

APPENDIX D

VISUAL SIMULATIONS AND CONTRAST RATING FORMS

Photographic Simulations and Representative Turbine Views

Organization

The photographic simulations are arranged in numerical order by key observation point (KOP). Each set of simulations includes a photograph of the existing condition and the simulation of Alternative A. Some KOPs also have simulations of additional action alternatives, dark gray turbines and obstruction lighting, and aboveground connector line poles and belowground collector line temporary construction disturbance widths.

Photographs of an existing five turbine wind farm in Kingman, Arizona are also included. They are arranged by distance of the viewer to the wind farm. Several of the distances are similar to distances from KOPs to the closest turbine in Alternative A, and are noted on the photograph. The photographs are located after the simulations.

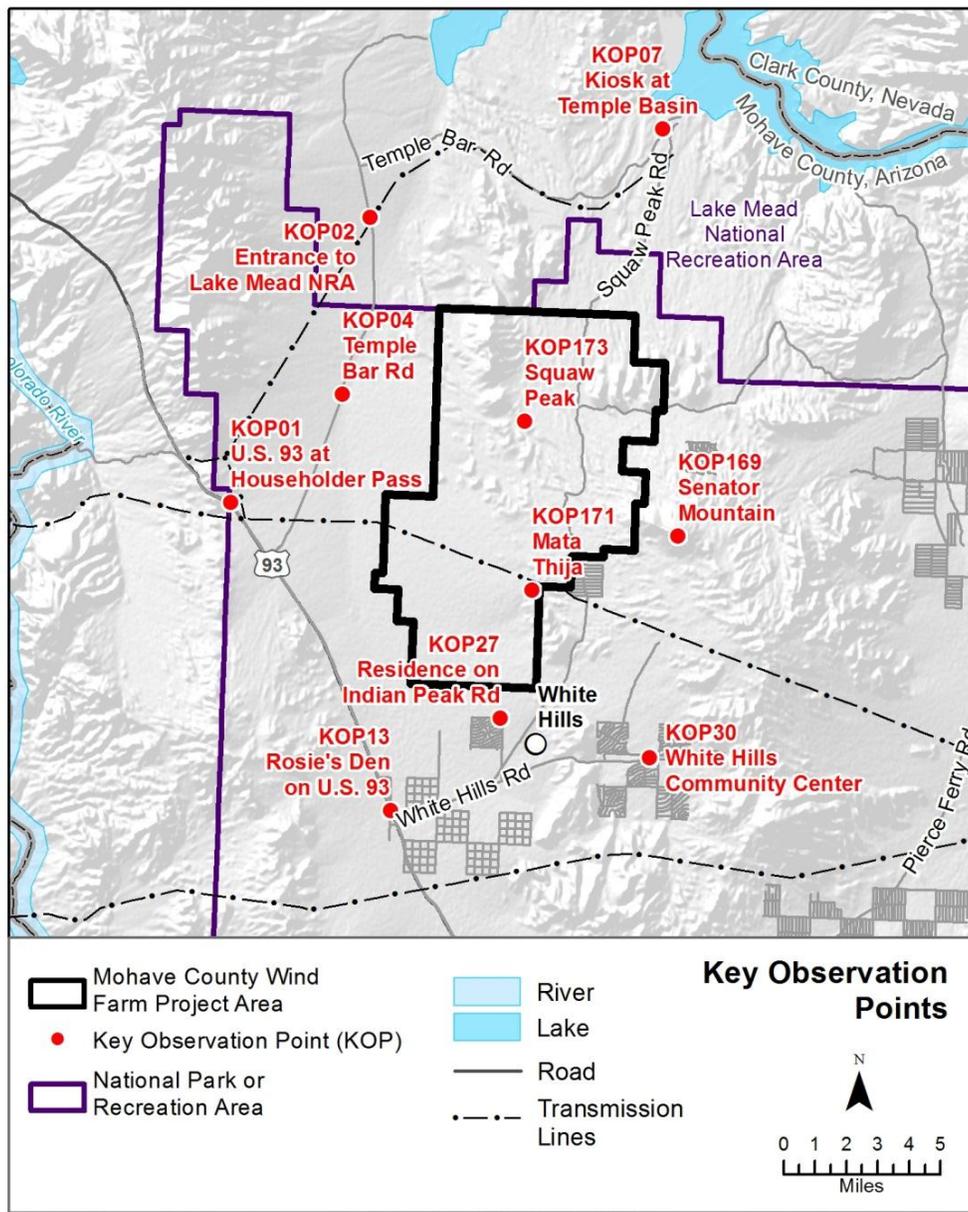


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Range of Viewing Conditions and Photographic Details

