



DEPARTMENT OF
ECOLOGY
State of Washington

**SIP Revision
for the
Thurston County, Washington
Second 10-Year Limited Maintenance Plan for
PM₁₀**

April 2013 PUBLIC REVIEW DRAFT
Publication no. [XX-XX-XXX]

Publication and Contact Information

This report is available on the Department of Ecology's website at <https://fortress.wa.gov/ecy/publications/SummaryPages/xxxxxxx.html>

For more information contact:

xxxxxxx

Air Quality Program

P.O. Box 47600

Olympia, WA 98504-7600

Phone: (360) 407-6600

Washington State Department of Ecology - www.ecy.wa.gov

- Headquarters, Olympia 360-407-6000
- Northwest Regional Office, Bellevue 425-649-7000
- Southwest Regional Office, Olympia 360-407-6300
- Central Regional Office, Yakima 509-575-2490
- Eastern Regional Office, Spokane 509-329-3400

If you need this document in a format for the visually impaired, call the Air Quality Program at (360) 407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

**SIP Revision
for the
Thurston County, Washington
Second 10-Year Limited Maintenance Plan for
PM₁₀**

Air Quality Program
Washington State Department of Ecology
Olympia, Washington
Project Lead: Laurie Hulse-Moyer, Air Quality Planner

In conjunction with
Olympic Region Clean Air Agency

Table of Contents

List of Figures and Tables.....	v
Tables.....	v
Figures.....	v
Acronyms and Abbreviations.....	vi
Abstract/Executive Summary.....	viii
Introduction.....	1
Background.....	2
Limited Maintenance Plan Option.....	4
Particulate Matter Monitoring.....	6
Emission Inventory.....	12
Control Measures.....	13
Contingency Measures.....	15
Commitment to Continued Monitoring.....	16
Verification of Continued Attainment.....	16
Summary of Maintenance Plan Commitments.....	17
Required Plans Complete.....	17
Appendix A. Limited Maintenance Plan Qualification.....	18
Appendix B. Ecology 2007 Network Report/EPA approval.....	21
Appendix C. Ecology Correlation, PM10 to Nephelometer.....	27
Appendix D. ORCAA Collocated Monitoring.....	28
Appendix E. Emission Inventory Documentation.....	29
Appendix F. Inventory Preparation Plan.....	33
Appendix G. Olympic Region Clean Air Agency Regulations.....	41
Appendix H. Washington State Regulation - Solid Fuel Burning Devices.....	45

List of Figures and Tables

Page

Tables

Table 1. EPA Actions and Plan Submittals for Thurston County	4
Table 2. Particulate Matter Monitoring at Lacey-College Street	7
Table 3. TCMA Annual and Winter Day PM ₁₀ Emissions	13
Table 4. Control Measures in ORCAA Rules	14
Table 5. Requested EPA Action on Chapter 173-433 WAC Solid Fuel Burning Devices.....	15
Table 6. Second 10-Year LMP Commitments	17

Figures

Figure 1. TCMA and the Lacey-College Street Particulate Monitoring Site.....	3
Figure 2. Lacey-College Street Historical PM ₁₀ Concentrations.....	8
Figure 3. Lacey-College Street Correlation.....	9
Figure 4. Lacey College Street 24-hour NPM10 Values – 2006-2012.....	10

DRAFT

Acronyms and Abbreviations

ADVMT	Average Daily Vehicle Miles Traveled
AERR	Air Emissions Reporting Rule
AP42	EPA's Compilation of Air Pollutant Emission Factors
AQI	Air Quality Index
AQS	Air Quality System
b_{scat}	A measure of light scatter, scattering coefficient
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CARB	California Air Resources Board
DQO	Data Quality Objectives
DV	Design Value
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
g/hr	grams per hour
HPMS	U.S. DOT Highway Performance Monitoring System
IPP/QAP	Inventory Preparation Plan and Quality Assurance Plan
LMP	Limited Maintenance Plan
MOS	Margin of Safety
NAA	Nonattainment area
NAAQS	National Ambient Air Quality Standards
NAMS	National Ambient Monitoring Sites
NEI	EPA's National Emission Inventory
NPM_{10}	Particulate Matter 10 microns or less from nephelometer values
$\text{NPM}_{2.5}$	Particulate Matter 2.5 microns or less from nephelometer values
ORCAA	Olympic Region Clean Air Agency
PM_{10}	Particulate Matter, ten microns or less
$\text{PM}_{2.5}$	Particulate Matter, 2.5 microns or less
RACM	Reasonably Available Control Technologies
RWC	Residential Wood Combustion
SIP	State Implementation Plan
SLAMS	State and Local Ambient Monitoring Sites
TCMA	Thurston County Maintenance Area
TRPC	Thurston Regional Planning Council
TEOM	Tapered Element Oscillating Microbalance
TSP	Total Suspended Particulate
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
VMT	Vehicle Miles Traveled
WRAP	Western Regional Air Partnership
WSDOT	Washington State Department of Transportation

Acknowledgements

The authors of this report would like to thank the following people for their contribution to this study:

Olympic Region Clean Air Agency:

- Robert Moody
- Jimmy Werner
- Odelle Hadley

Washington State Department of Ecology:

- Laurie Hulse-Moyer
- Doug Schneider
- Sally Otterson
- Joan McMillen
- Mike Ragan
- Sean Lundblad
- Anya Caudill
- Melanie Pearson
- Melanie Forster

DRAFT

Abstract/Executive Summary

The cities of Lacey, Olympia and Tumwater in Thurston County, Washington meet the federal standard for Particulate Matter 10 microns and smaller (PM₁₀). This State Implementation Plan (SIP) revision explains how this area will continue to meet this standard through 2020. EPA sets standards for particle pollution because smaller particles such as soot, dust, and unburned fuel can penetrate deeply into the lungs and cause health problems. The current 24-hour federal health standard for PM₁₀, set in 1987, is 150 micrograms per cubic meter (µg/m³). To maintain compliance with the standard, monitored levels should not exceed this level in the area more than once a year over three years.

The Lacey, Olympia, and Tumwater area, called the Thurston County Maintenance Area (TCMA or maintenance area), violated the 24-hour standard in the late 1980s. Smoke from woodstoves and fireplaces caused the TCMA to violate the standard. Control measures brought the TCMA into attainment by 1991. EPA redesignated the TCMA to attainment in 2000. The Olympic Region Clean Air Agency (ORCAA) has enforcement authority for the TCMA.

The Clean Air Act (CAA) requires an area being redesignated to attainment have an EPA-approved maintenance plan that provides for the area's continued compliance with the PM₁₀ standard for 10 years. A second 10-year plan must follow the first 10-year plan. This document, the SIP Revision for the Thurston County, Washington, Second 10-year Limited Maintenance Plan for PM₁₀,

- meets the requirement for a second 10-year plan,
- covers the period through 2020, and
- fulfills the final maintenance planning requirements of the CAA for the TCMA.

This plan includes justification for using an alternate monitoring method. Different types of monitors and methods have been used to assess particulate matter levels since 1985. ORCAA currently operates a nephelometer to track air quality. While not a federal reference method, both Ecology's and ORCAA's research shows that for this area, the nephelometer produces results similar to the federal reference method. Therefore, this monitor is a reasonable, accurate and reliable way to represent particulate matter levels and demonstrate compliance with the 1987 PM₁₀ standard for the TCMA.

Since the maintenance area meets EPA criteria and shows little risk of reviolating the federal standard, Ecology is submitting a streamlined maintenance plan called a Limited Maintenance Plan (LMP). The LMP relies on the same control measures that brought the area into attainment and supported the initial maintenance plan—basically,

- curtailment of wood burning devices during periods of impaired air quality
- certification of new wood burning devices
- rules governing sale and removal of uncertified wood stoves
- restrictions on outdoor burning

While these control measures have not changed, the underlying law and rules have. Ecology requests EPA approve ORCAA and Ecology rules that reflect these updates.

ORCAA will continue to monitor air quality in the TCMA and document the area's continued compliance with the 1987 PM₁₀ standard.

Introduction

This State Implementation Plan (SIP) revision explains how the cities of Lacey, Olympia and Tumwater in Thurston County, Washington currently meet and will continue to meet the 1987 National Ambient Air Quality Standard (NAAQS) for particulate matter ten microns or smaller (PM₁₀) through 2020.

Washington State Department of Ecology (Ecology) prepared this plan with the Olympic Region Clean Air Agency (ORCAA), the local clean air agency with jurisdiction over Thurston County.

Particulate Matter Standards - The Environmental Protection Agency (EPA) sets air quality standards for particulate matter to protect public health. Particle matter pollution is a public health issue because smaller particles can penetrate deep into the lungs and cause health problems. Particle matter comes from soot, dust, and unburned fuel suspended in the air. EPA revised the particulate matter NAAQS from total suspended particulate (TSP) to PM₁₀ on July 1, 1987, since smaller particles were determined to be more harmful. The primary or health-based 24-hour standard for PM₁₀ was set at 150 µg/m³, and cannot be exceeded more than once a year on average over three years. This standard remains in effect today. Ten years later on July 18, 1997, EPA set a 24-hour standard for fine particulate matter (particulate matter 2.5 microns or smaller or PM_{2.5}) at 65 µg/m³. In 2006, the 24-hour standard was revised from 65 µg/m³ to 35 µg/m³.

Thurston County Maintenance Area Compliance History - Thurston County violated the 24-hour PM₁₀ NAAQS in the late 1980s in the winter and wood smoke was the cause. These violations were recorded at ORCAA's PM₁₀ monitoring site on College Street in Lacey (Lacey-College Street)¹. When the 1990 Clean Air Act Amendments (CAAA) were passed, EPA designated the Thurston County Maintenance Area (TCMA)² a nonattainment area, an area out of compliance with the PM₁₀ standard.

Ecology and ORCAA prepared plans to fulfill Clean Air Act (CAA) requirements. An attainment plan described how the area would comply with the standard; a maintenance plan described how the area would stay in compliance.

Since woodstoves and fireplaces contributed the most to particulate matter levels in winter, limiting wood burning when air quality was poor was one of the control measures included in the attainment plan. Air quality improved once this and other measures from the plan went into effect. The control and contingency measures from the attainment and maintenance plans are still in place. By the early 1990s, the monitors were consistently recording values below the standard. The area has met the standard for well over two decades.

Plan Structure - This SIP revision includes the TCMA compliance history and describes how the area met and will continue to meet the standard, as well as what will be done if the standard is exceeded. This plan also includes other EPA-required elements, such as an emissions and monitoring review.

This document is organized as follows:

- Section 2 – TCMA and PM₁₀ Standard Background - describes the area's compliance history and contains background information on the PM₁₀ standard
- Section 3 – Limited Maintenance Plan (LMP) Option - describes the criteria an area must meet to

¹ At Mt. View Elementary School–SLAMS, Site ID 53-067-0013

² Comprised of the cities of, Lacey Olympia and Tumwater, as well as unincorporated areas of Thurston County lying within or between the municipal boundaries.

- qualify for this option and how the TCMA meets these criteria
- Section 4 – PM₁₀ Monitoring History - provides a brief history of monitoring in the TCMA, an evaluation of the relationship of PM₁₀ to PM_{2.5} in Thurston County and justification for using an alternative monitoring method
 - Section 5 – Emission Inventory - includes historical information on the most significant PM₁₀ emission categories from the original maintenance plan and an updated inventory on these categories
 - Section 6 – Control Measures - lists the measures and rules that were in place in the original maintenance plan, the current rules that maintain and enforce these measures and includes a request that EPA incorporate and include the updated rules in Washington State's SIP
 - Section 7 – Contingency Measures - describes the provisions that are in place in rules and will be taken, if the PM₁₀ standard is violated
 - Section 8 – Commitment to Continued Monitoring – states that continued monitoring will be done
 - Section 9 – Verification of Continued Attainment – describes how continued compliance will be confirmed
 - Section 10 – Summary of Maintenance Plan Commitments – outlines commitments of this plan
 - Section 11 – Completion of Required Plans – states that this document fulfills federal planning requirements

Background

Historical information on the TCMA, its compliance, and federal plan history are below.

Thurston County Maintenance Area - The TCMA is located in Washington State, west of the Cascade Mountains and south of Puget Sound. The topography influences the meteorology at the site. The monitoring site is located in Lacey, Washington, at an elevation of 70 meters (230 feet). Figure 1 shows the maintenance area boundary, the location of the three cities in the TCMA and the Lacey-College Street monitoring site.

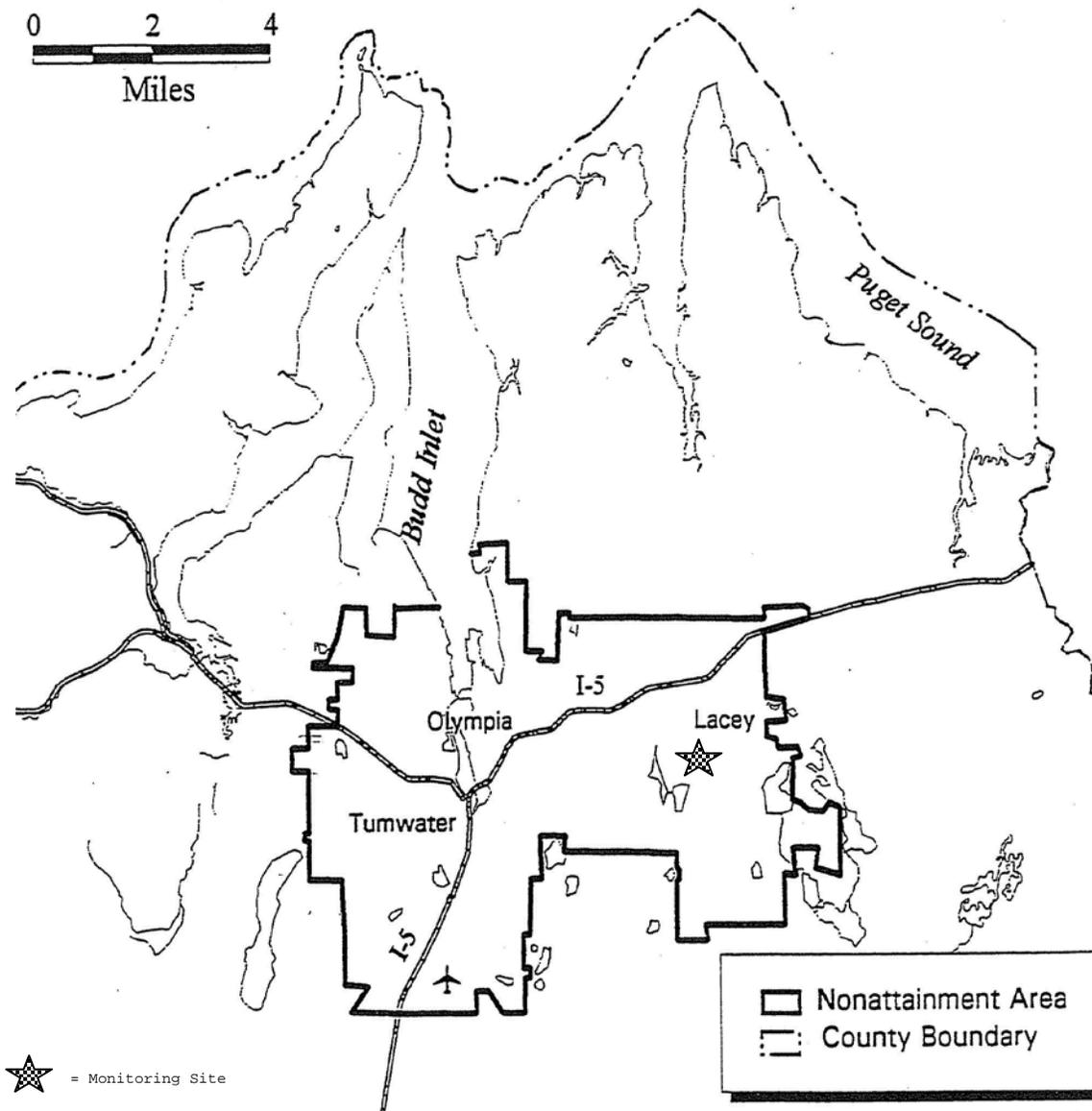


Figure 1. TCMA and the Lacey-College Street Particulate Monitoring Site.

Thurston County Compliance History - The Lacey-College Street monitoring site recorded ten exceedances of the PM_{10} standard between 1985 and 1988. When the new PM_{10} standard was set in July 1987, EPA identified Lacey, Olympia and Tumwater as a “Group I” area of concern, that is, at risk for violating the 24-hour PM_{10} standard (52 FR 29383, August 7, 1987). The 1990 Clean Air Act Amendments (CAAA) required EPA to designate Lacey, Olympia and Tumwater a moderate PM_{10} nonattainment area because of violations of the PM_{10} standard. The area attained the standard by 1991, was redesignated by EPA to a maintenance area in December 2000, and has remained in compliance with this standard.

Plans Submitted - Ecology and ORCAA prepared plans to fulfill CAA requirements. An attainment plan described how the area would comply with the standard; a maintenance plan described how the area would stay in compliance. These plans are:

- Attainment Plan comprised of two submittals – the original dated November 1988 and a

supplement, dated November 1991

- Redesignation Request and Maintenance Plan, dated June 1997³

The following table summarizes the EPA actions, Ecology and ORCAA submissions and EPA approvals for this area.

Table 1. EPA Actions and Plan Submittals for Thurston County

EPA Actions or Requirement	Agency Response or Plan	EPA Approval
Attainment Plan		
New standard set for PM ₁₀ - July 1, 1987 Thurston County designated Group I PM ₁₀ area of concern - August 7, 1987	<i>State Implementation Plan for Thurston County – Particulate Matter, A Plan for Attaining and Maintaining the NAAQS for PM₁₀</i> , dated November 1988, publication no. 88-28 (Ecology, Comis, Sue, et. al)	Plan fulfilled EPA requirements for Group I Areas
Thurston County designated PM ₁₀ nonattainment area by 1990 Clean Air Act Amendments - November 15, 1991	Supplement to above plan, November 1991, (Ecology, Schneider, Doug, et. al)	Supplement developed to address the 1990 CAAA EPA approved July 27, 1993 (58 FR 40056), effective September 27, 1993
Redesignation Request and Maintenance Plan		
Redesignation request must be accompanied by a maintenance plan (CAA 175A (a))	<i>Redesignation Request and Maintenance Plan for Thurston County, Washington PM₁₀ Nonattainment Area</i> , June 1, 1997, (ORCAA, Systems Applications International, Moody, Carr, et. al)	EPA approved October 4, 2000 (65 FR 59128) and the TCMA became a maintenance area effective December 4, 2000.

