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June 28, 2019

Via Electronic Filing

Ms. Tanowa Troupe
Administration/Docketing
Ohio Power Siting Board
180 East Broad Street, 11th Floor
Columbus, Ohio 43215-3793

**Re: Republic Wind LLC Case No. 17-2295-EL-BGN
Notice of Project Modifications and Project Information Update**

Dear Ms. Troupe:

On February 2, 2018, and as amended on December 26, 2018, Republic Wind LLC ("Republic Wind") filed its application for a certificate of environmental compatibility and public need for a wind-powered generating facility in Seneca and Sandusky Counties, Ohio. Attached, please find Republic Wind's notice of turbine model modifications to the facility.

These modifications include the capacity uprating of two currently proposed turbines, the Vestas V150 and Nordex N149. The dimensions of these turbines remain the same. Republic Wind also proposes the addition of a new turbine model for potential use in the project, the Vestas V136 turbine. This turbine is smaller than all of the other turbines proposed for use in the project. The use of the V136 will be limited to no more than 10 locations. No other changes are proposed in this filing.

Pursuant to Ohio Administrative Code Rule 4906-3-11(A)(6), these modifications do not create further impacts for property owners or within the planned site, and in some cases, result in a reduction of impacts to property owners.

A description of the turbine modifications is attached, along with corresponding updates to the application. Please do not hesitate to contact me if you have any questions.

Sincerely,

Dylan F. Borchers

Attachments

Cc: Eric Morrison (w/Attachments)

NOTICE OF PROJECT MODIFICATIONS AND INFORMATION UPDATE

An application for a Certificate of Environmental Compatibility and Public Need (the “Certificate Application”) for the Republic Wind Farm (the “Project”) was submitted to the Ohio Power Siting Board (OPSB) on February 2, 2018 by Apex Clean Energy (the “Applicant”). On December 26, 2018, the Applicant filed an amendment to its Certificate Application. Turbine models and dimensions under consideration for the Project at the time of the Certificate Application amendment are listed below in Table 1.

Table 1. Approximate Turbine Dimensions by Model

Turbine Model	Rated Power	Hub Height	Rotor Diameter	Maximum Total Height
Vestas V150	4.2 MW	105 meters (344 feet)	150 meters (492 feet)	180 meters (591 feet)
Siemens SG145	4.5 MW	107.5 meters (352 feet)	145 meters (476 feet)	180 meters (591 feet)
Nordex N149	4.5 MW	109 meters (357 feet)	149 meters (489 feet)	183.5 meters (602 feet)

Wind Turbine Updates

Since the December 2018 submittal, Vestas has released a V150 5.6 megawatt (MW) turbine and Nordex has released N149 4.8, 5.5, and 5.7 MW turbines. For economic reasons, the Applicant is considering the up-rated Vestas V150 and Nordex N149 turbines in addition to the models that were presented in the December 2018 submittal. While there is a change in turbine capacity (from 4.2 MW to 5.6 MW for the V150 and from 4.5 MW to 4.8, 5.5, or 5.7 MW for the N149), the turbine dimensions remain the same as presented in Table 1 above.

The Applicant is also adding the Vestas V136-3.6 MW turbine model for consideration for the Project. The turbine has a rotor diameter of 136 meters (446 feet) and a hub height of 82 meters (269 feet), resulting in a total height of 150 meters (492 feet). This turbine model is smaller than all of the other turbine models evaluated in the December 2018 Certificate Application. The use of the V136 will be limited to no more than 10 locations within the Project.

There is no change to the currently proposed turbine locations, and the total generating capacity of the Project remains unchanged and will not exceed 200 MW.

Since the dimensions of the V150 and N149 have not changed since the December 2018 Certificate Application submittal, there are no changes to the setbacks, shadow flicker, aviation, communication system inference, visual, or ecological impacts from what was presented originally. The V136 turbine model now under consideration by the Applicant is smaller than the models previously evaluated. As such, the impacts presented in the amended Certificate Application are conservative, and actually overstate the impacts from the V136 turbine model. However, the Applicant has updated the shadow flicker analysis for the inclusion of the V136 turbine model and a noise analysis for the new turbine models. Updated noise and shadow flicker analyses are attached.

Shadow Flicker Update

The shadow flicker report that was prepared for the December 2018 Application submittal was updated to reflect the new, smaller V136 turbine model (Attachment A). The analysis was

performed using the methods described in the 2018 Shadow Flicker Report (EDR, 2018). The updated analysis predicted that 39 receptors would receive over 30 hours of shadow flicker per year, which is a reduction from 77 receptors predicted to receive over 30 hours per year in the 2018 analysis (EDR, 2018). Once the final turbine model is selected, the Applicant will conduct the final pre-construction shadow flicker analysis for compliance filing, and ultimately, the Applicant is committing to operating the Facility such that no non-participating receptors are modeled to receive more than 30 hours of shadow flicker per year. It is anticipated that this will be accomplished through the pursuit of neighbor agreements, turbine operational measures, and/or other mitigation measures.

Sound Update

The Applicant consulted with Resource Systems Group (RSG), Inc. to determine the acoustical impacts of all of the turbine models under consideration for the Project: the Vestas V150 4.2 MW and 5.6 MW, Siemens/Gamesa SG4.5-145, Nordex N149 4.5 MW, 4.8 MW, 5.5 MW, and 5.7 MW, and the Vestas V136 MW (Attachment B). Sound propagation modeling was performed for the Vestas V150 4.2 and 5.6 MW turbines, Siemens SG 4.5-145, Nordex N149-4.5, 4.8, 5.5, and 5.7 MW turbines, and Vestas V136 3.6 MW turbines with identical parameters to what was included in the December 2018 Application submittal (RSG, 2018). Sound propagation modeling results are shown in Figures 42 through 48 of Attachment C. With noise reduced operations applied to some turbine locations, the highest sound level modeled at a nonparticipating residence was 46 dBA, with all nonparticipating receptors at or below the nighttime background Leq plus 5 dB of 46 dBA. These results are consistent with what was provided in the previous sound analysis conducted by RSG (RSG, 2018).

As stated in the Application, in compliance with Ohio Administrative Code (“O.A.C.”) Rule 4906-4-09(F), in no event will the facility sound contribution at any nonparticipating sensitive receptor within one mile of the Project boundary exceed the Project area ambient nighttime average sound level by 5 A-weighted decibels (dBA). In the unlikely event that future modeling of the two Nordex turbine models (N149 5.5 and 5.7 MW) without octave band spectral data demonstrates a sound level that is higher at a given receptor when compared to the previously modeled lower generator capacity version of that turbine model, the Applicant will either not build that turbine location, operationally curtail the turbine, or obtain the necessary waivers/participation agreements.”

Attachments Included

- Attachment A: Updated Shadow Flicker Memorandum
- Attachment B: Preconstruction Noise Assessment
- Attachment C: Critical Wind Speed Modelling Addendum

References

Environmental Design & Research (EDR). 2018. *Shadow Flicker Report: Republic Wind Farm*. Prepared for Apex Clean Energy. December 2018.

Resource System Group, Inc. (RSG). 2018. *Noise Impact Assessment for Republic Wind*. December 11, 2018.



Environmental Design & Research,
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memorandum

To: Dalton Carr, John Arehart **EDR Project No:** 15095
From: Lindsay Donahoe
Date: June 19, 2019
Reference: Republic Wind Farm
Case No. 17-2295-EL-BGN
Updated Shadow Flicker Analysis

Introduction

This memorandum report presents the findings of the updated shadow flicker analysis for the Republic Wind Farm (the Project; OPSB Case No. 17-2295-EL-BGN). As originally presented in the Application Amendment filed by Republic Wind, LLC (the Applicant), the Project consisted of up to 50 turbines with a maximum rotor diameter of 150 meters (492 feet). The Project layout has not changed and remains as presented in the Application Amendment. However, the list of turbine models under consideration for the Project has been expanded to include the Vestas V136 3.6 megawatt (MW) turbine. The V136 turbine has a rotor diameter of 136 meters (446 feet) and a hub height of 82 meters (269 feet) for a maximum total height of 150 meters (492 feet). Potential shadow flicker effects have been re-analyzed to account for the change in turbine dimension.

Shadow flicker refers to the shadows that a wind turbine casts over structures and observers at times of the day when the sun is directly behind the turbine rotor from an observer's position. During intervals of sunshine, operating wind turbine generators will cast a shadow on surrounding areas as the rotor blades pass in front of the sun, causing a flickering effect while the rotor is in motion. Shadow flicker is most pronounced in northern latitudes during winter months because of the lower angle of the sun in the winter sky. However, it is possible to encounter shadow flicker anywhere for brief periods after sunrise and before sunset (U.S. Department of the Interior, 2005). Shadow flicker does not occur when fog or clouds obscure the sun, or when turbines are not operating. Obstacles such as terrain, vegetation, and/or buildings occurring between residences and wind turbines can significantly reduce or eliminate shadow flicker effects.

The location and duration of shadow flicker can be predicted using computer modeling programs and input data regarding turbine locations, turbine dimensions, receptor locations, local topography, and sunshine frequency. A conservative assumption that the turbines are in continuous operation is also applied. Shadow flicker effects predicted by the modeling exercise are expressed in terms of frequency (hours per year) at each receptor location.

Methods

This updated shadow flicker analysis evaluated the potential impact of 50 Vestas V136-3.6 MW turbines, each with a rotor diameter of 136 meters and a hub height of 82 meters. Prior to conducting the shadow-flicker analysis, the Applicant identified potential receptors in the vicinity of the Project. Consistent with the Republic Wind Farm Shadow Flicker Report (EDR, 2018) a study area of 10 rotor diameters was used for analysis of shadow-flicker effects. In the case of the Vestas V136 turbine used in this analysis, 10 rotor diameters equals 1,360 meters (4,462 feet). Consequently, a Study Area of 1,360 meters was used for the analysis (Figure 1).

Section 4906-4-09(E)(1) of the OAC requires that, *"The Facility shall be designed to avoid unreasonable adverse shadow flicker effect at any non-participating sensitive receptor within one thousand meters of any turbine. At a minimum, the facility shall be operated so that shadow flicker levels do not exceed thirty hours per year at any such receptor."* The OPSB has used this threshold of acceptability (i.e., 30 annual hours of shadow flicker) in certifying all commercial wind power projects to date in Ohio (OPSB, 2011a, 2011b, 2012, 2013, 2014).

The shadow flicker analysis for the proposed Project used *WindPRO* 3.2.737 software and the associated Shadow module. *WindPRO* is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Input variables and assumptions used for shadow flicker modeling calculations for the proposed Project include:

- The latitude and longitude coordinates of 50 proposed wind turbine sites (provided by the Applicant).
- The latitude and longitude coordinates for 722 potential receptors located within the 1,360-meter Study Area (provided by the Applicant).
- USGS 1:24,000 topographic mapping and USGS digital elevation model (DEM) data.
- The rotor diameter (136 meters) and hub height (82 meters) for the Vestas V136.
- Annual wind rose data (provided by the Applicant) to determine the approximate directional frequency of rotor orientation throughout the year (Table A1 of Attachment A).
- To account for the occurrence of cloudy conditions, the average monthly percent of available sunshine for the nearest NOAA weather station with a similar latitude (Toledo, Ohio) was used (Table A2 of Attachment A). Data were obtained from NOAA's "Comparative Climatic Data for the United States through 2015" (<http://www.ncdc.noaa.gov>).
- No allowance was made for wind being below or above generation speeds. Blades are assumed to be moving during all daylight hours when the sun's elevation is more than 3 degrees above the horizon. Shadow flicker is generally considered imperceptible when the sun is less than 3 degrees above the horizon due to the scattering effect of the atmosphere on low angle sunlight (States Committee for Pollution Control, 2002).
- The possible screening effect of trees and buildings adjacent to the receptors was not taken into consideration in the modeling. In addition, the number and/or orientation of windows in residential receptors were not considered in the analysis.

Based on these variables and assumptions, *WindPRO* was used to calculate the theoretical number of hours per year that shadow flicker would occur at any given location in the vicinity of the Project.

The model calculations include the cumulative sum of shadow hours for all turbines. This omni-directional approach reports total shadow-flicker results at a receptor regardless of the presence or orientation of windows at the receptor residence (i.e., it assumes shadows from all directions can be perceived at a residence, which may or may not be true). A receptor in the model is defined as a one square meter area, one meter above ground level; the actual dimensions of the house or window locations are not taken into consideration.

Because the proposed Project is located adjacent to the proposed Emerson Creek Wind Farm and the Seneca Wind Farm, there exists the potential for cumulative shadow flicker impacts at certain receptors (i.e., those receptors located within a 10-rotor diameter distance of turbines in one or more of the proposed wind farms). To evaluate the potential for cumulative shadow flicker impacts from the three proposed wind farms, a second shadow flicker analysis was run for select turbines and receptors.

To determine receptors that would potentially be affected by turbines from more than one project, a 10-rotor diameter buffer was applied to the other wind farms (1,500 meters around Emerson Creek Wind turbines and 1,270 meters around Seneca Wind Farm turbines) and to the proposed Project turbines (1,360 meters). Fifty-four receptors are

located within the area where the Emerson Creek and Seneca wind turbine buffers overlap with the proposed Republic Wind buffer. Therefore, these receptors have the potential to experience cumulative shadow flicker impacts. The cumulative shadow flicker analysis was run using the method described above.

Results

Output from the model includes the following information:

- Calculated shadow-flicker time (specific days, maximum hours per day, and total hours per year when shadow flicker is expected) at each of the 722 receptors located in the Study Area.
- Tabulated and plotted time of day that structures are predicted to receive shadow flicker (Attachment B).
- Shadow isolines, which are used to create maps showing turbine locations, receptors, and projected shadow-flicker duration (hours per year) without taking into consideration the effect of screening provided by vegetation and structures (Figure 2).

A summary of the projected shadow flicker at each of the 722 receptors in the Project study area is presented below:

- 216 (30%) of the receptors are not expected to experience any shadow flicker,
- 10 (1%) of the receptors may be affected 0-1 hour/year,
- 284 (39%) of the receptors may be affected 1-10 hours/year,
- 130 (18%) of the receptors may be affected 10-20 hours/year,
- 43 (6%) of the receptors may be affected 20-30 hours/year,
- 39 (5%) of the receptors may be affected for more than 30 hours/year.

As these results indicate, 95% of the receptors are predicted to receive less than 30 hours of shadow flicker per year, with 70% of the receptors predicted to receive less than 10 hours of shadow flicker per year. While up to 39 receptors were predicted to receive more than 30 hours of shadow flicker per year, 12 of those receptors are located on properties owned by Project participants. At most receptor locations shadow flicker will occur primarily in the early morning or late afternoon and will generally last less than 1 hour per day. The maximum daily duration of shadow flicker predicted at any receptor is 1 hour and 44 minutes (at receptor 1097, see Attachment B).

Attachment B provides the results of the predicted shadow flicker at each structure calculated to experience more than 30 hours of shadow flicker per year. The times of day and duration of shadow flicker experienced by each structure will vary throughout the calendar year based on the position of the sun in the sky and the direction of prevailing winds. See Appendix B for detailed calendars that illustrate the specific times of year and day that shadow flicker may occur. Table 1 below provides the details associated with the receptors predicted to receive more than 30 hours of shadow flicker per year.

Table 1. Summary of Receptors Predicted to Experience Shadow Flicker > 30 hours/year

Receptor ID	Project Status	Predicted Annual Shadow Flicker (hh:mm/year)	Predicted Max Daily Shadow Flicker (hh:mm/day)	Predicted Number of Days with Shadow Flicker
4943	Non-Participating	31:29	0:54	168
12778	Non-Participating	32:21	0:51	188
9778	Non-Participating	32:29	0:53	218
11902	Non-Participating	32:40	1:12	213

Receptor ID	Project Status	Predicted Annual Shadow Flicker (hh:mm/year)	Predicted Max Daily Shadow Flicker (hh:mm/day)	Predicted Number of Days with Shadow Flicker
4923	Non-Participating	33:09	0:46	215
9772	Non-Participating	33:18	0:45	217
13427	Non-Participating	37:44	0:53	163
6602	Non-Participating	37:51	0:51	217
1097	Non-Participating	39:11	1:44	168
6298	Non-Participating	40:11	1:16	206
11900	Non-Participating	41:07	0:57	235
9775	Non-Participating	47:19	0:59	279
9771	Non-Participating	50:03	1:07	295
4917	Non-Participating	50:40	1:17	296
4922	Non-Participating	50:43	1:13	293
4919	Non-Participating	51:34	1:20	295
10615	Non-Participating	52:25	1:08	298
13520	Non-Participating	52:28	1:13	214
6297	Non-Participating	53:37	1:42	223
6500	Non-Participating	53:38	1:11	158
10619	Non-Participating	53:44	1:15	266
10616	Non-Participating	53:48	1:06	300
9773	Non-Participating	53:58	1:01	315
6535	Non-Participating	55:15	1:00	245
10617	Non-Participating	55:21	1:10	301
10618	Non-Participating	56:02	1:13	289
6536	Non-Participating	56:53	1:07	263
4661	Participating	33:26	1:23	179
11146	Participating	35:45	1:39	146
13048	Participating	36:01	0:52	160
13049	Participating	37:36	0:58	160
12051	Participating	40:04	1:43	111
13428	Participating	41:28	1:04	164
1154	Participating	42:25	0:53	181
6296	Participating	47:50	1:20	205
6537	Participating	49:01	1:02	190
4568	Participating	49:56	1:35	162

Receptor ID	Project Status	Predicted Annual Shadow Flicker (hh:mm/year)	Predicted Max Daily Shadow Flicker (hh:mm/day)	Predicted Number of Days with Shadow Flicker
13005	Participating	54:56	1:29	233
13435	Participating	59:39	1:09	212

The cumulative shadow flicker analysis was performed using the methods described in Section 3.2 of the Republic Wind Farm Shadow Flicker Report (EDR, 2018). The cumulative shadow flicker analysis evaluated the cumulative shadow flicker impact at 54 receptors that were within 10 rotor diameters of both the Republic Wind Farm turbines and turbines from one of the other proposed wind farms in the area (Figure 3). Table 2 below presents the cumulative shadow flicker impacts with the “predicted” columns representing shadow flicker from the Project only, and the “cumulative predicted” columns representing the combined shadow flicker impacts from both the proposed Project and one or more of the other proposed wind farms. Only receptors that were originally predicted to have shadow flicker from the Republic Wind Farm are included in Table 2. Results from the cumulative shadow flicker analysis at each receptor in the cumulative impact area are included in Attachment C.

Table 2. Daily Effect to Structures with Potential Cumulative Shadow Flicker

Receptor ID	Project Status	Predicted Annual Shadow Flicker – Republic Wind Only (hh:mm/year)	Cumulative Predicted Annual Shadow Flicker (hh:mm/year)	Predicted Max Daily Shadow Flicker – Republic Wind Only (hh:mm/day)	Cumulative Predicted Max Daily Shadow Flicker (hh:mm/day)
12194	Non-Participating	3:02	16:33	0:24	0:56
4860	Non-Participating	3:07	51:09	0:24	1:11
4887	Non-Participating	3:07	22:12	0:24	0:59
12195	Non-Participating	3:35	16:43	0:26	0:52
4861	Non-Participating	3:40	57:21	0:26	1:06
12185	Non-Participating	3:48	19:56	0:26	0:53
12196	Non-Participating	4:05	16:43	0:28	0:49
9762	Non-Participating	4:06	29:41	0:27	0:55
12183	Non-Participating	4:22	16:45	0:28	0:50
4886	Non-Participating	4:49	15:56	0:30	0:48
4877	Non-Participating	4:59	18:49	0:31	0:45
4875	Non-Participating	5:03	19:22	0:31	0:46
9769	Non-Participating	5:04	20:15	0:31	0:47
9767	Non-Participating	5:06	20:26	0:31	0:47
9766	Non-Participating	5:19	21:00	0:31	0:48
9759	Non-Participating	5:45	25:28	0:31	0:49
9756	Non-Participating	6:25	26:25	0:31	0:49

Receptor ID	Project Status	Predicted Annual Shadow Flicker – Republic Wind Only (hh:mm/year)	Cumulative Predicted Annual Shadow Flicker (hh:mm/year)	Predicted Max Daily Shadow Flicker – Republic Wind Only (hh:mm/day)	Cumulative Predicted Max Daily Shadow Flicker (hh:mm/day)
9758	Non-Participating	6:29	31:18	0:28	0:55
12184	Non-Participating	7:29	17:00	0:33	0:45
4879	Non-Participating	8:08	22:53	0:30	0:46
4847	Non-Participating	8:11	37:53	0:31	1:29
1157	Non-Participating	8:30	27:08	0:29	0:41
1156	Non-Participating	8:34	26:41	0:30	0:40
12188	Non-Participating	8:42	16:44	0:36	0:41
11247	Non-Participating	8:57	38:17	0:31	1:19
13050	Non-Participating	9:34	19:02	0:30	0:46
13040	Non-Participating	9:38	23:17	0:29	0:45
4814	Non-Participating	9:50	10:13	0:27	0:28
9717	Non-Participating	10:53	24:07	0:29	0:47
9716	Non-Participating	11:06	24:18	0:29	0:48
4815	Non-Participating	11:42	14:30	0:27	0:41
4829	Non-Participating	13:32	33:11	0:43	1:16
4824	Non-Participating	14:01	20:44	0:28	0:45
9739	Non-Participating	14:53	33:22	0:46	1:15
9713	Non-Participating	15:00	25:22	0:30	0:52
4880	Non-Participating	19:03	37:28	0:46	0:48
12192	Non-Participating	22:35	31:16	0:55	0:55
12193	Non-Participating	22:59	31:32	0:56	0:56
4914	Non-Participating	26:01	29:31	1:04	1:04
4910	Non-Participating	26:20	29:58	1:04	1:04

Of the 54 receptors located in the cumulative impact area, six were originally predicted to receive no shadow flicker from Republic Wind turbines and hence, will not experience cumulative impacts and are not included in Table 2. An additional eight receptors were predicted to receive no additional shadow flicker from the other proposed wind turbines, and as such, will not experience any cumulative shadow flicker impact as a result of the Project. As indicated in Table 2, a total of 40 receptors will experience cumulative shadow flicker from Republic Wind turbines and other proposed turbines in the area. Ten non-participating receptors are predicted to receive over 30 hours of shadow flicker due to the cumulative impact from the existing turbines.

Conclusion

In summary, as a result of modeling the proposed 50 turbine locations using the V136 turbine model, WindPRO predicted that 27 non-participating receptors will receive more than 30 hours of shadow flicker per year. The cumulative shadow flicker analysis predicted that 10 non-participating receptors will receive more than 30 hours of shadow flicker per year due to cumulative impacts from more than one wind project.

Although shadow flicker at these receptors are currently modeled to exceed the 30-hour per year threshold, these calculations do not take into account the actual location and orientation of windows, or the screening effects associated with existing, site-specific conditions and obstacles such as trees and/or buildings. Further, this analysis assumes turbine rotors are continuously in motion. Given these assumptions, the predicted shadow-flicker frequency represents a conservative scenario, and overstates the actual frequency of shadow flicker that would be experienced at any given receptor location. Once the final turbine model is selected, the Applicant will conduct the final pre-construction shadow flicker analysis for compliance filing, and ultimately, the Applicant is committing to operating the Facility such that no non-participating receptors are modeled to receive more than 30 hours of shadow flicker per year. It is anticipated that this will be accomplished through the pursuit of neighbor agreements, turbine operational measures, and/or other mitigation measures.

References

Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR). 2018. *Shadow Flicker Report, Republic Wind Farm*. Prepared for Apex Clean Energy. December 2018.

Ohio Power Siting Board (OPSB). 2011a. *Opinion, Order, and Certificate in the Matter of Hog Creek Windfarm, LLC*. Case No. 10-654-EL-BGN, Section V, (44), p. 32.

OPSB. 2011b. *Opinion, Order, and Certificate in the Matter of Hardin Wind Energy, LLC*. Case No. 11-3446-EL-BGA. Opinion Section D, p. 5.

OPSB. 2012. *Opinion, Order, and Certificate in the Matter of Champaign Wind, LLC*. Case No. 12-160-EL-BGN. Section VI, (F), P. 48.

OPSB. 2013. *Opinion, Order, and Certificate in the Matter of Northwest Ohio Wind, LLC*. Case No. 13-0197-EL-BGN. Section V, (39).

OPSB. 2014. *Opinion, Order, and Certificate in the Matter of Hardin Wind, LLC*. Case No. 13-1177-EL-BGN. Opinion Section D, p. 2.

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Figures

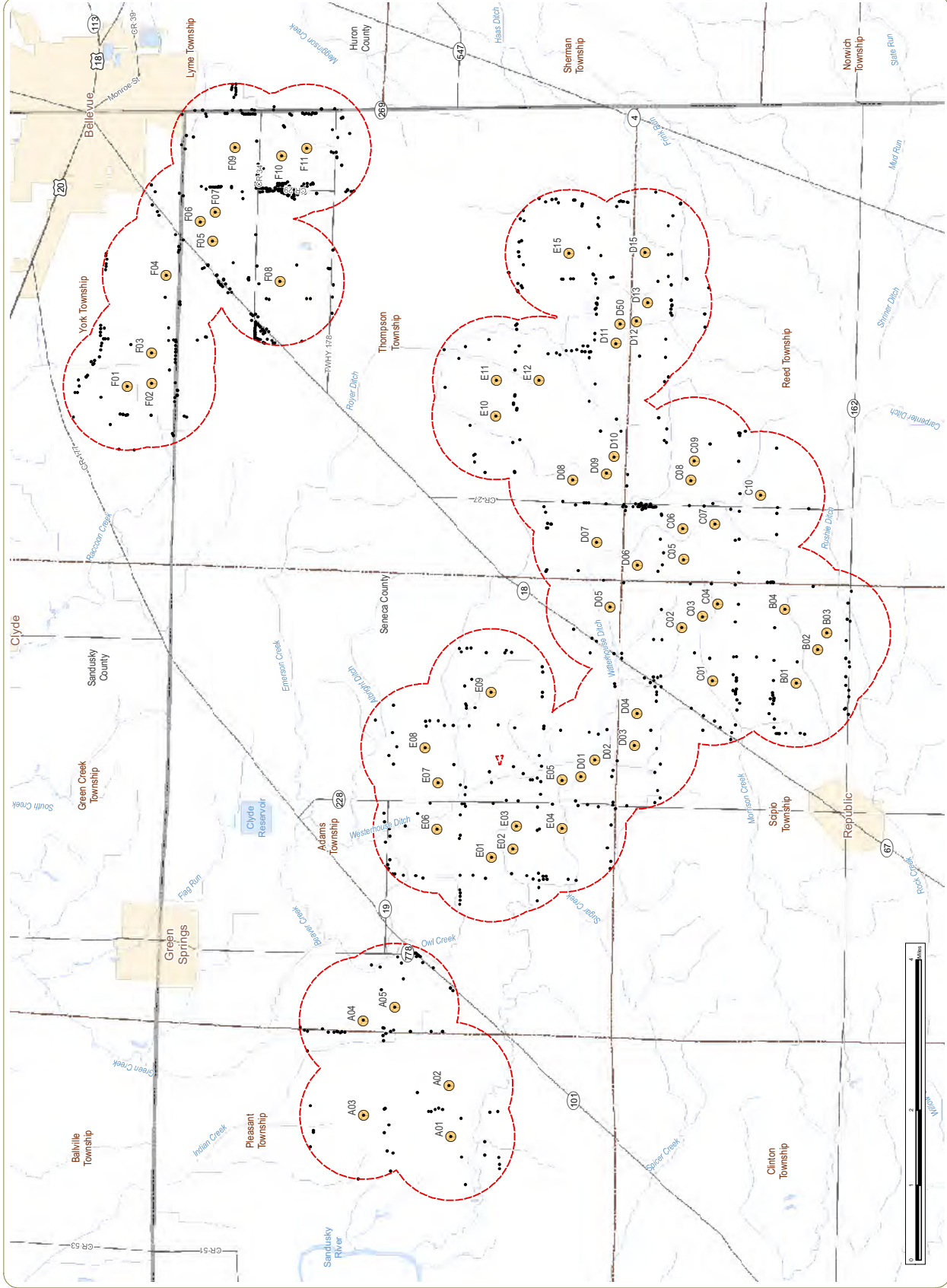
Republic Wind

York Township, Sandusky County, Pleasant, Adams, Thompson, Scipio, Reed Townships, Seneca County, Ohio

Figure 1. Proposed Turbine Layout

- Wind Turbine
- Receptor
- 1,370-Meter Study Area
- Township Boundary
- County Boundary

Notes:
 1. Basemap: ESRI Streetmap North America, 2006.
 2. This map was generated in ArcMap on April 30, 2018.
 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.



