

CORRESPONDENCE/MEMORANDUM

DATE: June 15, 2017
TO: Permit and Compliance Staff
FROM: Stationary Source Modeling Team
SUBJECT: Processed Meteorological Data (2011-2015) for Use in AERMOD

On January 17, 2017, USEPA released a new version of the meteorological data processor, AERMET, to coincide with changes to the regulatory default options codified in the Guideline on Air Quality Models (Appendix W to 40CFR Part 51). This includes the use of minute-reported wind information, the lower bound threshold wind speed of 0.5 m/s, and the adjustment to the friction velocity (ADJ_U*). WDNR obtained raw meteorological data for the period 2011-2015 and developed processed data for use in the regulatory dispersion model, AERMOD.

Air permits public noticed after June 30, 2017, where dispersion modeling was performed, will use the 2011-2015 processed meteorological data. Permits already in public comment or waiting to be issued can be re-evaluated for modeling on a case-by-case basis.

To develop the surface and profile files, the most recent versions of the meteorological tools were used:

- AERMET version 16216
- AERMINUTE version 15272
- AERSURFACE version 13016

The table below lists the AERMOD-pertinent details of the 19 stations.

<i>USAF ID</i>	<i>WBAN ID</i>	<i>FAA ID</i>	<i>STATION NAME</i>	<i>Upper Air ID (WBAN #)</i>	<i>ELEV (m)</i>	<i>LAT (deg)</i>	<i>LON (deg)</i>
726419	94929	ASX	ASHLAND	MPX (94983)	250	46.55	-90.92
727456	4919	DYT	SKY HARBOR	MPX (94983)	186	46.72	-92.04
726463	14897	AUW	WAUSAU	GRB (14898)	366	44.93	-89.63
726508	94973	HYR	HAYWARD	MPX (94983)	369	46.03	-91.44
727415	04803	RHI	RHINELANDER	GRB (14898)	503	45.63	-89.48
726435	14991	EAU	EAU CLAIRE	MPX (94983)	269	44.87	-91.49
726574	94985	MFI	MARSHFIELD	GRB (14898)	382	44.64	-90.19
726452	04826	ISW	WISCONSIN RAPIDS	GRB (14898)	309	44.36	-89.84
726506	04840	FLD	FOND DU LAC	GRB (14898)	242	43.77	-88.49
726450	14898	GRB	GREEN BAY	GRB (14898)	208	44.48	-88.14
726456	94855	OSH	WITTMAN	GRB (14898)	246	43.97	-88.56
726410	14837	MSN	MADISON	GRB (14898)	262	43.14	-89.35
725470	94908	DBQ	DUBUQUE	DVN (94982)	317	42.40	-90.71
726438	94994	OVS	BOSCOBEL	DVN (94982)	203	43.16	-90.68
726416	14921	LNR	LONE ROCK	DVN (94982)	218	43.21	-90.19
726430	14920	LSE	LA CROSSE	MPX (94983)	198	43.88	-91.25
726400	14839	MKE	MILWAUKEE	GRB (14898)	203	42.95	-87.90
726505	04845	ENW	KENOSHA	GRB (14898)	223	42.60	-87.94
726425	04841	SBM	SHEBOYGAN	GRB (14898)	229	43.77	-87.85

The table below lists the missing and calm hours for 2011-2015. All stations satisfy the USEPA and WDNR requirements for number of available hours. The stations are grouped by similar climatology.

<i>FAA ID</i>	<i>STATION</i>	<i>Calm Hours</i>	<i>Missing Hours</i>	<i>Total</i>	<i>% Available</i>
ASX	ASHLAND	894	301	1195	97.27
DYT	SKY HARBOR	8375	780	9155	79.11
AUW	WAUSAU	577	453	1030	97.65
HYR	HAYWARD	1862	1099	2961	93.24
RHI	RHINELANDER	627	537	1164	97.34
EAU	EAU CLAIRE	592	348	940	97.86
MFI	MARSHFIELD	289	436	725	98.35
ISW	WISCONSIN RAPIDS	1136	570	1706	96.11
GRB	GREEN BAY	313	395	708	98.38
OSH	OSHKOSH	387	538	925	97.89
FLD	FON DU LAC	302	451	753	98.28
MSN	MADISON	585	384	969	97.79
DBQ	DUBUQUE	290	524	814	98.14
OVS	BOSCOBEL	2518	744	3262	92.56
LNR	LONE ROCK	676	584	1260	97.12
LSE	LA CROSSE	257	317	574	98.69
SBM	SHEBOYGAN	327	319	646	98.53
MKE	MILWAUKEE	246	275	521	98.81
ENW	KENOSHA	150	371	521	98.81

Specific AERSURFACE Adjustments

Since AERSURFACE v13016 uses the 1992 land cover data, 2010, 2013, and 2015 aerial photos for each meteorological data station were examined. Starting from the location of the anemometer, the 1992 NLCD was compared to the aerial photos; for thirteen stations the 1992 NLCD is still representative of land cover. For LNR and GRB, deciduous tree cover is shown on the 1992 NLCD, but the AERSURFACE derived surface roughness is comparable to FLD, where no tree cover is present in the 1992 NLCD. Due to the similarities between the sites, no adjustments were made to the AERSURFACE output for LNR or GRB.

The AERSURFACE output for ASX was manually adjusted to reflect the current aerial photos. A grove of trees is no longer present west-northwest of the anemometer, so the surface roughness in sector 10 ($270^{\circ} - 300^{\circ}$) in each season for all years was set to the same value as sector 9 ($240^{\circ} - 270^{\circ}$).

The AERSURFACE output for ENW was also manually adjusted to reflect the current aerial photos. A building is now present to the northwest of the anemometer, so the surface roughness in sector 11 ($300^{\circ} - 330^{\circ}$) in each season for all years was set to the same value as sector 5 ($120^{\circ} - 150^{\circ}$). In addition, as the building extended partially into neighboring sectors, the roughness in sectors 10 ($270^{\circ} - 300^{\circ}$) and 12 ($330^{\circ} - 360^{\circ}$) were changed based on a weighted average (75% AERSURFACE value, 25% adjusted sector 11 value).

Due to airport modernization, the entire HYR ASOS instrument package was moved during spring 2014. The equipment was moved 1.2 km north-northeast from a location near the southern extent of the airfield to a location near the northern end. The NWS office in Duluth, MN confirmed that the new location was operational on May 21, 2014. AERSURFACE was run for both locations, but the northern location was found to have much less tree cover than shown in the 1992 NLCD. It was found that by using a 'dummy' location (46.0242, -91.4467) and the default 1 km radius from the tower, that AERSURFACE derived roughness is consistent with 2014-2015 conditions. The surface parameters derived for either HYR location were used as appropriate (old location Jan 2011 - May 2014, new location June 2014 - end).

The 1992 NLCD for RHI is not representative of current conditions with too much tree cover near the anemometer. The adjustment used in previous WDNR meteorological data processing was applied. To account for the open land, the radius of the roughness circle in AERSURFACE was reduced, and the center point adjusted slightly south, until a representative match (based on the ratio of open land to the total area of the circle) to the aerial photo was found. The revised parameters are longitude -89.4825, latitude 45.6303, radius 300m. Note that this approach has been independently verified by a consulting firm using GIS techniques during the 1-hour SO₂ NAAQS implementation.