# Improving Modeling Inventory Data: Speciation Profiles

Draft Technical Report

Prepared by
William Battye and Jeff Harris
EC/R Incorporated
6330 Quadrangle Dr., Suite 325
Chapel Hill, NC 27517

February 17, 2005

Lake Michigan Air Directors Consortium
Work Assignment No. LAD-004

Work Assignment Manager

Mike Koerber

Prepared For

Lake Michigan Air Directors Consortium
2250 East Devon Avenue, Suite 250
Des Plaines, IL 60018

1. INTRODUCTION . . . . . 1

2. ON-ROAD SOURCES . . . . . 1
2.1 Light Duty Gasoline Vehicles . . . . . 1
2.2 Diesel Vehicles . . . . . 3

3. OFF-ROAD SOURCES . . . . . 4
3.1 Lawn & Garden . . . . . 4
3.2 Snow Mobiles . . . . . 5
3.3 Agricultural and Construction Equipment and Railroads . . . . . 5
3.4 Marine Vessels . . . . . 5
3.4.1 Commercial Diesel Marine Vehicles (5);
3.4.2 Pleasure Craft (6)

4. AREA SOURCES . . . . . 6
4.1 Residential Wood Combustion . . . . . 6
4.1.1 Gas-Phase Organic Emissions (6);
4.1.2 Fireplaces, Midwest Specific $PM_{2.5}$ Emission Profiles (7);
4.1.3 Fireplaces, National $PM_{2.5}$ Emission Profile (7);
4.1.4 Woodstoves, National $PM_{2.5}$ Emission Profile (8);
4.1.5 Fireplaces & Woodstoves Composite, National $PM_{2.5}$ Emission Profile (8)
4.2 Surface Coating . . . . . 8
4.2.1 Architectural Coatings (8);
4.2.2 Other Surface Coating SCC's (9)
4.3 Dry Cleaning . . . . . 10
4.4 Degreasing . . . . . 10
4.5 Pesticide Application . . . . . 11
4.6 Commercial/Consumer Solvents . . . . . 11
4.6.1 Automotive Aftermarket (11);
4.6.2 Adhesives and Sealants (12);
4.6.3 Personal Care Products (12);
4.6.4 Pesticide Application (12);
4.6.5 General Commercial/Consumer Solvent Use (12)
4.7 Gasoline Marketing Stage 2 . . . . . 13
4.8 Open Burning . . . . . 13

5. POINT SOURCES . . . . . 14
5.1 Petroleum Refineries . . . . . 14
5.2 Pulp & Paper . . . . . 14
5.3 Primary Metals Production - Titanium . . . . . 15
5.4 Fires: Prescribed Burning, Wildfires, and Agricultural Burning . . . . . 15

6. TABLES ..... 19

# 1. INTRODUCTION

LADCO is developing improved chemical speciation profiles of organic carbon for select source categories (SCC). The profiles are specific to sources in the upper Midwest (i.e., States of Illinois, Indiana, Michigan, Ohio, and Wisconsin) wherever data is available to differentiate Midwest sources from National sources. This information will be used by the States in the upper Midwest as inputs for their Emission Inventory Models to assist in preparing State Implementation Plans for regional haze, fine particles, and ozone.

This study focused on four categories of emission sources: on-road motor vehicles, off-road sources (including off-road vehicles and lawn & garden equipment), area sources, and several specific point source categories. The list of specific source categories to be profiled was chosen based on the relative contribution of the SCCs to previous Midwest emission inventories, and similar lists of source categories chosen for improvement in other current model input improvement efforts.

# 2. ON-ROAD SOURCES

## 2.1 Light Duty Gasoline Vehicles

A number of sources were reviewed to identify VOC emission speciation data for gasoline vehicles. A particular goal of this effort was to develop speciation data that reflect the types of fuel used in the Midwest region. Therefore, studies were sought which focused on vehicles in the Midwest, or provided sufficient fuel composition information to allow us to adjust the measured speciation factors to better reflect Midwest fuels. Sources reviewed include a bibliography prepared by the EPA Office of Transportation and Air Quality (OTAQ), reports published under the Auto/Oil research program, speciation data previously developed by the U.S. EPA and the California Air Resources Board (CARB), journal articles, and other published sources.

No recent studies were identified of VOC speciation from vehicles in the Midwest. VOC speciation factors for motor vehicles were developed using two main sources: a study by Schauer *et al* study carried out in California, and a study by the Society of Automotive Engineers of vehicles carried out in North Carolina. The CARB study measured emissions of 66 VOC species from 11 vehicles. The federal test procedure (FTP) was used to ensure that measurements were representative of the entire driving cycle. In addition, two separate analytical procedures were used, and the results compared. The Schauer study also included a detailed chemical characterization of the fuel used.[1] The SAE study included a larger collection of vehicles –138 in all – but measurements were not as detailed as in the Schauer study. Emissions were reported for six VOC categories – alkanes, alkenes, aromatics, acetylenes, alcohols and ethers, and other unknown compounds. In addition, emissions were reported for about 20 individual species.[2]

In developing speciation factors, we began with the detailed measurements by Schauer *et al* of chemical species in liquid gasoline. This chemical composition was then adjusted to reflect available data on the properties or Midwest gasoline, based on county-level inputs to the MOBILE6 motor vehicle emission model. These inputs include the concentrations of methyl tert-butyl ether, methanol, ethanol, benzene, total aromatics, and total olefins in bulk gasoline. These concentrations were been estimated by the U.S. EPA[3] and by LADCO in preparing the motor vehicle emissions inventories for the region.[4] Using the EPA and LADCO fuel descriptions we developed six composite gasoline compositions to represent winter and summer gasolines sold in different sub-regions (see Table 6.1.1). Concentrations of benzene, and oxygenate additives were taken directly from the MOBILE6 inputs. Concentrations of toluene, xylene, and other aromatics (except benzene) reported by Schauer were adjusted proportionately to match the total estimated aromatic concentration for typical Midwest fuel. Likewise, concentrations of olefinic compounds were adjusted proportionately to match the total estimated olefin concentration in Midwest fuel.

MOBILE6 estimates emission factors for selected HAPs, based on the inputs discussed above for gasoline properties. Specific emission factors are produced for exhaust emissions of benzene, MTBE, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein; as well as evaporative emissions of benzene and MTBE. These emission factors were used to compute speciation factors for these compounds.

For compounds not addressed by MOBILE6, speciation factors were calculated separately for evaporative and exhaust emissions. Evaporative speciation factors were computed using Raoult's Law, assuming that evaporative emissions are roughly at equilibrium with gasoline liquid.

For exhaust emissions, we began with detailed measurements of exhaust gas emissions by Schauer *et al*. These were reviewed against measurements by the SAE, which included a larger number of vehicles but a smaller number of chemical species. The results of Schauer *et al* and the SAE were found to be consistent, taking into account the differences in gasoline composition between the two studies. Therefore, the detailed exhaust composition data from Schauer *et al* were taken as the baseline for speciation calculations. However, the speciation factors were adjusted to reflect the properties of gasoline used in the Midwest. As discussed above, six composite model gasolines were used, representing winter and summer gasolines in different sub-regions. These adjustments were based on tests of the impact of gasoline composition on the composition of emissions from nonroad engines, and on the MOBILE6 treatment of benzene and MTBE.[5] Emissions of other aromatics and oxygenated fuel additives were assumed to be proportional to their concentrations in bulk gasoline. Olefins were divided into two groups. The first group includes ethylene and propylene, which are not present in bulk gasoline, but are produced in the combustion process. Emissions of these species are assumed to be independent of gasoline composition. The second group includes butenes and heavier olefins, which are found in bulk gasoline, and can also be produced in combustion. These compounds were assumed to be partly proportional to their concentration in bulk gasoline.

The speciation profile for $PM_{2.5}$ emissions from on-road gasoline vehicles emissions is a composite of four studies.[6,7,8,9] While a number of studies were evaluated for use, these were chosen because they were more recent, and because they were either dynamometer studies entailing direct emission measurement, or were tunnel studies where light-duty gasoline vehicles were separated from other traffic.

The speciated emissions from each source (summer/winter average across all vehicle ages for Cadle) were placed side-by-side and averaged to prepare a composite profile. The sulfate values were taken only from the Cadle and Kirchstetter data (the Dynamometer tests), as results from the tunnel studies were deemed unreliably high (perhaps due to contamination from other sources.)

It has been assumed that no crustal species are present in motor vehicle exhaust, and that any crustal species appearing in analytical results are likely to have resulted from road dust. Organic carbon is expressed as mass of carbon. Where necessary, OC was adjusted downward to remove any adjustments for oxides that had been applied (some sources used these adjustments, some did not.) Then the OC was scaled up across the board according to factors developed by Carnegie Mellon University and provided by LADCO. Table 6.1.2 shows the composite profile for speciated light-duty gasoline vehicle $PM_{2.5}$ emissions, and the other profiles from which it was calculated.

## 2.2 Diesel Vehicles

In the course of developing the volatile organic species profile for on-road diesel engines several sources were evaluated, including recent literature[10] and more dated profiles from SPECIATE.[11,12] After comparing the profiles side by side, it was determined that the 1999 study by Schauer offered a much more detailed profile than either of the profiles from SPECIATE - probably because of improved analytical methods and because the '99 study was a dynamometer study which measured emissions directly, rather than a tunnel study. The profile for volatile organic emissions from diesel engines was calculated directly from the emission rates given in Schauer[10], and is shown in Table 6.1.3, with the SPECIATE profiles for comparison.

The speciation profile for $PM_{2.5}$ emissions from on-road diesel emissions is a composite of four studies.[6,7,13,14] A number of studies were evaluated for use, but these were chosen because they were recent, and because they were either dynamometer studies entailing direct emission measurement, or were tunnel studies where heavy-duty vehicles could clearly be separated from other traffic.

The speciated emissions from each source (summer/winter average for Cadle, average across all engine loads & RPM for Shi) were placed side-by-side and averaged to prepare a composite profile. It has been assumed that no crustal species are present in motor vehicle exhaust, and that any crustal species appearing in analytical results are likely to have resulted from road dust. Organic carbon is expressed as mass of carbon. Where necessary, OC was adjusted downward to remove any adjustments for oxides that had been applied (some sources

used these adjustments, some did not.) Then the OC was scaled up across the board according to factors developed by Carnegie Mellon University and provided by LADCO. Table 6.1.4 shows the composite profile for speciated diesel $PM_{2.5}$ emissions, and the other profiles from which is was calculated.

## 3. OFF-ROAD SOURCES

Searches of literature and existing profiles produced very little useful data regarding emissions from off-road internal combustion engine sources. One detailed study on speciated emissions from multiple four-stroke lawnmower engines was located, and was used as a basis for several profiles, with modifications detailed below. Profiles for larger engine off-road sources were developed by modifying the on-road profiles previously developed, as detailed below.

Because no useful speciated PM data for off-road sources was located, the PM profiles for on-road gasoline and diesel engines were selected as most representative of gasoline and diesel off-road emissions.

### 3.1 Lawn & Garden

The primary source for profiling speciated volatile organic emissions from lawn and garden equipment was a 1997 study on emissions from four-stroke lawn mower emissions by Gaebele[15] covering ten mowers with two types of gasoline (1990 “baseline” gas, and California phase 2 “reformulated” gas.) An exhaust profile was developed using the Gaebele study, while evaporative emissions were based on the evaporative emission profiles developed for on-road vehicles. The PM profile for on-road gasoline engines were selected as most representative of PM emissions from these SCCs.

The profile for emission of volatile organic species from exhaust was composited from the two emission profiles contained in the Gaebele study (one for each of the two fuels used.) The two profiles were placed side by side for comparison and composited, choosing elements from each based on comparison of the composition of the fuels used by Gaebele to that of fuels currently in use in the Midwest. Olefin and non-benzene aromatic compositions were taken from the 1990 “baseline” gasoline, while benzene and oxygenate compositions from the California reformulated gas were used (replacing MTBE with ethanol.) An average of the two profiles was used for the remaining components. Finally, the exhaust profile was normalized to total 100%.

Table 6.2.1 details the profiles from Gaebele and the composite exhaust emission profile for four-stroke lawn and garden engines composited from them. Because useful data on speciated emissions from two-stroke lawn and garden emissions could not be located, the four-stroke emission profile is also used for them.

Next, a series of Midwest-specific emission profiles were developed by adding an evaporative component to the exhaust profile. The evaporative component is based on the evaporative profiles developed for on-road sources, described in Section 2.1, above. The six

evaporative profiles (summer and winter profiles for high and low aromatics, and summer and winter profiles for gas with oxygenates) were composited with the exhaust profile based on data from EPA estimating evaporative emissions as a percentage of exhaust emissions for nonroad engine modeling.[16] Because of the possibility of fall and winter emissions from leaf and snow blowers in addition to summertime lawn & garden emissions, profiles for all seasons were prepared.

A weighted average of the exhaust and evaporative profiles was taken to create the composite profile. For four-stroke lawn and garden engines, exhaust emissions were assumed to be 34.6% of exhaust emissions (33% from crankcase emissions, 1.6% from diurnal evaporative emissions). For two-stroke lawn and garden engines, exhaust emissions were assumed to be 1.6% of exhaust emissions (no crankcase emissions due to the nature of combustion in two-stroke engines, 1.6% from diurnal evaporative emissions).

## 3.2 Snow Mobiles

Literature and internet searches failed to locate any data which would have allowed development of Midwest-specific speciated emission profiles for four-stroke snow mobile engine emissions. The exhaust profile developed for four-stroke lawn and garden engines was determined to be the most representative of the SCC. The evaporative profiles based on Midwest gasolines were combined in a weighted average with the exhaust profile. The evaporative emissions were weighted at 9.4% of the exhaust emissions, based on Mobile6 model outputs for a pre-catalyst motorcycle engine developed using model inputs supplied by LADCO. The PM profile for on-road gasoline engines was selected as most representative of PM emissions from this SCC.

## 3.3 Agricultural and Construction Equipment and Railroads

Literature and internet searches failed to locate any data which would have allowed development of Midwest-specific speciated emission profiles for engine emissions from diesel agricultural and construction equipment or railroads. The exhaust profiles for volatile organic species and PM developed for on-road diesel engines were determined to be the most representative of these SCCs.

## 3.4 Marine Vessels

### 3.4.1 Commercial Diesel Marine Vehicles

Literature and internet searches failed to locate any data which would have allowed development of Midwest-specific speciated emission profiles for engine emissions from commercial diesel marine vehicles. The exhaust profiles for volatile organic species and PM developed for on-road diesel engines were determined to be the most representative of this SCC.

### 3.4.2 Pleasure Craft

Literature and internet searches failed to locate any data which would have allowed development of Midwest-specific speciated emission profiles for two-stroke or four-stroke pleasure craft marine engine emissions. The exhaust profile developed for four-stroke lawn and garden engines was determined to be the most representative of these SCCs. The evaporative profiles based on Midwest gasolines were combined in a weighted average with the exhaust profiles. The PM profile for on-road gasoline engines was selected as most representative of PM emissions from these SCCs.

The evaporative emissions for two-stroke gasoline marine engines were weighted at 1.6% of the exhaust emissions (no crankcase emissions due to the nature of combustion in two-stroke engines, 1.6% from diurnal evaporative emissions), based on data from EPA estimating evaporative emissions as a percentage of exhaust emissions for nonroad engine modeling.[16] The evaporative emissions for four-stroke gasoline marine engines were weighted at 15.4% of the exhaust emissions, based on Mobile6 model outputs for a pre-catalyst light-duty gasoline vehicle developed using model inputs supplied by LADCO, with no crankcase emissions as set out in EPA guidance.[16]

## 4. AREA SOURCES

### 4.1 Residential Wood Combustion

Data on the distribution of tree species in the great lakes area was available in EPA's Biogenic Emission Land use Database version 3 (BELD3). A brief telephone survey of firewood vendors in the Midwest was performed to determine the relative frequency of use for hardwood and softwood fuels.

Speciation profiles were developed for several residential wood combustion SCCs, based on recent studies which measured emissions from wood combustion in fireplaces and wood stoves.[17,18,19,20] The studies provide speciated emission profiles from combustion of wood from several species of trees in fireplaces and woodstoves. These profiles were combined and weighted based on the estimated usage of hardwood and softwood in the Midwest and the distribution of species in the region, using data on distribution of tree species, and frequency of use of hardwood and softwood fuels.

### 4.1.1 Gas-Phase Organic Emissions

Most of the available studies focused on particulate emissions, with only Schauer[19] including detailed analysis of gas-phase organic emissions. As a result, only one national profile was developed for organic emissions, combining the oak and pine emissions profiles from Schauer, weighted 73% for hardwood (oak) and 27% for softwood (pine). The weighting factor used is an average of the Midwest factor calculated based on the telephone survey, and a similar

factor included in the Northern Front Range study.[20] The profile for speciated organic emissions from residential wood combustion is included in Table 6.3.1.

### 4.1.2 Fireplaces, Midwest Specific $PM_{2.5}$ Emission Profiles

Speciated $PM_{2.5}$ emission profiles taken from Fine[17,18] and Schauer[19] were composited. Profiles for species of wood present in the Midwest were chosen from those available, including red maple, red oak, yellow poplar, paper birch, white ash, mockernut hickory, eastern white pine, and more general "pine" and "oak" profiles.

Inspection revealed that the greatest variance amongst the profiles was between hardwood and softwood species. Accordingly, the first criteria used to weight the profiles was the relative frequency of use of hardwood and softwood fuels in the Midwest, as determined by a brief telephone survey of firewood vendors in the Midwest. Next, the profiles were weighted according to the distribution of the selected tree species in the great lakes area (as per EPA's BELD 3 Database.) Two profiles are provided, the second is more detailed, and includes speciation of metals and other inorganic particulate species.

For these profiles, crustal (FCRS) is defined according to the definition of "SOIL" taken from "A Guide to interpret data" for the IMPROVE Network, UC Davis, 1995. Crustal is defined to include the sum of soil derived elements (Al, Si, Ca, Fe, Ti) plus their normal oxides. Organic carbon is expressed as mass of carbon. Where necessary, OC was adjusted downward to remove any adjustments for oxides that had been applied (some sources used these adjustments, some did not.) Then the OC was scaled up across the board according to factors developed by Carnegie Mellon University and provided by LADCO. Profiles LAD30003m & LAD30004n, the Midwest-specific profile for speciated particulate emissions from residential wood combustion in fireplaces, are included in Table 6.3.2.

### 4.1.3 Fireplaces, National $PM_{2.5}$ Emission Profile

Speciated $PM_{2.5}$ emission profiles taken from Fine[17,18] Schauer[19], and Zielenska[20] were composited. Profiles for species of wood chosen included red maple, red oak, yellow poplar, paper birch, white ash, mockernut hickory, eastern white pine, Duraflame (commercially prepared firelogs), and more general "pine" and "oak" profiles, as well as composite pine and oak profiles from the Northern Front Range study.

Inspection revealed that the greatest variance amongst the profiles was between hardwood and softwood species. The profiles were divided into two groups (hardwood and softwood), for which an average profile was created. The two resulting profiles were then combined, weighted according to the relative frequency of use of hardwood and softwood fuels. The weighting factor was an average of the factor from by a brief telephone survey of firewood vendors in the Midwest, and a similar factor taken from the Northern Front Range study.

For these profiles, crustal (FCRS) is defined according to the definition of "SOIL" taken from “A Guide to interpret data” for the IMPROVE Network, UC Davis, 1995. Crustal is defined to include the sum of soil derived elements (Al, Si, Ca, Fe, Ti) plus their normal oxides. Organic carbon is expressed as mass of carbon. Where necessary, OC was adjusted downward to remove any adjustments for oxides that had been applied (some sources used these adjustments, some did not.) Then the OC was scaled up across the board according to factors developed by Carnegie Mellon University and provided by LADCO. Profile LAD30005n for speciated particulate emissions from residential wood combustion in fireplaces is included in Table 6.3.3.

#### 4.1.4 Woodstoves, National $PM_{2.5}$ Emission Profile

Only the Northern Front Range study (Zielenska[20]) included an emission profile for woodstoves, so it was used. As with the other residential wood profiles, crustal(FCRS) is defined according to the definition of "SOIL" taken from “A Guide to interpret data” for the IMPROVE Network, UC Davis, 1995. Crustal is defined to include the sum of soil derived elements (Al, Si, Ca, Fe, Ti) plus their normal oxides. Organic carbon is expressed as mass of carbon and was adjusted downward to remove any adjustments for oxides that had been applied. Then the OC was scaled up according to factors developed by Carnegie Mellon University and provided by LADCO. Profile LAD30006n for speciated particulate emissions from residential wood combustion in woodstoves is included in Table 6.3.4.

#### 4.1.5 Fireplaces & Woodstoves Composite, National $PM_{2.5}$ Emission Profile

Profile LAD30002n for fireplaces and woodstoves is an averaged composite of profiles LAD30005n and LAD30006n. The national profile for speciated particulate emissions from residential wood combustion in woodstoves and fireplaces is included in Table 6.3.5.