Republic Wind

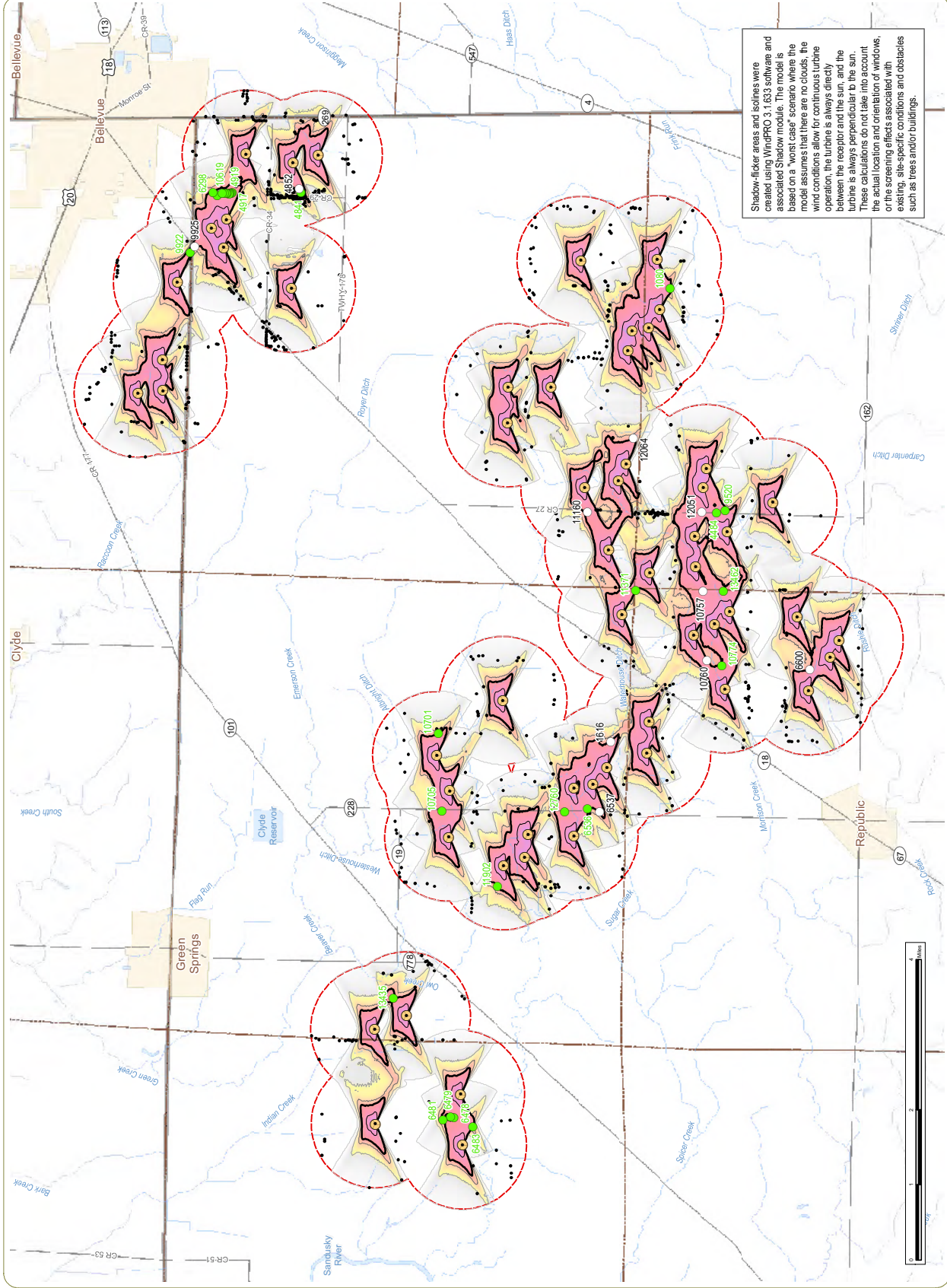
York Township, Sandusky County, Pleasant Adams, Thompson, Scipio, Reed Townships, Seneca County, Ohio, and Lyme Township, Huron County, Ohio

Figure 2. Expected Shadow Flicker

- Receptor < 30 hours/year
- Participant > 30 hours/year
- Non-Participant > 30 hours/year
- Wind Turbine
- 1,370-Meter Study Area
- Township Boundary
- County Boundary
- 0 hours/year
- 10 hours/year
- 20 hours/year
- 30 hours/year
- 100 hours/year
- Shadow Flicker (hours/year)
- < 1
- 1 - 10
- 10 - 20
- 20 - 30
- 30 - 100
- > 100

Notes:

1. Basemap: ESRI StreetMap North America, 2008.
2. This map was generated in ArcMap on April 30, 2018.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.



Attachment A

Wind Rose and Sunshine Data

Table A1. Wind Rose Data

SECTOR	N	NNE	NE	ENE	E	ESE	SE	SSE
Frequency	3.50	4.79	5.68	4.78	3.65	3.10	3.42	4.63
Hours of Operation	306	420	497	419	320	272	300	406

SECTOR	S	SSW	SW	WSW	W	WNW	NW	NNW
Frequency	10.25	13.26	11.60	11.36	8.89	5.13	3.19	2.77
Hours of Operation	897	1,162	1,016	995	779	449	279	243

Source: Wind rose data provided by Republic Wind LLC

Table A2. Sunshine Probability Data¹

Month	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Sunshine Probability ²	41	48	50	53	59	61	65	61	58	52	34	29

¹Source: NOAA Comparative Climatic Data for the United States through 2015 – Toledo, Ohio Weather Station.

²Defined by NOAA as the total time that sunshine reaches the surface of the earth, expressed as the percentage of the maximum amount possible from sunrise to sunset with clear sky conditions.

Attachment B

WindPRO Overview Reports and Calendars

SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

Assumptions for shadow calculations

Maximum distance for influence	1,360 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.41	0.48	0.50	0.53	0.59	0.61	0.65	0.61	0.58	0.52	0.34	0.29

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
306	420	497	419	320	272	300	406	897	1,162	1,016	995

W	WNW	NW	NNW	Sum
779	449	279	243	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: 2 meter contour.wpo (1)

Obstacles not used in calculation

Eye height for map: 1.5 m

Grid resolution: 1.0 m

All coordinates are in

UTM (north)-NAD83 (US+CA) Zone: 17

WTGs

	Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	RPM [RPM]
					Valid	Manufact.					
			[m]								
T1	326,526	4,564,671	224.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (1) No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T10	331,467	4,563,287	242.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T11	331,507	4,560,193	248.5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T12	331,740	4,560,600	245.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T13	331,839	4,560,028	251.1	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T14	335,007	4,556,468	270.9	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T15	335,033	4,558,007	264.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T16	335,199	4,555,826	270.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T17	335,252	4,557,236	262.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T18	335,336	4,556,418	271.5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T19	336,273	4,558,984	259.2	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T2	326,537	4,565,073	218.3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (2) No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T20	336,288	4,559,697	258.8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T21	336,561	4,559,513	260.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T22	336,846	4,559,680	258.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T23	336,885	4,558,025	265.8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T24	337,739	4,561,250	252.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T25	337,779	4,558,158	260.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T26	337,922	4,559,725	253.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T27	338,111	4,558,069	266.3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T28	338,226	4,559,840	254.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T29	338,410	4,562,017	252.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T3	326,658	4,564,169	222.3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (3) No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T30	338,542	4,559,758	256.8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T31	339,300	4,562,069	249.7	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T32	339,469	4,562,344	250.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T33	339,702	4,563,494	248.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T34	339,785	4,562,785	249.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T35	339,859	4,562,112	250.2	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T36	340,268	4,569,450	237.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T37	340,278	4,570,004	236.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T38	340,334	4,566,673	244.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T39	340,684	4,569,413	236.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T4	329,890	4,562,185	242.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (4) No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T40	341,370	4,559,432	260.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7

To be continued on next page...

SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

...continued from previous page

	Easting	Northing	Z	Row data/Description	WTG type		Power, rated [kW]	Rotor diameter [m]	Hub height [m]	RPM
					Valid	Manufact.				
			[m]							[RPM]
T41	341,544	4,558,921	262.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T42	343,005	4,567,906	236.8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T43	343,157	4,568,376	236.5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T44	343,321	4,568,070	235.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T45	343,604	4,568,382	232.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T46	343,770	4,568,055	235.4	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T47	344,804	4,565,988	244.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T48	344,861	4,566,427	244.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T49	344,878	4,567,522	240.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T5	329,993	4,561,848	239.3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (5) No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T50	345,325	4,567,813	239.5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (... No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T6	330,397	4,560,420	244.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (6) No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T7	330,450	4,562,203	240.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (7) No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T8	330,516	4,561,837	241.1	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (8) No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7
T9	331,362	4,559,101	251.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (9) No	No	VESTAS	V136-3.6-3,600	3,600	136.0	11.7

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
			[m]	[m]	[m]	a.g.l.	window		(ZVI) a.g.l.
			[m]	[m]	[m]		[°]		[m]
1076	339,290	4,558,558	265.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1077	337,375	4,558,614	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1078	337,376	4,558,633	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1079	337,372	4,558,652	260.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1080	342,212	4,558,571	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1085	337,368	4,558,686	261.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1087	337,380	4,558,709	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1091	342,354	4,559,949	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1094	342,365	4,559,959	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1097	337,464	4,560,053	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1098	340,704	4,560,013	258.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1099	339,644	4,560,042	258.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1100	340,573	4,560,042	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1101	340,692	4,560,045	258.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1110	336,736	4,561,606	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1112	336,654	4,561,615	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1114	340,831	4,561,550	254.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1120	340,559	4,562,845	248.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1133	340,122	4,564,151	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1143	345,713	4,565,364	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1151	340,488	4,565,517	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1152	339,714	4,565,532	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1153	345,301	4,565,438	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1154	344,249	4,566,211	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1155	340,599	4,566,277	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1156	345,817	4,566,194	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1157	345,821	4,566,197	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1158	339,186	4,566,317	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1159	339,310	4,566,349	243.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1162	344,073	4,566,295	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1164	344,066	4,566,302	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1165	344,112	4,566,316	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1167	342,162	4,567,133	240.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1168	340,664	4,567,164	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1169	344,132	4,567,107	240.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1170	341,455	4,567,154	240.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1171	340,983	4,567,166	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1172	341,298	4,567,160	241.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1173	344,280	4,567,110	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1174	344,306	4,567,109	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1175	344,227	4,567,113	241.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1176	344,209	4,567,114	241.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1177	344,329	4,567,115	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

To be continued on next page...

SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
1178	344,258	4,567,119	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1179	340,765	4,567,200	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1180	341,776	4,568,825	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1181	339,871	4,568,873	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1182	339,771	4,568,878	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1183	339,874	4,568,882	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1184	339,771	4,568,889	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1187	340,960	4,568,910	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1188	340,039	4,568,926	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1189	340,915	4,568,914	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1190	339,721	4,568,936	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1191	339,636	4,568,941	241.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1584	327,550	4,564,711	222.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1615	332,594	4,559,665	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1616	332,499	4,559,850	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1617	332,541	4,560,041	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1618	331,588	4,559,565	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1619	331,727	4,559,533	251.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1620	331,928	4,559,452	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1621	330,982	4,559,542	250.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1622	334,151	4,556,454	268.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4484	337,392	4,557,580	263.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4492	341,513	4,557,570	266.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4517	342,276	4,557,963	263.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4524	341,487	4,558,276	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4525	341,704	4,558,274	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4526	341,692	4,558,282	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4528	341,801	4,558,287	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4529	341,809	4,558,289	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4530	342,134	4,558,284	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4531	341,618	4,558,293	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4533	338,074	4,559,220	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4535	337,820	4,559,241	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4536	337,386	4,559,250	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4537	337,292	4,559,264	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4539	337,421	4,559,299	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4541	337,381	4,559,326	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4546	337,421	4,558,828	260.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4547	337,350	4,558,831	261.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4549	337,388	4,558,848	260.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4557	337,388	4,558,875	260.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4561	337,339	4,558,891	260.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4562	337,384	4,558,891	260.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4566	342,294	4,559,586	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4568	337,447	4,559,683	256.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4576	339,002	4,559,799	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4577	339,008	4,559,800	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4584	336,921	4,560,941	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4585	336,034	4,560,959	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4586	337,018	4,560,945	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4587	335,992	4,560,975	255.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4588	336,924	4,560,962	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4593	337,260	4,560,983	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4599	342,269	4,560,391	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4600	340,722	4,560,420	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4607	342,270	4,560,443	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4637	337,478	4,561,831	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4644	338,110	4,561,643	253.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4649	338,134	4,561,650	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4650	336,780	4,561,674	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4652	337,358	4,561,664	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4654	336,882	4,561,674	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4655	336,835	4,561,675	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4660	337,293	4,561,673	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4661	338,111	4,562,281	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
4677	338,509	4,562,499	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4678	338,334	4,562,503	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4696	339,935	4,563,142	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4699	340,752	4,563,159	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4710	339,135	4,564,024	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4711	340,276	4,564,005	246.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4720	339,160	4,564,039	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4721	339,304	4,564,037	249.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4728	344,151	4,564,847	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4731	344,137	4,564,888	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4733	344,168	4,564,928	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4760	345,388	4,565,187	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4763	344,171	4,565,230	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4764	344,173	4,565,236	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4771	344,136	4,565,266	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4774	339,959	4,565,387	244.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4778	340,097	4,565,693	244.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4779	339,698	4,565,704	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4780	339,992	4,565,701	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4781	339,927	4,565,706	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4782	339,960	4,565,712	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4790	345,917	4,565,508	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4791	339,717	4,565,615	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4793	344,975	4,565,530	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4796	339,818	4,565,629	246.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4803	339,519	4,565,643	245.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4804	339,707	4,565,643	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4810	344,098	4,565,898	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4811	344,104	4,565,900	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4813	339,211	4,566,013	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4814	345,816	4,565,902	244.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4815	345,810	4,565,930	244.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4816	339,303	4,566,046	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4819	344,301	4,565,974	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4820	344,326	4,565,978	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4824	345,826	4,565,981	244.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4825	344,295	4,566,020	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4827	344,264	4,566,626	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4828	344,185	4,566,628	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4829	345,557	4,566,604	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4830	344,140	4,566,633	243.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4831	344,311	4,566,632	243.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4832	344,115	4,566,638	242.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4834	344,268	4,566,648	243.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4835	344,190	4,566,657	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4836	344,153	4,566,668	243.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4837	344,275	4,566,685	243.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4838	344,312	4,566,688	243.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4839	344,141	4,566,465	243.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4840	344,177	4,566,465	243.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4841	344,258	4,566,478	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4842	344,068	4,566,490	243.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4843	344,098	4,566,489	243.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4844	344,181	4,566,494	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4845	344,133	4,566,496	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4846	339,328	4,566,584	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4847	345,804	4,566,473	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4848	344,047	4,566,507	242.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4851	344,065	4,566,519	243.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4852	344,343	4,566,518	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4854	344,096	4,566,529	243.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4855	339,337	4,566,628	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4856	344,131	4,566,546	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4857	340,948	4,566,852	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4858	344,153	4,566,806	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
4859	344,151	4,566,828	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4860	345,961	4,566,804	241.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4861	345,895	4,566,816	240.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4862	344,153	4,566,850	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4863	341,134	4,566,917	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4864	339,053	4,566,959	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4866	339,041	4,566,970	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4867	344,195	4,566,891	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4868	344,152	4,566,897	241.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4869	340,970	4,566,953	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4870	341,187	4,566,966	242.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4871	344,190	4,566,918	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4872	344,141	4,566,930	241.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4874	340,884	4,567,003	243.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4875	345,797	4,567,414	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4876	343,985	4,567,473	234.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4877	345,797	4,567,453	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4878	344,135	4,567,484	234.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4879	345,822	4,567,489	239.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4880	345,881	4,567,518	239.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4881	339,438	4,567,677	244.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4885	342,617	4,567,680	238.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4886	346,278	4,567,619	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4887	346,439	4,567,620	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4888	341,084	4,567,218	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4889	344,465	4,567,160	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4890	341,118	4,567,219	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4891	341,146	4,567,219	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4892	340,986	4,567,222	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4894	340,941	4,567,231	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4895	344,493	4,567,171	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4896	339,958	4,567,251	242.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4897	339,916	4,567,255	242.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4898	339,641	4,567,263	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4899	344,212	4,567,185	240.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4900	344,277	4,567,185	241.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4901	343,216	4,567,204	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4902	339,643	4,567,267	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4903	344,335	4,567,189	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4905	339,686	4,567,273	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4906	342,158	4,567,851	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4907	340,310	4,567,896	240.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4908	340,020	4,567,903	245.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4909	339,971	4,567,915	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4910	345,814	4,567,816	238.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4911	342,254	4,567,891	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4912	342,244	4,567,894	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4913	342,103	4,567,910	240.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4914	345,809	4,567,858	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4915	342,135	4,567,943	240.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4916	342,140	4,567,957	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4917	344,251	4,567,947	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4918	342,181	4,567,991	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4919	344,236	4,567,961	233.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4921	342,209	4,568,008	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4922	344,236	4,567,992	233.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4923	342,343	4,568,033	238.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4937	341,219	4,569,066	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4939	341,868	4,569,141	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4942	339,340	4,569,445	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4943	340,859	4,569,881	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
5161	339,361	4,570,109	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
5162	339,354	4,570,047	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
5163	339,335	4,569,989	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
5164	339,347	4,569,950	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
5246	340,836	4,568,916	237.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
5247	340,763	4,568,915	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
5248	340,697	4,568,920	238.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6082	340,740	4,570,529	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6083	340,884	4,570,500	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6084	340,980	4,570,464	236.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6085	341,054	4,570,535	237.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6086	341,121	4,570,532	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6087	341,194	4,570,527	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6088	341,267	4,570,528	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6089	341,207	4,570,449	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6090	340,980	4,570,423	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6091	340,982	4,570,364	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6160	343,851	4,569,416	233.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6296	344,237	4,568,182	235.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6297	344,187	4,568,266	236.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6298	344,254	4,568,362	237.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6433	326,106	4,565,289	216.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6434	326,118	4,565,348	216.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6435	326,094	4,565,382	216.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6436	326,116	4,565,436	216.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6437	326,119	4,565,459	216.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6438	326,110	4,565,518	216.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6439	326,105	4,565,647	216.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6440	326,183	4,565,769	215.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6445	327,927	4,563,888	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6446	327,771	4,563,734	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6447	327,814	4,563,767	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6448	327,799	4,563,805	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6449	327,751	4,563,711	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6450	327,728	4,563,754	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6451	327,727	4,563,674	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6452	327,603	4,563,618	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6453	327,873	4,563,592	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6454	327,590	4,564,070	230.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6455	327,721	4,564,154	230.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6460	330,804	4,564,453	239.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6466	331,853	4,564,246	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6467	332,230	4,564,173	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6468	332,042	4,564,341	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6484	326,119	4,563,196	226.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6485	327,002	4,562,969	235.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6486	327,056	4,563,026	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6487	326,900	4,562,857	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6497	328,929	4,561,157	240.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6498	329,210	4,561,122	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6499	329,465	4,561,379	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6500	329,507	4,561,716	238.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6501	329,395	4,561,246	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6502	329,514	4,561,135	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6503	329,366	4,561,120	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6504	329,387	4,561,030	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6525	332,671	4,561,019	250.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6526	332,620	4,561,023	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6534	332,584	4,560,659	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6535	330,970	4,560,286	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6536	331,070	4,560,343	246.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6537	330,992	4,560,086	246.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6538	329,386	4,560,494	240.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6539	329,369	4,560,325	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6558	330,987	4,558,563	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6559	330,979	4,558,518	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6560	331,129	4,558,523	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6561	331,293	4,558,577	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6562	331,676	4,558,634	247.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
6563	331,856	4,558,515	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6564	330,888	4,558,701	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6565	331,031	4,558,641	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6571	332,584	4,558,728	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6600	334,049	4,555,583	268.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6601	334,788	4,556,070	270.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6602	335,757	4,556,157	270.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6745	340,092	4,571,000	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6746	340,485	4,570,728	235.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6747	340,451	4,570,673	237.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6748	340,196	4,570,814	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9048	325,704	4,566,087	214.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9049	326,211	4,566,244	216.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9050	326,128	4,566,087	214.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9051	326,158	4,566,155	215.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9520	337,449	4,557,396	263.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9529	338,725	4,557,457	269.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9540	341,534	4,558,302	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9545	338,758	4,558,385	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9546	339,049	4,558,380	262.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9547	342,320	4,558,350	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9550	337,314	4,558,913	260.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9552	337,426	4,558,933	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9553	337,459	4,558,936	258.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9554	337,423	4,558,970	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9555	337,384	4,558,971	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9556	337,426	4,558,982	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9558	337,385	4,559,005	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9561	340,606	4,558,970	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9562	337,438	4,559,049	259.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9565	337,383	4,559,103	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9569	341,853	4,559,863	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9571	341,714	4,559,877	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9574	341,508	4,559,888	257.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9575	341,742	4,559,884	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9578	340,727	4,560,534	254.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9579	337,494	4,560,610	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9595	337,003	4,560,862	256.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9596	337,001	4,560,871	256.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9608	339,773	4,561,639	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9611	336,516	4,561,702	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9612	340,695	4,561,630	254.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9616	339,748	4,561,649	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9617	340,309	4,561,639	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9623	339,576	4,561,670	255.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9624	339,609	4,561,669	255.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9625	338,754	4,561,685	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9626	338,486	4,562,522	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9628	337,916	4,562,545	253.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9643	339,244	4,563,496	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9644	339,253	4,563,529	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9645	339,253	4,563,537	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9659	340,767	4,564,039	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9663	340,041	4,564,082	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9682	344,134	4,564,830	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9695	345,465	4,565,556	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9698	339,758	4,565,656	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9703	344,985	4,565,583	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9707	339,842	4,565,686	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9710	339,867	4,565,691	247.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9712	340,054	4,565,692	245.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9713	345,792	4,566,007	244.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9716	345,804	4,566,058	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9717	345,808	4,566,059	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9718	340,263	4,566,161	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
9719	344,250	4,566,096	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9720	344,310	4,566,095	243.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9721	339,306	4,566,197	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9722	344,108	4,566,136	242.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9723	344,182	4,566,550	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9725	344,098	4,566,556	243.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9726	344,314	4,566,557	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9728	344,132	4,566,563	243.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9730	344,101	4,566,572	243.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9731	344,110	4,566,584	243.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9732	344,177	4,566,583	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9733	344,126	4,566,586	243.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9734	344,098	4,566,593	243.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9735	344,309	4,566,591	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9737	344,144	4,566,600	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9739	345,520	4,566,585	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9742	341,113	4,566,999	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9743	344,142	4,566,961	241.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9744	344,197	4,566,963	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9745	341,147	4,567,017	242.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9746	344,210	4,566,968	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9747	341,158	4,567,032	242.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9748	340,898	4,567,037	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9749	341,090	4,567,037	243.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9750	344,203	4,566,993	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9751	341,182	4,567,052	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9752	345,218	4,567,181	240.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9753	341,479	4,567,262	241.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9755	341,375	4,567,290	241.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9756	345,799	4,567,218	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9757	341,510	4,567,300	241.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9758	345,885	4,567,227	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9759	345,804	4,567,260	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9762	345,898	4,567,282	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9763	342,301	4,567,349	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9764	342,243	4,567,352	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9765	342,272	4,567,366	235.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9766	345,801	4,567,317	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9767	345,803	4,567,357	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9769	345,801	4,567,370	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9771	344,249	4,568,000	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9772	342,340	4,568,046	238.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9773	342,564	4,568,216	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9774	341,013	4,568,254	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9775	342,554	4,568,230	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9777	341,020	4,568,277	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9778	342,505	4,568,303	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9779	345,753	4,568,254	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9780	345,809	4,568,267	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9919	343,707	4,569,312	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9920	343,629	4,569,277	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9921	343,219	4,568,916	232.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9922	342,962	4,568,851	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9923	342,885	4,568,845	236.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9924	342,839	4,568,856	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9925	343,103	4,568,754	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9955	340,618	4,568,919	239.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9956	340,549	4,568,923	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9957	340,472	4,568,928	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10615	344,228	4,568,018	233.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10616	344,237	4,568,057	234.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10617	344,234	4,568,079	234.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10618	344,237	4,568,117	234.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10619	344,237	4,568,156	234.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10700	332,790	4,563,463	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
10701	332,672	4,563,537	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10702	332,776	4,563,562	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10703	330,529	4,563,990	233.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10704	330,801	4,563,728	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10705	331,019	4,563,456	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10707	328,853	4,562,824	238.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10708	328,939	4,562,812	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10709	329,023	4,562,812	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10710	330,331	4,562,811	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10711	330,266	4,562,832	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10712	329,471	4,562,814	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10713	329,477	4,562,537	240.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10714	329,161	4,562,819	238.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10715	329,097	4,562,810	239.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10716	330,771	4,562,806	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10746	332,193	4,558,594	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10747	334,526	4,558,479	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10748	334,529	4,558,667	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10755	335,174	4,558,496	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10756	335,994	4,558,573	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10757	335,726	4,557,871	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10760	334,242	4,557,787	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10761	330,922	4,557,934	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10762	330,878	4,558,401	251.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10767	333,777	4,556,956	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10770	335,287	4,556,845	270.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10771	334,911	4,556,915	268.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10772	334,158	4,556,950	267.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10773	334,163	4,556,887	267.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10774	334,128	4,557,464	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11128	338,353	4,556,842	268.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11129	337,433	4,558,730	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11130	337,380	4,558,732	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11139	337,385	4,558,774	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11146	337,463	4,560,112	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11147	340,826	4,560,075	257.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11150	337,465	4,560,156	257.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11151	340,701	4,560,140	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11153	340,832	4,560,180	256.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11154	336,013	4,560,278	257.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11155	340,708	4,560,203	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11160	337,418	4,560,342	256.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11162	340,747	4,560,311	256.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11163	336,935	4,561,626	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11172	339,485	4,561,600	254.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11176	339,449	4,561,606	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11214	344,877	4,565,457	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11216	344,868	4,565,460	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11218	344,979	4,565,470	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11220	340,961	4,565,561	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11223	340,959	4,565,566	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11229	339,795	4,565,604	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11230	339,670	4,565,608	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11233	339,080	4,566,429	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11234	344,130	4,566,357	242.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11235	343,972	4,566,372	242.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11236	344,180	4,566,370	242.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11237	339,321	4,566,463	242.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11238	344,042	4,566,383	242.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11239	344,068	4,566,387	242.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11241	344,137	4,566,412	243.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11242	344,005	4,566,417	242.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11243	344,020	4,566,427	242.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11244	339,321	4,566,519	242.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11245	344,175	4,566,436	243.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
11246	344,139	4,566,443	243.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11247	345,777	4,566,429	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11248	340,762	4,567,204	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11249	340,227	4,567,214	242.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11250	342,538	4,567,178	242.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11251	340,138	4,567,223	242.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11252	344,730	4,567,147	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11253	341,295	4,567,208	241.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11254	341,509	4,567,206	240.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11255	341,264	4,567,211	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11256	341,339	4,567,210	241.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11257	341,017	4,567,216	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11258	341,049	4,567,216	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11259	344,493	4,567,157	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11260	341,218	4,567,214	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11261	341,115	4,567,216	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11262	344,425	4,567,159	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11263	341,176	4,567,217	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11264	341,076	4,567,219	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11277	340,958	4,568,959	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11279	340,312	4,569,049	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11281	340,948	4,569,067	236.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11369	336,389	4,558,450	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11370	336,134	4,558,478	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11371	335,749	4,559,309	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11372	335,804	4,559,736	257.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11695	345,054	4,568,715	237.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11696	345,144	4,568,790	235.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11697	345,337	4,568,688	236.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11698	345,304	4,568,538	236.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11699	345,792	4,568,779	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11700	345,804	4,568,847	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11701	345,813	4,568,883	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11702	345,882	4,568,507	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11898	331,461	4,562,142	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11899	331,690	4,562,184	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11900	331,014	4,562,108	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11901	331,074	4,561,821	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11902	329,406	4,562,272	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11911	331,035	4,559,534	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11912	330,909	4,559,484	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11913	330,960	4,559,236	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11914	330,551	4,559,576	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11915	330,941	4,559,848	248.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11916	330,060	4,559,657	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11917	329,775	4,559,584	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11918	329,614	4,559,600	244.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12051	337,405	4,557,895	266.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12063	342,260	4,557,944	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12064	338,997	4,559,362	262.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12071	339,258	4,559,464	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12080	342,303	4,559,534	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12082	337,382	4,561,015	255.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12100	337,555	4,561,966	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12101	337,564	4,561,967	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12103	337,473	4,561,982	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12109	336,741	4,562,150	254.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12116	339,126	4,563,988	252.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12117	340,741	4,563,969	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12123	339,585	4,564,002	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12124	340,174	4,563,994	247.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12125	340,571	4,563,987	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12126	339,883	4,564,001	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12127	340,173	4,563,997	247.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12128	340,758	4,563,988	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
12130	340,277	4,564,001	246.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12132	344,148	4,565,009	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12134	344,141	4,565,012	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12143	344,155	4,565,090	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12145	344,145	4,565,107	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12147	344,144	4,565,153	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12157	340,050	4,565,816	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12158	340,050	4,565,831	243.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12160	340,056	4,565,864	243.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12164	345,907	4,565,791	245.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12165	345,904	4,565,792	245.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12166	344,155	4,566,695	243.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12167	344,189	4,566,695	243.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12168	339,326	4,566,782	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12169	344,265	4,566,709	243.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12171	344,154	4,566,718	242.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12173	344,187	4,566,722	243.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12174	340,894	4,566,788	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12175	344,311	4,566,732	242.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12176	344,264	4,566,733	242.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12178	340,893	4,566,823	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12179	344,193	4,566,767	242.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12181	344,201	4,566,780	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12182	344,227	4,566,783	242.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12183	346,311	4,567,623	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12184	346,219	4,567,625	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12185	346,362	4,567,630	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12186	341,979	4,567,716	240.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12188	346,159	4,567,667	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12189	344,250	4,567,714	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12190	344,222	4,567,716	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12191	342,049	4,567,758	241.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12192	345,887	4,567,695	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12193	345,882	4,567,698	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12194	346,437	4,567,694	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12195	346,372	4,567,707	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12196	346,325	4,567,718	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12197	341,973	4,567,794	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12198	340,906	4,567,813	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12199	340,898	4,567,815	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12607	340,832	4,570,516	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12727	327,248	4,564,029	226.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12728	327,486	4,563,391	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12729	326,125	4,563,881	224.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12730	326,123	4,563,434	224.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12744	329,389	4,560,948	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12745	329,454	4,560,971	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12746	329,453	4,561,040	240.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12747	330,470	4,561,110	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12748	330,434	4,561,162	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12749	330,932	4,561,154	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12750	331,651	4,561,464	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12751	331,807	4,561,671	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12752	331,524	4,561,308	244.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12753	331,526	4,561,258	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12754	331,555	4,561,158	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12755	331,484	4,561,084	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12756	331,209	4,561,091	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12757	331,813	4,561,074	244.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12758	332,042	4,561,121	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12759	331,071	4,561,571	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12760	331,000	4,560,832	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12778	335,762	4,556,126	270.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12779	335,755	4,556,098	270.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12789	335,314	4,554,497	268.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
		[m]	[m]	[m]	[m]	[m]	[°]		[m]
12790	335,667	4,555,246	276.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12792	334,961	4,554,513	274.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12969	338,801	4,558,434	266.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12970	340,578	4,558,405	264.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12971	340,976	4,558,399	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12973	337,197	4,558,486	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12974	337,219	4,558,499	262.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12976	336,679	4,558,517	264.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12979	339,291	4,558,550	265.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12981	341,746	4,559,894	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12982	341,633	4,559,898	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12983	342,261	4,559,900	259.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12984	341,614	4,559,914	258.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12985	341,092	4,559,924	258.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12986	342,166	4,559,907	259.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12987	340,960	4,559,932	260.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12996	338,813	4,561,536	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13005	339,126	4,562,600	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13008	340,809	4,562,703	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13014	337,572	4,562,826	250.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13016	339,804	4,564,111	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13028	345,728	4,565,326	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13029	345,721	4,565,328	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13031	344,701	4,565,348	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13037	344,706	4,565,359	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13040	345,811	4,566,113	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13042	340,253	4,566,215	245.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13043	344,104	4,566,151	242.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13044	340,933	4,566,206	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13048	344,224	4,566,162	242.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13049	344,295	4,566,170	242.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13050	345,797	4,566,154	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13051	344,112	4,566,198	242.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13053	341,149	4,567,093	242.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13054	344,204	4,567,043	241.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13055	344,635	4,567,039	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13056	340,966	4,567,103	242.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13057	341,231	4,567,101	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13058	344,134	4,567,052	240.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13059	344,221	4,567,070	241.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13060	341,265	4,567,129	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13061	344,206	4,567,080	241.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13062	340,962	4,567,138	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13063	340,970	4,567,138	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13064	342,488	4,568,345	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13065	345,885	4,568,329	236.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13066	345,885	4,568,343	236.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13067	340,952	4,568,455	238.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13068	339,306	4,568,685	240.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13069	339,323	4,568,737	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13075	341,716	4,568,818	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13124	344,045	4,568,758	233.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13125	344,105	4,568,837	234.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13126	344,138	4,569,361	232.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13127	344,280	4,569,443	234.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13427	325,928	4,564,459	221.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13428	326,034	4,564,468	223.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13429	326,196	4,564,449	224.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13430	326,122	4,564,307	222.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13431	326,155	4,564,241	222.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13432	326,202	4,564,473	224.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13433	326,078	4,564,411	224.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13434	327,509	4,564,534	224.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13435	327,017	4,564,502	222.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13436	331,008	4,562,723	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: 2019-06-17_Republic SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
13437	330,955	4,562,701	240.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13438	331,204	4,562,707	237.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13439	331,358	4,562,692	239.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13440	331,411	4,562,806	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13441	331,849	4,562,950	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13442	331,006	4,562,777	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13443	332,786	4,563,283	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13444	332,687	4,563,153	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13445	332,686	4,562,966	242.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13460	336,656	4,556,916	270.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13461	336,681	4,556,832	270.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13462	335,725	4,557,430	263.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13463	335,705	4,556,913	267.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13464	335,960	4,556,841	270.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13465	337,322	4,557,008	264.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13466	337,283	4,556,828	266.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13467	337,661	4,556,815	268.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13471	334,084	4,556,083	270.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13520	335,752	4,556,223	268.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14002	339,140	4,570,316	237.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14003	339,729	4,570,520	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14004	339,963	4,570,990	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14005	339,832	4,571,022	237.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14006	339,829	4,571,074	237.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14007	340,162	4,570,842	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14008	340,433	4,570,697	236.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14009	340,514	4,570,656	236.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14010	340,591	4,570,556	236.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14026	340,963	4,562,200	248.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

