

Station to Distribution Circuit Mapping

This report prepared by:



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Station to Distribution Circuit Mapping

There is enough information in the data provided to accomplish multiple analyses:

- 1) Determine the appropriate stations to represent circuit level winds.
- 2) Ascertain WRF's accuracy at each station location using the following statistics:
 - 1) Bias: Average difference between WRF and station observed winds.
 - 2) MAE: Mean Absolute Error.
 - 3) RMSE: Root Mean Square Error.
 - 4) Correlation: If WRF is well correlated, you can use forecasted trends to supplement real-time monitoring.
- 3) We have provided a list of circuits with no representative stations.

Procedures Used to Generate Data

Examined the closest 10 SCE stations and RAWS to each circuit. Stations **NOT** included in the report include the following:

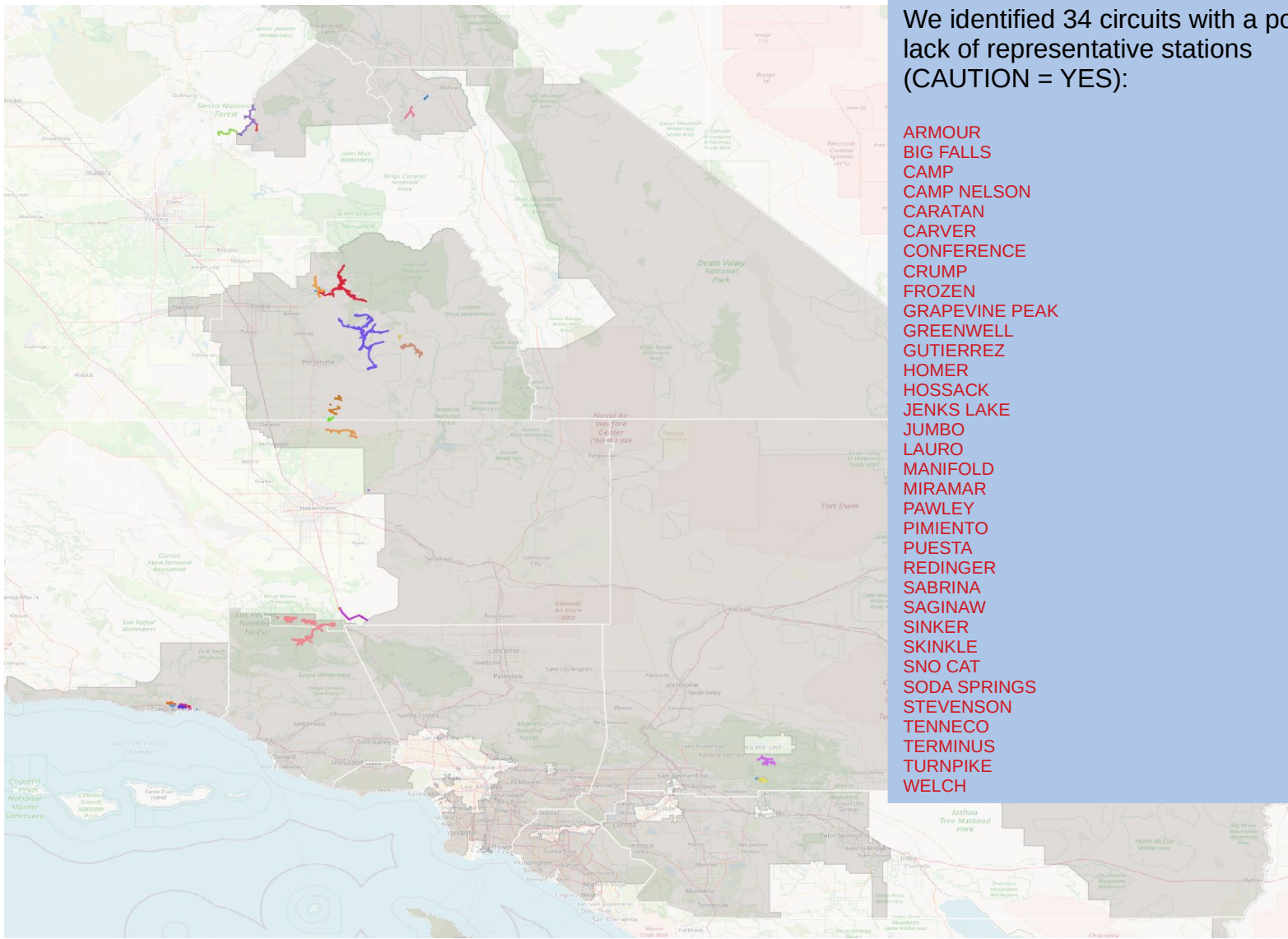
- 1) Stations more than 10 miles from the circuit.
- 2) Stations that did not report observations within the past month (Beyond October 30, 2020 at 00Z).
- 3) Stations with less than 1 month of data.

