State of California - The Resources Agency
ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
Central Region
1234 East Shaw Avenue
Fresno, California 93710
(559) 243-4593

DOCKET
08-AFC-2
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February 19, 2009

Susan Sanders
Susan Sanders Biological Consulting
12213 Half Moon Way
Nevada City, California 95959

Subject: Technical Memorandum, Beacon Solar Energy Project, Pine Tree Creek, California City, Kern County Streambed Alteration Notification 2008-0146-R4

Dear Ms. Sanders:

The Department of Fish and Game (Department) has requested technical assistance from Kris Vyverberg, Senior Engineering Geologist with the Department, regarding documents submitted to the Department by Beacon Solar LLC. as part of a Streambed Alteration Notification for Pine Tree Creek. The attached Technical Memorandum prepared by Ms. Vyverberg on February 10, 2009, is based on her review of the following documents:

- Drainage Study, Attachment 6, *prepared for* Beacon Solar, LLC by Carlton Engineering, June 2008.
- Supplemental Drainage Study, Attachment 6, Response to California Energy Commission (CEC) Staff Data Requests including Attachment DR-44 (Calculations) and Attachment DR-45 (Conceptual Grading, Cut/Fill, and Channel Cross Sections), *prepared for* Beacon Solar, LLC by Carlton Engineering, August 2008.
- Conceptual Mitigation Plan, Attachment 8, *prepared for* Beacon Solar, LLC by EDAW, Inc., July 2008.
- Revised Conceptual Mitigation Plan, Attachment 8, *prepared for* Beacon Solar, LLC by EDAW, Inc., August 2008.

PROOF OF SERVICE (REVISED 2/9/09) FILED WITH
ORIGINAL MAILED FROM SACRAMENTO ON 3/4/09
MS

Thank you for the opportunity to provide additional comments and recommendations regarding the proposed rerouting of the Pine Tree Creek. If you have any questions regarding these comments, please contact Annette Tenneboe, Environmental Scientist, at 1234 East Shaw Avenue, Fresno, California 93710 or by telephone at (559) 243-4014, extension 231.

Sincerely,

Jeffrey R. Single, Ph.D.
Regional Manager

Attachments (2)

cc: Rick York
California Energy Commission
Environmental Office
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Sacramento, California 9581

✓Eric Solorio
California Energy Commission
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1516 Ninth Street, MS 40
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ec: Julie Means
Senior Environmental Scientist

Julie Vance
Senior Environmental Scientist

Annette Tenneboe
Environmental Scientist

Kris Vyverberg
Senior Engineering Geologist

Interoffice Technical
MEMORANDUM

To: Annette Tenneboe, Central Region

From: Kris Vyverberg, Fisheries Engineering Team

Date: 10 February 2009

Subject: Beacon Solar Energy Project, Pine Tree Creek, California City, Kern County

Per your request, I reviewed the Beacon Solar Energy Project reports and plans collectively submitted as part a Streambed Alteration Agreement (SAA) notification package for a project that would result in permanent impacts to jurisdictional waters of the state. To optimize use of the project area, the applicant proposes to reroute Pine Tree Creek and a portion of a smaller, unnamed wash around the site. The changes to the unnamed wash appear to be designed and appropriately mitigated for and are not further discussed here.

The comments and recommendations that follow are based on my review of four Beacon Solar Energy Project report elements:

- Drainage Study, Attachment 6, *prepared for* Beacon Solar, LLC by Carlton Engineering, June 2008
- Supplemental Drainage Study, Attachment 6, Response to California Energy Commission (CEC) Staff Data Requests including Attachment DR-44 (Calculations) and Attachment DR-45 (Conceptual Grading, Cut/Fill, and Channel Cross Sections), *prepared for* Beacon Solar, LLC by Carlton Engineering, August 2008
- Conceptual Mitigation Plan, Attachment 8, *prepared for* Beacon Solar, LLC by EDAW, Inc., July 2008
- Revised Conceptual Mitigation Plan, Attachment 8, *prepared for* Beacon Solar, LLC by EDAW, Inc., August 2008

My review was also informed by reference to the following Kern County Engineering & Survey Services Department and US Army Corps of Engineers documents:

- Kern County Division Four Standards for Drainage
- Kern County Hydrology Manual
- Design and Construction of Levees, Engineer Manual EM 1110-2-1913, 2000

