Portland-Medford
SIP-VIP Updates Project

Emission Inventory Demonstration
for Air Toxics and Ozone Precursors

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DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

State of Oregon
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EXECUTIVE SUMMARY

This report presents results from DEQ's evaluation of several emission control strategies implemented in the Portland and Medford Air Quality Maintenance Areas. DEQ's analysis focused on Portland and Medford because DEQ operates a vehicle inspection and maintenance program in these AQMAs. DEQ analyzed emissions of nationally regulated pollutants, called criteria pollutants, as well as air toxics from multiple sources. DEQ analyzed pollutants from onroad vehicles and nonroad equipment, nonpoint sources, biogenic sources (such as vegetation), events (such as wildfires and prescribed burning) and permitted point sources. The report describes the technical analysis and emission inventory demonstration that DEQ completed to compare current and modified emissions control strategies.

DEQ staff generated the onroad portion of the emission inventory using the EPA Motor Vehicle Emissions Simulator model, called MOVES. For the MOVES runs, Metro Regional Government provided Portland area activity data as Vehicle Miles Traveled and ODOT provided VMT for the Medford area, both for base year 2015. DEQ staff generated 2014 emissions data for gasoline dispensing facilities, residential wood combustion and perchloroethylene dry cleaners. EPA's 2014 National Emissions Inventory (NEI) v.2 was the source of all other inventory data. DEQ staff allocated all emissions to the AQMA boundaries using Geographic Information Systems (GIS).

The emission inventory shows that onroad sources may contribute more than 50 percent of criteria and air toxics pollutant emissions to the Portland and Medford AQMAs. Onroad sources predominantly contribute the criteria emissions, nitrogen oxides (NO_X), carbon monoxide (CO) and volatile organic compounds (VOC). Air toxics prevalent in onroad emissions are ethylbenzene, benzene, 1,3-butadiene and acetaldehyde. Other toxics emitted by onroad sources include 15-PAH, naphthalene, formaldehyde, acrolein and the metals arsenic and hexavalent chromium. Onroad source contribution to total emissions varies by pollutant and ranges from 57 percent and 80 percent of ethylbenzene emitted in the Portland and Medford AQMAs, respectively, to 1 percent of emitted hexavalent chromium in each airshed.

Figures A and B show the contribution by source type to anthropogenic criteria pollutant emissions for the Portland and Medford AQMAs. Figures C and D show results for anthropogenic air toxic emissions. All of the figures are sorted from left to right by highest to lowest onroad contribution to the AQMA.