For each station, we calculated the following:

- Wind speed and gust correlation between the station's closest WRF grid cell and circuit level WRF data:
 - Answers the question: From a modeling perspective, can this grid cell approximate circuit level winds?
 - See station_to_circuit_complete_data file with columns: station_circuit_wind_corr and station_circuit_gust_corr.
- Wind speed and gust correlation between the station's closest WRF grid cell and observations.
 - Answers the questions:
 - Does WRF validate well at the station? Is there a station siting issue?
 - See station_to_circuit_complete_data file with columns: wrf_obs_wind_corr and wrf_obs_gust_corr.
- Bias, MAE, RMSE, mean correlation (Mean of 4 correlations discussed above).
- Minimum of 4 correlation statistics:
 - Answers the question: Does this station meet the standards to represent circuit level winds? Can be due to station siting issues or WRF issues.
 - If < 0.50 → **Caution = YES (Of all stations within 10 miles, this station was found to best approximate circuit level winds. However, confidence is low: WRF validation problem, or stations are not representative of circuit level winds!)**
 - If ≥ 0.50 → **Caution = NO (Of all stations within 10 miles, this station was found to best approximate circuit level winds using the criteria and methods in this study.)**

**Statistics calculated from 3 hourly maximums. Both WRF and observations must report within the 3 hour period.

**Done using latest Distribution circuit shapefiles valid: November 2020.



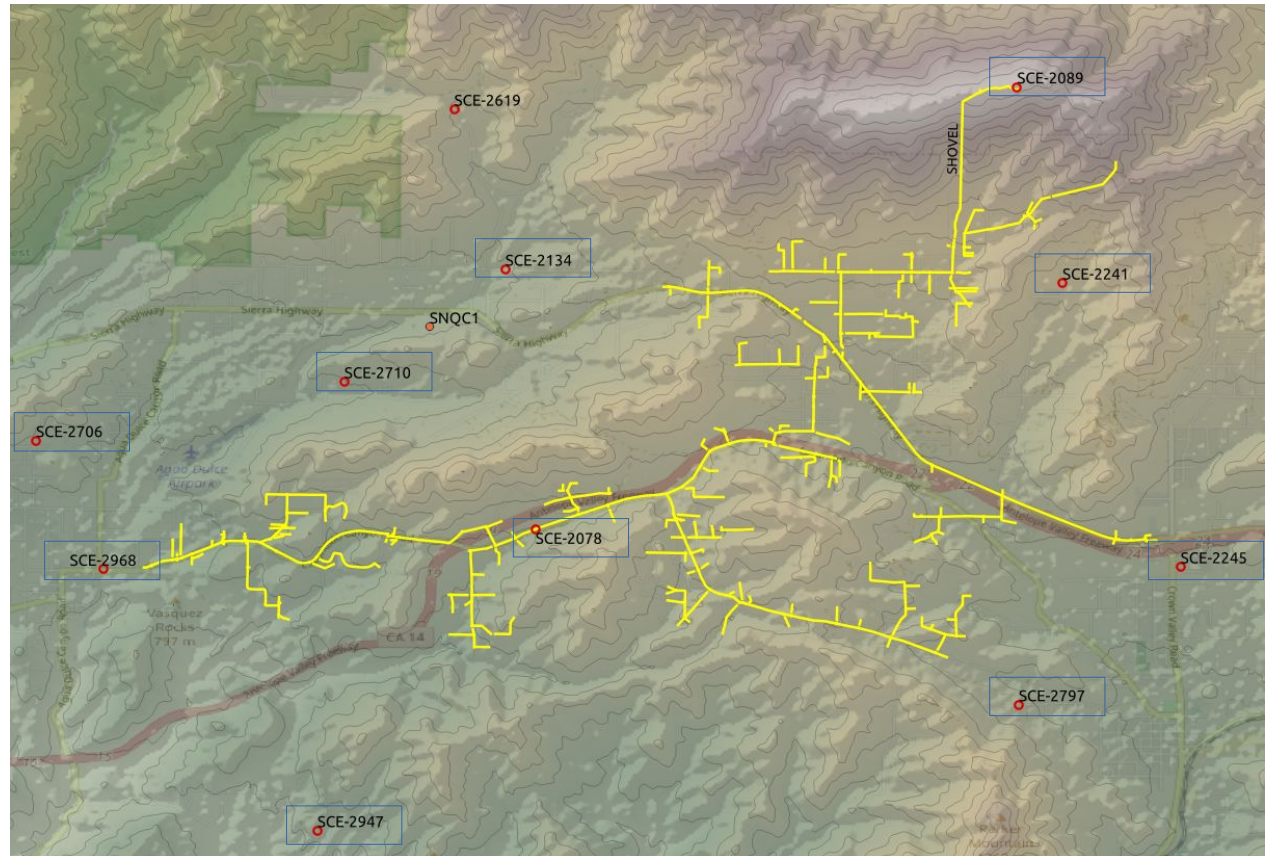
We identified 34 circuits with a possible lack of representative stations (CAUTION = YES):

- ARMOUR
- BIG FALLS
- CAMP
- CAMP NELSON
- CARATAN
- CARVER
- CONFERENCE
- CRUMP
- FROZEN
- GRAPEVINE PEAK
- GREENWELL
- GUTIERREZ
- HOMER
- HOSSACK
- JENKS LAKE
- JUMBO
- LAURO
- MANIFOLD
- MIRAMAR
- PAWLEY
- PIMIENTO
- PUESTA
- REDINGER
- SABRINA
- SAGINAW
- SINKER
- SKINKLE
- SNO CAT
- SODA SPRINGS
- STEVENSON
- TENNECO
- TERMINUS
- TURNPIKE
- WELCH

Example #1: SHOVEL

Examined the closest 10 stations to SHOVEL:

