael Morrison and US Fish and Wildlife Service in assessing the possible impacts of Santa Clara County's historical mercury mining on the federally listed red-legged frog. Also measured habitat in numerous 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." I obtained 188 signatures of scientists and environmental professionals on the letter submitted to the US Fish and Wildlife Service and the National Marine Fisheries Service. The letter was also provided to all US Senators. It helped change the prevailing view of HCPs as beneficial to listed species.

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

Cook *et al*. v. Rockwell International *et al*., No. 90-K-181 (D. Colorado). Providing 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 report based on three site visits and the most extensive document review of burrowing animals ever conducted. 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.

Hanford Nuclear Reservation Litigation. Providing 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 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.

Assessment of Environmental Technology Transfer to China, and Assessment of Agricultural Production System. Twice traveled to 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. Spent a total of five weeks in China, including in Shandong and Linxion Provinces and in Beijing.

Yolo County Habitat Conservation Plan. Conducted the landscape ecology study of Yolo County to identify the priority land units to receive mitigation so as to most improve the ecosystem functionality within the County from the perspective of 29 legally rare species of wildlife. 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 I developed implementation strategies.

Mountain Lion Track Count. Developed and conducted the 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. The transect was established on dusty, dirt roads within randomly selected quadrats. These roads are searched for tracks of the carnivores, which routinely use the roads for travel paths.

Sumatran Tiger and other Felids. Designed and conducted track counts for seven species of wild cats in Sumatra, including the Sumatran tiger, fishing cat, and golden cat. Spent four months

on Sumatra and Java, and learned Bahasa Indonesia (the official Indonesian language). I was awarded a Fulbright Research Fellowship to complete the project.

Wildlife in Agriculture. Beginning as my post-graduate research, I have 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 for six years. The data were analyzed using GIS and methods from landscape ecology, and the results were 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.

Representative Clients

Law offices and environmental groups	Government agencies	Businesses
Law Offices of Berger & Montague	US Department of Agriculture	Pacific Gas & Electric Co.
Law Offices of Roy Haber	US Forest Service	Southern California Edison Co
Law Offices of Edward MacDonald	US Fish & Wildlife Service	Georgia-Pacific Timber Co.
Law Office of John Gabrielli	California Department of Fish & Game	Northern Territories Inc.
California Wildlife Federation	California Department of Transportation	National Renewable Energy Lab
Defenders of Wildlife	California Department of Forestry	
Sierra Club	California Department of Food & Agriculture	
National Endangered Species Network	Sustainable Agriculture Research & Education Program	
Spirit of the Sage Council	County of Yolo	
The Humane Society	Tahoe Regional Planning Agency	
Californians for Renewable Energy		
Goldberg, Kamin & Garvin, Attorneys at Law		
Environmental Protection Information Center (EPIC)		

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 Clearcuts. Tested various poison baits and baiting regimes for pocket gopher control in forest plantations, and developed gopher sampling methods. Conducted the most extensive field study of pocket gophers ever, involving thousands of gophers in 68 research plots on 55 clearcuts 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. Developed 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:

Zhang, M., K. S. Smallwood, and E. Anderson. Relating indicators of ecological health and integrity to assess risks to sustainable agriculture and native biota. International Conference on Ecosystem Health.

Smallwood, K.S. and S. Geng. Pocket gopher (*Thomomys bottae*) density in alfalfa. Agriculture, Ecosystems & Environment: Accepted.

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Smallwood, K.S. and M.L. Morrison. 1999. Estimating burrow volume and excavation rate of pocket gophers (Geomyidae). *Southwestern Naturalist* 44:173-183.

Smallwood, K.S. and M.L. Morrison. 1999. Spatial scaling of pocket gopher (*Geomyidae*) density. *Southwestern Naturalist* 44:73-82.

Smallwood, K.S. 1999. Abating pocket gophers (*Thomomys* spp.) to regenerate forests in clearcuts. *Environmental Conservation* 26:59-65.