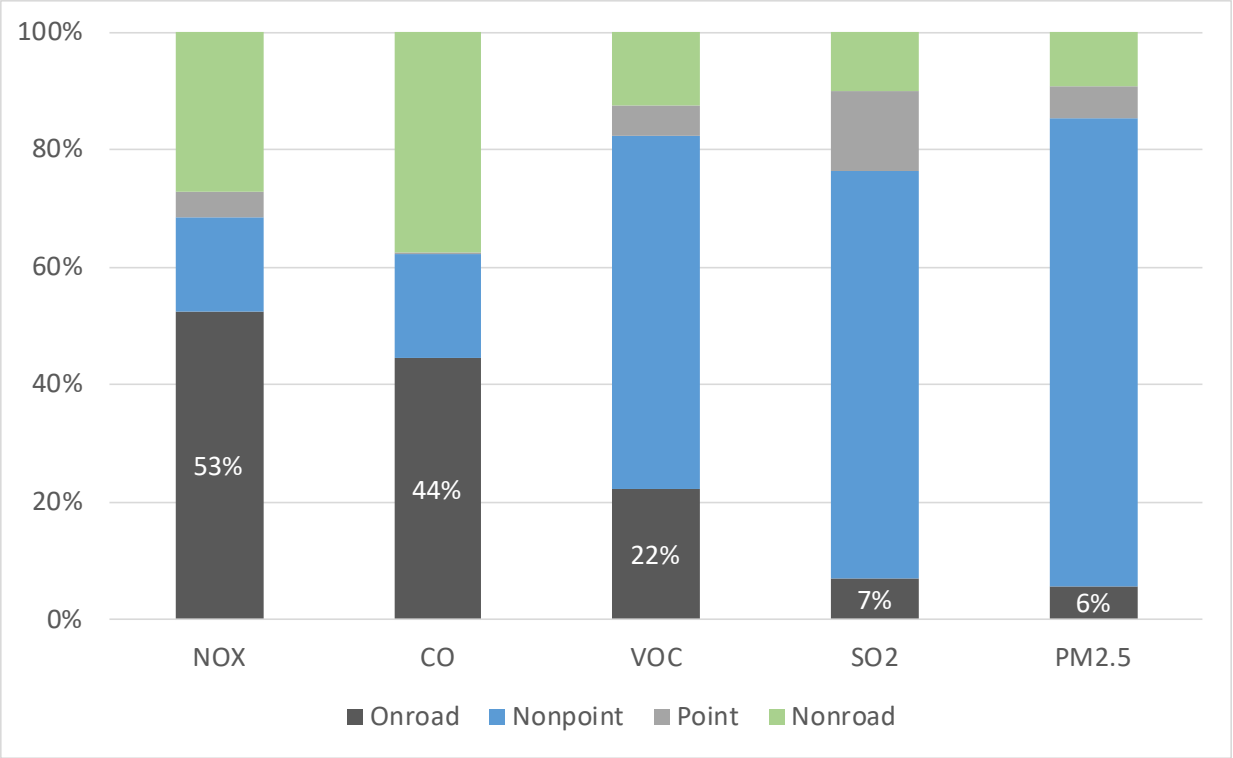

Figure A. Anthropogenic criteria pollutant emissions sources: Portland AQMA

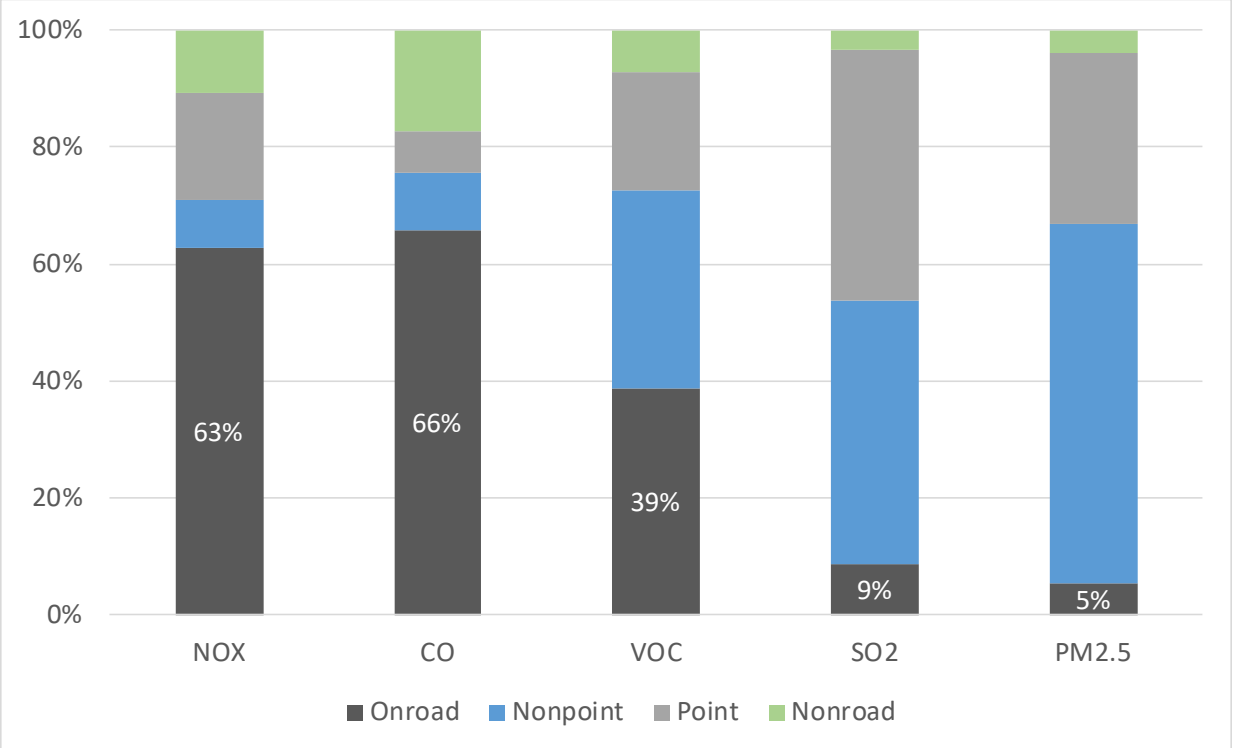

Figure B. Anthropogenic criteria pollutant emission sources: Medford AQMA

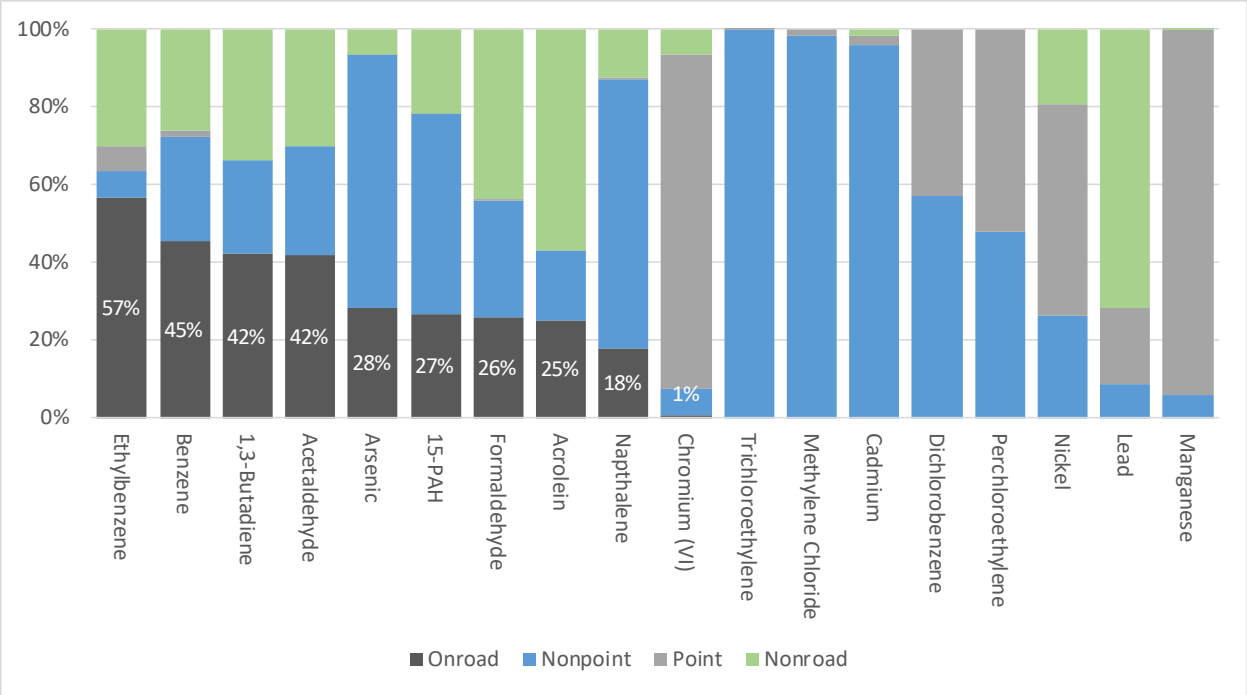

Figure C. Anthropogenic air-toxic pollutant emission sources: Portland AQMA

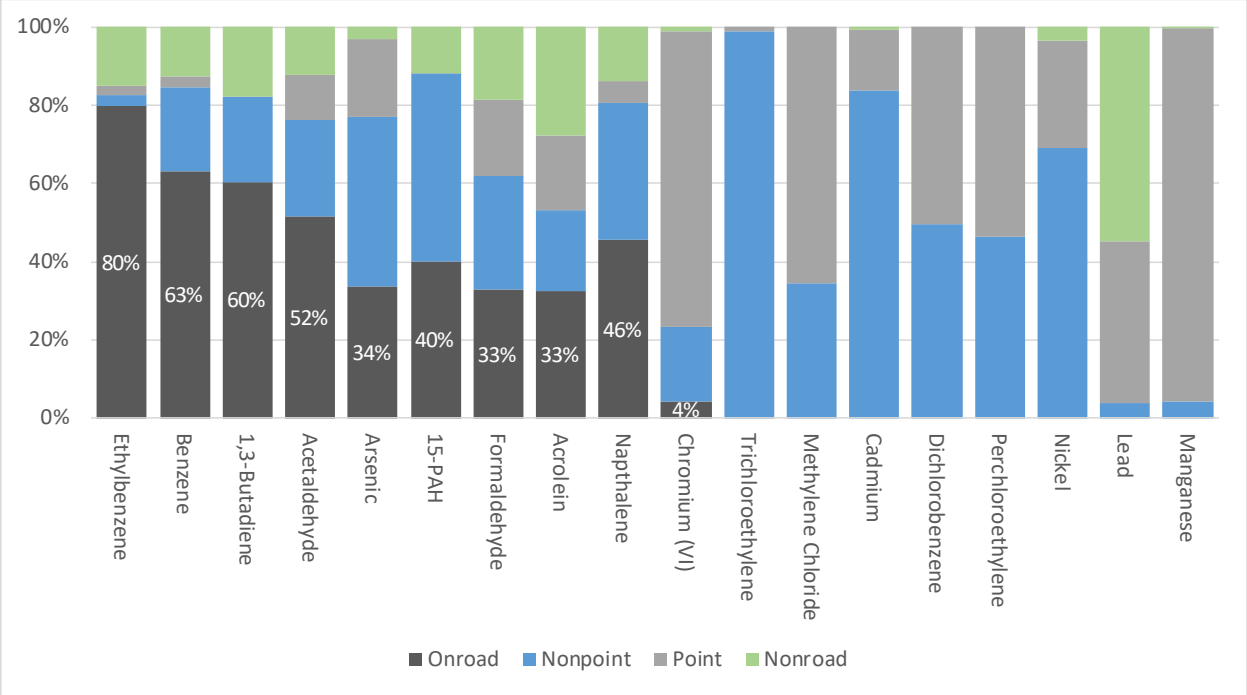

Figure D. Anthropogenic air-toxic pollutant emission sources: Medford AQMA

The purpose of this project was to compare criteria and toxics pollution reduction achievable from each of several control strategies in the Portland and Medford area Ozone and Carbon Monoxide maintenance plans, including a vehicle inspection program, employee commute options, barge loading controls and vapor recovery systems at gasoline dispensing facilities. The ECO Program requires large employers in the Portland area with more than 100 employees reporting to a work site to provide commute options to encourage employees to reduce auto trips to the work site. Vapor recovery, required in the Portland metropolitan area, captures fugitive emissions from gasoline as it is pumped into onroad vehicles. Barge loading controls capture fugitive emissions from gasoline as it is pumped from tank farms in the Portland area into barges for transport up the Columbia River to eastern Oregon.

For the evaluation of pollution reduction from VIP, DEQ analyzed four scenarios:

- Current VIP with 4-year new model exemption
- No VIP
- VIP with 5-year new model exemption
- VIP with 6-year new model exemption

DEQ's analysis shows that the vehicle inspection and maintenance program prevents hundreds of tons per year of pollutant emissions into the Portland and Medford areas. Criteria and air toxics emissions from onroad sources would increase by the percentages shown in Tables A and B if DEQ did not operate a Vehicle Inspection Program. Pollutants listed in both tables are those that onroad sources predominantly emit.

Table A. Percent increase to onroad emissions without VIP program: Portland AQMA

		2015 (tpy)	2015 No VIP (tpy)	Emissions Increase (a)
Air Toxic	1,3-Butadiene	30.14	35.71	18%
	Benzene	213.3	255.3	20%
	Ethylbenzene	128.0	148.5	16%
	Acetaldehyde	90.3	103.9	15%
	Napthalene	15.18	17.31	14%
	15-PAH	5.454	6.162	13%
	Formaldehyde	106.51	119.35	12%
	Acrolein	7.286	8.043	10%
Criteria	NOX	13,760	14,698	7%
	CO	74,894	85,748	14%
	VOC	7,783	9,260	19%

(a) % increase = ((2015 tpy no VIP) - (2015 tpy)) / (2015 tpy)

Table B. Percent increase to onroad emissions without VIP program: Medford AQMA

		2015 (tpy)	2015 No VIP (tpy)	Emissions Increase (a)
Air Toxic	1,3-Butadiene	8.04	8.73	8%
	Benzene	62.8	67.7	8%
	Ethylbenzene	43.1	45.7	6%
	Acetaldehyde	22.3	24.0	8%
	Napthalene	3.77	4.04	7%
	15-PAH	1.463	1.551	6%
	Formaldehyde	25.03	26.64	6%
	Acrolein	1.458	1.550	6%
Criteria	NOX	2,597	2,767	7%
	CO	21,703	22,920	6%
	VOC	2,515	2,647	5%

(a) % increase = ((2015 tpy no VIP) - (2015 tpy)) / (2015 tpy)

DEQ represents the effectiveness of all the control strategies by calculating the increase in total anthropogenic emissions if these strategies were not in place. Anthropogenic emissions come directly from human activities like driving, industrial operations and energy use. Emissions from natural sources, like wildfires, volcanic eruptions and vegetation, are not included in anthropogenic emissions. Table C compares anthropogenic emissions increase from removing each of the controls, VIP, ECO, VRS and barge loading. The analysis shows that among the strategies modeled, removing the vehicle inspection and maintenance program would result in the greatest emission increases.

Table C. Percent increase to anthropogenic emissions from removal of pollution control strategies

		Anthropogenic Emissions Increase (a) ------ Scenario: Control or Program Removed ------				
		Portland VIP	Medford VIP	Portland ECO	Portland GDF VRS	Portland Barge Loading
Air Toxic	1,3-Butadiene	7.8%	5.1%	0.5%	0%	0%
	Acetaldehyde	6.3%	4.0%	0.4%	0%	0%
	Acrolein	2.6%	2.1%	0.2%	0%	0%
	Benzene	8.9%	4.9%	0.5%	1.0%	2.0%
	Dichlorobenzene	0%	0%	0%	0%	0%
	Ethylbenzene	9.1%	4.6%	0.5%	1.7%	3.4%
	Formaldehyde	3.1%	2.1%	0.1%	0%	0%
	Methylene Chloride	0%	0%	0%	0%	0%
	Napthalene	2.5%	3.2%	0.1%	0%	0%
	Perchloroethylene	0%	0%	0%	0%	0%
	Trichloroethylene	0%	0%	0%	0%	0%
Air Toxic: 15-PAH	15-PAH	3.5%	2.4%	0.2%	0%	0%
Air Toxic: Metals	Arsenic	0%	0%	1.5%	0%	0%
	Cadmium	0%	0%	0%	0%	0%
	Chromium (VI)	0%	0%	0.04%	0%	0%
	Manganese	0%	0%	0%	0%	0%
	Nickel	0%	0%	0%	0%	0%
Criteria Pollutant	CO	6.4%	3.7%	0.8%	0%	0%
	Lead	0%	0%	0%	0%	0%
	NOX	3.6%	4.1%	0.4%	0%	0%
	PM10	0%	0%	0.03%	0%	0%
	PM2.5	0%	0%	0.05%	0%	0%
	SO2	0%	0%	0.3%	0%	0%
	VOC	4.2%	2.0%	0.2%	1.7%	3.3%

(a) % increase = [Emissions (control removed) – Emissions (control in place)]/Emissions (control in place)

Shaded indicates no impact

DEQ also analyzed the percent of total emissions from each anthropogenic sector and from natural sources, displayed in Figures D and E. DEQ illustrates the percent of total air toxics and criteria pollutant emissions, by EPA Tier 1 sector description, including non-anthropogenic sources: biogenic (vegetation) and miscellaneous (includes fires).