KOP	Simulation Photographs	Date	Time (mst)	Distance (miles)			Direction	Lighting Conditions	Solar Azimuth	Longitude	Latitude	Elevation (m)	Camera	Focal Length (mm)	35mm Equivalent
				A	B	C									
1	U.S. 93 at Householder Pass	11/23/09	9:27 AM	5.4	5.4	5.4	East	Back	135.81	35°50'40.20"W	114°34'28.44"W	684.6	Canon Rebel EOS XT	32	50
2	Entrance station to Lake Mead NRA	11/23/09	11:08 AM	3.9	x	x	South	Back	159.07	35°58'42.52"N	114°30'4.77"W	514.3	Canon Rebel EOS XT	32	50
2	Entrance station to Lake Mead NRA (Revised Images)	09/07/11	2:40 PM	3.9	7.0	6.7	South	Side	230.84	35°58'42.47"N	114°30'4.80"W	514.3	Nikon D700	50	50
2	Entrance station to Lake Mead NRA (Revised Images)	09/06/11	8:56 PM	3.9	x	x	South	Night	dark	35°58'42.47"N	114°30'4.80"W	514.3	Nikon D700	50	50
4	Temple Bar Road	11/23/09	12:17 PM	3.3	3.8	3.3	East	Side	177.86	35°53'46.96"N	114°30'48.56"W	563.2	Canon Rebel EOS XT	32	50
7	Kiosk in Temple Basin	11/23/09	1:20 PM	6.5	x	6.5	South	Back	195.51	36°1'27.02"N	114°20'12.53"W	447.8	Canon Rebel EOS XT	32	50
13	Rosie's Den on U.S. 93	11/23/09	4:04 PM	4.3	x	5.0	Northeast	Front	231.97	35°42'18.03"N	114°28'40.28"W	740.9	Canon Rebel EOS XT	32	50
13	Rosie's Den on U.S. 93 (Revised Images)	09/07/11	9:59 AM	4.3	x	5.0	Northeast	Back	124.48	35°42'18.03"N	114°28'40.28"W	740.9	Nikon D700	50	50
13	Rosie's Den on U.S. 93 (Revised Images Gray Turbines)	09/07/11	9:59 AM	4.3	x	x	Northeast	Back	124.48	35°42'18.12"N	114°28'40.16"W	740.9	Nikon D700	50	50
13	Rosie's Den on U.S. 93 (Revised Images)	09/06/11	9:30 PM	4.3	x	x	Northeast	night	124.48	35°42'18.12"N	114°28'40.16"W	740.9	Nikon D700	50	50
27	11025 Indian Peak Road	11/24/09	4:20 PM	1.2	x	1.9	North	Side	234.56	35°44'58.04"N	114°25'2.87"W	835.0	Canon Rebel EOS XT	32	50
27	11025 Indian Peak Road (Revised Images)	09/07/11	10:41 AM	1.2	x	1.9	North	Front	131.67	35°44'58.02"N	114°25'2.20"W	835.0	Nikon D700	50	50
27	11025 Indian Peak Road (Revised Images)	09/06/11	10:08 PM	1.2	x	x	North	Night	dark	35°44'58.02"N	114°25'2.20"W	835.0	Nikon D700	50	50
30	White Hills Community Center	04/16/10	4:09 PM	4.6	x	5.3	Northwest	Side / Back	255.71	35°43'53.91"N	114°19'58.51"W	1095.4	Canon Rebel EOS XT	32	50
169	Senator Mountain	04/15/10	10:09 AM	1.7	x	x	West	Front	118.37	35°50'10.90"N	114°19'14.14"W	1512.3	Canon Rebel EOS XT	32	50
171	Mata Thija	04/15/10	11:48 AM	0.9	x	x	Northwest	Front	153.43	35°48'32.85"N	114°24'8.24"W	933.5	Canon Rebel EOS XT	32	50
173	Squaw Peak	04/15/10	4:04 PM	0.2	x	x	Northwest	Side	254.23	35°53'13.35"N	114°24'34.05"W	832.3	Canon Rebel EOS XT	32	50
ID	Representative Photographs of Existing Turbines near Kingman, Arizona	Date	Time (mst)	Distance (Miles)			Direction	Lighting Conditions	Solar Azimuth	Longitude	Latitude	Elevation (m)	Camera	Focal Length (mm)	35mm equivalent
1	Representative photograph (Similar to KOP's 1, 30)	09/08/11	11:50 AM	4.9			Northeast	Front	158.52	35°9'39.71"N	114°4'31.51"W	936	Nikon D700	50	50
2	Representative photograph (Similar to KOP 2)	09/08/11	9:28 AM	3.1			Southwest	side	113.5	35°9'39.71"N	114°4'31.51"W	936	Nikon D700	50	50
3	Representative photograph (Similar to KOP's 4, 13)	09/07/11	4:54 PM	4.7			Northeast	side/ front	260.03	35°8'29.29"N	114°3'7.49"W	1089	Nikon D700	50	50
4	Representative photograph (Similar to KOP's 7)	09/08/11	11:44 AM	7			Northeast	side	155.83	35°9'58.03"N	114°3'42.97"W	964	Nikon D700	50	50
5	Representative photograph (Similar to KOP's 27, 169)	09/08/11	10:48 AM	1.1			Northeast	back	134.28	35°10'18.23"N	114°3'32.93"W	974	Nikon D700	50	50
6	Representative photograph (Similar to KOP's 27, 169)	09/08/11	9:37 AM	1.6			South	side	115.38	35°7'58.05"N	114°5'12.63"W	919	Nikon D700	50	50
7	Representative photograph (Similar to KOP's 27, 169)	09/07/11	7:28 PM	0.9			Southeast	night	282.15	35°7'43.55"N	114°6'12.34"W	873	Nikon D700	50	50
8	Representative photograph (Similar to KOP's 27, 169)	09/08/11	11:15 AM	1.7			Northeast	side	143.86	35°11'17.04"N	114°2'15.73"W	1054	Nikon D700	50	50
9	Representative photograph (Similar to KOP 173)	09/07/11	5:05 PM	0.9			Southeast	side	261.74	35°5'49.55"N	114°7'5.51"W	812	Nikon D700	50	50
10	Representative photograph at 8 Miles	09/07/11	11:50 AM	8.1			Northeast	Front/Side	158.02	35°5'39.84"N	114°7'7.23"W	812	Nikon D700	50	50
11	Representative photograph at 9 Miles	09/08/11	11:15 AM	8.9			Northeast	Front	143.62	35°3'39.13"N	114°7'27.79"W	778	Nikon D700	50	50
12	Representative photograph (Similar to KOP's 27, 169)	09/08/11	11:44 AM	0.9			Northeast	Front/Side	155.63	35°2'41.11"N	114°7'40.58"W	763	Nikon D700	50	50
13	Representative photograph at 2.5 Miles	09/08/11	9:37 AM	2.5			South	Side	115.27	35°2'2.60"N	114°8'1.35"W	740	Nikon D700	50	50