### 4.2 Surface Coating

Speciation profiles were developed for several surface coating SCCs which account for significant amounts of organic emissions in the Midwest Regional Planning Organization emissions inventory. These categories are (in approximate order of their contribution to the inventory): auto refinishing; traffic markings; wood furniture; paper, foil, and film; can coating; electrical and electronic coatings; miscellaneous manufacturing; and industrial maintenance coatings; and “all others”. Because the emissions inventory did not appear to contain any PM emissions from surface coating sources, no PM profiles were developed.

#### 4.2.1 Architectural Coatings

The profile for emissions from architectural coatings is a composite of three profiles taken from two surveys performed for CARB. Profiles for solvent and water-based paints were taken from the 1998 architectural coatings survey[21], a profile for thinners was taken from a 1996 study.[22] These three profiles were combined to make a composite profile, weighted according to

industry sales data taken from the 2002 US Census of Manufacturers.[23] In addition, species contained in "naptha" or "mineral spirits" were replaced by a more detailed speciation profile taken from a representative MSDS.[24]

Annual sales volumes were adjusted to remove volume attributed to solids and water, based on the composition of a typical latex interior paint. Thinners were assumed to be completely volatile. The adjusted annual sales volumes for water-based paints, solvent paints, and thinners were then used to create weighting factors used to combine the existing speciated emission profiles. Profile LAD30007n, for Architectural Coatings, is detailed in Table 6.3.6.

### 4.2.2 Other Surface Coating SCC's

Other important surface coating categories in the emissions inventory include: architectural coatings, auto refinishing; traffic markings; wood furniture; paper, foil, and film; can coating; electrical and electronic coatings; miscellaneous manufacturing; and industrial maintenance coatings. Earlier profiles for these categories have been based on a combination of solvent industry market data and chemical analyses of coating products. Current coating industry market data are not as detailed as the data that have been available in the past. However, the Freedonia Group reports the usage of various solvents (*e.g.*, toluene, xylene, etc.) for the entire coating formulation industry.

In the current effort, the Freedonia estimates have been used to update the earlier market-based profiles. These adjustments reflect recent changes in solvent composition due to market changes and regulatory issues. The data from the Freedonia group[25] included 1998 sales data for specific surface coating solvent species for the surface coating industry as a whole, while data available from the National Paint and Coatings Association (NPCA)[26] included projected 2000 total solvent sales for surface coating SCC's. Comparison of earlier profiles to the 1998 Freedonia speciated sales data suggested that a significant difference between 1990 coatings and 1998 coatings was substitution of aliphatic hydrocarbons and alcohols for more hazardous solvents (*i.e.*, toluene and xylenes.)

An overall species list was prepared, including all species that were present in the previously existing profiles of interest. A "1990 weighted average" for each species was then calculated, based on the average content of each species across the profiles of interest, weighted according to projected 2000 sales data for surface coating SCC's. This "1990 weighted average" was then compared to the 1998 Freedonia speciated sales data, and conversion factors were calculated for species which showed significant change (primarily increased percentages of mineral spirits and alcohols, and decreases in toluene and xylene.) These conversion factors were then applied to the appropriate species in each of the SPECIATE profiles. Species described as "naptha" or "mineral spirits" were replaced with a more detailed speciation profile taken from a representative MSDS.[24] Finally, the profiles were normalized to total 100%. Profiles for auto refinishing (lad30008n); wood furniture (lad30009n); miscellaneous manufacture (lad30010n); other special purpose coatings (lad30012n); metal cans (lad30011n); industrial maintenance coatings (lad30012n); electronic and other electrical coatings

(lad30013n); traffic markings (lad30014n); paper, foil, and film coatings (lad30015n); and all surface coatings (lad30010n) are detailed in Table 6.3.7.

## 4.3 Dry Cleaning

In the course of developing the profiles for the dry cleaning industry, several data sources were evaluated. Recent market data from the Freedonia Group[25] suggests that there are essentially two solvents in use by dry cleaners: perchloroethylene (a single compound), and mineral spirits (or stoddard solvent.) Existing profiles for mineral spirits used in dry cleaning from SPECIATE[27] and CARB[28] were examined, but were either insufficiently specific, or contained higher fractions of hazardous aromatics than it is believed are currently prevalent. Attempts to find current MSDS for stoddard solvent which include speciation data were also unsuccessful.

Internet research led to a toxicological profile for stoddard solvent from the U.S. Agency for Toxic Substances and Disease Registry[29] which contains several speciation profiles, including a profile for low aromatic white spirits which was chosen as most likely to represent solvents currently in use.

Two profiles for dry cleaning were developed. The first (LAD30020n) is a composite of the single species perchloroethylene and the low aromatics white spirits profile, weighted according to the overall dry cleaning solvent market data from Freedonia.[25] Profile LAD30020n should be used for commercial/industrial dry cleaners, or for an overall industry composite. The other profile (LAD30021n) is for coin-operated dry cleaners, and contains only the single species perchloroethylene, as per the current CARB profile for coin-operated dry cleaners. Profiles LAD30020n and LAD30021n for dry cleaning are detailed in Table 6.3.8. Because the LADCO inventory did not appear to contain any PM emissions from dry cleaning sources, no PM profiles were developed.

## 4.4 Degreasing

In order to develop the profiles for industrial degreasing (or surface cleaning), several data sources were evaluated. Recent market data on solvent sales for surface cleaning from the Freedonia Group[18] indicates that there are two broad categories of degreasing: cold cleaning with liquid solvent, and vapor degreasing. Existing speciation profiles from SPECIATE[27] and CARB[28] were compared to the Freedonia data, and found to be undesirable, as they were less detailed or contained large fractions of ozone-depleting substances such as trichloroethane which have been phased out of use due to stratospheric ozone impacts.

The sales data from Freedonia were supplied in millions of pounds of each solvent per year. These values were converted into percentages by division of the volume of sales for each species by the total, giving speciated emission profiles for cold cleaning and vapor degreasing. A composite degreasing profile was then created by combining the cold cleaning and vapor degreasing profiles, weighted according to their respective fractions of the total solvent sales for

both categories. Species described as "naptha" or "mineral spirits" were replaced with a more detailed speciation profile taken from a representative MSDS.[24] Profile LAD30017n for degreasing is detailed in Table 6.3.8. Because the LADCO inventory did not appear to contain any PM emissions from degreasing sources, no PM profiles were developed.

## 4.5 Pesticide Application

Solvent sales data for pesticides from the Freedonia Group[25] were evaluated and found to be insufficiently detailed for the development of a speciated emission profile. Internet research provided several MSDS for pesticides, which were also deemed unsuitable due to lack of detailed speciation. Data from the U.S. Department of Agriculture[30] and the *Chemical Economics Handbook*[31] suggested that the vast majority of pesticides used on corn, wheat, and soy (the primary agricultural products of the Midwest) are herbicides, while insecticides and fumigants are used sparingly.

SPECIATE[27] contains a fairly recent profile for speciated emissions from herbicides, based on a 1995 EPA study of commercial/consumer product solvent emissions[32], which was used as the basis for profile LAD0023m. Species described as "naptha" or "mineral spirits" were replaced with a more detailed speciation profile taken from a representative MSDS.[24] However, for this profile, xylenes were left unadjusted, due to indications[33] that xylene is used as an active ingredient in herbicides, not just as a solvent. Profile LAD0023m for agricultural pesticide application in the Midwest is detailed in Table 6.3.9. Because the LADCO inventory did not appear to contain any PM emissions from pesticide application sources, no PM profiles were developed.

## 4.6 Commercial/Consumer Solvents

Speciation profiles were developed for several commercial/consumer solvent use SCCs, by adjusting available profiles to be in accordance with more current market data. Profiles developed include the following: automotive aftermarket products, adhesives and sealants, personal care products, pesticide application, and a general commercial/consumer solvent profile. Because the LADCO inventory did not appear to contain any PM emissions from commercial/consumer solvent sources, no PM profiles were developed.

### 4.6.1 Automotive Aftermarket

Review of automotive aftermarket solvent sales data from the Freedonia Group[25] revealed that the only volatile solvent associated with automotive aftermarket uses was methanol from windshield washer fluid/deicers. Other solvents included in the market data were judged to be nonvolatile, resulting from brake fluids or antifreeze. Resultantly, profile LAD30024n for automotive aftermarket emissions is 100% methanol.

### 4.6.2 Adhesives and Sealants

The profile for commercial/consumer solvents adhesive use is a composite of data from two sources: solvent sales data from the Freedonia Group[25] and a 1995 EPA study of commercial/consumer product solvent emissions.[32] The SPECIATE[27] profile (#8523) taken from the 1995 study was more detailed, while the Freedonia solvent sales data offered a more recent snapshot of solvent usage, so the Freedonia data was used to update the solvent components of the SPECIATE profile. In addition, several solvent species described as "naptha" or "mineral spirits" were replaced with a more detailed speciation profile taken from a representative MSDS.[24] Finally, the profile was normalized to total 100%. Table 6.3.10 details profile LAD30025n for commercial/consumer solvents, adhesive and sealant use emissions.

### 4.6.3 Personal Care Products

The profile for personal care products was developed in a manner similar to that for adhesives and sealants. It is a composite of data from two sources: solvent sales data from the Freedonia Group[18] and a more detailed profile from SPECIATE[27] (8501) based on1995 EPA study of commercial/consumer product solvent emissions.[32] The Freedonia data was used to update the solvent components of the SPECIATE profile, leaving the other components intact. Table 6.3.11 details profile LAD30026n for commercial/consumer solvents, personal care product emissions.

### 4.6.4 Pesticide Application

Solvent sales data for pesticides from the Freedonia Group[25] were evaluated and found to be insufficiently detailed for the development of a speciated emission profile for commercial consumer pesticide use, assumed to represent primarily insecticides. Internet research provided several MSDS for pesticides, which were also deemed unsuitable due to lack of detailed speciation. SPECIATE[27] profile 8527 is a fairly recent profile for speciated emissions from insecticides, based on a 1995 EPA study of commercial/consumer product solvent emissions[32], and was used as the basis for profile LAD0027n.

Species described as "naptha" or "mineral spirits" in the SPECIATE profile were replaced with a more detailed speciation profile taken from a representative MSDS.[24] Freon was removed, because it is an ozone-depleting substance which has been phased out of use due to the Montreal Protocol. Also, "Undefined Propellant" was replaced with additional butane and propane. Profile LAD0027n for commercial/consumer pesticide application is detailed in Table 6.3.12.

### 4.6.5 General Commercial/Consumer Solvent Use

The general profile for other commercial/consumer solvent use was developed in a manner similar to that used for the profiles for adhesives and personal care products. It is a composite of data from two sources: solvent sales data from the Freedonia Group[25] and a more

detailed profile from SPECIATE[27] (8500) based on1995 EPA study of commercial/consumer product solvent emissions.[32] The Freedonia data was used to update the solvent components of the SPECIATE profile (non-specific species such as "ether solvents" were used to increase the weighting of similar species in the SPECIATE profile), while species described as "naptha" or "mineral spirits" in the SPECIATE profile were replaced with a more detailed speciation profile taken from a representative MSDS.[24] "Undefined Propellant" from the SPECIATE profile was replaced with additional butane and propane. Table 6.3.13 details profile LAD30029n for general commercial/consumer solvent emissions.

## 4.7 Gasoline Marketing Stage 2

Evaporative emissions from gasoline marketing are profiled using the evaporative emissions profiles for Midwest gasolines developed for on-road sources (see Section 2.1.)

## 4.8 Open Burning

Literature searches did not locate any recent data which would allow construction of Midwest-specific speciated emission profiles for open burning. Older profiles were deemed inappropriate because of shortcomings in the analytical methods, so data from more recent but non-Midwest-specific studies were used. The profile that was chosen is based on data compiled for the National Fire Emissions Technical Workshop[34], held in May, 2004. For open burning, a composite profile was chosen. Profiles LAD30032n and LAD30033n for household waste and land clearing debris are detailed in Table 6.4.1 (along with other profiles taken from the same data source.) OC as carbon was scaled up to adjust for oxides according to factors developed by Carnegie Mellon University and provided by LADCO. The PM profile is based on an aggregate of over twenty emission factors for elemental and organic carbon emissions from open fires. OC as carbon was scaled up to adjust for oxides according to factors developed by Carnegie Mellon University and provided by LADCO.

# 5. POINT SOURCES

## 5.1 Petroleum Refineries

Literature searches failed to locate any recent data which would have allowed development of improved or Midwest-specific speciated emission profiles for the petroleum refinery SCC's of interest. Several profiles from CARB[28] and SPECIATE[27] were reviewed and the following were selected as most representative:

| Profile | Category | Source |
|---|---|---|
| LAD40001n | Catalytic Cracking Unit VOC | CARB #504<br>"External combustion boilers-<br>distillate or residual" |
| | Catalytic Cracking Unit PM | SPECIATE #13505<br>"Residual Oil Fired Boiler:<br>Petroleum Refinery" |
| LAD40002n | Process Heaters, Gas Fired VOC | CARB #3<br>"External combustion boiler - natural gas" |
| | Process Heaters, Gas Fired PM | CARB#125<br>"Petroleum Heaters, Gas" |
| LAD40003n | Process Heaters, Oil Fired VOC | CARB#29<br>"Petroleum Refinery Catalytic Cracker" |
| | Process Heaters, Oil Fired PM | SPECIATE#26205<br>"Petroleum Refinery Catalytic Cracker" |

OC as carbon was scaled up to adjust for oxides according to factors developed by Carnegie Mellon University and provided by LADCO.

## 5.2 Pulp & Paper

Literature searches failed to locate any recent data which would have allowed development of improved or Midwest-specific speciated emission profiles for the pulp and paper SCC's of interest. Several profiles from CARB[28] and SPECIATE[27] were reviewed and the following profiles were selected as most representative. OC as carbon was scaled up to adjust for oxides according to factors developed by Carnegie Mellon University and provided by LADCO.

VOC: CARB profile #1413, "Pulp & Paper Industry, Average"
PM: SPECIATE profile #90015 "Pulp & Paper Industry, Average"

## 5.3 Primary Metals Production - Titanium

Literature searches failed to locate any recent data which would have allowed development of improved or Midwest-specific speciated emission profiles for the Primary Metals Production - Titanium SCC. Because the LADCO inventory did not appear to contain any volatile organic emissions from titanium production sources, no VOC profile was developed. Several profiles from CARB[28] and SPECIATE[27] were reviewed and the following profile was selected as most representative. OC as carbon was scaled up to adjust for oxides according to factors developed by Carnegie Mellon University and provided by LADCO.

PM: SPECIATE profile #90007 "Primary Metals Production - Average"

## 5.4 Fires: Prescribed Burning, Wildfires, and Agricultural Burning

Literature searches did not locate any recent data which would allow construction of Midwest-specific speciated emission profiles for open fires. Older profiles were deemed inappropriate because of shortcomings in the analytical methods, so data from more recent but non-Midwest-specific studies were used. The profiles that were chosen are all based on data compiled for the National Fire Emissions Technical Workshop[34], held in May, 2004.

Profile LAD40007n for prescribed burning is a composite profile. Profile LAD40008n for wildfires is a profile for woods wildfires (a grasslands wildfire profile has also been provided, as many wildfires in the Midwest are grasslands fires.) Profile LAD40009n for agricultural burning is an agricultural burning profile. The PM profile is based on an aggregate of over twenty emission factors for elemental and organic carbon emissions from open fires. OC as carbon was scaled up to adjust for oxides according to factors developed by Carnegie Mellon University and provided by LADCO.

Profiles LAD40007n for prescribed burning, LAD40008n for wildfires, and LAD40009n for agricultural burning are detailed in Table 6.4.1.

## REFERENCES


1. Schauer, James J., Michael J. Kleeman, Glen R. Cass, and Bernd R.T. Simoneit. 2002. "Measurement of Emissions from Air Pollution Sources. 5. $C_1$–$C_{32}$ Organic Compounds from Gasoline-Powered Motor Vehicles." *Environmental Science and Technology*. **36**: 1179–1180.

2. Knapp, Kenneth T., Silvestre Tejada, Steven Cadle, Douglas Lawson, Richard Snow, Barbara Zielinska, John Sagebiel, and Jacob McDonald. 2003. *Central Carolina Vehicle Particulate Emissions Study*. 2003-01-0299, SAE International, Warrendale, Pennsylvania.

3. U.S. Environmental Protection Agency. 2004. 2002 National Emissions Inventory. http://www.epa.gov/ttn/chief/net/2002inventory.html#onroad

4. MOBILE6 input files. Provided to Steve Fudge, EC/R Incorporated by Mark Janssen, Lake Michigan Air Directors Coalition. September 2004.

5. Gabele, Peter. 1997. "Emissions from four-stroke lawn mower engines." *Journal of the Air and Waste Management Association*. **47**: 945–952.

6. Cadle, Steven H. et al. "Composition of Light-Duty Motor Vehicle Exhaust Particulate Matter in the Denver, Colorado Area." Environmental Science Technology (1999), vol. 33, pp. 2328-2339.

7. Kirchstetter, Thomas W. et al. "On-road Measurement of Fine Particle and Nitrogen Oxide Emissions from Light- and Heavy-Duty Motor Vehicles." Atmospheric Environment (1999), vol. 33, pp. 2955-2968.

8. Schauer, Kleeman, Cass, Simoneit. "Measurement of Emissions from Air Pollution Sources. 5. C1-C32 Organic Compounds from Gasoline-Powered Motor Vehicles"Environ. Sci. Technol.2002, 36,1169-1180

9. Watson, J.G. and J.C. Chow. "Source Characterization of Major Emission Sources in the Imperial and Mexicali Valleys along the US/Mexico Border." The Science of the Total Environment (2001), vol. 276, pp. 33-47.

10. Schauer, Kleeman, Cass, Simoneit. "Measurement of Emissions from Air Pollution Sources. 5. C1-C30 Organic Compounds from Medium Duty Diesel Trucks" Environ. Sci. Technol.1999, 33.

11. U.S. EPA SPECIATE Database V3.2. Profile 1201, Light Duty Diesel Vehicles. (1) Vehicles Equipped with Diesel Engines, U. S. Environmental Protection Agency, Technical Report CTAB/PA/80-5, September 1980. (2) Braddock, J. M. and R. L. Bradow, Emission Patterns of Diesel-Powered Passenger Cars, Society of Automotive

Engineers, Paper No. 750682, June 3-5, 1975. (3) Braddock, J. M. and P. A. Gabele, Emission Patterns of Diesel-Powered Passenger Cars, Part II, Society of Automotive Engineers, Paper No. 770168, February 28-March 4, 1977.

12. U.S. EPA SPECIATE Database V3.2 Profile 2520. Tuscarora Tunnel Diesel, 1995.

13. Schauer, Kleeman, Cass, Simoneit. "Measurement of Emissions from Air Pollution Sources. 5. C1-C30 Organic Compounds from Medium Duty Diesel Trucks"Environ. Sci. Technol.1999, 33

14. Shi, J Ping, David Mark, and Roy M. Harrison. "Characterization of Particles from a Current Technology Heavy-Duty Diesel Engine." Environmental Science and Technology (2000), 34, 748-755.

15. Gaebele, Peter. "Exhaust Emissions from Four-Stroke Lawn Mower Engines" Journal of the Air and Waste Management, Association, 1997, Vol. 47, pp945-952.

16. U.S.EPA "Basic Evaporative and Crankcase Emission Rates for Nonroad Engine Modeling" April 2004, EPA420-P-04-012.

17. Phillip M. Fine, Glen R. Cass, Bernd R.T. Simoneit. "Chemical Characterization of Fine Particle Emissions from Fireplace Combustion of Woods Grown in the Northeastern United States". Environmental Science & Technology (2001) Vol 35, pp 2665-2675.

18. Phillip M. Fine, Glen R. Cass, Bernd R.T. Simoneit. "Chemical Characterization of Fine Particle Emissions from Fireplace Combustion of Woods Grown in the Southern United States". Environmental Science & Technology (2002) Vol 36, pp 1442-1451.

19. Shauer, J.J. Michael Kleemen, Glenn Cass, and Bernd Simoneit."Measurement of Emissions from Air Pollution Sources 3. C1-C29 Organic Compounds from Fireplace Combustion of Wood." Environmental Science & Technology (2001) Vol 35, pp 1716-1728.

20. Zielinska, McDonald, Hayes, Chow, Fujita, Watson. "NORTHERN FRONT RANGE AIR QUALITY STUDY Volume B: Source Measurements" April 17, 1998

21. California Air Resources Board. "1998 Architectural Coatings Survey Final Report, September 1999."

22. Albert Censullo, Dane Jones, Max Wills. "Improvement of Speciation Profiles for Architectural and Industrial Maintenance Coating Operations." CARB Report 93-319, June 30, 1996.

23. U.S. Census Bureau Current Industrial Reports Paint and Allied Products - 2002 MA325F(02)-1 Issued July 2003.

24. E M SCIENCE DIVISION OF E M INDUSTRIES Product ID: PETROLEUM SPIRITS, PETROLEUM NAPTHA, BENZINE CAS# 8032-32-4 MSDS Date:02/11/1988

25. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

26. Paint and Coatings '2000': Review and Forecast. Prepared by Kline and Company, Inc., for the National Paint and Coating Association, Washington, DC. 1995.