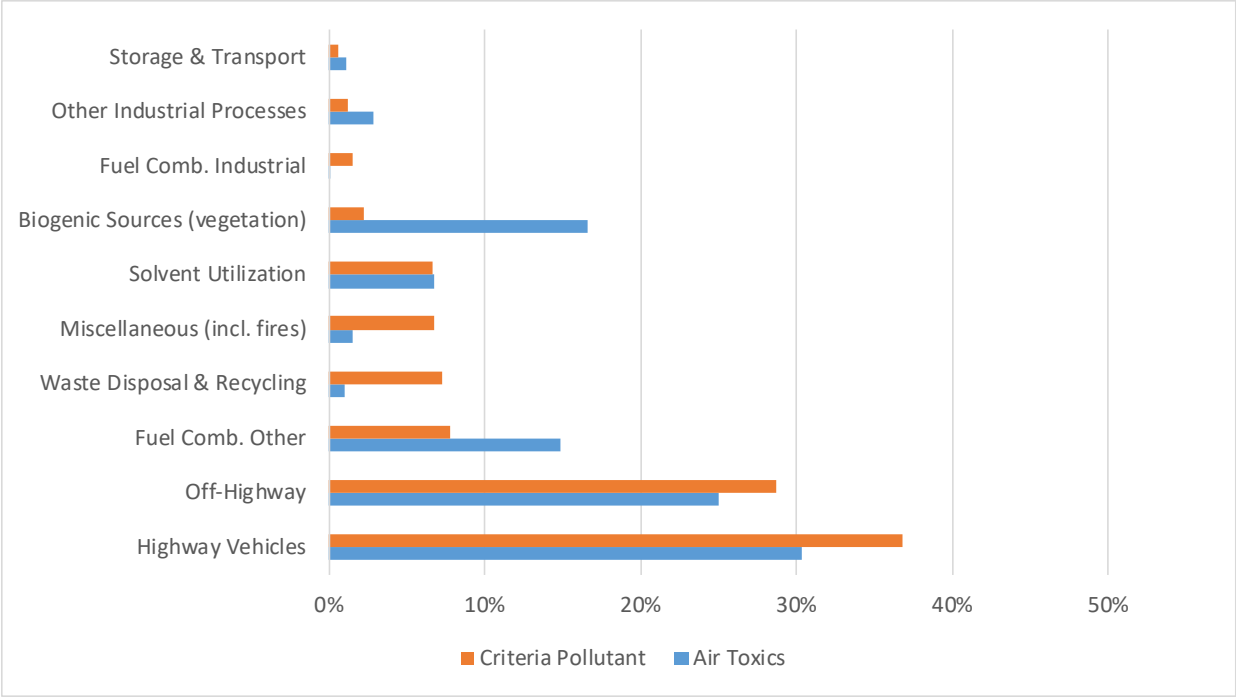

Figure D. Contribution to emissions, all sources: Portland AQMA. Biogenic and miscellaneous sources are non-anthropogenic.

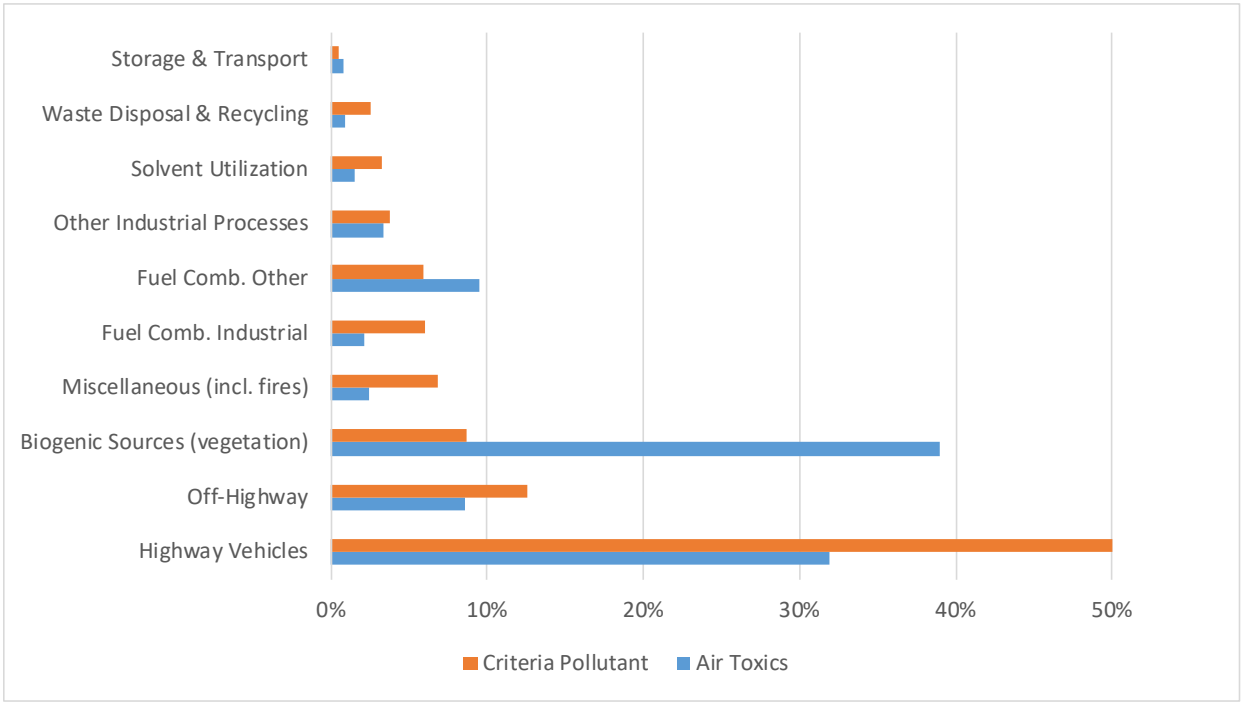

Figure E. Contribution to emissions, all sources: Medford AQMA. Biogenic and miscellaneous sources are non-anthropogenic.

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1 INTRODUCTION

1.1 Background

Since the 1990s, Oregon has fulfilled Clean Air Act requirements to maintain air pollution control strategies that assure compliance with National Ambient Air Quality Standards. EPA bases NAAQS on health criteria and these nationally regulated pollutants are called criteria pollutants. They are:

- Ozone
- Nitrogen oxides
- Carbon monoxide
- Particulate matter
- Sulfur dioxide
- Lead

Once Oregon had demonstrated approximately 20 years of maintenance with the NAAQS, the Oregon Department of Environmental Quality's air quality planning section asked how effective several air pollution control strategies were, with particular focus on air toxics and on-road sources. This report provides a technical basis for future decision-making by analyzing how DEQ's Vehicle Inspection Program and other strategies reduce criteria pollutant and air toxics emissions. The analysis encompasses the Portland and Medford-Ashland (Medford) Air Quality Maintenance Area boundaries. Within those AQMAs, DEQ analyzed data from an emission inventory of biogenic (for example, vegetation), event (for example, wildfires and prescribed burning), nonpoint (also called area), nonroad, permitted point and onroad sources.

Portland is classified as "in attainment" for ozone. In 2007, DEQ submitted to EPA an ozone maintenance plan that relied on strategies focusing on emission reductions from vehicles, industry, paints and household products. A subset of the ozone control strategies also control carbon monoxide, and are federally approved elements of the Portland CO Plan. Since Portland complies with the revised, more protective 2015 federal ozone standard, DEQ does not have to update or submit a new maintenance plan. Neither do conditions in Medford require maintenance plan updates, as EPA classifies Medford as maintaining the CO standard and attaining with ozone standard. However, population growth, increasing vehicle miles traveled and increasing hot weather periods will pose challenges for communities to maintain ozone concentrations below the standard.

DEQ used this analysis to better characterize the benefits of ozone control measures that also decrease air toxics, particulates and greenhouse gases. This report covers the project technical analysis, which consisted of an emission inventory demonstration and application to particular geographic areas. DEQ will use analytical results as an effectiveness measure of current and modified emissions control strategies and operating scenarios. The emissions inventory is broken down into two geographic areas:

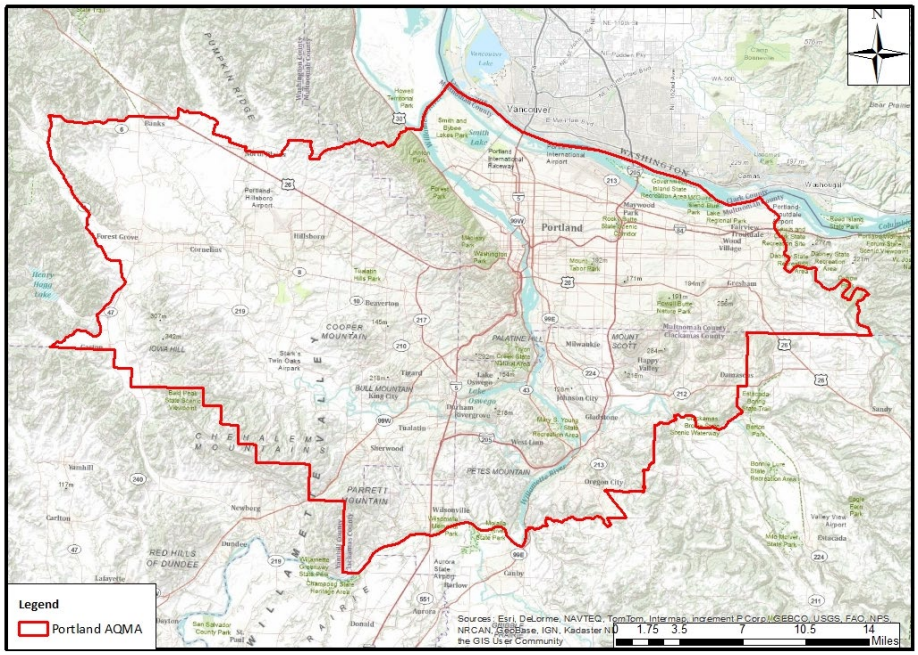
- Portland: analysis of VOC control strategies, including the Vehicle Inspection Program (VIP), for effectiveness in controlling ozone and reducing air toxics risk. This includes various model year exemption scenarios.
- Medford: initial analysis of VIP for effectiveness in controlling ozone and reducing air toxics risk.

1.2 Purpose

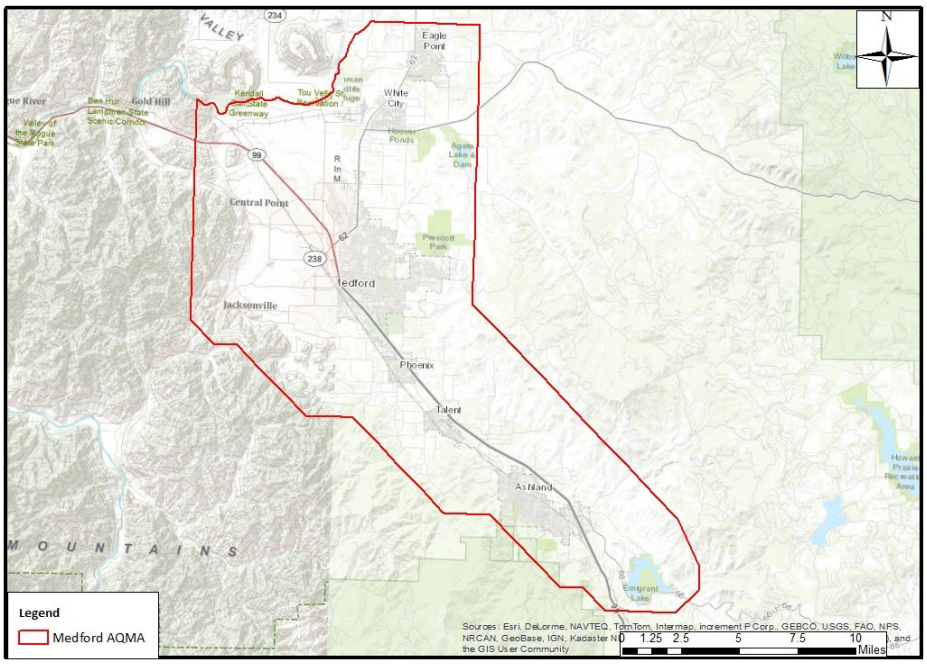
This report documents DEQ's analysis of control strategies for air toxics and ozone precursor pollutants in the Portland and Medford areas.