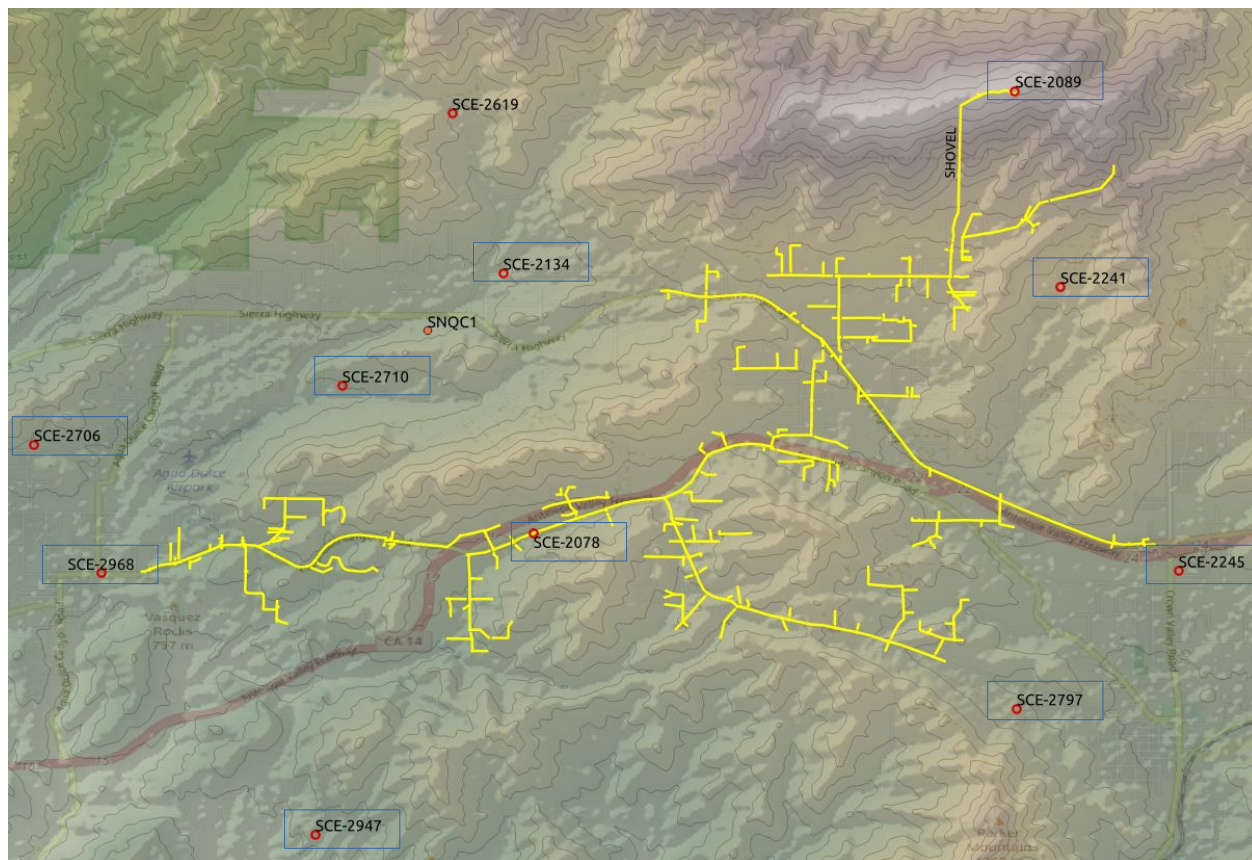
SCE-2241
SCE-2078
SCE-2797
SCE-2245
SCE-2710
SCE-2968
SCE-2089
SCE-2134
SCE-2947
SCE-2706



**Proximity determined using station closest WRF grid cell and WRF grid cell circuit mask.

1	circuit_name	strid	stnname	distance (mi)	station_circuit_wind_corr	station_circuit_gust_corr	sample_size	wrf_obs_wind_corr	wrf_obs_gust_corr	wrf_obs_wind_p_value	wrf_obs_gust_p_value	wind_bias	gust_bias	wind_MAE	gust_MAE	wind_RMSE	gust_RMSE	mean_corr	min_corr	caution
8498	SHOVEL	SCE-2241	SCE Red Rover Mine	0.5	0.92	0.91	4607	0.73	0.81	0	0	3.06	1.65	3.54	3.85	4.29	5.04	0.84	0.73	No
8499	SHOVEL	SCE-2078	SCE Antelope Valley Fwy	0.12	0.8	0.8	6287	0.8	0.84	0	0	0.34	-0.93	2.07	3.48	2.79	4.61	0.81	0.8	No
8500	SHOVEL	SCE-2797	SCE Sacramento Ave	0.7	0.74	0.74	1308	0.84	0.89	0	0	-0.66	-1.88	2.22	3.18	2.82	4.14	0.8	0.74	No
8501	SHOVEL	SCE-2245	SCE Acton	0.57	0.79	0.79	4605	0.77	0.82	0	0	-0.54	-1.07	2.29	3.43	2.94	4.56	0.79	0.77	No
8502	SHOVEL	SCE-2710	SCE Country Breeze Ln	1.24	0.78	0.78	1494	0.75	0.84	0	0	0.06	-1.1	1.9	3.13	2.55	4.12	0.79	0.75	No
8503	SHOVEL	SCE-2968	SCE Agua Dulce Canyon Rd	0.65	0.72	0.72	327	0.8	0.87	0	0	0.9	-0.23	2.06	2.7	2.56	3.66	0.78	0.72	No
8504	SHOVEL	SCE-2089	SCE Sierra Pelona	0.61	0.9	0.9	6287	0.58	0.69	0	0	-4.28	-5.04	5.5	6.87	7.15	8.6	0.77	0.58	No
8505	SHOVEL	SCE-2134	SCE Lettau Canyon	1.63	0.8	0.8	3186	0.71	0.79	0	0	1.52	0.79	3.01	4.56	4.35	6.35	0.77	0.71	No
8506	SHOVEL	SCE-2947	SCE Mesa Grande Rd	1.27	0.7	0.7	326	0.77	0.87	0	0	-1.91	-2.96	3.45	4.3	4.27	5.48	0.76	0.7	No
8507	SHOVEL	SCE-2706	SCE Lewis Hill Dr	1.25	0.71	0.71	1494	0.71	0.85	0	0	0.14	-0.81	2.01	2.88	2.75	3.84	0.74	0.71	No