Smallwood, K.S. 1998. Patterns of black bear abundance. *Transactions of the Western Section of the Wildlife Society* 34:32-38.

Smallwood, K.S. 1998. On the evidence needed for listing northern goshawks (*Accipter gentilis*) under the Endangered Species Act: a reply to Kennedy. *J. Raptor Research* 32:323-329.

Smallwood, K.S., B. Wilcox, R. Leidy, and K. Yarris. 1998. Indicators assessment for Habitat Conservation Plan of Yolo County, California, USA. *Environmental Management* 22: 947-958.

Smallwood, K.S., M.L. Morrison, and J. Beyea. 1998. Animal burrowing attributes affecting hazardous waste management. *Environmental Management* 22: 831-847.

Smallwood, K.S, and C.M. Schonewald. 1998. Study design and interpretation for mammalian carnivore density estimates. *Oecologia* 113:474-491.

Zhang, M., S. Geng, and K.S. Smallwood. 1998. Nitrate contamination in groundwater of Tulare County, California. *Ambio* 27(3):170-174.

Smallwood, K.S. and M.L. Morrison. 1997. Animal burrowing in the waste management zone of Hanford Nuclear Reservation. *Proceedings of the Western Section of the Wildlife Society Meeting* 33:88-97.

Morrison, M.L., K.S. Smallwood, and J. Beyea. 1997. Monitoring the dispersal of contaminants by wildlife at nuclear weapons production and waste storage facilities. *The Environmentalist* 17:289-295.

Smallwood, KS (1997) Interpreting puma (*Puma concolor*) density estimates for theory and management. *Environmental Conservation* 24(3):283-289.

Smallwood, K.S. 1997. Managing vertebrates in cover crops: a first study. *American Journal of Alternative Agriculture* 11:155-160.

Smallwood, K.S. and S. Geng. 1997. Multi-scale influences of gophers on alfalfa yield and quality. *Field Crops Research* 49:159-168.

Smallwood, K.S. and C. Schonewald. 1996. Scaling population density and spatial pattern for terrestrial, mammalian carnivores. *Oecologia* 105:329-335.

Smallwood, K.S., G. Jones, and C. Schonewald. 1996. Spatial scaling of allometry for terrestrial, mammalian carnivores. *Oecologia* 107:588-594.

Van Vuren, D. and K.S. Smallwood. 1996. Ecological management of vertebrate pests in agricultural systems. *Biological Agriculture and Horticulture* 13:41-64.

Smallwood, K.S., B.J. Nakamoto, and S. Geng. 1996. Association analysis of raptors on an agricultural landscape. Pages 177-190 in D.M. Bird, D.E. Varland, and J.J. Negro, eds., Raptors in human landscapes. Academic Press, London.

Erichsen, A.L., K.S. Smallwood, A.M. Commandatore, D.M. Fry, and B. Wilson. 1996. White-tailed Kite movement and nesting patterns in an agricultural landscape. Pages 166-176 in

D.M. Bird, D.E. Varland, and J.J. Negro, eds., Raptors in human landscapes. Academic Press, London.

Smallwood, K.S. 1996. Assessment of the BIOPORT model's parameter values for pocket gopher burrowing characteristics. Report to Berger & Montague, P.C. and Roy S. Haber, P.C., Philadelphia.

Smallwood, K.S. 1995. Scaling Swainson's hawk population density for assessing habitat-use across an agricultural landscape. *J. Raptor Research* 29:172-178.

Smallwood, K.S. and W.A. Erickson. 1995. Estimating gopher populations and their abatement in forest plantations. *Forest Science* 41:284-296.

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Smallwood, K.S. and E.L. Fitzhugh. 1993. A rigorous technique for identifying individual mountain lions *Felis concolor* by their tracks. *Biological Conservation* 65:51-59.

Smallwood, K.S. 1993. Mountain lion vocalizations and hunting behavior. *The Southwestern Naturalist* 38:65-67.