1.3 Description of Inventory and Area Covered

The emission inventory boundaries are the Portland and Medford AQMAs, as shown in Figure 1. Boundary legal descriptions, which coincide with the VIP implementation boundaries, are in Oregon Administrative Rules 340-204-0010 (14) and OAR 340-204-0010 (10).



A: Portland



B: Medford

Figure 1. Emission inventory analysis boundaries

1.4 Report Contents

The Report is divided into the following parts:

Part 1: Introduction to the Report
Part 2: Base Year Emission Inventory
Part 3: Strategy Evaluation
Part 4: Conclusions
Part 5: Quality Control
Part 6: References
Part 7: Appendices

Part 1 provides an introduction to this Report and its purpose.

Part 2 describes in detail DEQ's methodologies and approaches to estimate emissions in the Portland and Medford AQMA boundaries for the base year inventory. Part 2 is divided into sections describing the inventory process and the types of emission sources that are addressed in the inventory, as follows:

Section 2.1 provides maps of the Portland and Medford areas, with written descriptions of each area. This section also details the pollutants of concern and describes the inventory base year.

Section 2.2 contains summary tables for all sectors of emissions sources in the Portland AQMA and Medford AQMA.

Section 2.3 describes the stationary point source emission category methodology and emissions estimate approach. Tables summarizing point source emissions estimates follow the discussion.

Section 2.4 addresses area, nonroad, event and biogenic sources, and describes the approaches used to estimate emissions. Tables summarizing the emissions estimates from stationary area sources follow the discussion.

Section 2.5 describes the approach and methodology used to evaluate emissions from on-road mobile sources. Tables summarizing the emissions estimate from on-road mobile sources follow the discussion.

Part 3 provides emission inventory data for strategy evaluation.

Part 4 presents conclusions based on inventory results.

Part 5 describes the Quality Control procedures utilized in preparing the base year inventory.

Part 6 contains the list of references cited in this document.

Part 7 includes appendices with supplemental data used to estimate emissions, as well as detailed methodology descriptions for some source categories.

1.4.1 Overview of Inventory Sources

DEQ's Technical Services Section staff has assembled the inventory. DEQ staff calculated onroad mobile, residential wood combustion, gasoline dispensing facility and drycleaner emissions estimates. DEQ staff also calculated strategy and scenario estimates. DEQ staff obtained the remaining emissions estimates from the EPA 2014 National Emissions Inventory Version 2. DEQ staff double-checked permitted point source criteria pollutant emissions for accuracy using the DEQ Tracking Reporting and Administration of Air Contaminant Sources database. DEQ uses TRAACS to track compliance with plant site emission limits and report compliance status to EPA.

1.4.2 Sources Not Inventoried

DEQ considered all source categories contained in the EPA 2014 NEI for inclusion in the emission inventory. DEQ derived location data for all sources if that data was not known. After analysis and placement of emissions, DEQ excluded sources for one or both of the following reasons:

- sources did not emit pollutants of concern for this analysis
- source location was not within analysis boundaries of interest (Portland and Medford AQMAs)

1.4.3 Guidance Documents

For DEQ estimates, DEQ used current and applicable EPA procedure and guidance documents to compose the inventory. DEQ cites information sources in the text and includes references as end notes.

1.4.4 Personnel for the Inventory

An abbreviated list of those conducting or assisting with the emission inventory demonstration is shown below:

Oregon Department of Environmental Quality
Air Quality Division
Ali Mirzakhalili, Division Administrator
Jeffrey Stocum, Air Quality Technical Services Manager
Christopher Swab, Sr. Emission Inventory Analyst
Brandy Albertson, Emission Inventory Analyst
Wesley Risher, Emission Inventory Analyst
Michael Orman, Air Quality Planning Manager
Karen Font Williams, Air Quality Planner
MOVES Output Storage and Transformation (MOST) development
Brian Fields, DEQ Development Database Administrator
Gary Beyer, DEQ Environmental Engineer 2

2 EMISSION INVENTORY

2.1 Boundaries, Pollutants and Base Year

Maps of the emission inventory analysis boundaries (Portland and Medford AQMAs) are shown in the previous Figure 1.

2.1.1 Boundary Legal Descriptions

Oregon Administrative Rule 340-200-0020 defines "maintenance area" as any area that was formerly nonattainment for a criteria pollutant but has since met the ambient air quality standard, and EPA has approved a maintenance plan to comply with the standards under 40 CFR 51.110. The Oregon Environmental Quality Commission designates maintenance areas according to Division 204.

Oregon Administrative Rules 340-204-0010 (14) and OAR 340-204-0010 (10) provide the legal descriptions of the Portland and Medford boundary areas.

2.1.2 Pollutants

The pollutants DEQ analyzed are precursors to ozone formation and some air toxics from on-road sources, suggested by a review of the Portland Air Toxics Solutions Project (http://www.deq.state.or.us/aq/factsheets/12aq035patsReport.pdf). DEQ analyzed strategies

that control both criteria pollutants and air toxics. Table 1 lists the pollutants included in this analysis.

Table 1. Toxics pollutants known from on-road sources.

Air Toxic	*Air Toxic - 15-PAH*	*Criteria - Ozone Precursor*
1,3-Butadiene	Acenaphthene	Carbon Monoxide
Acetaldehyde	Acenaphthylene	Nitrogen Oxides
Acrolein	Anthracene	Volatile Organic Compounds
Benzene	Benz(a)anthracene	*Criteria - Other*
Dichlorobenzene	Benzo(a)pyrene	Lead and Lead Compounds
Ethylbenzene	Benzo(b)fluoranthene	PM10
Formaldehyde	Benzo(g,h,i)perylene	PM2.5
Methylene Chloride	Benzo(k)fluoranthene	Sulfur Dioxide
Napthalene	Chrysene	
Perchloroethylene	Dibenzo(a,h)anthracene	
Trichloroethylene	Fluoranthene	
Air Toxic - Metals	Fluorene	
Arsenic & Arsenic Compounds	Indeno(1,2,3,c,d)pyrene	
Cadmium & Cadmium Compounds	Phenanthrene	
Chromium (VI)	Pyrene	
Manganese and Manganese Compounds		
Nickel and Nickel Compounds		

2.1.3 Base Year

With the exception of on-road emissions estimates, the project inventory represents 2014 annual emissions. The on-road emission inventory base year is 2015 and derives from the activity data (vehicle miles traveled or VMT) that Metro and ODOT provided to DEQ.

2.2 Summary of Emissions Data

Tables 2 and 3 include summary emissions estimates from all source categories. Figures 2 and 3 show the emissions contribution from anthropogenic sources (nonroad, onroad, point and nonpoint sources). The Portland chart (Fig. 2) is sorted in order of the decreasing contribution from onroad sources by pollutant. The Medford chart (Fig. 3) follows the same pollutant order as the Portland chart. The percent contribution from each category (onroad, nonroad point, nonpoint) varies between Portland and Medford because of different types and quantities of sources, including commercial marine (not present in Medford), locomotives (higher percentage in Portland) and point sources (fewer in Medford).

Table 2. Base Year Summary of Emissions by Source Type, tons per year: Portland AQMA

		Biogenic	Event	Nonpoint	Nonroad	Onroad	Point	**Total**
Air Toxic	1,3-Butadiene		1.4	17.3	24.2	30.1		**73.0**
	Acetaldehyde	138.1	6.4	61.1	65.1	90.3		**361.0**
	Acrolein		2.3	5.2	16.4	7.3		**31.1**
	Benzene		2.1	126.3	122.7	213.3	7.1	**471.5**
	Dichlorobenzene			0.0057			0.0043	**0.0100**
	Ethylbenzene			15.4	67.7	128.0	14.8	**225.9**
	Formaldehyde	188.3	13.0	124.2	180.5	106.5	1.1	**613.6**
	Methylene Chloride			9.0			0.2	**9.2**
	Napthalene		1.9	58.2	10.6	15.2	0.1	**86.1**
	Perchloroethylene			15.1			16.41	**31.53**
	Trichloroethylene			42.8			0.05	**42.87**
Air Toxic: 15-PAH	15-PAH		0.2	10.5	4.4	5.5	0.00002	**20.49**
Air Toxic: Metals	Arsenic			0.057	0.0055	0.025	0.0002	**0.087**
	Cadmium			0.038	0.0		0.001	**0.039**
	Chromium (VI)			0.0011	0.001049	0.00013	0.0144	**0.0167**
	Manganese			0.08	0.0031		1.3	**1.4**
	Nickel			0.10	0.0770		0.219	**0.400**
Criteria Pollutant	CO	1,319.8	615.6	29,868.8	63,347.9	74,893.5	414.5	**170,460.2**
	Lead			0.13	1.1		0.3	**1.5**
	NOX	66.2	14.3	4,167.7	7,100.4	13,759.9	1,156.2	**26,264.7**
	PM10		67.9	19,125.1	627.7	728.7	401.2	**20,950.6**
	PM2.5		57.5	5,101.9	594.1	367.0	349.0	**6,469.5**
	SO2		6.4	955.0	140.0	97.0	186.9	**1,385.3**
	VOC	4,415.8	146.9	21,141.4	4,374.3	7,782.8	1,775.6	**39,636.7**

Table 3. Base Year Summary of emissions by source type, tons per year: Medford AQMA

