unpaved roads within the county (CARB, 1998). The emission reflects particulate matter stirred up by vehicles traveling along dirt and gravel roads including city and county roads, and farm roads.

**Fine Particulate Fraction of PM$_{10}$ Emissions**

PM$_{2.5}$, known as fine particulate matter, comprises a fraction of PM$_{10}$. Primary and secondary PM$_{2.5}$ emissions could be generated from existing dairy operations. Primary sources include equipment exhaust, fugitive dust from unpaved dairy corrals, agricultural land preparation, and windblown dust. A discussion of the potential PM$_{10}$ emissions associated with these primary sources is presented earlier in this section and summarized in Table 4.2-5a. The potential PM$_{2.5}$ emissions from these sources make up a fraction of the estimated potential PM$_{10}$ emissions. Based on recent studies conducted by CARB, approximately 92 percent of PM$_{10}$ emissions from exhaust (combustion) is expected to be in the PM$_{2.5}$ range. In addition to exhaust sources, fugitive dust from the unpaved dairy corrals, unpaved roadways, agricultural land preparation, and windblown dust from the proposed project would also generate primary PM$_{2.5}$ emissions. Based on recent studies conducted by CARB, the percentages of PM$_{10}$ emissions that are in the PM$_{2.5}$ range are approximately 12 percent for cattle feedlots and 22 percent for windblown dust, agricultural tilling, and unpaved roadways (CARB, undated, Speciation Profiles and Size Fractions). Table 4.2-5a currently provides the potential PM$_{10}$ emissions that could result from the above-mentioned sources.

Secondary sources of PM$_{2.5}$ would result mainly from the formation of ammonium nitrate from the reaction between ammonia and nitrates. Ammonium nitrate emissions in the PM$_{2.5}$ range result from reactions between ammonia emissions and nitrates available in the environment. For dairy operations, ammonia emissions are generated as the organic nitrogen contained in cattle fecal manure decomposes and when the urea manure hydrolyzes.

Limited information about PM$_{2.5}$ secondary particulate emissions from ammonia reactions is currently available. In the San Joaquin Valley, ammonia is believed to be more abundant than nitrates, indicating that the generation of ammonium nitrate is dependent on the availability of nitrates rather than the availability of ammonia (Gaffney, 2001). The SJVUAPCD is currently working with CARB and other parties (i.e., industry) on the development of the California Regional PM$_{10}$/PM$_{2.5}$ Air Quality Study (CRPAQS), a comprehensive program of monitoring, emissions inventory development, data analysis, and modeling of particulate matter, specifically PM$_{10}$ and PM$_{2.5}$. The purposes of the study are to provide an improved understanding of PM$_{10}$ and PM$_{2.5}$, establish a strong scientific foundation for informed decision making, and prepare efficient and cost-effective emission control strategies to achieve the PM$_{10}$ and PM$_{2.5}$ standards in central California. The study is also expected to provide some scientific basis for determining ammonia’s effect on PM$_{2.5}$.