27. U.S. EPA SPECIATE Database, V3.2

28. California Air Resources Board. "Speciation Profiles and Size Fractions." Data available via the internet. http://www.arb.ca.gov/ei/speciate/speciate.htm

29. "Toxicological Profile for Stoddard Solvent." U.s. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, June 1995. http://www.atsdr.cdc.gov/toxprofiles/tp79.html

30. U.S. Department of Agriculture, National Agricultural Statistics Service "USDA-NASS Agricultural Statistics 2003", Chapter XIV, Statistics of Fertilizers and Pesticides. http://www.usda.gov/nass/pubs/agr03/acro03.htm

31. Chemical Economics Handbook. SRI International, Menlo Park, CA. 1992.

32. "Study of Volatile Organic Compound Emissions from Consumer and Commercial Products", EPA-453/R-94-066-B, U. S. Environmental Protection Agency, Research Triangle Park, NC, March, 1995.

33. Chemical Market Reporter "Chemical Profile: Orthoxylene" & "Chemical Profile: Paraxylene" Schnell Publishing Co. Vol 253, Nos 19 & 20, May 11 & 18, 1998.

34. William Battye, Kathy Boyer. "Emission Factors for Fire – Update Following the National Fire Emissions Technical Workshop." Report prepared by EC/R Incorporated, Chapel Hill, NC for the U.S. EPA, September 30, 2004

## 6. Tables

**Table 6.0 Profile Summary**

| Report Section | Description | Profile Code |
|---|---|---|
| **On-Road Sources** | | |
| **Light Duty Gasoline Vehicles** | | |
| 2.1 | On-road summer general catalytic exhaust | LAD1SGCEXH |
| | On-road summer general composite | LAD1SGENCOMP |
| | On-road summer general catalytic evaporative | LAD1SGENEVAP |
| | On-road summer general non-catalytic exhaust | LAD1SGNEXH |
| | On-road summer high oxygenated catalytic exhaust | LAD1SHOXCEXH |
| | On-road summer high oxygenated composite | LAD1SHOXCOMP |
| | On-road summer high oxygenated evaporative | LAD1SHOXEVAP |
| | On-road summer high oxygenated non-catalytic exhaust | LAD1SHOXNEXH |
| | On-road summer low aeromatic catalytic exhaust | LAD1SLACEXH |
| | On-road summer low aeromatic composite | LAD1SLACOMP |
| | On-road summer low aeromatic evaporative | LAD1SLAEVAP |
| | On-road summer low aeromatic non-catalytic exhaust | LAD1SLANEXH |
| | On-road winter general catalytic exhaust | LAD1WGCEXH |
| | On-road winter general composite | LAD1WGENCOMP |
| | On-road winter general evaporative | LAD1WGENEVAP |
| | On-road winter general non-catalytic exhaust | LAD1WGNEXH |
| | On-road winter high oxygenated catalytic exhaust | LAD1WHOXCEXH |
| | On-road winter high oxygenated composite | LAD1WHOXCOMP |
| | On-road winter high oxygenated evaporative | LAD1WHOXEVAP |
| | On-road winter high oxygenated non-catalytic exhaust | LAD1WHOXNEXH |
| | On-road winter low aeromatic catalytic exhaust | LAD1WLACEXH |
| | On-road winter low aeromatic composite | LAD1WLACOMP |
| | On-road winter low aeromatic evaporative | LAD1WLAEVAP |
| | On-road winter low aeromatic non-catalytic exhaust | LAD1WLANEXH |
| | On and off-road gasoline PM | LAD1PMGAS |
| **Diesel Vehicles** | | |
| 2.2 | On-road diesel | LAD1DIESEL |
| | On and off-road diesel PM | LAD1PMDIES |

## Table 6.0 (continued) Profile Summary

| Report Section | Description | Profile Code |
|---|---|---|
| **Off-Road Sources** | | |
| **Lawn & Garden** | | |
| 3.1 | Off-road summer general lawn and garden 4-stroke | LAD2SGLG4 |
| | Off-road summer high oxygenated lawn and garden 4-stroke | LAD2SHOXLG4 |
| | Off-road summer low aromatic lawn and garden 4-stroke | LAD2SLALG4 |
| | Off-road winter general lawn and garden 4-stroke | LAD2WGLG4 |
| | Off-road winter high oxygenated lawn and garden 4-stroke | LAD2WHOXLG4 |
| | Off-road winter low aromatic lawn and garden 4-stroke | LAD2WLALG4 |
| | Off-road summer general lawn and garden 2-stroke | LAD2SGCOMP |
| | Off-road summer high oxygenated lawn and garden 2-stroke | LAD2SHOXCOMP |
| | Off-road winter general lawn and garden 2-stroke | LAD2WGCOMP |
| | Off-road summer low aromatic lawn and garden 2-stroke | LAD2SLACOMP |
| | Off-road winter high oxygenated lawn and garden 2-stroke | LAD2WHOXCOMP |
| | Off-road winter low aromatic lawn and garden 2-stroke | LAD2WLACOMP |
| **Snow Mobiles** | | |
| 3.2 | Off-road winter general snow mobiles | LAD2WGSNOW |
| | Off-road winter high oxygenated snow mobiles | LAD2WHOXSNOW |
| | Off-road winter low aromatic snow mobiles | LAD2WLASNOW |
| **Agricultural & Construction Equipment, Railroads** | | |
| 3.3 | Off-road diesel | LAD2DIESEL |
| | On and off-road diesel PM | LAD1PMDIES |
| **Marine Vessels** | | |
| 3.4.1 | Diesel Marine Vessels | LAD2DIESEL |
| | Diesel Marine Vessels PM | LAD1PMDIES |
| 3.4.2 | Off-road summer high oxygenated marine vessel 4-stroke | LAD2SHOXMAR4 |
| | Off-road summer low aromatic marine vessel 4-stroke | LAD2SLAMAR4 |
| | Off-road summer general marine vessel 4-stroke | LAD2SGMAR4 |

## Table 6.0 (continued) Profile Summary

| Report Section | Description | Profile Code |
|---|---|---|
| **Area Sources** | | |
| **Residential Wood Combustion** | | |
| 4.1.1 | Residential Wood, Organics | LAD3RESWVOC |
| 4.1.2 | Fireplaces: Insert; non-EPA certified, Midwest | LAD30003M |
| 4.1.3 | Fireplaces: Insert; non-EPA certified, National | LAD30005N |
| 4.1.4 | Woodstoves: General | LAD30006N |
| 4.1.5 | Total: Woodstoves and Fireplaces | LAD30002N |
| **Surface Coating** | | |
| 4.2.1 | Architectural Coating VOC | LAD30007N |
| 4.2.2 | Auto Refinishing VOC | LAD30008N |
| | Wood Furniture VOC | LAD30009N |
| | Misc Manufacturing VOC | LAD30010N |
| | Other Special Purpose Coatings VOC | LAD30012N |
| | Metal Cans VOC | LAD30011N |
| | Industrial Maintenance VOC | LAD30012N |
| | Electronic VOC | LAD30013N |
| | Traffic Markings VOC | LAD30014N |
| | Paper VOC | LAD30015N |
| | All Surface Coatings VOC | LAD30010N |
| **Dry Cleaning** | | |
| 4.3 | Dry Cleaning VOC: Commercial/Industrial or General | LAD30020N |
| | Dry Cleaning VOC: Coin-operated | LAD30021N |
| **Degreasing** | | |
| 4.4 | Degreasing VOC | LAD30017N |
| **Pesticide Application** | | |
| 4.5 | Agricultural Pesticides VOC: Midwest | LAD30023M |
| **Commercial/Consumer Solvents** | | |
| 4.6.1 | Auto After-market VOC | LAD30024N |
| 4.6.2 | Consumer Adhesives VOC | LAD30025N |
| 4.6.3 | Consumer Personal Care Products VOC | LAD30026N |
| 4.6.4 | Consumer Pesticides VOC | LAD30027N |
| 4.6.5 | All Consumer Products VOC | LAD30029N |
| **Gasoline Marketing - Stage 2** | | |
| 4.7 | See Section 2.1 for evaporative emissions from gasoline | |
| **Open Burning** | | |
| 4.8 | Open Burning Household Waste VOC | LAD30032N |
| | Open Burning Land Clearing Debris VOC | LAD30033N |
| | Open Burning PM2.5 | LAD40010N |

## Table 6.0 (continued) Profile Summary

| Report Section | Description | Profile Code |
|---|---|---|
| **Point Sources** | | |
| **Petroleum Refineries** | | |
| 5.1 | Catalytic Cracking Unit VOC | LAD40001N |
| | Catalytic Cracking Unit PM2.5 | LAD40001PMN |
| | Process Heaters, Gas VOC | LAD40002N |
| | Process Heaters, Gas PM2.5 | LAD40002PMN |
| | Process Heaters, Oil VOC | LAD40003N |
| | Process Heaters, Oil PM2.5 | LAD40003PMN |
| **Pulp and Paper** | | |
| 5.2 | Pulp and Paper VOC | LAD40004N |
| | Pulp and Paper PM2.5 | LAD40004PMN |
| **Primary Metals Production - Titanium** | | |
| 5.3 | Primary Metal PM2.5 | LAD40011PMN |
| **Prescribed Burning, Agricultural Burning, and Wildfires** | | |
| 5.4 | Prescribed Burning VOC | LAD40007N |
| | Wildfires - Woods VOC | LAD40008N |
| | Agricultural Burning VOC | LAD40009N |
| | Wild Land Fire PM2.5 | LAD40010N |

## Table 6.1.1 Composite Gasoline Compositions

| Compound | Summer Low Aromatic (%) | Winter Low Aromatic (%) | Summer General (%) | Winter General (%) | Summer High Oxygenate (%) | Winter High Oxygenate (%) |
|---|---|---|---|---|---|---|
| Ethanol | 10 | 10.5 | 0.89 | 0.89 | 3.99 | 3.99 |
| MTBE | 0 | 0 | | 0 | 2.65 | 2.65 |
| Aromatics | 17.8 | 16 | 29 | 24.4 | 24.4 | 24.4 |
| Benzene | 0.79 | 0.79 | 1.2 | 1.1 | 1.1 | 1.1 |
| Olefins | 8 | 6.22 | 8.9 | 9.9 | 9 | 9.9 |

**Table 6.1.2 Speciated $PM_{2.5}$ Emissions from Light-duty Gasoline Vehicles (Profile LAD1PMGas)**

| | | CA, 92 (Watson) | | CO, 96-97 (Cadle) | CA, 97 (Kirch-stetter) | CA, 99 (Schauer) | | Composite |
|---|---|---|---|---|---|---|---|---|
| Cpd ID | Compound | % | Unc. | % | % | % | Unc. | |
| PEC | PM-fine elemental carbon | 17.449 | ±5.61 | 23 | 31.82 | 10.30 | ±2.9 | 23.70 |
| PNO3 | PM-fine nitrate | 11.336 | ±11.8 | 0.03 | | 0.47 | ±0.45 | 4.54 |
| POA | PM-fine organic aerosol | 45.82 | ±18.81 | 54 | 48.18 | 43.70 | ±2.1 | 66.05 |
| PSO4 | PM-fine sulfate | 4.549 | ±1.91 | 0.44 | 1.93 | 1.09 | ±0.3 | 0.88 |
| FCRS | PM-fine crustal* | | | | | | | |
| FPRM | PM-fine "other" | 2.10 | | | | | | 2.41 |
| | Total | 81.26 | | 77.47 | 81.93 | 55.56 | | 100 |

## Table 6.1.3 Volatile Organic Emissions from On-Road Diesel Sources (Profile LAD1Diesel)

| cas | Species | Schauer (1999) % | Speciate 1201 (1980) % | Speciate 2520 (1995) % |
|---|---|---|---|---|
| | 1,2,3-trimethylbenzene | | | 1.53 |
| 95636 | 1,2,4-trimethylbenzene | 0.31 | | 6.84 |
| 108678 | 1,3,5-trimethylbenzene | 0.09 | | 1.92 |
| 106990 | 1,3-butadiene | 0.11 | | |
| | 1-Butene | | | 2.7 |
| 90120 | 1-methylnaphthalene | 0.13 | | |
| | 1-methylphenanthrene | 0.01 | | |
| | 1-Pentene | | | 0.82 |
| 540841 | 2,2,4-trimethylpentane | 0.44 | | 1.36 |
| 75832 | 2,2-dimethylbutane | 0.11 | | 2.41 |
| 565753 | 2,3,4-trimethylpentane | 0.11 | | 0.29 |
| 79298 | 2,3-dimethylbutane | 0.2 | | 0.29 |
| 584941 | 2,3-dimethylhexane | 0.06 | | |
| 565593 | 2,3-dimethylpentane | 0.25 | | 0.83 |
| 589435 | 2,4-dimethylhexane | 0.02 | | |
| 108087 | 2,4-dimethylpentane | 0.14 | | 0.33 |
| | 2,5-dimethylbenzaldehyde | 1.44 | | |
| 592132 | 2,5-dimethylhexane | 0.02 | | |
| | 2,6,10-trimethyltridecane | 0.13 | | |
| 563462 | 2-methyl-1-butene | 0.09 | | |
| | 2-Methyl-1-Pentene | | | 0.2 |
| 625274 | 2-methyl-2-pentene | 0.07 | | |
| | 2-methylanthracene | 0 | | |
| 592278 | 2-methylheptane | 0.04 | | |
| 591764 | 2-methylhexane | 0.2 | | |
| 91576 | 2-methylnaphthalene | 0.21 | | |
| 107835 | 2-methylpentane | 0.33 | | 1.81 |
| | 2-methylphenathrene | 0.01 | | |
| 619998 | 3-ethylhexane | 0.07 | | |
| 563451 | 3-methyl-1-butene | 0.06 | | |
| | 3-Methylheptane | | | 0.4 |
| 589344 | 3-methylhexane | 0.11 | | 2.12 |
| 96140 | 3-methylpentane | 0.24 | | 0.83 |
| | 3-methylphenanthrene | 0.01 | | |
| | 8β,13α-dimethyl-14β-[3'-methylbutyl]-podocarpane | 0 | | |
| | 8β,13α-dimethyl-14β-n-butylpodocarpane | 0.02 | | |
| | 9-methylphenanthrene | 0.01 | | |
| 83329 | acenaphthene | 0.01 | | |
| 208968 | acenaphthylene | 0.02 | | |
| | acephenanthrylene | 0 | | |
| 75070 | acetaldehyde | 14.69 | 2.91 | |
| 67641 | acetone | 7.73 | | |
| 98862 | acetophenone | 1.79 | | |
| 107028 | acrolein | 1.2 | | |
| 120127 | anthracene | 0 | | |
| | benz[a]anthracene | 0 | | |

**Table 6.1.3 (cont.) Volatile Organic Emissions from On-Road Diesel Sources (Profile LAD1Diesel)**

| cas | Species | Schauer (1999) % | Speciate 1201 (1980) % | Speciate 2520 (1995) % |
|---|---|---|---|---|
| 100527 | benzaldehyde | 1.34 | 0.55 | |
| 71432 | benzene | 0.96 | | 2.92 |
| | benzo[ghi]fluoranthene | 0 | | |
| | benzofuran | 0.02 | | |
| 65850 | benzoic acid | 0.44 | | |
| | biacetyl | 0.32 | | |
| 123728 | butanal | 0.46 | | |
| | butanone | 2.64 | | |
| | C1-fluorene | 0.02 | | |
| | C1-MW 202 PAH | 0.01 | | |
| | C1-MW 228 PAH | 0 | | |
| | C2-MW 178 PAH | 0.07 | | |
| | C3-MW 178 PAH | 0.03 | | |
| | C2-naphthalenes | 0.19 | | |
| | C3-naphthalenes | 0.08 | | |
| | C4-naphthalenes | 0.03 | | |
| | chrysene and triphenylene | 0 | | |
| 590181 | cis-2-butene | 0.09 | | 0.27 |
| 7688213 | cis-2-hexene | 0.04 | | |
| | CIS-2-PENTENE | | | 0.27 |
| 123739 | crotonaldehyde | 4.71 | 1.01 | |
| 110827 | cyclohexane | 0.07 | | 0.21 |
| | cyclopenta[cd]pyrene | 0 | | |
| 287923 | cyclopentane | 0.14 | | 0.29 |
| 142290 | cyclopentene | 0.07 | | |
| | decanal | 0.98 | | |
| | decanoic acid | 0.03 | | |
| | decylcyclohexane | 0.01 | | |
| 132649 | dibenzofuran | 0.01 | | |
| | dibenzothiazole | 0.09 | | |
| | dibenzothiophene | 0 | | |
| | dodecanal | 0.42 | | |
| | dodecanoic acid | 0.02 | | |
| | dodecylcyclohexane | 0.01 | | |
| | Ethane | | | 1.08 |
| 74851 | ethene | 3.01 | | |
| 100414 | ethylbenzene | 0.17 | | 2.61 |
| | Ethylene | | | 9.05 |
| 74862 | ethyne (Acetylene) | 1.62 | | 2.34 |
| | farnesane | 0.15 | | |
| 206440 | fluoranthene | 0.02 | | |
| 86737 | fluorene | 0.01 | | |
| | fluorenone | 0.01 | | |
| 50000 | formaldehyde | 7.84 | 8.61 | |
| 107222 | glyoxal | 0.74 | | |
| | heptanal | 1.12 | | |
| | heptylcyclohexane | 0.01 | | |

**Table 6.1.3 (cont.) Volatile Organic Emissions from On-Road Diesel Sources (Profile LAD1Diesel)**

| cas | Species | Schauer (1999) % | Speciate 1201 (1980) % | Speciate 2520 (1995) % |
|---|---|---|---|---|
| 66251 | hexanal | 0.77 | 0.08 | |
| | hexylcyclohexane | 0.01 | | |
| | indanone | 0.02 | | |
| | Isobutane | | | 0.25 |
| 115117 | isobutene | 0.4 | | |
| 78784 | isopentane | 0.96 | | 1.2 |
| | Isopropylbenzene | | | 0.3 |
| | m-and p-xylene | 0.82 | | 10.07 |
| | methacrolein | 1.41 | | |
| | methylbenzoic acids | 0.27 | | |
| 108872 | methylcyclohexane | 0.18 | | 0.4 |
| 96377 | methylcyclopentane | 0.22 | | 0.57 |
| 78988 | methylglyoxal | 0.6 | | |
| 620144 | m-ethyltoluene | 0.07 | | 3.8 |
| 1330207 | m-ethyltoluene | 0.07 | | |
| | naphthalene | 0.22 | | |
| 106978 | n-butane | 1.35 | | 0.59 |
| | n-decane | | | 2.4 |
| | n-docosane | 0.02 | | |
| 112403 | n-dodecane | 0.18 | | |
| | n-eicosane | 0.07 | | |
| | n-heneicosane | 0.02 | | |
| | n-heptacosane | 0.01 | | |
| 629787 | n-heptadecane | 0.22 | | |
| 142825 | n-heptane | 0.17 | | 0.52 |
| | n-hexacosane | 0.01 | | |
| 544763 | n-hexadecane | 0.25 | | |
| | n-hexane | | | 0.88 |
| | n-nonacosane | 0 | | |
| | n-nonadecane | 0.14 | | |
| 111842 | n-nonane | 0.06 | | 1.03 |
| | n-octacosane | 0.01 | | |
| | n-octadecane | 0.21 | | |
| 111659 | n-octane | 0.09 | | 0.28 |
| | nonanal | 1.55 | | |
| | nonanoic acid | 0.08 | | |
| | nonylcyclohexane | 0.01 | | |
| | norfarnesane | 0.13 | | |
| | norpristane | 0.2 | | |
| | n-pentacosane | 0.01 | | |
| 629629 | n-pentadecane | 0.14 | | |
| 109660 | n-pentane | 0.65 | | 1.39 |
| 103651 | n-propylbenzene | 0.04 | | 0.97 |
| | n-tetracosane | 0.01 | | |
| 629594 | n-tetradecane | 0.22 | | |
| | n-tricosane | 0.02 | | |
| 629505 | n-tridecane | 0.17 | | |