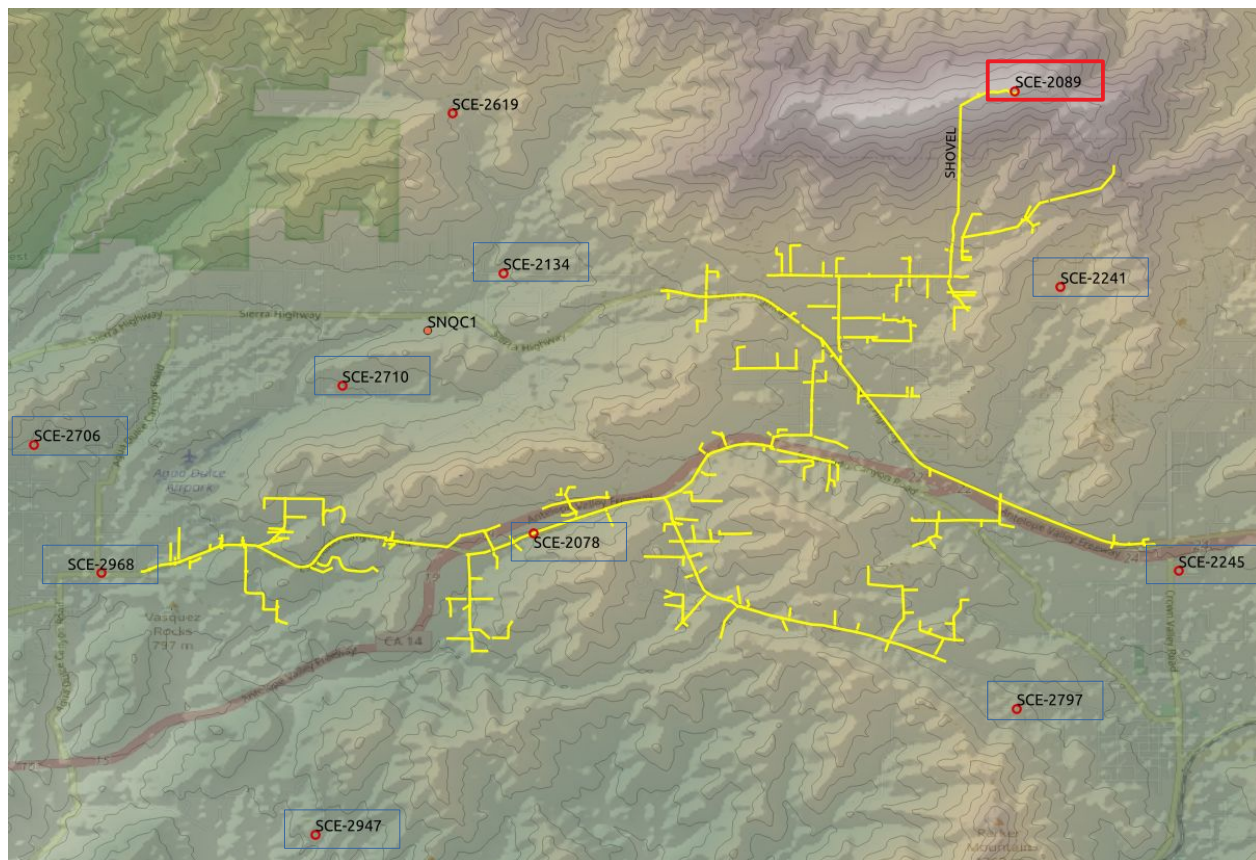
Closest stations to SHOVEL sorted in descending order by mean correlation. See file: station_to_circuit_complete_data