This plan, the SIP Revision for the Thurston County, Washington Second 10-Year Limited Maintenance Plan for PM₁₀, is the last maintenance plan for this area. This maintenance plan revision ensures compliance through 2020 and fulfills the second 10-year planning requirement of CAA Section 175A (b).

Limited Maintenance Plan Option

Because the TCMA is a maintenance area, the CAA requires Ecology submit a plan that demonstrates compliance with the NAAQS through 2020. EPA developed the Limited Maintenance Plan (LMP) option so areas with little risk of reviolating the PM₁₀ standard could be easily redesignated from nonattainment

³ This plan was withdrawn after EPA established a revised PM₁₀ standard and instituted a process for revoking the old standard. The plan was withdrawn over concerns that if the plan were approved, the area would have a maintenance plan and a 10-year commitment for a standard that no longer existed. However, in 1999, the US Court of Appeals vacated the 1997 standard and EPA determined that the 1987 standard still applied. As a result, ORCAA requested that Ecology resubmit the maintenance plan to EPA.

to attainment (also called maintenance status). EPA also allows states use this policy to prepare the required second 10-year maintenance plans, if the area meets the qualification criteria in the EPA LMP Option Guidance (LMP Guidance)⁴. This section describes the advantages of the LMP option and how the TCMA meets the qualification criteria.

Maintenance Demonstration: A maintenance plan normally contains an emissions or modeling demonstration that shows how the area will stay in compliance through the 10-year maintenance period. This demonstration normally requires a projected emissions inventory. However, an area meeting the LMP qualification criteria is at little risk of violating the standard because emissions are not expected to grow sufficiently to threaten maintenance of the standard. Therefore, when an area meets the criteria, the maintenance demonstration is presumed to be satisfied and there is no need to project emissions over the maintenance period.

Transportation Conformity: The transportation conformity rule (40 CFR Parts 51 and 93) applies to nonattainment and maintenance areas. It is not reasonable to expect that motor vehicle emissions would grow enough to threaten maintenance, if an area expects only limited growth in traffic emissions and qualifies for the LMP option. Therefore, a regional emissions analysis is not required to determine whether the region's long-range transportation plan and short-term transportation improvement program conform to the maintenance plan. Other conformity requirements, such as consultation between agencies on air quality impacts of transportation projects, still apply.

LMP Qualification Criteria - To take advantage of the LMP option, an area must be attaining the NAAQS, cannot exceed the average 24-hour PM₁₀ design value of 98 µg/m³ and should expect only limited growth in on-road motor vehicle emissions. The TCMA meets these criteria as described below; supporting information can be found in Appendix A.

How the TCMA qualifies for the LMP option:

1. *The area must be attaining the NAAQS:* Thurston County attained the standard in 1991, was formally redesignated to attainment in 2000, and has been in compliance with the PM₁₀ standard for well over two decades.
2. *The average 24-hour PM₁₀ design value for the area based upon the most recent five years of data should not exceed 98 µg/m³.* A design value is the statistic based on monitoring data that determines an area's compliance status. The LMP Guidance directs the design value be based on the most recent five years of data⁵. The TCMA design value based on Federal Reference Method (FRM) 24-hour PM₁₀ monitoring data from 2001 through 2005 is 60 µg/m³. The most recent design value estimate based on an alternative method, using 2008 to 2012 values, is 45 µg/m³. Since both these values are below 98 µg/m³, the value stipulated in the LMP Guidance, the TCMA meets this condition.
3. *The area should expect only limited growth in on-road motor vehicle PM₁₀ Emissions (including fugitive dust) and should have passed a motor vehicle regional emissions analysis test, (i.e., passes the Motor Vehicle Regional Analysis Methodology found in Attachment B of the LMP Guidance.)* TCMA meets both these criteria. First, the Thurston Regional Planning Council (TRPC) projects only limited growth in on-road motor vehicle PM₁₀ emissions for the

⁴ Wegman, Lydia, Limited Maintenance Plan Option for Moderate PM₁₀ Nonattainment Areas, EPA memo, August 9, 2001

⁵ Ibid, pp 3.

TCMA from 2010 through 2020⁶. Second, the area passes the motor vehicle regional emissions analysis test.

As described above and in Appendix A, this area clearly attains the NAAQS, the design values are well below the defined margin of safety and the growth in PM₁₀ emissions from motor vehicles will not threaten compliance with the standard. Thus, the TCMA meets the LMP qualification criteria and qualifies for the LMP option.

Ecology provided its analysis to EPA Region 10. EPA Region 10 and Ecology mutually agreed to the LMP approach. ORCAA will calculate the 5-year design value estimate and provide it to Ecology annually. Ecology will include a statement that the area continues to qualify for the LMP option in the annual monitoring network report.

Particulate Matter Monitoring

This section discusses the history of PM₁₀ and PM_{2.5} monitoring in the TCMA, the analysis that demonstrates using a correlated nephelometer is a reasonable way to estimate PM₁₀ levels in Thurston County, and the relationship between PM₁₀ and PM_{2.5} in the TCMA.

Particulate Matter Monitoring History – ORCAA conducts ambient monitoring in Thurston County. The Lacey-College Street site has long served as the monitoring site that represents particulate matter levels in Thurston County.

Types of Particulate Monitors – At the Lacey-College Street monitoring site, PM₁₀ and PM_{2.5} have been measured using both Federal Reference Methods (FRM) and alternative methods not approved by EPA for comparison to the NAAQS. The following monitors have been used to measure particulate matter at the site.

- FRM
 - Two different models of PM₁₀ High Volume (Hi-Vol) monitor,
 - PM_{2.5} sequential monitor
- Alternative Methods
 - PM_{2.5} Tapered Element Oscillating Microbalance (TEOM),
 - Two types of nephelometers

Nephelometers have been used at Lacey-College Street and other locations in the maintenance area for decades. A nephelometer measures light scatter (b_{scat}) and, when correlated with a FRM instrument, accurately represents particulate matter levels. Ecology and ORCAA analysis shows that the nephelometer produces results similar to those recorded with the FRM PM₁₀ instrument at Lacey-College Street. Particulate matter results derived from nephelometer values for PM₁₀ and PM_{2.5} are designated as NPM₁₀ and NPM_{2.5}, respectively.

Monitoring Dates By Pollutant - From November 1985 through April 2006, PM₁₀ was measured by FRM and the data reported to EPA's Air Quality System (AQS). FRM PM_{2.5} monitoring began after adoption of the federal fine particulate standard. ORCAA also ran a nephelometer to compare against FRMs for both PM₁₀ and PM_{2.5}. Table 2 below presents monitoring by pollutant type, instrument, EPA approval status and whether the data is in EPA's Air Quality System (AQS).

⁶ Thurston Regional Planning Council, 2011 Update to the Thurston Regional Transportation Plan, Section 4. Air Quality Conformity, page 4, Table labeled, *Maintenance Area VMT and total PM10 Mobile Emissions*, June 3, 2011.

Table 2. Particulate Matter Monitoring at Lacey-College Street

Pollutant	Monitoring Dates	Instrument	EPA Monitoring Designation Status (Reference, Equivalent, Alternative)	Data in AQS?
PM ₁₀	1/1/1985 to 7/31/1988	HI -VOL SA321	FRM - Reference	Yes
PM ₁₀	8/1/1988 to 4/29/2006	HI -VOL SA1200/GMW 2000	FRM - Reference	Yes
PM _{2.5}	10/31/1998 to 2/29/2004	R&P Partisol-Plus 2025 Sequential monitor	FRM - Reference	Yes
PM _{2.5}	8/29/2000 to 1/17/2007	R&P/Thermal PM2.5 WINS w/Correction Factor TEOM	TPM2.5 - Alternative	Yes
<i>PM (b_{scat})</i> *	Operated seasonally 9/12/1990 to 4/30/1993;	MRI/Belfort 1590 nephelometer	NPM10 - Alternative	No
	<i>Continuously from 3/22/1996-present</i>	<i>Radiance M903 nephelometer</i>	<i>NPM10/NPM2.5 - Alternative</i>	<i>Yes (NPM2.5 since 10/1/2002)</i>

*Italics denotes current monitoring instrument and status

In addition to data available through AQS, ORCAA has other particulate matter data for the Lacey College Street site. This includes nephelometer data dating back to 1990. Nephelometer data was not submitted to AQS until EPA issued guidance on correlating b_{scat} to PM_{2.5} in 2002.

PM₁₀ Concentrations - PM₁₀ was monitored with a FRM from 1985 to 2006. The 24-hour concentrations are shown in Figure 2 below. Monitored concentrations exceeded the 1987 standard in the late 1980's but were well under the standard by the early 1990s and have stayed low for decades. The maximum 24-hour concentration recorded during the last five years of FRM monitoring was 60 µg/m³.

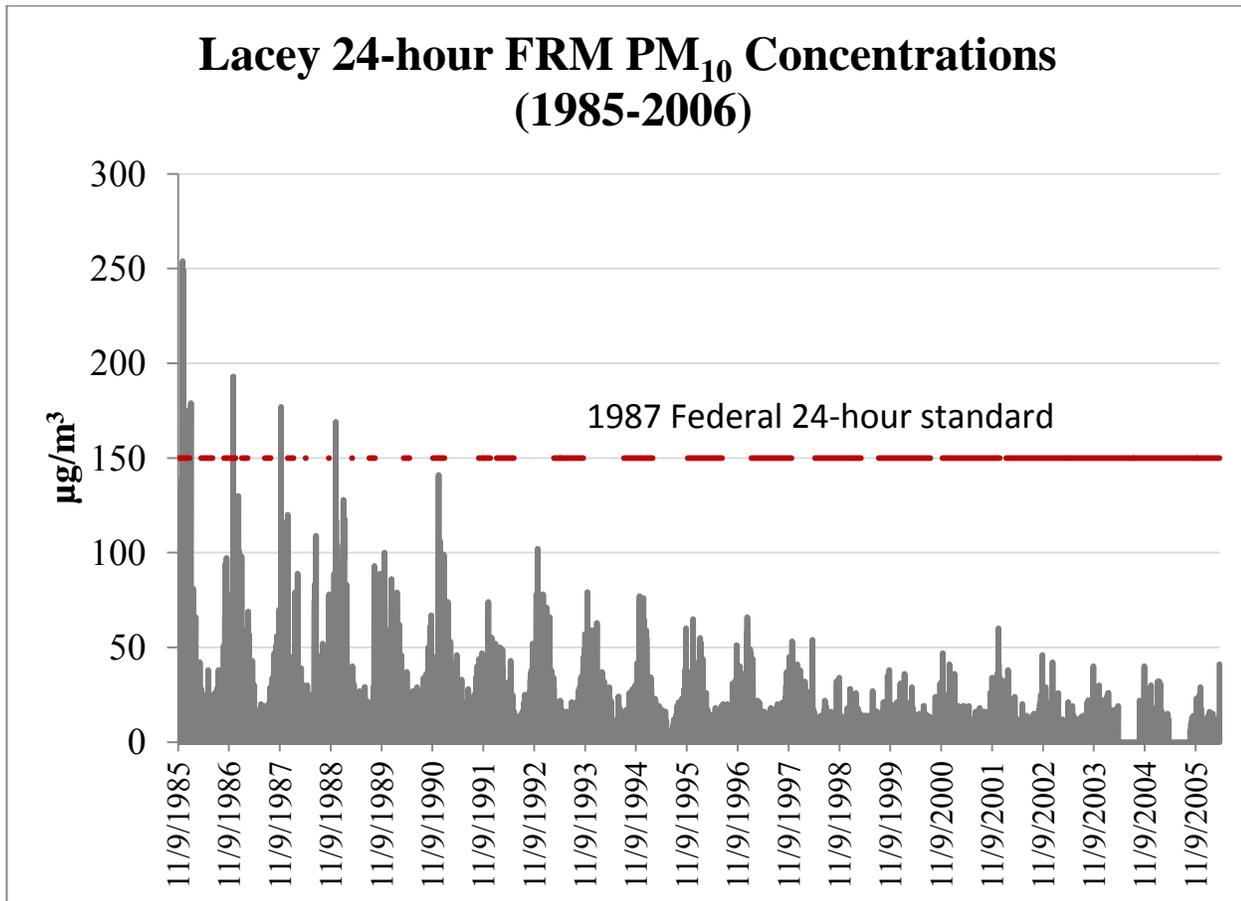


Figure 2. Lacey-College Street Historical PM₁₀ Concentrations

Because PM₁₀ values were well below the federal standard, FRM monitoring was limited to the winter season beginning in 2004 and discontinued in 2006, when EPA approved Ecology's 2007 Monitoring Network Report⁷. Excerpts from this report are included as Appendix B. ORCAA has continued to estimate PM₁₀ concentrations with a nephelometer.

Ecology's PM₁₀ Correlation – Ecology's statistical analysis of seven years of nephelometer readings and FRM PM₁₀ values (February 5, 1999 to April 23, 2006) found the two were highly correlated. Ecology then used this information to develop a model to calculate PM₁₀ concentrations from nephelometer b_{scat} data.

Model Development - Ecology used EPA's Data Quality Objective Guidance (DQO Guidance⁸) to develop the model. While a nephelometer is an alternative method and not a FEM, the correlation still exceeds the minimum criteria outlined in the DQO Guidance. Ecology derived a Pearson Correlation Coefficient (r^2) of 0.88. The DQO Guidance states that 0.70 is sufficient to establish a successful model. The Ecology model to convert nephelometer values (scattering coefficient or b_{scat}) to PM₁₀ is:

$$\text{Calculated PM}_{10} \text{ value (NPM10)} = 25.2 * b_{scat} + 6.2$$

Output from the correlation analysis is provided in Appendix C; Figure 3 shows the high correlation graphically.

⁷ Washington State Department of Ecology, 2007 Ambient Air Monitoring Network Report 2007, publication no. 07-02-011

⁸ EPA-454/B-02-002 November 2002, Data Quality Objectives (DQOs) for Relating Federal Reference Method (FRM) and Continuous PM_{2.5} Measurements to Report, an Air Quality Index (AQI)

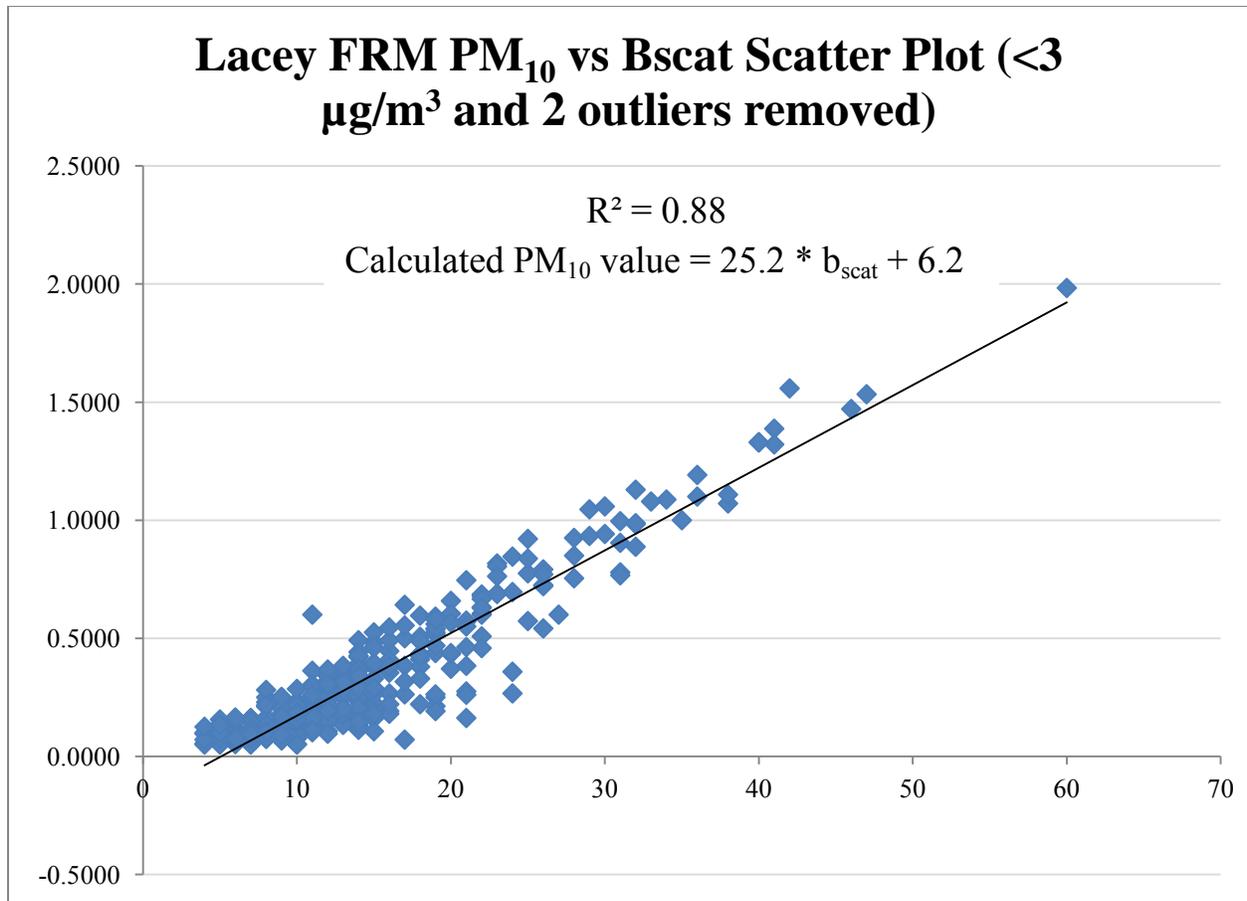


Figure 3. Lacey-College Street Correlation

PM₁₀ Nephelometer Monitoring - Because of the high correlation between nephelometer readings and PM₁₀ concentrations, Ecology and ORCAA conclude that NPM₁₀ values calculated directly from a nephelometer using the Ecology model above are a reliable, reproducible approach to represent the PM₁₀ levels in the TCMA. Ecology and ORCAA have used and continue to use the nephelometer to measure particulate matter levels at the Lacey-College Street site.