		Biogenic	Event	Nonpoint	Nonroad	Onroad	Point	**Med Total**
Air Toxic	1,3-Butadiene		0.4	2.9	2.4	8.0		**13.7**
	Acetaldehyde	86.8	2.5	10.6	5.3	22.26	5.0	**132.4**
	Acrolein		0.8	0.9	1.2	1.46	0.9	**5.3**
	Benzene		0.9	21.4	12.6	62.76	2.9	**100.5**
	Dichlorobenzene			0.0005			0.0005	**0.0009**
	Ethylbenzene			1.5	8.0	43.1	1.5	**54.1**
	Formaldehyde	118.3	4.6	22.5	14.3	25.03	14.7	**199.5**
	Methylene Chloride			0.7			1.4	**2.1**
	Napthalene		0.8	2.9	1.1	3.77	0.5	**9.1**
	Perchloroethylene			1.2			1.34	**2.49**
	Trichloroethylene			3.3			0.03	**3.31**
Air Toxic: 15-PAH	15-PAH		0.1	1.7	0.4	1.46	0.00	**3.71**
Air Toxic: Metals	Arsenic			0.004	0.0003	0.003	0.002	**0.010**
	Cadmium			0.003	0.0		0.001	**0.003**
	Chromium (VI)			0.0001	0.000005	0.00002	0.0003	**0.0004**
	Manganese			0.01	0.0002		0.1	**0.1**
	Nickel			0.01	0.0004		0.003	**0.012**
Criteria Pollutant	CO	828.7	246.2	3,185.8	5,731.8	21,703.2	2,345.9	**34,041.5**
	Lead			0.01	0.1		0.1	**0.3**
	NOX	21.8	4.5	341.9	448.7	2,596.6	747.2	**4,160.8**
	PM10		26.1	3,366.3	51.2	119.6	401.8	**3,964.9**
	PM2.5		22.1	744.0	48.0	65.4	351.1	**1,230.6**
	SO2		2.2	68.5	5.3	13.3	65.3	**154.6**
	VOC	3,853.4	58.4	2,188.5	474.6	2,514.8	1,311.7	**10,401.3**

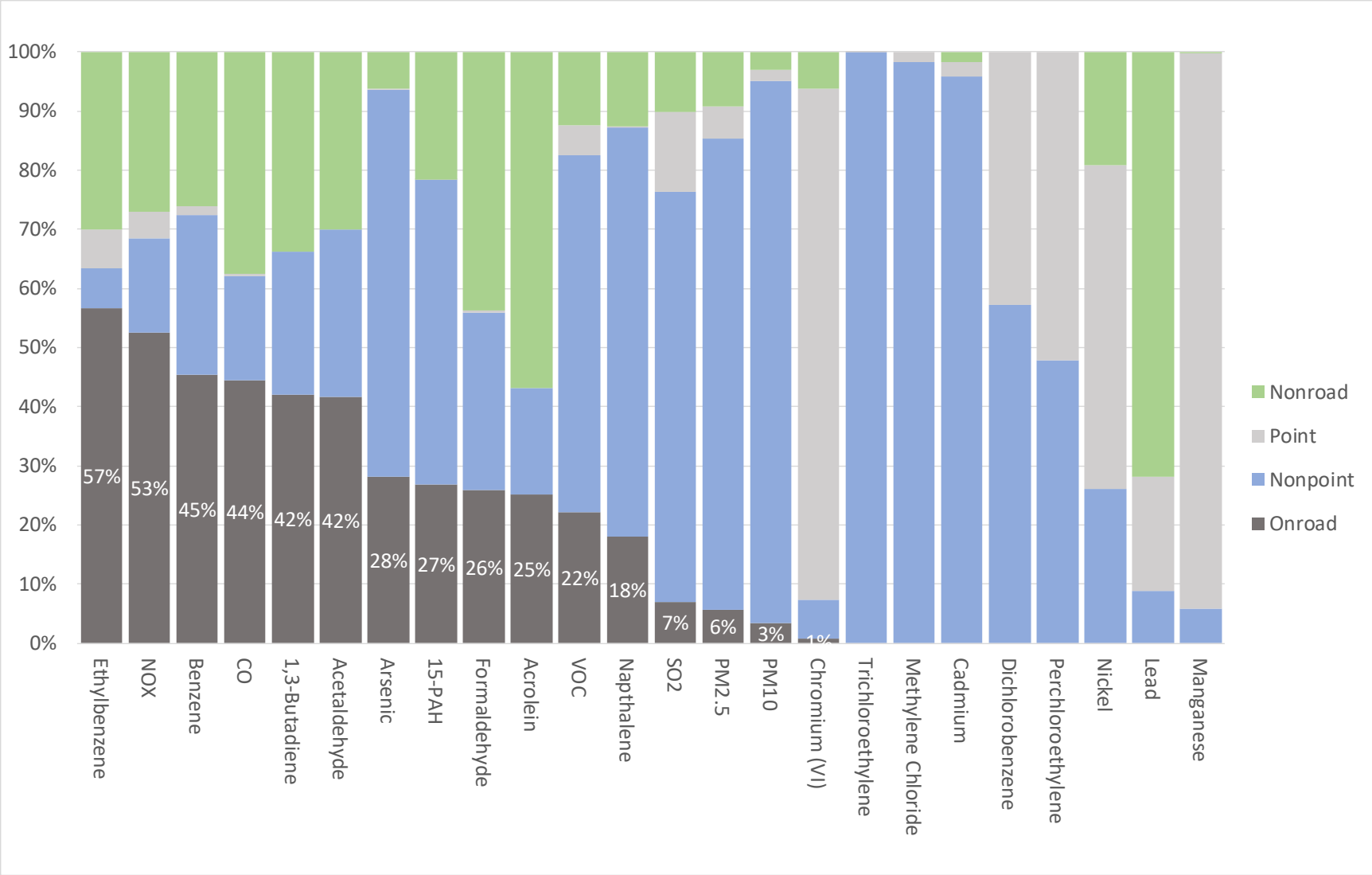


Figure 2. Percent anthropogenic emissions contributed to the total by source category, Portland AQMA

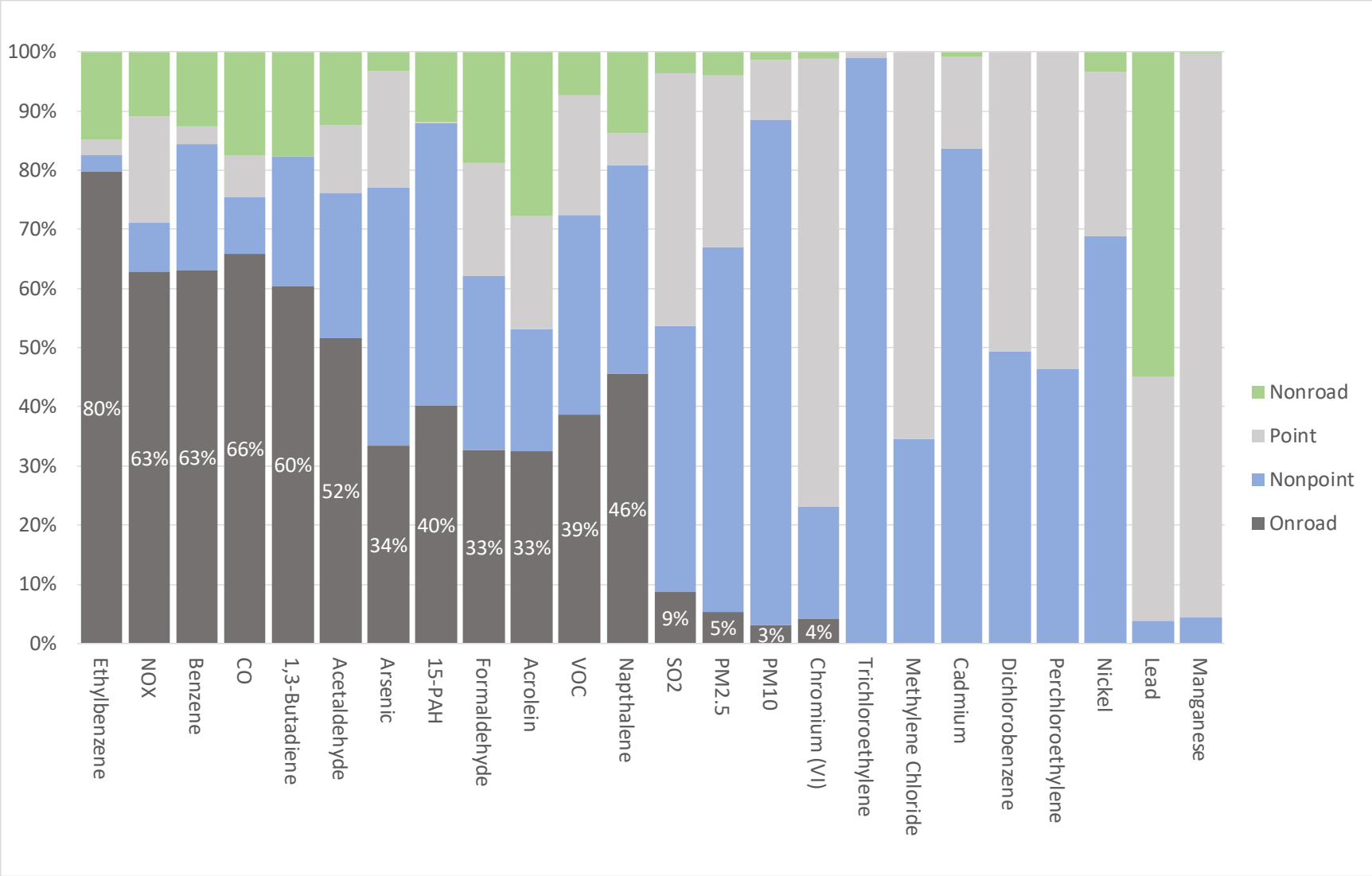


Figure 3. Percent anthropogenic emissions contributed to the total by source category, Medford AQMA

2.3 Stationary Permitted Point Sources

2.3.1 Data sources

DEQ obtained permitted point source emissions data from the EPA 2014 National Emission Inventory Version 2. The NEI compiles point source emissions data for Oregon that DEQ has submitted to EPA, as well as emissions information from the EPA Toxics Release Inventory. Through the TRI program, facilities in different industry sectors must report air toxics emission quantities to EPA annually. EPA permitted and non-permitted point source emissions data is categorized under the "Facility" sector. In Section 2.4 and Figure 4 of this report, DEQ describes and illustrates source data used in this analysis, including Facility data.

2.3.2 DEQ methodology – reporting to EPA

2.3.2.1 Activity

DEQ collected activity data from 2014 annual reports for all permitted facilities. Facilities must fulfill permit conditions for annual reporting by submitting emission estimates for criteria and/or some hazardous air pollutant emissions. DEQ used the activity data to verify existing 2014 emissions estimates from the reports, as well as to calculate emissions not typically reported by the facilities themselves.

