

Appendix E

Site-Specific Adjustment to Land Use for AERSURFACE Modeling

As described in Section 6.6, AERMET was used for the processing of the Dulles International Airport data for the AERMOD modeling. One of the auxiliary steps needed for the meteorological data processing is the determination of appropriate surface characteristics needed by AERMET (surface roughness, Bowen ratio, and albedo) from digit land use data provided as input to the AERSURFACE program.

The current version of AERSURFACE (Version 08009) supports the use of land cover data from the USGS National Land Cover Data 1992 archives (NLCD92). The NLCD92 archive provides data at a spatial resolution of 30 meters based upon a 21-category classification scheme applied over the continental U.S. The AERMOD Implementation Guide recommends that the surface characteristics are determined based on the land use within 1 km from the site where the surface meteorological data were collected. The selection of the land use types assigned in the NLCD92 database will be reviewed and may be altered with justification based upon a site-specific analysis.

As recommended in the AIG for surface roughness, the 1-km radius circular area centered at the meteorological station site can be divided into sectors for the analysis; each chosen sector has a mix of land uses that is different from that of other selected sectors. The land use depiction is shown in Figure E-1 as a aerial photo and in Figure E-2 with digital land use assignments. It is evident from Figure E-2 that the 1-km circle is dominated by the land use category 85 ("urban/recreational grasses"). This type of cover is described¹ as follows:

"Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses." The very low surface roughness lengths involved indicate that these areas are kept well manicured and mowed, such as a lawn² with a height of 2 cm. Our review of Figure E-1 indicated that the area in question was not consistent with this characterization.

Further investigation involved a review of photos of the Dulles airport anemometer site in 8 cardinal directions, provided in Figures E-3 through E-10 for directions looking north clockwise through northwest. It is evident from the photos that the nature of the grassland (with occasional shrubs) is such that the area is not consistent with mowed and manicured lawns, but rather natural grasslands such as those used for grazing. The Randerson reference indicates that for grassy areas with a height of about 50 cm (similar to that in the photographs), the roughness length should be about 10 cm. This value matches that for a more appropriate land use category, which is 71 (grasslands/herbaceous). This change was therefore made to the AERSURFACE run by introducing an IF statement in the FORTRAN code that changed the land use category from 85 to 71 for this application.

¹ See <http://landcover.usgs.gov/classes.php>.

² The AERSURFACE citation for the grassy area surface roughness values is Table 5.4 in Randerson, D., 1984, "Atmospheric Boundary Layer," in *Atmospheric Science and Power Production*, ed., D. Randerson. Technical Information Center, Office of Science and Technical Information, U.S. Department of Energy, Springfield, VA, 850pp. This table indicates that the surface roughness is about 1/10 of the height of the grass.

Figure E-1 Sectors Used for Surface Characteristics at Dulles International Airport