Comments and Recommendations

1. **The project proponent should be advised to revisit their channel geometry and hydraulic analyses and to revise the proposed channel design accordingly.** This recommendation is based on the following:
   - **The radius of curvature used to develop the channel geometry of Turn 1 is incorrect:** The centerline radius of curvature is used to develop the channel geometry of the turn, and is a variable in the equation used to compute the increase in water surface elevations as the design high flow (100-year recurrence interval event) sweeps through turns. This water surface elevation is then used to derive the channel depth necessary to keep the design flow event within the banks of the constructed channel. The proposed design specifies an outside radius of curvature of 1800 feet, a centerline radius of 600 feet, and an inside radius of 970 feet (pages 4 and S-4, Attachment 6 and Supplemental Drainage Study Attachment 6, respectively). The radii lengths are incorrect: <u>the centerline radius of 600 feet should be greater, not less than the inside radius of 900 feet</u>. The shorter the radius of curvature, the tighter the turn, and the greater the boundary shear stress and velocity gradient directed at the outer bank resulting in accelerated erosion at the turn. Thus the Kern County requirement that <u>the minimum centerline radii for curves in constructed channels be three (3) times the top width of the design water surface</u> (Section 410-4.02, Kern County Division Four Standards for Drainage).

     Although the top width of the design water surface used to derive the geometry of Turn 1 is not provided, the hydraulic data provided for the top width of the water surface at the entrance and exit of the turn suggest that a correct radius might range from a minimum of 1137 feet to a maximum of 4833 feet (pages 11-12, Calculations, Attachment DR-44, Supplemental Drainage Study: 3 x 379' = 1137' or 3 x 1611' = 4833').

   - **The channel design and hydraulic detail at the interface of the natural desert wash with the constructed channel is incomplete and thus not adequate to evaluate the stability and sustainability of the proposed channel design or its potential impact on the surrounding landscape.** For example: (1) although there is a radical change in channel cross sectional width from 1600 feet to 345 feet no hydraulic analyses or design details are provided for this critical transition area between the natural channel and the entrance to the constructed channel, and (2) none of the design drawings provided show the local topography or channel dimensions of the Pine Tree Creek channel anywhere other than within the project boundaries. This even though (1) the exit of the constructed channel will intersect another desert wash at or just beyond the eastern boundary or the project area, and (2) the southeast end of Section

A-A near the entrance of the constructed channel extends across the channel to the right bank of the creek some distance beyond the southern boundary and the cross section clearly indicates work will be done outside of the project boundaries.

- **Rock lining the low flow channel in either of the two proposed design scenarios will result in an increased rather than decreased threat of erosion due to differences in roughness between the lined and unlined portions of the channel** (page S-2, S-6 and Design Sheet C5, Channel Geometry and Roughness, Drainage Study supplement, Attachment 6). Lining only the low flow channel will result in erosion at the interface of the lined and unlined sections of the channel. Similarly, rock lining the entire channel width will result in erosion where the rock lining ends and the unlined portion of the channel begins. Presuming the design depth of the rock keyway along the right and/or left bank of the constructed channel is based on an actual scour analysis this project element should provide adequate protection of the constructed channel from the threat of meander-induced erosion in the straight reaches of the channel.
- **The concrete energy dissipation/flow spreading structure at the exit of the constructed channel is likely to be similarly plagued by erosion.** At a minimum, we should anticipate that sediment deposition will occur downstream of the vertical elements of the structure and that this change in sediment load in combination with the reduced roughness of the concrete will result in channel degradation at the downstream end of the structure.
- **Absence of embankment toe protection at Turn 1 and 2.** No rock protection is indicated where – in my opinion and experience – it is most certainly called for given the calculated water velocities, the radical changes in cross-sectional area proposed, the increased erosive energy that will be directed at the bed and bank at these locations during high flow events due (in part) to a predictable shift in erosive energy that will occur regardless of whether or not the low flow channel is lined with rock.
- **The design dimensions for the low flow channel are provided but not the flow event for which the channel was designed.**

In addition to the corrections and additional hydraulic channel geometry detail noted above, the project proponent should also be asked to provide a longitudinal survey profile and two additional cross sections. The longitudinal profile should include the entire length of the constructed channel and the natural channel reaches most susceptible to project-induced erosion up- and downstream of the project. The profile should begin in the natural channel well upstream of the start of Turn 1, continue through the constructed channel, and extend downstream to the confluence of the

constructed channel with the desert wash that comes into the project area at the approximate mid-point of the eastern project boundary (Figure 1). This profile will provide the detail necessary to evaluate channel stability in these transitional areas, and will provide the baseline from which future project performance and mitigation effectiveness can be evaluated. The upstream-most cross section should be in the natural channel of Pine Tree Creek upstream of the entrance to the constructed channel; the downstream-most cross section should extend across the outlet of the constructed channel and completely span the unnamed desert wash near its confluence with the channel exit (Figure 1). These cross sections should be included in the revised hydraulic analysis provided for the project.