2.3.2.2 Emission Factors

Emission factors used for the point source emission inventory submitted to EPA were developed through DEQ source testing, or EPA approved emissions factors from documentation such as AP-42[8] or the National Council for Air and Stream Improvement. [360]

2.3.2.3 Annual Emissions Calculations

Data used in the annual emissions estimates includes emission factors, annual throughput or process rate from source submitted annual reports, and operation schedules. DEQ used the emission factors, together with the annual production levels, to estimate annual emissions.

2.3.2.4 Control Efficiency, Rule Effectiveness, and Rule Penetration

DEQ considered permitted point source emission factors to include the efficiency of control devices.

2.3.3 Source location and mapping

DEQ used ArcGIS mapping to determine the locations of sources emitting pollutants of concern within AQMA boundaries. Plant-site coordinates were mapped and only those sources falling within the AQMA boundaries were included. Appendix A, Figures A-1 through A-4 show the locations of the stationary point sources included in this project's inventory.

2.3.4 Gasoline dispensing facilities

DEQ obtained 2014 permitted Gasoline Dispensing Facilities annual throughput, tank size, location (lat/long), and controls data from DEQ permitting staff.[968,969] DEQ mapped GDFs and reviewed facility control data[849] as a quality control check.

DEQ used 2014 Oregon vehicle registration data from ODOT Driver and Motor Vehicle Services to estimate the vehicle population with Onboard Refueling Vapor Recovery. ORVR interferes with specific types of gasoline pump vapor recovery controls, potentially increasing volatile emissions. DEQ grouped and summed the number of registered gasoline vehicles for each county by vehicle year, type (car and truck), and class (light, medium, and heavy duty). DEQ then used ORVR phase-in estimates, specific to the Pacific Northwest and based on vehicle class and type,[(848)] to estimate ORVR fleet penetration.

DEQ calculated VOC emission factors, which are temperature dependent, for each county using 2014 NOAA temperature data. DEQ calculated VOC emission factors for six processes: Underground Storage Tank breathing/emptying, controlled and uncontrolled Stage I vapor recovery UST filling, and controlled and uncontrolled Stage II vapor recovery pump dispensing. DEQ then used ORVR fleet penetration to estimate ORVR's effects on specific controls.

DEQ mapped GDFs using location-specific coordinates from the DEQ TRAACS database. DEQ did not include GDFs, and their associated emissions, if they fell outside the AQMA boundaries were not included in this project's emission inventory. DEQ describes its GDF emission inventory methodology in Reference 987.

2.3.5 Perchloroethylene dry cleaners

DEQ estimated emissions from perchloroethylene dry cleaners through facility 2015 annual reports, and calculated emission factors for each reporting facility using information that DEQ land quality program staff compile. The method used to calculate emission factors is mass balance: the amount of solvent evaporated from a facility equals the amount of solvent purchased minus the amount of solvent contained in still bottoms sent for reclamation. The base year EI for perchloroethylene drycleaners is 2015, the first year the EI method was used to estimate emissions.

DEQ mapped perchloroethylene drycleaners from coordinates stored in the TRAACS database. DEQ did not include drycleaners, and their associated emissions, that fell outside the AQMA boundaries in the inventory. DEQ provides additional explanation of the perchloroethylene dry cleaner emission inventory methodology in Reference 988.

2.3.6 Summary of Stationary Permitted Point Source Emissions Estimates

Tables 4 through 7 summarize point source emissions by facility and industry for the Portland and Medford AQMAs. Facilities represented are those for which data was available in the NEI, including sources that DEQ inventoried and those sources that reported toxics emissions data to the EPA TRI.

Table 4. Portland base year (2014) AQMA point source emissions in tons by facility

EIS Facility ID NUMBER	Facility Name	DEQ Source Number	15-PAH	Acetaldehyde	Acrolein	Arsenic	Benzene	Cadmium	Chromium (VI)	Ethylbenzene	Formaldehyde	Manganese	Methylene Chloride	Napthalene	Nickel	Perchloroethylene	Trichloroethylene	CO	Lead	NOX	PM10	PM2.5	SO2	VOC
789411	Oregon Cutting Systems								2.9E-04										1.6E-05					
790211	Oeco L L C																		1.4E-05					
891311	Owens Corning Roofing and Asphalt, LLC	26-3067	9.9E-07			7.1E-06	1.5E-04	3.9E-05	2.0E-06	0.0E+00	5.4E-03	1.4E-05		4.4E-05	7.5E-05	0.0E+00		5.4E+01		1.6E+01	3.6E+00	3.6E+00	5.2E+01	3.8E+00
910311	Cascade Corp	26-3038										7.3E-02												
910511	Columbia Steel Casting Co Inc	26-1869							3.2E-04			3.4E-01			1.4E-02				3.0E-03					
910711	Rodda Paint Co									4.3E-01														
910811	PCC STRUCTURALS INC LARGE PARTS CAMPUS	26-1867							2.9E-03						8.0E-02									
911211	ESCO Corp								1.8E-04			3.2E-02			2.2E-02				1.1E-02					
911511	Sapa Inc Coatings Div								6.1E-03	6.5E-01									7.0E-07					
911611	Aviation Exteriors Portland Inc													8.5E-03										
911711	Tarr Inc									1.7E-02				7.2E-03										
912011	Glacier Northwest Inc Troutdale Ready-Mix Plant																		3.5E-05					
912311	Glacier Northwest Inc Front Ave Ready-Mix Plant																		4.0E-05					
3774611	Fiskars Brands/Gerber Legendary Blades Div								3.4E-06															
3774911	Glacier Northwest Inc Tualatin Ready-Mix Plant																		3.0E-05					
3775211	Valmont Coatings Pacific States Galvanizing	34-0005																	2.0E-03					
4695411	Glacier Northwest Inc Hillsboro Ready-Mix Plant																		2.0E-05					
4695511	Quality Production Ltd																		3.8E-04					
7393511	Shaw s Fiberglass and Plastics, Inc.	03-0017																			1.0E+00	1.0E+00		6.4E+00
7394211	Northwest Pipe Company	26-2492																		1.7E+00	3.9E+00	1.9E+00		6.6E+00
7394311	Graphic Packaging International, Inc	26-2777																2.3E+00		6.8E+00	7.4E+00	6.2E+00	1.2E+00	2.1E+01
8055511	Miles Fiberglass & Plastics, Inc.	03-2777																						1.0E+01
8055611	Miles Fiberglass & Composites	03-2778																						8.3E+00
8140711	Western Star Truck Plant Portland	26-2197	3.4E-06			2.5E-05	1.4E-04	1.4E-04	6.9E-06		5.1E-03	4.7E-05		5.0E-04	2.6E-04			2.1E+00		2.3E+01	8.2E+00	6.8E+00	1.1E+00	2.2E+02
8140811	Boeing Company (The)	26-2204							2.9E-03						2.0E-03	6.0E+00			5.6E-03					
8203911	Ash Grove Cement Company																		2.5E-04					
8204011	Willbridge Asphalt Refinery	26-2025	8.7E-07			6.2E-06	1.3E-04	3.4E-05	1.7E-06		4.7E-03	1.2E-05		3.8E-05	6.6E-05			5.2E+00	1.6E-05	6.2E+00	1.6E-01	1.6E-01	1.1E-01	5.1E+01
8219311	Tosco Portland Terminal						4.9E-01			1.1E-01				6.6E-02										
8219411	Chevron Products Company	26-2027				1.3E-05	1.6E-01	7.4E-05	3.8E-06	5.9E-02		2.5E-05		1.4E-02	1.4E-04			1.2E+00	1.0E-04	1.2E+00	3.4E-01	3.4E-01	3.3E-02	9.2E+01
8219511	Willbridge Terminal	26-2028																0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.0E+01
8220311	Nustar	26-2029																4.4E-02		2.6E-02	4.0E-03	4.0E-03	3.2E-04	3.0E+01
8220411	BP West Coast Products, LLC	26-2030					1.8E-01			6.0E-02				1.5E-02				9.9E+00		3.9E+00	5.9E-01	5.9E-01	5.9E-01	3.4E+01
8220511	Oregon Health Sciences University	26-2050	3.8E-06			2.8E-05	5.5E-04	1.5E-04	7.7E-06		2.0E-02	5.2E-05		1.6E-04	2.9E-04			1.9E+00	3.2E-06	1.0E+01	1.7E+00	1.7E+00	1.5E+00	2.5E+00
8220611	ESCO Corporation	26-2068							6.5E-04			2.2E-01			2.1E-02			1.5E+02	4.3E-02	3.2E+01	5.2E+01	5.2E+01	3.7E+00	3.4E+01
8401111	Gunderson LLC	26-2944										6.2E-01								3.1E+00	3.7E+01	3.0E+01		1.1E+02
8405111	Tektronix Inc																		3.7E-05					
8405211	DMH, Inc.	34-2756																			1.6E+00	1.6E+00		4.2E+01
8417511	West Linn Paper Company	03-2145	1.0E-05			7.6E-05	4.1E-04	4.2E-04	2.1E-05		1.5E-02	1.4E-04		1.2E-04	7.9E-04			3.6E+01	1.5E-03	4.2E+02	1.7E+01	1.0E+01	3.1E+00	7.6E+01
8418211	Portland Operations	26-3009	1.1E-06			7.7E-06		4.2E-05	2.2E-06		1.0E+00	1.5E-05			8.1E-05			1.7E+01	1.9E-05	3.0E+01	1.2E+00	1.2E+00	1.2E+00	1.1E+01
8418411	Vigor Industrial, LLC	26-3224	5.3E-07			3.8E-06		2.1E-05	1.1E-06	8.4E+00		7.2E-06			4.0E-05			1.3E+00	1.2E-03	5.4E+00	1.0E+01	4.9E+00	9.9E-02	1.2E+02
8505611	PCC Structurals Inc Small Structurals Business Operation	03-2674							6.8E-04						5.2E-02									
8520811	Owens-Brockway Glass Container Inc.	26-1876	1.9E-07			1.4E-06	1.5E-05	7.7E-06	3.9E-07		5.3E-04	2.7E-06		4.3E-06	1.5E-05			1.0E+01	1.2E-01	4.1E+02	1.1E+02	9.1E+01	1.2E+02	2.3E+00
8521611	EVRAZ Inc, NA	26-1865																1.3E+02	9.6E-02	1.8E+02	1.4E+02	1.3E+02	3.8E+00	1.3E+02
9235511	Utility Vault																		5.0E-07					
9248411	U.S. Air Force Portland ANG AFB OR													2.5E-03										
9248811	CERTAINTEED CORP																		4.5E-05					
16725411	PCC STRUCTURALS INC DEER CREEK ANNEX	03-0020							3.4E-04						2.7E-02									
17018111	Owens Corning-Gresham Plant	26-9537																5.3E-01		2.0E-01	7.9E+00	5.3E+00		1.0E+00
Various	Percholorethylene Dry Cleaners															1.0E+01								
Various	Gasoline Dispensing Facilities						4.2E+00			3.4E+00														5.2E+02

