**Summit Repower Siting Process**

August 23, 2016

## Introduction

This document describes the process used by Altamont Winds LLC to locate turbines for the proposed Summit repowering project. Micro-siting is proceeding and will be completed following the final selection of the wind turbine make/model and completion of avian collision risk modeling. Altamont Winds will update this siting process information document for County review prior to submittal of building permit applications.

The Summit repowering project will decommission and remove 569 existing wind turbines and replace them with up to 27 modern wind turbines of 2.0 to 2.5 MW each, with a combined capacity of approximately 54.5 MWs. The repower will also upgrade or replace supporting infrastructure. The proposed project footprint comprises 17 parcels totaling approximately 3,470 acres in the northwest portion of the Altamont Pass Wind Resource Area (APWRA).

The proposed repower project size of 54.5 MWs is smaller than the existing project due to constraints in footprint and power output. Constraints in footprint is due to the available land that can be leased and the number of turbines that can be placed within the footprint without exceeding County setback requirements. Power output is restricted as a result of a transmission interconnection capacity limitation imposed by CAISO on the project at its points of interconnection to the PG&E system.

An iterative siting process balancing and considering the many limitations and project needs can be summarized in the following categories:

- Existing project layout and infrastructure
- Wind resource and topography
- Turbine spacing requirements
- County setback requirements
- Wetland resources
- Cultural resources
- Biological resources
- Avian resources
- Shadow flicker analysis
- Sound analysis
- Blade throw
- Federal Aviation Administration (FAA) review
- Community considerations

- Communication infrastructure

Much of the pre-CUP approval siting work discussed in this report assumed 33 turbine sites and using the Suzlon S97 2.1 MW turbines with a 97 meter rotor diameter and at 90 meter hub heights, which demonstrates that the project will be built in compliance with the CUP conditions and FPEIR requirements. Specifically, the noise, shadow flicker, and blade throw studies. During the CUP permitting process, six of the 33 turbine sites were removed from the layout leaving 27 turbine sites with CUP approval. Altamont Winds is now considering newer larger turbines such as the Vestas V110 2 – 2.2 MW with a 110 meter rotor and a 95 meter hub height; and the GE 116 2.3 – 2.5 MW with a 116 meter rotor and a 85 meter hub height. The advantage of these larger turbines are higher annual energy capture for the rated capacity, and less turbines required to achieve the project's 54.5 MW maximum output. The relevant studies will be redone once a turbine is finalized for the project.

**Existing project layout and infrastructure**

A considerable influence on the repower project layout is the existing project. Using existing access gates and roads, and locating the new turbines where existing turbines were clustered allows for reduced environmental impacts. Crossing streams with existing culverts results in less wetland impacts than creating new stream crossings to accommodate new road routes. Operations and maintenance areas and substations can be improved on their original footprints minimizing new disturbed areas.

**Wind resource and topography**

Due to a strong and predictable wind resource, the APWRA has for decades been able to financially support many wind energy projects through many evolutions of turbine design and industry growth. The terrain comprises of undulating hills and ridges and is considered complex from a wind resource view.

The wind resource in the APWRA has been measured and studied for decades. Most of the measurements were at lower heights appropriate for the older turbines. To better define the wind resource and energy production potential for the Summit project area at higher heights that better match the hub heights of modern turbines, two 60 meter meteorological towers were installed in 2011 in locations representative of the wind resource within the project footprint.

The higher measurements from the new meteorological towers are key inputs to modeling and understanding wind speed variations across the project at hub heights of 85 to 95 meters. The modeled results are used to optimize the turbine locations and turbine array for maximum energy production from the project. Included in the optimization are considerations of constructability, use of existing road corridors and facilities, setback requirements, turbine spacing to avoid wake and turbulence, neighboring wind farm impacts, turbine vendor site suitability requirements, and noise and shadow flicker impacts.

The topography of the site with hills, ridgelines, and valleys adds considerable restrictions to the turbine array as it did to the existing wind project. The turbines are constrained to the hill tops and ridgelines as that is where the wind resource is greatest and the least turbulent, thereby limiting siting options.