2. **The project proponent should provide design details for the leveed sections of the constructed channel, or provide design details for the "dirt berms" as proposed along with an explanation of why these project elements should be considered exempt from Kern County levee design and construction requirements.**
   - The Kern County Standards for Drainage require that when a designed water surface is within the embankment area, (*i.e.,* within the bounds of the constructed channel as is the case of the proposed design), *"...the design and construction of the channel...be in accordance with the levee design criteria, including freeboard requirements"* (Section 410-2.02, Chapter X, Constructed Channel Design Criteria and Chapter XI, Levee Design). In addition to more rigorous freeboard requirements, these design criteria require that levees be designed in accordance with the latest version of the USACE Design and Construction of Levees (Engineering Manual EM 1110-2-1913).
   - **The proposed channel depth is not adequate and dirt berms are not engineered levees.** Per Kern County Standards for Drainage specifications for constructed channels and as indicated by the design reports and drawings, a minimum channel depth of 13 feet (including freeboard) is required at the entrance to Turn 1 and Straight Reach 1, and a minimum channel depth of 8 feet is required along Straight Reach 2 (Summary Tables, pages S-5-7, Attachment DR-44, Supplemental Drainage Study, and Sections A-A, B-B, and E-E, Drawing Sheets C-5 and C6). The design drawings indicate that these depth requirements are accomplished by the addition of "dirt berms" 5 feet and 3.5 feet high above the otherwise overly shallow 8 and 5-foot depths of the constructed channel at these locations.

3. **The project proponent should be advised to revisit the proposed mitigation plan because:**
   - The existing plan is based on the flawed assumption that the low flow/channel

thalweg is a static feature that can (1) be pinned in place without inducing bed and bank erosion detrimental to proposed in-channel mitigation work, or (2) can be pinned in place so as not to contribute to bed and bank erosion at the channel bends.

- The existing plan is based on the assumption that the constructed channel will eventually replicate the functions and wildlife values of a natural desert wash although the channel geometry and hydraulic design does essentially nothing to protect the processes that would be necessary to naturally create and maintain the physical form and function of this habitat.
- The existing mitigation plan does not address how the mitigation work will be protected against, or be adjusted for in response to, the potentiality identified in the Drainage Study that the high water velocities (8.2-12 feet per second) may require additional post-project erosion control measures and materials in specified and unspecified areas of the channel.

Lastly, if it is the intent of this department and the California Energy Commission to see the impacts of rerouting this creek mitigated onsite and in-channel, I most strongly recommend that the project proponent be encouraged to consult with a fluvial geomorphologist with expertise in arid system channel design.

Call if you have any questions. And, if it would be helpful to you, please feel free to refer California Energy Commission staff to me if they would like to discuss any of the above in greater detail.

Regards,

Kris Vyverberg
Senior Engineering Geologist
Fisheries Engineering Program
Regional Operations Division

Attachment

cc: Department of Fish and Game – Lake and Streambed Alteration Program
Cathie Vouchilas
Serge Glushkoff