Figure 4 shows NPM₁₀ values calculated from nephelometer data since the FRM was discontinued in December 2006. The break in the data in the summer of 2010 was due to a remodeling project at the monitoring site. The NPM₁₀ values have the same general pattern and similar high winter values as the FRM. PM₁₀ concentrations continue to remain well below the PM₁₀ standard of 150 μg/m³.

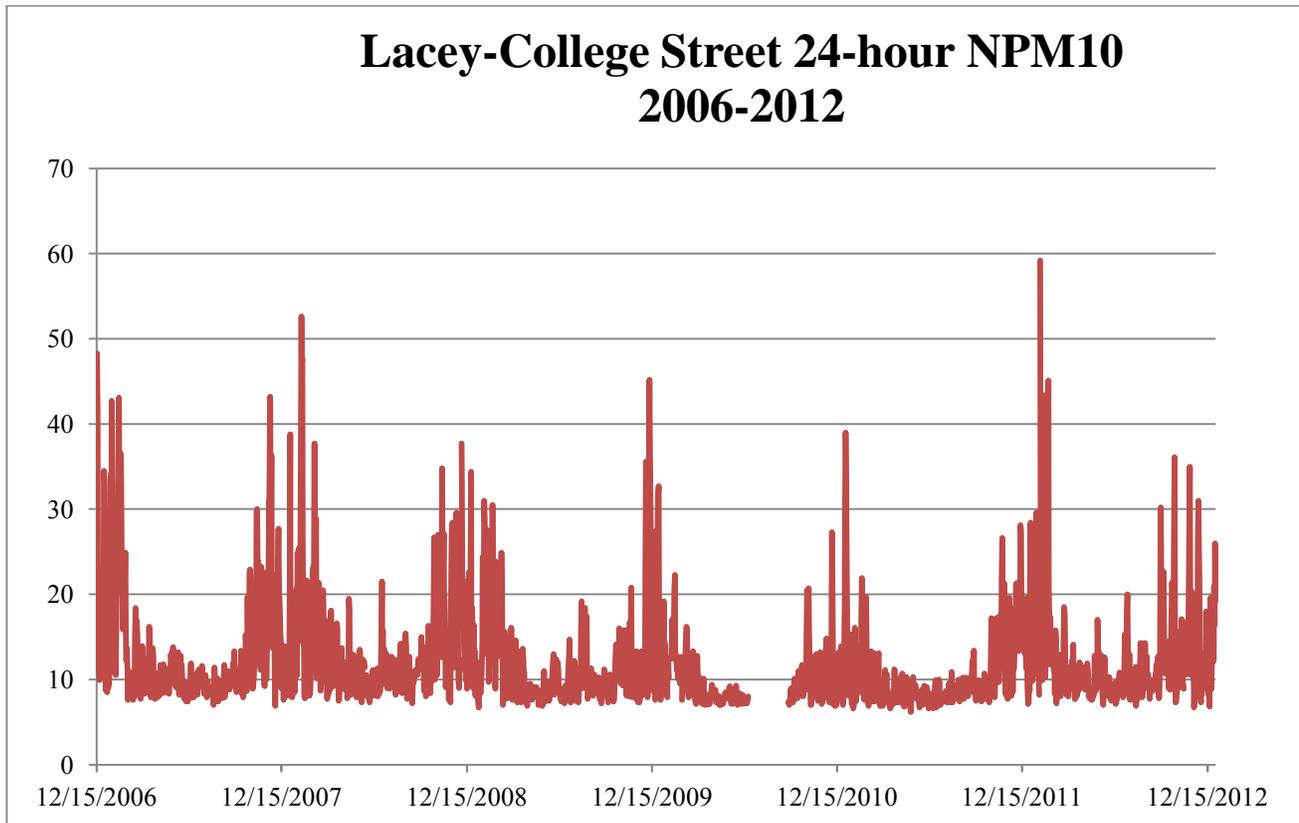


Figure 4. Lacey College Street 24-hour NPM10 Values – 2006-2012

Today the focus of particulate monitoring at Lacey-College Street is $PM_{2.5}$.

$PM_{2.5}$ in the TCMA – This subsection reviews $PM_{2.5}$ monitoring in the TCMA and the usefulness of nephelometer measurements of $PM_{2.5}$ as a day-to-day indicator of air quality. These values are also used to inform curtailments and to assess continued compliance with the PM_{10} standard.

$PM_{2.5}$ Monitoring – $PM_{2.5}$ was first measured at Lacey College Street on October 31, 1998 using a FRM. Consistent with EPA’s phase-in plan for this new standard, official reporting to AQS did not begin until the beginning of the following year. $PM_{2.5}$ values derived from a nephelometer (NPM2.5) have been reported in EPA’s AQS database since October 2002⁹.

24-Hour $PM_{2.5}$ Design Value Estimates – The design value, the metric defined by EPA to determine an area’s compliance with the 24-hour standard, is the three-year average of the 98th percentile of 24-hour concentrations for $PM_{2.5}$. Because monitored values are derived from a nephelometer, and are not approved for comparison to the NAAQS, some of the design values at Lacey-College Street technically are “estimates”. The data used are as follows:

- Design values for the 3-year periods ending in 2001, 2002, and 2003 are based on FRM data,
- Design value estimates for the 3-year period ending in 2004 is based on 2002 and 2003 FRM data and 2004 NPM2.5 data
- Design value estimates for the 3-year period ending in 2005 is based on 2003 FRM data and 2004 and 2005 NPM2.5 data
- Later design value estimates are based on entirely on NPM2.5 data.

⁹ While nephelometer values are available beginning in September 1990, EPA did not allow the reporting of NPM2.5 values to AQS until 2002, when the EPA issued guidance for correlating b_{scat} values to $PM_{2.5}$.

Design values and design value estimates indicate that the TCMA continues to remain below the PM_{2.5} standard as shown in Figure 5.

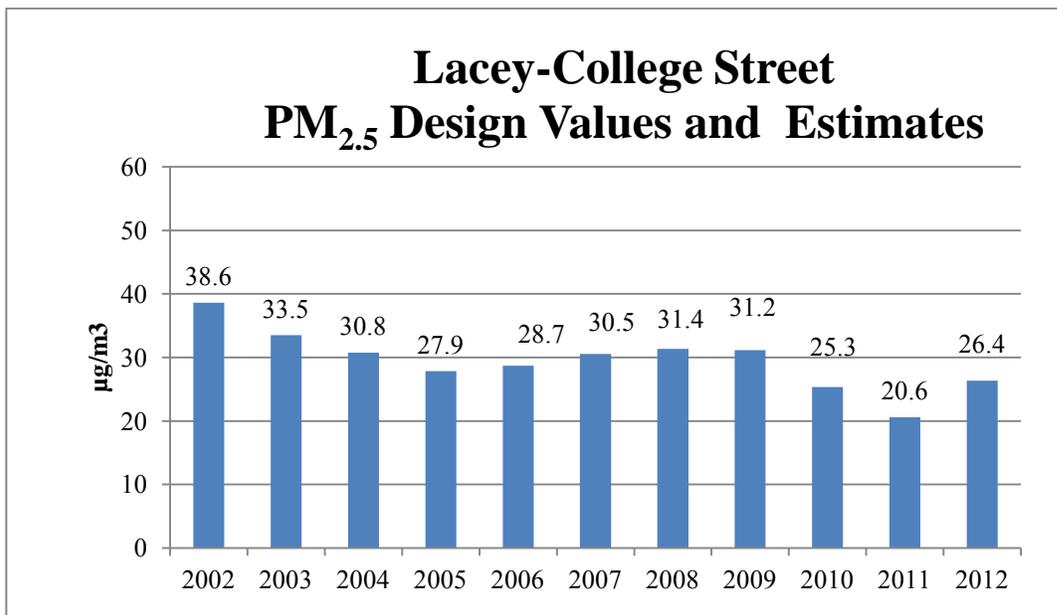


Figure 5. 24-Hour PM_{2.5} Design Values (2001-2003) and Design Value Estimates (2004-2012)

Based on current monitoring values, the TCMA is in compliance with the 2006 24-hour PM_{2.5} standard.

PM₁₀ Violation Unlikely - Compliance with the 2006 24-hour PM_{2.5} standard of 35 µg/m³ will help assure continued compliance with the 1987 PM₁₀ standard. ORCAA ran collocated FRM PM₁₀ and FRM PM_{2.5} monitors from 1999 through 2002. Data was separated by season: October to March for winter and April to September for summer. ORCAA found a high correlation between PM₁₀ and PM_{2.5} for coincident 24-hour values from 1999 and 2000¹⁰. The seasonal correlations are shown in Appendix D. In the wintertime, the ratio of PM_{2.5} to PM₁₀ is nearly one-to-one. The winter model that describes this relationship is:

$$PM_{2.5} = 0.9446 (PM_{10}) - 3.053$$

To exceed the PM₁₀ standard, the PM_{2.5} level would have to be 139
 (138.6 = 0.9446 * 150 ug/m³ - 3.053)

Given ORCAA's finding, the 24-hour PM_{2.5} levels in the critical winter period would have to exceed 139 µg/m³ to exceed the PM₁₀ standard. Then, because of the one-exceedance form of the PM₁₀ standard, this PM_{2.5} level would have to be exceeded more than once a year, over a three year average, to violate the PM₁₀ standard. This demonstrates that PM_{2.5} is the controlling standard. Since the highest NPM_{2.5} value measured since FRM PM₁₀ monitoring was discontinued in December 2006 was 60 ug/m³, an exceedance is highly unlikely.

¹⁰ORCAA 1:6 Coincidental ORCAA 1:6 day monitoring from 11/12/1999 through 11/26/2000 for FRM PM₁₀ and FRM PM_{2.5}, email from Odelle Hadley, dated February 15, 2013.

Current NPM10 and NPM2.5 Data Availability - NPM10 concentrations using the NPM10 model above are available on Ecology's website¹¹ and can be provided to EPA and the public on request. The nephelometer values and the NPM_{2.5} concentrations calculated from them are reported to AQS.

Emission Inventory

This section presents the emissions inventory for this second 10-year maintenance plan and briefly describes its development. The LMP Guidance requires the maintenance plan include an attainment inventory—that is, an inventory with emission levels consistent with attainment of the PM₁₀ standard.

EPA develops a triennial national emission inventory based on EPA and state inputs. EPA issued the Air Emissions Reporting Rule (AERR) to clarify state reporting requirements. EPA and Ecology agreed on developing the attainment inventory from available triennial inventory information. Appendix E provides details.

Emission years and categories - EPA approved the Inventory Preparation Plan (IPP) prepared by Ecology that proposed use of readily available information. This plan is provided as Appendix F. Emission estimates in this maintenance plan inventory are from Ecology's 2005 triennial emissions inventory¹² (2005 EI) and the 2008 National Emission Inventory (2008 NEI). Thurston County values from the four most significant categories have been temporally and spatially allocated to the TCMA. These four emissions categories were chosen based on a review of the emission sources in the original maintenance plan.

Significant source categories - The most significant sources of PM₁₀ listed in the original maintenance plan for the TCMA were *Residential Wood Combustion (i.e., Wood Burning)* and *Road Dust from paved roads*¹³. Lesser amounts of PM₁₀ came from *Vehicle Exhaust and Tire Wear* and *Construction Dust*. The same four significant emission categories are included in this attainment inventory. Other sources are deemed insignificant, including industrial sources. Outdoor burning is prohibited in the TCMA, so emissions would be minimal. Activities in the TCMA continue to be governmental, commercial and residential in nature.

Maintenance Plan Inventory - Washington State's 2005 EI is the most recent, complete, readily available emission inventory for Thurston County for three of the four emission categories. Since neither Ecology nor ORCAA have local information on emissions for Construction Dust, these values are taken from the 2008 NEI. The NEI Construction Dust emission estimates have inherent uncertainties because the data was collected nationally and was not developed specifically for a local area such as the TCMA. Emissions for these four emission categories are shown in Table 3 below.

¹¹ Ecology website. <https://fortress.wa.gov/ecy/enwiwa/Default.htm>.

¹² Washington State Base Year 2005 County Inventories, Washington State Department of Ecology Air Quality Program, Sally Otterson, June 8, 2007

¹³ The inventory includes only paved roads as there are few unpaved roads in the TCMA.

Table 3. TCMA Annual and Winter Day PM₁₀ Emissions

Emission Categories	Inventory Source	Emission Report Year	Annual, tons/year	Tons/Winter Day	% of Tons/Winter Day
Road Dust, paved roads only	Ecology	2005	237	0.74	20
Vehicle Exhaust and Tire Wear	Ecology	2005	58	0.14	4
Construction Dust	NEI	2008	627	1.01	28
Wood Burning	Ecology	2005	272	1.72	48
Totals			1,194	3.61	100

Based on the 2005 EI, uncertified stoves and older fireplaces represented 74% of the total solid fuel wood burning devices in Washington. Thurston County's total was comparable at 72%¹⁴ for these two types of units. Since wood burning devices are the most significant source of PM₁₀, strategies to reduce wood smoke emissions continue to be key to compliance with the standard.

Control Measures

Wood smoke is the most significant source of PM₁₀ in Thurston County in the winter. ORCAA and Ecology relied upon Reasonably Available Control Measures (RACM) for residential wood combustion to return the area to compliance with the 1987 PM₁₀ standard. Ecology and ORCAA have continued to implement the control measures included in the attainment and earlier maintenance plans. The control measures include:

- Curtailment program during impaired air quality
- Certification of new woodstoves
- Rules that govern the sale and transfer of uncertified stoves
- Opacity limits
- Fuel restrictions

ORCAA and Ecology rules provide the legal authority to implement, maintain and enforce the control measures in this plan. They are described below and provided as Appendices G and H, respectively.

Control Measures in ORCAA Rules – Washington State's Clean Air Act grants the authority for and outlines the conditions under which ORCAA may adopt its own rules. ORCAA has jurisdiction over the TCMA and relies upon its rules to maintain and enforce the PM₁₀ standard. The state of Washington requests EPA adoption of the ORCAA rules listed in Table 4 and found in Appendix G into the federally approved SIP.

¹⁴Otterson, Sally, Department of Ecology, 2005 EI, from County Devices.xls

Table 4. Control Measures in ORCAA Rules

<p>ORCAA Rule 8.1 Wood Heating</p> <ul style="list-style-type: none"> 8.1.1 Definitions - Certified 8.1.1 Definitions - Opacity 8.1.1 Definitions - First and Second stage curtailment 8.1.2 General Emission Standards (b) and (c) 8.1.3 Prohibited Fuel Types 8.1.4 Curtailment (a) – (d) <ul style="list-style-type: none"> Stage 1 - only certified or pellet stoves Stage 2 - shall not operate any solid fuel burning device 8.1.5 Exemptions 8.1.6 Penalties 8.1.7 Sale and Installation of Uncertified Woodstoves 8.1.8 Disposal of Uncertified Woodstoves
<ul style="list-style-type: none"> 6.2.3 No residential or land clearing burning is allowed in specified cities and/ or UGAs (Lacey, Tumwater and Olympia only) 6.2.6 Curtailment – restricts outdoor burning during curtailment 6.2.7 Recreational Burning – none allowed in TCMA

ORCAA’s Curtailment Program- The curtailment program has been successfully implemented in the TCMA. ORCAA’s curtailment program is key to maintaining compliance with the standard. When wood smoke pollution impairs air quality, ORCAA restricts wood burning. When ORCAA calls burn bans for the area, woodstove use and outdoor burning are restricted or prohibited. Burn bans do not apply to homes without another source of adequate heat.

Burn bans can be called at two stages. A Stage 1 ban prohibits all uncertified wood heating devices when pollution approaches unhealthful levels. A Stage 2 ban prohibits all wood heating when pollution reaches a specified higher level. Unhealthful levels are defined as follows: A Stage 1 burn ban (First Stage of Impaired Air Quality) is declared when meteorological conditions are predicted to cause fine particulate levels to exceed $35 \mu\text{g}/\text{m}^3$ within 48 hours, when measured on a 24 hour average basis. A Stage 2 burn ban (Second Stage of Impaired Air Quality) is declared when a first stage of impaired air quality has been in force and has not been sufficient to reduce the increasing fine particulate pollution trend. Under certain circumstances a Stage 2 ban may be declared without calling a Stage 1 ban first.

Since Stage 1 and Stage 2 burn bans are designed to maintain the more stringent 2006 $\text{PM}_{2.5}$ standard, ORCAA’s burn ban rules are more protective of the PM_{10} standard than the state burn ban rules supporting the attainment and first 10-year maintenance plan for the TCMA.

ORCAA Woodstove Change Out Programs - Over the years, ORCAA has helped many residents within the TCMA upgrade their heating systems using grants through Ecology. In the winter of 1994-95, ORCAA successfully helped Thurston County residents remove 143 uncertified woodstoves by offering a bounty of \$100 on each stove. Then, in the winter of 2008-09, another grant program replaced an additional 90 uncertified stoves in the area. The latest program, which began in the fall of 2011, is designed to replace uncertified woodstoves with cleaner fuel burning devices. This program serves the TCMA and other urban growth areas¹⁵ in Thurston County. ORCAA offers residents who want to replace

¹⁵ Expected growth areas of incorporated cities of Thurston County established under the Growth Management Act.

wood heat systems \$750 toward purchase of gas fireplaces and \$1,000 toward purchase of other qualifying replacements. Qualifying replacement appliances include gas fireplaces/gas fireplace inserts, electric or natural gas/propane furnaces, natural gas/propane heaters/stoves, or electric heat pumps including ductless heat pumps. This program ends June 30, 2013.