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Smallwood, K.S. 1990. Turbulence and the ecology of invading species. Ph.D. Thesis, University of California, Davis.

Other Publications

Morrison, M.L., and K.S. .Smallwood. 1999. NTI plan evaluation and comments. Exhibit C in W.D. Carrier, M.L. Morrison, K.S. Smallwood, and Vail Engineering. Recommendations for NBHCP land acquisition and enhancement strategies. Northern Territories, Inc., Sacramento.

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Smallwood, K.S. 1997. Spatial scaling of pocket gopher (Geomyidae) burrow volume. Abstract in Proceedings of 44th Annual Meeting, Southwestern Association of Naturalists. Department of Biological Sciences, University of Arkansas, Fayetteville.

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EIP Associates. 1995. Yolo County Habitat Conservation Plan Biological Resources Report. Yolo County Planning and Development Department, Woodland, California.

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Geng, S., K.S. Smallwood, and M. Zhang. 1995. Sustainable agriculture and agricultural sustainability. Proc. 7th International Congress SABRAO, 2nd Industrial Symp. WSAA. Taipei, Taiwan.

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Smallwood, K.S. and E.L. Fitzhugh. 1989. Differentiating mountain lion and dog tracks. Pages 58-63 in Smith, R.H., ed. Proc. Third Mountain Lion Workshop. Arizona Game and Fish Department, Pheonix.

Fitzhugh, E.L. and K.S. Smallwood. 1989. Techniques for monitoring mountain lion population levels. Pages 69-71 in Smith, R.H., ed. Proc. Third Mountain Lion Workshop. Arizona Game and Fish Department, Pheonix.

Fitzhugh, E.L. and K.S. Smallwood. 1987. Methods Manual – A statewide mountain lion population index technique. California Department of Fish and Game, Sacramento.

Salmon, T.P. and K.S. Smallwood. 1989. Final Report – Evaluating exotic vertebrates as pests to California agriculture. California Department of Food and Agriculture, Sacramento.

Smallwood, K.S. and W. A. Erickson (written under supervision of W.E. Howard, R.E. Marsh, and R.J. Laacke). 1990. Environmental exposure and fate of multi-kill strychnine gopher baits. Final Report to USDA Forest Service –NAPIAP, Cooperative Agreement PSW-89-0010CA.

Fitzhugh, E.L., K.S. Smallwood, and R. Gross. 1985. Mountain lion track count, Marin County, 1985. Unpublished report on file at Wildlife Extension, University of California, Davis.

Posters at Professional Meetings

Smallwood, K.S. and E.L. Fitzhugh. 1989. Differentiating mountain lion and dog tracks. Third Mountain Lion Workshop, Prescott, AZ.

Smith, T. R. and K. S. Smallwood. 2000. Effects of study area size, location, season, and allometry on reported *Sorex* shrew densities. Annual Meeting of the Western Section of The Wildlife Society.

Papers In Review

Smallwood, K.S., M. Zhang, and S. Geng. Landscape effects on pocket gopher density in alfalfa.

Geng, S., Yixing Zhou, Minghua Zhang, and K. Shawn Smallwood. A Sustainable Agro-ecological Solution to Water Shortage in North China Plain (Huabei). Environmental Management.

Jones, G., W. D. Sterling, and K. S. Smallwood. A model for spatial scaling effects in ecological density estimation.

Morrison, Michael L., K. Shawn Smallwood, Daniel C. Pearson, Carl G. Thelander, with contributions (in alphabetical order) from H. Resit Akcakaya, Peter A. Bowler, Robert R. Copper, Patrick Foley, Brian Loew, John McCaull, David E. Moser, Richard Redak, and Thomas A. Scott. Role of ecological restoration in habitat conservation plans.

Wilcox, B. A., K. S. Smallwood, and J. R. Kahn. Toward indicators for ecosystem health and natural capital of forest ecosystems. International Conference on Ecosystem Health.

Smallwood, K.S., Conservation Affairs Committee, The Wildlife Society—Western Section. Suggested standards for science applied to conservation issues.