Table 5. Medford AQMA base year (2014) point source emissions in tons by facility

EIS Facility ID NUMBER	Facility Name	DEQ Source Number	15-PAH	Acetaldehyde	Acrolein	Arsenic	Benzene	Cadmium	Chromium (VI)	Ethylbenzene	Formaldehyde	Manganese	Methylene Chloride	Napthalene	Nickel	Perchloroethylene	Trichloroethylene	CO	Lead	NOX	PM10	PM2.5	SO2	VOC
8054611	Rogue Valley	15-0020	4.4E-07			3.2E-06	6.1E-05	1.8E-05	9.0E-07		2.2E-03	6.1E-06		1.8E-05	3.4E-05			2.6E+00	8.0E-06	3.0E+00	4.4E+00	1.4E+00	4.8E-02	6.3E+00
8054711	Timber Products Co.	15-0025	2.6E-06	1.1E+00		1.8E-05	2.0E-04	1.0E-04	5.2E-06		7.0E-03	3.5E-05		5.7E-05	1.9E-04			2.4E+01	1.1E-02	9.6E+01	5.4E+01	5.1E+01	2.7E+00	2.5E+02
8054811	Carestream Health, Inc.	15-0029	1.6E-06			1.1E-05	4.7E-02	6.2E-05	3.2E-06		1.7E+00	2.2E-05		1.4E-02	1.2E-04			1.3E+01	2.8E-05	1.5E+01	3.1E-01	3.1E-01	7.9E-01	1.6E+02
8056111	Medford MDF	15-0073	3.7E-04	5.1E-01	5.0E-03	3.1E-04	2.6E-01	5.8E-05	5.0E-05	1.9E-02	9.5E+00	2.3E-02	1.8E-01	5.9E-02	4.7E-04	2.3E-02	1.8E-02	2.8E+01	3.1E-02	1.3E+02	1.8E+02	1.6E+02	3.9E+00	5.1E+02
8056211	Biomass One, L.P.	15-0159	5.5E-04	1.8E-01	8.5E-01	4.7E-04	8.9E-01	8.7E-05	7.4E-05	6.6E-03	9.4E-01	3.4E-02	6.2E-02	2.1E-02	7.0E-04	8.1E-03	6.4E-03	4.8E+02	6.0E-02	3.6E+02	2.2E+01	1.2E+01	2.2E+01	1.4E+01
8418111	Medford	15-0004	1.3E-03	3.2E+00		1.1E-03		2.1E-04	1.8E-04	1.2E-01	2.6E+00	8.1E-02	1.1E+00	3.7E-01	1.7E-03			1.6E+03	3.8E-03	1.2E+02	1.3E+02	1.2E+02	1.6E+01	1.4E+02
Various	Percholorethylene Dry Cleaners															1.3E+00								
Various	Gasoline Dispensing Facilities						1.7E+00			1.3E+00														2.0E+02

Table 6. Portland base year (2014) AQMA point source emissions in tons by industry

NAICS description	15-PAH	Acetaldehyde	Acrolein	Arsenic	Benzene	Cadmium	Chromium (VI)	Ethylbenzene	Formaldehyde	Manganese	Methylene Chloride	Napthalene	Nickel	Perchloroethylene	Trichloroethylene	CO	Lead	NOX	PM10	PM2.5	SO2	VOC
Aircraft Manufacturing												8.5E-03										
All Other Miscellaneous Nonmetallic Mineral P																	5.0E-07					
All Other Plastics Product Manufacturing																			1.0E+00	1.0E+00		6.4E+00
Asphalt Paving Mixture and Block Manufacturin	9.9E-07			7.1E-06	1.5E-04	3.9E-05	2.0E-06	0.0E+00	5.4E-03	1.4E-05		4.4E-05	7.5E-05	0.0E+00		5.4E+01		1.6E+01	3.6E+00	3.6E+00	5.2E+01	3.8E+00
Asphalt Shingle and Coating Materials Manufac																	4.5E-05					
Bare Printed Circuit Board Manufacturing																	3.8E-04					
Colleges, Universities, and Professional Scho	3.8E-06			2.8E-05	5.5E-04	1.5E-04	7.7E-06		2.0E-02	5.2E-05		1.6E-04	2.9E-04			1.9E+00	3.2E-06	1.0E+01	1.7E+00	1.7E+00	1.5E+00	2.5E+00
Commercial Gravure Printing																2.3E+00		6.8E+00	7.4E+00	6.2E+00	1.2E+00	2.1E+01
Custom Compounding of Purchased Resins																						1.8E+01
Cutlery and Handtool Manufacturing							3.4E-06															
Electroplating, Plating, Polishing, Anodizing							2.9E-04										1.6E-05					
Fuel Dealers								1.7E-02				7.2E-03										
Glass Container Manufacturing	1.9E-07			1.4E-06	1.5E-05	7.7E-06	3.9E-07		5.3E-04	2.7E-06		4.3E-06	1.5E-05			1.0E+01	1.2E-01	4.1E+02	1.1E+02	9.1E+01	1.2E+02	2.3E+00
Heavy Duty Truck Manufacturing	3.4E-06			2.5E-05	1.4E-04	1.4E-04	6.9E-06		5.1E-03	4.7E-05		5.0E-04	2.6E-04			2.1E+00		2.3E+01	8.2E+00	6.8E+00	1.1E+00	2.2E+02
Industrial Truck, Tractor, Trailer, and Stack										7.3E-02												
Instrument Manufacturing for Measuring and Te																	3.7E-05					
Iron and Steel Pipe and Tube Manufacturing fr																		1.7E+00	3.9E+00	1.9E+00		6.6E+00
Lime Manufacturing																	2.5E-04					
Metal Coating, Engraving (except Jewelry and							6.1E-03	6.5E-01									2.0E-03					
Metal Heat Treating																1.3E+02	9.6E-02	1.8E+02	1.4E+02	1.3E+02	3.8E+00	1.3E+02
National Security												2.5E-03										
Nonferrous Metal Foundries							3.4E-04						2.7E-02									
Other Aircraft Parts and Auxiliary Equipment							2.9E-03						2.0E-03	6.0E+00			5.6E-03					
Other Nonferrous Metal Foundries (except Die-							3.6E-03						1.3E-01									
Paint and Coating Manufacturing								4.3E-01														
Paper (except Newsprint) Mills	1.0E-05			7.6E-05	4.1E-04	4.2E-04	2.1E-05		1.5E-02	1.4E-04		1.2E-04	7.9E-04			3.6E+01	1.5E-03	4.2E+02	1.7E+01	1.0E+01	3.1E+00	7.6E+01
Petroleum and Petroleum Products Merchant Who					4.9E-01			1.1E-01				6.6E-02										
Petroleum Bulk Stations and Terminals				1.3E-05	3.4E-01	7.4E-05	3.8E-06	1.2E-01		2.5E-05		2.9E-02	1.4E-04			1.1E+01	1.0E-04	5.1E+00	9.3E-01	9.3E-01	6.3E-01	1.3E+02
Petroleum Refineries	8.7E-07			6.2E-06	1.3E-04	3.4E-05	1.7E-06		4.7E-03	1.2E-05		3.8E-05	6.6E-05			5.2E+00	1.6E-05	6.2E+00	1.6E-01	1.6E-01	1.1E-01	5.1E+01
Polystyrene Foam Product Manufacturing																5.3E-01		2.0E-01	7.9E+00	5.3E+00		1.0E+00
Power, Distribution, and Specialty Transforme																	1.4E-05					
Pump and Pumping Equipment Manufacturing										6.2E-01								3.1E+00	3.7E+01	3.0E+01		1.1E+02
Ready-Mix Concrete Manufacturing																	1.3E-04					
Ship Building and Repairing	5.3E-07			3.8E-06		2.1E-05	1.1E-06	8.4E+00		7.2E-06			4.0E-05			1.3E+00	1.2E-03	5.4E+00	1.0E+01	4.9E+00	9.9E-02	1.2E+02
Steam and Air-Conditioning Supply	1.1E-06			7.7E-06		4.2E-05	2.2E-06		1.0E+00	1.5E-05			8.1E-05			1.7E+01	1.9E-05	3.0E+01	1.2E+00	1.2E+00	1.2E+00	1.1E+02
Steel Foundries (except Investment)							1.1E-03			5.9E-01			5.6E-02			1.5E+02	5.7E-02	3.2E+01	5.2E+01	5.2E+01	3.7E+00	3.4E+01
Wood Window and Door Manufacturing																			1.6E+00	1.6E+00		4.2E+01
Perchlorethylene Dry Cleaners														1.0E+01								
Gasoline Dispensing Facilities					4.2E+00			3.4E+00														5.2E+02

Table 7. Medford AQMA base year (2014) point source emissions in tons by industry