1	circuit_name	stnid	stnname	distance (mi)	station_circuit_wind_corr	station_circuit_gust_corr	sample_size	wrf_obs_wind_corr	wrf_obs_gust_corr	wrf_obs_wind_p_value	wrf_obs_gust_p_value	wind_bias	gust_bias	wind_MAE	gust_MAE	wind_RMSE	gust_RMSE	mean_corr	min_corr	caution
8498	SHOVEL	SCE-2241	SCE Red Rover Mine	0.5	0.92	0.91	4607	0.73	0.81	0	0	3.06	1.65	3.54	3.85	4.29	5.04	0.84	0.73	No
8499	SHOVEL	SCE-2078	SCE Antelope Valley Fwy	0.12	0.8	0.8	6287	0.8	0.84	0	0	0.34	-0.93	2.07	3.48	2.79	4.61	0.81	0.8	No
8500	SHOVEL	SCE-2797	SCE Sacramento Ave	0.7	0.74	0.74	1308	0.84	0.89	0	0	-0.66	-1.88	2.22	3.18	2.82	4.14	0.8	0.74	No
8501	SHOVEL	SCE-2245	SCE Acton	0.57	0.79	0.79	4605	0.77	0.82	0	0	-0.54	-1.07	2.29	3.43	2.94	4.56	0.79	0.77	No
8502	SHOVEL	SCE-2710	SCE Country Breeze Ln	1.24	0.78	0.78	1494	0.75	0.84	0	0	0.06	-1.1	1.9	3.13	2.55	4.12	0.79	0.75	No
8503	SHOVEL	SCE-2968	SCE Agua Dulce Canyon Rd	0.65	0.72	0.72	327	0.8	0.87	0	0	0.9	-0.23	2.06	2.7	2.56	3.66	0.78	0.72	No
8504	SHOVEL	SCE-2089	SCE Sierra Pelona	0.61	0.9	0.9	6287	0.58	0.69	0	0	-4.28	-5.04	5.5	6.87	7.15	8.6	0.77	0.58	No
8505	SHOVEL	SCE-2134	SCE Lettau Canyon	1.63	0.8	0.8	3186	0.71	0.79	0	0	1.52	0.79	3.01	4.56	4.35	6.35	0.77	0.71	No
8506	SHOVEL	SCE-2947	SCE Mesa Grande Rd	1.27	0.7	0.7	326	0.77	0.87	0	0	-1.91	-2.96	3.45	4.3	4.27	5.48	0.76	0.7	No
8507	SHOVEL	SCE-2706	SCE Lewis Hill Dr	1.25	0.71	0.71	1494	0.71	0.85	0	0	0.14	-0.81	2.01	2.88	2.75	3.84	0.74	0.71	No

Sierra Pelona is the worst among the 10 closest stations to represent SHOVEL circuit level winds:

- WRF does not validate well at that location:
- WRF is typically slower (-4.28MPH/-5.04MPH wind speed/gust bias) with the largest MAE and RMSE values.
- This is consistent with our previous reports regarding the WRF at the Sierra Pelona station.



Example #1: SHOVEL circuit

1784	SHOVEL	SCE-2241	SCE Red Rover Mine	0.73	0.81	3.06	1.65	No
1785	SHOVEL	SCE-2078	SCE Antelope Valley Fwy	0.8	0.84	0.34	-0.93	No

SHOVEL top 2 closest stations sorted in descending order. See file: recommended_stations_for_distribution_hfa

The 2 top ranked stations for the SHOVEL circuit are:

SCE-2241: The closest WRF gridcell statistics:

Wind speed correlation: 0.73

Wind gust correlation: 0.81

Wind speed bias: 3.06 MPH

Wind gust bias: 1.65 MPH

Caution: **No (This station can be used to approximate circuit conditions).**

SCE-2078: The closest WRF grid cell statistics:

Wind speed correlation: 0.80

Wind gust correlation: 0.84

Wind speed bias: 0.34 MPH

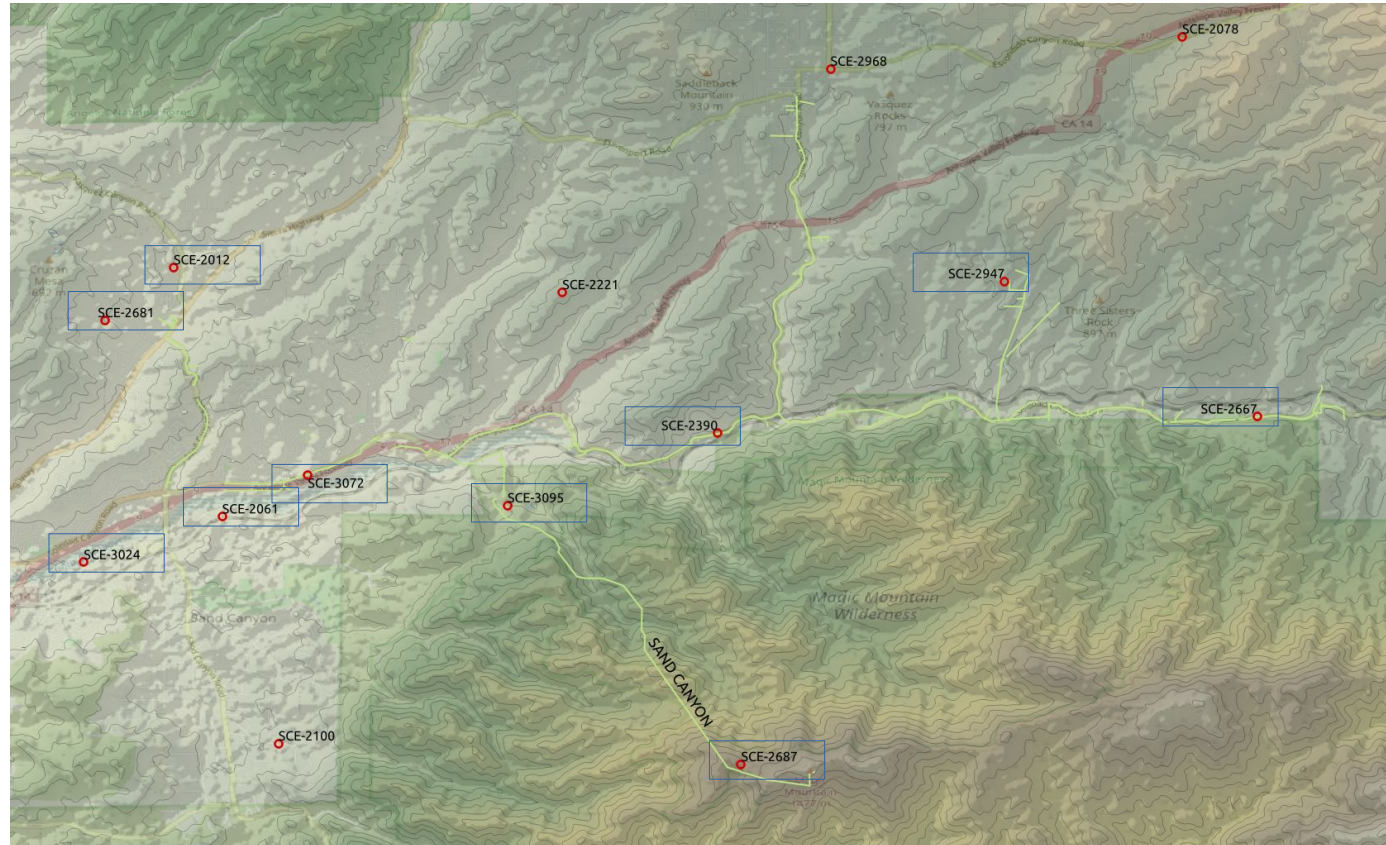
Wind gust bias: -0.93 MPH

Caution: **No (This station can be used to approximate circuit conditions).**

Example #2: SAND CANYON

Examined the closest 10 stations to SAND CANYON:

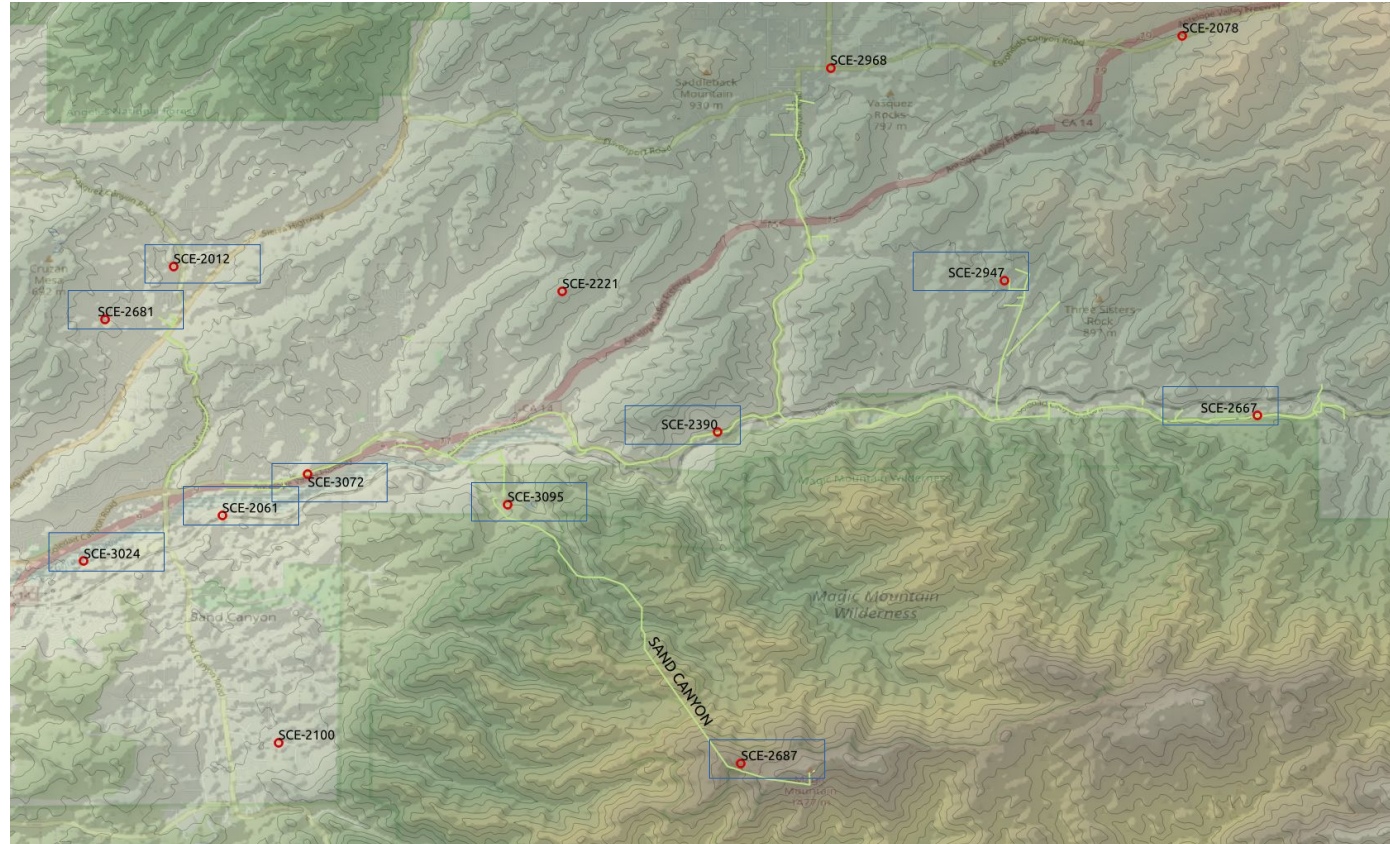
SCE-2390
SCE-3095
SCE-2687
SCE-2012
SCE-2947
SCE-2061
SCE-2681
SCE-3024
SCE-2667
SCE-3072