**Table 6.1.3 (cont.) Volatile Organic Emissions from On-Road Diesel Sources (Profile LAD1Diesel)**

| cas | Species | Schauer (1999) % | Speciate 1201 (1980) % | Speciate 2520 (1995) % |
|---|---|---|---|---|
| | n-undecane | | | 4.88 |
| | octanal | 1.09 | | |
| | octanoic acid | 0.04 | | |
| | octylcyclohexane | 0.01 | | |
| | o-ethyltoluene | | | 1.83 |
| | other | | | 7.8 |
| 95476 | o-xylene | 0.29 | | 3.42 |
| | pentadecylcyclohexane | 0 | | |
| 38792891 | pentylcyclohexane | 0.03 | | |
| 622968 | p-ethyltoluene | 0.18 | | 1.28 |
| 85018 | phenanthrene | 0.03 | | |
| | phytane | 0.15 | | |
| | pristane | 0.16 | | |
| 123386 | propanal | 4.92 | | |
| | propane | | | 2.03 |
| 115071 | propene | 0.27 | | |
| | propionaldehyde | | 1.77 | |
| | propylene | | | 3.66 |
| 129000 | pyrene | 0.03 | | |
| | styrene | | | 1.7 |
| | tetradecanoic acid | 0 | | |
| | tetradecylcyclohexane | 0.01 | | |
| 108883 | toluene | 1.4 | | 4.12 |
| 624646 | trans-2-butene | 0.18 | | 0.22 |
| 4050457 | trans-2-hexene | 0.06 | | |
| 646048 | trans-2-pentene | 0.02 | | 0.33 |
| | tridecanal | 0.7 | | |
| | tridecanoic acid | 0 | | |
| | tridecylcyclohexane | 0.01 | | |
| | undecanal | 0.91 | | |
| | undecanoic acid | 0.07 | | |
| | undecylcyclohexane | 0.01 | | |
| | xanthone | 0 | | |
| | C-1 COMPOUNDS | | 5.8 | |
| | C-2 COMPOUNDS | | 19.96 | |
| | C-3 COMPOUNDS | | 5.21 | |
| | C-4 COMPOUNDS | | 4.08 | |
| | C-5 COMPOUNDS | | 2.36 | |
| | C-6 COMPOUNDS | | 4.3 | |
| | C-7 COMPOUNDS | | 2.89 | |
| | C-8 COMPOUNDS | | 1.13 | |
| | C-9 COMPOUNDS | | 0.75 | |
| | C-10 COMPOUNDS | | 3.52 | |
| | C-11 COMPOUNDS | | 3.58 | |
| | C-12 COMPOUNDS | | 2.2 | |
| | C-13 COMPOUNDS | | 3.43 | |

**Table 6.1.3 (cont.) Volatile Organic Emissions from On-Road Diesel Sources (Profile LAD1Diesel)**

| cas | Species | Schauer (1999) % | Speciate 1201 (1980) % | Speciate 2520 (1995) % |
|---|---|---|---|---|
| | C-14 COMPOUNDS | | 4.45 | |
| | C-15 COMPOUNDS | | 4.35 | |
| | C-16 COMPOUNDS | | 3.49 | |
| | C-17 COMPOUNDS | | 3.06 | |
| | C-18 COMPOUNDS | | 2.04 | |
| | C-19 COMPOUNDS | | 1.56 | |
| | C-20 COMPOUNDS | | 0.91 | |
| | C-21 COMPOUNDS | | 0.75 | |
| | C-22 COMPOUNDS | | 0.59 | |
| | C-23 COMPOUNDS | | 0.48 | |
| | C-24 COMPOUNDS | | 0.48 | |
| | C-25 COMPOUNDS | | 0.54 | |
| | C-26 COMPOUNDS | | 0.44 | |
| | C-27 COMPOUNDS | | 0.22 | |
| | C-28 COMPOUNDS | | 0.32 | |
| | C-29 COMPOUNDS | | 0.14 | |
| | C-30 COMPOUNDS | | 0.32 | |
| | C-31 COMPOUNDS | | 0.29 | |
| | C-32 COMPOUNDS | | 0.27 | |
| | C-33 COMPOUNDS | | 0.22 | |
| | C-34 COMPOUNDS | | 0.24 | |
| | C-35 COMPOUNDS | | 0.16 | |
| | C-36 COMPOUNDS | | 0.2 | |
| | C-37 COMPOUNDS | | 0.08 | |
| | C-38 COMPOUNDS | | 0.05 | |
| | C-39 COMPOUNDS | | 0.11 | |
| | C-40 COMPOUNDS | | 0.02 | |
| | C-41 COMPOUNDS | | 0.05 | |
| | C-42 COMPOUNDS | | 0.02 | |
| | C-43 COMPOUNDS | | 0.01 | |
| | Unresolved Complex Mixture | 18.91 | | 0.36 |
| | Total | 100 | 100 | 100 |

## Table 6.1.4 Speciated $PM_{2.5}$ Emissions from On-Road Diesel Sources (Profile LAD1PMDies)

| Species | Description | 1995 (Shi) % | CA, 96 (Schauer) % | Co, 96-97 (Cadle) % | CA, 97 (Kirchstetter) % | Composite % |
|---|---|---|---|---|---|---|
| **PEC** | **PM-fine elemental carbon** | 36.39 | 30.8 | 48.9 | 52.00 | 55.02 |
| **PNO3** | **PM-fine nitrate** | 2.46 | 0.23 | 0.11 | | 1.22 |
| **POA** | **PM-fine organic aerosol** | 31.96 | 19.7 | 32.6 | 20.00 | 40.96 |
| **PSO4** | **PM-fine sulfate** | 4.9 | 1 | 0.49 | 1.80 | 2.68 |
| **FCRS** | **PM-fine crustal*** | | | | | |
| **FPRM** | **PM-fine "other"** | 0.09 | | | | 0.12 |
| **Total** | | 75.8 | 51.73 | 82.1 | 73.8 | 100 |

## Table 6.2.1 Speciated Exhaust Emissions from Four-Stroke Lawn & Garden Engines

| Compound | 1990 "Baseline" Gas | CA Phase 2 Gas | Composite |
|---|---|---|---|
| | % of Total Organlc Gases | | |
| ACETYLENE | 12.69 | 12.14 | 13.45 |
| METHANE | 9.42 | 9.28 | 9.91 |
| ETHYLENE | 9.34 | 9.52 | 9.90 |
| TOLUENE | 6.73 | 6.22 | 7.14 |
| BENZENE | 4.78 | 3.6 | 3.82 |
| M&P-XYLENE | 4.55 | 4.07 | 4.82 |
| ISO-PENTANE | 4.51 | 2.77 | 3.86 |
| PROPYLENE | 3.87 | 4.91 | 4.10 |
| ISO-OCTANE | 1.94 | 3.06 | 2.65 |
| N-BUTANE | 1.8 | 0.46 | 1.20 |
| 1,2,4-TRIMETHYLBENZENE | 1.79 | 1.61 | 1.90 |
| ISO-BUTYLENE | 1.66 | 3.36 | 1.76 |
| ETHYLBENZENE | 1.64 | 1.66 | 1.74 |
| 0-XYLENE | 1.58 | 1.35 | 1.68 |
| 2-METHYLPENTANE | 1.42 | 1.56 | 1.58 |
| 1-METHYL-3-ETHYLBENZENE | 1.25 | 1.1 | 1.33 |
| ETHANE | 1.16 | 1.42 | 1.37 |
| FORMALDEHYDE | 1.08 | 1.4 | 1.31 |
| 3-METHYLHEXANE | 0.97 | 0.6 | 0.83 |
| 2,3-DIMETHYLPENTANE | 0.95 | 1.67 | 1.39 |
| 2-METHYLHEXANE | 0.84 | 0.52 | 0.72 |
| 3-METHYLPENTANE | 0.81 | 0.96 | 0.94 |
| 1,3-BUTADIENE | 0.81 | 0.79 | 0.86 |
| N-HEPTANE | 0.64 | 0.37 | 0.54 |
| 1,3,5-TRIMETHYLBENZENE | 0.63 | 0.57 | 0.67 |
| 1-METHYL-4-ETHYLBENZENE | 0.58 | 0.51 | 0.61 |
| 2,4-DIMETHYLPENTANE | 0.58 | 0.83 | 0.75 |
| N-PENTANE | 0.58 | 0.5 | 0.57 |
| 2,3-DIMETHYLBUTANE | 0.51 | 0.74 | 0.66 |
| 1 -NONENE | 0.5 | 0.53 | 0.53 |
| 1,2-DIETHYLBENZENE | 0.46 | 0.37 | 0.49 |
| 2,3.4-TRIMETHYLPENTANE | 0.43 | 0.79 | 0.65 |
| 1-METHYL-2-ETHYLBENZENE | 0.41 | 0.4 | 0.43 |
| METHYLACETYLENE | 0.39 | 0.5 | 0.47 |
| 1.3-DIETHYLBENZENE | 0.37 | 0.29 | 0.39 |
| 2,4-DIMETHYLHEXANE | 0.37 | 0.47 | 0.45 |
| N-HEXANE | 0.37 | 0.44 | 0.43 |
| 3-METHYLHEPTANE | 0.33 | 0.33 | 0.35 |
| METHYLCYCLOPENTANE | 0.33 | 0.22 | 0.29 |
| 1-BUTENE | 0.33 | 0.29 | 0.35 |
| 1.2,3-TRIMETHYLBENZENE | 0.33 | 0.27 | 0.35 |
| N-PROPYLBENZENE | 0.31 | 0.28 | 0.33 |
| 2-METHYLHEPTANE | 0.3 | 0.29 | 0.31 |
| 2-METHYL-2-BUTENE | 0.3 | 0.26 | 0.32 |
| NAPHTHALENE | 0.29 | 0.24 | 0.28 |

| Table 6.2.1 (cont.) Speciated Exhaust Emissions from Four-Stroke Lawn & Garden Engines | | | |
|---|---|---|---|
| | 1990 "Baseline" Gas | CA Phase 2 Gas | Composite |
| Compound | % of Total Organic Gases | | |
| 2-METHYL-1-BUTENE | 0.29 | 0.28 | 0.31 |
| TRANS-2-PENTENE | 0.28 | 0.17 | 0.30 |
| 1,3-DIMETHYL-2-ETHYLBENZENE | 0.28 | 0.22 | 0.30 |
| ISOPRENE | 0.26 | 0.24 | 0.28 |
| 2,3-DIMETHYLHEXANE | 0.26 | 0.31 | 0.30 |
| 2,2,5-TRIMETHYLHEXANE | 0.25 | 0.36 | 0.32 |
| MTBE | 0.25 | 3.27 | |
| ETHANOL | | | 3.47 |
| 2,2-DIMETHYLBUTANE | 0.25 | 0.44 | 0.37 |
| ACETALDEHYDE | 0.25 | 0.23 | 0.25 |
| N-OCTANE | 0.25 | 0.24 | 0.26 |
| PROPADIENE | 0.24 | 0.34 | 0.25 |
| TRANS-2-BUTENE | 0.23 | 0.29 | 0.24 |
| TRANS-1,3-DIMETHYLCYCLOPENTANE | 0.23 | 0.14 | 0.20 |
| 1-PENTENE | 0.22 | 0.15 | 0.23 |
| C10H12 | 0.22 | 0.15 | 0.20 |
| 1-METHYL-3-n-PROPYLBENZENE | 0.21 | 0.18 | 0.22 |
| BENZALDEHYDE | 0.21 | 0.2 | 0.22 |
| 0-METHYLSTYRENE | 0.21 | 0.18 | 0.22 |
| CYCLOPENTADIENE | 0.21 | 0.16 | 0.22 |
| 2,3-DIHYDROINDENE(INDAN) | 0.2 | 0.14 | 0.18 |
| 2,5-DIMETHYLHEXANE | 0.2 | 0.26 | 0.24 |
| METYHLCYCLOHEXANE | 0.2 | 0.1 | 0.16 |
| 1-BUTEN-3-YNE | 0.19 | 0.17 | 0.20 |
| C8H16 | 0.18 | 0.37 | 0.29 |
| 1,2,3,5-TETRAMETHYLBENZENE | 0.18 | 0.14 | 0.19 |
| CIS-2-BUTENE | 0.18 | 0.22 | 0.19 |
| CIS-2-PENTENE | 0.17 | 0.1 | 0.18 |
| I-HEXENE | 0.06 | 0.18 | 0.06 |
| 3-METHYLOCTANE | 0.16 | 0.12 | 0.15 |
| 1,3-DIMETHYL-4-ETHYLBENZENE | 0.16 | 0.12 | 0.17 |
| CIS-3-METHYL-3-HEXENE | 0.15 | 0.09 | 0.16 |
| 2-METHYL-2-PENTENE | 0.15 | 0.1 | 0.16 |
| 1,2-DIMETHYL-4-ETHYLBENZENE | 0.14 | 0.12 | 0.15 |
| 4-METHYLHEPTANE | 0.14 | 0.15 | 0.15 |
| M-TOLUALDEHYDE | 0.13 | 0.11 | 0.14 |
| TRANS-2-HEXENE | 0.13 | 0.08 | 0.14 |
| 1 -METHYLCYCLOPENTENE | 0.13 | 0.08 | 0.14 |
| METHANOL | 0.12 | 0.46 | 0.31 |
| TOTAL | 92.5 | 94.18 | 100.00 |

## Table 6.3.1 Gas Phase Emissions from Residential Wood Combustion

| compound | Pine | Oak | Composite |
|---|---|---|---|
| | Emission Contribution | | |
| **n-alkanes** | | | |
| methane | 20.223% | | 5.460% |
| ethane | 2.101% | | 0.567% |
| propane | 0.830% | | 0.224% |
| n-butane | 0.127% | | 0.034% |
| n-pentane | 0.023% | | 0.006% |
| n-heptane | 0.142% | | 0.038% |
| n-octane | 0.008% | | 0.002% |
| n-nonane | 0.019% | | 0.005% |
| n-octadecane | 0.002% | | 0.000% |
| n-nonadecane | 0.002% | 0.007% | 0.005% |
| n-eicosane | 0.001% | 0.007% | 0.006% |
| n-heneicosane | 0.001% | 0.003% | 0.003% |
| n-docosane | 0.000% | 0.002% | 0.002% |
| n-tricosane | 0.000% | | 0.000% |
| n-tetracosane | 0.000% | | 0.000% |
| **branched alkanes** | | | |
| isopentane | 0.027% | | 0.007% |
| 2-methylpentane | 0.042% | | 0.011% |
| 2-methylhexane | 0.013% | | 0.003% |
| ethene | 5.497% | | 1.484% |
| propene | 2.106% | | 0.569% |
| 1-butene | 0.445% | | 0.120% |
| trans-2-butene | 0.326% | | 0.088% |
| cis-2-butene | 0.174% | | 0.047% |
| 1-pentene | 0.042% | | 0.011% |
| trans-2-pentene | 0.079% | | 0.021% |
| cis-2-pentene | 0.051% | | 0.014% |
| trans-2-hexene | 0.042% | | 0.011% |
| **branched alkenes** | | | |
| i-butene | 0.197% | | 0.053% |
| 3-methyl-1-butene | 0.034% | | 0.009% |
| 2-methyl-1-butene | 0.068% | | 0.018% |
| 2-methyl-2-butene | 0.066% | | 0.018% |
| 2-methyl-2-pentene | 0.034% | | 0.009% |
| **alkynes** | | | |
| ethyne (acetylene) | 3.446% | | 0.930% |

## Table 6.3.1 (cont.) Gas Phase Emissions from Residential Wood Combustion

| compound | Pine | Oak | Composite |
|---|---|---|---|
| | Emission Contribution | | |
| **diolefins** | | | |
| 1,3-butadiene | 0.574% | | 0.155% |
| isoprene | 0.201% | | 0.054% |
| **cycloalkanes** | | | |
| methylcyclohexane | 0.042% | | 0.011% |
| **aromatic hydrocarbons** | | | |
| benzene | 1.880% | | 0.508% |
| toluene | 0.776% | | 0.209% |
| ethylbenzene | 0.112% | | 0.030% |
| m-xylene +p-xylene | 0.295% | | 0.080% |
| o-xylene | 0.089% | | 0.024% |
| naphthalene | 1.114% | | 0.301% |
| 2-methylnaphthalene | 0.074% | 0.125% | 0.111% |
| 1-methylnaphthalene | 0.052% | 0.083% | 0.075% |
| dimethylnaphthalene | 0.068% | 0.150% | 0.128% |
| acenaphthylene | 0.091% | 0.141% | 0.128% |
| acenaphthene | 0.010% | 0.015% | 0.014% |
| fluorene | 0.022% | 0.050% | 0.042% |
| phenanthrene | 0.077% | 0.120% | 0.108% |
| anthracene | 0.017% | 0.028% | 0.025% |
| 3-methylphenanthrene | 0.006% | 0.013% | 0.011% |
| 2-methylphenanthrene | 0.009% | 0.017% | 0.015% |
| 2-methylanthracene | 0.005% | 0.009% | 0.008% |
| 9-methylphenanthrene | 0.007% | 0.016% | 0.014% |
| 1-methylphenanthrene | 0.011% | 0.014% | 0.013% |
| C2-178 MW PAH | 0.018% | 0.020% | 0.020% |
| retene | 0.007% | 0.016% | 0.013% |
| fluoranthene | 0.015% | 0.047% | 0.038% |
| acephenanthrylene | 0.005% | 0.015% | 0.012% |
| pyrene | 0.009% | 0.031% | 0.025% |
| C1-202 MW PAH | 0.004% | 0.016% | 0.013% |
| benzo[ghi]fluoranthene | 0.000% | 0.001% | 0.001% |
| **phenol and substituted phenols** | | | |
| phenol | 2.577% | 3.914% | 3.553% |
| o-cresol | 0.440% | 0.622% | 0.573% |
| m-and p-cresol | 1.865% | 2.335% | 2.208% |
| dimethylphenols | 0.540% | 0.661% | 0.629% |
| o-benzenediol | 1.531% | 1.853% | 1.766% |
| p-benzenediol | 0.084% | 0.184% | 0.157% |
| m-benzenediol | 0.014% | 0.058% | 0.046% |
| methylbenzenediols | 0.051% | 0.731% | 0.547% |

## Table 6.3.1 (cont.) Gas Phase Emissions from Residential Wood Combustion

| compound | Pine | Oak | Composite |
|---|---|---|---|
| | Emission Contribution | | |
| hydroxybenzaldehydes | 0.059% | 0.184% | 0.150% |
| 4-(2-hydroxyethyl)phenol | | 0.145% | 0.106% |
| **guaiacol and substituted guaiacols** | | | |
| guaiacol | 1.369% | 2.244% | 2.008% |
| 4-methylguaiacol | 1.664% | 1.318% | 1.411% |
| 4-ethylguaiacol | 0.996% | 1.305% | 1.221% |
| 4-propylguaiacol | 0.342% | 0.412% | 0.393% |
| eugenol | 0.281% | 0.270% | 0.273% |
| vanillin | 0.515% | 0.661% | 0.622% |
| acetovanillone | 0.153% | 0.303% | 0.262% |
| guaiacyl acetone | 0.435% | 1.605% | 1.289% |
| **syringol and substituted syringols** | | | |
| syringol | | 5.180% | 3.781% |
| 4-methylsyringol | 0.001% | 2.270% | 1.658% |
| 4-ethylsyringol | 0.001% | 2.401% | 1.753% |
| 4-propylsyringol | | 0.855% | 0.624% |
| allylsyringol | | 0.017% | 0.013% |
| 4-propenylsyringol | | 0.017% | 0.012% |
| syringaldehyde | | 0.101% | 0.074% |
| acetosyringone | | 0.013% | 0.010% |
| syringyl acetone | 0.001% | 0.070% | 0.051% |
| **aliphatic aldehydes** | | | |
| formaldehyde | 5.718% | 9.903% | 8.773% |
| acetaldehyde | 8.364% | 10.738% | 10.097% |
| propanal | 1.252% | 1.996% | 1.795% |
| butanal/isobutanal | 0.471% | 0.809% | 0.718% |
| pentanal | 0.157% | 1.148% | 0.881% |
| hexanal | 2.052% | 1.174% | 1.411% |
| heptanal | 2.057% | 1.005% | 1.289% |
| **aliphatic ketones** | | | |
| acetone | 3.676% | 6.028% | 5.393% |
| butanone | 1.055% | 1.500% | 1.380% |
| **olefinic aldehydes** | | | |
| acrolein | 0.309% | 0.574% | 0.503% |
| crotonaldehyde | 1.355% | 2.309% | 2.052% |
| methacrolein | 0.113% | 0.119% | 0.117% |
| **aromatic carbonyls** | | | |
| benzaldehyde | 0.241% | 0.209% | 0.217% |
| m-and p-tolualdehyde | 0.059% | | 0.016% |
| acetophenone | 0.019% | 0.069% | 0.056% |

| Table 6.3.1 (cont.) Gas Phase Emissions from Residential Wood Combustion | | | |
|---|---|---|---|
| | Pine | Oak | Composite |
| compound | Emission Contribution | | |
| 2,5-dimethylbenzaldehyde | 0.059% | 0.261% | 0.206% |
| **dicarbonyls** | | | |
| glyoxal | 3.289% | 5.728% | 5.069% |
| methylglyoxal | 4.629% | 4.188% | 4.307% |
| biacetyl | 0.437% | 0.952% | 0.813% |
| 2-oxobutanal | 1.183% | 2.531% | 2.167% |
| **PAH ketones** | | | |
| indan-1-one | 0.086% | 0.180% | 0.155% |
| 9H-fluoren-9-one | 0.033% | 0.078% | 0.066% |
| 1H-phenalen-1-one | 0.001% | | 0.000% |
| **other compounds** | | | |
| veratraldehyde | 0.006% | | 0.002% |
| hydroxymethylfurfural | 0.697% | 1.892% | 1.569% |
| 2-furaldehyde | 0.545% | 2.609% | 2.052% |
| 2-methylfuraldehyde | 0.049% | 0.069% | 0.064% |
| Unidentified Complex Mixture | 6.528% | 12.251% | 10.706% |
| Total | **100%** | **100%** | **100%** |