Simulation Methodology

The simulation process can be broken down into five main steps: data collection, modeling, camera viewpoint alignment, rendering, and compositing.

Field data collection is a key component to the simulation process. To ensure a high degree of visual accuracy in the simulations, global positioning systems equipment (GPS) was used to record the date, time, and location of each photograph. The degree of accuracy of the GPS location data is to within 3.3 feet (approximately 1 meter). Digital photographs were taken from KOPs with views toward the location of the proposed facilities. A 10 megapixel camera with a 50 millimeter lens was used consistently for all photographs. Overlapping photographs were taken and then electronically converted into one panoramic view for each KOP.

In addition to the field data collection, information was collected regarding the proposed structures' size, location, height, and color. This information was then used to create a real-world scaled, computer-generated model of the proposed facilities in Autodesk AutoCAD version 2010 and Civil 3D version 2010 computer-aided design (CAD) software. The model was then imported into Autodesk 3ds Max Design version 2010 software where color and texture information were added to resemble the materials that are planned to be used.

To generate a correct view relative to the actual photograph, the electronic camera was placed in the digital environment at a location corresponding to the real-world location provided by GPS records collected during the field visits. The electronic camera lens is set to match the camera lens focal length that was actually used in the field. This allows for viewing of the computer-generated model in the same way that the facilities would be viewed in the field. Each camera was then adjusted to match the photograph taken. Information such as time, date, and aperture were imported from the metadata information the digital camera embeds into each image. These settings allow the digital environment settings for sun angle to be modeled accurately to correctly match the light and shadows on the photographs.