Control Measures in Washington Rules – Ecology’s woodstove rules are published in Chapter 173-433 Washington Administrative Code (WAC). Notably these rules include emission standards for new woodstoves found in WAC 173-433-100. Washington State has one of the most protective woodstove emission standards in the country. Since January 1, 1994, new woodstoves must meet a 2.5 grams/hour (g/hr) emission limit for catalytic stoves and 4.5 g/hr for all other (noncatalytic) stoves. EPA (which is working on revising its standards) set standards of 4.1 g/hr for catalytic stoves and 7.5 g/hr for noncatalytic stoves in 1998.

Ecology is requesting EPA action on the Sections of 173-433 as listed in Table 5 below.

Table 5. Requested EPA Action on Chapter 173-433 WAC Solid Fuel Burning Devices

Section and Title	State effective date	EPA effective date	State revision (yes/no)	State revision effective date	Requested EPA action
173-433-030 Definitions	10/18/90	1/15/93	Yes	4/20/91	Approval
173-433-100 Emission Performance Standards	10/18/90	1/15/93	Yes	3/6/93	Approval
173-433-110 Opacity Standards	10/18/90	1/15/93	Yes	3/6/93	Approval
173-433-120 Prohibited Fuel Types	10/18/90	1/15/93	Yes	4/20/91	Approval
173-433-140 Impaired air quality criteria			New	4/20/91	Approval
173-433-150 Curtailment	10/18/90	1/15/93	Yes	4/20/91	Approval
173-433-170 Retail sales fee	1/3/89	1/15/93	n/a	n/a	Removal

Ecology requests EPA approval of six Sections of WAC 173-433. Three sections of the WAC were revised on April 20, 1991 and two additional sections were revised on March 6, 1993. These five sections of the WAC update Ecology rules that were previously approved by EPA and became effective January 15, 1993. One section, WAC 173-433-140, Impaired Air Quality Criteria, also approved by the state in April 1991, is new and has not previously been approved by EPA or adopted into the federal SIP. EPA approval of these six sections of the WAC will strengthen the state rules in the SIP.

Ecology also requests removal from the SIP of WAC 173-433-170 Retail sales fee, which was approved by EPA and effective January 15, 1993. This section of state rules is not a control measure but a legislatively mandated fee on wood stove sales. EPA approval of state-levied fees for state purposes is inappropriate and this provision should be removed from the federally approved SIP. Appendix H is a strikeout version of the rule showing changes since EPA last approved Washington’s rules into the federal SIP up through the March 6, 1993 revisions.

Contingency Measures

CAA Section 175(A) requires a maintenance plan include contingency measures necessary to ensure prompt correction of any violation of the standard that may occur after redesignation. ORCAA's Rule 8.1.4 (e) provides for prohibition of the use of uncertified woodstoves in the TCMA for the sole purpose of meeting CAA requirements for contingency measures. To implement this provision, the rule requires that the EPA, in consultation with Ecology and ORCAA, must make written findings that:

- (1) The area has failed to maintain a national ambient air quality standard
- (2) Emissions from solid fuel burning devices from a particular geographic area are a contributing factor to such failure to make reasonable further progress or attain or maintain a national ambient air quality standard
- (3) A prohibition issued under 8.1.4(e) shall not apply to a person that does not have an adequate source of heat without burning wood
- (4) The area consists of all areas within the city limits of Lacey, Olympia, and Tumwater and unincorporated areas of Thurston County lying within or between the municipal boundaries

Ecology requests EPA approval of ORCAA Rule 8.1.4.(e) as part of the federally approved SIP.

Contingency Measure Trigger - The contingency measure will be triggered if a violation of the PM₁₀ standard occurs at the TCMA monitor based on nephelometer and/or FRM monitoring. A violation of the PM₁₀ standard will be determined by the procedures outlined in 40 CFR Part 50, Appendix K – Interpretation of the NAAQS for Particulate Matter.

Commitment to Continued Monitoring

EPA considers continued monitoring especially important in a LMP area because there is no cap on emissions. Emissions in the TCMA are not expected to grow enough to threaten compliance with the standard as discussed in Section 3 of this plan.

ORCAA makes a commitment to continue operation of a nephelometer in the TCMA through the 2020, the end of the maintenance period, to determine PM₁₀ levels. In the unlikely event that after exceptional events are discounted, the second highest PM₁₀ concentration in a calendar year based on nephelometer monitoring exceeds the LMP threshold of 98 µg/m³, Ecology, ORCAA and EPA will discuss reestablishment of FRM monitoring as part of the annual network monitoring report process. NPM₁₀ concentrations are available on Ecology's monitoring website¹⁶ and can be provided to EPA and the public on request.

Verification of Continued Attainment

ORCAA will calculate the TCMA PM₁₀ design value estimate annually from nephelometer data through 2020 to confirm the area continues to meet the PM₁₀ NAAQS. A 3-year NPM₁₀ design value estimate of or below 150 µg/m³ demonstrates continued compliance with the PM₁₀ NAAQS. Ecology will include a statement in the annual network report to inform EPA of continued attainment for the TCMA based on the NPM₁₀ values.

¹⁶ Ecology website: <https://fortress.wa.gov/ecy/enviwa/Default.htm>; ORCAA monitoring data can be requested at: <http://data.orcaa.org/request-data/>

Summary of Maintenance Plan Commitments

Commitments made in this maintenance plan are summarized in Table 6.

Table 6. Second 10-Year LMP Commitments

Section	Commitment	Responsible Agency
3	Annual calculation of the TCMA PM ₁₀ design value estimate through 2020 to show continued qualification for the LMP option.	ORCAA
3	Reporting to EPA on continued qualification for the LMP option in the annual monitoring network report	Ecology
7	Implementation of the contingency measure if the TCMA violates the PM ₁₀ standard based on nephelometer monitoring	ORCAA
8	Continued nephelometer monitoring of PM ₁₀ in the TCMA through 2020	ORCAA
9	Annual calculation of the TCMA PM ₁₀ design value estimate through 2020 to assess compliance with the PM ₁₀ standard	ORCAA
9	Reporting to EPA on continued PM ₁₀ attainment in the annual monitoring network report	Ecology

Required Plans Complete

The TCMA was redesignated to attainment for the 1987 24-hour PM₁₀ standard in 2000. EPA approved the first 10-year maintenance plan in December of 2000. This plan ensures compliance through 2020 and fulfills the final requirement for maintenance plans specified by the CAA.

Appendix A.

Limited Maintenance Plan Qualification

Design Values

The TCMA Federal Reference Method (FRM) design value based on FRM 24-hour PM₁₀ monitoring data from the College Street site in Lacey, Washington. The LMP Guidance directs the design value be based on the most recent five years of data¹. The most recent five years of FRM data is from 2001-2005; the most recent data from an alternative method, using a nephelometer, is from 2008-2012.

FRM Design Value

The PM₁₀ SIP Development Guideline² (SIP Guideline) stipulates that the design concentration be the highest value for data sets of 347 or fewer values. Since the FRM data set has fewer than 347 values, the design value is 60 µg/m³, the highest value from 2001-2005. The relevant values are shown in Table A-1 below.

Table A-1. Lacey-College Street Maximums and 5-Year FRM Design Values, 1999-2005

YEAR	ANNUAL NO. OBSERVATIONS	MAXIMUM MONITORED VALUES, µg/m ³	5-YEAR PERIOD YEARS	NO. OBSERVATIONS	5-YEAR MAXIMUM DESIGN VALUE, µg/m ³
1999	60	38			
2000	60	47			
2001	61	60			
2002	60	46			
2003	60	42	1999-2003	301	60
2004	37	40	2000-2004	278	60**
2005	36	32	2001-2005	254	60**

**Design value reflects wintertime seasonal sampling which occurred from Jan 2004 through April 2006.

Alternative Method Design Value Estimate

FRM monitoring was discontinued in 2006 because PM₁₀ values were well below the federal standard. ORCAA continues to estimate PM₁₀ concentrations from nephelometer values (NPM10). Since nephelometer values are not technically approved for comparison to the NAAQS, the design value derived from this alternative method is an “estimate”. The SIP Guideline directs that the design concentration used for data sets with 1,391-1,738 values be the fifth highest high. The design value estimate using the 1,723 NPM10 values from 2008-2012 is 45.2 µg/m³.

¹ LMP Guidance, pp 3.

² Tabular estimation method from PM-10 SIP Development Guideline, publication EPA 450/2 86-001, Table 6-1, pp.6-5.

Since both these values are below $98 \mu\text{g}/\text{m}^3$ — the value stipulated in the LMP guidance — the TCMA meets this condition.

Motor Vehicle Regional Analysis

To qualify for the PM₁₀ LMP option, an area should expect only limited growth in on-road motor vehicle PM₁₀ emissions. This means the area must pass the Motor Vehicle Regional Analysis, found in Appendix B of the LMP Guidance. The result of the analysis must be less than $98 \mu\text{g}/\text{m}^3$, the Margin of Safety (MOS) value for the 24-hour PM₁₀ standard.

The following methodology was used to determine whether increased emissions from on-road mobile sources could, in the next 10 years, increase concentrations in the TCMA and threaten the assumption of maintenance that underlies the LMP Guidance.

$$DV + (\text{VMT}_{\text{pi}} \times DV_{\text{mv}}) < \text{MOS}$$

Where:

- DV = the area’s design value based on the most recent 5 years of data, $\mu\text{g}/\text{m}^3$
- VMT_{pi} = The projected percent increase in vehicle miles traveled (VMT) over the next 10 years
- DV_{mv} = Motor vehicle design value based on on-road mobile portion of the attainment year inventory, $\mu\text{g}/\text{m}^3$
- MOS = Margin of safety for 24-hour PM-10 standard is $98 \mu\text{g}/\text{m}^3$

Step 1. Determine the 5-year design value (DV).

The maximum from five complete years of data (2001-2005) as shown above is **60 $\mu\text{g}/\text{m}^3$** .

Step 2. Determine the percent increase in maintenance area average daily VMT over the next ten years (VMT_{pi}).

The VMT data for the TCMA for 2010 and 2020 was supplied by the Thurston Regional Planning Council (TRPC)³. The percent increase in VMT was calculated by calculating the difference between 2020 and 2010 VMT per day and determining the % change. VMT values are:

2020	3,283,767 miles per day
2010	2,809,324 miles per day
10-year increase =	474,443, miles per day
Percent Increase (VMT_{pi}) =	16.9%

Step 3. Determine the motor vehicle design value based on on-road mobile portion of the attainment year inventory (DV_{mv}).

The third paragraph of Attachment B of the LMP Guidance offers: “Please note that DV_{mv} is derived by multiplying DV by the percentage of the attainment year inventory represented by on-road mobile sources. This variable should be based on both primary and

³ Thurston Regional Planning Council, 2011 Amendment to the Thurston Regional Transportation Plan, adopted June 3, 2011, page 4

secondary PM₁₀ emissions of the on-road mobile portion of the attainment year inventory, including re-entrained road dust.”

Table A-2. Onroad mobile PM₁₀ emissions, Ecology, 2005

Category	Annual, tons/year	Tons/Winter Day	% Winter Day Total
Vehicle Exhaust and Tire Wear	58	0.14	3.9
Road Dust, paved roads only	237	0.74	20.0
Total			23.9

Total On Road Mobile (ORM) source emissions from Vehicle Exhaust and Tire Wear and Road Dust from Paved Roads are 3.9% and 20% of the TCMA 2005 winter day emission inventory, respectively. This makes the percentage of the ORM inventory 23.9%.

$$DV_{mv} = DV \times \% \text{ Onroad Emissions}$$

Therefore:

$$DV_{mv} = 60 * 0.239 = \mathbf{14.34}$$

Step 4. Calculate the Regional Emissions Analysis Margin of Safety (MOS).

The variables and the values for the equation are shown below:

$$DV + VMT_{pi} \times DV_{mv} = MOS$$

$$60 + (0.169 \times 14.34) = \mathbf{62}$$

Step 5. Compare with MOS of 98 µg/m³

$$62 \mu\text{g}/\text{m}^3 \ll 98 \mu\text{g}/\text{m}^3$$

Since 62 µg/m³ is much less than 98 µg/m³, the area passes the motor vehicle regional analysis and qualifies for the LMP approach.

Appendix B.

Ecology 2007 Network Report/EPA approval

2007 Network Report, PM₁₀ Section

The following Appendix contains Section 4.5 from the Washington State Department of Ecology 2007 Ambient Air Annual Monitoring Network Report. This portion of the Report contains information on PM₁₀ monitoring for that year. The letter from EPA approving this report follows.

4.5 Particulate Matter (PM₁₀, 81102)

National Ambient Air Quality Standard (NAAQS), 1987:

- Twenty-four hour average PM₁₀ concentration not to exceed 150 µg/m³ on more than one occasion per year when averaged over three years.
- Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the EPA revoked the annual PM₁₀ standard in 2006 (effective December 17, 2006).

Washington's Particulate Matter 10 monitoring network consists of eleven sites statewide.

4.5 Particulate Matter 10 (PM₁₀, 81102)

AIRS#	Site Name	Est.	Type	Scale	Sampling Type	Action for 2007
530332004	Kent/Central & James	5/87	SLAMS	Neighborhood	Continuous only	Continue
530330057	Seattle/Duwamish	8/71	SLAMS	Neighborhood	Continuous only	Continue
530530031	Tacoma/Alexander	2/87	SLAMS	Neighborhood	Continuous only	Continue
530730015	Bellingham/Yew St.	6/88	SLAMS	Neighborhood	Discontinued	Discontinued
530670013	Lacey/Mt. View ES	4/84	SLAMS	Neighborhood	Discontinued	Discontinued
530110013	Vancouver/Moose Lodge	3/90	SPMS	Neighborhood	Discontinued	Discontinued
530050002	Kennewick/Kennewick VSC	10/94	SLAMS	Neighborhood	Continuous only	Disc. FRM
530770009	Yakima/Yakima MH	4/00	SLAMS	Neighborhood	1/6	Disc. FRM
530770005	Sunnyside/Harrison MS	8/98	SLAMS	Neighborhood	Discontinued	Disc. Site
530650004	Colville/Colville	11/96	SPMS	Neighborhood	Continuous only	Disc. FRM
530710005	Walla-Walla/Walla-Walla FS	4/89	SPMS	Neighborhood	Discontinued	Disc. FRM
530710006	Burbank/Burbank School	1/03	SPMS	Middle	Continuous only	Disc. FRM
530630016	Spokane/Crown Z	4/72	SLAMS	Middle	Continuous & 1/3	Continue both
530630016	Spokane/Crown Z	4/72	SLAMS Co-lo	Middle	Continuous & 1/6	Continue both
530030004	Clarkston/Clarkston STP	6/93	SLAMS	Neighborhood	Discontinued	Disc. FRM

Additional Monitors: None

Recommendations/Proposed Modifications: Washington State discontinued Particulate Matter 10 FRM operation at all of its sites except Yakima and Spokane Crown Z. Operation of equivalent method PM₁₀ continuous devices network is in place at remaining locations. At Clarkston, the PM₁₀ FRM has been replaced with a PM_{2.5} continuous device and correlation with an FRM is underway. At Sunnyside, the PM₁₀ FRM and platform was damaged by high winds in December 2006. It will not be replaced.

Kent/Central & James - SLAMS

AIRS # 530332004

Address: 203 East Smith Street (James Street & Central Avenue), Kent

LAT/LONG: 047 23' 10" / 122 13' 55"

Adequacy

Central & James is a neighborhood scale site for PM10 established in 1987. It is located in a mixed commercial/residential area in Downtown Kent.

Exceedences

This site has not exceeded the standard for PM10 in the past 3 years.

Justification for continued monitoring

The Central & James PM10 continuous device is operated as part of the maintenance plan for the Puget Sound.

Seattle/Duwamish - SLAMS

AIRS # 530330057

Address: 4752 East Marginal Way South, Seattle

LAT/LONG: 047 33' 31" / 122 20' 19"

Adequacy

Duwamish is a neighborhood scale site for PM10 established in 1971. It is located in a commercial/industrial area south of downtown Seattle.

Exceedences

This site has not exceeded the standard for PM10 in the past 3 years.

Justification for continued monitoring

The Duwamish PM10 continuous device is operated as part of the maintenance plan for the Puget Sound.

Kennewick/Kennewick VSC- SLAMS

AIRS # 530050002

Address: 5929 West Metaline, Kennewick

LAT/LONG: 046 13' 06" / 119 12' 03"

Adequacy

Kennewick is a neighborhood scale site for PM10 established in 1994. It is located in the downtown Kennewick area.

Exceedences

This site has not exceeded the standard for PM10 in the past 3 years.

Justification for continued monitoring

The Kennewick site is representative of the Kennewick area. The Kennewick area is subject to windblown dust.

Yakima/Yakima Mental Health - SLAMS

AIRS # 530770009

Address: 402 South 4th Avenue, Yakima

LAT/LONG: 046 35' 42" / 120 30' 44"

Adequacy

Yakima Mental Health is a neighborhood scale site for PM10 established in 2000. It is located in a commercial/residential area in Downtown Yakima.

Exceedences

This site has not exceeded the daily or annual standard for PM10 in the past 3 years.

Justification for continued monitoring

The Yakima Mental Health site is representative of the Yakima area. Yakima has been Particulate Matter 10 non-attainment area.

Colville/Colville - SLAMS

AIRS # 530650004

Address: 215 South Oak, Colville

LAT/LONG: 048 32' 41" / 122 54' 13"

Adequacy

Colville is a neighborhood scale site for PM10 established in 1996. It is located in a commercial/residential area of Colville.

Exceedences

This site has not exceeded the standard for PM10 in the past 3 years.

Justification for continued monitoring

Ecology has discontinued the Colville PM10 FRM.

Walla-Walla/Walla-Walla Fire Station - SLAMS

AIRS # 530710005

Address: 200 South 12th, Walla-Walla

LAT/LONG: 046 03' 32" / 118 21' 06"

Adequacy

Walla-Walla is a neighborhood scale site for PM10 established in 1989. It is located in a commercial/residential area of Walla-Walla.

Exceedences

This site has not exceeded the standard for PM10 in the past 3 years.

Justification for continued monitoring

Ecology has discontinued the Walla-Walla PM10 FRM.