## Table 6.3.2 Fireplaces, Midwest Specific $PM_{2.5}$ Emission Profiles (Profiles LAD30003m & LAD30004n)

| Cpd | Description | Wt % PM2.5 Mass<br>Fireplace, Red Maple | Wt % PM2.5 Mass<br>Fireplace, Northern Red Oak | Wt % PM2.5 Mass<br>Fireplace, Paper Birch | Wt % PM2.5 Mass<br>Fireplace, Yellow Poplar | Wt % PM2.5 Mass<br>Fireplace, White Ash | Wt % PM2.5 Mass<br>Fireplace, Mockernut Hickory | Wt % PM2.5 Mass<br>Fireplace, Eastern White Pine | Wt % PM2.5 Mass<br>Fireplace, Pine | Wt % PM2.5 Mass<br>Fireplace, Oak | Wt % PM2.5 Mass<br>Composite |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PEC** | **PM-fine elemental carbon** | 6.700 | 3.800 | 22.000 | 3.400 | 6.400 | 1.200 | 31.300 | 1.40 | 3.20 | **6.442** |
| **PNO3** | **PM-fine nitrate** | 0.600 | 0.400 | 0.280 | 0.320 | 0.650 | 0.260 | 0.170 | 0.19 | 0.44 | **0.420** |
| **POA** | **PM-fine organic aerosol** | 85.500 | 87.500 | 86.800 | 60.643 | 54.857 | 53.000 | 73.400 | 56.00 | 59.00 | **92.609** |
| **PSO4** | **PM-fine sulfate** | 0.310 | 0.420 | 1.680 | 0.360 | 0.770 | 0.180 | 0.130 | 0.12 | 0.41 | **0.422** |
| **FCRS** | **PM-fine crustal*** | 0.135 | 0.055 | 0.374 | 0.080 | 0.148 | 0.028 | 0.461 | 0.038 | 0.053 | **0.107** |
| **FPRM** | **PM-Fine "other"** | | | | | | | | | | |
| CL- | Chloride (Ionic) | 0.630 | 0.400 | 0.650 | 0.150 | 0.460 | 0.170 | 0.130 | 0.29 | 0.20 | **0.357** |
| NA+ | Sodium (Ionic) | | | | | | | | 0.09 | 1.00 | **0.636** |
| AL | ALUMINUM | | | | | | | | 0.004 | 0.000 | **0.001** |
| NH4 | AMMONIA | 0.120 | 0.060 | 0.210 | 0.040 | 0.070 | 0.060 | 0.030 | 0.090 | 0.100 | **0.087** |
| SB | ANTIMONY | | | | | | | | 0.004 | 0.000 | **0.001** |
| AS | ARSENIC | | | | | | | | 0.000 | 0.000 | **0.000** |
| BA | BARIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| BR | BROMINE | 0.004 | 0.005 | 0.006 | 0.001 | 0.002 | 0.002 | 0.001 | 0.000 | 0.000 | **0.003** |
| CD | CADMIUM | | | | | | | | 0.004 | 0.007 | **0.005** |
| CA | CALCIUM | 0.020 | 0.020 | 0.020 | 0.020 | 0.030 | 0.005 | 0.011 | 0.004 | 0.008 | **0.015** |
| CL | CHLORINE | 0.674 | 0.357 | 0.784 | 0.124 | 0.512 | 0.164 | 0.145 | 0.181 | 0.127 | **0.328** |
| CR | CHROMIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| CO | COBALT | | | | | | | | 0.000 | 0.000 | **0.000** |
| CU | COPPER | | | | | | | | 0.000 | 0.000 | **0.000** |
| GA | GALLIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| IN | INDIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| FE | IRON | | | | | | | | 0.001 | 0.000 | **0.000** |

## Table 6.3.2 (Cont.) Fireplaces, Midwest Specific $PM_{2.5}$ Emission Profiles (Profiles LAD30003m & LAD30004n)

| Cpd | Description | Wt % PM2.5 Mass<br>Fireplace, Red Maple | Wt % PM2.5 Mass<br>Fireplace, Northern Red Oak | Wt % PM2.5 Mass<br>Fireplace, Paper Birch | Wt % PM2.5 Mass<br>Fireplace, Yellow Poplar | Wt % PM2.5 Mass<br>Fireplace, White Ash | Wt % PM2.5 Mass<br>Fireplace, Mockernut Hickory | Wt % PM2.5 Mass<br>Fireplace, Eastern White Pine | Wt % PM2.5 Mass<br>Fireplace, Pine | Wt % PM2.5 Mass<br>Fireplace, Oak | Wt % PM2.5 Mass<br>Composite |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA | LANTHANUM | | | | | | | | 0.001 | 0.000 | **0.000** |
| PB | LEAD | 0.005 | 0.003 | 0.014 | 0.002 | 0.008 | 0.003 | 0.002 | 0.000 | 0.000 | **0.003** |
| MN | MANGANESE | | | | | | | | 0.000 | 0.000 | **0.000** |
| HG | MERCURY | | | | | | | | 0.000 | 0.000 | **0.000** |
| MO | MOLYBDENUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| NI | NICKEL | | | | | | | | 0.000 | 0.000 | **0.000** |
| PD | PALLADIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| P | PHOSPHOROUS | | | | | | | | 0.004 | 0.007 | **0.005** |
| K | POTASSIUM | 1.235 | 1.001 | 0.976 | 0.726 | 1.751 | 0.200 | 0.439 | 0.277 | 0.647 | **0.870** |
| RB | RUBIDIUM | 0.006 | 0.005 | 0.006 | 0.001 | 0.007 | 0.003 | 0.002 | 0.000 | 0.000 | **0.003** |
| SE | SELENIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| SI | SILICON | 0.041 | 0.009 | 0.137 | 0.019 | 0.040 | 0.008 | 0.178 | 0.008 | 0.016 | **0.033** |
| AG | SILVER | | | | | | | | 0.000 | 0.000 | **0.000** |
| SR | STRONTIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| S | SULFUR | 0.127 | 0.129 | 0.197 | 0.101 | 0.261 | 0.081 | 0.080 | 0.059 | 0.148 | **0.135** |
| SN | TIN | | | | | | | | 0.001 | 0.001 | **0.001** |
| TI | TITANIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| V | VANADIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| Y | YTTRIUM | | | | | | | | 0.000 | 0.000 | **0.000** |
| ZN | ZINC | 0.039 | 0.012 | 0.491 | 0.006 | 0.049 | 0.027 | 0.021 | 0.006 | 0.005 | **0.033** |
| ZR | ZIRCONIUM | | | | | | | | 0.000 | 0.000 | **0.000** |

**Table 6.3.3 Residential Wood Combustion PM2.5 Fireplaces, National Profile (Profile LAD30005n)**

| | Description | Red Maple | Northern Red Oak | Paper Birch | Yellow Poplar | White Ash | Mocker-nut Hickory | Eastern White Pine | Pine | Oak | Dura-flame | Soft-wood (Cpsite) | Hard-wood (Cpsite) | National Com-posite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Weight % $PM_{2.5}$ Mass | | | | | | | | | | | | |
| PEC | PM-fine elemental carbon | 6.700 | 3.800 | 22.000 | 3.400 | 6.400 | 1.200 | 31.300 | 1.40 | 3.20 | 64.003 | 33.597 | 8.230 | **13.808** |
| PNO3 | PM-fine nitrate | 0.600 | 0.400 | 0.280 | 0.320 | 0.650 | 0.260 | 0.170 | 0.19 | 0.44 | 0.022 | 0.104 | 0.200 | **0.320** |
| POA | PM-fine organic aerosol | 85.500 | 87.500 | 86.800 | 60.643 | 54.857 | 53.000 | 73.400 | 56.00 | 59.00 | 28.713 | 51.437 | 53.624 | **85.244** |
| PSO4 | PM-fine sulfate | 0.310 | 0.420 | 1.680 | 0.360 | 0.770 | 0.180 | 0.130 | 0.12 | 0.41 | 0.000 | 0.185 | 0.561 | **0.457** |
| FCRS | PM-fine crustal* | 0.135 | 0.055 | 0.374 | 0.080 | 0.148 | 0.028 | 0.461 | 0.038 | 0.053 | 0.608 | 0.192 | 0.043 | **0.171** |
| FPRM | PM-Fine “Other” | | | | | | | | | | | | | |

| Table 6.3.4 Residential Wood Combustion PM2.5 Woodstoves, National Profile (Profile LAD30006n) | | |
|---|---|---|
| | **Description** | **Woodstove, Hardwood (Composite)** |
| | | Wt % $PM_{2.5}$ Mass |
| **PEC** | PM-fine elemental carbon | 11.835 |
| **PNO3** | PM-fine nitrate | 0.088 |
| **POA** | PM-fine organic aerosol | 86.971 |
| **PSO4** | PM-fine sulfate | 1.063 |
| **FCRS** | PM-fine crustal* | 0.043 |

| Table 6.3.5 Residential Wood Combustion PM2.5 Fireplaces & Woodstoves Composite, National Profile (Profile LAD30002n) | | | | |
|---|---|---|---|---|
| | **Description** | **Fireplace Composite** | **Woodstove Composite** | **Fireplace & Woodstove Composite** |
| | | | Weight % $PM_{2.5}$ Mass | |
| **PEC** | PM-fine elemental carbon | 13.808 | 11.385 | 12.821 |
| **PNO3** | PM-fine nitrate | 0.320 | 0.088 | 0.204 |
| **POA** | PM-fine organic aerosol | 85.244 | 86.971 | 86.108 |
| **PSO4** | PM-fine sulfate | 0.457 | 1.063 | 0.760 |
| **FCRS** | PM-fine crustal* | 0.171 | 0.043 | 0.107 |

## Table 6.3.6 Surface Coating: Architectural Coatings (Profile LAD30007n)

| CAS | CHEMICAL NAME | Water-based Paints | Solvent Paints | Thinners | Com-posite |
|---|---|---|---|---|---|
| | | % TOG | | | |
| 8704 | DISTILLATES/ NAPHTHA/ MINERAL SPIRITS | 5.436 | 70.631 | | |
| 109660 | PENTANE | | | | 30.847 |
| 107835 | 2-METHYL PENTANE | | | | 1.322 |
| 96140 | 3-METHYL PENTANE | | | | 3.305 |
| 287923 | CYCLOPENTANE | | | | 1.102 |
| 75832 | 2,2-DIMETHYL Butane | | | | 1.102 |
| 79298 | 2,3-DIMETHYL Butane | | | | 1.102 |
| 78784 | 2-METHYLBUTANE | | | | 1.102 |
| 25265774 | 2,2,4-TRIMETHYL-1,3-PENTANEDIOL ISOBUTYRATE {TEXANOL} | 27.996 | 0.038 | | 8.979 |
| 57556 | PROPYLENE GLYCOL | 27.888 | 0.003 | | 8.926 |
| 107211 | ETHYLENE GLYCOL | 15.763 | 0.009 | | 5.049 |
| 9996 | AGGREGATED VOCS < 1.0% | 9.013 | 1.732 | | 3.820 |
| 1330207 | ISOMERS OF XYLENE | 0.034 | 4.817 | | 2.612 |
| 108883 | TOLUENE | 0.106 | 3.180 | 4.150 | 2.332 |
| 112345 | 2-(2-BUTOXYETHOXY)ETHANOL {BUTYL CARBITOL} | 4.305 | 0.010 | | 1.383 |
| 108872 | METHYLCYCLOHEXANE | | | 9.800 | 1.372 |
| 64175 | ETHYL ALCOHOL | 0.005 | 1.904 | 2.370 | 1.361 |
| 78933 | METHYL ETHYL KETONE (MEK) (2-BUTANONE) | | 2.496 | 0.010 | 1.349 |
| 123864 | N-BUTYL ACETATE | | 1.791 | 1.140 | 1.127 |
| 67561 | METHYL ALCOHOL | 2.828 | 0.095 | 0.370 | 1.008 |
| 71556 | 1,1,1-TRICHLOROETHANE | | 1.728 | | 0.933 |
| 67641 | ACETONE | | 0.672 | 3.480 | 0.850 |
| 142825 | N-HEPTANE | | 0.027 | 5.100 | 0.729 |
| 1120214 | N-UNDECANE | | | 4.470 | 0.626 |
| 111762 | BUTYL CELLOSOLVE {2-BUTOXYETHANOL} {EGBE} | 0.883 | 0.490 | 0.480 | 0.614 |
| 124185 | N-DECANE | | | 4.340 | 0.608 |
| 75092 | DICHLOROMETHANE {METHYLENE CHLORIDE} | | 1.106 | | 0.597 |
| 67630 | ISOPROPYL ALCOHOL | 0.058 | 1.006 | | 0.562 |
| 95636 | 1,2,4-TRIMETHYLBENZENE {1,3,4-TRIMETHYLBENZENE} | 0.021 | 0.668 | 1.380 | 0.561 |
| 111659 | N-OCTANE | | | 3.860 | 0.540 |
| 8725 | MISC. OILS - LINSEED/TUNG/SOY/ETC. (TOG PORTION) | 0.235 | 0.824 | | 0.520 |
| 110190 | ISOBUTYL ACETATE | | 0.868 | | 0.469 |
| 110430 | METHYL AMYL KETONE | | 0.635 | 0.860 | 0.463 |
| 638040 | CIS-1,3-DIMETHYLCYCLOHEXANE | | | 2.460 | 0.344 |
| 71363 | N-BUTYL ALCOHOL | 0.086 | 0.531 | 0.020 | 0.317 |
| 111773 | METHYL CARBITOL {2-(2-METHOXYETHOXY)ETHANOL} {DEGME} | 0.962 | 0.007 | | 0.312 |
| 592278 | 2-METHYLHEPTANE | | | 2.180 | 0.305 |
| 108101 | METHYL ISOBUTYL KETONE | | 0.550 | 0.030 | 0.301 |
| 100414 | ETHYLBENZENE | 0.001 | 0.348 | 0.430 | 0.248 |
| 9991 | MISC. PROPRIETARY VOC | 0.402 | 0.176 | | 0.224 |
| 107982 | PROPYLENE GLYCOL METHYL ETHER {1-METHOXY-2-PROPANOL} | 0.090 | 0.338 | | 0.211 |
| 4428 | MISC. ETHYLENEAMINES | | 0.373 | | 0.201 |
| 17302282 | 2,6-DIMETHYLNONANE | | | 1.400 | 0.196 |
| 589811 | 3-METHYLHEPTANE | | | 1.380 | 0.193 |
| 8701 | MISC. GLYCOLS, GLYCOL ETHERS, AND ACETATES | 0.268 | 0.193 | | 0.190 |

**Table 6.3.6 (continued) Surface Coating: Architectural Coatings (Profile LAD30007n)**

| CAS | CHEMICAL NAME | Water-based Paints | Solvent Paints | Thinners | Com-posite |
|---|---|---|---|---|---|
| | | | | % TOG | |
| 99073 | 1,2,4-TRIMETHYLCYCLOPENTANE | | | 1.330 | 0.186 |
| 591764 | 2-METHYLHEXANE | | | 1.290 | 0.181 |
| 63449398 | CHLORINATED PARAFFIN | | 0.328 | | 0.177 |
| 1678804 | TRANS,TRANS-1,2,4-TRIMETHYLCYCLOHEXANE | | | 1.210 | 0.169 |
| 111842 | N-NONANE | | | 1.170 | 0.164 |
| 2452995 | 1,2-DIMETHYLCYCLOPENTANE | | | 1.150 | 0.161 |
| 90090 | ETHYL PROPYLCYCLOHEXANES | | | 1.100 | 0.154 |
| 108656 | PROPYLENE GLYCOL MONOMETHYL ETHER ACETATE {2-(1-METHOXY)PROPYL ACETATE} | | 0.276 | | 0.149 |
| 1678917 | ETHYLCYCLOHEXANE | | | 1.010 | 0.141 |
| 17301949 | 4-METHYLNONANE | | | 0.940 | 0.132 |
| 108383 | M-XYLENE | 0.109 | 0.082 | 0.370 | 0.131 |
| 34590948 | DI(PROPYLENE GLYCOL) METHYL ETHER | 0.348 | 0.033 | | 0.129 |
| 2207047 | TRANS-1,4-DIMETHYLCYCLOHEXANE | | | 0.850 | 0.119 |
| 2207036 | TRANS-1,3-DIMETHYLCYCLOHEXANE | | | 0.830 | 0.116 |
| 6975980 | 2-METHYLDECANE | | | 0.830 | 0.116 |
| 25551137 | TRIMETHYLBENZENES (MIXED) | 0.026 | 0.199 | | 0.116 |
| 26967646 | METHYL PROPYLCYCLOHEXANES | | | 0.820 | 0.115 |
| 111466 | DIETHYLENE GLYCOL | 0.357 | | | 0.114 |
| 25265718 | DIPROPYLENE GLYCOL | 0.291 | 0.036 | | 0.113 |
| 763699 | ETHYL-3-ETHOXYPROPIONATE | | 0.205 | | 0.111 |
| 1072055 | 2,6-DIMETHYLHEPTANE | | | 0.760 | 0.106 |
| 13151343 | 3-METHYLDECANE | | | 0.750 | 0.105 |
| 2807309 | ETHYLENE GLYCOL PROPYL ETHER {2-PROPOXYETHANOL} | 0.218 | 0.063 | | 0.104 |
| 100425 | STYRENE | 0.235 | 0.045 | 0.020 | 0.102 |
| 8723 | MISC. VINYL/ACRYLIC AND OTHER COPOLYMERS (TOG PORTION) | 0.304 | 0.004 | | 0.100 |
| 1795273 | CIS-1,CIS-3,5-TRIMETHYLCYCLOHEXANE | | | 0.690 | 0.097 |
| 99074 | 1,2,3-TRIMETHYLCYCLOPENTANE | | | 0.680 | 0.095 |
| 99075 | TRANS,CIS-1,2,4-TRIMETHYLCYCLOHEXANE | | | 0.670 | 0.094 |
| 4516692 | 1,1,3-TRIMETHYLCYCLOPENTANE | | | 0.660 | 0.092 |
| 8720 | MISC. ASPHALT MIXTURES (TOG PORTION) | 0.279 | 0.004 | | 0.091 |
| 3073663 | 1,1,3-TRIMETHYLCYCLOHEXANE | | | 0.650 | 0.091 |
| 2847725 | 4-METHYLDECANE | | | 0.640 | 0.090 |
| 97858 | ISOBUTYL ISOBUTYRATE | | 0.164 | | 0.089 |
| 99076 | TRANS,TRANS-1,3,5-TRIMETHYLCYCLOHEXANE | | | 0.630 | 0.088 |
| 526738 | 1,2,3-TRIMETHYLBENZENE | | | 0.630 | 0.088 |
| 13151354 | 5-METHYLDECANE | | | 0.630 | 0.088 |
| 589537 | 4-METHYLHEPTANE | | | 0.600 | 0.084 |
| 108678 | 1,3,5-TRIMETHYLBENZENE | | 0.123 | 0.120 | 0.083 |
| 1678939 | BUTYLCYCLOHEXANE | | | 0.580 | 0.081 |
| 112403 | N-DODECANE | | | 0.570 | 0.080 |
| 8724 | MISC. ALKYD, ACRYLIC, AND RELATED RESINS (TOG PORTION) | 0.133 | 0.068 | | 0.079 |
| 871830 | 2-METHYLNONANE | | | 0.560 | 0.078 |