**Turbine spacing requirements**

Turbine spacing requirements are largely driven by a site's ambient turbulence caused by complex topography, and added wake induced turbulence from neighboring turbines. Turbulence impacts increase loads on the turbines which reduce component life, resulting in higher operation and maintenance costs, ultimately impacting project economics. It is critical that these loads do not exceed the operating envelope of the wind turbine and the limits set by turbine manufacturers to support their commercial warranties. Loads on a specific turbine due to site turbulence are determined by conducting a detailed site suitability assessment for specific turbine makes using site specific data. In areas of complex terrain, turbine spacing to minimize wake effects conflict with locating turbines to capture the highest production. On undulating ridgelines, spacing turbines to minimize wake effect may mean locating turbines at lower elevations, in saddles, or downslope from high points where the wind resource is less. In the Altamont, the swells and saddles along the ridgelines may have increased bird activity. An effort to minimize bird impacts may require moving a turbine to a location that decreases turbine spacing and increases wake induced turbulence on neighboring turbines. Siting with these considerations is an iterative process balancing the needs of reducing wake impacts, maximizing energy capture, while minimizing possible avian impacts.

**County setback requirements**

Turbine placement must conform to the setback conditions established in the County's Program EIR. Under the general setback requirements, all turbines should be sited no less than 3 times the total turbine height from any dwelling unit, 2.5 times the total turbine height from any public road, trail, commercial, or residential zoning, and 2 times the total turbine height from transmission lines. Alternative setback requirements are allowable on request with the agreement of the owner of the affected property, and in certain circumstances, with a report prepared by a qualified professional and verified by the County, demonstrating that a lesser setback is adequate. In no case would a setback less than 50% of the established setback be allowed. The County standards are shown in Table 1 below, together with *bold & italic* notes indicating the applicable dimensions for the Suzlon S97 model turbine with a total turbine height of 454 feet.

Table 1: Adopted Alameda County Turbine Setback Requirements

| Affected Land Use or Corridor | General Setback | Setback Adjustment for Turbine Elevation Above or Below Affected Use[a] | Alternative Minimum[b] |
|---|---|---|---|
| Adjacent parcel with approved wind energy CUP[c] | 1.1 times rotor length ***(159 feet x 1.1=175 feet for the Project)*** | 1% TTH added or subtracted per 10ft. of turbine elevation, respectively, above or below affected parcel | 50% of general setback |
| Adjacent parcel without approved wind energy CUP | 1.25 times TTH ***(454 feet x 1.25=568 feet for the Project)*** | 1% TTH per 10ft. above or below affected parcel | 1.1 times rotor length |
| Adjacent dwelling unit | 3 times TTH ***(454 feet x 3.0=1,362 feet for the Project)*** | 1% TTH per 10ft. above or below affected unit | 50% of general or elevation differential setback |
| Public road (including I-580), trail, commercial or residential zoning | 2.5 times TTH ***(454 feet x 2.5=1,135 feet for the Project)*** | 1% TTH per 10ft. above or below affected right-of-way | 50% of general setback with report by qualified professional, approved by Planning Director |
| Recreation area or property | 1.25 times TTH ***(454 feet x 1.25=568 feet for the Project)*** | 1% TTH per 10ft. above or below affected property | TTH |
| Transmission line[d] | 2 times TTH ***(454 feet x 2.0=908 feet for the Project)*** | 1% TTH per 10ft. above or below path of conductor line at ground level | 50% of general setback with report by qualified professional, approved by Planning Director |

Notes:
TTH = total turbine height: the height to the top of the rotor at 12:00 position. Setback distance to be measured horizontally from center of tower at ground level.
[a] The General Setback based on TTH will be increased or reduced, respectively, based on whole 10-ft. increments in the ground elevation of the turbine above or below an affected parcel, dwelling unit, road right of-way, or transmission corridor conductor line. Any portion of a 10-ft increment in ground elevation will be disregarded (or rounded down to the nearest 10-ft interval).
[b] *Alternative Minimum* refers to a reduced setback standard, including any adjustment for elevation, allowed with a notarized agreement or an easement on the affected property, subject to approval of the Planning Director.
[c] No setback from parcel lines is required within the same wind energy CUP boundary. Knowledge of proposed wind energy CUPs on adjacent parcels to be based on best available information at the time of the subject application.
[d] Measured from the center of the conductor line nearest the turbine.

The November 2015 CEQA Implementation Checklist Supporting Document stated that several residences located along Dyer Road were within about 1,100 feet of existing turbines. Specifically turbines 11, 23, 24, 25, and 26. To verify, the consultant, Power Engineers, conducted a field verification of the location of individual residential dwelling units on November 24, 2015. Their measurements are shown in Table 2 below; along with the elevation adjusted and alternative minimum setbacks based on the County adopted standards for turbines. Immediately below is the project site plan prepared by Power Engineers which shows turbine locations, as well as the location of receptors/residences.