Burbank/Wallula - SLAMS

AIRS#530710006

Address: 755 Maple Street, Burbank

LAT/LONG: 046 12' 00" / 119 00' 30"

Adequacy

Burbank is a middle scale site for PM10 established in 2002. Burbank is located in the residential area of Burbank.

Exceedences

The Burbank/Wallula site has not exceeded the standard for PM10 in the past 3 years.

Justification

The Burbank site is within the previous Wallula PM10 non-attainment area and is subject to windblown dust.

Ecology is discontinuing the Burbank PM10 FRM.

Spokane/Crown Zellerbach - SLAMS

AIRS # 530630016

Address: E. 3530 Ferry Street, Spokane

LAT/LONG: 047 39' 39" / 117 21' 26"

Adequacy

Crown Zellerbach is middle scale site for PM10 established in 1972. It is located in a highly traveled commercial area of Spokane.

Exceedences

This site has not exceeded the standard for PM10 in the past 3 years.

Justification for continued monitoring

The Crown Zellerbach site is representative of the Spokane area. Spokane is a past Particulate Matter 10 non-attainment area.

Clarkston/Clarkston STP - SLAMS

AIRS # 530030004

Address: 13th Street and Port Way, Clarkston

LAT/LONG:+46.425571/117.059727

Adequacy

Clarkston is a neighborhood scale site for PM10 established in 1993. It is located in a mixed/residential area of Clarkston.

Exceedences

This site has not exceeded the standard for PM10 in the past 3 years.

Justification for continued monitoring

Clarkston is representative of the Clarkston area and used for local needs such as identification of impacts from wood smoke and mobile sources. **Ecology is discontinued the Clarkston PM10 FRM. Ecology has established a PM2.5 continuous device at the Clarkston site.**

Discontinued PM10 Sites

Bellingham/Yew Street - Discontinued

AIRS # 530730015

Address: 2420 Yew Street, Bellingham

LAT/LONG: 048 45' 46" / 122 26' 25"

Lacey/Mt. View Elementary - Discontinued

AIRS # 530670013

Address: 1900 College Street, Lacey

LAT/LONG: 047 01' 43" / 122 49' 15"

Sunnyside/Harrison Middle School - Discontinued

AIRS # 530770005

Address: 1101 South 16th Street, Sunnyside

Vancouver/Moose Lodge - Discontinued

AIRS # 530110013

Address: 8205 East 4th Plain Boulevard, Vancouver

LAT/LONG: 045 38' 55" / 122 35' 16"



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

NOV 16 2007

Reply to
Attn Of: OAWT-107

Mr. Mike Ragan, Air Monitoring Coordinator
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

Re: 2007 Washington Ambient Air Monitoring Network Assessment

Dear Mr. Ragan:

We have evaluated the 2007 Washington Ambient Air Monitoring Network Assessment and Ecology's proposed air monitoring network for 2008. This network assessment proposes the following changes to the Washington ambient air monitoring network that have occurred since EPA's approval of the 2006 network assessment:

- 1) CO - The Vancouver CO site was discontinued on 9/30/06. It is proposed the CO Bellevue (148th) and Spokane (3rd & Washington) sites in Washington be designated as SLAMS sites.
- 2) Ozone - The FCC Loomis and Wishram sites have been discontinued. The remaining ozone sites in Washington are recommended as SLAMS with one exception. The Seattle Beacon Hill is recommended as an NCore site.
- 3) NO₂ - Ecology has ceased operation of the Beacon Hill NO₂ monitor. Trace level NO_y has been established at the Seattle Beacon Hill site.
- 4) SO₂ - The Seattle Beacon Hill SO₂ monitor has been discontinued. Trace level SO₂ has been established at the Beacon Hill site.
- 5) Ecology has discontinued operating all PM₁₀ FRMs, except at the Yakima and Spokane Crown Z sites. Operation of equivalent method PM₁₀ continuous devices are in place at all remaining locations. At Clarkston, the PM₁₀ FRM has been replaced with a PM_{2.5} continuous device and correlation with a PM_{2.5} FRM is underway. At Sunnyside, the PM₁₀ FRM and platform was damaged by high winds in December 2006. It will not be replaced.
- 6) PM_{2.5} FRMs at Vancouver and Yakima were re-established as of 1/1/2007 because PM_{2.5} design values at these sites are close to the new PM_{2.5} 24-hour standard.
- 7) PM_{2.5} speciation: The Olive Street and Duwamish speciation monitors will be relocated to the following locations by the end of 2007:

- a) Moose Lodge, 8205 E 4th Plain Boulevard, Vancouver, AIRS #530110013
- b) Comprehensive Mental Health, 402 South 4th Avenue, Yakima, AIRS #530770009

These changes are consistent with the network design criteria identified in 40 CFR Part 58, Appendix D. I therefore approve these changes.

The following monitors are designated "core" monitors because they are either: 1) required by 40 CRF Part 58, Appendix D; 2) have a design value near or above the new PM2.5 24-hour standard of 35 ug/m3; or 3) they are essential monitoring parameters at NCore sites:

1. PM2.5 FRMs (or Approved Regional Method):
 - a) Beacon Hill
 - b) Duwamish (primary and co-located)
 - c) Crown Zellerbach (primary and co-located)
 - d) Tacoma/L Street
 - e) Darrington
 - f) Marysville
 - g) Yakama
 - h) Vancouver
2. PM2.5 speciation monitors:
 - a) Beacon Hill
 - b) Olive Street (to be moved to Yakama by the end of 2007)
 - c) Duwamish (to be move to Vancouver by the end of 2007)
 - d) Tacoma
3. Pre-cursor gas monitors at the Beacon Hill NCore site

"Core" monitors are those monitors in the network that must be operated with available PM2.5 monitoring funds. The "non-core" PM2.5 monitors in the State's network can be operated at Ecology's discretion with any remaining federal or State funds.

If you have any questions about our approval of the Washington monitoring network, please contact Keith Rose at (206) 553-1949.

Sincerely,



Mahbubul Islam, Manager
State and Tribal Program Unit

cc: Chris Hall, OEA
Keith Rose, OAWT

Appendix C.

Ecology Correlation, PM₁₀ to Nephelometer

Ecology analyzed the relationship between nephelometer readings and Federal Reference Method (FRM) PM₁₀ concentrations for seven years - from February 5, 1999¹ to April 23, 2006. Ecology used EPA's Data Quality Objective (DQO Guidance²) to develop a model. The analysis showed that the nephelometer data correlated well to the FRM data. Ecology derived a Pearson Correlation Coefficient (r²) of 0.88, which surpasses DQO Guidance identified minimum specification of 0.70³.

$$\text{Calculated PM}_{10} \text{ value} = 25.2 * (b_{\text{scat}}) + 6.2$$

Comparing calculated PM₁₀ (NPM10) to FRM PM₁₀ - 1999-2006

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.939057793
R Square	0.881829538
Adjusted R Square	0.881520192
Standard Error	2.762976502
Observations	384

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	21761.73194	21761.73	2850.618	3.0689E-179
Residual	382	2916.202956	7.634039		
Total	383	24677.9349			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	6.202619631	0.210018104	29.53374	1.2E-100	5.789683413	6.61555585	5.789683413	6.615555849
X Variable 1	25.1957634	0.471908701	53.39118	3.1E-179	24.26789961	26.1236272	24.26789961	26.12362719

¹ While nephelometer readings are available earlier, the values were not reportable to AQS until 2002, when the guidance for correlating to PM_{2.5} was issued.

² EPA-454/B-02-002 November 2002, Data Quality Objectives (DQOs) for Relating Federal Reference Method (FRM) and Continuous PM_{2.5} Measurements to Report, an Air Quality Index (AQI)

³ Ibid, pp 13

Appendix D.

ORCAA Collocated Monitoring

This graph shows the close correlation of PM_{2.5}-to-PM₁₀ in Lacey. This plot shows coinciding daily averages of PM_{2.5} and PM₁₀ by season - winter is October to March; summer is April to September. The data used in this analysis were collected between 1999 and 2000 using FRM, gravimetric filter analysis.

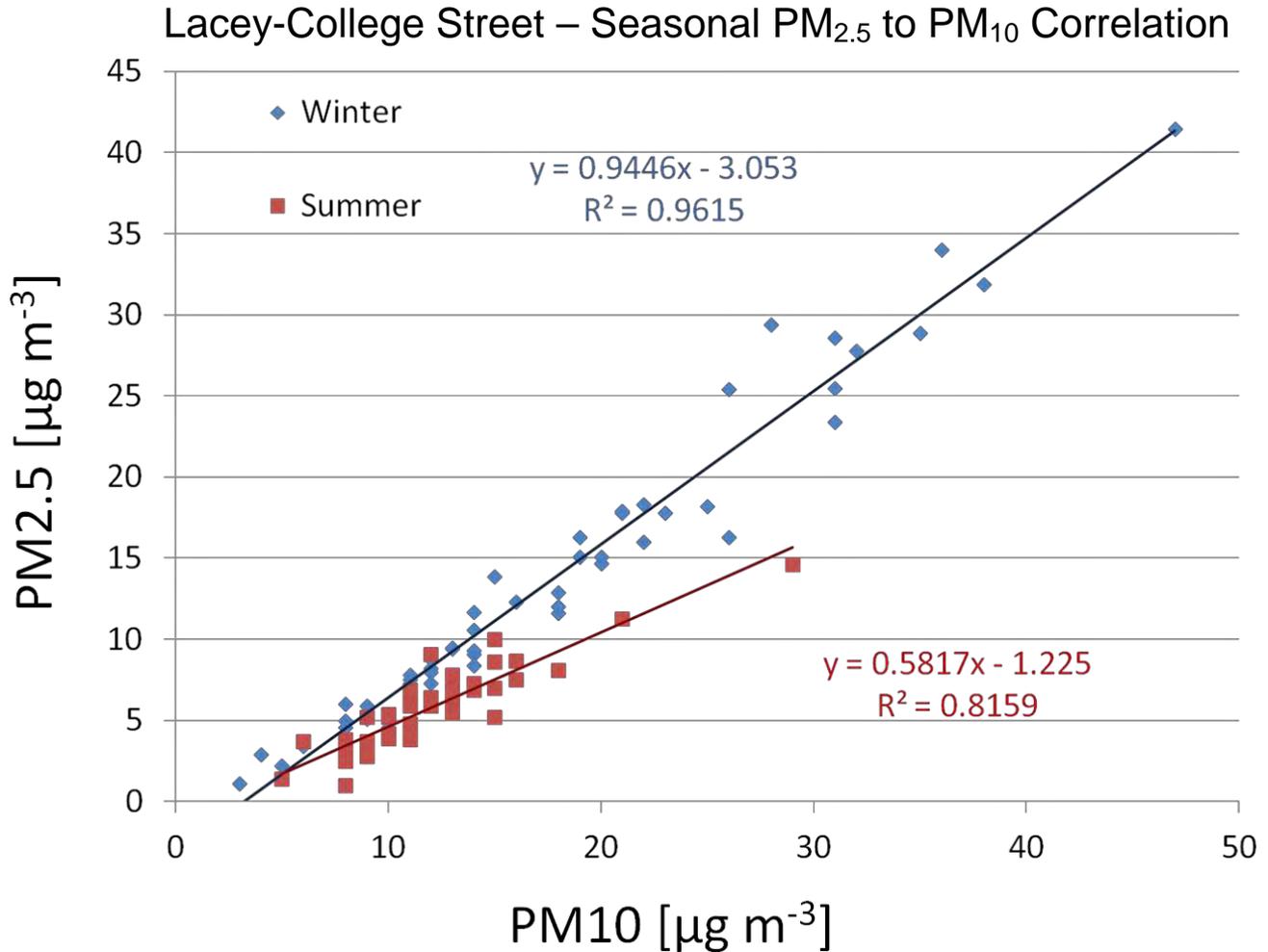


Figure D-1 Lacey Seasonal Correlation of Daily Averages of PM_{2.5} to PM₁₀

Appendix E.

Emission Inventory Documentation

Ecology developed an inventory of annual and winter weekday PM₁₀ emissions estimates for the LMP. In the original maintenance plan, all sources of PM₁₀ were included. For this LMP, the four most significant sources in the original plan were inventoried: Residential Wood Combustion, Paved Road Dust, Onroad Motor Vehicles, and Construction Dust. Other categories inventoried in the original maintenance plan were deemed insignificant, and were not inventoried.

Ecology's 2005 triennial emissions inventory (2005 EI) was used for all categories except Construction Dust. Since neither Ecology nor ORCAA have local information on emissions for Construction Dust, emissions for this category were taken from the 2008 National Emission Inventory (2008 NEI).

The 2005 EI estimates were available as annual and winter season emissions for Thurston County. The 2008 NEI estimates were annual estimates for Thurston County. These estimates were temporally allocated to a winter weekday, and spatially allocated to the nonattainment area as described below.

Nonpoint Sources

Residential Wood Combustion, Paved Road Dust and Construction Dust are nonpoint sources. These emissions are typically estimated by multiplying an activity level, such as wood combusted or Vehicle Miles Traveled (VMT), by an emission factor in mass per activity.

$$\text{Emissions} = \text{Activity level} \times \text{Emission Factor}$$

Estimation methods and data sources for these nonpoint sources are described below.

Residential Wood Combustion

Residential wood combustion (RWC) emissions are based on the 2005 Emission Inventory. RWC consists of home heating and recreational use of woodstoves, fireplaces, fireplace inserts and central furnaces. Activity parameters for the 2005 EI include the type of wood burning devices [certified (catalytic and noncatalytic) woodstoves, uncertified woodstoves and fireplaces], the amount and species of wood burned from each device and seasonal, daily and hourly usage rates. Most of this information was obtained through WSU's *Wood Burning Stove Survey for Idaho, Oregon and Washington State* (WSU Survey 2001). Emission factors were taken from AP 42, the 2002 NEI, and the particulate matter size distribution from the California Air Resources Board (CARB).

Wood burning devices include central furnaces, fireplaces, pellet stoves, and certified and uncertified woodstoves and inserts. Close to three quarters of all wood burning devices in the state are fireplaces or uncertified woodstoves and inserts.

Table E-1, Solid Fuel Devices, Washington State and Thurston County

	Thurston County	Washington State
Fireplaces	22,126	705,985
Uncertified woodstoves and inserts	12,130	272,103
All Devices Total	47,444	1,320,959
Percentage, fireplaces and uncertified stoves and inserts	72%	74%

Source: WSU Survey 2001 as used in the 2005 EI

Paved Road Dust

Paved Road Dust emission values for paved roads are based upon the 2005 EI. Average Daily Vehicle Miles Traveled (ADVMT) for Thurston County was estimated by Washington State Department of Transportation (WSDOT) through use of the federal Department of Transportation's Highway Performance Monitoring System (HPMS)¹. HPMS includes a system of traffic counts collected over several urban and rural sampling areas. The Paved Road Dust equation in AP-42² was used to calculate emissions. Both the 1995 and 2005 emission inventories excluded Unpaved Roads.

Construction Dust

Construction Dust values from EPA's 2008 NEI³ are used because neither ORCAA nor Ecology has local data for this category for 2005. The 2008 NEI data includes construction dust in three categories: Industrial/ Commercial/Institutional, Residential Construction, and Road Construction. It should be noted that top-down inventories such as the NEI have inherent uncertainties because data is collected nationally, and was not developed specifically for a local area, such as the TCMA.

Onroad Mobile Sources

Onroad mobile source emissions are those generated by operating vehicles on public roadways. The activity measure for onroad mobile sources is the number of miles driven. Emissions from fuel combustion, and brake and tire wear are estimated based on the 2005 EI.

Average Daily Vehicle Miles Traveled

ADVMT for Thurston County was estimated by WSDOT as described above in the Paved Road Dust section.

Emission Factors - Tailpipe Emissions and Brake and Tire Wear

Onroad mobile source emissions were calculated with EPA's Mobile 6.2 model. Emission rates in grams per mile were generated for unique combinations of month, vehicle type, pollutant and pollutant type (exhaust, evaporative, brake wear, tire wear). MOBILE 6.2 uses a combination of default and local input data to estimate emission factors. Local data was used for the following input parameters: evaluation month (age of fleet), registration distribution, temperature, humidity, and fuel parameters for Reid vapor pressure (RVP), fuel program, and diesel sulfur content. The parameters are described in Section 3.3 of the 2005 EI. The model parameters and data sources are listed in Table 2-2 below.

Table D-2 Mobile 6.2 Model Parameters and Data Sources⁴

Parameter	Data Source
Temporal allocation to month and day of week	WSDOT
Reid vapor pressure	Fuel surveys from Alliance of Automobile Manufacturers and TRW/Northrop-Grumman
Diesel sulfur content	Western Regional Air Partnership (WRAP)
Temperature and humidity	Olympia airport meteorological site
Vehicle age distribution	State Dept. of Licensing, State Office of the Superintendent of Public Instruction, Federal Transit Administration

¹ 2005 HPMS Mileage and Daily Travel Summary. Washington State Department of Transportation. July 2006

² Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources. AP-42. Section 13.2.1 Paved (11/06) and Section 13.2.2 Unpaved (11/06).

³ General Purpose Release version 1.5

⁴ Ecology 2005 EI, Table 2-2

Spatial Allocation Methods

Spatial surrogates were used to approximate emissions inside the TCMA from county data. For sources without specific coordinates, spatial surrogates were used to approximate both the location and magnitude of the emissions. TCMA emissions are estimated as:

$$E_{TCMA} = E_{County} * Surrogate_{TCMA} / Surrogate_{County}$$

Where E_{TCMA} = emissions in the TCMA, E_{County} = emissions in county, $Surrogate_{TCMA}$ = surrogate activity in the TCMA, and $Surrogate_{County}$ = surrogate activity in county.

The spatial surrogates and data sources used are shown in Table 3-1 below.

Table D-3 - Spatial Surrogates⁵

Sector and Category	Spatial Surrogate	Data Source
NONPOINT SOURCES		
Construction Dust - Industrial/Commercial/Institutional, Residential Construction Dust	Population	2010 Census
Construction Dust – Roads	Road miles	Thurston Regional Planning Council
Residential Fuel – Wood	Population	2010 Census
Paved Road Dust	Road VMT	Thurston Regional Planning Council
ONROAD MOBILE SOURCES		
All Vehicles	Road VMT	Thurston Regional Planning Council

Temporal Allocation Methods

Annual emissions data were adjusted to tons per average winter day for the maintenance area for each source category. Methods for each category are described below.