The model of the proposed facilities, the camera and the lighting information was then used in a process called rendering to generate a two-dimensional image of the proposed facility representing the view from each of the KOPs.

The rendered image was then composited with the existing photograph. No additional filters that represent atmospheric conditions (such as blur, focus, haze) were applied to the simulations. Foreground objects were verified at this point; foreground objects are any existing objects such as landscape or buildings that would screen the viewer from seeing the proposed facilities. Areas of the rendering that are blocked, or screened by foreground objects were then masked so they cannot be seen in the final simulation.

The resulting photographic simulations show the white turbines with various shades of white and gray. The color variation was automatically created by the software, and replicates the real life appearance of existing white turbines. The appearance of the proposed project under different seasons or different time of day was simulated for select KOPs, and used to demonstrate the appearance of turbines under varying lighting conditions (front lit, side lit, or back lit). Additional simulations were created for KOPs 2 and 169 to show the differences between the ground disturbance for belowground connector lines during the construction phase and the aboveground collector lines and towers during the operation phase. These simulations label the operation phase internal Project roads that include both the collector line and the turbine line corridors, and also label the narrowest and widest collector line construction ROW. KOPs 2 and 169 were selected because the locations of these two KOPs best show the potential differences in

visual impact from the north-south collector line routes from both the east and west sides of the Wind Farm Site.

Contrast Rating Forms and KOP Descriptions

The contrast rating forms are arranged in numerical order by KOP and are located after the photographic simulations in this appendix. Sections C and D of the forms refer to the contrasts as represented in the simulations.

The following table is a detailed description of the existing visual conditions from each KOP, arranged by common and/or sensitive views from five general areas.

Existing Visual Conditions

Key Observation Point Location	KOP Description	Distance from Wind Farm Site Boundary (approx.)
Temple Bar Road (Outside the Lake Mead NRA)		
Temple Bar Road KOP 4	KOP 4 represents views of recreational motorists traveling northeast on Temple Bar Road approximately 11.3 miles from Alkali Cove at Lake Mead. KOP 4 would also represent direct views of the Reclamation land. The open panoramic views across the Detrital Valley toward Squaw Peak in the background distance zone exhibit moderate levels of variation in form, line, color, and texture. There are scattered manmade features in the view, not including the roadway, which are not easily identified from this distance. Views of some distinct landscape features as well as diversely colored vegetation are of moderate scenic quality due to the overall naturalness of the view.	3 miles to all three alternatives
Lake Mead NRA		
Entrance station to Lake Mead NRA KOP 2	KOP 2 represents views of recreationists from the entrance station approximately 3 miles into the Lake Mead NRA on Temple Bar Road looking south. KOP 2 would also represent direct views of the Reclamation land within the Project. From this low elevation vantage point, there are open panoramic and focal views across the valley formed by Detrital Wash toward Senator Mountain and the White Hills in the background. There are few manmade features in the view with the exception of the roadway and a small power line in the immediate foreground of the view. Open panoramic and focal views of rolling hills, dramatic mountainous terrain and silhouettes, and the broad, sweeping valley terrain offer moderate to high scenic quality due to the lack of disturbance and variation of form, line, color, and texture of the natural landscape elements when compared to the surrounding region.	3 miles to the closest alternative (A)
Kiosk at Temple Basin KOP 7	KOP 7 represents recreational views at the kiosk on Temple Bar Road approximately 0.5 mile west from the campgrounds at Temple Bar on Lake Mead. The open panoramic and low elevation views toward Golden Rule Peak and Senator Mountain in the background exhibit moderate levels of variation in form, line, color, and texture. There are few apparent manmade features in the view, not including the roadway and kiosk, and the mottled vegetation creates a uniformity of foliage. Views of some distinct landscape features as well as uniform, undulating vegetation are of moderate scenic quality.	8 miles to all three alternatives