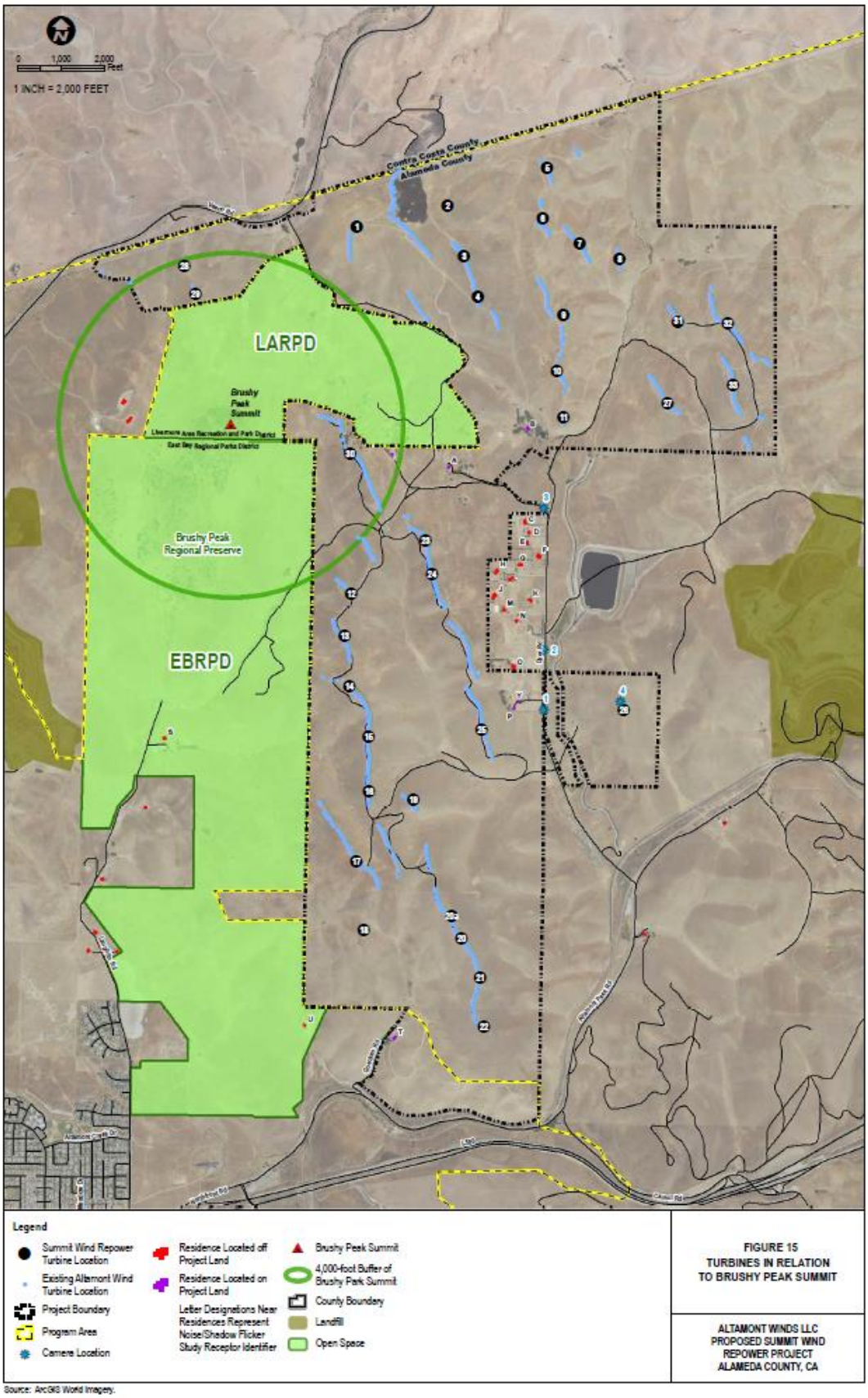
1 INCH = 2,000 FEET
Contra Costa County
Alameda County
LARPD
Brushy Peak Summit
Brushy Peak Regional Preserve
EBRPD
Legend
Summit Wind Repower Turbine Location
Existing Altamont Wind Turbine Location
Project Boundary
Program Area
Camera Location
Residence Located off Project Land
Residence Located on Project Land
Letter Designations Near Residences Represent Noise/Shadow Flicker Study Receptor Identifier
Brushy Peak Summit
4,000-foot Buffer of Brushy Park Summit
County Boundary
Landfill
Open Space
FIGURE 15
TURBINES IN RELATION TO BRUSHY PEAK SUMMIT
ALTAMONT WINDS LLC
PROPOSED SUMMIT WIND REPOWER PROJECT
ALAMEDA COUNTY, CA
Source: ArcGIS World Imagery.