Smallwood, K.S., and S. Anderson. Using a Geographic Positioning System (GPS) to map wildlife and habitat.

Papers in Preparation (Soon to be Submitted)

Smallwood, K.S. The allometry of density within the space used by populations of Mammalian Carnivores.

Smallwood, K.S. Mountain lions in Utopia. Book.

Smallwood, K.S. Estimating prairie dog impacts on the environment.

Smallwood, K.S., and T.R. Smith. Study design and interpretation of Sorex density estimates.

Smallwood, K.S. A biologist's view of CEQA.

Stitt, E. and K. S. Smallwood. Study design and interpretation of Natracine snakes.

Smallwood, K. Shawn, Lourdes Rugge, Stacia Hoover, Michael Morrison, and Carl Thelander. Intra- and inter-turbine string comparison of fatalities to animal burrow densities at Altamont Pass.

Presentations:

Using a Geographic Positioning System (GPS) to map wildlife and habitat. Annual Meeting of the Western Section of The Wildlife Society, Riverside, CA, January, 2000.

Suggested standards for science applied to conservation issues. Annual Meeting of the Western Section of The Wildlife Society, Riverside, CA, January, 2000.

The indicators framework applied to ecological restoration in Yolo County, California. Society for Ecological Restoration, September 25, 1999.

Ecological restoration in the context of animal social units and their habitat areas. Society for Ecological Restoration, September 24, 1999.

Relating Indicators of Ecological Health and Integrity to Assess Risks to Sustainable Agriculture and Native Biota. International Conference on Ecosystem Health, August 16, 1999.

A crosswalk from the Endangered Species Act to the HCP Handbook and real HCPs. Southern California Edison, Co. and California Energy Commission, March 4-5, 1999.

Mountain lion track counts in California: Implications for Management. Ecological & Environmental Issues Seminar, Department of Biological Sciences, California State University, Sacramento, November 4, 1998.

"No Surprises" -- Lack of science in the HCP process. California Native Plant Society Annual Conservation Conference, The Presidio, San Francisco, September 7, 1997.

In Your Interest. A half hour weekly show aired on Channel 10 Television, Sacramento. In this episode, I served on a panel of experts discussing problems with the implementation of the Endangered Species Act. Aired August 31, 1997.

Spatial scaling of pocket gopher (*Geomyidae*) density. Southwestern Association of Naturalists 44th Meeting, Fayetteville, Arkansas, April 10, 1997.

Estimating prairie dog and pocket gopher burrow volume. Southwestern Association of Naturalists 44th Meeting, Fayetteville, Arkansas, April 10, 1997.

Ten years of mountain lion track survey. Fifth Mountain Lion Workshop, San Diego, February 27, 1996.

Study and interpretive design effects on mountain lion density estimates. Fifth Mountain Lion Workshop, San Diego, February 27, 1996.

Small animal control. Session moderator and speaker at the California Farm Conference, Sacramento, California, Feb. 28, 1995.

Small animal control. Ecological Farming Conference, Asylomar, California, Jan. 28, 1995.

Habitat associations of the Swainson's Hawk in the Sacramento Valley's agricultural landscape. 1994 Raptor Research Foundation Meeting, Flagstaff, Arizona.

Alfalfa as wildlife habitat. Seed Industry Conference, Woodland, California, May 4, 1994.

Habitats and vertebrate pests: impacts and management. Managing Farmland to Bring Back Game Birds and Wildlife to the Central Valley. Yolo County Resource Conservation District, U.C. Davis, February 19, 1994.

Management of gophers and alfalfa as wildlife habitat. Orland Alfalfa Production Meeting and Sacramento Valley Alfalfa Production Meeting, February 1 and 2, 1994.

Patterns of wildlife movement in a farming landscape. Wildlife and Fisheries Biology Seminar Series: Recent Advances in Wildlife, Fish, and Conservation Biology, U.C. Davis, Dec. 6, 1993.