Department of Fish and Game – Region 4
Dale Stanton, Hydraulic Engineer

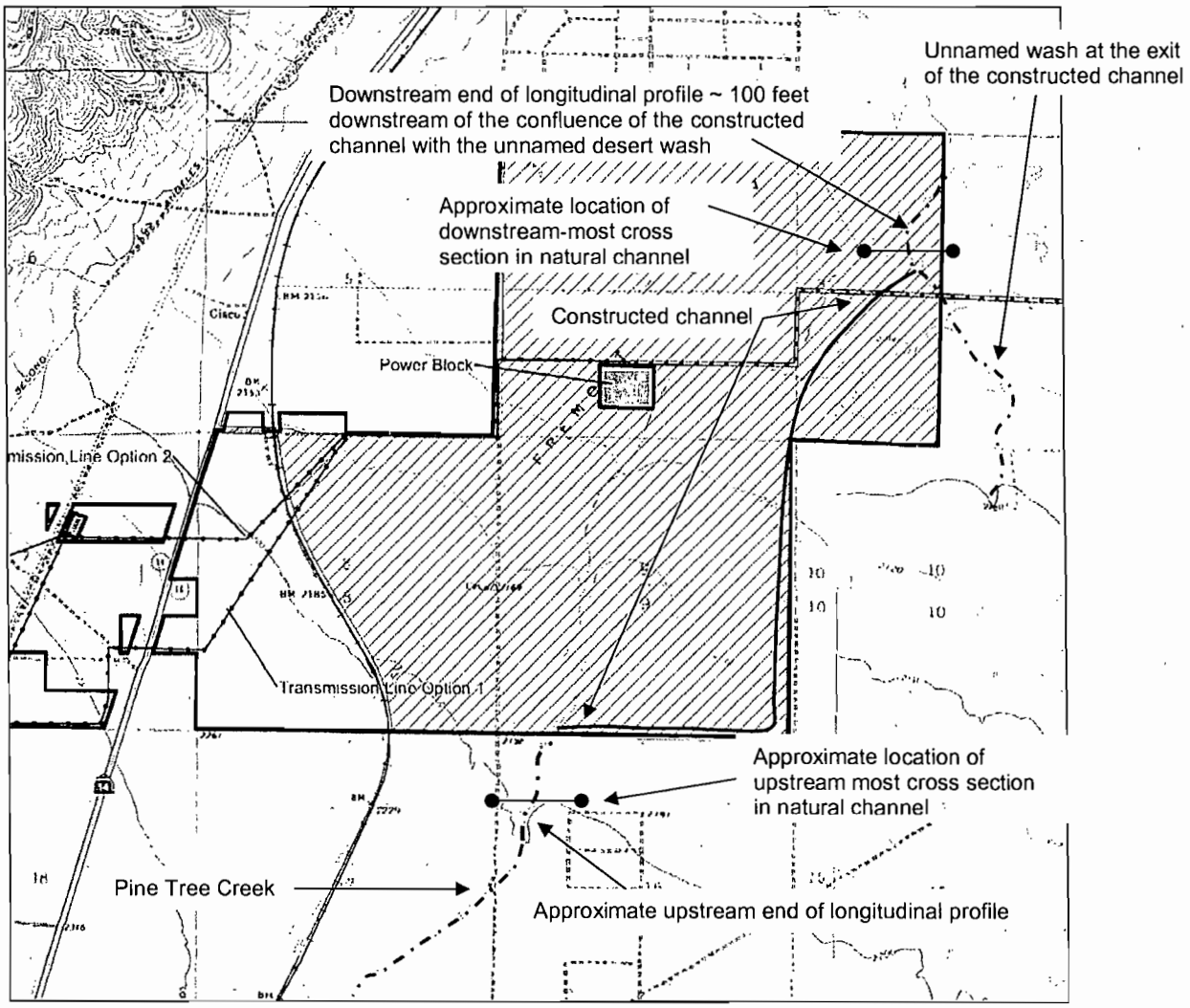

Figure 1. Approximate extent of the recommended longitudinal profile and additional cross sections of Pine Tree Creek and the constructed channel. The profile should begin upstream of the channel entrance and beyond the proposed construction footprint, extend along the entire length of the constructed channel and continue at least 100 feet downstream of the channel exit and its confluence with the unnamed desert wash on the east side of the project boundary.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION
For the *BEACON SOLAR ENERGY PROJECT*

Docket No. 08-AFC-2

PROOF OF SERVICE
(Revised 2/9/09)

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DECLARATION OF SERVICE

I, Maria Santourdjian, declare that on March 11, 2009, I served and filed copies of the attached CDFG Technical Memorandum Streambed Alteration. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[www.energy.ca.gov/sitingcases/beacon]**. The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

FOR SERVICE TO ALL OTHER PARTIES:

__✓__ sent electronically to all email addresses on the Proof of Service list;

__✓__ by personal delivery or by depositing in the United States mail at Sacramento, CA with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

FOR FILING WITH THE ENERGY COMMISSION:

__✓__ sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (***preferred method***);

OR

_____ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-4
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Maria Santourdjian