Table 2: Adjusted setback distance to nearest residences

| TURBINES | | RECEPTORS/RESIDENCES | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | DISTANCE TO NEAREST RESIDENCE | | RECEPTOR/ RESIDENCE IDENTIFICATION | RECEPTOR/ RESIDENCE ELEVATION (FEET) | TURBINE ELEVATION DIFFERENCE (FEET) | *ADOPTED COUNTY STANDARD (INCLUDES ELEVATION ADJUSTMENT)* [C] (FEET) | CALCULATED ALTERNATIVE MINIMUM SETBACK (FEET) |
| TURBINE # | TURBINE ELEVATION (FEET) | METERS | FEET | | | | | |
| 11[A] | 863 | 263 | 864 | B | 726 | +110 | ***1,410*** | *706* |
| 23 | 1141 | 537 | 1,761 | H | 863 | +278 | ***1,480*** | *Meets adopted standard w/elevation adjustment* |
| 24 | 1098 | 443 | 1,453 | H | 863 | +235 | ***1,460*** | *730* |
| 25[B] | 996 | 265 | 868 | P | 798 | +198 | ***1,450*** | *725* |
| 26[B] | 1021 | 733 | 2,406 | Y | 779 | +242 | ***1,410*** | *Meets adopted standard w/elevation adjustment* |

[A]- Nearest residence is located associated with the Walker property who have agreed to provide necessary waivers.
[B]- Nearest residence is located associated with the DeVincenzi property who have agreed to provide necessary waivers.
[C]- 1% turbine height =4.5' per 10' of elevation difference; rounded to whole 10-foot increment.

Of the five turbines concerned, 23, 24, 25, and 26 have been removed from the project layout and need no further consideration. The remaining turbine 11, falls outside of the alternative minimum setbacks, but falls within adopted County setback standards when topographic elevations are taken into account. The residence B is on property that is part of the Summit project and the landowner will provide the necessary waivers.

If a turbine is chosen for the project which has a higher total turbine height, turbine distances from receptors/residences will be reevaluated for compliance with the County setback requirements.

**Wetland resources**

A field survey and delineation of wetlands and other waters was conducted for the Summit project by Power Engineers, Inc. in March 2014. A 238.5-acre area within the project boundary identified as the U.S. Army Corps of Engineers (USACE) Jurisdictional Determination Boundary was field investigated to determine the presence of potentially jurisdictional Waters of the United States (including wetlands) that would likely be subject to regulation by the USACE under Section 404 of the Clean Water Act. The 238.5 acre area included all potential ground disturbances required for the new turbine sites, new access roads, improved existing roads, O&M areas, and other related infrastructure for both construction and operation of the proposed wind project.

The field investigation resulted in the delineation of three wetlands totaling 0.630 acres and ten waterways totaling 1,754 linear feet and 0.158 acres within the USACE Jurisdictional Determination Boundary. All of the delineated features were preliminarily determined to be jurisdictional based on an observed or historic connection to a known Waters of the United States. Final jurisdictional status for the delineated wetlands and waterways will be provided by the USACE.

Of the 0.630 acres of wetlands within the area of potential disturbed ground, 0.575 acres are within a planned operations and maintenance (O&M) area near access gate 7 off Dyer road. Since this single area represents approximately 92% of the projects potential wetland impacts, Altamont Winds is evaluating relocating or abandoning this O&M area and designing the road layout to use access gate 6, also on Dyer road. The remaining wetland impacts are at existing access road culverts and streams located along access roads with one small wetland within the proposed construction pad of turbine site 2. This impact may be avoided with the slight repositioning of the construction pad.

In the case of the Summit project, wetlands and streams have little impact on the siting of the turbines with exception of turbine site 28. The routing of 28's access road and collection cable may add wetland impacts. If changes to the layout result in proposed turbines, roads or other proposed infrastructure, being located outside of the area previously investigated, an update to the field delineations will be conducted to include the changed disturbance areas.