**Proximity determined using station closest WRF grid cell and WRF grid cell circuit mask.

1	circuit_name	stnid	stnname	distance (mi)	station_circuit_wind_corr	station_circuit_gust_corr	sample_size	wrf_obs_wind_corr	wrf_obs_gust_corr	wrf_obs_wind_p_value	wrf_obs_gust_p_value	wind_bias	gust_bias	wind_MAE	gust_MAE	wind_RMSE	gust_RMSE	mean_corr	min_corr	caution
8128	SAND CANYON	SCE-2390	SCE Soledad Canyon Rd	0.36	0.93	0.89	4210	0.79	0.82	0	0	-0.97	-2.55	2.16	4	2.7	4.95	0.86	0.79	No
8129	SAND CANYON	SCE-3095	SCE Magic Mountain	0.57	0.94	0.92	279	0.73	0.82	0	0	-1.54	-4.41	3.3	5.82	3.93	6.84	0.85	0.73	No
8130	SAND CANYON	SCE-2687	SCE Magic Mtn Truck Trail	0.09	0.87	0.93	1518	0.74	0.81	0	0	-9.02	-9.06	9.11	9.32	10.74	10.88	0.84	0.74	No
8131	SAND CANYON	SCE-2012	SCE Vasquez Canyon Rd	0.23	0.9	0.87	7237	0.73	0.81	0	0	0.85	-0.49	2.2	3.28	2.98	4.38	0.83	0.73	No
8132	SAND CANYON	SCE-2947	SCE Mesa Grande Rd	0.32	0.86	0.83	326	0.77	0.87	0	0	-1.91	-2.96	3.45	4.3	4.27	5.48	0.83	0.77	No
8133	SAND CANYON	SCE-2061	SCE Oak Spring Canyon	0.6	0.93	0.89	6718	0.72	0.76	0	0	-0.88	-1.45	2.35	4.56	3.01	5.88	0.82	0.72	No
8134	SAND CANYON	SCE-2681	SCE Arline St	0.58	0.9	0.87	1534	0.71	0.8	0	0	0.89	-0.28	1.89	2.87	2.53	3.87	0.82	0.71	No
8135	SAND CANYON	SCE-3024	SCE Jakes Way	0.66	0.89	0.86	846	0.72	0.8	0	0	-1.13	-1.91	2.33	3.6	2.93	4.56	0.82	0.72	No
8136	SAND CANYON	SCE-2667	SCE Soledad Canyon Ranch	0.56	0.84	0.79	1519	0.7	0.86	0	0	-0.84	-0.88	2.04	2.58	2.47	3.37	0.8	0.7	No
8137	SAND CANYON	SCE-3072	SCE MAC Hill	0.5	0.93	0.89	454	0.55	0.64	0	0	-0.97	-1.85	2.77	5.53	3.61	7.08	0.75	0.55	No

Closest stations to SAND CANYON sorted in descending order by mean correlation. See file: station_to_circuit_complete_data