**Table 6.3.6 (continued) Surface Coating: Architectural Coatings (Profile LAD30007n)**

| CAS | CHEMICAL NAME | Water-based Paints | Solvent Paints | Thinners | Com-posite |
|---|---|---|---|---|---|
| | | | | % TOG | |
| 1640897 | ETHYLCYCLOPENTANE | | | 0.560 | 0.078 |
| 1759586 | TRANS-1,3-DIMETHYLCYCLOPENTANE | | | 0.540 | 0.076 |
| 2051301 | 2,6-DIMETHYLOCTANE | | | 0.540 | 0.076 |
| 874351 | 5-METHYLINDAN | | | 0.520 | 0.073 |
| 1074551 | 1-METHYL-4N-PROPYLBENZENE | | | 0.510 | 0.071 |
| 7146603 | 2,3-DIMETHYLOCTANE | | | 0.490 | 0.069 |
| 8986 | OTHER, MISC. VOC COMPOUNDS AGGREGATED IN PROFILE | 0.109 | 0.060 | | 0.067 |
| 124685 | 2-AMINO-2-METHYL-1-PROPANOL | 0.198 | | | 0.063 |
| 589435 | 2,4-DIMETHYLHEXANE | | | 0.450 | 0.063 |
| 622968 | 1-METHYL-4-ETHYLBENZENE | | | 0.450 | 0.063 |
| 2216344 | 4-METHYLOCTANE | | | 0.450 | 0.063 |
| 78831 | ISOBUTYL ALCOHOL | | 0.114 | | 0.062 |
| 2216300 | 2,5-DIMETHYLHEPTANE | | | 0.440 | 0.062 |
| 17302328 | 3,7-DIMETHYLNONANE | | | 0.440 | 0.062 |
| 19489102 | CIS-1-ETHYL-3-METHYLCYCLOHEXANE | | | 0.440 | 0.062 |
| 1678928 | PROPYLCYCLOHEXANE | | | 0.430 | 0.060 |
| 106423 | P-XYLENE | | 0.016 | 0.350 | 0.058 |
| 535773 | 1-METHYL-3-ISOPROPYLBENZENE | | | 0.410 | 0.057 |
| 767588 | 1-METHYLINDAN | | | 0.410 | 0.057 |
| 2532583 | CIS-1,3-DIMETHYLCYCLOPENTANE | | | 0.410 | 0.057 |
| 124174 | DIETHYLENE GLYCOL BUTYL ETHER ACETATE {2-2-(BUTOXYETHOXY)ETHYL ACETATE} | 0.141 | 0.022 | | 0.057 |
| 1678973 | 1,2,3-TRIMETHYLCYCLOHEXANE | | | 0.400 | 0.056 |
| 2216333 | 3-METHYLOCTANE | | | 0.400 | 0.056 |
| 99035 | OTHER C12 | | | 0.390 | 0.055 |
| 611143 | 1-METHYL-2-ETHYLBENZENE | | | 0.370 | 0.052 |
| 17302271 | 2,5-DIMETHYLNONANE | | | 0.370 | 0.052 |
| 95476 | O-XYLENE | | 0.010 | 0.320 | 0.050 |
| 107415 | HEXYLENE GLYCOL {2-METHYL-2,4-PENTANEDIOL} | 0.154 | | | 0.049 |
| 99040 | 1-METHYL-3-ISOPROPYLCYCLOHEXANE | | | 0.350 | 0.049 |
| 934805 | 1,2-DIMETHYL-4-ETHYLBENZENE | | | 0.340 | 0.048 |
| 8714 | MISC. COPOLYMERS, SURFACTANTS, RESINS (TOG PORTION) | 0.060 | 0.052 | | 0.048 |
| 112243 | TRIETHYLENETETRAMINE | | 0.086 | | 0.046 |
| 91203 | NAPHTHALENE | | 0.021 | 0.250 | 0.046 |
| 620144 | 1-METHYL-3-ETHYLBENZENE | | | 0.330 | 0.046 |
| 5911046 | 3-METHYLNONANE | | | 0.330 | 0.046 |
| 99041 | 1-METHYL-2-ISOPROPYLCYCLOHEXANE | | | 0.320 | 0.045 |
| 584941 | 2,3-DIMETHYLHEXANE | | | 0.320 | 0.045 |
| 619998 | 3-ETHYLHEXANE | | | 0.320 | 0.045 |
| 3741002 | PENTYLCYCLOPENTANE | | | 0.320 | 0.045 |
| 3221612 | 2-METHYLOCTANE | | | 0.310 | 0.043 |
| 99032 | OTHER C9 | | | 0.300 | 0.042 |
| 1678984 | ISOBUTYLCYCLOHEXANE | | | 0.300 | 0.042 |
| 7045718 | 2-METHYLUNDECANE {ISODODECANE} | | | 0.300 | 0.042 |

**Table 6.3.6 (continued) Surface Coating: Architectural Coatings (Profile LAD30007n)**

| CAS | CHEMICAL NAME | Water-based Paints | Solvent Paints | Thinners | Com-posite |
|---|---|---|---|---|---|
| | | | % TOG | | |
| 100516 | BENZYL ALCOHOL | | 0.076 | | 0.041 |
| 527537 | 1,2,3,5-TETRAMETHYLBENZENE | | | 0.290 | 0.041 |
| 696297 | ISOPROPYLCYCLOHEXANE | | | 0.290 | 0.041 |
| 99079 | CIS,TRANS-1,2,4-TRIMETHYLCYCLOHEXANE | | | 0.280 | 0.039 |
| 98828 | ISOPROPYLBENZENE (CUMENE) | | 0.008 | 0.240 | 0.038 |
| 590669 | 1,1-DIMETHYLCYCLOHEXANE | | | 0.260 | 0.036 |
| 934747 | 1,3-DIMETHYL-5-ETHYLBENZENE | | | 0.260 | 0.036 |
| 2870044 | 1,3-DIMETHYL-2-ETHYLBENZENE | | | 0.260 | 0.036 |
| 13150817 | 2,6-DIMETHYLDECANE | | | 0.260 | 0.036 |
| 107879 | METHYL PROPYL KETONE {2-PENTANONE} | | 0.065 | | 0.035 |
| 98062 | DIETHYLCYCLOHEXANE | | | 0.240 | 0.034 |
| 99080 | TRANS-1-ETHYL-3-METHYLCYCLOHEXANE | | | 0.230 | 0.032 |
| 2213232 | 2,4-DIMETHYLHEPTANE | | | 0.230 | 0.032 |
| 95932 | 1,2,4,5-TETRAMETHYLBENZENE | | | 0.220 | 0.031 |
| 4259001 | 1,1,2-TRIMETHYLCYCLOPENTANE | | | 0.220 | 0.031 |
| 96297 | METHYL ETHYL KETOXIME | | 0.055 | | 0.030 |
| 99082 | TRANS-1-ETHYL-4-METHYLCYCLOHEXANE | | | 0.210 | 0.029 |
| 1758889 | 1,4-DIMETHYL-2-ETHYLBENZENE | | | 0.210 | 0.029 |
| 4292926 | PENTYLCYCLOHEXANE | | | 0.210 | 0.029 |
| 2855132 | ISOPHORONE DIAMINE | | 0.054 | | 0.029 |
| 872504 | 1-METHYL-2-PYRROLIDINONE | 0.091 | | | 0.029 |
| 496117 | INDAN | | | 0.200 | 0.028 |
| 14676290 | 3-ETHYL-2-METHYLHEPTANE | | | 0.190 | 0.027 |
| 15869962 | 4,5-DIMETHYLOCTANE | | | 0.190 | 0.027 |
| 99043 | 1,1,3,4-TETRAMETHYLCYCLOHEXANE | | | 0.180 | 0.025 |
| 99044 | 6-ETHYL-2-METHYLOCTANE | | | 0.180 | 0.025 |
| 99045 | 6-METHYLUNDECANE | | | 0.180 | 0.025 |
| 1196583 | 3-PHENYLPENTANE | | | 0.180 | 0.025 |
| 70657704 | 2-METHOXY-1-PROPANOL ACETATE | | 0.044 | | 0.024 |
| 99046 | 1,2-DIMETHYL-3-ETHYLCYCLOHEXANE | | | 0.170 | 0.024 |
| 99048 | 1-ETHYL-3-METHYLCYCLOPENTANE | | | 0.170 | 0.024 |
| 99083 | 1-ETHYL-2-METHYLCYCLOPENTANE | | | 0.170 | 0.024 |
| 565593 | 2,3-DIMETHYLPENTANE | | | 0.170 | 0.024 |
| 98566 | PARACHLOROBENZOTRIFLUORIDE {PCBTF} | | 0.043 | | 0.023 |
| 110827 | CYCLOHEXANE | | 0.001 | 0.160 | 0.023 |
| 85687 | BUTYLBENZYLPHTHALATE | 0.068 | 0.002 | | 0.023 |
| 99033 | OTHER C10 | | | 0.160 | 0.022 |
| 99049 | 4-ETHYLDECANE | | | 0.160 | 0.022 |
| 624293 | CIS-1,4-DIMETHYLCYCLOHEXANE | | | 0.160 | 0.022 |
| 15869804 | 3-ETHYLHEPTANE | | | 0.160 | 0.022 |
| 112072 | ETHYLENE GLYCOL BUTYL ETHER ACETATE {2-BUTOXYETHYL ACETATE} | | 0.040 | | 0.021 |
| 583482 | 3,4-DIMETHYLHEXANE | | | 0.150 | 0.021 |
| 589344 | 3-METHYLHEXANE | | | 0.150 | 0.021 |

**Table 6.3.6 (continued) Surface Coating: Architectural Coatings (Profile LAD30007n)**

| CAS | CHEMICAL NAME | Water-based Paints | Solvent Paints | Thinners | Com-posite |
|---|---|---|---|---|---|
| | | | | % TOG | |
| 4218488 | 1-ETHYL-4-ISOPROPYLBENZENE | | | 0.150 | 0.021 |
| 4551513 | CIS-BICYCLO[4.3.0]NONANE | | | 0.150 | 0.021 |
| 7094271 | 1,1,4-TRIMETHYLCYCLOHEXANE | | | 0.150 | 0.021 |
| 25550145 | ETHYLTOLUENES {METHYLETHYLBENZENES} | | 0.038 | | 0.021 |
| 99034 | OTHER C11 | | | 0.140 | 0.020 |
| 99050 | 2-METHYLDECALIN | | | 0.140 | 0.020 |
| 99051 | 3-ETHYL-3-METHYLOCTANE | | | 0.140 | 0.020 |
| 874419 | 1,3-DIMETHYL-4-ETHYLBENZENE | | | 0.140 | 0.020 |
| 78922 | SEC-BUTYL ALCOHOL | 0.061 | | | 0.020 |
| 1569013 | PROPYLENE GLYCOL N-PROPYL ETHER | 0.045 | 0.008 | | 0.019 |
| 99052 | (2-METHYLBUTYL)CYCLOHEXANE | | | 0.130 | 0.018 |
| 99053 | 1,2-DIETHYL-1-METHYLCYCLOHEXANE | | | 0.130 | 0.018 |
| 99054 | CIS,CIS-1,2,4-TRIMETHYLCYCLOHEXANE | | | 0.130 | 0.018 |
| 1002433 | 3-METHYLUNDECANE | | | 0.130 | 0.018 |
| 4923788 | TRANS-1-ETHYL-2-METHYLCYCLOHEXANE | | | 0.130 | 0.018 |
| 15869940 | 3,6-DIMETHYLOCTANE | | | 0.130 | 0.018 |
| 108327 | PROPYLENE CARBONATE | | 0.033 | | 0.018 |
| 2980690 | 4-METHYLUNDECANE | | | 0.120 | 0.017 |
| 3522949 | 2,2,5-TRIMETHYLHEXANE | | | 0.120 | 0.017 |
| 15869939 | 3,5-DIMETHYLOCTANE | | | 0.120 | 0.017 |
| 5131668 | PROPYLENE GLYCOL BUTYL ETHER {1-BUTOXY-2-PROPANOL} | 0.052 | | | 0.017 |
| 99055 | 2-ETHYL-1,3-DIMETHYLCYCLOHEXANE | | | 0.110 | 0.015 |
| 99056 | 5-ISOPROPYLNONANE | | | 0.110 | 0.015 |
| 99057 | HEXYLCYCLOPENTANE | | | 0.110 | 0.015 |
| 135988 | (1-METHYLPROPYL)BENZENE | | | 0.110 | 0.015 |
| 1632708 | 5-METHYLUNDECANE | | | 0.110 | 0.015 |
| 5881174 | 3-ETHYLOCTANE | | | 0.110 | 0.015 |
| 15869928 | 3,4-DIMETHYLOCTANE | | | 0.110 | 0.015 |
| 8711 | MISC. ACETATES AND ESTERS (TOG PORTION) | 0.036 | 0.007 | | 0.015 |
| 110543 | N-HEXANE | 0.045 | 0.001 | | 0.015 |
| 101688 | METHYLENE(B)4-PHENYLISOCYANATE {METHYLENE DIPHENYL DIISOCYANATE} | | 0.027 | | 0.014 |
| 1638262 | 1,1-DIMETHYLCYCLOPENTANE | | | 0.100 | 0.014 |
| 2207014 | CIS-1,2-DIMETHYLCYCLOHEXANE | | | 0.100 | 0.014 |
| 111900 | CARBITOL {DEGEE} {2-(2-ETHOXYETHOXY)ETHANOL} | 0.037 | 0.003 | | 0.013 |
| 565753 | 2,3,4-TRIMETHYLPENTANE | | | 0.090 | 0.013 |
| 609267 | 2-METHYL-3-ETHYLPENTANE | | | 0.090 | 0.013 |
| 824226 | 4-METHYLINDAN | | | 0.090 | 0.013 |
| 17301234 | 2,6-DIMETHYLUNDECANE | | | 0.090 | 0.013 |
| 20348725 | CIS,TRANS-1,2,3-TRIMETHYLCYCLOHEXANE | | | 0.090 | 0.013 |
| 141786 | ETHYL ACETATE | | 0.023 | | 0.012 |
| 108054 | VINYL ACETATE | 0.038 | | | 0.012 |
| 80626 | METHYL METHACRYLATE | 0.036 | | | 0.012 |
| 628637 | AMYL ACETATE | | 0.021 | | 0.011 |

**Table 6.3.6 (continued) Surface Coating: Architectural Coatings (Profile LAD30007n)**

| CAS | CHEMICAL NAME | Water-based Paints | Solvent Paints | Thinners | Com-posite |
|---|---|---|---|---|---|
| | | | | % TOG | |
| 99059 | 1,1-DIMETHYL-2-PROPYLCYCLOHEXANE | | | 0.080 | 0.011 |
| 99060 | 1-ETHYL-2,2,6-TRIMETHYLCYCLOHEXANE | | | 0.080 | 0.011 |
| 108087 | 2,4-DIMETHYLPENTANE | | | 0.080 | 0.011 |
| 1072168 | 2,7-DIMETHYLOCTANE | | | 0.080 | 0.011 |
| 2040962 | PROPYLCYCLOPENTANE | | | 0.080 | 0.011 |
| 75070 | ACETALDEHYDE | 0.031 | | | 0.010 |
| 99061 | 1-ETHYL-1,2-DIMETHYLCYCLOHEXANE | | | 0.070 | 0.010 |
| 6876239 | TRANS-1,2-DIMETHYLCYCLOHEXANE | | | 0.070 | 0.010 |
| 7094260 | 1,1,2-TRIMETHYLCYCLOHEXANE | | | 0.070 | 0.010 |
| 16747505 | 1,1-METHYLETHYLCYCLOPENTANE | | | 0.070 | 0.010 |
| 9999 | AGGREGATE INGREDIENTS < 0.1% | 0.025 | 0.003 | | 0.010 |
| 108941 | CYCLOHEXANONE | | 0.018 | | 0.010 |
| 99062 | 1,1,2,3-TETRAMETHYLCYCLOHEXANE | | | 0.060 | 0.008 |
| 99063 | 1-ETHYL-2,4-DIMETHYLCYCLOHEXANE | | | 0.060 | 0.008 |
| 99064 | 1-METHYL-4-ISOBUTYLBENZENE | | | 0.060 | 0.008 |
| 493016 | CIS-DECALIN | | | 0.060 | 0.008 |
| 7154805 | 3,3,5-TRIMETHYLHEPTANE | | | 0.060 | 0.008 |
| 17302248 | 2,4-DIMETHYLNONANE | | | 0.060 | 0.008 |
| 8710 | MISC. STYRENE-CONTAINING MATERIAL (TOG PORTION) | 0.011 | 0.009 | | 0.008 |
| 99065 | 1,3-DIMETHYL-4-ISOPROPYLBENZENE | | | 0.050 | 0.007 |
| 99066 | 4,5-DIMETHYLDECANE | | | 0.050 | 0.007 |
| 99876 | 1-METHYL-4-ISOPROPYLBENZENE | | | 0.050 | 0.007 |
| 103651 | N-PROPYLBENZENE | | | 0.050 | 0.007 |
| 629505 | N-TRIDECANE | | | 0.050 | 0.007 |
| 694724 | CIS-BICYCLO[3.3.0]OCTANE | | | 0.050 | 0.007 |
| 3728561 | CIS-1-ETHYL-4-METHYLCYCLOHEXANE | | | 0.050 | 0.007 |
| 4923777 | CIS-1-ETHYL-2-METHYLCYCLOHEXANE | | | 0.050 | 0.007 |
| 17085960 | 3-ETHYLDECANE | | | 0.050 | 0.007 |
| 1897456 | CHLOROTHALONIL | 0.016 | 0.003 | | 0.007 |
| 127184 | PERCHLOROETHYLENE | | 0.011 | | 0.006 |
| 624419 | 2-METHYL-1-BUTYL ACETATE | | 0.011 | | 0.006 |
| 123422 | DIACETONE ALCOHOL | | 0.011 | | 0.006 |
| 91576 | 2-METHYLNAPHTHALENE | | | 0.040 | 0.006 |
| 99037 | OTHER C13 | | | 0.040 | 0.006 |
| 930892 | CIS-1-ETHYL-2-METHYLCYCLOPENTANE | | | 0.040 | 0.006 |
| 7154792 | 2,2,3,3-TETRAMETHYLPENTANE | | | 0.040 | 0.006 |
| 121448 | TRIETHYLAMINE | 0.017 | | | 0.006 |
| 9994 | TOTAL AGGREGATE ORGANIC INGREDIENTS < 0.1% | | 0.010 | | 0.005 |
| 133073 | N-(TRICHLOROMETHYLTHIO)PHTHALIMIDE {FOLPET} | | 0.010 | | 0.005 |
| 138863 | DL-LIMONENE {DIPENTENE} | | 0.009 | | 0.005 |
| 25013154 | METHYL STYRENE (MIXED) {VINYL TOLUENE} | | 0.009 | | 0.005 |
| 111159 | 2-ETHOXYETHYL ACETATE {CELLOSOLVE ACETATE} | | 0.009 | | 0.005 |
| 8708 | MISC. URETHANE-CONTAINING MATERIAL (TOG PORTION) | 0.006 | 0.004 | | 0.004 |

**Table 6.3.6 (continued) Surface Coating: Architectural Coatings (Profile LAD30007n)**

| CAS | CHEMICAL NAME | Water-based Paints | Solvent Paints | Thinners | Com-posite |
|---|---|---|---|---|---|
| | | % TOG | | | |
| 123546 | 2,4-PENTANEDIONE | | 0.008 | | 0.004 |
| 1163195 | DECABROMODIPHENYL OXIDE | | 0.008 | | 0.004 |
| 26471625 | TOLUENE DIISOCYANATES (MIXED ISOMERS) | | 0.008 | | 0.004 |
| 99031 | OTHER C8 | | | 0.030 | 0.004 |
| 99067 | 2,7-DIMETHYLDECANE | | | 0.030 | 0.004 |
| 99068 | 3,5-DIMETHYLNONANE | | | 0.030 | 0.004 |
| 99084 | 1-METHYL-3-BUTYLBENZENE | | | 0.030 | 0.004 |
| 592132 | 2,5-DIMETHYLHEXANE | | | 0.030 | 0.004 |
| 1071267 | 2,2-DIMETHYLHEPTANE | | | 0.030 | 0.004 |
| 3074713 | 2,3-DIMETHYLHEPTANE | | | 0.030 | 0.004 |
| 9989 | VOLATILE METHYL SILOXANES (VMS) | 0.009 | 0.001 | | 0.004 |
| 9997 | AGGREGATED EXEMPT COMPOUNDS < 1.0% | 0.006 | 0.002 | | 0.003 |
| 117817 | DI(2-ETHYLHEXYL)PHTHALATE | | 0.006 | | 0.003 |
| 99038 | OTHER C14 | | | 0.020 | 0.003 |
| 99070 | 1,2,3-TRIMETHYL-4-ETHYLBENZENE | | | 0.020 | 0.003 |
| 99071 | CIS-1-ETHYL-3-METHYLCYCLOPENTANE | | | 0.020 | 0.003 |
| 99085 | TRANS-1-ETHYL-3-METHYLCYCLOPENTANE | | | 0.020 | 0.003 |
| 4292755 | HEXYLCYCLOHEXANE | | | 0.020 | 0.003 |
| 4306654 | 1,1,3,5-TETRAMETHYLCYCLOHEXANE | | | 0.020 | 0.003 |
| 15869893 | 2,5-DIMETHYLOCTANE | | | 0.020 | 0.003 |
| 20278857 | 2,3,5-TRIMETHYLHEPTANE | | | 0.020 | 0.003 |
| 52896910 | 3-ETHYL-4-METHYLHEPTANE | | | 0.020 | 0.003 |
| 101906 | DIGLYCIDYL RESORCINOL ETHER {DGRE} | | 0.005 | | 0.003 |
| 108112 | 4-METHYL-2-PENTANOL {METHYL ISOBUTYL CARBINOL} | | 0.005 | | 0.003 |
| 109604 | PROPYL ACETATE | | 0.005 | | 0.003 |
| 9016879 | METHYLENEDIPHENYLISOCYANATE POLYMERIC | | 0.004 | | 0.002 |
| 584849 | 2,4-TOLUENE DIISOCYANATE {TDI} | | 0.004 | | 0.002 |
| 80159 | CUMENE HYDROPEROXIDE | | 0.004 | | 0.002 |
| 84742 | DIBUTYL PHTHALATE | 0.007 | | | 0.002 |
| 50000 | FORMALDEHYDE | 0.006 | | | 0.002 |
| 61788769 | CHLORAFIN | | 0.004 | | 0.002 |
| 108010 | N,N-DIMETHYLETHANOLAMINE | 0.006 | | | 0.002 |
| 123911 | 1,4-DIOXANE | | 0.003 | | 0.002 |
| 102716 | TRIETHANOLAMINE | 0.005 | | | 0.002 |
| 110496 | ETHYLENE GLYCOL METHYL ETHER ACETATE {METHYL CELLOSOLVE ACETATE} | | 0.003 | | 0.001 |
| 131113 | DIMETHYL PHTHALATE | | 0.003 | | 0.001 |
| 96377 | METHYLCYCLOPENTANE | | | 0.010 | 0.001 |
| 99072 | METHYL PENTYLCYCLOHEXANE | | | 0.010 | 0.001 |
| 99821 | 1-METHYL-4-ISOPROPYLCYCLOHEXANE | | | 0.010 | 0.001 |
| 4032944 | 2,4-DIMETHYLOCTANE | | | 0.010 | 0.001 |
| 94360 | BENZOYL PEROXIDE | | 0.002 | | 0.001 |
| 8713 | MISC. HYDROCARBON RESINS (TOG PORTION) | | 0.002 | | 0.001 |
| 141322 | N-BUTYL ACRYLATE | 0.001 | | | 0.000 |
| 78784 | ISOPENTANE | | | 0.000 | 0.000 |
| 99030 | OTHER C7 | | | 0.000 | 0.000 |
| | | 100 | 100 | 99 | 100 |