**Cultural resources**

A cultural resource survey was conducted for the project. Cultural resources tend to be in protected valleys, in areas having slopes of less than 20%, and are unlikely along the windy exposed ridgelines. The proposed turbines are located along the ridgelines, and as confirmed by the cultural surveys, will not impact known cultural resources. The access roads and collection cables do pass near cultural resource areas but will easily avoid impacts by routing roads and collection cables away and around known cultural resources. Turbines sites 29 and 30 fall within an East Bay Regional Park District (EBRPD)-requested 4,000 ft. buffer from Brushy Peak, which is considered a cultural resource site. Brushy Peak is located outside the project boundary. Turbines sites 29 and 30 were withdrawn from consideration by Altamont Winds during the CUP permit process.

**Biological resources**

Pursuant to the federal Endangered Species Act (ESA), U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) have authority over projects that may result in take of a species listed as threatened or endangered under the act. *Take* is defined under ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Under federal regulations, take is further defined to include habitat modification or degradation that results, or is reasonably expected to result, in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

The disturbance inherent in construction and operation of the project may impact the habitat of threatened or endangered species (T&E species). Avoidance of areas determined to be crucial habitat for a T&E species may require alteration of access roads, collection cables, or relocation or removal of a turbine site.

**Avian resources**

Substantial avian data has been collected for the project area through the Alameda County Fatality Monitoring Program ("Mteam"). The Mteam monitored bird and bat use and fatalities in the APWRA through a scientific approach from 2005 to the end of 2014. The monitoring methods included the division of the APWRA into areas of similar terrain and habitat called, base layer of operating group boundaries ("blob"). The Summit project occupies portions of

blobs 5, 6, 7, 12, 13. A detailed description of the Mteam's methods and results is contained in the Altamont Pass Wind Resource Area Bird Fatality Study, Bird Years 2005 to 2013. (ICF 2015).

Altamont Winds hired an avian consultant with experience in the Altamont Pass (Smallwood) to do a wind turbine siting analysis in 2014. As a result of that analysis, the locations of several turbine sites were relocated to areas where impacts might be reduced. As development of the project progresses, further adjustments to the turbine sites ("micro-siting") are possible. Micro-sited changes to layout will in part be based on avian behavioral data that has been collected for the project area in accordance with the Program EIR Mitigation Measure BIO-11b. The final siting plan will be provided to the Technical Advisory Committee (TAC) in advance of construction in accordance with the Mitigation Monitoring and Reporting Plan.

### Shadow flicker analysis

The potential for shadow flicker has been raised as a visual issue by close neighbors of wind farm projects. The County created setback requirements for the turbines in part helps to address this impact. In the event that setbacks may not be sufficient to prevent shadow flicker from the newer and larger turbines, the County also developed the following mitigation measure to help resolve any shadow flicker issues:

> **Mitigation Measure AES-5: Analyze shadow flicker distance and mitigate effects or incorporate changes into Project design to address shadow flicker**
> Where shadow flicker could result from the installation of wind turbines proposed near residences (i.e., within 500 meters [1,640 feet] in a generally east or west direction to account for seasonal variations), the Project applicant will prepare a graphic model and study to evaluate shadow flicker impacts on nearby residences. No shadow flicker in excess of 30 minutes in a given day or 30 hours in a given year will be permitted. If it is determined that existing setback requirements, as established by the County, are not sufficient to prevent shadow flicker impacts on residences, Alameda County will require an increase in the required setback distances to ensure that residences are not affected. If any residence is affected by shadow flicker within the 30-minute/30-hour thresholds, the applicant will implement measures to minimize the effect, such as relocating the turbine; providing opaque window coverings, window awnings, landscape buffers, or a combination of these features to reduce flicker to acceptable limits for the affected receptor; or shutting down the turbine during the period shadow flicker would occur. Such measures may be undertaken in consultation with owner of the affected residence. If the shadow flicker study indicates that any given turbine would result in shadow flicker exceeding the 30-minute/30-hour thresholds and the property owner is not amenable to window coverings, window awnings, or landscaping, and the turbine cannot be shut down during the period of shadow flicker, then the turbine will be relocated to reduce the effect to acceptable limits.