No.	Shadow, worst case		Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
1076	7:47	35	0:21	2:21
1077	78:55	124	1:09	16:11
1078	66:00	119	1:03	13:38
1079	53:15	112	0:54	11:11
1080	37:15	77	0:39	12:29
1085	39:34	100	0:35	8:34
1087	31:36	88	0:32	6:57
1091	14:23	52	0:27	3:50
1094	13:54	52	0:26	3:42
1097	164:48	168	1:44	39:11
1098	28:43	56	0:37	5:10
1099	8:49	36	0:23	2:49
1100	30:26	70	0:32	5:36
1101	20:58	48	0:33	3:41
1110	11:17	39	0:26	3:05
1112	9:08	35	0:24	2:30
1114	11:24	54	0:18	3:47
1120	32:52	92	0:39	10:18
1133	0:00	0	0:00	0:00
1143	0:00	0	0:00	0:00
1151	0:00	0	0:00	0:00
1152	0:00	0	0:00	0:00
1153	0:00	0	0:00	0:00
1154	120:42	181	0:53	42:25
1155	0:00	0	0:00	0:00
1156	27:07	86	0:30	8:34
1157	26:56	86	0:29	8:30
1158	11:30	44	0:23	4:30

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
1159	16:41	54	0:28	6:35	
1162	51:56	116	0:40	16:02	
1164	50:47	115	0:39	15:35	
1165	58:36	123	0:41	17:33	
1167	0:00	0	0:00	0:00	
1168	0:00	0	0:00	0:00	
1169	21:16	78	0:24	6:15	
1170	9:31	38	0:23	2:50	
1171	42:00	70	0:42	10:09	
1172	14:59	52	0:27	4:03	
1173	0:00	0	0:00	0:00	
1174	0:00	0	0:00	0:00	
1175	0:00	0	0:00	0:00	
1176	1:34	20	0:07	0:39	
1177	0:00	0	0:00	0:00	
1178	0:00	0	0:00	0:00	
1179	0:00	0	0:00	0:00	
1180	15:59	65	0:20	5:20	
1181	0:00	0	0:00	0:00	
1182	1:58	26	0:06	0:50	
1183	0:00	0	0:00	0:00	
1184	3:57	34	0:10	1:41	
1187	0:00	0	0:00	0:00	
1188	0:00	0	0:00	0:00	
1189	0:00	0	0:00	0:00	
1190	18:16	64	0:23	7:45	
1191	24:02	77	0:24	10:06	
1584	50:04	172	0:29	14:54	
1615	50:41	123	0:39	16:48	
1616	48:03	80	0:52	15:39	
1617	40:03	79	0:46	12:54	
1618	0:00	0	0:00	0:00	
1619	13:15	32	0:31	2:59	
1620	63:21	108	0:49	16:24	
1621	36:09	87	0:46	7:42	
1622	33:18	108	0:35	9:19	
4484	0:00	0	0:00	0:00	
4492	0:00	0	0:00	0:00	
4517	0:00	0	0:00	0:00	
4524	0:00	0	0:00	0:00	
4525	0:00	0	0:00	0:00	
4526	0:00	0	0:00	0:00	
4528	0:00	0	0:00	0:00	
4529	0:00	0	0:00	0:00	
4530	0:00	0	0:00	0:00	
4531	0:00	0	0:00	0:00	
4533	8:19	40	0:19	2:45	
4535	34:36	124	0:27	11:30	
4536	66:20	158	0:50	23:44	
4537	75:11	135	1:06	25:51	
4539	62:47	174	0:37	22:05	
4541	62:34	168	0:45	21:18	
4546	8:36	36	0:23	2:42	
4547	10:13	37	0:25	3:13	
4549	9:13	35	0:23	2:55	
4557	9:18	36	0:24	2:57	
4561	10:25	37	0:25	3:18	
4562	9:23	36	0:24	2:58	
4566	16:50	57	0:31	5:09	
4568	147:03	162	1:35	49:56	
4576	82:55	88	1:17	27:03	
4577	80:59	88	1:16	26:24	
4584	42:49	100	0:36	17:36	
4585	0:00	0	0:00	0:00	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
4586	47:53	90	0:42	19:59	
4587	0:00	0	0:00	0:00	
4588	37:22	97	0:36	15:12	
4593	25:35	56	0:36	10:58	
4599	0:00	0	0:00	0:00	
4600	0:00	0	0:00	0:00	
4607	0:00	0	0:00	0:00	
4637	17:09	50	0:31	6:06	
4644	52:38	105	0:53	14:41	
4649	54:31	109	0:53	15:16	
4650	12:48	44	0:27	3:18	
4652	63:29	119	0:55	14:55	
4654	17:30	52	0:32	4:11	
4655	15:06	48	0:30	3:44	
4660	68:52	121	0:55	15:12	
4661	158:24	179	1:23	33:26	
4677	41:54	135	0:34	11:10	
4678	20:23	77	0:27	5:32	
4696	0:00	0	0:00	0:00	
4699	27:04	90	0:29	8:47	
4710	28:17	54	0:39	5:05	
4711	25:47	50	0:38	6:02	
4720	16:45	40	0:32	2:55	
4721	0:00	0	0:00	0:00	
4728	0:00	0	0:00	0:00	
4731	0:00	0	0:00	0:00	
4733	0:00	0	0:00	0:00	
4760	0:00	0	0:00	0:00	
4763	0:00	0	0:00	0:00	
4764	0:00	0	0:00	0:00	
4771	0:00	0	0:00	0:00	
4774	0:00	0	0:00	0:00	
4778	0:00	0	0:00	0:00	
4779	0:00	0	0:00	0:00	
4780	0:00	0	0:00	0:00	
4781	0:00	0	0:00	0:00	
4782	0:00	0	0:00	0:00	
4790	14:05	57	0:22	4:44	
4791	0:00	0	0:00	0:00	
4793	0:00	0	0:00	0:00	
4796	0:00	0	0:00	0:00	
4803	0:00	0	0:00	0:00	
4804	0:00	0	0:00	0:00	
4810	32:45	64	0:44	11:23	
4811	33:17	64	0:44	11:34	
4813	0:10	10	0:01	0:04	
4814	29:59	104	0:27	9:50	
4815	35:25	112	0:27	11:42	
4816	0:00	0	0:00	0:00	
4819	65:34	86	1:02	21:58	
4820	72:55	91	1:05	24:23	
4824	42:00	127	0:28	14:01	
4825	59:30	80	1:01	18:57	
4827	38:47	67	0:50	10:46	
4828	29:34	59	0:44	8:14	
4829	46:39	102	0:43	13:32	
4830	33:02	81	0:41	8:24	
4831	46:25	73	0:54	12:43	
4832	34:46	87	0:40	8:30	
4834	39:30	69	0:50	10:49	
4835	29:59	60	0:44	8:17	
4836	26:48	57	0:42	7:24	
4837	40:56	72	0:50	10:44	
4838	47:20	77	0:53	12:03	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
4839	72:16	144	0:42	17:03	
4840	79:19	144	0:45	18:46	
4841	82:33	134	0:51	20:19	
4842	57:59	140	0:38	13:36	
4843	63:49	140	0:40	14:53	
4844	74:57	134	0:45	17:37	
4845	68:55	134	0:41	16:00	
4846	13:27	42	0:29	4:35	
4847	26:58	90	0:31	8:11	
4848	54:38	136	0:37	12:41	
4851	58:00	132	0:38	13:18	
4852	59:12	97	0:59	16:47	
4854	61:38	128	0:39	14:05	
4855	13:26	41	0:29	4:28	
4856	60:43	118	0:41	13:55	
4857	37:39	66	0:49	12:16	
4858	28:47	66	0:40	6:40	
4859	29:34	70	0:39	6:33	
4860	9:35	37	0:24	3:07	
4861	11:29	40	0:26	3:40	
4862	31:04	76	0:39	6:35	
4863	21:09	51	0:37	6:53	
4864	6:09	29	0:19	1:42	
4866	5:58	28	0:19	1:39	
4867	44:58	94	0:41	8:35	
4868	38:01	96	0:38	7:22	
4869	36:17	70	0:46	11:13	
4870	18:12	48	0:34	5:54	
4871	44:14	86	0:40	8:20	
4872	38:50	90	0:37	7:22	
4874	64:40	114	0:51	17:08	
4875	15:54	46	0:31	5:03	
4876	45:33	140	0:34	15:24	
4877	15:36	44	0:31	4:59	
4878	50:59	113	0:42	17:34	
4879	25:06	80	0:30	8:08	
4880	57:16	116	0:46	19:03	
4881	0:00	0	0:00	0:00	
4885	37:48	95	0:40	15:52	
4886	15:33	46	0:30	4:49	
4887	9:59	36	0:24	3:07	
4888	34:03	68	0:36	8:11	
4889	0:00	0	0:00	0:00	
4890	33:26	72	0:34	8:06	
4891	32:11	76	0:33	7:50	
4892	24:47	51	0:36	5:47	
4894	13:34	36	0:28	3:03	
4895	0:00	0	0:00	0:00	
4896	0:00	0	0:00	0:00	
4897	0:00	0	0:00	0:00	
4898	29:33	58	0:37	5:19	
4899	28:35	67	0:35	12:10	
4900	16:04	50	0:26	6:53	
4901	0:00	0	0:00	0:00	
4902	27:54	56	0:36	5:00	
4903	4:24	27	0:13	1:52	
4905	19:29	46	0:32	3:25	
4906	37:49	120	0:36	13:49	
4907	0:00	0	0:00	0:00	
4908	0:00	0	0:00	0:00	
4909	0:00	0	0:00	0:00	
4910	80:17	128	1:04	26:20	
4911	46:29	127	0:42	16:35	
4912	46:49	129	0:41	16:48	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
4913	48:04	145	0:32	18:05	
4914	79:28	128	1:04	26:01	
4915	52:10	155	0:33	19:25	
4916	52:15	158	0:34	19:21	
4917	177:19	296	1:17	50:40	
4918	55:42	170	0:35	20:15	
4919	180:05	295	1:20	51:34	
4921	59:15	176	0:37	21:21	
4922	177:58	293	1:13	50:43	
4923	93:01	215	0:46	33:09	
4937	32:02	104	0:29	10:40	
4939	7:58	35	0:21	2:28	
4942	15:41	61	0:31	5:09	
4943	107:57	168	0:54	31:29	
5161	38:18	113	0:31	8:47	
5162	34:41	128	0:31	8:28	
5163	29:53	96	0:30	7:53	
5164	30:30	96	0:31	8:22	
5246	0:00	0	0:00	0:00	
5247	0:00	0	0:00	0:00	
5248	0:00	0	0:00	0:00	
6082	0:00	0	0:00	0:00	
6083	36:03	62	0:42	8:37	
6084	41:57	88	0:39	10:23	
6085	33:22	74	0:34	8:07	
6086	27:56	82	0:31	6:56	
6087	18:27	66	0:28	4:49	
6088	13:44	52	0:26	3:39	
6089	15:12	50	0:29	4:16	
6090	39:25	100	0:39	10:08	
6091	30:54	72	0:41	8:46	
6160	0:00	0	0:00	0:00	
6296	146:39	205	1:20	47:50	
6297	171:57	223	1:42	53:37	
6298	141:09	206	1:16	40:11	
6433	78:03	99	1:06	19:43	
6434	100:23	132	1:05	21:10	
6435	92:32	120	1:00	18:47	
6436	85:15	96	1:01	16:23	
6437	73:12	86	1:00	13:56	
6438	42:49	62	0:51	7:55	
6439	0:00	0	0:00	0:00	
6440	0:00	0	0:00	0:00	
6445	5:17	30	0:16	1:38	
6446	10:18	46	0:20	3:26	
6447	8:19	39	0:19	2:43	
6448	8:28	38	0:19	2:44	
6449	11:47	50	0:21	3:57	
6450	11:39	47	0:22	3:53	
6451	16:06	68	0:21	5:27	
6452	10:57	54	0:17	3:38	
6453	9:54	53	0:16	3:20	
6454	26:02	100	0:29	8:28	
6455	19:27	84	0:24	6:24	
6460	0:00	0	0:00	0:00	
6466	0:00	0	0:00	0:00	
6467	0:00	0	0:00	0:00	
6468	0:00	0	0:00	0:00	
6484	0:00	0	0:00	0:00	
6485	0:00	0	0:00	0:00	
6486	0:00	0	0:00	0:00	
6487	0:00	0	0:00	0:00	
6497	0:00	0	0:00	0:00	
6498	0:00	0	0:00	0:00	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
6499	26:12	80	0:25	10:59	
6500	137:33	158	1:11	53:38	
6501	21:00	88	0:24	5:32	
6502	21:47	54	0:29	3:53	
6503	17:42	76	0:24	3:21	
6504	13:47	52	0:25	2:48	
6525	14:21	48	0:28	4:11	
6526	16:59	54	0:30	4:46	
6534	38:42	120	0:34	11:19	
6535	164:35	245	1:00	55:15	
6536	171:28	263	1:07	56:53	
6537	138:08	190	1:02	49:01	
6538	12:18	38	0:28	3:50	
6539	12:44	40	0:28	4:20	
6558	0:00	0	0:00	0:00	
6559	0:00	0	0:00	0:00	
6560	0:00	0	0:00	0:00	
6561	0:00	0	0:00	0:00	
6562	0:00	0	0:00	0:00	
6563	0:00	0	0:00	0:00	
6564	0:00	0	0:00	0:00	
6565	0:00	0	0:00	0:00	
6571	7:17	35	0:18	2:20	
6600	10:17	39	0:24	3:40	
6601	92:11	120	1:07	21:12	
6602	122:33	217	0:51	37:51	
6745	0:00	0	0:00	0:00	
6746	0:00	0	0:00	0:00	
6747	0:00	0	0:00	0:00	
6748	0:00	0	0:00	0:00	
9048	0:00	0	0:00	0:00	
9049	0:00	0	0:00	0:00	
9050	0:00	0	0:00	0:00	
9051	0:00	0	0:00	0:00	
9520	0:00	0	0:00	0:00	
9529	0:00	0	0:00	0:00	
9540	0:00	0	0:00	0:00	
9545	48:54	107	0:45	14:43	
9546	20:22	66	0:30	6:33	
9547	0:00	0	0:00	0:00	
9550	11:01	37	0:26	3:30	
9552	8:18	34	0:23	2:39	
9553	9:51	57	0:21	3:09	
9554	12:41	67	0:22	4:06	
9555	9:57	53	0:24	3:11	
9556	15:31	75	0:23	5:03	
9558	16:52	76	0:24	5:30	
9561	15:20	61	0:30	4:57	
9562	33:10	103	0:29	11:02	
9565	46:19	115	0:41	15:36	
9569	46:28	68	0:51	11:18	
9571	0:41	7	0:07	0:08	
9574	0:00	0	0:00	0:00	
9575	6:12	22	0:22	1:19	
9578	0:00	0	0:00	0:00	
9579	11:23	38	0:21	1:56	
9595	18:41	59	0:26	7:58	
9596	21:52	63	0:28	9:19	
9608	0:00	0	0:00	0:00	
9611	6:27	31	0:19	1:46	
9612	15:27	58	0:22	5:08	
9616	0:00	0	0:00	0:00	
9617	17:53	64	0:25	6:01	
9623	8:54	38	0:21	2:51	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
9624	8:00	36	0:19	2:32	
9625	28:10	105	0:26	10:18	
9626	39:18	131	0:33	10:14	
9628	14:23	36	0:30	2:29	
9643	77:48	93	1:08	25:42	
9644	77:00	91	1:09	24:24	
9645	76:07	91	1:09	23:49	
9659	11:32	46	0:24	3:05	
9663	0:00	0	0:00	0:00	
9682	0:00	0	0:00	0:00	
9695	4:04	30	0:11	1:19	
9698	0:00	0	0:00	0:00	
9703	0:00	0	0:00	0:00	
9707	0:00	0	0:00	0:00	
9710	0:00	0	0:00	0:00	
9712	0:00	0	0:00	0:00	
9713	44:53	131	0:30	15:00	
9716	33:24	104	0:29	11:06	
9717	32:46	102	0:29	10:53	
9718	0:00	0	0:00	0:00	
9719	67:36	125	0:55	22:13	
9720	65:37	109	1:01	19:41	
9721	23:47	73	0:26	10:01	
9722	80:06	154	0:43	29:13	
9723	57:53	111	0:44	13:44	
9725	58:12	120	0:39	13:12	
9726	47:29	71	0:56	13:34	
9728	56:28	114	0:41	12:58	
9730	55:09	114	0:39	12:28	
9731	51:54	109	0:40	11:51	
9732	46:31	100	0:44	11:21	
9733	49:42	106	0:40	11:31	
9734	49:57	108	0:39	11:22	
9735	46:02	72	0:55	12:57	
9737	43:36	97	0:42	10:27	
9739	50:54	105	0:46	14:53	
9742	22:52	57	0:37	7:06	
9743	38:40	80	0:37	7:14	
9744	40:04	72	0:40	7:24	
9745	21:01	56	0:35	6:29	
9746	38:41	68	0:40	7:06	
9747	20:29	54	0:34	6:14	
9748	63:08	102	0:49	16:01	
9749	25:54	63	0:38	7:31	
9750	32:44	62	0:39	5:56	
9751	19:23	53	0:33	5:48	
9752	0:00	0	0:00	0:00	
9753	9:39	43	0:22	2:34	
9755	15:12	67	0:24	3:54	
9756	19:33	57	0:31	6:25	
9757	9:11	44	0:21	2:24	
9758	21:56	78	0:28	6:29	
9759	17:57	52	0:31	5:45	
9762	13:08	44	0:27	4:06	
9763	0:00	0	0:00	0:00	
9764	0:00	0	0:00	0:00	
9765	0:00	0	0:00	0:00	
9766	17:03	49	0:31	5:19	
9767	16:20	47	0:31	5:06	
9769	16:11	46	0:31	5:04	
9771	176:20	295	1:07	50:03	
9772	93:42	217	0:45	33:18	
9773	192:25	315	1:01	53:58	
9774	0:00	0	0:00	0:00	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
9775	175:02	279	0:59	47:19	
9777	0:00	0	0:00	0:00	
9778	130:09	218	0:53	32:29	
9779	33:28	50	0:58	7:48	
9780	40:25	58	0:57	9:34	
9919	0:00	0	0:00	0:00	
9920	0:00	0	0:00	0:00	
9921	0:00	0	0:00	0:00	
9922	45:49	88	0:41	8:38	
9923	37:01	98	0:37	7:10	
9924	32:49	99	0:34	6:24	
9925	72:12	102	0:54	13:56	
9955	0:00	0	0:00	0:00	
9956	0:00	0	0:00	0:00	
9957	0:00	0	0:00	0:00	
10615	182:06	298	1:08	52:25	
10616	182:58	300	1:06	53:48	
10617	184:43	301	1:10	55:21	
10618	181:20	289	1:13	56:02	
10619	169:04	266	1:15	53:44	
10700	5:10	27	0:17	1:38	
10701	6:54	31	0:20	2:10	
10702	5:21	28	0:17	1:41	
10703	23:56	66	0:27	4:23	
10704	42:24	100	0:40	8:15	
10705	70:24	88	1:06	19:25	
10707	13:01	53	0:24	2:37	
10708	18:55	84	0:26	3:39	
10709	26:45	74	0:29	4:58	
10710	21:23	84	0:23	8:56	
10711	12:19	52	0:21	5:03	
10712	14:49	59	0:25	2:58	
10713	110:03	140	1:15	22:15	
10714	23:16	52	0:33	4:08	
10715	29:12	66	0:32	5:20	
10716	24:56	62	0:29	5:56	
10746	8:59	47	0:17	2:57	
10747	44:25	68	0:48	8:13	
10748	0:00	0	0:00	0:00	
10755	23:03	77	0:23	9:41	
10756	37:17	87	0:53	8:33	
10757	43:34	66	1:02	13:57	
10760	44:18	119	0:39	14:47	
10761	0:00	0	0:00	0:00	
10762	0:00	0	0:00	0:00	
10767	7:11	32	0:21	1:56	
10770	28:20	45	0:48	6:37	
10771	13:40	34	0:31	2:21	
10772	37:30	113	0:35	10:02	
10773	36:34	109	0:35	10:49	
10774	8:56	34	0:24	2:30	
11128	0:00	0	0:00	0:00	
11129	15:08	61	0:21	3:44	
11130	25:00	79	0:28	5:41	
11139	11:40	52	0:23	3:18	
11146	153:20	146	1:39	35:45	
11147	0:00	0	0:00	0:00	
11150	128:14	126	1:36	29:57	
11151	0:00	0	0:00	0:00	
11153	0:00	0	0:00	0:00	
11154	28:38	76	0:31	5:20	
11155	0:00	0	0:00	0:00	
11160	39:34	81	0:51	8:44	
11162	0:00	0	0:00	0:00	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
11163	20:02	54	0:35	5:01	
11172	13:29	51	0:24	4:30	
11176	15:28	55	0:25	5:11	
11214	0:00	0	0:00	0:00	
11216	0:00	0	0:00	0:00	
11218	0:00	0	0:00	0:00	
11220	0:00	0	0:00	0:00	
11223	0:00	0	0:00	0:00	
11229	0:00	0	0:00	0:00	
11230	0:00	0	0:00	0:00	
11233	7:38	34	0:20	2:41	
11234	62:00	132	0:42	17:25	
11235	36:56	99	0:34	10:48	
11236	76:44	156	0:46	20:31	
11237	14:23	45	0:28	5:08	
11238	45:37	112	0:37	12:49	
11239	49:47	118	0:38	13:45	
11241	67:30	162	0:42	17:06	
11242	40:56	107	0:35	11:07	
11243	43:11	111	0:35	11:29	
11244	13:39	44	0:28	4:45	
11245	81:22	155	0:45	19:34	
11246	72:01	152	0:42	17:18	
11247	28:52	90	0:31	8:57	
11248	0:00	0	0:00	0:00	
11249	0:00	0	0:00	0:00	
11250	0:00	0	0:00	0:00	
11251	0:00	0	0:00	0:00	
11252	0:00	0	0:00	0:00	
11253	16:26	61	0:27	4:19	
11254	8:26	38	0:21	2:23	
11255	19:11	70	0:29	4:59	
11256	14:07	52	0:26	3:45	
11257	30:42	58	0:38	7:16	
11258	33:48	64	0:38	8:04	
11259	0:00	0	0:00	0:00	
11260	25:26	84	0:30	6:23	
11261	33:46	72	0:35	8:11	
11262	0:00	0	0:00	0:00	
11263	30:02	80	0:31	7:24	
11264	34:09	68	0:36	8:12	
11277	0:00	0	0:00	0:00	
11279	0:00	0	0:00	0:00	
11281	25:41	65	0:32	8:33	
11369	62:36	83	0:52	11:46	
11370	37:17	82	0:49	8:33	
11371	96:05	194	0:53	26:01	
11372	89:20	127	1:04	27:21	
11695	0:00	0	0:00	0:00	
11696	0:00	0	0:00	0:00	
11697	0:00	0	0:00	0:00	
11698	0:00	0	0:00	0:00	
11699	0:00	0	0:00	0:00	
11700	0:00	0	0:00	0:00	
11701	0:00	0	0:00	0:00	
11702	0:00	0	0:00	0:00	
11898	24:43	83	0:28	7:59	
11899	13:39	63	0:21	4:23	
11900	134:01	235	0:57	41:07	
11901	73:19	160	0:55	23:55	
11902	130:43	213	1:12	32:40	
11911	16:53	36	0:36	2:56	
11912	77:49	114	0:57	15:07	
11913	88:14	97	1:13	24:56	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
11914	22:40	64	0:33	4:46	
11915	22:53	74	0:33	8:22	
11916	0:00	0	0:00	0:00	
11917	0:00	0	0:00	0:00	
11918	0:00	0	0:00	0:00	
12051	116:39	111	1:43	40:04	
12063	0:00	0	0:00	0:00	
12064	19:07	88	0:22	6:16	
12071	53:52	112	0:41	18:10	
12080	33:36	88	0:31	9:15	
12082	0:19	5	0:06	0:08	
12100	19:02	50	0:34	6:24	
12101	19:37	50	0:35	6:36	
12103	14:59	44	0:30	4:58	
12109	0:00	0	0:00	0:00	
12116	43:13	69	0:45	7:58	
12117	11:36	42	0:25	3:19	
12123	0:00	0	0:00	0:00	
12124	7:01	24	0:22	1:31	
12125	21:31	71	0:31	5:39	
12126	0:00	0	0:00	0:00	
12127	5:10	20	0:19	1:05	
12128	11:15	44	0:25	3:09	
12130	27:40	52	0:39	6:30	
12132	0:00	0	0:00	0:00	
12134	0:00	0	0:00	0:00	
12143	0:00	0	0:00	0:00	
12145	0:00	0	0:00	0:00	
12147	0:00	0	0:00	0:00	
12157	0:00	0	0:00	0:00	
12158	0:00	0	0:00	0:00	
12160	0:00	0	0:00	0:00	
12164	15:03	77	0:24	4:47	
12165	15:01	77	0:24	4:46	
12166	27:02	58	0:41	7:22	
12167	30:06	61	0:43	8:07	
12168	12:13	38	0:28	3:44	
12169	39:58	73	0:48	10:09	
12171	27:07	60	0:41	7:14	
12173	30:15	63	0:43	7:55	
12174	45:52	71	0:54	14:47	
12175	50:02	86	0:51	11:40	
12176	40:43	75	0:48	9:54	
12178	45:54	72	0:54	14:58	
12179	32:10	68	0:43	7:47	
12181	33:21	71	0:42	7:47	
12182	37:27	76	0:45	8:30	
12183	14:06	44	0:28	4:22	
12184	23:48	77	0:33	7:29	
12185	12:10	40	0:26	3:48	
12186	15:29	75	0:27	5:38	
12188	27:37	82	0:36	8:42	
12189	80:39	204	0:48	24:56	
12190	78:22	200	0:46	24:21	
12191	23:49	94	0:30	8:42	
12192	70:46	126	0:55	22:35	
12193	72:07	129	0:56	22:59	
12194	9:36	36	0:24	3:02	
12195	11:19	39	0:26	3:35	
12196	12:51	42	0:28	4:05	
12197	24:57	102	0:26	9:37	
12198	0:00	0	0:00	0:00	
12199	0:00	0	0:00	0:00	
12607	20:57	44	0:35	4:50	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]	
12727	51:58	86	0:52	16:41	
12728	0:00	0	0:00	0:00	
12729	26:06	58	0:35	11:10	
12730	0:00	0	0:00	0:00	
12744	12:14	44	0:26	2:43	
12745	15:31	55	0:28	3:13	
12746	19:21	84	0:27	3:45	
12747	0:00	0	0:00	0:00	
12748	0:00	0	0:00	0:00	
12749	29:38	84	0:32	5:36	
12750	10:06	42	0:22	3:16	
12751	5:36	28	0:17	1:45	
12752	20:58	72	0:24	7:01	
12753	11:44	56	0:18	3:54	
12754	0:07	7	0:01	0:02	
12755	14:48	74	0:21	3:42	
12756	47:37	64	1:06	9:04	
12757	0:00	0	0:00	0:00	
12758	0:00	0	0:00	0:00	
12759	73:40	132	0:54	24:32	
12760	78:08	144	0:45	20:28	
12778	101:35	188	0:51	32:21	
12779	90:38	169	0:52	29:12	
12789	0:00	0	0:00	0:00	
12790	0:00	0	0:00	0:00	
12792	0:00	0	0:00	0:00	
12969	43:55	113	0:41	12:43	
12970	10:09	50	0:17	4:20	
12971	0:00	0	0:00	0:00	
12973	71:00	152	0:55	18:39	
12974	84:42	178	0:57	21:40	
12976	8:36	35	0:23	2:21	
12979	7:50	34	0:21	2:24	
12981	1:04	9	0:09	0:13	
12982	0:00	0	0:00	0:00	
12983	18:25	58	0:30	4:56	
12984	0:00	0	0:00	0:00	
12985	0:00	0	0:00	0:00	
12986	30:24	92	0:34	7:46	
12987	4:56	20	0:19	0:48	
12996	15:42	76	0:25	5:37	
13005	217:39	233	1:29	54:56	
13008	34:07	117	0:27	9:30	
13014	0:00	0	0:00	0:00	
13016	0:00	0	0:00	0:00	
13028	0:00	0	0:00	0:00	
13029	0:00	0	0:00	0:00	
13031	0:00	0	0:00	0:00	
13037	0:00	0	0:00	0:00	
13040	29:30	93	0:29	9:38	
13042	0:00	0	0:00	0:00	
13043	79:41	161	0:43	28:53	
13044	0:00	0	0:00	0:00	
13048	100:54	160	0:52	36:01	
13049	108:58	160	0:58	37:36	
13050	29:46	91	0:30	9:34	
13051	68:58	145	0:43	23:45	
13053	22:43	63	0:34	6:15	
13054	16:45	42	0:30	2:55	
13055	0:00	0	0:00	0:00	
13056	51:09	89	0:43	12:40	
13057	17:21	52	0:31	4:56	
13058	25:12	54	0:34	4:30	
13059	4:14	20	0:16	0:40	

