MEMORANDUM

DATE August 1, 2017

TO Tim Snellings, Dan Breedon, Pete Calarco, and Chuck Thistlethwaite

FROM Tanya Sundberg

SUBJECT Weighted Raster Overlay Model

To help stakeholders and County staff explore possible options for the optimal locations for utility-scale solar energy facility development, PlaceWorks worked with County staff to prepare a "weighted raster overlay model" using Geodesign. This memo explains the components and functionality of the final model, and how it was used to identify the locations in Butte County with the best attributes for utility-scale solar facility development. The results of that analysis are available in the PowerButte Utility-Scale Solar Guide mapping tool (available at power.buttecounty.net), with the darker colors identifying the most suitable areas in the county. Please note that all utility-scale solar development is subject to a conditional use permit (CUP) and may not necessarily be approved, even if the project is located in a desirable area based upon the suitability analysis.

The following are key definitions and key concepts related to the model:

» There are seven "layers" used in the model, each of which is described below. The layers are the criteria that were used in the analysis. Each layer is assigned a weight, which is a percentage of the total score, and together the seven layers must add up to 100 percent. To ensure that the model functions properly, it is limited to seven layers. However, some layers address multiple "factors." For example, the Constrained Areas layer combines many different constraint factors into one layer. The layers used in the analysis and the factors that are considered in each layer are described in detail in this memo.

» All locations that are to be excluded from consideration in the model are assigned a value of 0 in the corresponding layer. Because the model uses multiplication in determining the score, once a 0 value is used, that location will always have a score of 0 and therefore be excluded from consideration.

» The scores assigned to each location, by layer, are tallied up in the model, so that each location has a total score. The resulting map uses a color gradient to demonstrate the most suitable areas based on this score. A higher scope means a more suitable area.

The following sections of this memo describe each layer and the factors that it considers, and presents the approaches to weighting each layer in the model.

Layer Descriptions

This section presents the layers, the factors that are addressed in each layer, and the data sources for each factor.

1. UNSUITABLE AREAS

The following factors identify areas where utility-scale solar facility development is prohibited under the current Zoning Ordinance or where the County considers solar facility development to be incompatible with existing resources or site conditions.

» Important Farmland: Prime Farmland, Farmland of Statewide Significance, and Unique Farmland (*Source: California Department of Conservation Farmland Mapping and Monitoring Program, 2014*)

» Urban Residential and Planned Unit Development (PUD) Zones; this includes the following zones: (*Source: Butte County GIS, 2015*)

- VLDR
- VLDR-2.5
- VLDCR
- LDR
- MDR
- MHDR
- HDR
- VHDR
- PUD

» Airport Land Use Compatibility Zone A (*Source: Butte County GIS, 2015*)

» Areas with Sensitive Biological Resources:

- Conservation Areas (*Source: Butte County Department of Development Services, 2017*)
- Critical Habitat (*Source: Butte County Association of Governments [BCAG], 2015*)
- Meadowfoam Preserve (*Source: BCAG, 2015*)

» State, Federal, Tribal, and Municipal Lands

- City/Town Limits (*Source: Butte County GIS, 2015)*
- Tribal Lands (*Source: Butte County GIS, 2015*)
- State and Federal Lands (*Sources: California Spatial Information Library, US Fish & Wildlife Service [USFWS], California Gap Analysis Project, 2015*)

This layer's scoring approach is as follows:

» Locations within the unsuitable areas = 0 (i.e., excluded)

» Locations not within the unsuitable areas = 9 (i.e., not excluded)

2. FARMLAND CATEGORIES

This layer includes the farmland categories from the Farmland Mapping and Monitoring Program (*California Department of Conservation, 2014*). Prime Farmland, Farmland of Statewide Importance, and Unique Farmland are also listed under Unsuitable Areas. The categories are scored as follows:

» Prime Farmland, Farmland of Statewide Importance, and Unique Farmland = 0 (i.e., excluded)

» Grazing Land = 2 (i.e., highly constrained)

» All other categories (Urban, Water, and Other) = 9 (i.e., not constrained)

3. CONSTRAINED AREAS

This layer identifies other constraints related to land use compatibility, biological resources, agricultural resources, and natural hazards. It includes the following factors:

» Land Use Compatibility
- Non-Urban Residential Parcels Less than 20 Acres; includes parcels less than 20 acres in size in the following zones: (*Source: Butte County GIS, 2015*)
    - FR
    - FCR
    - RR
    - RCR
- Commercial and Industrial Areas; includes parcels with the following General Plan land use designations (*Source: Butte County GIS, 2015)*
    - Industrial
    - Research and Business Park
    - Retail and Office
    - Recreation Commercial
    - Sports and Entertainment
    - Mixed Use
- Airport Land Use Compatibility Zones B through D[1] (*Source: Butte County GIS, 2015*)
- Scenic Highway Overlay Zone (*Source: Butte County GIS, 2015*)

» Biological Resources
- Wetlands (*Sources: USFWS and BCAG, 2015*)
- Oak Woodlands (*Source: BCAG, 2015*)
- Migratory Deer Ranges (*Source: Butte County GIS, 2015*)

» Agricultural Resources
- Williamson Act Lands (*Source: Butte County GIS, 2015*)

» Natural Hazards
- Severe Erosion Hazard Areas (*Source: Butte County GIS, 2015*)

[1] Airport Land Use Compatibility Zone A is included in the Unsuitable Areas layer.