As indicated under Impact AES-5 of the November 2015 CEQA Implementation Checklist, several residences are located within 500 meters generally east or west of the Project, and turbine blades could cause shadow flicker that may disturb sensitive viewers. The November 2015 CEQA Implementation Checklist and Application Supporting Materials include a detailed shadow flicker analysis and discussed shadow flicker relative to residences located along Dyer Road. Table 3 shows an update to the shadow flicker analysis completed in December 2015 based on the current layout and residences field verified by Power Engineers on November 24, 2015:

Table 3: Yearly expected shadow hours at receptor locations

| RECEPTOR | EXPECTED SHADOW FLICKER | | ASSOCIATED TURBINE | DISTANCE TO TURBINE | MITIGATION MEASURE |
|---|---|---|---|---|---|
| | HRS PER YEAR | DAYS WITH MORE THAN 30 MINUTES PER DAY | | | |
| B | 49:15 | 70 | 11 | 864 | Landowner Waiver |
| C[A] | 18:07 | 1 | 23 | 2,326 | Curtailment 23 |
| E[A] | 18:38 | 10 | 23 & 24 | 2,292 | Curtailment 23 & 24 |
| G[A] | 26:13 | 47 | 23 & 24 | 2,013 | Curtailment 23 & 24 |
| H | 30:01 | 59 | 23 & 24 | 1,453 | Curtailment 23 & 24 |
| I[A] | 22:02 | 34 | 24 | 1,773 | Curtailment 24 |
| J | 23:56 | 63 | 24 | 1,475 | Curtailment 24 |
| K[A] | 12:57 | 15 | 24 | 2,303 | Curtailment 24 |
| O[A] | 4:35 | 0 | 25 | 1,594 | - |
| P | 63:32 | 83 | 25 | 868 | Landowner Waiver |
| Y | 45:45 | 72 | 25 | 1,071 | Landowner Waiver |

[A]- Receptor falls outside of the 1,640 feet County Adopted standard for shadow flicker or is not located in a generally east-west position from turbines. However, curtailment may still be warranted.

Turbines 23, 24, and 25 have been removed from the layout and need no further consideration. Turbine 11 creates shadow flicker in excess of 30 minutes per day for at least one day per year on Receptor B. However, Receptor B is on property included in the project and the landowner will provide the necessary waiver.

The current shadow flicker analysis assumed 33 turbine sites and the Suzlon S97 model turbine. If a different turbine is chosen for the project, the shadow flicker analysis will be redone and any impacts avoided through micro-siting or other approved mitigation measures.

## Sound analysis

Within the project boundary are scattered single-family rural residences on both very large parcels of more than a 100 acres, and comparatively small lots of less than 5 acres. Most of the residences are located outside the project boundary to the east of the project along Dyer road, and to the west and south of the project.

As described in the Program EIR, construction and operational noise could affect adjacent residences and commercial businesses. Because of the potential to exceed noise ordinance standards, the Program EIR required the following mitigation measure:

> **Mitigation Measure NOI-1: Perform project-specific noise studies and implement measures to comply with County noise standards**
>
> The applicant for any proposed repowering project will retain a qualified acoustic consultant to prepare a report that evaluates noise impacts associated with operation of the proposed wind turbines. This evaluation will include a noise monitoring survey to quantify existing noise conditions at noise sensitive receptors located within 2,000 feet of any proposed turbine location. This survey will include measurement of the daily A-weighted and C-weighed Ldn values over a 1-week period and concurrent logging of wind speeds at the nearest meteorological station. The study will include a site-specific evaluation of predicted operational noise levels at nearby noise sensitive uses. If operation of the project is predicted to result in noise in excess of 55

dBA (Ldn) where noise is currently less than 55 dBA (Ldn), result in a 5 dB increase where noise is currently greater than 55 dBA (Ldn), or result in noise that exceeds 70 dBC (Ldn), the applicant will modify the project, including selecting new specific installation sites within the program area, to ensure that these performance standards will not be exceeded. Methods that can be used to ensure compliance with these performance standards include increasing the distance between proposed turbines and noise sensitive uses and the use of alternative turbine operational modes to reduce noise. Upon completion of the evaluation, the project applicant will submit a report to the County demonstrating how the project will comply with these performance standards. After review and approval of the report by County staff, the applicant will incorporate measures as necessary into the project to ensure compliance with these performance standards.