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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No.	Shadow, worst case		Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
13060	15:59	52	0:29	4:26
13061	4:04	20	0:15	0:39
13062	47:26	78	0:43	11:34
13063	47:12	78	0:43	11:32
13064	114:05	199	0:50	28:12
13065	25:01	46	0:45	5:44
13066	17:12	38	0:39	3:54
13067	0:00	0	0:00	0:00
13068	0:00	0	0:00	0:00
13069	0:00	0	0:00	0:00
13075	10:38	53	0:17	3:31
13124	84:05	123	0:59	21:52
13125	50:38	108	0:46	12:44
13126	0:00	0	0:00	0:00
13127	0:00	0	0:00	0:00
13427	101:44	163	0:53	37:44
13428	115:01	164	1:04	41:28
13429	74:34	116	1:00	16:39
13430	49:14	73	0:56	14:01
13431	58:56	79	1:01	17:46
13432	106:34	161	1:00	25:56
13433	59:10	115	0:50	18:31
13434	48:09	159	0:33	15:30
13435	192:18	212	1:09	59:39
13436	27:00	80	0:32	6:36
13437	26:02	80	0:32	6:26
13438	37:18	80	0:36	9:08
13439	18:00	60	0:29	4:47
13440	21:41	76	0:26	5:21
13441	0:00	0	0:00	0:00
13442	10:13	46	0:21	2:41
13443	5:23	28	0:17	1:43
13444	7:00	31	0:20	2:12
13445	7:51	35	0:20	2:27
13460	0:00	0	0:00	0:00
13461	0:00	0	0:00	0:00
13462	76:28	142	1:02	25:32
13463	43:34	92	0:40	10:55
13464	91:31	195	0:44	26:33
13465	0:00	0	0:00	0:00
13466	0:00	0	0:00	0:00
13467	0:00	0	0:00	0:00
13471	52:11	156	0:31	20:06
13520	167:43	214	1:13	52:28
14002	8:06	33	0:22	2:14
14003	31:58	56	0:42	5:47
14004	0:00	0	0:00	0:00
14005	0:00	0	0:00	0:00
14006	0:00	0	0:00	0:00
14007	0:00	0	0:00	0:00
14008	0:00	0	0:00	0:00
14009	0:00	0	0:00	0:00
14010	0:00	0	0:00	0:00
14026	29:10	111	0:24	9:44

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
T1	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (1)	234:05	84:55
T10	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (10)	173:08	48:37
T11	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (11)	256:17	83:28
T12	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (12)	189:27	56:09
T13	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (13)	206:17	65:33

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SHADOW - Main Result**Calculation:** 2019-06-17_Republic SFA

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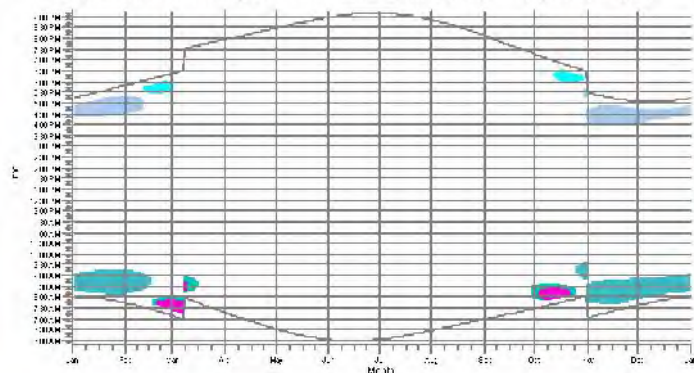
No.	Name	Worst case [h/year]	Expected [h/year]
T14	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (14)	250:55	76:42
T15	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (15)	138:25	38:48
T16	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (16)	218:33	56:28
T17	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (17)	131:18	41:56
T18	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (18)	186:38	55:03
T19	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (19)	177:14	52:52
T2	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (2)	212:34	49:43
T20	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (20)	143:03	45:22
T21	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (21)	192:12	59:59
T22	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (22)	208:26	59:39
T23	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (23)	186:08	50:09
T24	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (24)	228:37	63:25
T25	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (25)	112:57	25:54
T26	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (26)	204:01	54:25
T27	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (27)	161:39	44:52
T28	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (28)	134:39	39:44
T29	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (29)	245:44	62:08
T3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (3)	444:52	124:42
T30	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (30)	211:16	69:01
T31	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (31)	65:37	19:31
T32	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (32)	168:32	37:47
T33	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (33)	227:54	62:31
T34	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (34)	124:34	44:04
T35	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (35)	104:45	29:46
T36	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (36)	154:39	41:03
T37	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (37)	219:14	59:40
T38	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (38)	285:29	85:28
T39	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (39)	53:26	19:43
T4	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (4)	240:19	59:35
T40	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (40)	158:46	37:56
T41	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (41)	80:56	25:45
T42	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (42)	278:33	80:09
T43	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (43)	224:37	80:59
T44	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (44)	175:06	57:11
T45	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (45)	330:51	93:00
T46	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (46)	377:55	116:32
T47	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (47)	372:31	103:53
T48	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (48)	456:05	141:53
T49	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (49)	268:29	77:33
T5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (5)	198:13	64:14
T50	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (50)	300:39	92:43
T6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (6)	235:55	66:07
T7	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (7)	197:04	56:57
T8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (8)	269:01	85:34
T9	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (9)	307:48	74:32

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

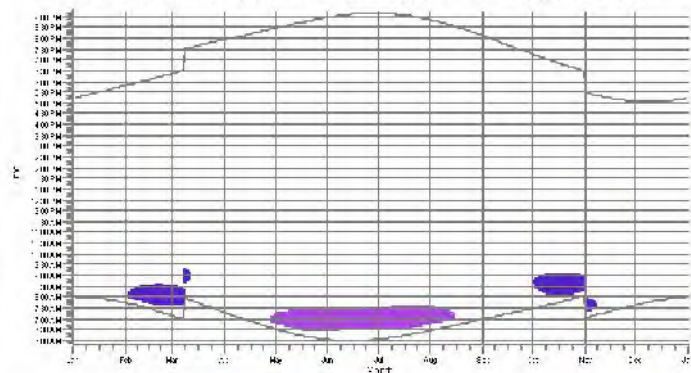
SHADOW - Calendar, graphical

Calculation: 2019-06-17_Republic SFA

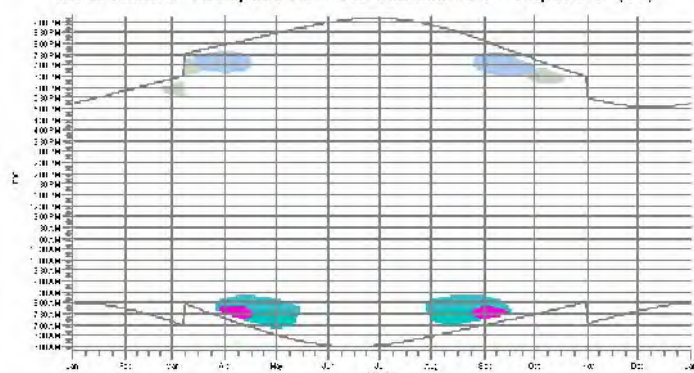
1097: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (10)



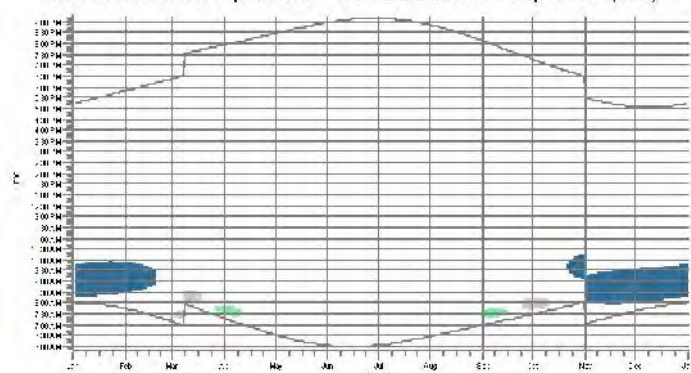
1154: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (24)



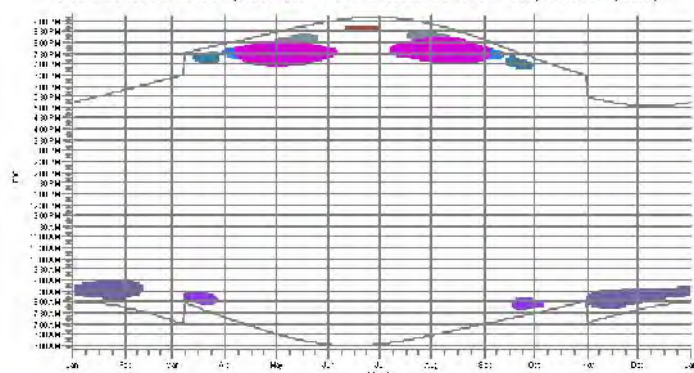
4568: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (88)



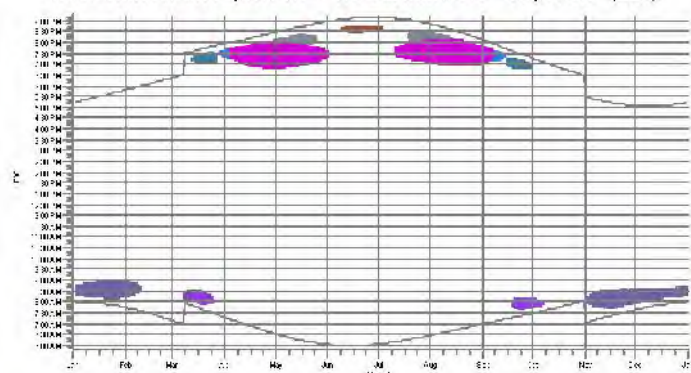
4661: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (108)



4917: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (225)



4919: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (227)



WTGs

T20: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (20)
T21: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (21)
T22: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (22)
T26: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (26)
T28: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (28)

T29: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (29)
T30: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (30)
T31: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (31)
T32: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (32)
T42: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (42)

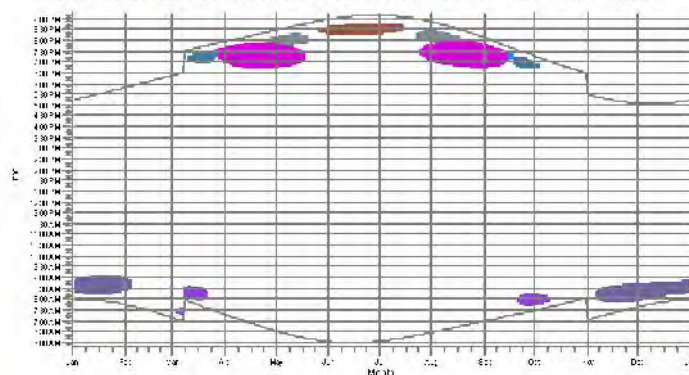
T43: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (43)
T44: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (44)
T45: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (45)
T46: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (46)
T47: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (47)

T48: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (48)
T49: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (49)
T50: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (50)

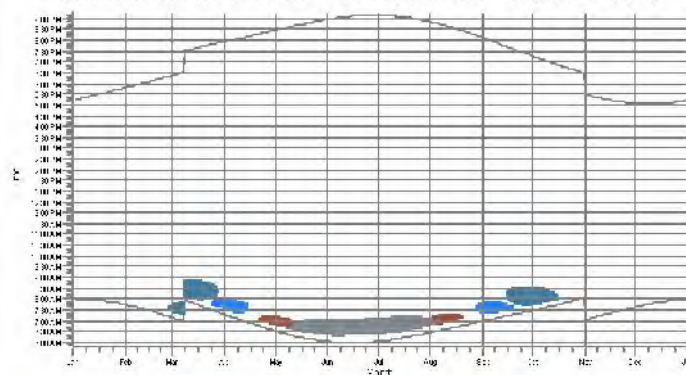
SHADOW - Calendar, graphical

Calculation: 2019-06-17_Republic SFA

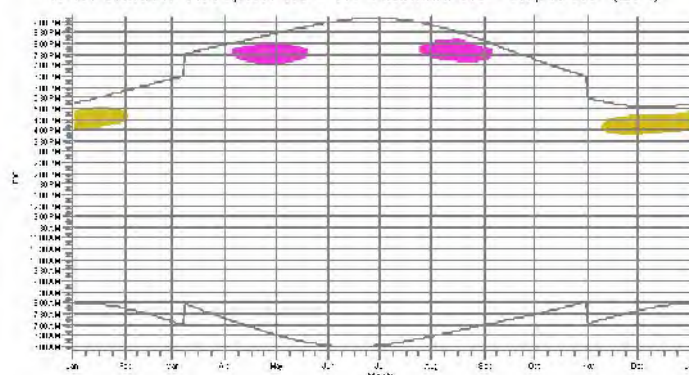
4922: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (229)



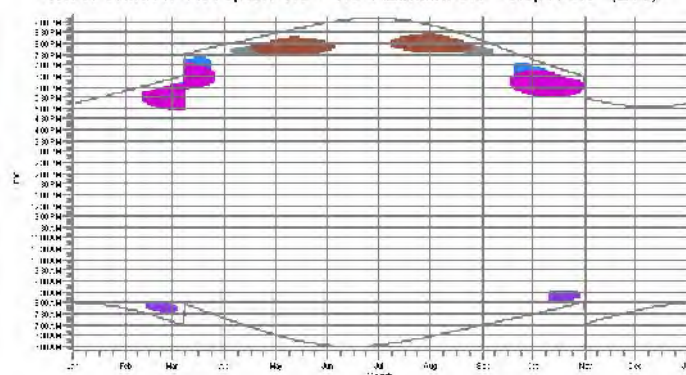
4923: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (230)



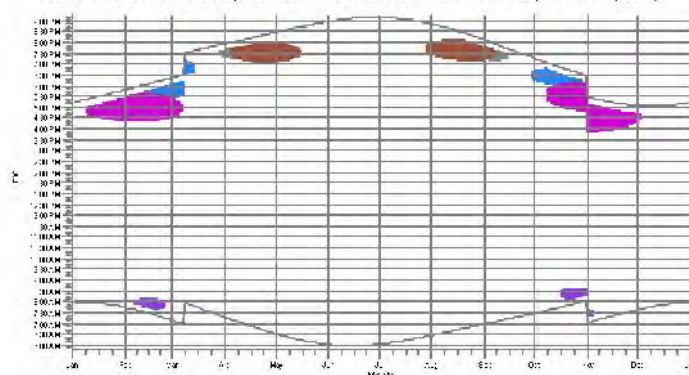
4943: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (234)



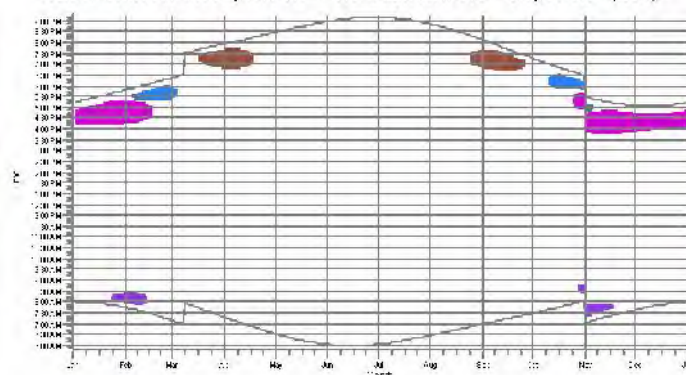
6296: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (253)



6297: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (254)



6298: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (255)



WTGs

T36: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (36)
T37: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (37)
T42: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (42)

T43: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (43)
T44: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (44)
T45: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (45)

T46: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (46)
T49: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (49)
T50: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (50)

Project:

2019-06-17_SFA

Licensed user:

EDR
217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688

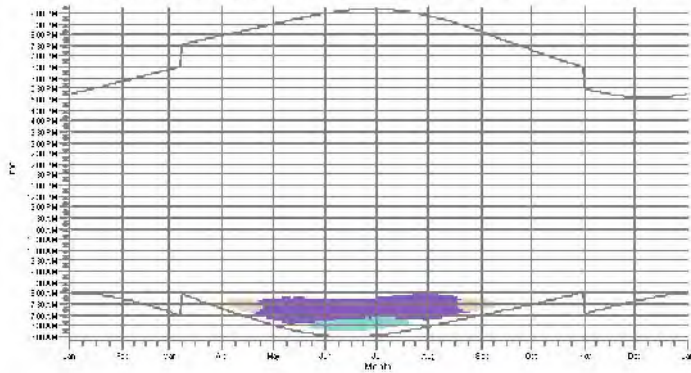
Calculated:

6/18/2019 2:13 PM/3.2.737

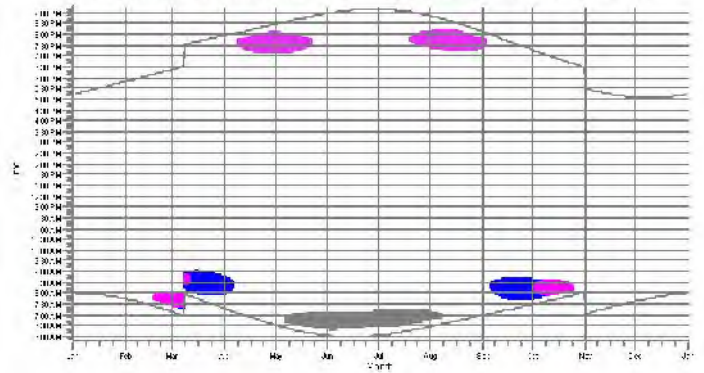
SHADOW - Calendar, graphical

Calculation: 2019-06-17_Republic SFA

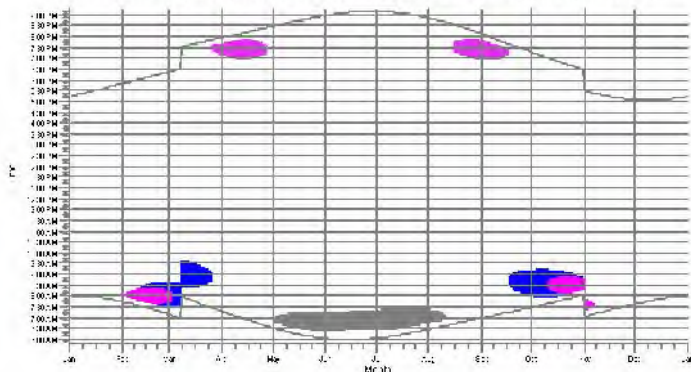
6500: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (286)



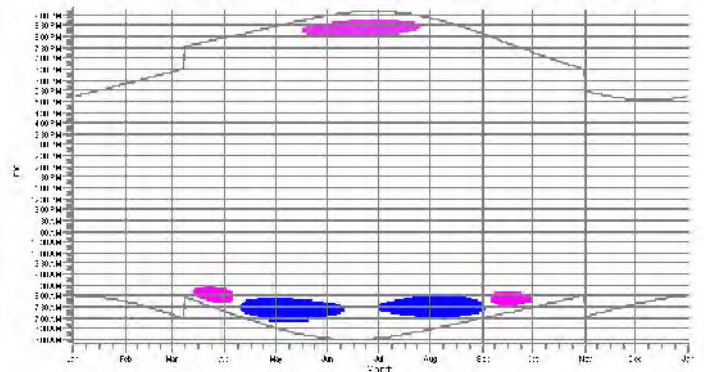
6535: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (294)



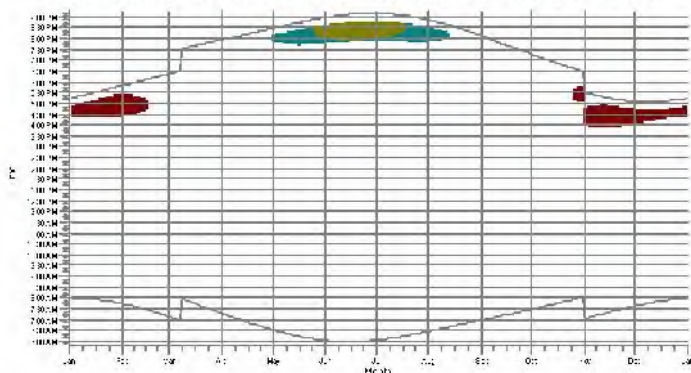
6536: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (295)



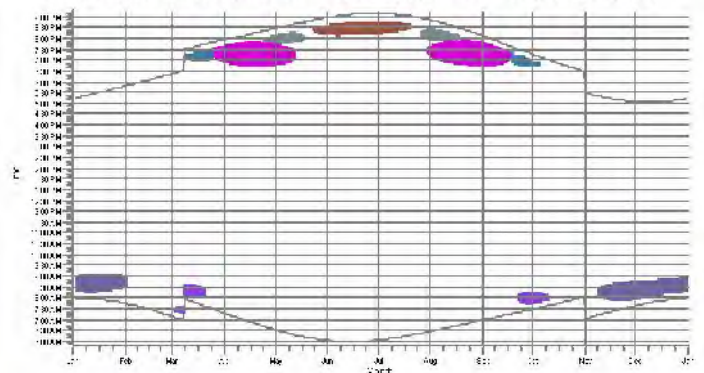
6537: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (296)



6602: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (310)



9771: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (409)



WTGs

T11: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (11)
T12: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (12)
T13: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (13)
T14: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (14)
T16: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (16)

T18: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (18)
T42: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (42)
T43: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (43)
T44: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (44)
T45: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (45)