Key Observation Point Location	KOP Description	Distance from Wind Farm Site Boundary (approx.)
Traditional Cultural Areas of the Hualapai Tribe		
Senator Mountain KOP 169	KOP 169 represents viewers on Senator Mountain, an area of cultural importance to the Hualapai Tribe, looking west towards the dramatic terrain surrounding Mount Wilson, Squaw Peak, Pilot Knob, and the Black Mountains. The open panoramic views of the Detrital Valley and surrounding mountains exhibit few discernable man-made features and high levels of variation in form, line, color, and texture. A high elevation view of the undulating and angular landscape features and rugged mountain silhouettes is of high scenic quality.	1.5 miles from the closest alternatives (A and B)
Mata Thija KOP 171	KOP 171 represents viewers at Mata Thija, an area of cultural importance to the Hualapai Tribe, looking north towards the dramatic terrain surrounding Mount Wilson, Squaw Peak, Pilot Knob, and the Black Mountains. The open panoramic views of the Detrital Valley and surrounding mountains exhibit few discernable man-made features and high levels of variation in form, line, color, and texture. The man-made features that are apparent in the view include the two parallel high-voltage transmission lines that cross the foreground of the view. A view of the undulating and angular landscape features, crossed by the transmission lines in the foreground to middleground, and the rugged mountain silhouettes is of moderate scenic quality.	Inside (Alternative A) or at boundary (Alternatives B and C)
Squaw Peak KOP 173	KOP 173 represents recreational and tribal viewers adjacent to Squaw Peak, an area of cultural importance to the Hualapai Tribe, looking north towards the dramatic terrain surrounding Squaw Peak. The focal views of the peak and surrounding hills and mountains exhibit few discernable man-made features and high levels of variation in form, line, color, and texture. The man-made features that are apparent in the view include the meteorological tower in the foreground of the view. A view of the undulating and angular landscape features, with the meteorological tower in the foreground, and the rugged mountain silhouettes is of moderate to high scenic quality.	Inside (Alternative A) or at boundary (Alternatives B and C)
US 93		
US 93 at Householder Pass KOP 1	KOP 1 represents views of motorists traveling south on US 93 toward Dolan Springs. This portion of US 93 is considered a scenic route in the Mohave County General Plan. KOP 1 would also represent direct views of the Reclamation land within the Wind Farm Site. From this high elevation vantage point, there are open panoramic and focal views across the valley formed by Detrital Wash toward Senator Mountain in the background. There are numerous manmade features in the view including the highway, two parallel high-voltage transmission lines, and a fence in the immediate foreground of the view. Although the transmission lines are incongruent with the surrounding landscape elements they do not compete with more natural-appearing features for attention due to the overall scale of the built elements within the overall view. Open panoramic and focal views of rolling hills, mountainous terrain, and the broad, sweeping valley terrain offer low to moderate scenic quality due to the visible level of manmade disturbance in the view and the natural landscape elements that are common in the region.	3 miles to all three alternatives

Key Observation Point Location	KOP Description	Distance from Wind Farm Site Boundary (approx.)
US 93 at Rosie's Den KOP 13	KOP 13 represents views of motorists and recreationists at Rosie's Den on US 93, approximately 11 miles south of KOP 1 on US 93 at Householder Pass, looking east toward the White Hills area. KOP 13 would also represent direct views of both the Reclamation land as well as BLM lands within the Wind Farm Site. The open panoramic views toward the White Hills community exhibit rural residential features and moderate levels of variation in form, line, color, and texture. There are few apparent manmade features in the view, other than the roadway in the foreground. The mottled yet relatively uniform vegetation creates a congruent overall landscape character. Views of some distinct landscape features as well as uniform, undulating vegetation are of moderate scenic quality.	4 miles to the closest alternative (A)
White Hills Area		
Residence on Indian Peak Road KOP 27	KOP 27 represents residents of the White Hills community on Indian Peak Road looking north towards the dramatic terrain surrounding Squaw Peak and the foothills of the White Hills. The open, panoramic views of the mountains exhibit some rural residential features and moderate levels of variation in form, line, color, and texture. There are few manmade features in the view, which are not apparent due to the tall, dense vegetation (Joshua trees), which creates a congruent overall landscape character. Views of undulating and angular landscape features as well as the tall, mottled vegetation are of moderate scenic quality.	0.5 mile to the closest alternative (A)
White Hills Community Center KOP 30	KOP 30 represents residents and guests at the White Hills Community Center on Lunado Drive (approximately 4 miles east of the KOP 27, the residence on Indian Peak Road), looking north towards the dramatic terrain surrounding Senator Peak, Squaw Peak, and Mount Wilson. The partially screened, focal views of the mountains exhibit little rural residential features and moderate to high levels of variation in form, line, color, and texture. There are few manmade features adjacent to the view, which are not apparent, creating a congruent overall landscape character. A view of undulating and angular landscape features and silhouettes as well as the tall, mottled vegetation is of moderate to high scenic quality.	4 miles from the closest alternative (A)