In accordance with Appendix G of the State CEQA Guidelines and the County conditions of approval for the existing turbine operations, the Summit project would be considered to have a significant effect if it would result in any of the conditions listed below:

- Exposure of residences to noise from new wind turbines in excess of 55 decibel A filter (**"**dBA**"**) Day-night Average Sound Level (**"**Ldn**"**) where existing wind turbine noise is currently less than 55 dBA (Ldn). In the situation where the dwelling unit is on the same parcel being leased for a windfarm, 65 dBA (Ldn) is used as the threshold.

- Exposure of residences to a daily noise increase in Ldn value of more than 5 decibel (**"**dB**"**) from the addition of new wind turbines where the existing noise level is in excess of 55 dBA (Ldn). In the situation where the dwelling unit is on the same parcel being leased for a windfarm, 65 dBA (Ldn) is used as the threshold.

A project-specific noise study was conducted in September 2015 as described in Mitigation Measure NOI-1 to assess the operational noise generated by the project using WindPRO, a commercially available windfarm siting software. The study assumed 33 turbine sites hosting Suzlon S97 2.1 MW turbines.

The November 2015 CEQA Implementation Checklist identified several receptors along Dyer Road to be located within about 1,750 feet of a group of wind turbines and could possibly be exposed to noise that exceeds 55 dBA (Ldn) or increases in noise greater than 5 dB.

In December 2015, calculated noise results were revised based on a November 24, 2015 field verification of distances to residential receptors by Power Engineers. The results indicate that all receptors would fall below the threshold levels discussed above, and are shown below in Table 4:

Note that turbines 23, 24, 25, and 26 have been removed from the layout and while the current results are below the CUP threshold, sound pressure levels will likely be lower without these turbines.

Table 4: Receptor Sound Pressure Levels vs. FPEIR Thresholds

| RECEPTOR | CUP THRESHOLD | EXISTING SPL DB(A) | EXISTING SPL DB(A) (LDN) | FPEIR THRESHOLD | SUMMIT SPL DB(A) | SUMMIT SPL DB(A) (LDN) | SUMMIT CHANGE FROM EXISTING WTS DB(A) | SUMMIT BELOW THRESHOLD AMOUNT, DB(A) |
|---|---|---|---|---|---|---|---|---|
| B | 65 | 51.7 | 58.1 | 65 | 50.0 | 56.4 | -1.7 | 15.0 |
| H | 55 | 51.6 | 58.0 | 55 | 47.0 | 53.4 | -4.6 | 8.0 |
| P | 65 | 54.0 | 60.4 | 65 | 48.6 | 55.0 | -5.4 | 16.4 |
| Y | 65 | 46.2 | 52.6 | 65 | 47.6 | 54.0 | 1.4 | 17.4 |

The current noise analysis assumed 33 turbine sites and the Suzlon S97 model turbine. Since the final project layout will have fewer turbines, and the sound characteristics of different turbine models can vary, the noise study will be redone by a qualified acoustic consultant for the final turbine selected for the project, and with fewer turbines.

**Blade throw**

A blade throw analysis was done for the project with Suzlon S97-2.1 MW wind turbines at a hub height of 90 meters above ground level (AGL) by Epsilon Associates Inc. The S97 has a rotor diameter of 97 meters and a blade length of 47.5 meters. The rotor turns at 11.8 to 17.7 rpm.

Blade throw calculations were completed for a full blade release at the maximum nominal rotor speed of 17.7 rpm. The blade was assumed to travel and land in its original plane of rotation, and to occur anywhere within 360 degrees of each wind turbine (independent of wind direction). The maximum range in a vacuum is achieved when the release angle is 45 degrees from horizontal. However, this is only true for an object that lands at the same elevation from which it was released, a virtual impossibility for a utility scale wind turbine on flat or elevated terrain, unless it is located at the bottom of a valley. The base elevation of each WTG, derived from USGS Digital Elevation Model (DEM) data, was used to evaluate elevation changes within 650 ft. surrounding each WTG. Based on this information, the maximum elevation drop from any turbine base modeled to a potential impact site can be as much as 98 m (321 ft.). Due to these elevation changes, maximum range of throw for a full blade in a vacuum was calculated to occur not at 45 degrees, but rather when the blade's "overhand" release angle is 20 degrees from horizontal. The results of the analysis found that, for the "full blade" scenario considered, the maximum blade throw ranges between 167 and 196 m (548-643 ft.), or between 1.2 and 1.4 times the total turbine height (TTH) of 138.5 m, depending on local terrain. Given that the closest distance from any turbine (Turbine #20, now designated as #20alt) to the existing PG&E overhead transmission line is 290 m (951 feet, 2.1 TTH), all wind turbines are well beyond the maximum blade throw distances predicted by this analysis.