Residential Wood Combustion

For residential wood combustion, seasonal activity fractions from the WSU survey for western Washington were used⁶ to calculate emissions for a winter day.

Onroad Mobile Sources

WSDOT provided monthly ADVMT adjustment factors based on 2005 traffic counts.⁷ The factors were used to calculate winter day VMT. The winter emission factors calculated with MOBILE 6.2 were multiplied by the winter day VMT to estimate emissions.

⁵ 2005 EI, Table 3-1

⁶ 2005 EI, Table 3-58, page 63

⁷ Email from Guorong Liu, Washington State Department of Transportation to Sally Otterson, Washington State Department of Ecology. Transmitting spreadsheets with monthly, day-of-week, and hourly adjustment factors. monthfac_all.xls, dowfac_all.xls, hourfac_all.xls. Sept. 5, 2006.

Road Dust

WSDOT provided monthly ADVMT adjustment factors based on 2005 traffic counts. The factors were used to calculate winter day VMT on paved roads. Winter emission factors were calculated assuming no rainfall, and therefore no moisture adjustment. The emission factors were multiplied by the winter day VMT to estimate emissions.

Construction Dust

Construction Dust values are from EPA's 2008 NEI. Activity Adjustments for Construction Dust are as follows.

The EPA NONROAD2008 model for Construction Equipment allocates 20.7% of construction equipment activity to winter (SEASON.DAT file). Construction equipment is assumed to operate 6 days/week. The total winter day emissions are calculated:

$$T/\text{day} = (T/\text{yr} \times 0.207) / [(6/7) * 90 \text{ days/winter}]$$

Temporal Allocation – Additional Adjustments for Construction Dust

A further adjustment was made to construction dust emissions to account for higher soil moisture values in the winter. The NEI dust equations contains a multiplier of 24/PE where PE is the 30-year average precipitation-evaporation value from Thornthwaite's PE Index. A variation of Thornwaite's precipitation-evaporation equation (below) was used to calculate PE by month using 13 years of temperature and precipitation data⁸ from the Olympia Airport meteorological station. The calculated monthly PE values for Oct-Mar were normalized to produce a 12-month PE value representative of the winter. The normal annual PE was divided by the winter PE to produce a moisture adjustment factor (60%).

PE Equation

$$PE = \sum^{12} 115 [P/T-10]^{10/9}$$

where P is average monthly precipitation (inches) with 0.5 being the minimum value
T is average monthly temperature (degrees F) with 28.4 ° F being the minimum value used in the calculation.

Table D-4 Olympia Airport Temperature (°F) and Precipitation (Inches), 1996-2008⁹

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature	39.4	40.6	44	47.6	53.7	58.6	63.9	63.7	58.2	50	43.4	38.9	50.2
Precipitation	8.95	4.81	5.89	2.75	1.96	1.71	0.53	1.06	1.46	4.52	8.74	8.38	50.76

The calculated 60% adjustment was reasonable when compared to other information: ORCAA regulations specify reasonable and/or appropriate precautions shall be taken to prevent fugitive particulate material from becoming airborne (RULE 8.3 (c) General Standards for Maximum Particulate Matter.

Emissions Inventory Improvement Program estimation method applies 50% control to PM nonattainment areas. The Western Regional Air Partnership and AP 42 attribute 10% - 74% control efficiency for watering depending on schedule and operation

⁸ Western Climatic Data Center, 1996-2008 Average for the Olympia Airport meteorological site.

⁹ Ibid, Table 32:

Appendix F.

Inventory Preparation Plan

Table of Contents

Inventory Preparation Plan	33
1 Introduction	34
1.1 Geographic Area	34
1.2 Temporal Resolution	35
2 Inventory Development	35
2.1 Nonpoint Sources	36
2.1.1 Residential Wood Combustion	36
2.1.2 Road Dust	36
2.1.3 Construction Dust	37
2.2 Onroad Mobile Sources	37
3 Spatial Allocation Methods	38
4 Temporal Allocation Methods	39
4.1 Residential Wood Combustion	39
4.2 Onroad Mobile Sources	39
4.3 Road Dust	39
4.4 Construction Dust	39
5 Quality Assurance and Quality Control	39
6 External Audits	39
7 Responsibility	39
8 Schedule	39

Inventory Preparation and Quality Assurance Plan Thurston County PM₁₀ Maintenance Area

1 Introduction

A portion of Thurston County, Washington exceeded the newly adopted 24-hour PM₁₀ standard of 150 µg/m³ in 1987 and was designated Group I by EPA for violating this standard. In 1990, the area was designated nonattainment per the 1990 Amendments to the Clean Air Act. The area was reclassified to attainment in 2000 when EPA approved the first 10-year maintenance plan for Thurston County in December of 2000. The maintenance plan for the second 10-year period was due before December 2010. Once approved by EPA, the second ten year plan will fulfill the final maintenance planning requirement of the Clean Air Act. This Inventory Preparation and Quality Assurance Plan (IP/QA Plan) is in support of the development of the required second 10-year PM₁₀ maintenance plan.

The Thurston County PM₁₀ maintenance area (TCMA) includes the cities of Olympia, Lacey and Tumwater and unincorporated areas within or between these cities' boundaries. Air quality is monitored at the College Street monitoring station in Lacey. The area has been in compliance with the standard for decades. The design value for 2003-2005 was 42 µg/m³. Measured Federal Reference Method (FRM) PM₁₀ values were so low that the monitor was removed with EPA approval in 2006. Since then, only continuous, non-reference method monitoring has been conducted in Lacey with a correlated nephelometer.

Ecology will prepare the maintenance plan in coordination with Olympic Region Clean Air Agency (ORCAA). Because the area has been in compliance for many years and the risk to the community of exceeding the PM₁₀ standard is low, Thurston County qualifies for the Limited Maintenance Plan (LMP) approach. A LMP assumes there is low risk of exceeding the standard and the demonstration of maintenance is presumed to be satisfied. A LMP includes a base year (attainment) inventory, but does not require a projected year inventory. Ecology proposes using existing information from Ecology's 2005 triennial emissions inventory¹ (2005 EI) and the 2008 National Emission Inventory (NEI) to create the inventory for the most significant emission sources.

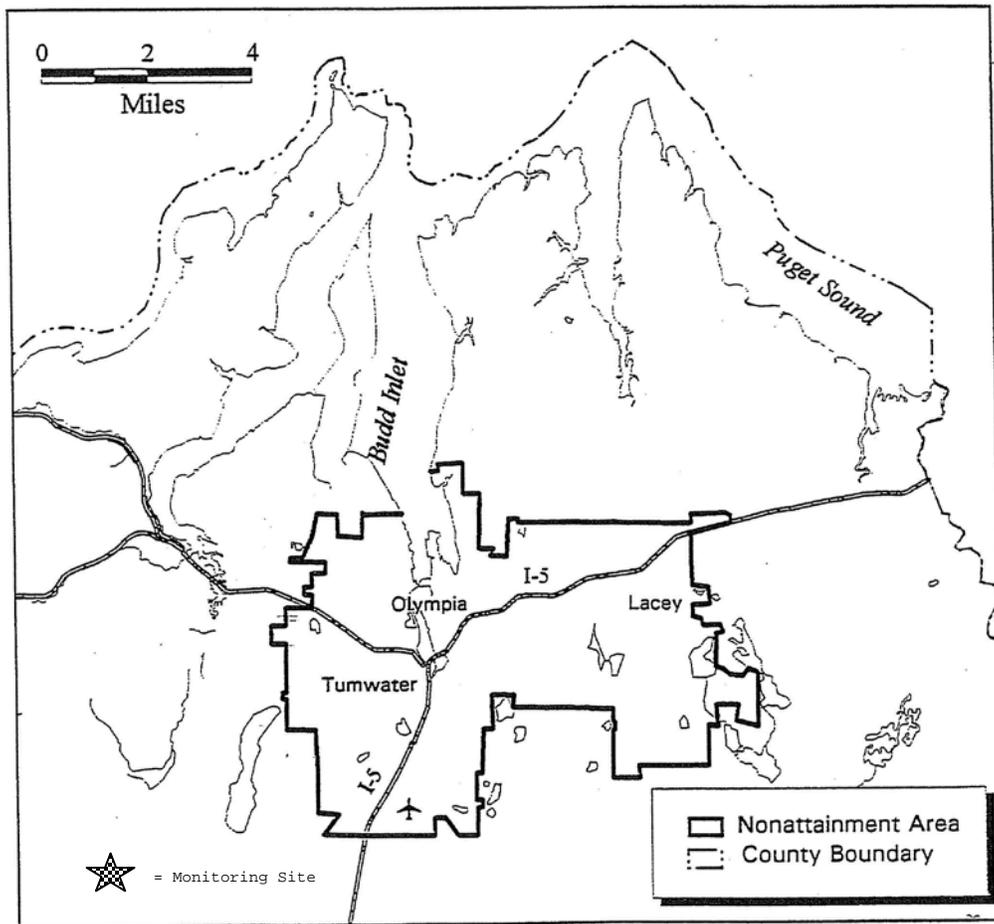
The following sections describe the planned approach to the LMP EI and the basis for selecting that approach. Ecology is submitting this IP/QA Plan for EPA approval.

1.1 Geographic Area

The TCMA is located west of the Cascade Mountains at the southern end of Puget Sound. The College Street monitoring site is at the Mountain View School in Lacey, WA at an elevation of 70 meters, (230 feet). Figure 1 below shows the features surrounding the maintenance area and the location of the monitoring site.

¹ Washington State Base Year 2005 County Inventories, Washington State Department of Ecology Air Quality Program, Sally Otterson, June 8, 2007

Figure 1 - Thurston County Maintenance Area



1.2 Temporal Resolution

Historical exceedances of the 24-hour PM_{10} standard occurred primarily during cold days from October through March. Therefore, the inventory will address average winter daily emissions in the maintenance area in addition to annual emissions.

2 Inventory Development

Ecology and ORCAA will develop an emission inventory using readily available data. We will document the estimation methods and gather information from the relevant inventory reports. We will begin with existing county data and temporally and spatially allocate it to the TCMA. The emission inventory will include annual and winter day emissions.

Initially, we proposed four emissions categories be included in this LMP. This was based on a review of emission categories listed in the first maintenance plan. Table 2.1 shows the breakdown of PM_{10} emissions for an average winter day in 1995.

Table 2-1 - 1995 PM₁₀ Average Winter Day Emissions

<i>Emissions Categories</i>	<i>Tons Per Winter Day</i>	<i>Percent of Winter Day Emissions</i>
<i>Road Dust</i>	2.27	25.3%
<i>Vehicle Exhaust and Tire Wear</i>	0.57	6.4%
<i>Construction Dust</i>	0.5	5.6%
<i>Residential Wood Combustion (labeled Wood Burning in 1995 plan)</i>	5.45	60.8%
Open Burning	0.04	0.4%
Airplane Activity	0.07	0.8%
Point Sources	0.1	1.1%

The most significant sources of PM₁₀ in the TCMA were and continue to be *Residential Wood Combustion (i.e., Wood Burning) and Road Dust*. Smaller contributions come from *Vehicle Exhaust and Tire Wear* and *Construction Dust*. Other sources are deemed insignificant and will not be included in the inventory. In previous discussions, EPA agreed that these four categories are all that need to be included in this LMP. Inventory values are available from Ecology's 2005 EI for Thurston County for most of these source categories². Since a 2005 EI value is not available for Construction Dust, ***Ecology and ORCAA would like to omit it from the inventory***. While existing 2008 data from the NEI could be used, it is not ideal. This is discussed further below.

2.1 Nonpoint Sources

Residential Wood Combustion, Road Dust and *Construction Dust* are nonpoint sources. These emissions are typically estimated by multiplying an activity level, such as wood combusted or Vehicle Miles Traveled (VMT), by an emission factor in mass per activity.

$$\text{Emissions} = \text{Activity level} \times \text{Emission Factor}$$

Estimation methods and data sources for these nonpoint sources are described below.

2.1.1 Residential Wood Combustion

Residential wood combustion (RWC) emissions will be based on the 2005 EI. RWC consists of home heating and recreational use of woodstoves, fireplaces, fireplace inserts and central furnaces. The basis for the 2005 EI include the type of wood burning devices (certified (catalytic and noncatalytic) woodstoves, uncertified woodstoves and fireplaces), the amount and species of wood burned from each device and seasonal, daily and hourly usage rates. Some of this information was obtained through surveys, such as WSU's *Wood Burning Stove Survey for Idaho, Oregon and Washington State* (2001). Emission factors were taken from AP-42, the 2002 NEI, and the PM size distribution from the California Air Resources Board (CARB).

2.1.2 Road Dust

Road Dust for paved and unpaved roads will be based upon the 2005 EI. Average Daily Vehicle Miles Traveled (ADVMT) for Thurston County was estimated by Washington State Department of Transportation (WSDOT) through use of the national Department of Transportation's Highway Performance Monitoring System (HPMS)³. HPMS includes a system of traffic counts collected over several urban and rural sampling areas. VMT on unpaved

² The categories are defined in the 2005 Emission Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations.

³ 2005 HPMS Mileage and Daily Travel Summary. Washington State Department of Transportation. July 2006

roads was estimated using data from the County Road Administration Board (CRAB) and WSDOT. The Road Dust equations in AP-42 were used to calculate emission factors⁴.

2.1.3 Construction Dust

If Construction Dust is included in the inventory, data from EPA's 2008 NEI would have to be used because neither ORCAA nor Ecology has local data for this category for 2005. The 2008 EI data includes construction dust in three categories: Industrial/Commercial/Institutional, Residential Construction, and Road Construction.

- Industrial/Commercial/Institutional construction dust is a function of the acreage disturbed for non-residential construction. Regional variances in construction emissions are corrected using soil moisture level and silt content. Values on this activity are taken from census reports such as Annual Value of Construction Put in Place⁵ and County Business Patterns⁶ as well as the Bureau of Labor Statistics⁷.
- Residential Construction Dust emissions rely on information on housing starts^{8,9} and building permits^{10,11} to estimate emissions from soil disturbed from this activity.
- Road Construction emissions are based on the amount of land disturbed for road construction. These values came from the Federal Highway Administration (FHWA).

Top-down inventories such as the NEI have inherent uncertainties because data is collected nationally and aggregated. Based on these uncertainties and because of the small contribution of this category to the total, *Ecology and ORCAA would like to omit this category from the EI. We request EPA concurrence.*

2.2 Onroad Mobile Sources

Onroad mobile source emissions are those generated by operating vehicles on public roadways. Emissions from fuel combustion and evaporation, and brake and tire wear will be estimated based on the 2005 EI. The activity measure for onroad mobile sources is the number of miles driven. The units are typically given in ADVMT.

VMT

ADVMT for Thurston County was estimated by WSDOT as described above in the Road Dust section.

Emission Factors - Tailpipe Emissions and Brake and Tire Wear

Onroad mobile source emissions were calculated with EPA's Mobile 6.2 model. Emission rates in grams per mile were generated for unique combinations of month, vehicle type, pollutant and pollutant type (exhaust, evaporative, brake wear, tire wear). MOBILE 6.2 uses a combination of default and local input data to estimate emission factors. Local data was used for the following input parameters: evaluation month (age of fleet), registration distribution, temperature, humidity, and fuel parameters for Reid vapor pressure (RVP), fuel program, and diesel sulfur content. The parameters are described in Section 3.3 of the 2005 EI. The model parameters and data sources are listed in Table 2-2 below.

⁴ Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources. AP42. Section 13.2.1 Paved (11/06) and Section 13.2.2 Unpaved (11/06). (Note that the methodology for calculating Road Dust for the maintenance plan was different. The alternative method correlated relative humidity and entrained road dust using a WSDOT 2006 algorithm.)

⁵ <http://www.census.gov/const/www/ototpage.html>

⁶ <http://www.census.gov/econ/cbp/index.html>

⁷ <http://www.bls.gov/data/> Table BMNR

⁸ New Privately Owned Housing Units Started for 2008 (Not seasonally adjusted), <http://www.census.gov/const/startsuu.pdf>

⁹ Table 2au. New Privately Owned Housing Units Authorized Unadjusted Units for Regions, Divisions, and States <http://www.census.gov/const/C40/Table2/tb2u2007.txt>

¹⁰ Annual Housing Units Authorized by Building Permits CO2007A, purchased from US Department of Census

¹¹ Type of Foundation in New One-Family Houses Completed, <http://www.census.gov/const/C25Ann/sfttotalfoundation.pdf>

2-2: Mobile 6.2 Model Parameters and Data Sources

Parameter	Data Source
Temporal allocation to month and day of week	WSDOT
Reid vapor pressure	Fuel surveys from Alliance of Automobile Manufacturers and TRW/Northrop-Grumman
Diesel sulfur content	Western Regional Air Partnership (WRAP)
Temperature and humidity	Olympia airport meteorological site
Vehicle age distribution	State Dept. of Licensing, State Office of the Superintendent of Public Instruction, Federal Transit Administration

3 Spatial Allocation Methods

Spatial surrogates are used to approximate emissions inside the TCMA from county data. For sources without specific coordinates, spatial surrogates are used to approximate both the location and magnitude of the emissions. TCMA emissions are estimated as:

$$E_{TCMA} = E_{County} * Surrogate_{TCMA} / Surrogate_{County}$$

Where E_{TCMA} = emissions in the TCMA, E_{County} = emissions in county, $Surrogate_{TCMA}$ = surrogate activity in the TCMA, and $Surrogate_{County}$ = surrogate activity in county.

The spatial surrogates and data sources used are shown in Table 3-1 below.

Table 3-1: Spatial Surrogates

Sector and Category	Spatial Surrogate	Data Source
NONPOINT SOURCES		
Construction Dust - Industrial/Commercial/Institutional, Residential Construction Dust	Population	2010 Census
Construction Dust – Roads	Road miles	Thurston Regional Planning Council
Residential Fuel – Wood	Population	2010 Census
Road Dust	Road VMT	Thurston Regional Planning Council
ONROAD MOBILE SOURCES		
All Vehicles	Road VMT	Thurston Regional Planning Council

4 Temporal Allocation Methods

Annual emissions data will be adjusted to tons per average winter day for the maintenance area for each source category. Methods for each category are described below.