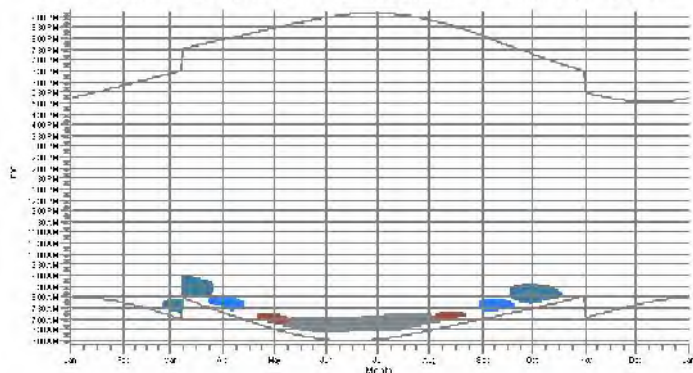
T46: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (46)
T49: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (49)
T5: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (5)
T50: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (50)
T6: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (6)

T7: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (7)
T8: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (8)

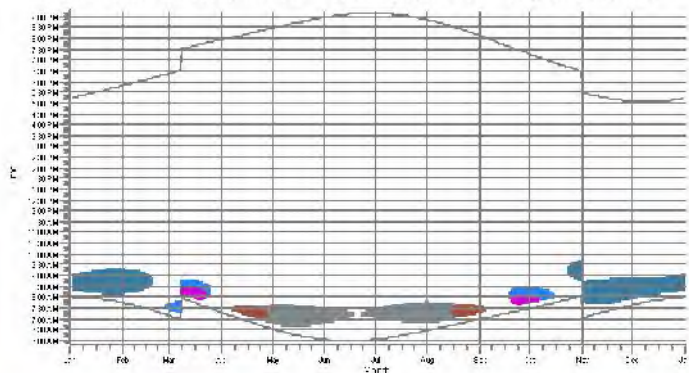
SHADOW - Calendar, graphical

Calculation: 2019-06-17_Republic SFA

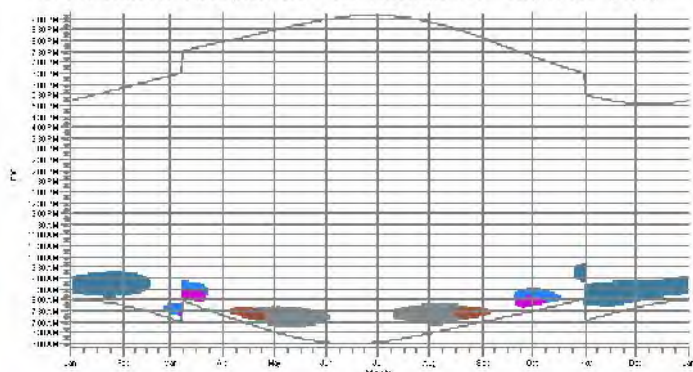
9772: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (410)



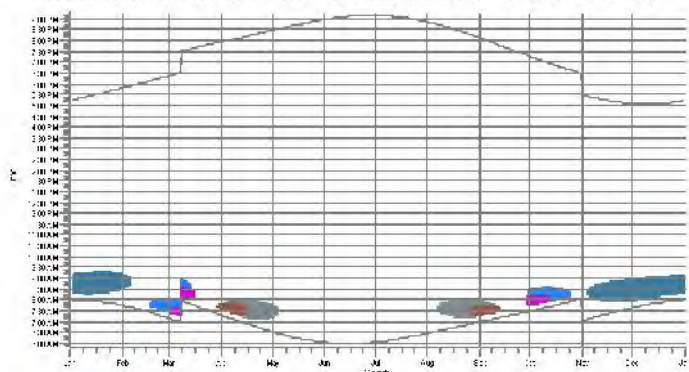
9773: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (411)



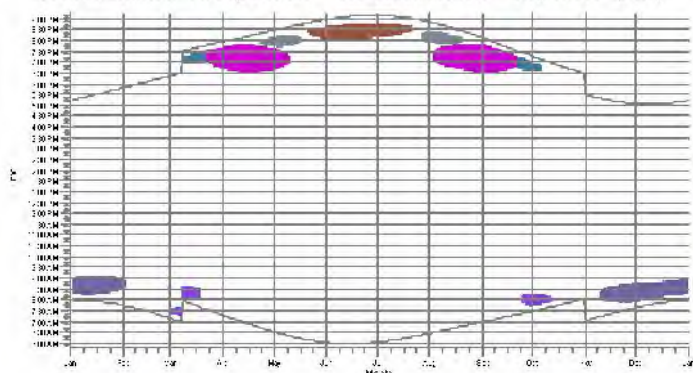
9775: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (413)



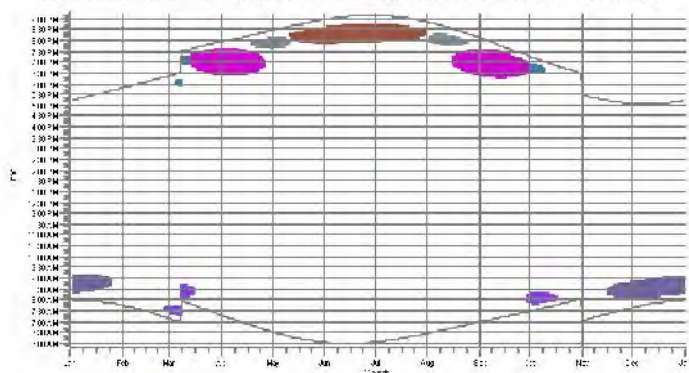
9778: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (415)



10615: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (428)



10616: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (429)



WTGs

T42: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (42)
T43: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (43)

T44: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (44)
T45: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (45)

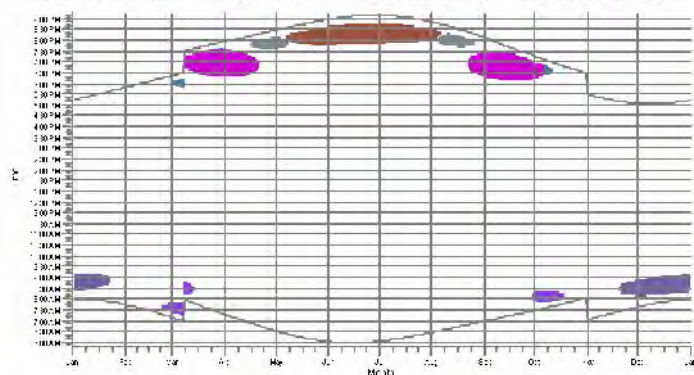
T46: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (46)
T49: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (49)

T50: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (50)

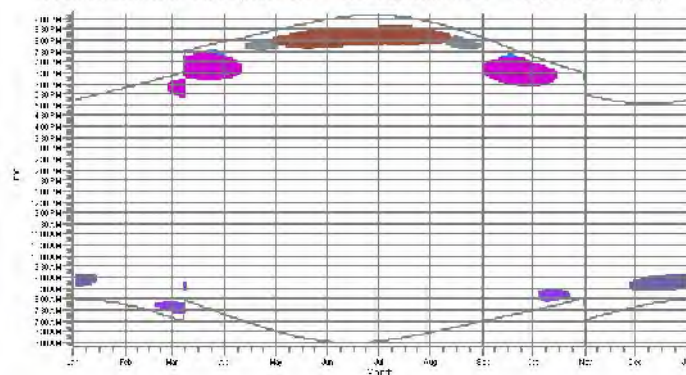
SHADOW - Calendar, graphical

Calculation: 2019-06-17_Republic SFA

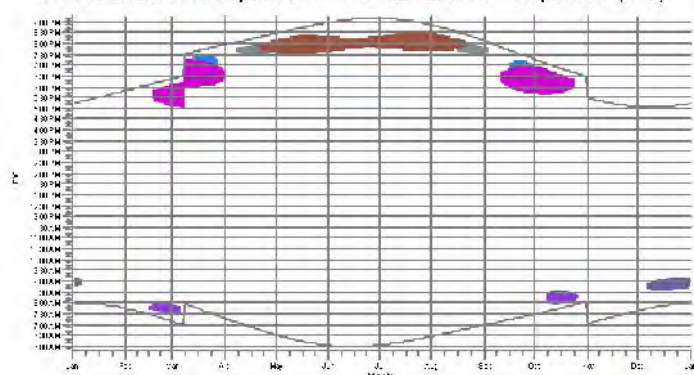
10617: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (430)



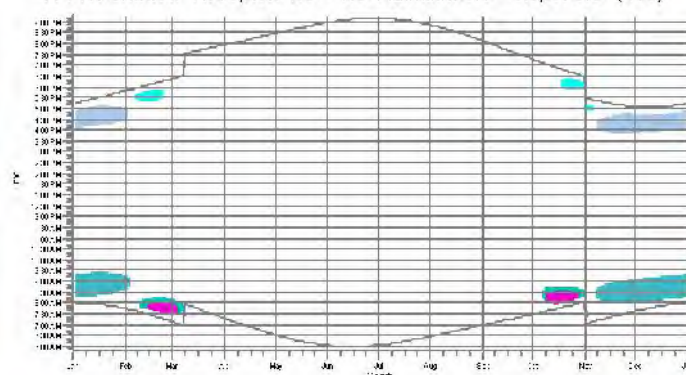
10618: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (431)



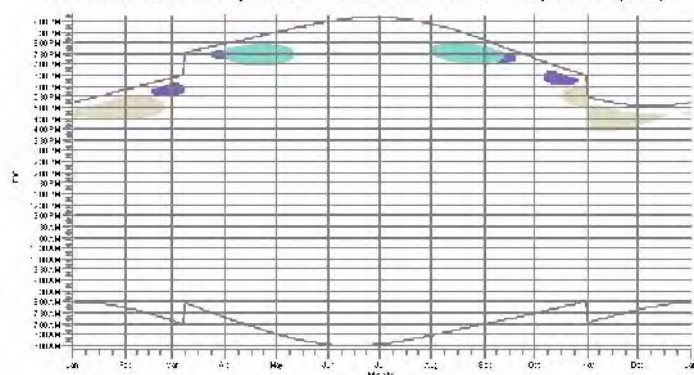
10619: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (432)



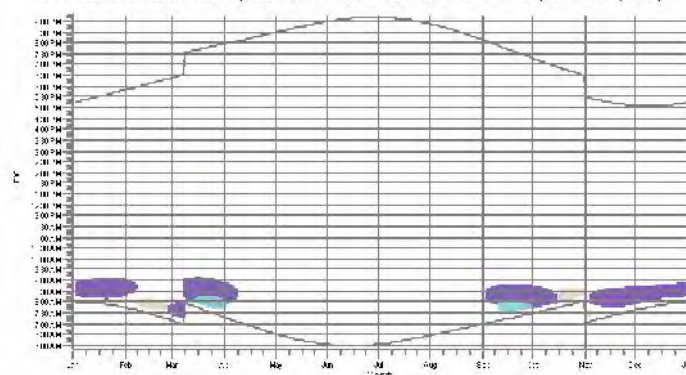
11146: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (468)



11900: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (535)



11902: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (537)



WTGs

T20: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (20)
T21: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (21)
T22: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (22)
T26: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (26)
T28: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (28)

T30: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (30)
T4: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (4)
T42: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (42)
T43: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (43)
T44: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (44)

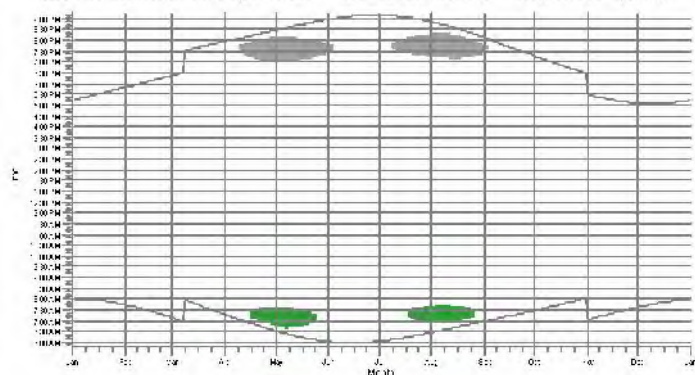
T45: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (45)
T46: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (46)
T49: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (49)
T5: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (5)
T50: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (50)

T7: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (7)
T8: VESTAS V136-3.6 3600 136.0 IOI hub: 82.0 m (TOT: 150.0 m) (8)

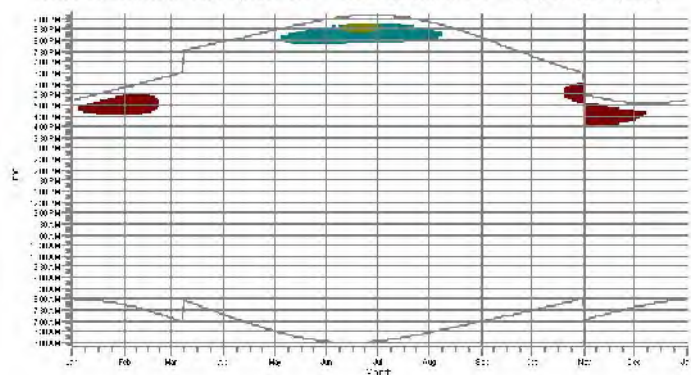
SHADOW - Calendar, graphical

Calculation: 2019-06-17_Republic SFA

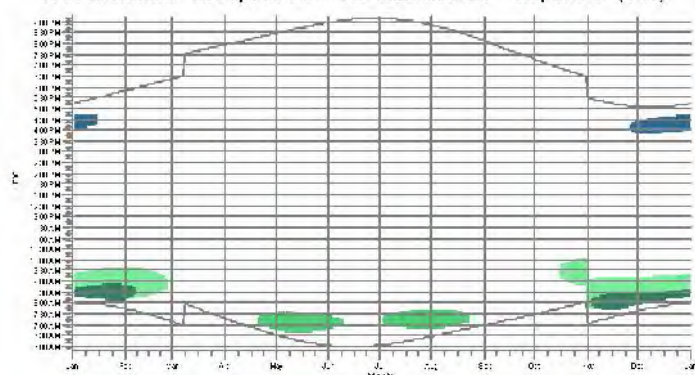
12051: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (546)



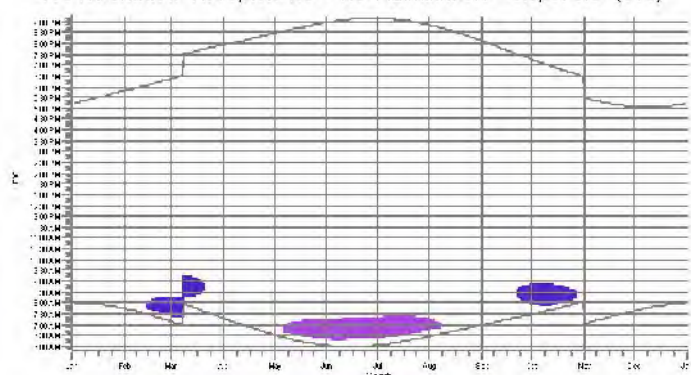
12778: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (626)



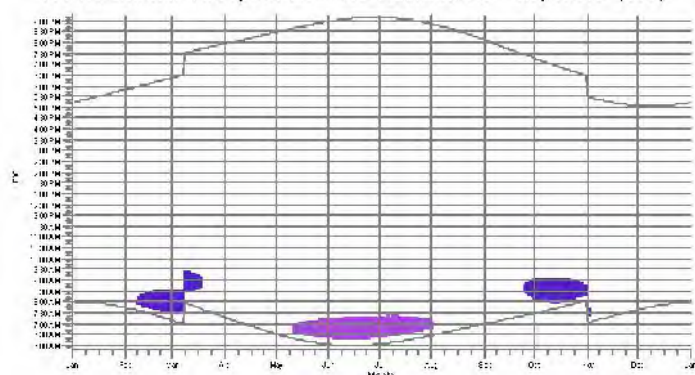
13005: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (646)



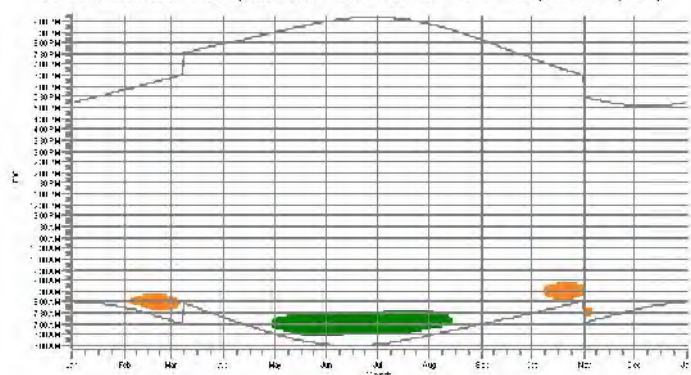
13048: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (658)



13049: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (659)



13427: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (684)



WTGs

T1: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (1)

T14: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (14)

T16: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (16)

T18: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (18)

T23: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (23)

T27: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (27)

T29: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (29)

T3: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (3)

T32: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (32)

T34: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (34)

T35: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (35)

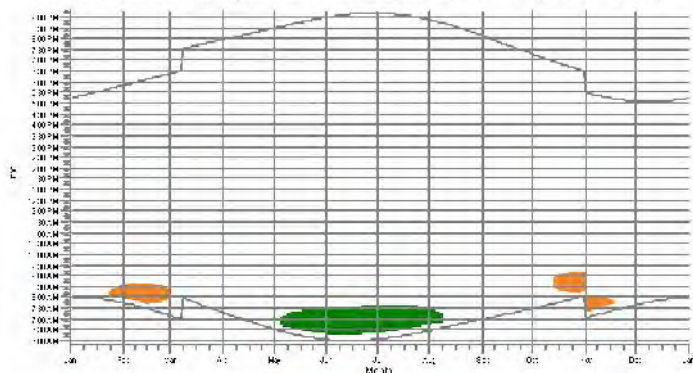
T47: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (47)

T48: VESTAS V136-3.6 3600 136.0 IOf hub: 82.0 m (TOT: 150.0 m) (48)

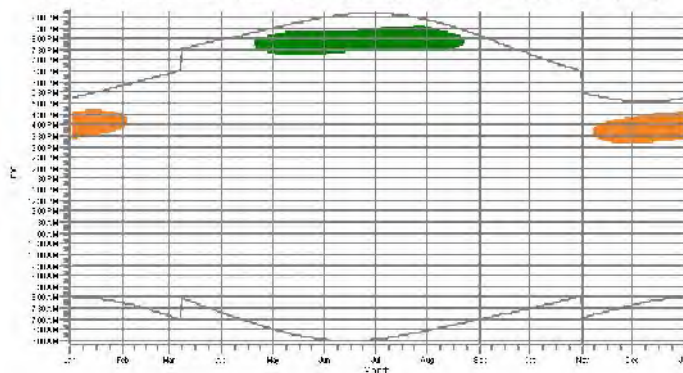
SHADOW - Calendar, graphical

Calculation: 2019-06-17_Republic SFA

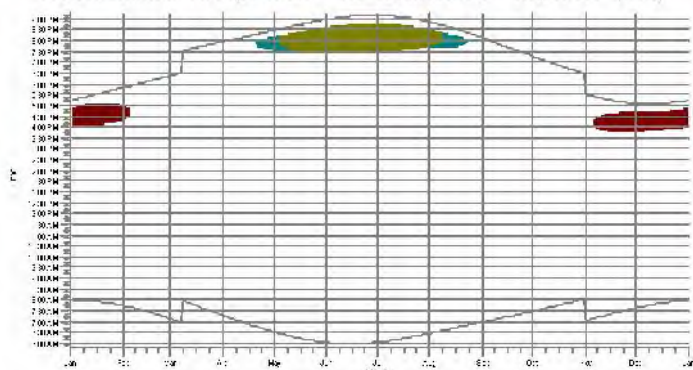
13428: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (685)



13435: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (692)



13520: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (712)



WTGs

T1: VESTAS V136-3.6 3600 136.0 101 hub: 82.0 m (TOT: 150.0 m) (1)
T14: VESTAS V136-3.6 3600 136.0 101 hub: 82.0 m (TOT: 150.0 m) (14)

T16: VESTAS V136-3.6 3600 136.0 101 hub: 82.0 m (TOT: 150.0 m) (16)
T18: VESTAS V136-3.6 3600 136.0 101 hub: 82.0 m (TOT: 150.0 m) (18)

T3: VESTAS V136-3.6 3600 136.0 101 hub: 82.0 m (TOT: 150.0 m) (3)

Attachment C

WindPRO Cumulative Report

SHADOW - Main Result

Calculation: 2019-06-18_Republic Cumulative SFA

Assumptions for shadow calculations

Maximum distance for influence 1,360 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 1 minutes

Sunshine probability S/S0 (Sun hours/Possible sun hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.41	0.48	0.50	0.53	0.59	0.61	0.65	0.61	0.58	0.52	0.34	0.29

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
306	420	497	419	320	272	300	406	897	1,162	1,016	995

W	WNW	NW	NNW	Sum
779	449	279	243	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: 2 meter contour.wpo (1)

Obstacles not used in calculation

Eye height for map: 1.5 m

Grid resolution: 1.0 m

All coordinates are in

UTM (north)-NAD83 (US+CA) Zone: 17

WTGs

	Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	RPM [RPM]
					Valid	Manufact.					
			[m]								
1	335,999	4,553,181	282.0	GE WIND ENERGY GE 2.5-127 2500 127.0 !O! hub: ...	Yes	GE WIND ENERGY	GE 2.5-127-2,500	2,500	127.0	134.0	13.0
2	336,382	4,553,173	282.7	GE WIND ENERGY GE 2.5-127 2500 127.0 !O! hub: ...	Yes	GE WIND ENERGY	GE 2.5-127-2,500	2,500	127.0	134.0	13.0
3	334,776	4,553,264	275.3	GE WIND ENERGY GE 2.5-127 2500 127.0 !O! hub: ...	Yes	GE WIND ENERGY	GE 2.5-127-2,500	2,500	127.0	134.0	13.0
T1	326,526	4,564,671	224.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T10	331,467	4,563,287	242.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T11	331,507	4,560,193	248.5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T12	331,740	4,560,600	245.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T13	331,839	4,560,028	251.1	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T14	335,007	4,556,468	270.9	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T15	335,033	4,558,007	264.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T16	335,199	4,555,826	270.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T17	335,252	4,557,236	262.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T18	335,336	4,556,418	271.5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T19	336,273	4,558,984	259.2	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T2	326,537	4,565,073	218.3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T20	336,288	4,559,697	258.8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T21	336,561	4,559,513	260.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T22	336,846	4,559,680	258.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T23	336,885	4,558,025	265.8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T24	337,739	4,561,250	252.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T25	337,779	4,558,158	260.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T26	337,922	4,559,725	253.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T27	338,111	4,558,069	266.3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T28	338,226	4,559,840	254.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T29	338,410	4,562,017	252.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T3	326,658	4,564,169	222.3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T30	338,542	4,559,758	256.8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T31	339,300	4,562,069	249.7	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T32	339,469	4,562,344	250.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T33	339,702	4,563,494	248.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T34	346,474	4,567,059	239.8	NORDEX N149/4.0-4.5 4500 149.0 !O! hub: 125.0 m...	Yes	NORDEX	N149/4.0-4.5-4,500	4,500	149.0	125.0	10.7
T34	339,785	4,562,785	249.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T35	339,859	4,562,112	250.2	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T36	340,268	4,569,450	237.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T37	340,278	4,570,004	236.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T37	346,951	4,566,553	241.9	NORDEX N149/4.0-4.5 4500 149.0 !O! hub: 125.0 m...	Yes	NORDEX	N149/4.0-4.5-4,500	4,500	149.0	125.0	10.7

To be continued on next page...

SHADOW - Main Result

Calculation: 2019-06-18_Republic Cumulative SFA

...continued from previous page

	Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	RPM [RPM]
					Valid	Manufact.					
			[m]								
T38	340,334	4,566,673	244.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T38	346,312	4,566,449	244.5	NORDEX N149/4.0-4.5 4500 149.0 !O! hub: 125.0 m...	Yes	NORDEX	N149/4.0-4.5-4,500	4,500	149.0	125.0	10.7
T39	340,684	4,569,413	236.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T4	329,890	4,562,185	242.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T40	341,370	4,559,432	260.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T41	341,544	4,558,921	262.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T42	343,005	4,567,906	236.8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T43	343,157	4,568,376	236.5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T44	343,321	4,568,070	235.6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T45	343,604	4,568,382	232.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T46	343,770	4,568,055	235.4	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T47	344,804	4,565,988	244.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T48	344,861	4,566,427	244.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T49	344,878	4,567,522	240.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T5	329,993	4,561,848	239.3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T50	345,325	4,567,813	239.5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T6	330,397	4,560,420	244.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T7	330,450	4,562,203	240.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T8	330,516	4,561,837	241.1	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7
T87	346,898	4,567,229	240.0	NORDEX N149/4.0-4.5 4500 149.0 !O! hub: 125.0 m...	Yes	NORDEX	N149/4.0-4.5-4,500	4,500	149.0	125.0	10.7
T9	331,362	4,559,101	251.0	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT:...	No	VESTAS	V136-3.6-3,600	3,600	136.0	82.0	11.7

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
1143	345,713	4,565,364	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1153	345,301	4,565,438	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1156	345,817	4,566,194	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
1157	345,821	4,566,197	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4790	345,917	4,565,508	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4814	345,816	4,565,902	244.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4815	345,810	4,565,930	244.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4824	345,826	4,565,981	244.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4829	345,557	4,566,604	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4847	345,804	4,566,473	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4860	345,961	4,566,804	241.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4861	345,895	4,566,816	240.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4875	345,797	4,567,414	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4877	345,797	4,567,453	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4879	345,822	4,567,489	239.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4880	345,881	4,567,518	239.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4886	346,278	4,567,619	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4887	346,439	4,567,620	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4910	345,814	4,567,816	238.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4914	345,809	4,567,858	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9695	345,465	4,565,556	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9713	345,792	4,566,007	244.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9716	345,804	4,566,058	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9717	345,808	4,566,059	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9739	345,520	4,566,585	242.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9752	345,218	4,567,181	240.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9756	345,799	4,567,218	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9758	345,885	4,567,227	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9759	345,804	4,567,260	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9762	345,898	4,567,282	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9766	345,801	4,567,317	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9767	345,803	4,567,357	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9769	345,801	4,567,370	240.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9779	345,753	4,568,254	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9780	345,809	4,568,267	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11247	345,777	4,566,429	243.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12164	345,907	4,565,791	245.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result**Calculation:** 2019-06-18_Republic Cumulative SFA

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
12165	345,904	4,565,792	245.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12183	346,311	4,567,623	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12184	346,219	4,567,625	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12185	346,362	4,567,630	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12188	346,159	4,567,667	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12192	345,887	4,567,695	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12193	345,882	4,567,698	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12194	346,437	4,567,694	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12195	346,372	4,567,707	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12196	346,325	4,567,718	238.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12792	334,961	4,554,513	274.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13028	345,728	4,565,326	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13029	345,721	4,565,328	246.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13040	345,811	4,566,113	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13050	345,797	4,566,154	244.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13065	345,885	4,568,329	236.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13066	345,885	4,568,343	236.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

No.	Shadow, worst case			Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]	
1143	0:00	0	0:00	0:00	
1153	0:00	0	0:00	0:00	
1156	71:27	173	0:40	26:41	
1157	72:30	175	0:41	27:08	
4790	14:05	57	0:22	4:44	
4814	30:55	104	0:28	10:13	
4815	42:03	112	0:41	14:30	
4824	57:51	127	0:45	20:44	
4829	103:10	186	1:16	33:11	
4847	117:12	157	1:29	37:53	
4860	193:54	243	1:11	51:09	
4861	203:15	250	1:06	57:21	
4875	70:55	153	0:46	19:22	
4877	72:04	154	0:45	18:49	
4879	89:56	206	0:46	22:53	
4880	144:39	262	0:48	37:28	
4886	65:19	127	0:48	15:56	
4887	105:14	148	0:59	22:12	
4910	97:02	165	1:04	29:58	
4914	96:44	164	1:04	29:31	
9695	4:04	30	0:11	1:19	
9713	69:30	131	0:52	25:22	
9716	65:03	145	0:48	24:18	
9717	64:28	145	0:47	24:07	
9739	103:26	187	1:15	33:22	
9752	32:40	103	0:27	7:37	
9756	91:04	198	0:49	26:25	
9758	111:57	240	0:55	31:18	
9759	90:10	201	0:49	25:28	
9762	111:00	241	0:55	29:41	
9766	71:46	152	0:48	21:00	
9767	71:22	153	0:47	20:26	
9769	71:21	152	0:47	20:15	
9779	33:28	50	0:58	7:48	
9780	40:25	58	0:57	9:34	
11247	114:10	166	1:19	38:17	
12164	15:03	77	0:24	4:47	
12165	15:01	77	0:24	4:46	
12183	71:43	136	0:50	16:45	
12184	65:01	148	0:45	17:00	

To be continued on next page...