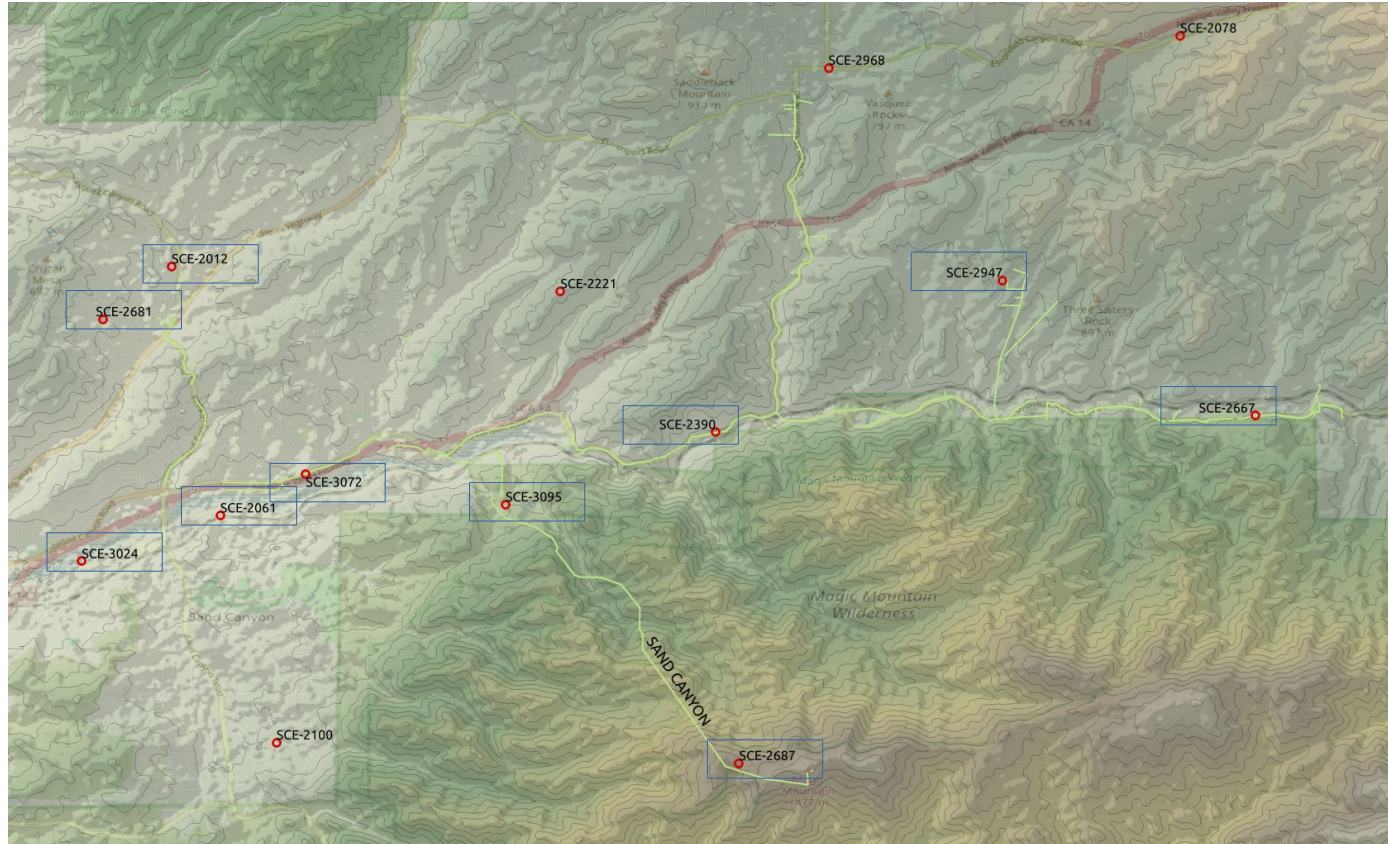


1	circuit_name	stnid	stnname	distance (mi)	station_circuit_wind_corr	station_circuit_gust_corr	sample_size	wrf_obs_wind_corr	wrf_obs_gust_corr	wrf_obs_wind_p_value	wrf_obs_gust_p_value	wind_bias	gust_bias	wind_MAE	gust_MAE	wind_RMSE	gust_RMSE	mean_corr	min_corr	caution
8128	SAND CANYON	SCE-2390	SCE Soledad Canyon Rd	0.36	0.93	0.89	4210	0.79	0.82	0	0	-0.97	-2.55	2.16	4	2.7	4.95	0.86	0.79	No
8129	SAND CANYON	SCE-3095	SCE Magic Mountain	0.57	0.94	0.92	279	0.73	0.82	0	0	-1.54	-4.41	3.3	5.82	3.93	6.84	0.85	0.73	No
8130	SAND CANYON	SCE-2687	SCE Magic Mtn Truck Trail	0.09	0.87	0.93	1518	0.74	0.81	0	0	-9.02	-9.06	9.11	9.32	10.74	10.88	0.84	0.74	No
8131	SAND CANYON	SCE-2012	SCE Vasquez Canyon Rd	0.23	0.9	0.87	7237	0.73	0.81	0	0	0.85	-0.49	2.2	3.28	2.98	4.38	0.83	0.73	No
8132	SAND CANYON	SCE-2947	SCE Mesa Grande Rd	0.32	0.86	0.83	326	0.77	0.87	0	0	-1.91	-2.96	3.45	4.3	4.27	5.48	0.83	0.77	No
8133	SAND CANYON	SCE-2061	SCE Oak Spring Canyon	0.6	0.93	0.89	6718	0.72	0.76	0	0	-0.88	-1.45	2.35	4.56	3.01	5.88	0.82	0.72	No
8134	SAND CANYON	SCE-2681	SCE Arline St	0.58	0.9	0.87	1534	0.71	0.8	0	0	0.89	-0.28	1.89	2.87	2.53	3.87	0.82	0.71	No
8135	SAND CANYON	SCE-3024	SCE Jakes Way	0.66	0.89	0.86	846	0.72	0.8	0	0	-1.13	-1.91	2.33	3.6	2.93	4.56	0.82	0.72	No
8136	SAND CANYON	SCE-2667	SCE Soledad Canyon Ranch	0.56	0.84	0.79	1519	0.7	0.86	0	0	-0.84	-0.88	2.04	2.58	2.47	3.37	0.8	0.7	No
8137	SAND CANYON	SCE-3072	SCE MAC Hill	0.5	0.93	0.89	454	0.55	0.64	0	0	-0.97	-1.85	2.77	5.53	3.61	7.08	0.75	0.55	No

Closest stations to SAND CANYON sorted in descending order by mean correlation. See file: station_to_circuit_complete_data

Although correlated well, Magic Mtn Truck Trail has the worst WRF validation statistics among the 10 closest stations:

- WRF is typically slower (-9.02MPH/-9.06MPH wind speed/gust bias) with the largest MAE and RMSE values.
- This is consistent with our previous reports regarding the WRF at the Magic Mtn Truck Trail station.
- **Due to relatively high correlations, this station could be used assuming the bias is accounted for.**



Example #2: SAND CANYON

1706	SAND CANYON	SCE-2390	SCE Soledad Canyon Rd	0.79	0.82	-0.97	-2.55	No
1707	SAND CANYON	SCE-3095	SCE Magic Mountain	0.73	0.82	-1.54	-4.41	No

SAND CANYON top 2 closest stations sorted in descending order. See file: recommended_stations_for_distribution_hfa

The 2 top ranked stations for the SAND CANYON circuit are:

SCE-2390: The closest WRF gridcell statistics:

Wind speed correlation: 0.79

Wind gust correlation: 0.82

Wind speed bias: -0.97 MPH

Wind gust bias: -2.55 MPH

Caution: **No (This station can be used to approximate circuit conditions).**

SCE-3095: The closest WRF grid cell statistics:

Wind speed correlation: 0.73

Wind gust correlation: 0.82

Wind speed bias: -1.54 MPH

Wind gust bias: -4.41 MPH

Caution: **No (This station can be used to approximate circuit conditions).**