4.1 Residential Wood Combustion

For residential wood combustion, seasonal activity fractions from the WSU survey for western Washington were used¹² to calculate emissions for a winter day.

4.2 Onroad Mobile Sources

WSDOT provided monthly ADVMT adjustment factors based on 2005 traffic counts.¹³ The factors were used to calculate winter day VMT. The winter emission factors calculated with MOBILE 6.2 were multiplied by the winter day VMT to estimate emissions.

4.3 Road Dust

WSDOT provided monthly ADVMT adjustment factors based on 2005 traffic counts.¹⁴ The factors were used to calculate winter day VMT on paved and unpaved roads. Winter emission factors were calculated assuming no rainfall, and therefore no moisture adjustment. The emission factors were multiplied by the winter day VMT to estimate emissions.

4.4 Construction Dust

Monthly and weekday activity adjustment factors for construction equipment from EPA's NONROAD model will be used to allocate the 2008 NEI annual emissions to average winter day emissions, if included in the inventory. A further adjustment will be made for average winter soil moisture..

5 Quality Assurance and Quality Control

We are using existing data that has already been quality checked. Ecology uses the data quality objectives of accuracy, completeness, comparability, and representativeness. Ecology and ORCAA staff will perform quality assurance on the spatial and temporal allocation of emissions from the existing inventory. EPA has a process for assuring the quality of data in the NEI, if Construction Dust values are included.

6 External Audits

The state is willing to be audited by EPA, and make changes to this inventory preparation and quality assurance plan if warranted.

7 Responsibility

Since we are using available data, the inventory process will be simplified. Ecology will create the inventory with assistance from ORCAA. Both agencies will participate in inventory review and quality assurance activities outlined in this plan.

8 Schedule

The section below shows the schedule for document submittal to EPA Region 10. Ecology will submit a draft inventory to EPA upon their request. We will submit the final inventory according to this Inventory Preparation and Quality Assurance (IP/QA) Plan.

¹² 2005 EI, Table 3-58, page 63

¹³ Email from Guorong Liu, Washington State Department of Transportation to Sally Otterson, Washington State Department of Ecology. Transmitting spreadsheets with monthly, day-of-week, and hourly adjustment factors. monthfac_all.xls, dowfac_all.xls, hourfac_all.xls. Sept. 5, 2006.

¹⁴ Ibid.

Schedule

- SIP Development Plan Provided to EPA, June 16, 2011
- Inventory Preparation Plan (IPP) Provided to EPA October 2011
- Plan Development and Supporting Technical Work July–December 2011
- Draft SIP to EPA November–December 2011
- Present Draft SIP to ORCAA board January–March 2012
- SIP to EPA January–March 2012
- EPA Approval September 2012

DRAFT

Appendix G.

Olympic Region Clean Air Agency Regulations

Regulation 6, Rule 6.2 Outdoor Burning (portions)
 Regulation 8, Rule 8.1, Wood Heating (portions)

RULE 6.2 OUTDOOR BURNING

Rule 6.2.3 No residential or land clearing burning is allowed in the following cities and/ or UGAs:

Clallam	Grays Harbor	Jefferson	Mason	Pacific	Thurston
Carlsberg Clallam Bay Forks Joyce Port Angeles Seki Sequim	Aberdeen Hoquiam	Port Townsend Irontdale Port Hadlock	Allyn Belfair Shelton	Ilwaco Long Beach Raymond Seaview South Bend	Bucoda Grand Mound Lacey Olympia Rainier Tenino Tumwater Yelm

Rule 6.2.6 Curtailment

- (a) No outdoor fire shall be ignited in a geographical area where a burn ban has been declared.
- (b) The person responsible for an outdoor fire must extinguish the fire when a burn ban is declared.
- (c) Three (3) hours after a burn ban is declared smoke visible from all types of outdoor burning, except land clearing burning, will constitute prima facie evidence of unlawful outdoor burning.
- (d) Eight (8) hours after a burn ban is declared smoke visible from land clearing burning will constitute prima facie evidence of unlawful outdoor burning.

Rule 6.2.7 Recreational Burning

The following burn practices shall be used for recreational burning where allowed.

- (a) Maximum pile size is three (3) feet in diameter and two (2) feet high. (WAC 173-425-060)
- (b) Only dry, seasoned firewood or charcoal and enough clean paper necessary to start a fire may be burned.
- (c) No recreational fires are allowed within the city limits of Lacey, Olympia, and Tumwater, and unincorporated areas of Thurston County lying within or between the municipal boundaries of these cities. Charcoal, propane, or natural gas may be used without a permit.

RULE 8.1 WOOD HEATING

The provisions of this rule apply to solid fuel burning devices in all areas within the jurisdiction of Olympic Region Clean Air Agency (ORCAA).

Rule 8.1.1 Definitions

“**Adequate Source of Heat**” means a furnace or heating system, connected or disconnected from its energy source, designed with the ability to maintain seventy degrees Fahrenheit (70°F) at a point three (3) feet above the floor in all normally inhabited areas of a dwelling. Garages are specifically excluded.

“**Certified**” means that a woodstove meets emission performance standards when tested by an accredited independent laboratory and labeled according to procedures specified by EPA in 40 CFR Part 60 Subpart AAA-Standards of Performance for Residential Wood Heaters as amended through July 1, 1990.

“**Cook Stove**” means an appliance designed with the primary function of cooking food and containing an integrally built-in oven, with an internal temperature indicator and oven rack, around which the fire is vented,

as well as a shaker grate ash pan, and an ash cleanout below the firebox. Any device with a fan or heat channels used to dissipate heat into the room shall not be considered a cook stove.

“Fireplace” means a permanently installed masonry fireplace; or a factory-built metal solid fuel burning device designed to be used with an open combustion chamber and without features to control the air to fuel ratio.

“First Stage of Impaired Air Quality” means the same as Stage 1 burn ban and is declared when meteorological conditions are predicted to cause fine particulate levels to exceed 35 micrograms per cubic meter measured on a 24 hour average, within 48 hours.

“Second Stage of Impaired Air Quality” means the same as Stage 2 burn ban and is declared when a first stage of impaired air quality has been in force and has not been sufficient to reduce the increasing fine particulate pollution trend (RCW 70.94.473). A second stage burn ban may be called without calling a first stage burn ban only when all of the following occur (RCW 70.94.473(c)(ii)):

- (a) Fine particulate levels have reached or exceeded 25 micrograms per cubic meter, measured on a 24 hour average;
- (b) Meteorological conditions have caused fine particulate levels to rise rapidly;
- (c) Meteorological conditions are predicted to cause fine particulate levels to exceed the 35 micrograms per cubic meter, measured on a 24 hour average, within 24 hours; and,
- (d) Meteorological conditions are highly likely to prevent sufficient dispersion of fine particulate.

“Nonaffected Pellet Stove” means that a pellet stove has an air-to-fuel ratio equal to or greater than 35.0 when tested by an accredited laboratory in accordance with methods and procedures specified by the EPA in 40 CFR Part 60 Appendix A, Reference Method 28A-Measurement of Air to Fuel Ratio and minimum achievable burn rates for wood fired appliances as amended through July 1, 1990.

“Salt Laden Wood” means any species of wood that has been soaked in salt water.

“Seasoned Wood” means clean, untreated wood of any species that has been sufficiently dried so as to contain twenty percent (20%) or less moisture by weight.

“Solid Fuel Burning Device” means a device that burns seasoned wood, coal, or any other nongaseous or nonliquid fuels except those prohibited by Rule 8.1.3. This also includes devices used for aesthetic or a space heating purpose, which has a heat input less than one million British thermal units per hour. A cook stove is specifically excluded from this definition.

“Treated Wood” mean wood of any species that has been chemically impregnated, painted, or similarly modified to improve structural qualities or resistance to weathering or deterioration.

“Woodstove” means an enclosed solid fuel burning device capable of and intended for space heating and/or domestic water heating.

Rule 8.1.2 General Emission Standards

~~(a) No person shall cause or allow an emission from a solid fuel burning device that unreasonably interferes with the use and enjoyment of property or workplace.~~

(b) No person shall cause or allow emission of a smoke plume from any solid fuel burning device to exceed an average of twenty percent (20%) opacity as determined by EPA Method 9. The provision of this requirement shall not apply during the starting of a new fire for a period not to exceed 20 minutes in any 4 hour period.

(c) Smoke visible from a chimney, flue, or exhaust duct, in excess of the opacity standard shall constitute prima facie evidence of unlawful operation of an applicable solid fuel burning device. This presumption may be refuted by demonstration that the smoke was not caused by an applicable solid fuel burning device.

Rule 8.1.3 Prohibited Fuel Types

A person shall not cause or allow any of the following materials to be burned in a solid fuel burning device:

- (a) Garbage;
- (b) Treated wood;
- (c) Plastic products;

- (d) Rubber products;
- (e) Animals;
- (f) Asphalt products;
- (g) Petroleum products;
- (h) Paints and chemicals;
- (i) Salt laden wood; or
- (j) Any substance that normally emits dense smoke or obnoxious odors.

Rule 8.1.4 Curtailment

(a) Whenever the Agency has declared a Stage 1 burn ban for a geographic area, a person within that geographic area with an adequate source of heat other than a solid fuel burning device shall not operate any solid fuel burning device, unless the solid fuel burning device is one of the following:

- (1) Certified; or
- (2) A nonaffected pellet stove.

(b) Whenever the Agency has declared a Stage 2 burn ban for a geographic area, a person within that geographical area with an adequate source of heat other than a solid fuel burning device shall not operate any solid fuel burning device.

(c) The affected geographic area of a declared Impaired Air Quality shall be determined by the Executive Director or their designee.

(d) A person responsible for an applicable solid fuel burning device already in operation at the time Impaired Air Quality is declared shall withhold new solid fuel for the duration of the Impaired Air Quality. Smoke visible from a chimney, flue, or exhaust duct after three hours has elapsed from the declaration of the Impaired Air Quality shall constitute prima facie evidence of unlawful operation of an applicable solid fuel burning device. This presumption may be refuted by demonstration that the smoke was not caused by a solid fuel burning device.

(e) For the sole purpose of a contingency measure to meet the requirements of Section 172(c)(9) of the Federal Clean Air Act, the use of solid fuel burning devices, except fireplaces as defined in RCW 70.94.453(3), woodstoves meeting the standards set forth in RCW 70.94.457 or pellet stoves either certified or issued an exemption by the EPA in accordance with Title 40, Part 60 of the Code of Federal Regulations will be prohibited if the EPA, in consultation with Ecology and the Agency, makes written findings that:

- (1) The area has failed to make reasonable further progress or attain or maintain a national ambient air quality standard; and,
- (2) Emissions from solid fuel burning devices from a particular geographic area are a contributing factor to such failure to make reasonable further progress or attain or maintain a national ambient air quality standard.
- (3) A prohibition issued under 8.1.4(e) shall not apply to a person that does not have an adequate source of heat without burning wood.
- (4) The area is to consist of all areas within the city limits of Lacey, Olympia, and Tumwater and unincorporated areas of Thurston County lying within or between the municipal boundaries.

Rule 8.1.5 Exemptions

Written exemptions granted by the Agency shall be valid for one (1) year from date of issue. Exemptions may be canceled at any time if the original request is found to be incorrect, inaccurate or fraudulent. Exemptions shall apply only to the use of solid fuel burning device during an Impaired Air Quality and not to the other rules of this regulation or other applicable regulations.

(a) Emergency exemption. In an emergency situation the Agency may issue a written solid fuel burning device emergency exemption. An emergency situation shall include, but is not limited to, a situation where a person demonstrates that their heating system, other than a solid fuel heating device, is inoperable for reasons other than their own actions or a situation where the heating system has been involuntarily disconnected by a utility company or other fuel supplier.

(b) Inadequate heat source. Written exemptions may be issued by the Agency if a person can demonstrate that:

- (1) The structure was originally designed with a solid fuel burning device as the source of heat; or
- (2) The existing heat source, fueled with other than solid fuel, will not provide adequate heat.

Rule 8.1.6 Penalties

A person in violation of this Rule 8.1 may be subject to the provisions of Rule 2.5.

Rule 8.1.7 Sale and Installation of Uncertified Woodstoves

It shall be unlawful to install, sell, offer for sale, advertise for sale, or otherwise transfer an uncertified solid fuel burning device unless the device has been rendered permanently inoperable as a combustion device.

Rule 8.1.8 Disposal of Uncertified Woodstoves

At such time as an uncertified solid fuel burning device is to be permanently removed from its location it shall be rendered inoperable as a solid fuel burning device. A removed uncertified solid fuel burning device shall not be sold, bartered, traded, or given away for a purpose other than recycling of the materials to form something other than an uncertified solid fuel burning device.

DRAFT

Chapter 173-433 WAC SOLID FUEL BURNING DEVICE STANDARDS**Redline strikeout version, selected sections**

~~of latest changes to 173-433 as published in Washington Register.
State effective: 12/16/87; EPA effective: 1/15/93~~

173-433-030 Definitions

The definitions of terms contained in chapter 173-400 WAC are incorporated by reference. Unless a different meaning is clearly required by context, the following words and phrases as used in this chapter, shall have the following meanings:

- (1) "Adequate source of heat" means the ability to maintain seventy degrees Fahrenheit at a point three feet above the floor in all normally inhabited areas of a dwelling.
- (2) "Certified" means that a woodstove meets emission performance standards when tested by an accredited independent laboratory and labeled according to EPA or DEQ procedures specified by the EPA in "40 C.F.R. 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990.
- (3) "**Coal-only heater**" means an enclosed, coal burning appliance capable of and intended for residential space heating, domestic water heating, or indoor cooking, which has all of the following characteristics:
 - (a) An opening for emptying ash which is located near the bottom or the side of the appliance;
 - (b) A system which admits air primarily up and through the fuel bed;
 - (c) A grate or other similar device for shaking or disturbing the fuel bed or power driven mechanical stoker; and
 - (d) The model is listed by a nationally recognized safety testing laboratory for use of coal only, except for coal ignition purposes.
- ~~(4) "Dealer" means a person other than a manufacturer or a retailer who is engaged in selling solid fuel burning devices to retailers or others for resale.~~
- ~~(5) "DEQ" means Oregon department of environmental quality.~~
- ~~(6) (4) "EPA" means United States Environmental Protection Agency.~~
- ~~(7) "Impaired Air Quality" means a condition declared by ecology or an authority whenever:
 - (a) Meteorological conditions are conducive to an accumulation of air contamination concurrent~~

with:

~~(i) Total suspended particulate at an ambient level of one hundred twenty-five micrograms per cubic meter measured on a twenty-four hour average; or~~

~~(ii) Particulate that is ten-micron and smaller in diameter (PM10) at an ambient level of ninety micrograms per cubic meter measured on a twenty-four hour average; or~~

~~(iii) Carbon monoxide at an ambient level of eight parts of contaminant per million parts of air by volume (ppm) measured on an eight-hour average; or~~

~~—(b) Air quality reaches other limits established by ecology or an authority.~~

~~(8) "Manufacturer" means any person who constructs or imports a solid fuel burning device or parts for a solid fuel burning device.~~

~~(9) (5) "New Woodstove" means a woodstove that has not been sold at retail, bargained, exchanged, or given away for the first time by the manufacturer, the manufacturer's dealer or agency, or a retailer, and has not been so used as to become what is commonly known as "second hand" within the ordinary meaning of that term.~~

~~(6) "Nonaffected pellet stove" means that a pellet stove has an air-to-fuel ratio equal to or greater than 35.0 when tested by an accredited laboratory in accordance with methods and procedures specified by the EPA in "40 C.F.R. 60 Appendix A, REFERENCE METHOD 28A - MEASUREMENT OF AIR TO FUEL RATIO AND MINIMUM ACHIEVABLE BURN RATES FOR WOOD-FIRED APPLIANCES" as amended through July 1, 1990.~~

~~(10) (7) "Retailer" means any person engaged in the sale of solid fuel burning devices directly to the public. A contractor who sells dwellings with solid fuel burning devices installed or a mail order outlet which sells solid fuel burning devices directly to the public is considered to be a solid fuel burning device retailer.~~

~~(11) (8) "Seasoned wood" means wood of any species that has been sufficiently dried so as to contain twenty percent or less moisture by weight.~~

~~(12) (9) "Solid fuel burning device" (same as solid fuel heating device) means a device that burns wood, coal, or any other nongaseous or nonliquid fuels, and includes any device burning any solid fuel except those prohibited by WAC 173-433-120. This also includes devices used for aesthetic or space-heating purposes in a private residence or commercial establishment, which has a heat input less than one million British thermal units per hour.~~

~~(13) (10) "Treated wood" means wood of any species that has been chemically impregnated, painted, or similarly modified to prevent weathering, and deterioration, and damage due to insects.~~

~~(14) (11) "Woodstove" (same as "wood heater") means an enclosed solid fuel burning device capable of and intended for residential space heating and domestic water heating that meets all of the following criteria:~~

~~(a) For the purposes of determining qualification under Oregon Administrative Rules, Chapter~~

~~340, Division 21—Woodstove Certification—dated November 1984: An air to fuel ratio in the combustion chamber less than 30.0 during the burning of ninety percent or more of the fuel mass consumed in the low firing cycle. The low firing cycle means less than or equal to twenty five percent of the maximum burn rate achieved with the doors closed or the minimum burn rate achievable, whichever is greater; or~~

~~(b) For the purposes of determining qualification under the following criteria contained in “40 CFR 60 Subpart AAA - Standards of Performance for Residential Wood Heaters —dated February 26, 1988—as amended through July 1, 1990:~~

- ~~(i) (a) An air-to-fuel ratio in the combustion chamber averaging less than 35.0, as determined by EPA Reference Method 28A;~~
- ~~(ii) (b) A useable firebox volume of less than twenty cubic feet;~~
- ~~(iii) (c) A minimum burn rate less than 5kg/hr as determined by EPA Reference Method 28;~~
- ~~(iv) (d) A maximum weight of 800 kg, excluding fixtures and devices that are normally sold separately, such as flue pipe, chimney, and masonry components not integral to the appliance.~~

Any combination of parts, typically consisting of but not limited to: Doors, legs, flue pipe collars, brackets, bolts and other hardware, when manufactured for the purpose of being assembled, with or without additional owner supplied parts, into a woodstove, is considered a woodstove.