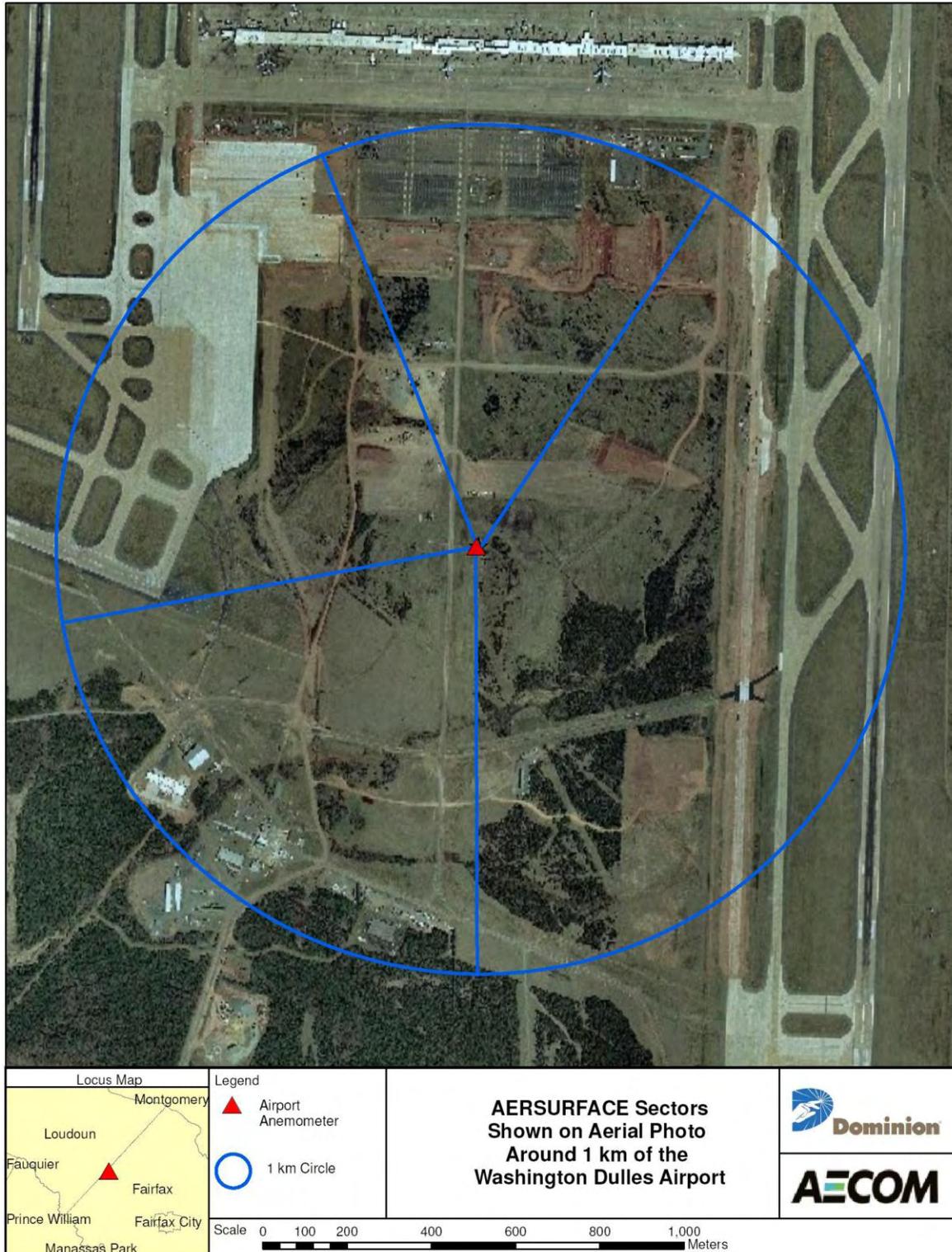


Figure E-2 1-km Radius for Dulles International Airport With Surface Roughness Sectors Shown on Land Use Imagery

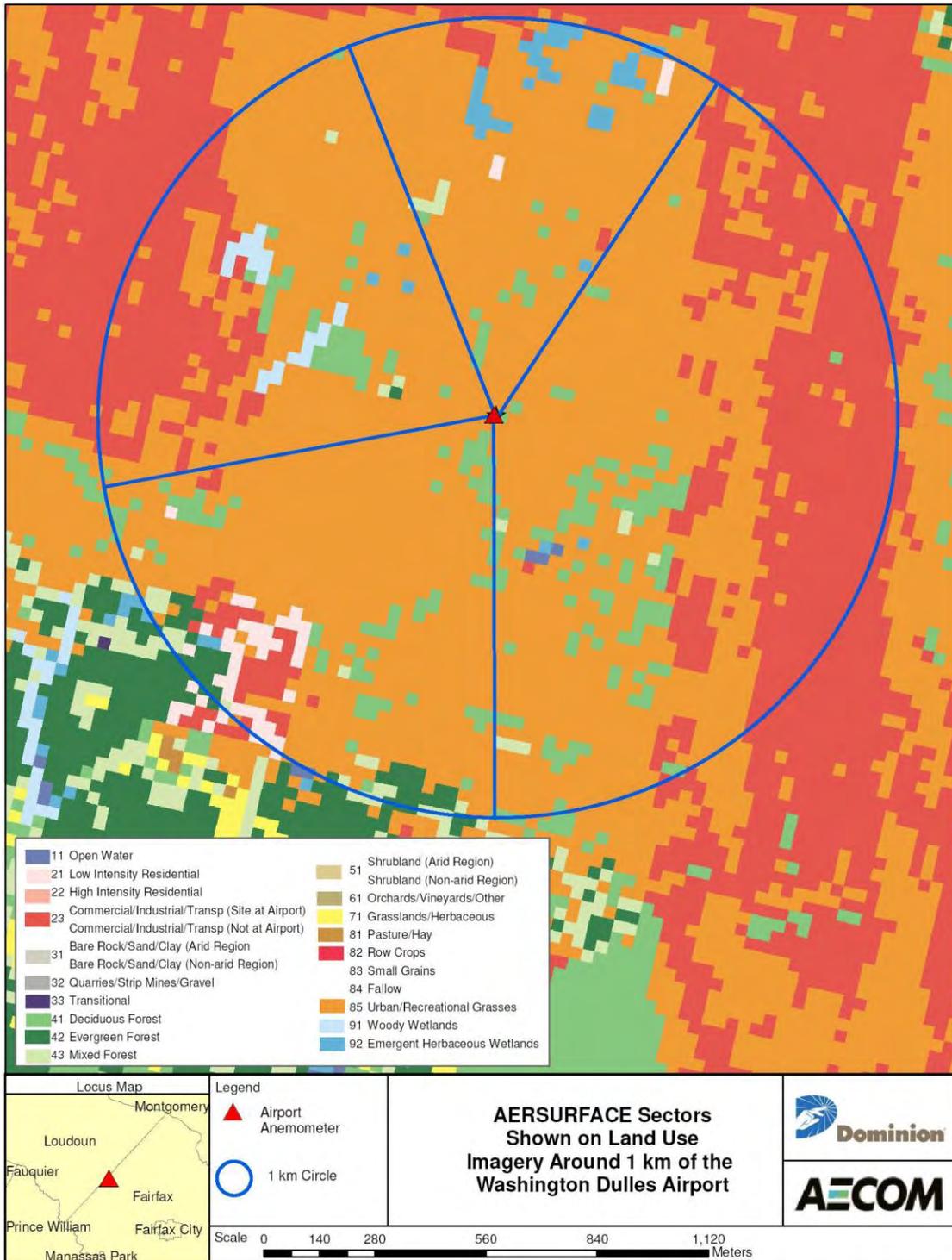


Figure E-3 View of Dulles Meteorological Station Looking North



Figure E-4 View of Dulles Meteorological Station Looking Northeast



Figure E-5 View of Dulles Meteorological Station Looking East



Figure E-6 View of Dulles Meteorological Station Looking Southeast



Figure E-7 View of Dulles Meteorological Station Looking South



Figure E-8 View of Dulles Meteorological Station Looking Southwest



Figure E-9 View of Dulles Meteorological Station Looking West



Figure E-10 View of Dulles Meteorological Station Looking Northwest