SHADOW - Main Result**Calculation:** 2019-06-18_Republic Cumulative SFA

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No.	Shadow, worst case		Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
12185	91:46	156	0:53	19:56
12188	63:34	150	0:41	16:44
12192	111:16	218	0:55	31:16
12193	112:04	222	0:56	31:32
12194	80:00	123	0:56	16:33
12195	79:53	129	0:52	16:43
12196	78:59	135	0:49	16:43
12792	0:00	0	0:00	0:00
13028	0:00	0	0:00	0:00
13029	0:00	0	0:00	0:00
13040	62:43	160	0:45	23:17
13050	53:18	135	0:46	19:02
13065	25:01	46	0:45	5:44
13066	17:12	38	0:39	3:54

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	GE WIND ENERGY GE 2.5-127 2500 127.0 !O! hub: 134.0 m (TOT: 197.5 m) (5)	0:00	0:00
2	GE WIND ENERGY GE 2.5-127 2500 127.0 !O! hub: 134.0 m (TOT: 197.5 m) (6)	0:00	0:00
3	GE WIND ENERGY GE 2.5-127 2500 127.0 !O! hub: 134.0 m (TOT: 197.5 m) (7)	0:00	0:00
T1	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (1)	0:00	0:00
T10	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (10)	0:00	0:00
T11	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (11)	0:00	0:00
T12	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (12)	0:00	0:00
T13	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (13)	0:00	0:00
T14	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (14)	0:00	0:00
T15	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (15)	0:00	0:00
T16	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (16)	0:00	0:00
T17	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (17)	0:00	0:00
T18	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (18)	0:00	0:00
T19	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (19)	0:00	0:00
T2	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (2)	0:00	0:00
T20	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (20)	0:00	0:00
T21	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (21)	0:00	0:00
T22	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (22)	0:00	0:00
T23	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (23)	0:00	0:00
T24	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (24)	0:00	0:00
T25	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (25)	0:00	0:00
T26	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (26)	0:00	0:00
T27	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (27)	0:00	0:00
T28	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (28)	0:00	0:00
T29	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (29)	0:00	0:00
T3	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (3)	0:00	0:00
T30	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (30)	0:00	0:00
T31	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (31)	0:00	0:00
T32	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (32)	0:00	0:00
T33	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (33)	0:00	0:00
T34	NORDEX N149/4.0-4.5 4500 149.0 !O! hub: 125.0 m (TOT: 199.5 m) (1)	284:27	80:51
T34	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (34)	0:00	0:00
T35	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (35)	0:00	0:00
T36	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (36)	0:00	0:00
T37	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (37)	0:00	0:00
T37	NORDEX N149/4.0-4.5 4500 149.0 !O! hub: 125.0 m (TOT: 199.5 m) (2)	136:33	43:57
T38	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (38)	0:00	0:00
T38	NORDEX N149/4.0-4.5 4500 149.0 !O! hub: 125.0 m (TOT: 199.5 m) (3)	320:49	86:17
T39	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (39)	0:00	0:00
T4	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (4)	0:00	0:00
T40	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (40)	0:00	0:00
T41	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (41)	0:00	0:00
T42	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (42)	0:00	0:00
T43	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (43)	0:00	0:00
T44	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (44)	0:00	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: 2019-06-18_Republic Cumulative SFA

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
T45	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (45)	0:00	0:00
T46	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (46)	0:00	0:00
T47	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (47)	103:58	31:04
T48	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (48)	135:10	43:16
T49	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (49)	101:21	31:36
T5	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (5)	0:00	0:00
T50	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (50)	232:07	71:44
T6	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (6)	0:00	0:00
T7	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (7)	0:00	0:00
T8	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (8)	0:00	0:00
T87	NORDEX N149/4.0-4.5 4500 149.0 !O! hub: 125.0 m (TOT: 199.5 m) (4)	277:39	73:14
T9	VESTAS V136-3.6 3600 136.0 !O! hub: 82.0 m (TOT: 150.0 m) (9)	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.



REPORT

**NOISE IMPACT ASSESSMENT FOR
REPUBLIC WIND – SENECA AND
SANDUSKY COUNTY, OHIO**

6.21.2019



PREPARED FOR:
APEX CLEAN ENERGY

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NOISE IMPACT ASSESSMENT FOR REPUBLIC WIND – SENECA AND SANDUSKY COUNTY, OHIO

PREPARED FOR:
APEX CLEAN ENERGY

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1.0 INTRODUCTION

Apex Clean Energy is proposing the Republic Wind project in an area straddling the border between Seneca County and Sandusky County, Ohio between the towns of Republic and Bellevue. A previous noise assessment was published for this project by RSG (*Noise Impact Assessment for Republic Wind*, December 22, 2017) with a 58-turbine array. The array summarized in this current report has up to 50 wind turbines, with one spare location, modeled with eight turbine model options. The current array is being presented as an alternative and does not replace the previous array.

As part of the Ohio Power Siting Board (OPSB) permitting process, Apex Clean Energy retained RSG to conduct a pre-construction noise assessment. This assessment includes both long-term background sound monitoring and computer sound propagation modeling of the proposed turbines.

This report includes:

- A project description;
- A summary of sound level limits applicable to the project;
- Background sound level monitoring procedures and results;
- Discussion of acoustical concerns particular to wind turbine noise;
- Sound propagation modeling procedures and results;
- Construction noise modeling;
- Discussion; and
- Conclusions.

2.0 PROJECT DESCRIPTION

Republic Wind is proposed to span Seneca and Sandusky Counties in Ohio. The project rights have been acquired by Apex Clean Energy.

The project covers approximately 15,000 acres, with up to 58 wind turbine locations and a total project output of at least 200 MW. A map showing the project area is shown in Figure 1, showing an alternative layout with up to 50 locations, including one spare location.

The project is roughly bounded by U.S. 20, which passes approximately two kilometers north of the project area, Ohio Route 4 on the east, and Ohio Routes 18 and 162 on the South.

Terrain in the area is flat overall with small undulations. Southern parts of the project area generally have more elevation change. The Sandusky river passes just to the west of the project area. Land use is primarily agricultural. Most land is cultivated, with some scattered stands of trees.

A final wind turbine type has not been selected for the project. Currently considered turbine models for this particular array are the Vestas V150 4.2 MW and 5.6 MW with hub heights of 105 meters; Siemens/Gamesa SG4.5-145 with a 107.5-meter hub height; Nordex N149 4.5 MW, 4.8 MW, 5.5 MW, and 5.7 MW with 109-meter hub heights; and Vestas V136 3.6 MW with 82-meter hub height. The turbine models considered for the previously-modeled turbine array were the GE 3.6-137, Acciona AW132, and Vestas V136 3.6 MW. The project will also include a single 67-90-112 MVA transformer at the collector substation and individual pad-mounted transformers at the base of each turbine.

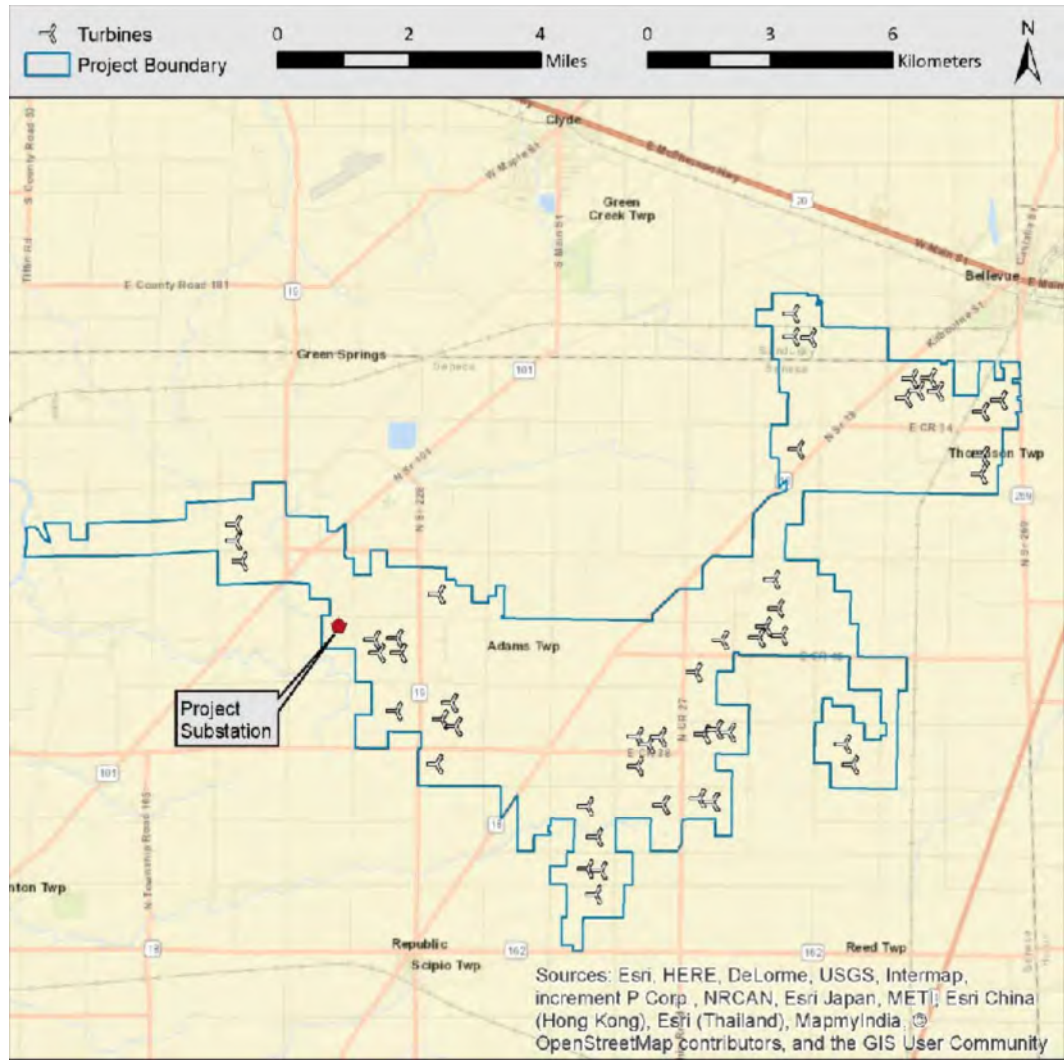


FIGURE 1: PROJECT AREA MAP

3.0 SOUND LEVEL LIMITS/GUIDELINES

3.1 | STATE STANDARDS

Sound levels from wind power projects are regulated under Section 4906-4-09(F) of the Ohio Administrative Code (“OAC”) which states:

(2) The facility shall be operated so that the facility noise contribution does not result in noise levels at any non-participating sensitive receptor within one mile of the project boundary that exceed the project area ambient nighttime average sound level (L_{eq}) by five A-weighted decibels (dBA). During daytime operation only (seven a.m. to ten p.m.), the facility may operate at the greater of: the project area ambient nighttime L_{eq} plus five dBA; or the validly measured ambient L_{eq} plus five dBA at the location of the sensitive receptor. After measured ambient L_{eq} plus five dBA at the location of the sensitive receptor. After commencement of commercial operation, the applicant shall conduct further review of the impact and possible mitigation of all project-related noise complaints through its complaint resolution process. Non-participating, as used in this context, refers to a property for which the owner has not signed a waiver or otherwise agreed to be subject to a higher noise level.

Based on ambient sound monitoring conducted at seven locations throughout the Republic project area (see Section 4), the existing nighttime background L_{eq} in the area is 41 dBA. Applying the OPSB sound level limit results in a nighttime sound level limit of 46 dBA. As discussed in Section 4, the daytime sound levels are generally higher than the nighttime sound levels throughout the project area, so a higher daytime limit may be possible at some sensitive receptors, but for the purposes of this assessment, the nighttime sound level limit of 46 dBA is applied.

Section 4906-4-09(F) also limits the hours of construction activities that increase sound above ambient levels at sensitive receptors to the hours of 7 AM to 7 PM or dusk, whichever is later. Pile driving, blasting, and rock hammering are further restricted to the hours of 10 AM to 5 PM. There are also requirements regarding notification of property owners and tenants related to construction activities.

4.0 PRE-CONSTRUCTION BACKGROUND SOUND LEVELS

Background sound monitoring was conducted to assess representative ambient sound levels in the project area to form the basis for the noise limit. This section of the report describes the monitoring performed and discusses the results obtained. It includes a description of the monitoring procedures, monitoring locations, sound data processing, and the results obtained for each of the monitoring locations. Observations and conclusions regarding the existing soundscapes at each monitoring location are included.

4.1 | DESCRIPTIONS OF THE MONITORING LOCATIONS

Background sound level monitoring was performed from February 3 through February 18, 2016 at seven different locations spread across the proposed project area. Each location was selected as representative of a given landscape or soundscape that would be in proximity of one or more of the proposed wind turbines. In placing monitors, consideration is also given to accessibility in winter weather and to the security of the monitoring equipment.

The seven sites are shown in Figure 2, and the reasons for selecting each are described below:

1. “North Boundary”: This location is near the northern extremity of the proposed project, on the boundary between Seneca and Sandusky Counties. This area represents a lower vehicle traffic agricultural area in the northern part of the project;
2. “Mixed Residential”: Flat Rock is one of the few higher-density residential areas within the proposed project boundary. It is also along a rail line with a crossing;
3. “Agricultural Operations”: Most of the area within the proposed project boundary is taken up with larger-scale agricultural operations and related low-density housing. Note that our monitoring took place in the winter and farming activities were not evident;
4. “Busy Roadway”: Most of the area is crossed with town roads (TR) and county roads (CR) with very light traffic. But the project area is also crossed by a few larger roadways. This site is near State Route 18 (SR18), which bisects the entire project area and where the traffic is significantly higher;
5. “Wooded Area”: The majority of the proposed project area is characterized by open agricultural fields. There are a few forested areas, where the soundscape includes a different mix of biogenic sources. This particular wooded area was selected because it was further from roadways but still accessible in wintertime;
6. “Remote Rural”: As stated above, most the area is open agricultural fields crossed by lightly-traveled roadways. This site represents an effort to find a quiet area that is still subject to agricultural activity; and,

7. “Southern Boundary”: This location is near the southern extremity of the proposed project. This location represents a lower traffic agricultural area in the southern part of the project.

Each monitoring location is described in detail below. Note that some of the installation photos were taken on February 2 or 3 when there had been no recent snowfall, while others were taken on February 11, when a light snow was on the ground.

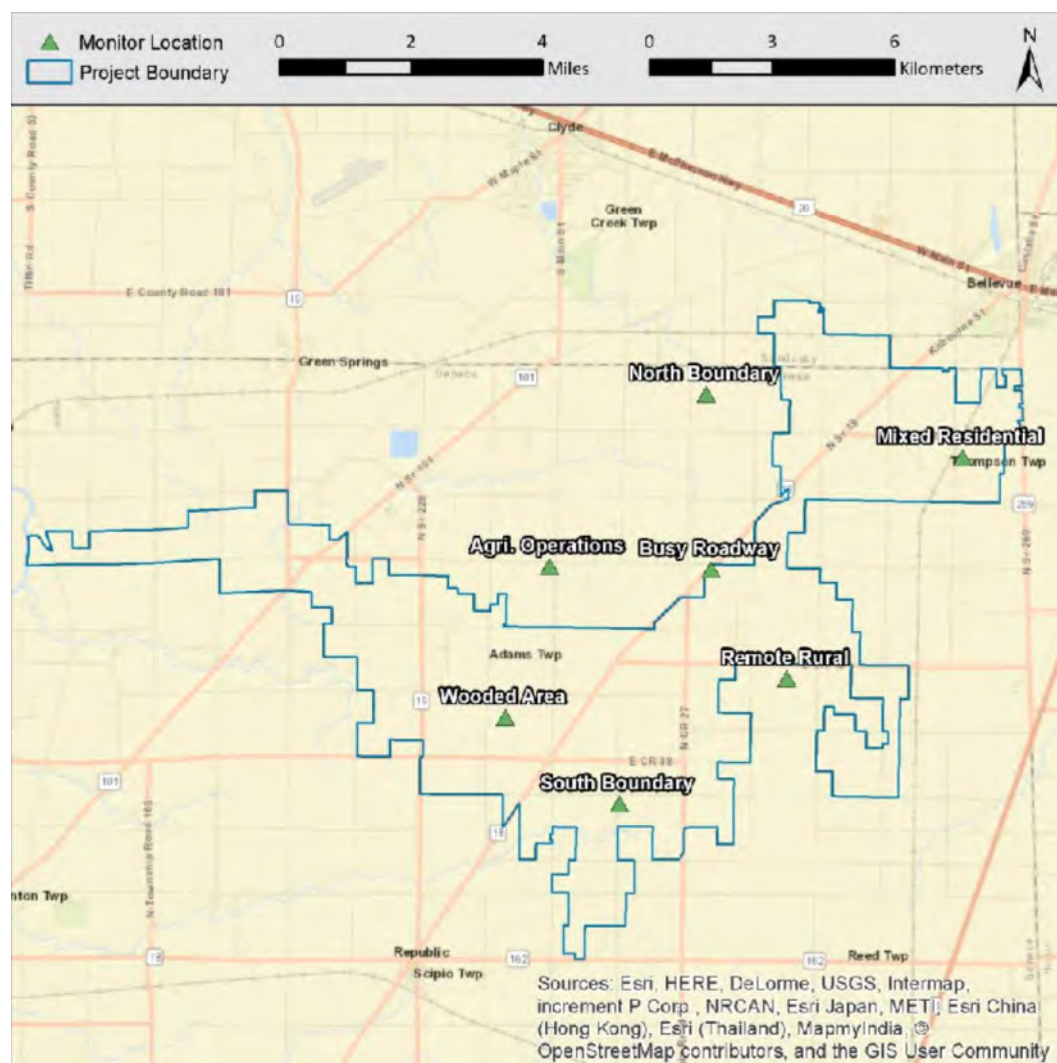


FIGURE 2: LONG-TERM MONITORING LOCATIONS FOR REPUBLIC WIND (PRE-CONSTRUCTION)

NORTH BOUNDARY

The monitor labeled “North Boundary” was located 375 meters (1,230 feet) east of Route TR79. The project boundary is located approximately 1,220 meters (4,000 feet) to the east, along TR80 and the border between Seneca and Sandusky Counties (County Route 62) is located approximately 700 meters (2,300 feet) to the north. The site is shown in Figure 3. A

two-building chicken operation was located about 454 meters (1,490 feet) to the north of the monitor.

The monitoring system and an anemometer were secured along the tree-line separating two parcels, as shown in Figure 4.

MIXED RESIDENTIAL

The monitor labeled “Mixed Residential” was in the village of Flat Rock. It was placed 208 meters (682 feet) east of North County Road 29, 106 meters (348 feet) northeast of the Flat Rock Care Center. The site is shown in Figure 5. To the west of the monitor was the residential area; to the east were agricultural fields. The monitor was 392 meters (1,286 feet) from the closest point of approach of the rail line, and 515 meters (1,690 feet) from the crossing of that rail line with CR29.

The monitoring system, an anemometer, and a thermometer were secured along the tree-line separating the residential parcels from the farm fields, as shown in Figure 6.

AGRICULTURAL OPERATIONS

The monitor labeled “Agricultural Operations” was located near the residence of an agricultural parcel at the corner of County Roads 32 and 21 in Clyde, Ohio as shown in Figure 7. The monitor was placed approximately 90 meters (300 feet) south of Country Road 32, and 120 meters (390 feet) west of Country Road 21. The participating parcel includes the residence, grain storage containers, and two equipment barns, all surrounded by agricultural fields.

The monitoring system and an anemometer were secured on the northern edge of the residential portion of the property, as shown in Figure 8.

BUSY ROADWAY

The monitor labeled “Busy Roadway” was located 85 meters (279 feet) southeast of State Route 18 (SR18) and 149 meters (489 feet) south of County Road 32 (CR32), as shown in Figure 9. The monitor was placed along a small grove of trees in an open, untilled patch bordered by three agricultural fields. A residence was located 210 meters (689 feet) to the northeast, across CR32.

The monitoring system was secured near one of the trees in the grove, as shown in Figure 10.

WOODED AREA

The monitor labeled “Wooded Area” was located 613 meters (2,011 feet) south of Town Road 138 (TR138) and 588 meters (1,929 feet) east of Town Road 179 (TR 179), as shown in Figure 11. The location was near a maple sugaring shack that was in operation for brief periods during monitoring. A large confinement facility was located across TR138, approximately 777 meters (2,550 feet) to the north of the monitor.

The monitoring system was secured within the trees on the northern edge of the woods, as shown in Figure 12.

REMOTE RURAL AREA

The monitor labeled “Remote Rural Area” was located 355 meters (1,165 feet) south of County Road 46 (CR46) and 874 meters (2,867 feet) east of Town Road 80 (TR80), as shown in Figure 13. It was on the edge of a small grove of trees in the center of the adjacent agricultural fields. This location was also 351 meters (1,152 feet) to the west of the boundary line of the proposed project area near CR46. While the location and density of residences is similar in this area to others selected for monitoring, it is further from more heavily-traveled roads. It was 3.22 kilometers (2 miles) due west of the rail line that passes through Flat Rock.

The monitoring system was secured along the edge of the field and tree-line, as shown in Figure 14. The microphone is highlighted in the photograph.

SOUTH BOUNDARY

The monitor labeled “South Boundary” was located 251 meters (823 feet) south of County Road 24 (CR24) and 96 meters (315 feet) east of Town Road 183 (TR183), as shown in Figure 15. This area is near the southern boundary of the proposed project area: the boundary follows CR24 and then jogs south to Town Road 124 (TR124) for just over one mile.

The monitoring system and an anemometer were secured along south edge of a stand of trees in this area, as shown in Figure 16.

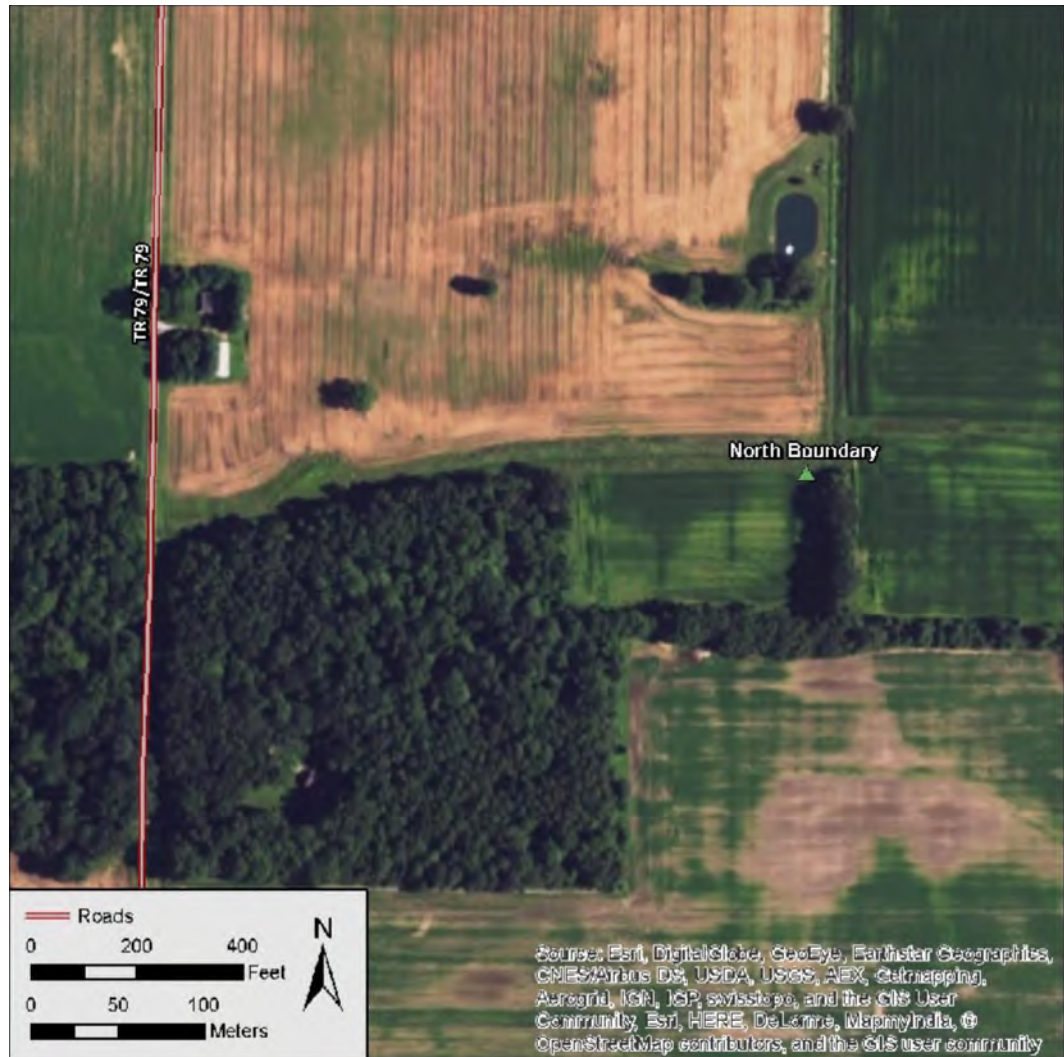


FIGURE 3: MAP OF THE "NORTH BOUNDARY" MONITOR SITE WITH ORTHO-IMAGERY



FIGURE 4: PHOTOGRAPH OF THE MONITOR INSTALLATION AT "NORTH BOUNDARY"



FIGURE 5: MAP OF THE "MIXED RESIDENTIAL" MONITOR LOCATION WITH ORTHO-IMAGERY



FIGURE 6: PHOTOGRAPH OF THE MONITOR INSTALLATION AT "MIXED RESIDENTIAL"



FIGURE 7: MAP OF THE "AGRICULTURAL OPERATIONS" MONITOR LOCATION WITH ORTHO-IMAGERY



FIGURE 8: PHOTOGRAPH OF THE MONITOR INSTALLATION AT "AGRICULTURAL OPERATIONS"

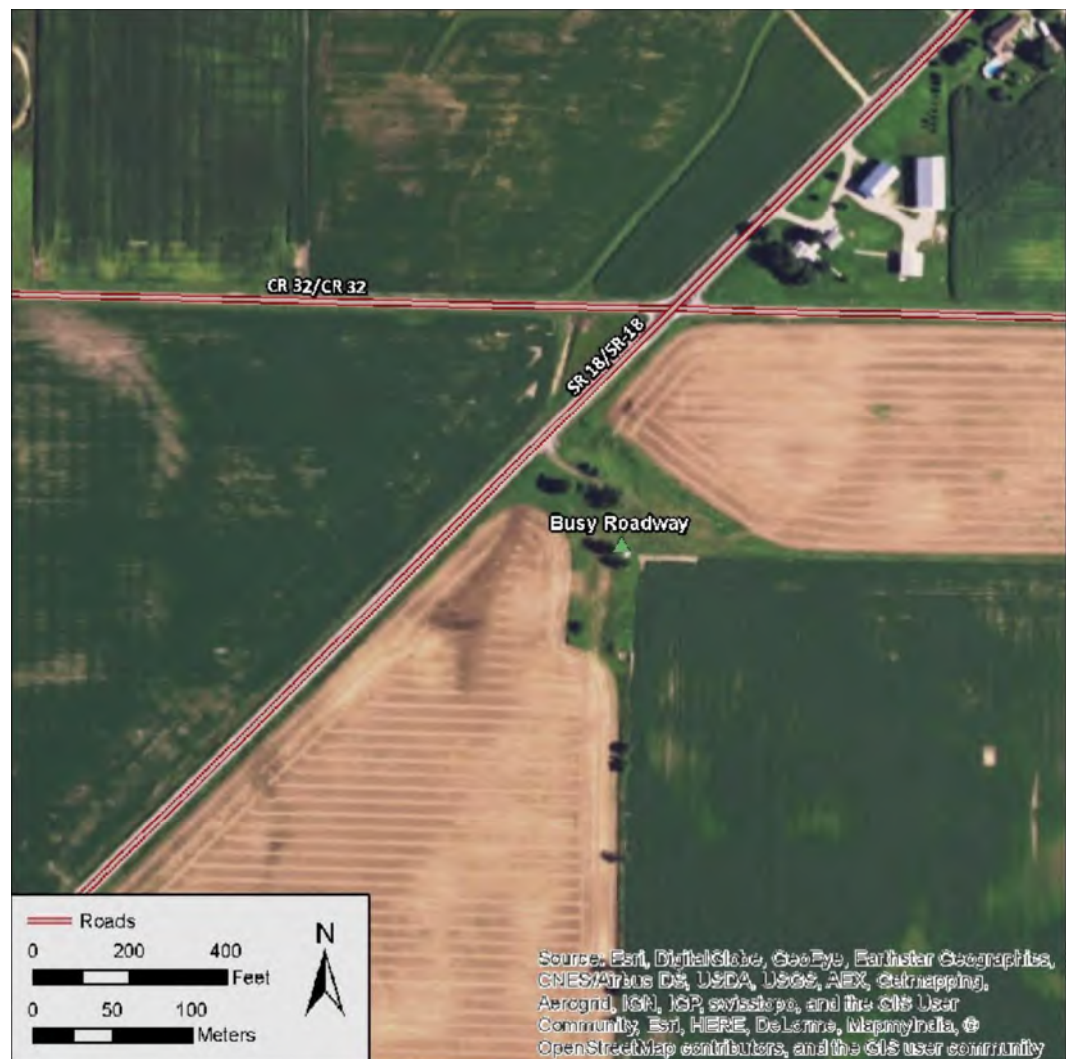


FIGURE 9: MAP OF THE "BUSY ROADWAY" MONITOR LOCATION WITH ORTHO-IMAGERY



FIGURE 10: PHOTOGRAPH OF THE MONITOR INSTALLATION AT "BUSY ROADWAY"



FIGURE 11: MAP OF THE "WOODED AREA" MONITOR LOCATION WITH ORTHO-IMAGERY



FIGURE 12: PHOTOGRAPH OF THE MONITOR INSTALLATION AT "WOODED AREA"



FIGURE 13: MAP OF THE "REMOTE RURAL AREA" MONITOR LOCATION WITH ORTHO-IMAGERY



FIGURE 14: PHOTOGRAPH OF THE MONITOR INSTALLATION AT "REMOTE RURAL AREA"



FIGURE 15: MAP OF THE "SOUTH BOUNDARY" LOCATION WITH ORTHO-IMAGERY



FIGURE 16: PHOTOGRAPH OF THE MONITOR INSTALLATION AT "SOUTH BOUNDARY"

4.2 | MONITORING METHODOLOGY

DATA ACQUISITION

Sound levels at each monitoring location were measured using one of three sound level meters: the Cesva SC-310, Svantek SV979, or Rion NL-22. All sound level meters logged A-weighted equivalent continuous sound levels once each second. The Cesva and Svantek models are ANSI/IEC Type 1 sound level meters, and logged 1/3-octave-band spectral sound levels once each second. The Rion model used at the “Busy Roadway” location is an ANSI/IEC Type 2 sound level meter. It did not log spectral sound levels.