## Table 6.3.7 Surface Coating: Other Surface Coating SCC's

| cas | pollutant | 1990 Wtd Avg | Fraction of 1998 Sales | Convert Factor | Auto Refinishing lad30008n | Traffic Markings lad30014n | Wood Furniture lad30009n | Paper, Foil, Film lad30015n | Can Coating lad30011n | Electronic & Other lad30013n | Misc Manuf. lad30010n | Industrial Maint. lad30012n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % | % | | % | % | % | % | % | % | % | % |
| 108883 | TOLUENE | 20.45 | 2.78 | 0.136 | 1.636 | 6.364 | 3.780 | 1.707 | 1.326 | 0.000 | 1.093 | 4.385 |
| 1330207 | ISOMERS OF XYLENE | 16.09 | 1.64 | 0.067 | 1.602 | 0.045 | 1.060 | 0.844 | 0.592 | 0.000 | 0.708 | 2.780 |
| | UNC PEAKS TO CBM XYLENE | 8.33 | | 0.067 | 0.188 | 0.727 | 0.241 | 0.349 | 0.275 | 4.622 | 0.618 | 0.744 |
| 64475850 | MINERAL SPIRITS | 10.39 | 33.26 | 3.203 | ~~41.260~~ | ~~65.629~~ | ~~10.729~~ | ~~45.633~~ | ~~49.263~~ | ~~83.143~~ | ~~54.078~~ | 0.000 |
| 109660 | PENTANE | | | | 31.914 | 50.763 | 8.299 | 35.296 | 38.104 | 64.309 | 41.828 | |
| 107835 | 2-METHYL PENTANE | | | | 1.368 | 2.176 | 0.356 | 1.513 | 1.633 | 2.756 | 1.793 | |
| 96140 | 3-METHYL PENTANE | | | | 3.419 | 5.439 | 0.889 | 3.782 | 4.083 | 6.890 | 4.482 | |
| 287923 | CYCLOPENTANE | | | | 1.140 | 1.813 | 0.296 | 1.261 | 1.361 | 2.297 | 1.494 | |
| 75832 | 2,2-DIMETHYL Butane | | | | 1.140 | 1.813 | 0.296 | 1.261 | 1.361 | 2.297 | 1.494 | |
| 79298 | 2,3-DIMETHYL Butane | | | | 1.140 | 1.813 | 0.296 | 1.261 | 1.361 | 2.297 | 1.494 | |
| 78784 | 2-METHYLBUTANE | | | | 1.140 | 1.813 | 0.296 | 1.261 | 1.361 | 2.297 | 1.494 | |
| 123864 | N-BUTYL ACETATE | 7.07 | 2.99 | 1.00 | 4.925 | 0.000 | 5.579 | 3.896 | 6.337 | 0.000 | 3.337 | 24.667 |
| 78933 | METHYL ETHYL KETONE | 5.79 | 5.25 | 1.00 | 10.758 | 5.630 | 5.854 | 8.429 | 4.469 | 2.465 | 3.567 | 4.452 |
| 108101 | METHYL ISOBUTYL KETONE | 5.57 | 2.05 | 1.00 | 2.866 | 0.000 | 7.682 | 5.625 | 6.890 | 0.000 | 4.685 | 13.340 |
| 64175 | ETHYL ALCOHOL | 2.72 | 7.67 | 2.820 | 5.963 | 0.000 | 30.455 | 6.700 | 3.712 | 0.000 | 4.798 | 0.000 |
| 78922 | S-BUTYL ALCOHOL | 2.70 | | 1.00 | 1.261 | 0.000 | 10.725 | 3.031 | 1.617 | 0.000 | 2.951 | 0.000 |
| 111762 | BUTYL CELLOSOLVE | 2.37 | | 1.00 | 1.855 | 0.000 | 0.898 | 3.808 | 5.899 | 1.458 | 3.099 | 3.503 |
| 67630 | ISOPROPYL ALCOHOL | 2.32 | 4.93 | 2.125 | 9.007 | 0.000 | 12.755 | 2.766 | 5.508 | 0.000 | 1.904 | 0.000 |
| 67641 | ACETONE | 2.26 | 7.21 | 3.190 | 9.498 | 12.452 | 3.742 | 4.152 | 0.000 | 0.000 | 3.173 | 18.957 |
| 141786 | ETHYL ACETATE | 2.20 | 2.72 | 1.00 | 1.317 | 0.000 | 3.043 | 4.324 | 0.382 | 1.240 | 1.414 | 6.204 |
| 78831 | ISOBUTYL ALCOHOL | 2.14 | | 1.00 | 3.376 | 0.000 | 0.782 | 0.000 | 3.396 | 3.208 | 4.077 | 3.912 |
| 123422 | DIACETONE ALCOHOL | 1.83 | | 1.00 | 1.252 | 0.000 | 0.888 | 1.398 | 1.064 | 1.998 | 3.173 | 6.335 |
| 109604 | N-PROPYL ACETATE | 1.21 | 0.18 | 1.00 | 1.029 | 0.000 | 0.000 | 0.000 | 0.894 | 0.000 | 0.863 | 5.533 |
| 71556 | 1,1,1-TRICHLORO-ETHANE | 1.20 | | 1.00 | 0.000 | 9.152 | 0.000 | 0.000 | 0.000 | 0.000 | 1.989 | 0.000 |

**Table 6.3.7 (continued) Surface Coating: Other Surface Coating SCC's**

| | | 1990 Wtd Avg | Fraction of 1998 Sales | Convert Factor | Auto Refinishing | Traffic Markings | Wood Furniture | Paper, Foil, Film | Can Coating | Electronic & Other | Misc Manuf. | Industrial Maint. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | lad30008n | lad30014n | lad30009n | lad30015n | lad30011n | lad30013n | lad30010n | lad30012n |
| **cas** | **pollutant** | **%** | **%** | | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| 107211 | ETHYLENE GLYCOL | 0.73 | 0.71 | 1.00 | 0.148 | 0.000 | 0.074 | 3.337 | 2.478 | 0.117 | 0.773 | 0.295 |
| 108656 | PROPYLENE GLYCOL MONOMETHYL ETHER ACETATE | 0.48 | | 1.00 | 0.380 | 0.000 | 0.180 | 0.777 | 1.202 | 0.292 | 0.633 | 0.720 |
| | OXYGENATES | 0.47 | | 1.00 | 0.260 | 0.000 | 0.814 | 0.437 | 0.569 | 0.292 | 0.526 | 0.851 |
| 112345 | BUTYL CARBITOL | 0.44 | | 1.00 | 0.343 | 0.000 | 0.169 | 0.699 | 1.081 | 0.262 | 0.567 | 0.638 |
| 111159 | CELLOSOLVE ACETATE | 0.29 | | 1.00 | 0.223 | 0.000 | 0.106 | 0.463 | 0.723 | 0.175 | 0.378 | 0.426 |
| | KETONES - GENERAL | 0.27 | 1.37 | 1.00 | 0.185 | 0.000 | 0.137 | 0.210 | 0.154 | 0.292 | 0.469 | 0.949 |
| 107982 | 1-METHOXY-2-PROPANOL | 0.24 | | 1.00 | 0.185 | 0.000 | 0.085 | 0.393 | 0.601 | 0.102 | 0.312 | 0.360 |
| 34590948 | MONOMETHYL ETHER DIPROPYLENE GLYCOL | 0.24 | | 1.00 | 0.185 | 0.000 | 0.085 | 0.393 | 0.601 | 0.102 | 0.312 | 0.360 |
| 110805 | CELLOSOLVE | 0.19 | | 1.00 | 0.148 | 0.000 | 0.074 | 0.314 | 0.479 | 0.117 | 0.255 | 0.295 |
| 111900 | CARBITOL | 0.10 | | 1.00 | 0.074 | 0.000 | 0.032 | 0.157 | 0.244 | 0.058 | 0.123 | 0.147 |
| 111773 | METHYL CARBITOL | 0.10 | | 1.00 | 0.074 | 0.000 | 0.032 | 0.157 | 0.244 | 0.058 | 0.123 | 0.147 |
| **Total** | | 98.20 | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**Table 6.3.8 Dry Cleaning: Commercial/Industrial (LAD30020n) and Coin Operated (LAD30021n)**

| **LAD30021n - Coin Operated Dry Cleaners** | |
|---|---|
| **Species** | **%** |
| Perchloroethylene | 100 |

| **LAD30020n Commercial/Industrial Dry Cleaners** | | | |
|---|---|---|---|
| | Perc | White Spirits | Composite |
| **Species** | **%** | **%** | **%** |
| Perchloroethylene | 100 | | 77 |
| n-nonane | | 9.7 | 2.23 |
| n-decane | | 6.5 | 1.50 |
| methylnonanes | | 4.2 | 0.97 |
| 2,6,-dimethyloctane | | 2.3 | 0.53 |
| n-undecane | | 2.3 | 0.53 |
| other alkanes | | 26.5 | 6.09 |
| monocycloparaffins | | 14.0 | 3.22 |
| trimethylcyclohexane | | 4.0 | 0.93 |
| tert-butylcyclohexane | | 3.9 | 0.89 |
| n-butylcyclopentane | | 4.3 | 0.99 |
| n-butylcyclohexane | | 1.8 | 0.42 |
| other cycloparaffins | | 20.1 | 4.63 |
| other aromatics | | 0.3 | 0.06 |
| Total | | 100.0 | 100.0 |

**Table 6.3.9 Degreasing (LAD30017n)**

| CAS | Species | Cold Cleaning % | Vapor Degreasing % | Composite % |
|---|---|---|---|---|
| | Special Napthas | 27.09 | | |
| 109660 | PENTANE | | | 16.76 |
| 107835 | 2-METHYL PENTANE | | | 0.72 |
| 96140 | 3-METHYL PENTANE | | | 1.80 |
| 287923 | CYCLOPENTANE | | | 0.60 |
| 75832 | 2,2-DIMETHYL Butane | | | 0.60 |
| 79298 | 2,3-DIMETHYL Butane | | | 0.60 |
| 78784 | 2-METHYLBUTANE | | | 0.60 |
| | Pinene Solvents | 19.40 | | 15.52 |
| | D-Limonene Solvents | 14.05 | | 11.24 |
| | Acetone | 9.36 | | 7.49 |
| | Ether Solvents | 8.70 | | 6.96 |
| | Other Ethylene Oxide Solvents | 4.68 | | 3.75 |
| | Other Propylene Oxide-Derived Solvents | 4.01 | | 3.21 |
| | Perchloroethylene | 3.68 | 33.33 | 9.61 |
| | Ester Solvents | 3.68 | | 2.94 |
| | Tetrahydrofuran Solvents | 3.34 | | 2.68 |
| | Other Chlorinated Solvents | 1.34 | | 1.07 |
| | Trichloroethylene | 0.67 | | 0.54 |
| | Trichloroethane | 0.00 | | 0.00 |
| | Methylene Chloride | | 66.67 | 13.33 |
| | | 100.00 | 100.00 | 100.00 |

**Table 6.3.10 Agricultural Pesticide Application (Midwest) (LAD0023m)**

| CAS | POLLUTANT | Speciate 8529 | Composite |
|---|---|---|---|
| 108907 | CHLOROBENZENE | 28.79 | 28.79 |
| 25168052 | CHLOROTOLUENE | 13.39 | 13.39 |
| | UNDEFINED VOC | 16.99 | |
| | UNDEFINED AROMATIC | 13.81 | |
| | KEROSENE/DIESEL/FUEL OIL | 2.96 | |
| | UNDEFINED PETROLEUM DISTILLATES | 0.35 | |
| 64475850 | MINERAL SPIRITS | 0.02 | |
| 64742956 | AROMATIC 100 | 3.04 | |
| | PARAFFINS/OLEFINS (C12-C16) | 1.82 | |
| 76416938 | TENNECO 500-100 | 2.72 | |
| 109660 | PENTANE | | 32.26 |
| 107835 | 2-METHYL PENTANE | | 1.38 |
| 96140 | 3-METHYL PENTANE | | 3.46 |
| 287923 | CYCLOPENTANE | | 1.15 |
| 75832 | 2,2-DIMETHYL Butane | | 1.15 |
| 79298 | 2,3-DIMETHYL Butane | | 1.15 |
| 78784 | 2-METHYLBUTANE | | 1.15 |
| 67630 | ISOPROPYL ALCOHOL | 0.28 | 0.28 |
| 71363 | N-BUTYL ALCOHOL | 0.21 | 0.21 |
| 64175 | ETHYL ALCOHOL | 0.21 | 0.21 |
| 64197 | ACETIC ACID | 0.04 | 0.04 |
| 1330207 | ISOMERS OF XYLENE | 11.78 | 11.78 |
| 95476 | O-XYLENE | 0.31 | 0.31 |
| 124403 | DIMETHYLAMINE | 2.61 | 2.61 |
| 78591 | ISOPHORONE | 0.18 | 0.18 |
| | ALIPHATICS | 0.15 | 0.15 |
| 111762 | BUTYL CELLOSOLVE | 0.14 | 0.14 |
| 108941 | CYCLOHEXANONE | 0.13 | 0.13 |
| 141797 | MESITYL OXIDE | 0.05 | 0.05 |
| 1610180 | PRAMITOL | 0.02 | 0.02 |
| Total | | 100 | 100 |

**Table 6.3.11 Commercial/Consumer Solvents: Adhesive and Sealant Use (Profile LAD30025n)**

| CAS | POLLUTANT | Speciate 8523 | Freedonia | Composite |
|---|---|---|---|---|
| 8030306 | NAPHTHA | 3.09 | 31.59 | |
| 64742956 | AROMATIC 100 | 10.82 | | |
| | UNDEFINED VOC | 8.76 | | |
| | UNDEFINED PETROLEUM DISTILLATES | 4.46 | | |
| 64475850 | MINERAL SPIRITS | 3.81 | | |
| | UNDEFINED AROMATIC | 0.25 | | |
| | KEROSENE/DIESEL/FUEL OIL | 0.1 | | |
| | UNDEFINED PARAFFIN | 0.05 | | |
| 142825 | N-HEPTANE | 3.82 | | |
| | ALIPHATICS | 0.54 | | |
| 8052413 | STODDARD SOLVENT | 0.35 | | |
| 110543 | N-HEXANE | 13.12 | | |
| 8032324 | PETROLEUM ETHER | 6.14 | | |
| 108941 | CYCLOHEXANONE | 0.77 | | |
| 115106 | DIMETHYLETHER | 0.46 | | |
| 589344 | 3-METHYLHEXANE | 0.16 | | |
| 75285 | ISOBUTANE | 0.15 | | |
| 110827 | CYCLOHEXANE | 0.14 | | |
| 591764 | 2-METHYLHEXANE | 0.13 | | |
| 109660 | N-PENTANE | 0.11 | | |
| 64742898 | LACTOL SPIRITS | 0.07 | | |
| 111466 | DIETHYLENE GLYCOL | 0.02 | | |
| 109660 | PENTANE | | | 24.97 |
| 107835 | 2-METHYL PENTANE | | | 1.07 |
| 96140 | 3-METHYL PENTANE | | | 2.68 |
| 287923 | CYCLOPENTANE | | | 0.89 |
| 75832 | 2,2-DIMETHYL Butane | | | 0.89 |
| 79298 | 2,3-DIMETHYL Butane | | | 0.89 |
| 78784 | 2-METHYLBUTANE | | | 0.89 |
| 67561 | METHYL ALCOHOL | 0.11 | 11.67 | 11.93 |
| 64175 | ETHYL ALCOHOL | 0.9 | 7.24 | 7.40 |
| 67630 | ISOPROPYL ALCOHOL | 2.75 | | |
| 71363 | N-BUTYL ALCOHOL | 0.02 | | |
| 98000 | FURFURYL ALCOHOL | 0.02 | | |
| 71238 | N-PROPYL ALCOHOL | 0.03 | | |
| 78933 | METHYL ETHYL KETONE | 6.35 | 10.46 | 10.69 |
| 108883 | TOLUENE | 14.01 | 7.75 | 7.92 |
| 67641 | ACETONE | 11.77 | 4.43 | 4.53 |
| 127184 | PERCHLOROETHYLENE | 0.11 | 4.02 | 4.11 |
| 1330207 | ISOMERS OF XYLENE | 1.63 | 2.21 | 2.26 |

| | | | | |
|---|---|---|---|---|
| 109999 | TETRAHYDROFURAN | 2.59 | | 3.45 |

**Table 6.3.11 (cont.) Commercial/Consumer Solvents: Adhesive and Sealant Use (Profile LAD30025n)**

| CAS | POLLUTANT | Speciate 8523 | Freedonia | Composite |
|---|---|---|---|---|
| 97994 | TETRAHYDRO-2-FURANMETHANOL | 0.19 | | 0.25 |
| | TETRAHYDROFURAN SOLVENTS | | 3.62 | |
| 141786 | ETHYL ACETATE | 1.08 | | 2.44 |
| 123864 | N-BUTYL ACETATE | 0.25 | 2.82 | 1.59 |
| 108214 | ISOPROPYL ACETATE | 0.02 | | 1.36 |
| 110190 | ISOBUTYL ACETATE | 0.02 | | 1.36 |
| | ESTER ACETATE | | 5.23 | |
| 111762 | BUTYL CELLOSOLVE | 0.01 | | 2.05 |
| | BUTANEDIOL DERIVATIVES | | 2.01 | |
| 108101 | METHYL ISOBUTYL KETONE | 0.21 | 0.4 | 0.41 |
| 1321944 | METHYLNAPHTHALENE | 0.06 | | 0.06 |
| 8006642 | TURPENTINE | 0.04 | | 0.04 |
| 91203 | NAPTHALENE | 0.02 | | 0.02 |
| 5989275 | D-LIMONENE | 0.02 | | 0.02 |
| 112243 | TRIETHYLENE TETRAMINE | 0.01 | | 0.01 |
| 107982 | 1-METHOXY-2-PROPANOL | 0.01 | | 0.01 |
| 83329 | ACENAPHTHENE | 0.01 | | 0.01 |
| 79016 | TRICHLOROETHYLENE | 0.01 | | 0.01 |
| 1321671 | NAPHTHOL | 0.01 | | 0.01 |
| 91576 | 2-METHYL NAPHTHALENE | 0.01 | | 0.01 |
| 67721 | HEXACHLOROETHANE | 0.01 | | 0.01 |
| 106887 | 1,2-EPOXYBUTANE | 0.01 | | 0.01 |
| 106978 | N-BUTANE | 0.01 | | |
| 74986 | PROPANE | 0.12 | | |
| | UNDEFINED PROPELLANT | 0.26 | | |
| | ESTER SOLVENTS | | 3.42 | 3.50 |
| | METHYLENE CHLORIDE | | 2.21 | 2.26 |
| | OTHER KETONE SOLVENTS | | 0.4 | |
| Total | | 100.00 | 99.48 | 100 |

**Table 6.3.12 Commercial/Consumer Solvents: Personal Care Products (Profile LAD30026n)**

| CAS | POLLUTANT | Speciate 8501 | Freedonia | Composite |
|---|---|---|---|---|
| 64175 | ETHYL ALCOHOL | 60.99 | 89 | 73.64 |
| 67630 | ISOPROPYL ALCOHOL | 7.96 | 11 | 9.10 |
| | UNDEFINED VOC | 9.52 | | |
| 75285 | ISOBUTANE | 9.16 | | 9.16 |
| 74986 | PROPANE | 2.62 | | 2.62 |
| | UNDEFINED PROPELLANT | 1.91 | | |
| 106978 | N-BUTANE | 1.78 | | 1.78 |
| | UNDEFINED PETROLEUM DISTILLATES | 1.55 | | |
| 67641 | ACETONE | 1.40 | | 1.40 |
| 141786 | ETHYL ACETATE | 0.63 | | 0.63 |
| 64475850 | MINERAL SPIRITS | 0.62 | | |
| 5989275 | D-LIMONENE | 0.29 | | 0.29 |
| | PARAFFINS (C16-C34) | 0.29 | | 0.29 |
| 68916392 | WITCH HAZEL | 0.24 | | 0.24 |
| 123864 | N-BUTYL ACETATE | 0.22 | | 0.22 |
| 115106 | DIMETHYLETHER | 0.20 | | 0.20 |
| 108883 | TOLUENE | 0.13 | | |
| 64197 | ACETIC ACID | 0.11 | | 0.11 |
| 8030306 | NAPHTHA | 0.06 | | 0.06 |
| 111762 | BUTYL CELLOSOLVE | 0.05 | | 0.05 |
| 8007452 | COAL TAR | 0.05 | | 0.05 |
| | ALIPHATICS | 0.04 | | |
| 119368 | METHYL SALICYLATE | 0.04 | | 0.04 |
| 8012951 | MINERAL OIL | 0.03 | | 0.03 |
| 76222 | CAMPHOR | 0.02 | | 0.02 |
| 63148629 | SILICONE | 0.02 | | 0.02 |
| 102716 | TRIETHANOLAMINE | 0.02 | | 0.02 |
| 64742956 | AROMATIC 100 | 0.01 | | |
| 100516 | BENZYL ALCOHOL | 0.01 | | 0.01 |
| 141435 | ETHANOLAMINE | 0.01 | | 0.01 |
| 60297 | ETHYL ETHER | 0.01 | | 0.01 |
| | UNDEFINED PARAFFIN | 0.01 | | |
| | | 100.00 | 100.00 | 100.00 |

