UNITED STATE ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27111

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Release of AERSURFACE, Version 20060

FROM: Clint Tillerson, Physical Scientist 4/6/2020
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TO: EPA Regional Modeling Contacts

The United States Environmental Protection Agency (EPA), Office of Air Quality Planning and Standards (OAQPS) is releasing version 20060 (February 29, 2020) of the AERSURFACE tool. Users should note that as of the date of this release, version 20060 replaces version 13016 as the current version of AERSURFACE and finalizes many of the updates that were implemented in draft version 19039_DRFT.

This memorandum provides information on version 20060, including the nature of the updates and its status for regulatory use. This newest version of AERSURFACE, along with a user's guide and additional technical information, can be downloaded from the EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM) website at https://www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#aersurface.

Background and Status of AERSURFACE

In 2005, the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) was promulgated as the EPA's preferred near-field dispersion model for regulatory applications, replacing the Industrial Source Complex (ISC) model. AERMOD was designed to accept more robust meteorological data, including multi-level profiles of wind, temperature, and turbulence to more accurately simulate the atmospheric boundary layer. The

more advanced boundary layer algorithms in AERMET, the meteorological preprocessor for AERMOD, require user-specified surface characteristics (albedo, Bowen ratio, and surface roughness length). To aid the user community with an objective method for determining these AERMET-required surface characteristics, the AERSURFACE tool was developed and first released in 2008. AERSURFACE generates estimates of these surface parameters using land cover/land use data from the National Land Cover Database (NLCD).

AERSURFACE is not a regulatory component of the AERMOD Modeling System as listed in Appendix A to the *Guideline on Air Quality Models* (published as "Appendix W" to 40 CFR Part 51), which includes the AERMAP terrain and AERMET meteorological preprocessors, in addition to the AERMOD dispersion model. However, Section 8.4.2(b) of the *Guideline* recommends the use of the latest version of AERSURFACE for determining surface characteristics when processing measured meteorological data through AERMET (i.e., representative site-specific data or data from a nearby National Weather Service or comparable station). Where it is not possible to run AERSURFACE, Section 8.4.2(b) recommends using the methods in AERSURFACE to determine surface characteristic values.

Users should note that the 2017 revision of the *Guideline* includes an option for use of prognostic meteorological data in regulatory compliance demonstrations. Section 8.4.2(b) of the Guideline states that the surface characteristics associated from the meteorological output for the representative grid cell should be used in such cases. In other words, AERSURFACE should not be used to estimate surface characteristics when using prognostic meteorological data. Rather, surface characteristics from the meteorological model output should be used to maintain data integrity between the surface characteristics in the model and meteorological parameters.

Updates Included in AERSURFACE Version 20060

The original 2008 release and all revisions of AERSURFACE through version 13016 were limited to the use of the 1992 NLCD, which is becoming increasingly unrepresentative and difficult to acquire. The United States Geological Service (USGS) recently removed the 1992 NLCD from their web services and are strongly encouraging the user community to transition to more recent land cover/land use data. The EPA implemented an interim process for using the 1992 NLCD with AERSURFACE version 13016, but a full transition away from the 1992 NLCD is necessary for contemporary applications of AERSURFACE. In response to this long-

term limitation, in early 2019, the EPA released a draft version of AERSURFACE (19039_DRFT) for public review which added the ability for AERSURFACE to process more recent NLCD products, including 2001, 2006, and 2011 land cover data, and the ability to supplement those data with concurrent percent impervious and percent tree canopy data, where available. This release of AERSURFACE version 20060 finalizes many of the updates in version 19039_DRFT with the added ability to process NLCD products from the 2016 NLCD, recently released by the Multi-Resolution Land Characteristics (MRLC) Consortium.

Updates to versions 13016 and 19039_DRFT that are implemented in version 20060 include the following:

- User interface has been modified to read a user-generated input control file that makes use of a keyword/pathway approach similar to AERMOD, AERMET, and AERMAP. The interface is no longer prompt driven and interactive as it was in version 13016.
- Capability to process land cover data, supplemented with concurrent percent impervious and percent tree canopy from the 2001, 2006, 2011, and 2016 NLCDs in GeoTIFF files compatible with AERSURFACE.
- Capability to process 1992 NLCD state binary files has been removed, while the capability to process 1992 NLCD GeoTIFF files compatible with AERSURFACE has been retained.
- Research grade method, referred to as ZOEFF, for determining surface roughness length, as implemented in 19039_DRFT, was retained. However, the method for determining surface roughness length (now referred to as ZORAD), utilized in version 13016 and bases roughness on a fixed radius, was also retained and remains the recommended and default method for determining surface roughness.
- The output format has been updated with appropriate keywords for direct input to AERMET, based on whether the site location is defined as the primary or secondary meteorological site.

Use of this Draft Version of AERSURFACE

As mentioned previously, this release of AERSURFACE version 20060 replaces version 13016 as the current version finalizing many of the updates and enhancements implemented in the 19039_DRFT version. When used in the context of a regulatory application of the AERMOD modeling system, the EPA recommends that AERSURFACE version 20060 is used in accordance with the following:

- The default method for determining surface roughness length (ZORAD) should be used. The ZOEFF method is considered research grade and should be used only for testing and evaluation purposes.
- Land cover data should only be supplemented with concurrent percent impervious and percent tree canopy data (i.e., data representative of one year should not be substituted for another year).
- For the NLCD year of the land cover being processed, if only one of impervious or tree canopy data is available, or neither is available, then the land cover data should be processed by itself without the use of the impervious or tree canopy data. Land cover data should not be supplemented with impervious data only or tree canopy data only. Furthermore, as stated in the previous recommendation, the impervious and canopy data should be concurrent with the land cover data.

Users should contact their regional office and/or appropriate reviewing authority with any questions or if clarification is needed regarding the use of AERSURFACE for any particular permit action.

Where to Obtain NLCD Products that are Compatible with AERSURFACE 20060

At the time of this release, NLCD data products are available from the MRLC as GeoTIFF files that are compatible with AERSURFACE and can be downloaded for a user-defined area from the MRLC website using the MRLC Viewer tool at https://www.mrlc.gov/viewer/. Land cover data are available for the conterminous US (CONUS) for 2001, 2006, 2011, and 2016. Some intermediate years are also available, but AERSURFACE does not include keywords to process the intermediate years. Percent impervious and/or percent tree canopy data are available for the

CONUS for select years. Similarly, land cover, impervious, and tree canopy for Alaska, Hawaii, and Puerto Rico are only available for select years. Users should also note that the 2001, 2006, and 2011 NLCDs were also updated and released with the 2016 NLCD.

The EPA has also generated sets of GeoTIFF files for the 1992 NLCD and the most recent release of the 2001, 2006, 2011, and 2016 NLCDs. The files range in coverage from partial state, as in the case of Texas and California, to multi-state coverage depending on the size of an individual state. Coverage has been segregated by region. These have been stored on an EPA FTP server with anonymous FTP access and can be downloaded directly via a web browser at ftp://newftp.epa.gov/aqmg/nlcd/. An archive of the 3 x 3 degree and state files from the 2011 edition of the 2001 NLCD which included land cover, impervious, and tree canopy for the CONUS is also available.

Refer to EPA's SCRAM website at https://www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#aersurface for the most up to date information on where and how to obtain NLCD products for the conterminous US, Alaska, Hawaii, and Puerto Rico for use with AERSURFACE. The MRLC Consortium (https://www.mrlc.gov/) should be considered the primary source for information about current NLCD data products.

Please send questions to Clint Tillerson through email at tillerson.clint@epa.gov.