Each sound level meter’s microphone was mounted on a wooden stake at a height of approximately 1.2 meters (4 feet) and covered with a weather-resistant windscreen. The windscreen acts to reduce the influence of wind-induced self-noise on the measurements.

Real time audio was recorded continuously at each location using the signal acquired through the sound level meter microphone. The Svantek SV979 meters recorded WAV audio internally. The analog signals from each of the other meters were input to external digital audio recorders.

Average wind speeds and maximum gust speeds were logged once per minute at four locations throughout the site using ONSET Hoboware anemometers. Air temperature was logged once per minute at the “Mixed Residential” location.

DATA ANALYSIS

After the monitoring period, 1-second logged sound level data were compiled in 10-minute periods. Data from those periods during which weather conditions exceeded the operational ranges of the instrumentation were removed from results. These conditions include maximum gust speeds above 5 m/s (11 mph), temperatures below -10 °C (14 °F), or precipitation in the form of rain. (Snow periods are not excluded.) Other data periods were removed for seasonal sound sources (snow plows, snowmobiles, etc.), anomalous activities in the immediate vicinity of the microphones (such as interaction of people or animals with the equipment), and during station calibration/check-up.

For each monitor site, results are presented as graphs of sound levels and maximum wind (gust) speed as a function of time throughout the monitoring period. Two sound level metrics are plotted in each graph: equivalent continuous sound levels (L_{eq}) and 10th-percentile sound levels (L_{90}). The data which were excluded from summary processing are included in the graphs but shown in lighter colors.

4.3 | MONITORING RESULTS

SUMMARY OF METEOROLOGICAL DATA

Strong winds were common throughout the monitoring period, and temperatures dropped below -10 °C (14 °F) several times. Temperatures during the monitoring period ranged from a low of -19.1° C (-2.4° F) to a high of 15.6° C (60.1° F). The maximum wind speeds and

gusts recorded at the four sites equipped with anemometry are listed in Table 1. Over the 15 days of monitoring, precipitation fell as rain on February 8 and February 15.¹ The exact rain periods at each site were verified from their respective audio recordings.

TABLE 1: MAXIMUM MEASURED WIND SPEEDS BY SITE

Monitoring Location	Max Wind Speed		Max Gust Speed		Average Wind Speed	
	m/s	mph	m/s	mph	m/s	mph
Agricultural Operations	9.1	20.3	12.1	27.0	1.7	3.8
Mixed Residential	7.1	15.8	11.3	25.3	1.4	3.2
North Boundary	6.8	15.2	10.8	24.2	1.3	2.9
Southern Boundary	10.3	23.1	13.6	30.4	1.6	3.5

SUMMARY OF SOUND LEVELS

The equivalent continuous sound level (L_{eq}) and tenth-percentile sound level (L_{90}) data logged at each monitoring location are plotted as time history graphs, along with the maximum 10-minute gust speed and temperature in Figures 17 through 37. (For an explanation of the sound level metrics and their use, see Appendix A, “A Primer on Sound and Noise”.) Each time history graph spans one calendar week for ease of viewing. Periods that have been excluded from the averaging of sound levels due to high wind, low temperature, rain, or anomalous events, are indicated on each graph. However, the original data for those periods are still shown, using lighter colors. Results specific to each monitor location are described in the following sections.

All the monitors were within audible range of freight train passby events (and their horns at crossings). Additionally, aircraft overflights, mostly by commercial jets operating at cruise altitudes, were evident at every site. All the monitors were near dormant farm fields. As the monitoring occurred in the winter, field farming activities were not evident in the data.

Summary sound levels for the monitoring period at all sites are presented in Table 2. They include the equivalent continuous average (L_{eq}), and the 10th-percentile (L_{90}), 50th-percentile (L_{50}) and 90th-percentile (L_{10}) statistical levels for the entire period, for the daytime periods, and for the nighttime periods.²

The Mixed Residential monitor was the closest monitor to a residential area (“in town”). It recorded the highest average levels as a result of frequent use of the nearby Flat Rock Care facility parking lot. The Busy Roadway monitor was exposed to regular high-speed car and truck passbys.

¹ Rain periods were identified from historical meteorology data available online Weather Underground stations KOHMONRO6 and KOHREPUB2, at <http://www.wunderground.com>.

² Daytime is defined here as the period from 7:00 AM to 10:00 PM; nighttime is defined here as the period from 10:00 PM to 7:00 AM the following day.

The quietest sites were the Southern Boundary and the Wooded Area, which were more distant from roads and areas of frequent human activity.

The relatively larger differences between equivalent continuous levels (L_{eq}) and lower tenth-percentile levels (L_{90}) at most of the sites indicate that the soundscapes are dominated by transient events resulting from human activity. Weather patterns (mostly wind) also influenced sound levels. Thus, only some of the data show a typical anthropogenic diurnal pattern, where sound levels are higher during the day and lower at night.

The OPSB level limit is calculated from the arithmetic average of the site-wide nighttime equivalent average sound levels (L_{eq}) plus 5 dB. The site-wide average sound levels are shown in the last row of Table 2. Among all seven sites in the Republic project area, the average nighttime L_{eq} is 41 dB, which results in an OPSB project-only sound level limit of 46 dBA L_{eq} 1-hr.

TABLE 2: SUMMARY SOUND LEVELS FROM PRE-CONSTRUCTION MONITORING

Location	Sound Level (dBA)											
	Overall				Day				Night			
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}
Agricultural Operations	43	26	35	46	44	29	37	47	40	24	30	41
Busy Roadway	50	27	39	54	52	32	42	55	47	24	33	49
Mixed Residential	51	29	36	47	51	31	37	47	51	27	34	46
North Boundary	47	27	33	42	48	28	34	42	44	25	31	41
Rural	42	24	32	44	43	26	34	45	39	21	30	40
Southern Boundary	37	21	31	39	38	23	32	39	34	17	28	37
Wooded Area	36	23	30	38	37	25	31	39	32	21	27	35
Arithmetic Average	44	25	34	44	45	28	35	45	41	23	30	41

RESULTS AT EACH MONITORING LOCATION

North Boundary

The overall L_{eq} at the North Boundary monitoring location was 47 dBA. The daytime and nighttime L_{eq} were 48 and 44 dBA, respectively. These levels were higher than the L_{10} for the same period, which indicates that the maximum sound levels over the period were brief, but relatively high. This is due to the preponderance of train horn blasts at the crossings of the east-west rail line about 1 mile (1.52 km) north of the site. The overall L_{90} , as an indication of the residual sound level, was lower: 27 dBA overall, 28 dBA daytime, and 25 dBA nighttime.

No sound anomalies were identified and excluded from the data analysis at this location.

None of the transient sounds were out of character for the area, and they did not take place abnormally close to the microphone.

The sound level meter was taken out of service for one hour after midnight on February 11, 2016 to download data and replace the system's batteries.

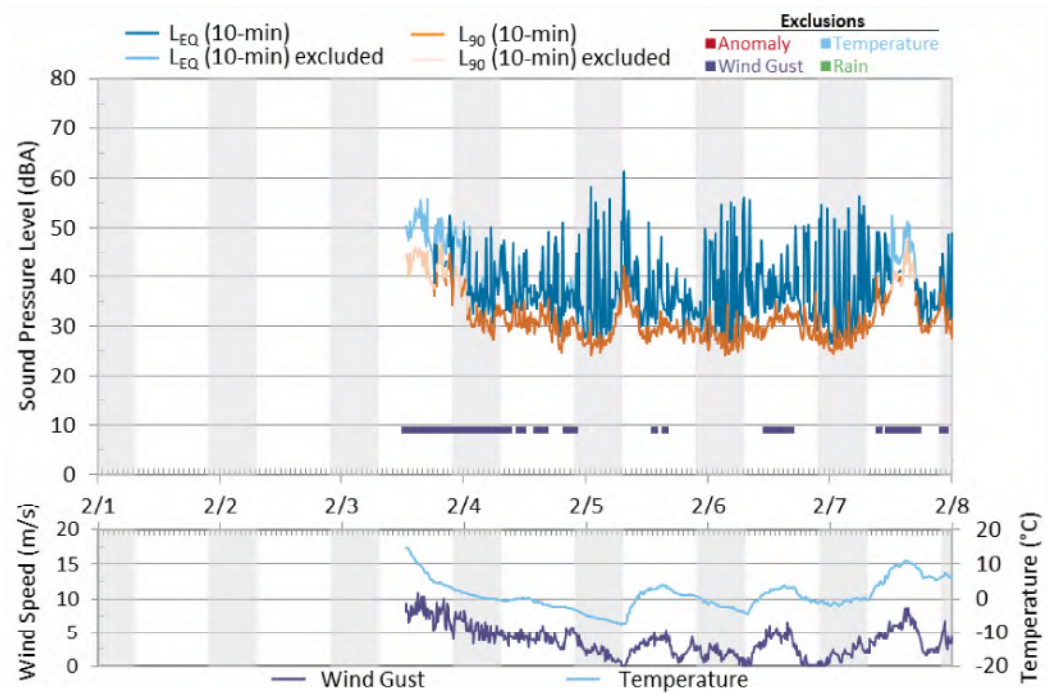


FIGURE 17: MONITOR DATA, NORTH BOUNDARY SITE, FEBRUARY 3-7, 2016

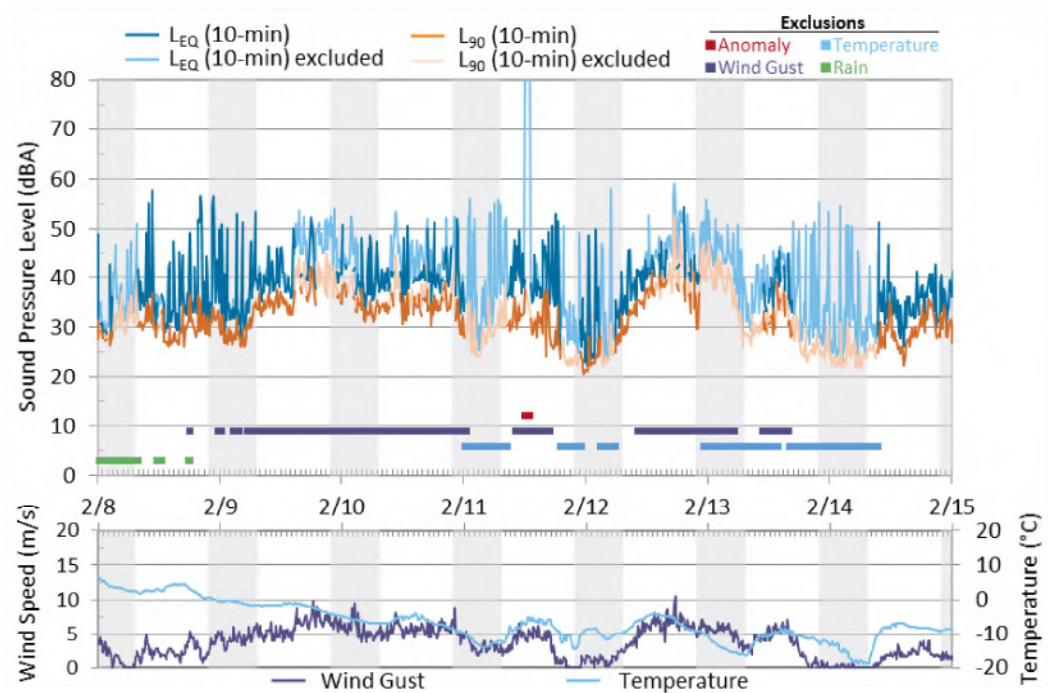


FIGURE 18: MONITOR DATA, NORTH BOUNDARY SITE, FEBRUARY 8-14, 2016

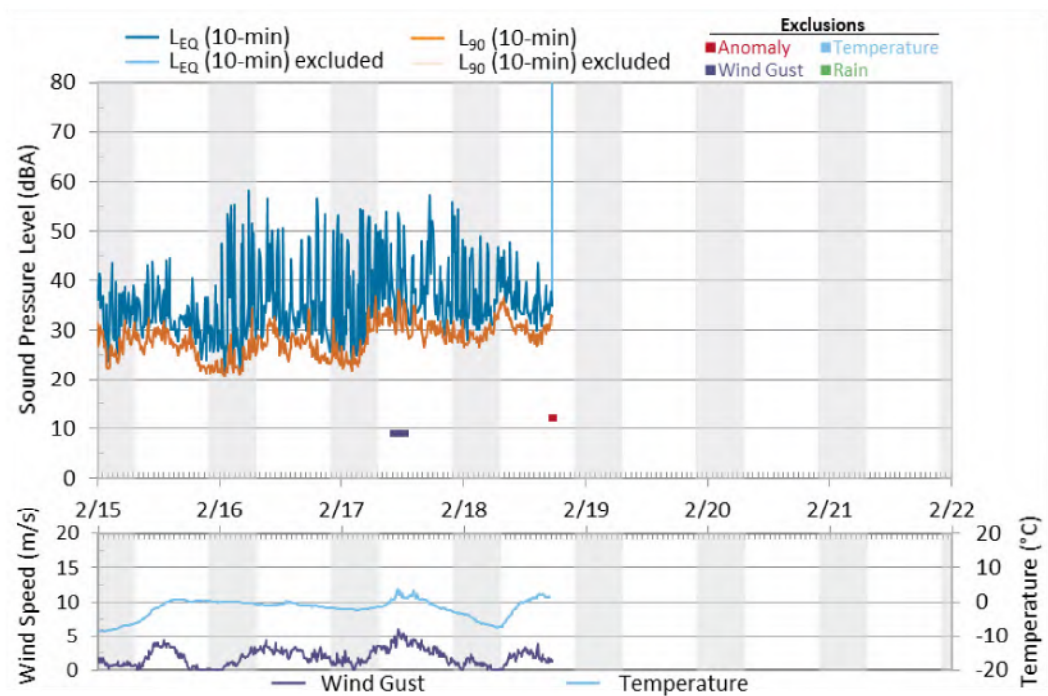


FIGURE 19: MONITOR DATA, NORTH BOUNDARY SITE, FEBRUARY 15-18, 2016

Mixed Residential

The overall L_{eq} at the Mixed Residential monitoring location was 51 dBA, the highest of the seven sites. The daytime and nighttime L_{eq} were the same, at 51 dBA. This indicates a relatively high amount of regular, but transient anthropogenic noise. It also indicates the proximity to the rail line, and the sounding of train horns both day and night. The overall L_{90} , was lower: 29 dBA overall, 31 dBA daytime, and 27 dBA nighttime.

Of the many transient events identified in the sound level data for this site, none were excluded as anomalies. This is because they were not out of character for the area, and they did not take place abnormally close to the microphone.

The sound level meter was taken out of service from 7:00 PM on February 10, 2016 until 11:30 AM on February 11, 2016 to download data and charge the system's batteries.

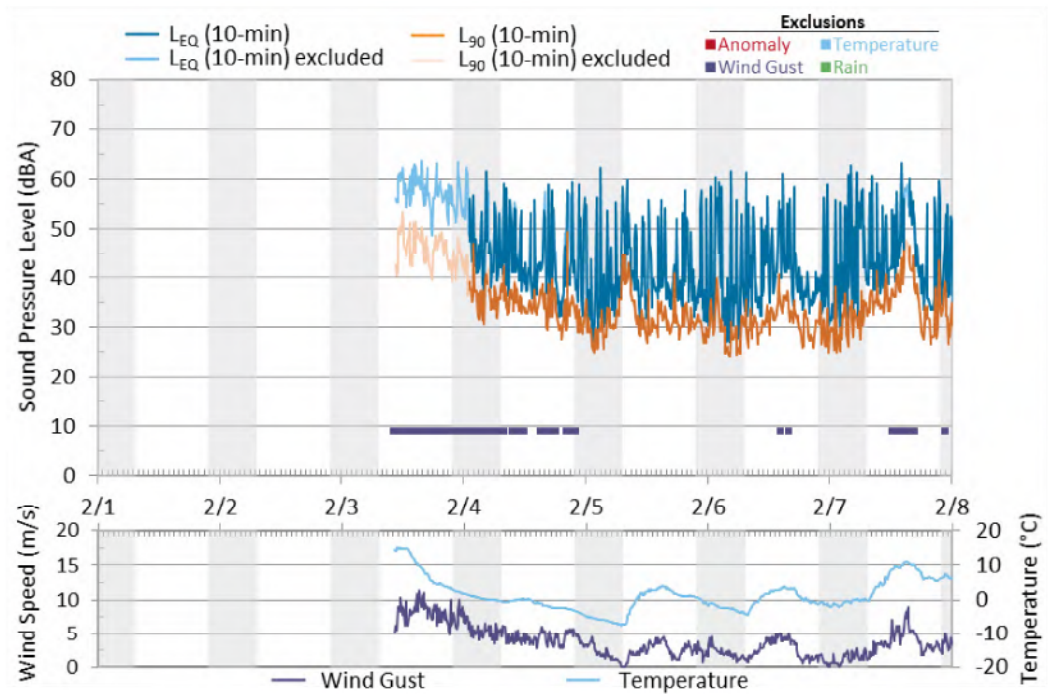


FIGURE 20: MONITOR DATA, MIXED RESIDENTIAL SITE, FEBRUARY 3-7, 2016

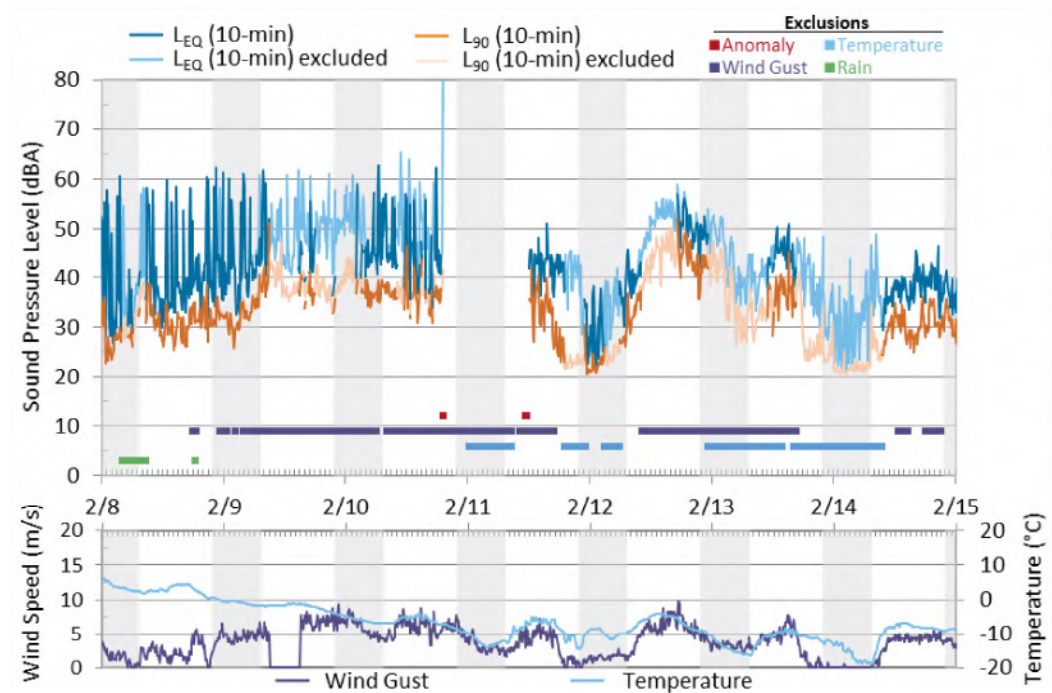


FIGURE 21: MONITOR DATA, MIXED RESIDENTIAL SITE, FEBRUARY 8-14, 2016

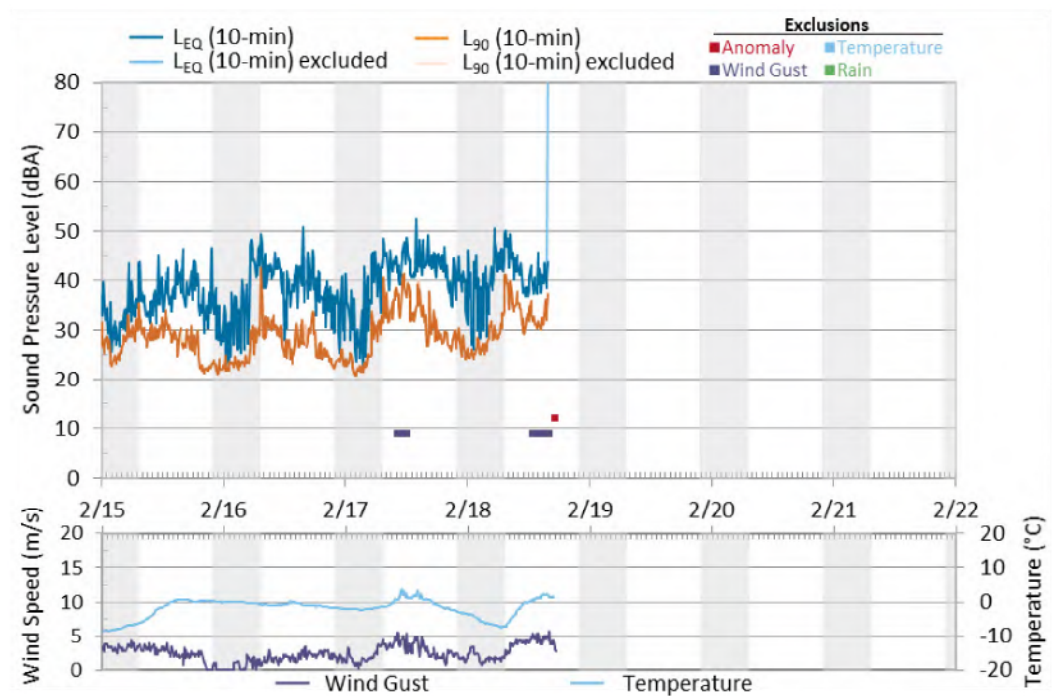


FIGURE 22: MONITOR DATA, MIXED RESIDENTIAL SITE, FEBRUARY 15-18, 2016

Agricultural Operations

The overall L_{eq} at the Agricultural Operations monitoring location was 43 dBA. The daytime and nighttime L_{eq} were 44 and 40 dBA, respectively. These levels were within 3 dB of the L_{10} for the same period. This is indicative of transient anthropogenic events. The overall L_{90} , as an indication of the background sound level, was lower: 26 dBA overall, 29 dBA daytime, and 24 dBA nighttime.

Anomalies at this site that were excluded from data analysis included children playing very near the microphone on February 15 and February 16, 2016, along with car horn and automobile door slams during the same periods.

The sound level meter was taken out of service from 6:00 PM on February 10 until 10:00 AM on February 11 to download data and charge the system's batteries.