**Table 6.3.13 Commercial/Consumer Insecticide Application (Profile LAD0027n)**

| CAS | POLLUTANT | Speciate 8527 | LAD30027n |
|---|---|---|---|
| | UNDEFINED PETROLEUM DISTILLATES | 16.68 | |
| 64475850 | MINERAL SPIRITS | 12.03 | |
| | UNDEFINED VOC | 5.03 | |
| | UNDEFINED AROMATIC | 4.72 | |
| 64742956 | AROMATIC 100 | 4.1 | |
| | KEROSENE/DIESEL/FUEL OIL | 1.84 | |
| | UNDEFINED PARAFFIN | 0.37 | |
| 76416938 | TENNECO 500-100 | 0.35 | |
| | PARAFFINS (C16-C34) | 0.23 | |
| 109660 | PENTANE | | 35.09 |
| 107835 | 2-METHYL PENTANE | | 1.50 |
| 96140 | 3-METHYL PENTANE | | 3.76 |
| 287923 | CYCLOPENTANE | | 1.25 |
| 75832 | 2,2-DIMETHYL Butane | | 1.25 |
| 79298 | 2,3-DIMETHYL Butane | | 1.25 |
| 78784 | 2-METHYLBUTANE | | 1.25 |
| 1330207 | ISOMERS OF XYLENE | 13.39 | 13.39 |
| 67630 | ISOPROPYL ALCOHOL | 7.67 | 7.67 |
| 64175 | ETHYL ALCOHOL | 0.69 | 0.69 |
| 91203 | NAPTHALENE | 7.55 | 7.55 |
| 75285 | ISOBUTANE | 5.19 | 5.19 |
| 106467 | P-DICHLOROBENZENE | 4.22 | 4.22 |
| 74986 | PROPANE | 4.83 | 5.86 |
| 106978 | N-BUTANE | 3.66 | 4.69 |
| | UNDEFINED PROPELLANT | 2.05 | |
| | ALIPHATICS | 1.33 | 1.33 |
| 115106 | DIMETHYLETHER | 1.12 | 1.12 |
| 108941 | CYCLOHEXANONE | 0.93 | 0.93 |
| 111762 | BUTYL CELLOSOLVE | 0.75 | 0.75 |
| 333415 | DIAZINON | 0.3 | 0.30 |
| 5989275 | D-LIMONENE | 0.29 | 0.29 |
| 111273 | N-HEXANOL | 0.24 | 0.24 |
| 63252 | CARBARYL (Sevin) | 0.11 | 0.11 |
| 110123 | METHYL ISOAMYL KETONE | 0.1 | 0.10 |
| 628637 | AMYL ACETATE (MIXED ISOMERS) | 0.06 | 0.06 |
| 127184 | PERCHLOROETHYLENE | 0.04 | 0.04 |
| 111466 | DIETHYLENE GLYCOL | 0.03 | 0.03 |
| 121755 | MALATHION | 0.02 | 0.02 |
| 25551137 | TRIMETHYLBENZENE | 0.02 | 0.02 |
| 11126059 | FREON | 0.02 | |
| 67641 | ACETONE | 0.01 | 0.01 |
| 60515 | DIMETHOATE | 0.01 | 0.01 |
| 108101 | METHYL ISOBUTYL KETONE | 0.01 | 0.01 |
| 8002093 | PINE OIL | 0.01 | 0.01 |
| | | 100 | 100 |

**Table 6.3.14 General Commercial/Consumer Solvent Emissions (Profile LAD30029n)**

| CAS | POLLUTANT | Speciate (8500) | Freedonia | Composite |
|---|---|---|---|---|
| 64175 | ETHYL ALCOHOL | 22.46 | 22.51 | 13.90 |
| 67561 | METHYL ALCOHOL | 5.28 | 39.66 | 24.48 |
| 67630 | ISOPROPYL ALCOHOL | 4.43 | 9.90 | 6.11 |
| | UNDEFINED VOC | 11.78 | | |
| 64475850 | MINERAL SPIRITS | 5.23 | | |
| | UNDEFINED PETROLEUM DISTILLATES | 3.1 | | |
| 64742956 | AROMATIC 100 | 2.68 | | |
| 8052413 | STODDARD SOLVENT | 2.32 | | |
| | KEROSENE/DIESEL/FUEL OIL | 1.56 | | |
| | UNDEFINED AROMATIC | 1.31 | | |
| | ALIPHATICS | 1.27 | | |
| 110543 | N-HEXANE | 0.91 | | |
| 8030306 | NAPHTHA | 0.57 | 6.70 | |
| 142825 | N-HEPTANE | 0.56 | | |
| 76416938 | TENNECO 500-100 | 0.2 | | |
| 8012951 | MINERAL OIL | 0.01 | | |
| 109660 | N-PENTANE | 0.01 | | |
| 109660 | PENTANE | | | 5.18 |
| 107835 | 2-METHYL PENTANE | | | 0.22 |
| 96140 | 3-METHYL PENTANE | | | 0.56 |
| 287923 | CYCLOPENTANE | | | 0.19 |
| 75832 | 2,2-DIMETHYL Butane | | | 0.19 |
| 79298 | 2,3-DIMETHYL Butane | | | 0.19 |
| 78784 | 2-METHYLBUTANE | | | 0.19 |
| 75285 | ISOBUTANE | 4.34 | | 4.34 |
| 67641 | ACETONE | 3.87 | | 3.87 |
| | UNDEFINED PROPELLANT | 3.47 | | |
| 108883 | TOLUENE | 2.88 | 0.79 | 2.88 |
| 1330207 | ISOMERS OF XYLENE | 2.58 | | |
| 74839 | METHYL BROMIDE | 2.4 | | 2.40 |
| 74986 | PROPANE | 2.08 | | 3.82 |
| 108907 | CHLOROBENZENE | 1.6 | | 1.60 |
| 8002093 | PINE OIL | 1.21 | 1.82 | 1.21 |
| 111762 | BUTYL CELLOSOLVE | 1.12 | | 6.95 |
| 106467 | P-DICHLOROBENZENE | 1.06 | | 1.06 |
| 10061015 | CIS-1,3-DICHLOROPROPYLENE | 0.82 | | 0.82 |
| 25168052 | CHLOROTOLUENE | 0.77 | | 0.77 |
| 106978 | N-BUTANE | 0.77 | | 2.51 |
| 8032324 | PETROLEUM ETHER | 0.74 | | |
| 10061026 | TRANS-1,3-DICHLOROPROPENE | 0.74 | | 0.74 |
| 78933 | METHYL ETHYL KETONE | 0.67 | | 0.67 |
| 111466 | DIETHYLENE GLYCOL | 0.51 | | 3.16 |
| 91203 | NAPTHALENE | 0.46 | | 0.46 |
| 127184 | PERCHLOROETHYLENE | 0.45 | | 0.45 |
| 5989275 | D-LIMONENE | 0.3 | 0.59 | 0.59 |
| 141786 | ETHYL ACETATE | 0.26 | | 0.26 |
| | PARAFFINS (C16-C34) | 0.25 | | 0.25 |
| 75218 | ETHYLENE OXIDE | 0.2 | | |
| 115106 | DIMETHYLETHER | 0.16 | | 0.99 |

**Table 6.3.14 (Cont.) General Commercial/Consumer Solvent Emissions (Profile LAD30029n)**

| CAS | POLLUTANT | Speciate (8500) | Freedonia | Composite |
|---|---|---|---|---|
| 60297 | ETHYL ETHER | 0.16 | | 0.99 |
| 123864 | N-BUTYL ACETATE | 0.16 | | 0.16 |
| 124403 | DIMETHYLAMINE | 0.15 | | 0.15 |
| 109999 | TETRAHYDROFURAN | 0.15 | | 0.15 |
| 108941 | CYCLOHEXANONE | 0.13 | | 0.13 |
| 76062 | CHLOROPICRIN | 0.12 | | 0.12 |
| | PARAFFINS/OLEFINS (C12-C16) | 0.11 | | 0.11 |
| | UNDEFINED PARAFFIN | 0.11 | | |
| 108101 | METHYL ISOBUTYL KETONE | 0.09 | | 0.09 |
| 141435 | ETHANOLAMINE | 0.08 | | 0.08 |
| 8001589 | CREOSOTE | 0.07 | | 0.07 |
| 68916392 | WITCH HAZEL | 0.07 | | 0.07 |
| 107982 | 1-METHOXY-2-PROPANOL | 0.06 | | 0.37 |
| 111308 | GLUTARALDEHYDE | 0.06 | | 0.06 |
| 75525 | NITROMETHANE | 0.06 | | 0.06 |
| 8006642 | TURPENTINE | 0.06 | | 0.06 |
| 111773 | METHYL CARBITOL | 0.05 | | 0.31 |
| 64197 | ACETIC ACID | 0.04 | | 0.04 |
| 111900 | CARBITOL | 0.04 | | 0.04 |
| 763699 | ETHYL-3-ETHOXYPROPIONATE | 0.04 | | 0.25 |
| 100414 | ETHYLBENZENE | 0.04 | | 0.04 |
| 50000 | FORMALDEHYDE | 0.04 | | 0.04 |
| 110190 | ISOBUTYL ACETATE | 0.04 | | 0.04 |
| 1321671 | NAPHTHOL | 0.04 | | 0.04 |
| 8008579 | OIL OF ORANGE | 0.04 | | 0.04 |
| 67663 | CHLOROFORM | 0.03 | | 0.03 |
| 109864 | METHYL CELLOSOLVE | 0.03 | | 0.19 |
| 100516 | BENZYL ALCOHOL | 0.02 | | 0.02 |
| 74851 | ETHYLENE | 0.02 | | |
| 108214 | ISOPROPYL ACETATE | 0.02 | | 0.02 |
| 79209 | METHYLACETATE | 0.02 | | 0.02 |
| 71363 | N-BUTYL ALCOHOL | 0.02 | | 0.02 |
| 71238 | N-PROPYL ALCOHOL | 0.02 | | 0.02 |
| 95476 | O-XYLENE | 0.02 | | 0.02 |
| 30525894 | PARAFORMALDEHYDE | 0.02 | | 0.02 |
| 97994 | TETRAHYDRO-2-FURANMETHANOL | 0.02 | | 0.02 |
| 79016 | TRICHLOROETHYLENE | 0.02 | | 0.02 |
| 121448 | TRIETHYLAMINE | 0.02 | | 0.02 |
| 7785264 | (1S)-(-)-ALPHA-PINENE | 0.01 | | 0.01 |
| 25265774 | 2,2,4-TRIMETHYL-1,3-PENTANEDIOL ISOBUTYRATE | 0.01 | | 0.06 |
| 104767 | 2-ETHYL HEXANOL | 0.01 | | 0.01 |
| 591764 | 2-METHYLHEXANE | 0.01 | | 0.01 |
| 107835 | 2-METHYLPENTANE | 0.01 | | 0.01 |
| 589344 | 3-METHYLHEXANE | 0.01 | | 0.01 |
| 108112 | 4-METHYL-2-PENTANOL | 0.01 | | 0.01 |
| 2492366 | BUTYL | 0.01 | | |
| | C10 PARAFFINS | 0.01 | | 0.01 |
| 76222 | CAMPHOR | 0.01 | | 0.01 |
| 63252 | CARBARYL | 0.01 | | 0.01 |
| 110805 | CELLOSOLVE | 0.01 | | 0.06 |

**Table 6.3.14 (Cont.) General Commercial/Consumer Solvent Emissions (Profile LAD30029n)**

| CAS | POLLUTANT | Speciate (8500) | Freedonia | Composite |
|---|---|---|---|---|
| 8007452 | COAL TAR | 0.01 | | 0.01 |
| 1338029 | COPPER NAPHTHENATE | 0.01 | | 0.01 |
| 110827 | CYCLOHEXANE | 0.01 | | 0.01 |
| 123422 | DIACETONE ALCOHOL | 0.01 | | 0.01 |
| 333415 | DIAZINON | 0.01 | | 0.01 |
| 96480 | GAMMA-BUTYROLACTONE | 0.01 | | 0.01 |
| 67721 | HEXACHLOROETHANE | 0.01 | | 0.01 |
| 78591 | ISOPHORONE | 0.01 | | 0.01 |
| 64742898 | LACTOL SPIRITS | 0.01 | | 0.01 |
| 110123 | METHYL ISOAMYL KETONE | 0.01 | | 0.01 |
| 119368 | METHYL SALICYLATE | 0.01 | | 0.01 |
| 111273 | N-HEXANOL | 0.01 | | 0.01 |
| 95498 | O-CHLOROTOLUENE | 0.01 | | 0.01 |
| 95501 | O-DICHLOROBENZENE | 0.01 | | 0.01 |
| 79210 | PEROXYACETIC ACID | 0.01 | | 0.01 |
| 57556 | PROPYLENE GLYCOL | 0.01 | 4.63 | 4.63 |
| 108656 | PROPYLENE GLYCOL MONOMETHYL ETHER ACETATE | 0.01 | | 0.06 |
| 63148629 | SILICONE | 0.01 | | 0.01 |
| 102716 | TRIETHANOLAMINE | 0.01 | | 0.01 |
| 1300716 | XYLENOL | 0.01 | | 0.01 |
| | Ether Solvents | | 9.01 | |
| | E-Series Ether Solvents | | 2.27 | |
| | Other Propylene Oxide-Derived Solvents | | 2.12 | |
| Total | | 100 | 100 | 100 |

**Table 6.4.1 Open Fire Profiles**

| Profile Number | lad40008n | | lad30032n lad30033n lad40007n | lad40009n |
|---|---|---|---|---|
| **Compound** | **Forest fuels** | **Grasslands** | **Composite** | **Agricultural** |
| Ethane | 2.7 | 2.1 | 2.4 | 7 |
| Propane | 0.6 | 0.6 | 0.5 | 4 |
| n-Butane | 0.17 | 0.15 | 0.16 | 0.4 |
| i-Butane | 0.05 | 0.05 | 0.05 | 0.1 |
| n-Pentane | 0.15 | 0.04 | 0.11 | 0.17 |
| 2-Methylbutane | 0.07 | 0.09 | 0.07 | 0.12 |
| n-Hexane | 0.12 | 0.31 | 0.16 | 0.3 |
| i-Hexanes | 0.2 | 0.4 | 0.23 | 0.6 |
| Heptanes | 0.2 | 0.4 | 0.23 | 0.6 |
| Acetylene | 0.7 | 2.3 | 1 | 2.5 |
| Propyne | 0.12 | 0.17 | 0.13 | 0.22 |
| 1,3-Butadiene | 0.6 | 0.6 | 0.5 | 0.6 |
| Isoprene | 1.2 | 0.16 | 1.1 | 0.3 |
| Ethylene | 4 | 8 | 5 | 10 |
| Propylene | 2.2 | 2.3 | 2.4 | 7 |
| 1-Butene | 0.3 | 0.6 | 0.3 | 0.9 |
| Methylvinylether | 1.3 | 1.9 | 1.3 | |
| i-Butene | 0.2 | 0.23 | 0.19 | 0.6 |
| t-2-Butene | 0.07 | 0.19 | 0.1 | 0.28 |
| c-2-Butene | 0.17 | 0.16 | 0.16 | 0.3 |
| 1-Pentene | 0.12 | 0.17 | 0.13 | 0.06 |
| 2-Methylbutenes | 0.08 | 0.06 | 0.07 | 0.05 |
| Cyclopentene | 0.05 | 0.09 | 0.05 | 0.14 |
| 4-Methyl-1-pentene | 0.12 | 0.4 | 0.17 | 0.11 |
| 1-Hexene | 0.22 | 0.29 | 0.22 | 0.09 |
| Octenes | 0.012 | 0.5 | 0.11 | 0.028 |
| Terpenes | 0.5 | 0.12 | 0.4 | 0.1 |
| Benzene | 1.8 | 1.7 | 1.7 | 1 |
| Toluene | 1.5 | 1.2 | 1.3 | 0.18 |
| Xylenes | 0.5 | 0.4 | 0.4 | 0.07 |
| Ethylbenzene | 0.12 | 0.1 | 0.11 | 0.21 |
| Styrene | 0.3 | 0.19 | 0.27 | 0.21 |
| Methanol | 7 | 10 | 8 | 14 |
| Phenol | 5 | 3 | 5 | 0.007 |
| Ethanol | 0.04 | 0.09 | 0.05 | 0.12 |
| 1-Propanol | 0.1 | 0.2 | 0.11 | 0.28 |
| Butanols | 0.027 | 0.06 | 0.03 | 0.08 |
| Cyclopentanol | 0.1 | 0.25 | 0.13 | 0.12 |
| Formaldehyde | 6 | 6 | 7 | 10 |

| Table 6.4.1 (Cont.) Open Fire Profiles | | | | |
|---|---|---|---|---|
| **Profile Number** | **lad40008n** | | **lad30032n lad30033n lad40007n** | **lad40009n** |
| **Compound** | **Forest fuels** | **Grasslands** | **Composite** | **Agricultural** |
| Acetaldehyde | 5 | 5 | 4 | 4 |
| Glycolaldehyde | 3.1 | 4 | 4 | |
| Acrolein | 0.6 | 0.6 | 0.6 | 1.2 |
| Propanal | 0.3 | 0.07 | 0.26 | 0.6 |
| Butanals | 0.5 | 0.4 | 0.5 | 0.14 |
| Hexanals | 0.05 | 0.1 | 0.06 | 0.08 |
| Heptanals | 0.01 | 0.023 | 0.012 | 0.007 |
| Acetone | 2.3 | 2.5 | 2.2 | 4 |
| 2-Butanone | 1.1 | 2 | 1.3 | 3 |
| 1-hydroxy-2-Propanone | 20 | 5 | 15 | |
| 2,3-Butanedione | 2.3 | 4 | 2.6 | 6 |
| Pentanones | 0.22 | 0.12 | 0.19 | 0.05 |
| Heptanones | 0.012 | 0.05 | 0.019 | 0.014 |
| Octanones | 0.05 | 0.12 | 0.06 | 0.14 |
| Benzaldehyde | 0.09 | 0.23 | 0.11 | 0.06 |
| Furan | 1.3 | 1.2 | 1.3 | 3 |
| 2-methyl Furan | 1.2 | 4 | 1.6 | 0.08 |
| 3-methyl Furan | 0.12 | 0.07 | 0.1 | 0.021 |
| 2-ethyl Furan | 0.015 | 0.008 | 0.012 | 0.007 |
| 2,4-dimethyl Furan | 0.05 | 0.06 | 0.05 | 0.014 |
| 2,5-dimethyl Furan | 0.12 | 0.016 | 0.09 | 0.21 |
| Tetrahydrofuran | 0.05 | 0.13 | 0.06 | 0.04 |
| 2,3-Dihydrofuran | 0.04 | 0.09 | 0.05 | 0.03 |
| Benzofuran | 0.06 | 0.11 | 0.07 | 0.028 |
| Acetonitrile | 1.9 | 0.9 | 1.6 | 1.2 |
| Propenenitrile | 0.5 | 0.5 | 0.4 | |
| Propanenitrile | 0.6 | 0.3 | 0.5 | |
| Formic acid | 3 | 5 | 4 | 1.5 |
| Acetic acid | 14 | 15 | 16 | 6 |
| Chloromethane | 0.12 | 0.6 | 0.23 | 1.7 |
| Furfural | 1.1 | 1.8 | 1.2 | 2.5 |
| Methyl formate | 0.06 | 0.12 | 0.07 | 0.17 |
| Methyl acetate | 0.27 | 0.4 | 0.29 | 0.7 |
| Hydrogen cyanide | 0.4 | 0.22 | 0.31 | 1 |
| Carbonyl sulfide | 0.08 | 0.12 | 0.08 | 0.4 |
| Methyl bromide | 0.008 | 0.016 | 0.009 | 0.021 |
| Methyl iodide | 0.0015 | 0.004 | 0.0019 | 0.007 |
| Total | 100 | 100 | 100 | 100 |