Alfalfa as wildlife habitat. California Alfalfa Symposium, Fresno, California, Dec. 9, 1993.

Management of pocket gophers in Sacramento Valley alfalfa. California Alfalfa Symposium, Fresno, California, Dec. 8, 1993.

Association analysis of raptors in a farming landscape. Plenary speaker at Raptor Research Foundation Meeting, Charlotte, North Carolina, Nov. 6, 1993.

Landscape strategies for biological control and IPM. Plenary speaker, International Conference on Integrated Resource Management and Sustainable Agriculture, Beijing, China, Sept. 11, 1993.

Landscape Ecology Study of Pocket Gophers in Alfalfa. Alfalfa Field Day, U.C. Davis, July 1993.

Patterns of wildlife movement in a farming landscape. Spatial Data Analysis Colloquium, U.C. Davis, August 6, 1993.

Sound stewardship of wildlife. Veterinary Medicine Seminar: Ethics of Animal Use, U.C. Davis. May 1993.

Landscape ecology study of pocket gophers in alfalfa. Five County Grower's Meeting, Tracy, California. February 1993.

Turbulence and the community organizers: The role of invading species in ordering a turbulent system, and the factors for invasion success. Ecology Graduate Student Association Colloquium, U.C. Davis. May 1990.

Evaluation of exotic vertebrate pests. Fourteenth Vertebrate Pest Conference, Sacramento, California. March 1990.

Analytical methods for predicting success of mammal introductions to North America. The Western Section of the Wildlife Society, Hilo, Hawaii. February 1988.

A state-wide mountain lion track survey. Sacramento County Dept Parks and Recreation. April 1986.

The mountain lion in California. Davis Chapter of the Audubon Society. October 1985.

Ecology Graduate Student Seminars, U.C. Davis, 1985-1990: Social behavior of the mountain lion; Mountain lion control; Political status of the mountain lion in California.

Memberships in Professional Societies:

Western Section of the Wildlife Society
Association of Southwest Naturalists
Raptor Research Foundation

Society for Ecological Restoration

Honors and Awards:

Certificate of Appreciation, The Wildlife Society—Western Section, 2000
Fulbright Research Fellowship to Indonesia, 1987.
Northern California Athletic Association Most Valuable Cross Country Runner, 1984.
National Junior Record, 20 kilometer run, 1982.
J.G. Boswell Full Academic Scholarship, 1981 (Paid expenses for undergraduate education).
American Legion Award, Corcoran High School, 1981, and John Muir Junior High, 1977.
CIF Section Champion, Cross Country in 1978 and Track & Field 2 mile run in 1981.
National Age Group Record, 1500 meter run, 1978.

References:

Professor-Emeritus K.E.F. Watt, Department of Zoology, University of California, Davis, CA 95616. (530) 752-1558.

Dr. Michael Morrison, Department of Biological Sciences, California State University, Sacramento CA 95819. (916) 683-0464

Dr. Jan Beyea, Consulting in the Public Interest, 53 Clinton Street, Lambertville, New Jersey, 08530. (609) 397-2370

Dr. Bruce Wilcox, Center for Conservation Research and Training, University of Hawaii, Gilmore 405, 3050 Maile Way, Honolulu, HI 96822. bwilcox@hawaii.edu

Dr. Gene R. Trapp, Department of Biological Sciences, California State University, Sacramento, CA 95819-6077 Phone: (916) 278-6279 FAX : (916) 278-6993 e-mail: trappgr@csus.edu

Dr. Christine Schonewald, Biological Resources Division, US Geological Survey, Department of Environmental Studies, University of California, Davis, CA 95616. (530) 752-9162.

Professor Richard G. Coss, Department of Psychology, University of California, Davis, CA 95616. (530) 752-1626.

Professor Shu Geng, Department of Agronomy and Range Science, University of California, Davis, CA 95616. (530) 752-6939.

CAlifornians for Renewable Energy, Inc. (CARE)
821 Lakeknoll Dr.
Sunnyvale, CA 94089