State effective: 10/18/90; EPA effective: 1/15/93

WAC 173-433-100 Emission Performance Standards

(1) Woodstove sales.

~~WAC 173-433-100 Emission performance standards. (1) Woodstoves. On or before January 1, 1995, a person shall not advertise to sell, offer to sell, sell, bargain, exchange, or give away a new woodstove in Washington unless it has been tested to determine its emission performance and heating efficiency and certified and labeled in accordance with procedures and criteria specified:~~

~~(a) Requirements for sale of new woodstoves in "Washington after July 1, 1988:~~

~~(i) By the DEQ in “Oregon Administrative Rules, Chapter 340, Division 21—Woodstove Certification” dated November 1984, is adopted by reference and on file at ecology; or~~

~~(ii) By the EPA in “40 CFR 60 Subpart AAA - Standards of Performance for Residential Wood Heaters” dated February 26, 1988, is adopted by reference and on file at ecology as amended through July 1, 1990. After January 1, 1995, woodstove sales shall comply with the requirements of subsection (3) of this section, Solid fuel burning devices.~~

~~(b) Requirements for sale of new solid fuel burning devices in Washington after July 1, 1990: a~~

person shall not advertise to sell, offer to sell, sell, bargain, exchange, or give away a new woodstove in Washington unless it has been tested to determine its emission performance and heating efficiency, certified and labeled in accordance with criteria and procedures specified by the EPA in “40 CFR 60 Subpart AAA—Standards of Performance for Residential Wood Heaters” dated February 26, 1988, and is adopted by reference and on file at ecology.

(2) Exemptions. The following solid fuel burning devices are exempt from the requirements of this section:

(a) Solid fuel burning devices sold at retail on or before July 1, 1988.

(b) Any solid fuel burning device exempted under “Oregon Administrative Rules, Chapter 340, Division 21—Woodstove Certification” dated November 1984, bearing the appropriate labeling or written proof of exempt status furnished by the DEQ.

(c) Any solid fuel burning device exempted under “40 CFR 60 Subpart AAA—Standards of Performance for Residential Wood Heaters” as amended through July 1, 1988, section 60.530, paragraphs (a), (b), (c), (e), (f), (g), (h), or (i), bearing the appropriate labeling or exempt status furnished by the EPA.

(3) General certification procedures. A solid fuel burning device that is exempt and therefore not eligible for certification under DEQ or EPA regulations may be tested to demonstrate its emission performance in accordance with criteria and procedures no less stringent than those imposed under “40 CFR 60 Subpart AAA—Standards of Performance for Residential Wood Heaters” as amended through July 1, 1988, subject to the following conditions:

(a) All criteria and procedures shall be submitted by the applicant for review and approval by ecology prior to certification testing;

(b) Certification of the solid fuel burning device shall be granted by ecology upon approval of test results that demonstrate that the solid fuel burning device meets emission performance standards equivalent to those under “40 CFR 60 Subpart AAA—Standards of Performance for Residential Wood Heaters” as amended through July 1, 1988.

(c) The certification of a woodstove shall be valid for only the specific model, design, plans and specifications that were originally submitted, tested and approved for certification.

(4) State-wide emission performance standards. An authority shall not adopt or enforce emission performance standards for solid fuel burning devices that are more stringent than the state-wide standard.

(5) Emission performance standards for certification.

(a) A new woodstove advertised for sale, offered for sale, or sold in Washington after July 1, 1988, bearing a DEQ certification label shall not exceed the standards for particulate matter under Section 340 21-115, “Oregon Administrative Rules, Chapter 340, Division 21—Woodstove Certification” dated November 1984.

(b) A new woodstove advertised for sale, offered for sale, or sold in Washington after July 1, 1988, bearing an EPA certification label shall not exceed the standards for particulate matter under

“40 CFR 60 Subpart AAA – Standards of Performance for Residential Wood Heaters” as amended through July 1, 1988.

(6) Labeling requirements:

(a) Woodstoves required to be labeled pursuant to subsection (1)(a)(i) of this section shall have labeling required by the DEQ in “Oregon Administrative Rules, Chapter 340, Division 21 – Woodstove Certification” dated November 1984.

(b) Woodstoves or other solid fuel burning devices required to be labeled pursuant to subsection (1)(a)(ii) or (b) of this section shall have labeling required by the EPA under “40 CFR 60 Subpart AAA – Standards of Performance for Residential Wood Heaters” dated February 26, 1988.

(7) Label alteration. A manufacturer, dealer, or retailer shall not alter either the permanent or removable label in any way from the label approved by the EPA or the DEQ.

(8) Woodstove alteration. A manufacturer, dealer, or retailer shall not remove or render inoperable any devices or components of any systems installed by the manufacturer of a woodstove for the purpose of controlling air contaminant emissions, other than for replacement or routine maintenance.

(9) Alternative testing procedure. A Washington state manufacturer who believes his solid fuel burning device, for technical reasons, should be subject to an alternative testing procedure to that established by the EPA may apply to ecology for an alternative or modified procedure. ecology will evaluate such applications. If disapproved, the solid fuel burning device shall remain subject to the EPA testing protocol. If the application is approved, the manufacturer shall propose an alternative or modified testing procedure. If the procedure is approved by ecology, it shall be the responsibility of the manufacturer to submit the device to an accredited testing laboratory and furnish ecology with final test reports. If test results are equivalent to those required by EPA testing, Washington certification may be issued. Interim certification, for a period not to exceed sixty days, may be issued by ecology to cover the testing period. Interim certification may be renewed.

(2) Fireplaces. After January 1, 1997, a person shall not advertise to sell, offer to sell, sell, bargain, exchange, or give away a factory built fireplace unless it meets the 1990 United States Environmental Protection Agency standards for woodstoves or equivalent standard that may be established by the state building code council by rule. Subsection (3) of this section shall not apply to fireplaces, including factory built fireplaces, and masonry fireplaces.

(3) Solid fuel burning devices. After January 1, 1995, a person shall not advertise to sell, offer to sell, sell, bargain, exchange, or give away a solid fuel burning device in Washington unless it has been certified and labeled in accordance with procedures and criteria specified in "40 **CFR**.F.R. 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990, and meets the following particulate air contaminant emission standards and the test methodology of the United States Environmental Protection Agency in effect on January 1, 1991, or an equivalent standard under any test methodology adopted by the United States Environmental Protection Agency subsequent to such date; methodology adopted by the United States Environmental Protection Agency subsequent to such date:

(a) Two and one-half grams per hour for catalytic woodstoves; and

(b) Four and one-half grams per hour for all other solid fuel burning devices.

(c) For purposes of this subsection, "equivalent" shall mean the emissions limits specified in this subsection multiplied by a statistically reliable conversion factor determined by ecology that relates the emission test results from the methodology established by the United States Environmental Protection Agency prior to May 15, 1991, to the test results from the methodology subsequently adopted by that agency.

State effective: 10/18/90; EPA effective: 1/15/93

WAC [Statutory Authority: Chapter 70.94 RCW and 501-506 ESHB 1028, 1991-93-04-105 (Order 91-55), § 173-433-100, filed 2/3/93, effective 3/6/93. Statutory Authority: Chapter 70.94 RCW, 91-07-066 (Order 90-58), § 173-433-100, filed 3/20/91, effective 4/20/91. Statutory Authority: RCW 70.94.331, 90-19-062 (Order 90-10), § 173-433-100, filed 9/17/90, effective 10/18/90. Statutory Authority: Chapters 70.94 and 43.21A RCW, 89-02-054 (Order 88-38), § 173-433-100, filed 1/3/89; 88-01-056 (Order 87-44), § 173-433-100, filed 12/16/87.]

173-433-110 Opacity Standards

(1) Phase 1 opacity level. A person shall not cause or allow emission of a smoke plume from any solid fuel burning device to exceed an average of forty percent opacity for six consecutive minutes in any one-hour period.

(2) Phase 2 opacity level. After July 1, 1990, A person shall not cause or allow emission of a smoke plume form any solid fuel burning device to exceed an average of twenty percent opacity for six consecutive minutes in any one hour period.

(3) (2) State-wide opacity standard. An authority shall not adopt or enforce an opacity level for solid fuel burning devices that is more stringent than the state-wide standard.

(4) (3) Test method and procedures. EPA Methods and procedures specified by the EPA in "40 C.F.R. 60 Appendix A reference method 9 - Visual Determination of the Opacity of Emissions from Stationary Sources as amended through July 1, 1990, shall be used to determine compliance with subsections (1) and (2) of this section.

(5) (4) Enforcement. Smoke visible from a chimney, flue or exhaust duct in excess of the opacity standard shall constitute prima facie evidence of unlawful operation of an applicable solid fuel burning device. This presumption may be refuted by demonstration that the smoke was not caused by an applicable solid fuel burning device. The provisions of this requirement shall:

(a) Be enforceable on a complaint basis.

(b) Not apply during the starting of a new fire for a period not to exceed twenty minutes in any four-hour period.

(5) Education. Any person or retailer providing information on the operation of solid fuel burning devices, such as brochures, demonstrations, and public education programs, should include information that opacity levels of ten percent or less are attainable through proper operation.

State effective: 10/18/90; EPA effective: 1/15/93

WAC 173-433-120 Prohibited Fuel Types

A person shall not cause or allow any of the following materials to be burned in a solid fuel burning device:

- (1) Garbage;
- (2) Treated wood;
- (3) Plastic and plastic products;
- (4) Rubber products;
- (5) Animal carcasses;
- (6) Asphaltic products;
- (7) Waste petroleum products;
- (8) Paints and chemicals; or
- (9) Any substance which normally emits dense smoke or obnoxious odors other than paper to start the fire, properly seasoned fuel wood, or coal with sulfur content less than 1.0% by weight burned in a coal-only heater; ~~which normally emits dense smoke or obnoxious odors.~~

State effective: 10/18/90; EPA effective: 1/15/93

WAC 173-433-140 Impaired Air Quality Criteria.

Impaired air quality shall be determined by ecology or an authority in accordance with the following criteria:

- (1) "First stage impaired air quality" - the first stage indicates the presence of:
 - (a) Particulate matter ten microns and smaller in diameter (PM₁₀) at or above an ambient level of seventy-five micrograms per cubic meter; or
 - (b) Carbon monoxide at or above an ambient level of eight parts of contaminant per million parts of air by volume (ppm).
- (2) "Second stage impaired air quality" - the second stage indicates the presence of particulate matter ten microns and smaller in diameter (PM₁₀) at or above an ambient level of one hundred five micrograms per cubic meter.

(3) On or after July 1, 1995, if an authority has geographically limited the use of solid fuel burning devices as specified under WAC 173-433-150(6), a single stage of impaired air quality will apply within the geographical area defined by the authority. A single stage of impaired air quality indicates the presence of:

(a) Particulate matter ten microns and smaller in diameter (PM₁₀) at or above an ambient level of ninety micrograms per cubic meter; or

(b) Carbon monoxide at or above an ambient level of eight parts of contaminant ppm.

(4) Acceptable ambient air quality measurement methods.

(a) Particulate matter ten microns and smaller in diameter (PM₁₀).

(i) Procedures specified by the EPA in "40 C.F.R. 50, APPENDIX J - REFERENCE METHOD FOR THE DETERMINATION OF PARTICULATE MATTER AS PM₁₀ IN THE ATMOSPHERE" as amended through July 1, 1990, shall be used to gather reference ambient PM₁₀ data on a twenty-four-hour average.

(ii) More timely ambient PM₁₀ measurement methods may be utilized to evaluate air quality impairment if accepted and approved by ecology. Any alternative method for evaluating air quality impairment for the purpose of curtailing solid fuel burning device use must be done at the same location and in parallel to the reference method, and must be related to the reference method by a mathematical relationship with a correlation coefficient of no less than 0.85.

(b) Carbon monoxide (CO) must be measured on an eight-hour average in accordance with procedures specified by the EPA in "40 C.F.R. 50, APPENDIX C - REFERENCE METHOD FOR THE DETERMINATION OF CARBON MONOXIDE IN THE ATMOSPHERE (NON-DISPURSIIVE INFRARED PHOTOMETRY)" as amended through July 1, 1990..

(c) All monitors used to measure PM₁₀ for evaluation of air quality impairment due to solid fuel burning device use must be sited in accordance with EPA siting criteria in or near affected residential areas.

WAC 173-433-150 Curtailment

(1) A person in a residence or commercial establishment with an adequate source of heat other than the burning of solid fuel shall not burn solid fuel in any solid fuel burning device:

(a) Whenever ecology has declared an air pollution episode for the geographical area pursuant to chapter 173-435 WAC; or

(b) Whenever ecology or an authority has declared impaired air quality for the geographical area, except when the solid fuel burning device is certified under WAC 173-433-100.

(1) Whenever ecology or an authority has declared the first stage of impaired air quality for a geographical area a person in a residence or commercial establishment within that geographical area with an adequate source of heat other than a solid fuel burning device shall not operate any solid fuel burning device, unless the solid fuel burning device is one of the following:

(a) A nonaffected pellet stove; or

(b) A woodstove certified and labeled by the EPA under "40 C.F.R. 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990; or

(c) A woodstove meeting the "Oregon Department of Environmental Quality Phase 2" emissions standards contained in Subsections (2) and (3) of Section 340-21-115, and certified in accordance with "Oregon Administrative Rules, Chapter 340, Division 21 - Woodstove Certification" dated November 1984.

(2) Whenever ecology or an authority has declared the second stage of impaired air quality for a geographical area a person in a residence or commercial establishment within that geographical area with an adequate source of heat other than a solid fuel burning device shall not operate any solid fuel burning device.

(3) Whenever ecology has declared an air pollution episode at a level above forecast a person in a residence or commercial establishment within that geographical area with an adequate source of heat other than a solid fuel burning device shall not operate any solid fuel burning device.

(4) The following matrix graphically illustrates the applicability of different types of solid fuel burning devices to the provisions of subsections (1) through (3) of this section:

<u>Burn Condition</u>	<u>Impaired Air Quality</u>		<u>Episode</u>	
	<u>First Stage</u>	<u>Second Stage</u>	<u>Forecast</u>	<u>Alert, Warning, or Emergency</u>
<u>Pellet Stove (nonaffected)</u>	<u>OK</u>	<u>NO</u>	<u>OK</u>	<u>NO</u>
<u>EPA Certified Woodstove</u>	<u>OK</u>	<u>NO</u>	<u>OK</u>	<u>NO</u>
<u>DEQ Phase 2 Woodstove</u>	<u>OK</u>	<u>NO</u>	<u>OK</u>	<u>NO</u>
<u>EPA Exempted Device</u>	<u>NO</u>	<u>NO</u>	<u>OK</u>	<u>NO</u>
<u>All Other Devices</u>	<u>NO</u>	<u>NO</u>	<u>OK</u>	<u>NO</u>

NOTES: "OK" indicates that the device may be operated
"NO" indicates that the device may not be operated

(5) On or after July 1, 1995, an authority may prohibit use of solid fuel burning devices within specific geographical areas:

(a) The following factors shall be considered in the exercise of this limitation:

(i) The contribution of solid fuel devices that do not meet the standards set forth in "40 C.F.R. 60

Subpart AAA -Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990, to nonattainment of national ambient air quality standards;

(ii) The population density of the applicable geographical area; and

(iii) The public health effects of the use of solid fuel devices which do not meet the standards set forth in "40 C.F.R. 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990.

(b) The following solid fuel devices are exempted from this limitation:

(i) Fireplaces;

(ii) Woodstoves certified and labeled by the EPA under "40 CFR. 60 Subpart AAA - Standards of Performance for Residential Wood Heaters" as amended through July 1, 1990; or

(iii) Nonaffected pellet stoves.

(c) An authority shall allow an exemption from this subsection for low-income persons who reside in the geographical area affected by this subsection.

(6) On or after July 1, 1995, whenever an authority has declared impaired air quality in accordance with criteria contained in WAC 173-433-140(3) for a geographical area defined under subsection (5) of this section, a person in a residence or commercial establishment within that geographical area shall not operate any solid fuel burning device.

(2) (7) A person responsible for a an applicable solid fuel burning device already in operation at the time an episode is declared shall withhold new solid fuel for the duration of the episode. A person responsible for a an applicable solid fuel burning device that is not certified under WAC 173-433-100 already in operation at the time impaired air quality is declared shall withhold new solid fuel for the duration of the impaired air quality. Smoke visible from a chimney, flue or exhaust duct after three hours has elapsed from the declaration of the episode or impaired air quality shall constitute prima facie evidence of unlawful operation of an applicable solid fuel burning device. This presumption may be refuted by demonstration that the smoke was not caused by a solid fuel burning device.

(3) (8) Ecology, authorities, health departments, fire departments, or local police forces having jurisdiction in the area may enforce compliance with the above solid fuel burning device curtailment rules after three hours has elapsed from the declaration of the episode or impaired air quality.

State effective: 10/18/90; EPA effective: 1/15/93

173-433-170 Retail Sales Fee

(1) A person selling a solid fuel burning device at retail shall impose upon the buyer a fee, pursuant to RCW 70.94.483.

(2) The fee shall be:

~~(a) Set at a minimum of five dollars until January 1, 1989, and annually thereafter it may be adjusted upward according to increases in the consumer price index;~~

~~(b) Applicable to all new and used solid fuel burning devices with the exception of built-in masonry places;~~

~~(c) Collected by the department of revenue in conjunction with the retail sales tax under chapter 82.08 RCW;~~

~~(3) If the seller should fail to collect the fee herein imposed or remit the fee to the department of revenue as prescribed in chapter 82.08 RCW, the seller shall be personally liable to the state for the amount of the fee with the subsequent actions taken in accordance with the collection provisions of chapter 82.32 RCW.~~

~~State effective: 1/3/89; EPA effective: 1/15/93~~

DRAFT