If a different turbine is chosen for the project, the blade throw analysis will be updated when the project's final turbine is selected.

**Federal Aviation Administration (FAA) review**

The location of the turbines and their height above ground level are subject to approval from the FAA. If approved, the FAA issues Determination of No Hazards (DNHs) for each turbine. If a turbine currently holding a DNH is relocated more than 100 feet, or increases in topographic elevation more than 1 foot, it is again subject to review and approval. The project current holds DNHs for the 33 turbine sites for the Suzlon S97 with a total height of 454 feet. If a different turbine and taller turbine is chosen for the project, the turbine sites are again subject to FAA review and approval.

**Community considerations**

The Livermore Area Recreation and Park District (LARPD) owns 500 acres that envelope the summit of Brushy Peak, located directly adjacent to the Summit project. They operate the acreage as public open space park in conjunction with the EBRPD, which owns and operates over 1,000 acres of open space parkland leading up to Brushy Peak, also adjacent to the Summit project.

The EBRPD voiced concerns over the locations of turbine sites 29 and 30 as they fell within an EBRPD-requested 4,000 ft. buffer of Brushy Peak. The park believed the turbines at site 29 and 30 would negatively impact the view shed from the trails surrounding Brushy Peak. Altamont Winds considered relocating the turbine sites. Particularly site 30 as it has the best wind resource of the project. However, County setback requirements prevented finding alternate locations resulting in Altamont Winds agreeing to omit them from the layout.

**Communication infrastructure**

Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz). Altamont Winds hired Comsearch to perform a search of microwave bands and other communication paths which may cross the Summit project area. Comsearch has developed and maintains comprehensive technical databases containing information on licensed microwave networks throughout the United States. These systems are the telecommunication backbone of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services.

The study identified 35 microwave paths intersecting the Summit Wind project area. The Fresnel Zones for these microwave paths were calculated and mapped. Altamont Winds has incorporated the results into the layout being certain that the turbines avoid microwave paths. As part of the final micro-siting, Comsearch will perform an obstruction analysis with the final turbine locations and final turbines, and address any obstruction issues. Any turbines obstructing communication paths will need to be relocated.

**Summary**

The current Summit project layout of 27 turbine sites is the result of evaluation of many variables effecting environmental impacts, maximum energy production, and community concerns. More micro-siting work will be done before a final layout is complete but the below summarizes specific changes made to date siting the turbines:

| Site No. | Site Location Changes | Further Considerations |
|---|---|---|

| | | |
|---|---|---|
| 1 | No change | |
| 2 | No change | |
| 3 | Moved southeast approx. 6m per Smallwood avian recommendation | |
| 4 | Moved south approx. 26m due to waking | |
| 5 | No change | |
| 6 | Moved approx. 22m northwest due to WT wake impacts | |
| 7 | Moved approx. 7m southeast due to WT wake impacts | |
| 8 | No change | |
| 9 | No change | |
| 10 | Moved north approx. 13m due to WT wake impacts | |
| 11 | Moved north approx. 20m to comply with road setback | |
| 12 | Moved south away from north side of saddle approx. 79m per Smallwood avian recommendation | |
| 13 | No change | |
| 14 | No change | |
| 15 | No change | |
| 16 | Moved north approx. 51m due to WT wake impacts | |
| 17 | No change | |
| 18 | Moved approx. 130m east per Smallwood avian recommendation | |
| 19 | No change | |
| 20 | Moved west approx. 41 m for construction access purposes | |
| 20 Alt | No change | |
| 21 | Moved north approx.12 m for construction access purposes | |
| 22 | Moved west approx. 39m for construction access purposes | |
| 23 | Moved approx. 20m northwest to comply with transmission setback | Removed |
| 24 | Moved approx. 16m northwest out of saddle per Smallwood avian recommendation | Removed |
| 25 | Moved approx. 175m southeast to comply with noise setback | Removed |
| 26 | No change | Removed |
| 27 | No change | |
| 28 | Moved approx. 46m south to comply with road setback | |
| 29 | No change | Removed |
| 30 | No change | Removed |
| 31 | No change | |
| 32 | No change | |
| 33 | No change | |

## Attached References


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