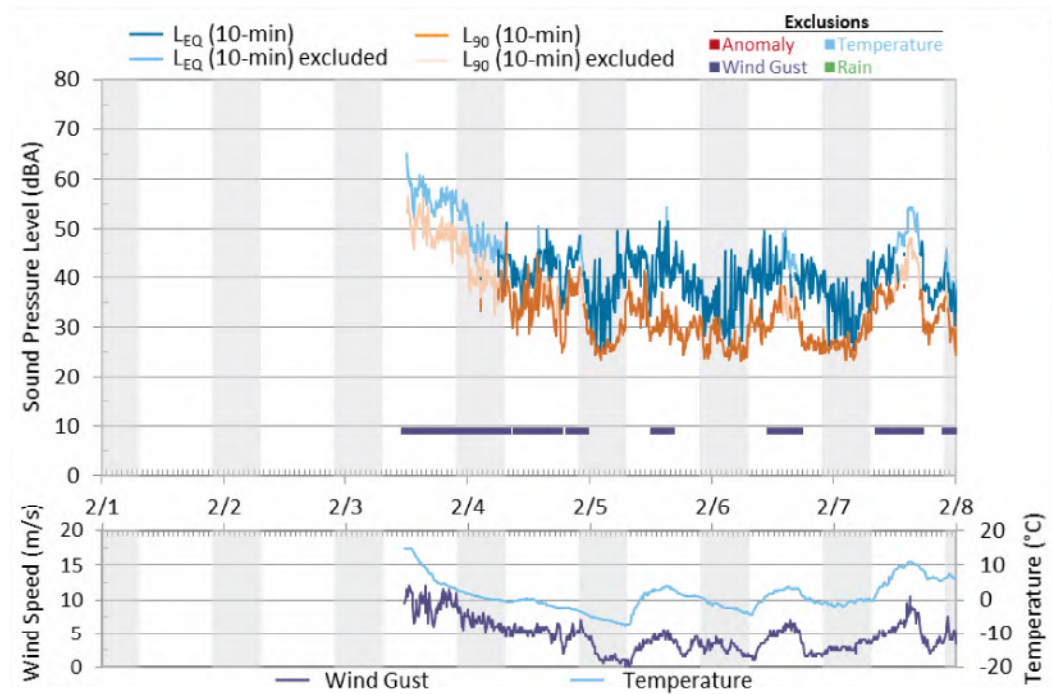


FIGURE 23: MONITOR DATA, AGRICULTURAL OPERATIONS SITE, FEBRUARY 3-7, 2016

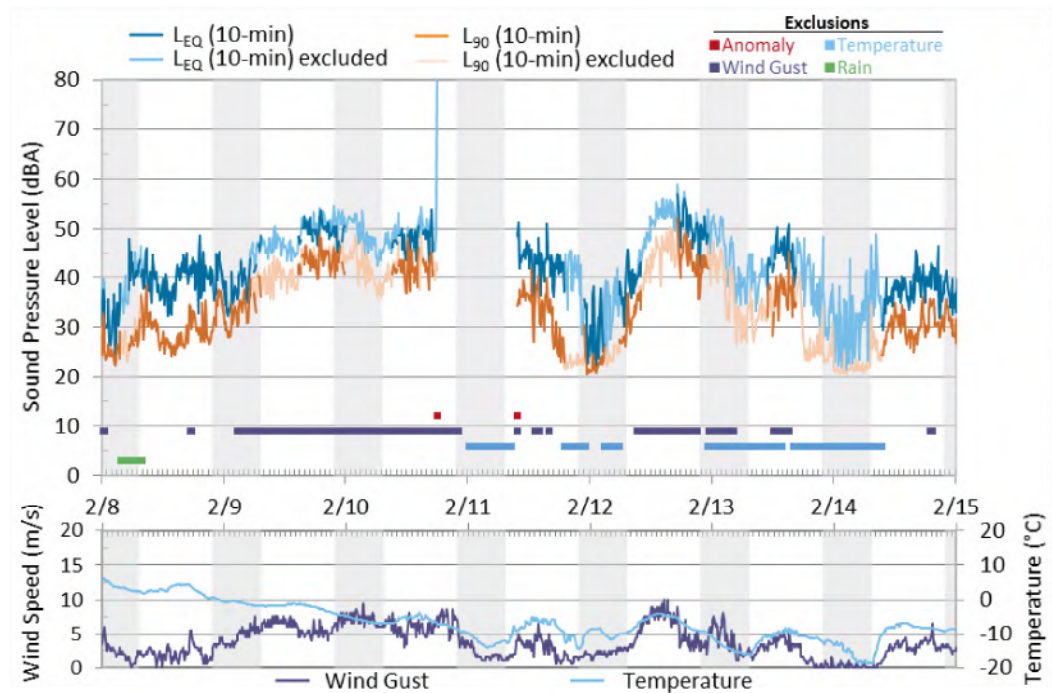


FIGURE 24: MONITOR DATA, AGRICULTURAL OPERATIONS SITE, FEBRUARY 8-14, 2016

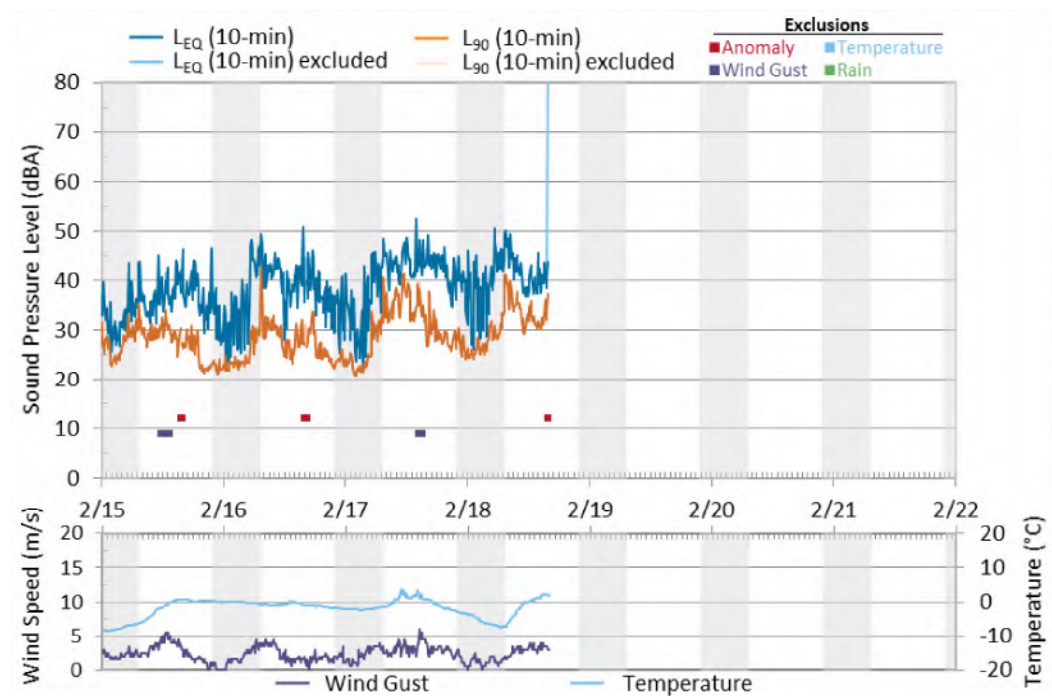


FIGURE 25: MONITOR DATA, AGRICULTURAL OPERATIONS SITE, FEBRUARY 15-18, 2016

Busy Roadway

The overall L_{eq} at the Busy Roadway monitoring location was 50 dBA. The daytime and nighttime L_{eq} were 52 and 47 dBA, respectively. The overall L_{90} was 27 dBA overall, 32 dBA daytime, and 24 dBA nighttime. These patterns are indicative of transient anthropogenic noise. The 8 dB difference between daytime and nighttime L_{90} indicate a diurnal pattern, mostly caused by reduced roadway traffic at night. Confirmation of this can be found by the convergence of the L_{eq} and L_{90} at night, indicating a reduction in transient sounds such as car passbys.

No sound anomalies were identified and excluded from the data analysis at this location. None of the transient sounds out of character for the area, and they did not take place abnormally close to the microphone. A long period of data, from 7:50 PM on February 8 until 2:00 PM on February 10, 2016, was excluded due to wind noise. The exact wind speed was not available, because the anemometer arm froze, but the sound levels (and lack of diurnal pattern) were indicative of very high winds. After comparing to the conditions at the other sites, that entire time period was excluded.

The sound level meter was not taken out of service, but the audio recorder was disconnected from 7:00 PM on February 10 until 11:30 AM on February 11, 2016 to download data.

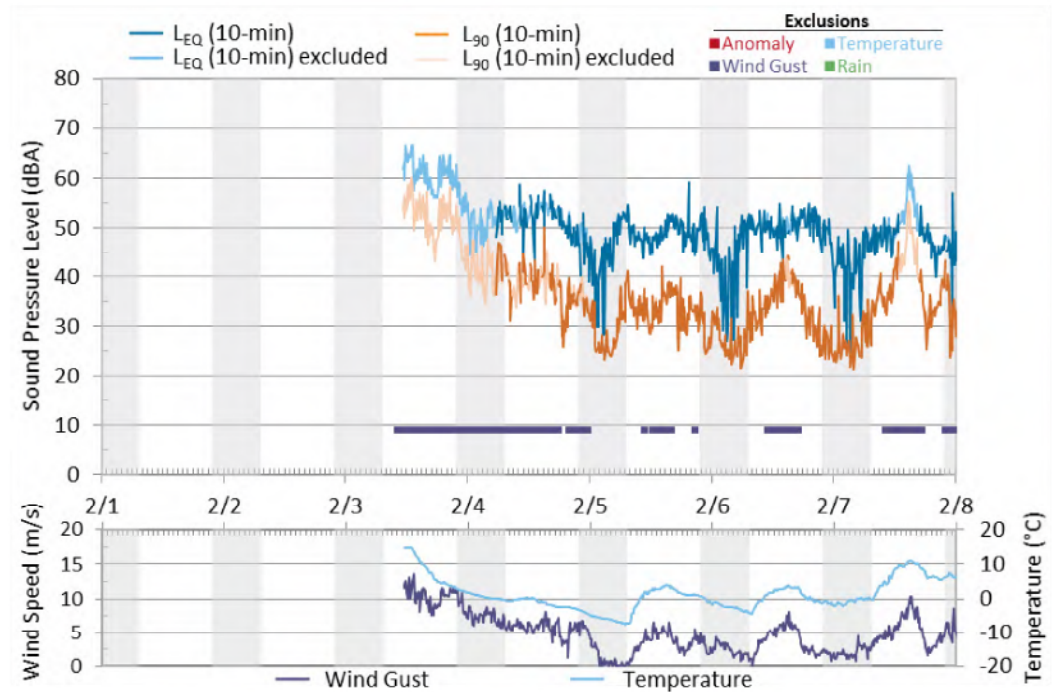


FIGURE 26: MONITOR DATA, BUSY ROADWAY SITE, FEBRUARY 3-7, 2016

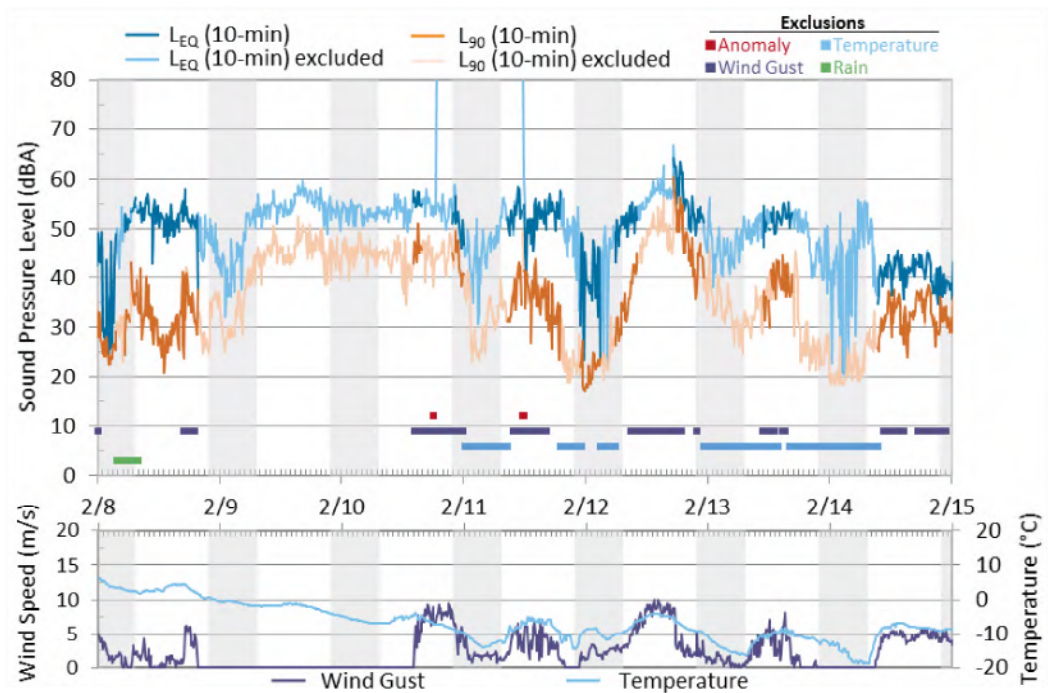


FIGURE 27: MONITOR DATA, BUSY ROADWAY SITE, FEBRUARY 8-14, 2016

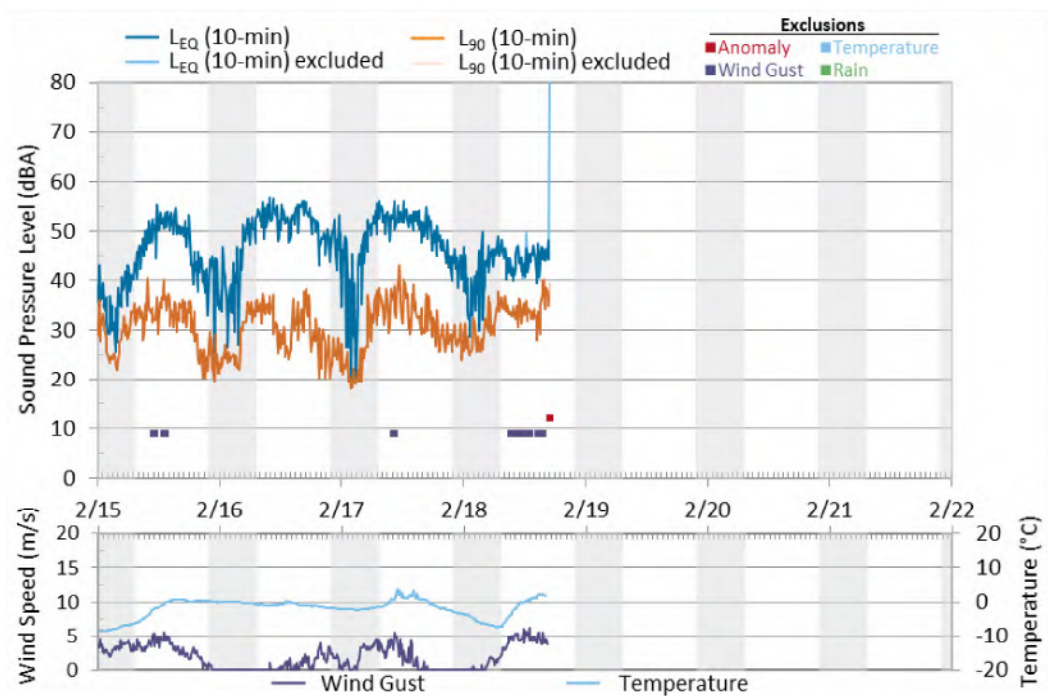


FIGURE 28: MONITOR DATA, BUSY ROADWAY SITE, FEBRUARY 15-18, 2016

Wooded Area

The overall L_{eq} at the Wooded Area monitoring location was 36 dBA, the quietest of monitored locations. The daytime and nighttime L_{eq} were 37 and 34 dBA, respectively. These levels were within 3 dB of the L_{10} for the same period, indicating some amount of transient anthropogenic noise. The overall L_{90} was 23 dBA overall, 25 dBA daytime, and 21 dBA nighttime. The small difference (4 dB) between daytime and nighttime levels indicates that background sound in the area does not follow a strong diurnal pattern.

Anomalies excluded from data analysis at this site included:

- A very low military aircraft flight directly over the microphone on February 4;
- Tractor operations in the woods very near the microphone on February 6;
- A group of people partying in the woods on February 7;
- Gunshots near the microphone on February 7 and February 14; and
- An unmuffled ATV approaching the microphone on February 16 and February 18.

The sound level meter was taken out of service from 6:15 PM on February 10 until 10:00 AM on February 11, 2016 to download data and charge the system's batteries.

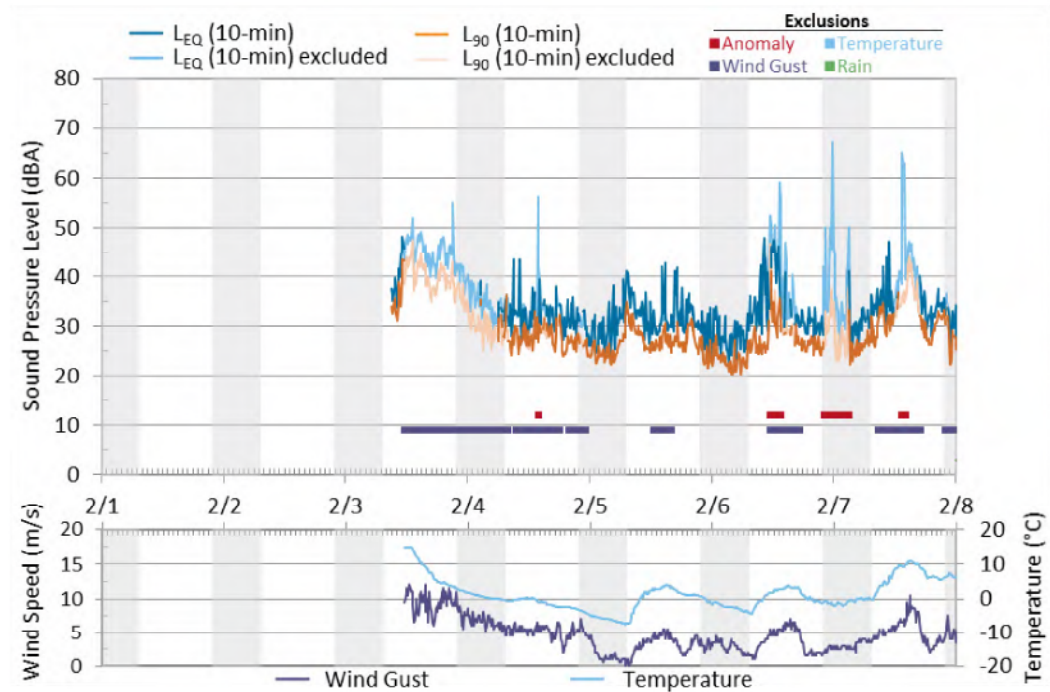


FIGURE 29: MONITOR DATA, WOODED AREA SITE, FEBRUARY 3-7, 2016

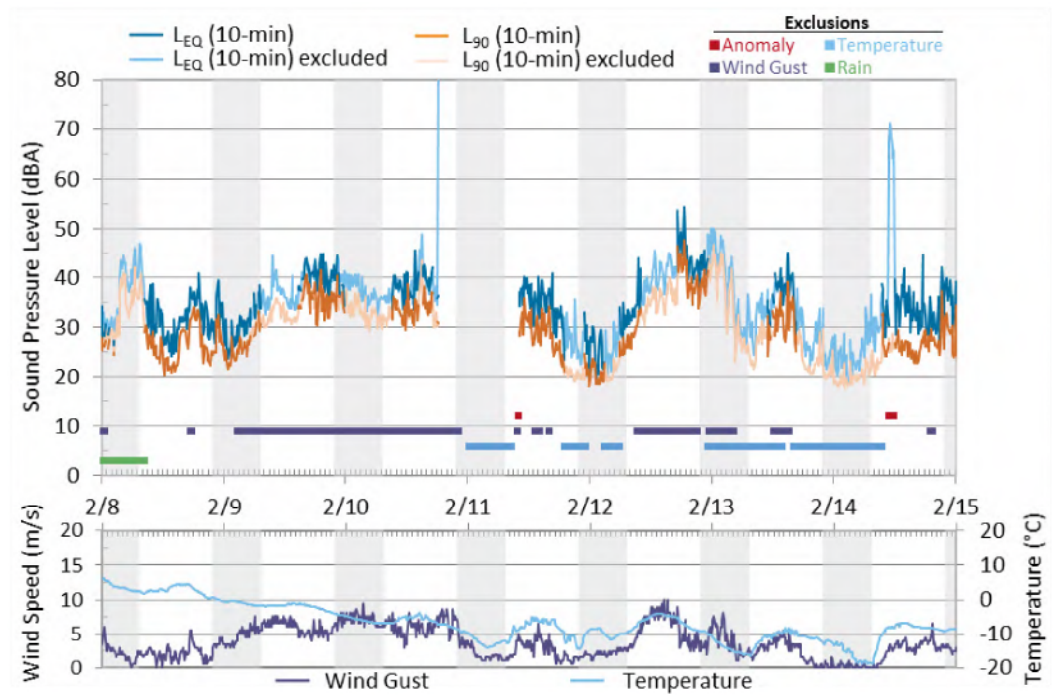


FIGURE 30: MONITOR DATA, WOODED AREA SITE, FEBRUARY 8-14, 2016

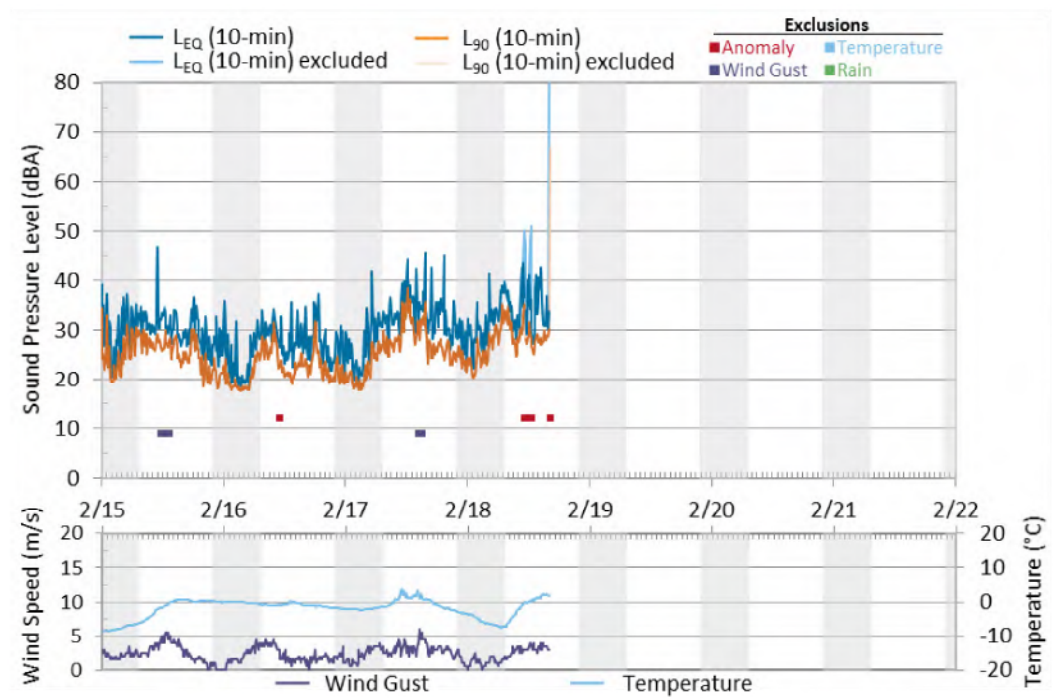


FIGURE 31: MONITOR DATA, WOODED AREA SITE, FEBRUARY 15-18, 2016

Remote Rural

The overall L_{eq} at the Remote Rural Area monitoring location was 42 dB. The daytime and nighttime L_{eq} were 43 and 39 dBA, respectively. These levels were within 2 dB of the L_{10} for the same period, indicating transient anthropogenic noise. The overall L_{90} was 24 dBA overall, 26 dBA daytime, and 21 dBA nighttime. The sound levels tended to follow a diurnal pattern, but train horns at nearby crossings during the night raised the nighttime L_{eq} .

No sound anomalies were identified and excluded from the data analysis at this location. None of the transient sounds out of character for the area, and they did not take place abnormally close to the microphone.

The sound level meter was taken out of service from midnight on February 10 until 11:10 AM on February 11, 2016 to download data and charge the system's batteries.

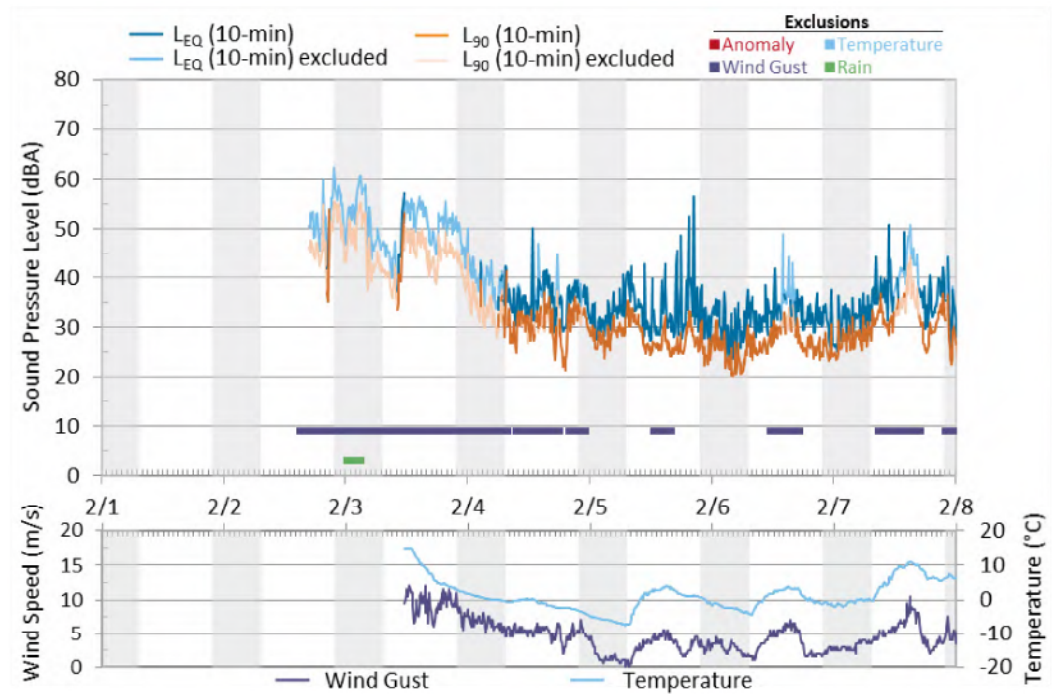


FIGURE 32: MONITOR DATA, REMOTE RURAL SITE, FEBRUARY 3-7, 2016

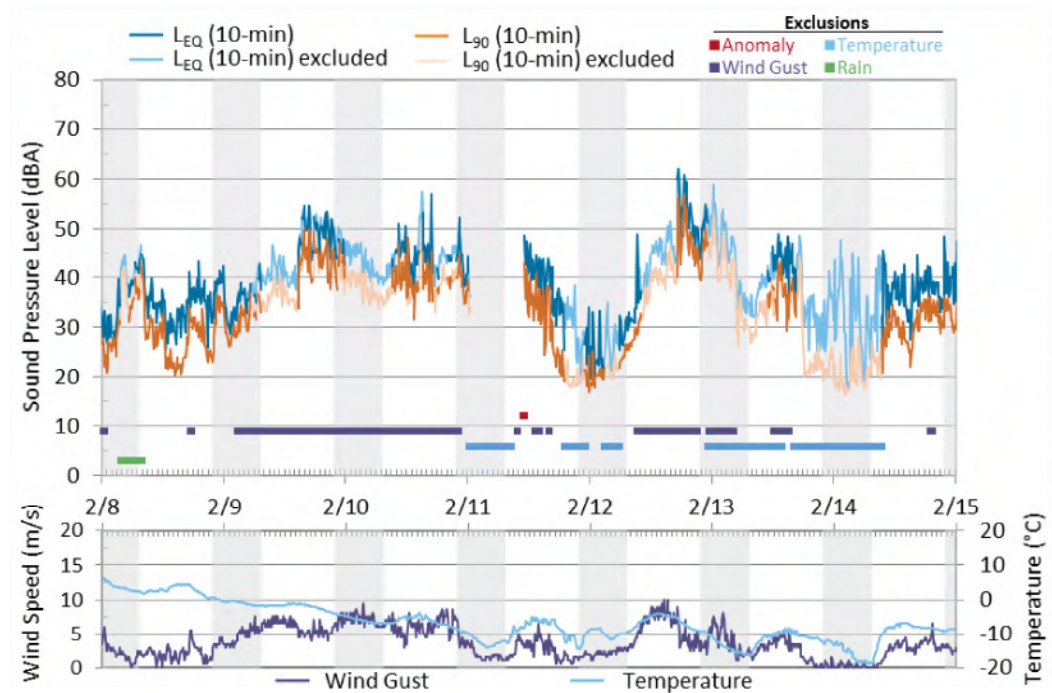


FIGURE 33: MONITOR DATA, REMOTE RURAL AREA, FEBRUARY 8-14, 2016

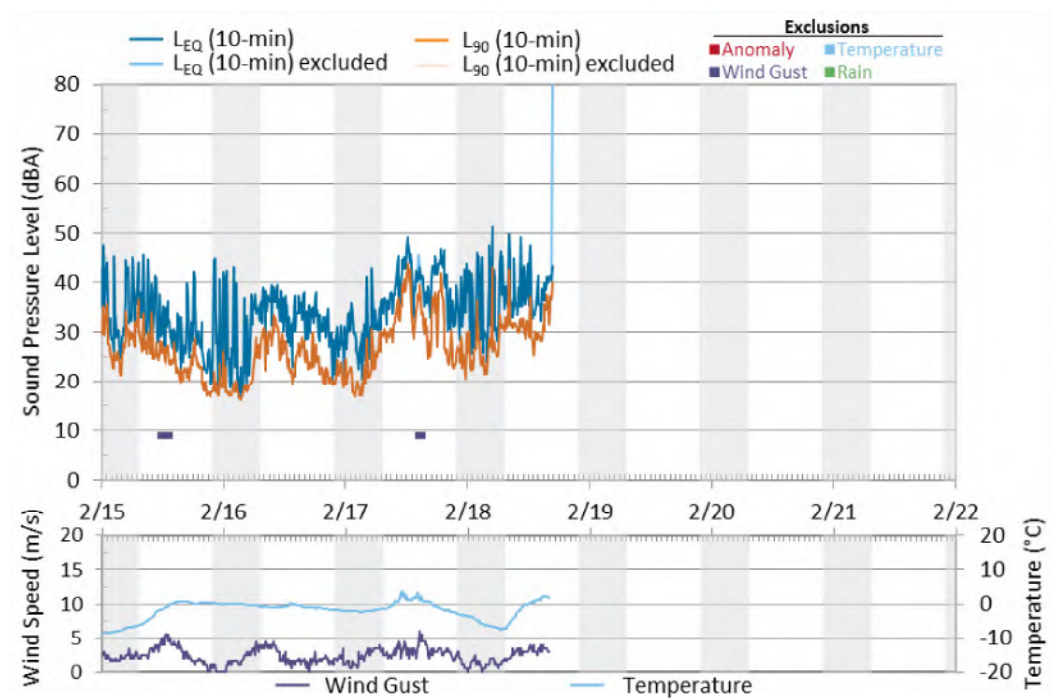


FIGURE 34: MONITOR DATA, REMOTE RURAL AREA, FEBRUARY 15-18, 2016

This foregoing document was electronically filed with the Public Utilities

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in

Case No(s). 17-2295-EL-BGN

Summary: Text Republic Wind, LLC's Notice of Project Modifications and Project Information Update - Part 1 of 2 electronically filed by Teresa Orahod on behalf of Dylan F. Borchers