- Fire Hazard Zones; includes High and Very High Fire Hazard Severity Zones (*Source: California Department of Forestry and Fire Protection [CALFIRE], 2011*)
- 100-Year Flood Hazard Areas (*Source: Federal Emergency Management Agency [FEMA], 2011*)

This layer's scoring approach is as follows:

» Locations within the areas listed above, except for wetlands, fire hazard zones, 100-year flood hazard areas, and non-urban residential parcels less than 20 acres = 1 (i.e., very constrained)

» Locations within wetlands, 100-year flood hazard areas, and non-urban residential parcels less than 20 acres = 3 (i.e., highly constrained)

» Locations within the fire hazard zones = 5 (i.e., constrained)

» Locations not within the areas listed above = 9 (i.e., not constrained)

4. CONSTRAINED BUFFERS

This layer includes constraint factors that are based on a buffer analysis. It includes the following factors and scoring approaches:

» Proximity to Parcels with a Residential General Plan Land Use Designation (*Source of General Plan Land Use Designation Data: Butte County GIS, 2015*):
  - Locations within 1,000 feet of a residential designation = 1 (i.e., very highly constrained)
  - Locations 1,000 to 2,000 feet from a residential designation = 3 (i.e., highly constrained)
  - Locations 2,000 to 3,000 feet from a residential designation = 5 (i.e., moderately constrained)
  - Locations 3,000 to 4,000 feet from a residential designation = 7 (i.e., minimally constrained)
  - Locations more than 4,000 feet from a residential designation = 9 (i.e., not constrained)

» Scenic Highway Buffers (*Source of Scenic Highway Data: Butte County GIS, 2015*):
  - Locations within 1,000 feet of a General Plan-identified scenic highway = 1 (i.e., highly constrained)
  - Locations 1,000 to 2,000 feet from a General Plan-identified scenic highway = 3 (i.e., moderately constrained)
  - Locations 2,000 to 3,000 feet from a General Plan-identified scenic highway = 5 (i.e., constrained)
  - Locations 3,000 to 4,000 feet from a General Plan-identified scenic highway = 7 (i.e., less constrained)
  - Locations more than 4,000 feet from a General Plan-identified scenic highway = 9 (i.e., not constrained)

5. PARCEL SIZE

This layer rates parcels according to their size. Adjacent parcels under the same ownership are grouped as one parcel for size purposes. The scoring for parcel size is based on guidance from the National Renewable Energy Laboratory (NREL) and is as follows: (*Source of Parcel Data: Butte County GIS, 2015*)

» Less than 2 acres = 1 (i.e., least feasible)
» 2 to 5 acres = 3 (i.e., less feasible)
» 5 to 10 acres = 5 (i.e., feasible)
» 10 to 20 acres = 7 (i.e., more feasible)
» More than 20 acres = 9 (i.e., most feasible)

6. OPPORTUNITY AREAS

This layer identifies areas that are conducive to utility-scale solar development, including areas that have limited opportunities for other uses. This layer includes the following factors and scoring:

» Areas with Limited Opportunities for Other Uses
    - Solid Waste Management Facility Overlay Zone (*Source: Butte County GIS, 2015*)
    - Contaminated Sites (*Source: California Department of Toxic Substances Control – Envirostor, 2015*)
» Urban Permit Areas, as identified in the Draft Butte Regional Conservation Plan (*Source: BCAG, 2015*)
» Non-Urban Residential Parcels More than 20 Acres; includes parcels greater than or equal to 20 acres in size in the following zones: (*Source: Butte County GIS, 2015*)
    - FR
    - FCR
    - RR
    - RCR

This layer's scoring approach is as follows:

» Locations not within the opportunity areas = 1 (i.e., least opportune)
» Locations within the opportunity areas = 9 (i.e., more opportune)

7. OPPORTUNITY BUFFERS

This layer identifies areas that are conducive to utility-scale solar development based on a buffer analysis. This layer includes the following factors and scoring:

» Proximity to Transmission Lines (*Source: Platts, a data vendor, 2015*)
    - More than 2,000 feet from a transmission line = 1 (i.e., least opportune)
    - 1,501 to 2,000 feet from a transmission line = 3 (i.e., less opportune)

- 1,001 to 1,500 feet from a transmission line = 5 (i.e., opportune)
- 501 to 1,000 feet from a transmission line = 7 (i.e., more opportune)
- Within 500 feet of a transmission line = 9 (i.e., most opportune)

» Proximity to Substations (*Source: Platts, a data vendor, 2015*)

- More than 5 miles from a substation = 1 (i.e., least opportune)
- 4 to 5 miles from a substation = 3 (i.e., less opportune)
- 2 to 4 miles from a substation = 5 (i.e., opportune)
- 1 to 2 miles from a substation = 7 (i.e., more opportune)
- Within 1 mile of a substation = 9 (i.e., most opportune)

Model Weighting

The model weights each layer as indicated below, which emphasizes the importance of the opportunity areas and proximity to energy infrastructure. Note that the Unsuitable Areas weight is irrelevant because of the 0 value. It can be set as low as 1 percent and have the same impact as any other weight. Each layer's weight is as follows:

» Unsuitable Areas: 3 percent

» Farmland Categories: 10 percent

» Constrained Areas: 10 percent

» Constrained Buffers: 10 percent

» Parcel Size: 10 percent

» Opportunity Areas: 29 percent

» Opportunity Buffers: 28 percent