NAICS description	15-PAH	Acetaldehyde	Acrolein	Arsenic	Benzene	Cadmium	Chromium (VI)	Ethylbenzene	Formaldehyde	Manganese	Methylene Chloride	Napthalene	Nickel	Perchloroethylene	Trichloroethylene	CO	Lead	NOX	PM10	PM2.5	SO2	VOC
Hardwood Veneer and Plywood Manufacturing	4.4E-07			3.2E-06	6.1E-05	1.8E-05	9.0E-07		2.2E-03	6.1E-06		1.8E-05	3.4E-05			2.6E+00	8.0E-06	3.0E+00	4.4E+00	1.4E+00	4.8E-02	6.3E+00
Reconstituted Wood Product Manufacturing	3.7E-04	5.1E-01	5.0E-03	3.1E-04	2.6E-01	5.8E-05	5.0E-05	1.9E-02	9.5E+00	2.3E-02	1.8E-01	5.9E-02	4.7E-04	2.3E-02	1.8E-02	2.8E+01	3.1E-02	1.3E+02	1.8E+02	1.6E+02	3.9E+00	5.1E+02
Softwood Veneer and Plywood Manufacturing	1.3E-03	3.2E+00		1.1E-03		2.1E-04	1.8E-04	1.2E-01	2.6E+00	8.1E-02	1.1E+00	3.7E-01	1.7E-03			1.6E+03	3.8E-03	1.2E+02	1.3E+02	1.2E+02	1.6E+01	1.4E+02
Steam and Air-Conditioning Supply	5.6E-04	1.8E-01	8.5E-01	4.8E-04	9.4E-01	1.5E-04	7.7E-05	6.6E-03	2.6E+00	3.4E-02	6.2E-02	3.4E-02	8.2E-04	8.1E-03	6.4E-03	4.9E+02	6.0E-02	3.8E+02	2.2E+01	1.2E+01	2.2E+01	1.7E+02
Veneer, Plywood, and Engineered Wood Product	2.6E-06	1.1E+00		1.8E-05	2.0E-04	1.0E-04	5.2E-06		7.0E-03	3.5E-05		5.7E-05	1.9E-04			2.4E+01	1.1E-02	9.6E+01	5.4E+01	5.1E+01	2.7E+00	2.5E+02
Perchlorethylene Dry Cleaners														1.3E+00								
Gasoline Dispensing Facilities					1.7E+00			1.3E+00														2.0E+02

2.4 Nonpoint (area), Nonroad, Event and Biogenic Sources

2.4.1 Introduction and Scope

This section describes the development of the emissions inventory for area, nonroad and biogenic sources in the Portland and Medford AQMAs for the 2014 Base Year. Included are the following broad categories of emissions sources:

Nonpoint (area) sources:

- Non-permitted industrial, commercial/institutional, and residential fossil fuel combustion
- Commercial agricultural pesticide and fertilizer application
- Agricultural burning and residential open burning
- Structure fires
- Residential charcoal grilling, and restaurants (emissions from cooking meat)
- Gasoline distribution, including tanker trucks and portable gas cans
- Solvent use, including graphic arts, and non-permitted industrial and commercial/consumer cleaning, degreasing and coating, and asphalt production and application
- Publicly owned treatment works (POTWs)
- Residential Wood Combustion (RWC)
- Fugitive dust from construction, agricultural and livestock activity
- Fugitive dust from paved and unpaved roads
- Miscellaneous industrial processes not covered in Section 2.3

Nonroad sources

- Aircraft, locomotives and marine vessels (commercial and recreational)
- Recreational, construction, lawn & garden, agricultural, commercial, logging, light industrial, railway maintenance, and airport ground support vehicles and equipment

Biogenic sources: Emissions from vegetation

Events: Wildfires and prescribed burning

2.4.2 Methodology and Approach

2.4.2.1 Data Sources

2.4.2.1.1 EPA 2014 NEI v.2

With the exception of residential wood combustion, DEQ downloaded county-wide 2014 annual emissions data for area, nonroad and biogenic sources from the EPA 2014 NEI version 2 website[1]. Data report format was EPA source classification code, encompassing a total of 448 SCCs. The county-wide NEI data is the basis for emissions estimates that are specific to the Portland and Medford AQMA boundaries.

[1] https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data

2.4.2.1.2 Residential Wood Combustion

DEQ staff estimated residential wood combustion emissions, excluding emissions from outdoor wood burning and wood-fired central furnaces, from the 2014 Portland Residential Wood Combustion Survey.[939]

2.4.2.1.3 Prevention of Double-Counting

DEQ avoided double counting between permitted and non-permitted solvent and fuel use by using two EPA emissions estimation tools, provided to states specifically to remove double-counting in the NEI:

- Solvent Emissions Tool v.1.5, released December 2015.
- Industrial, Commercial and Institutional (ICI) Fuel Combustion Tool v. 1.4, released December 2015

These tools generated non-permitted emissions from fuel and solvent use after DEQ staff removed permitted point source activity levels from EPA-estimated Oregon total fuel and solvent use.

2.4.2.2 Allocation of County-Wide Emissions Data to AQMA

County-wide emissions data were allocated to AQMA using the following equation:

*AQMA emissions = (county-wide emissions) * (AQMA spatial surrogate)*

For sectors in which DEQ did not have precise geographic coordinates of county-wide emissions, DEQ developed spatial surrogates specific to emission source type through a process called "clipping" in ArcGIS desktop. For each county, DEQ clipped county-wide GIS data (zoning, land-cover, track length, etc.) associated with the source of the emissions to the AQMA boundary. The value (area or length) of the clipped data was then divided by the county total, resulting in the spatial surrogate value.

For sectors where emissions location was specific to coordinates, DEQ created spatial surrogates by mapping source location relative to the AQMA boundary. Examples of coordinate-specific source types include gas stations (permitted by DEQ), and wildfires and prescribed burning (where location is provided as part of the NEI release). Other coordinate-specific source types include airports (ground support equipment, aircraft to 3000 feet), commercial marine (in-transit and port), and recreational marine boat launch location combined with boat use days from the OSMB Triennial Boating Survey.[967]

2.4.2.3 Residential Wood Combustion Spatial Allocation

For residential wood combustion, DEQ allocated emissions to U.S. Census block-group level by correlating survey results and Census housing data. DEQ then summed results by census block-group to the AQMA boundary. [986]

2.4.2.4 Relational Databases

DEQ used linked MS Access databases to estimate final emissions. DEQ gave an ID number to spatial surrogates, specific to county and general source type. DEQ assigned each EPA SCC in the inventory an SSID according to its general source type. For example, DEQ assigned SCCs

pertaining to construction equipment and vehicles in Washington County a specific construction SSID (4106711), and estimated via GIS clipping of building and roadway data in Washington County, the portion of the Portland AQMA within Washington County.

Figure 4 shows the EI source data and data flow for the nonroad portion of the project, and includes the GIS component of the EI preparation.

2.4.3 Summary of Nonpoint, Nonroad, Event and Biogenic Source Emissions

Emissions summary data for nonpoint (area), nonroad, event and biogenic sources are detailed by source category in Tables 8 and 9 for the major area source categories. Appendix B contains spatial surrogate data and maps for nonpoint, nonroad, event, biogenic and stationary non-permitted facility (aircraft and railyard) sources.

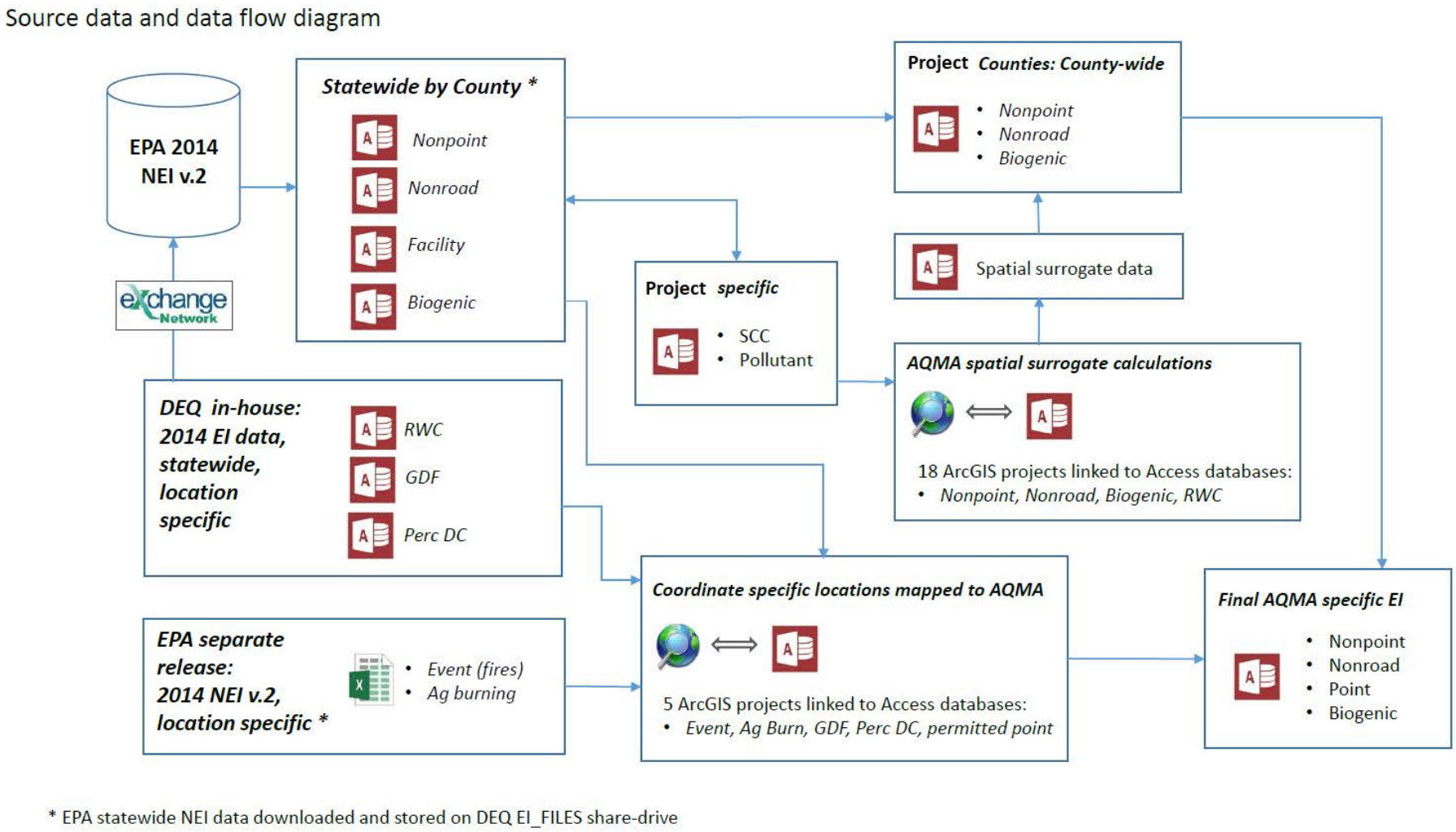


Figure 4. Data flow and GIS components of non-onroad EI preparation

Table 8. Portland base year (2014) AQMA nonpoint, nonroad, biogenic and event source emissions in tons.

Data Category	Sector	1,3-Butadiene	15-PAH	Acetaldehyde	Acrolein	Arsenic	Benzene	Cadmium	Chromium (VI)	Dichlorobenzene	Ethylbenzene	Formaldehyde	Manganese	Methylene Chloride	Napthalene	Nickel	Perchloroethylene	Trichloroethylene	CO	Lead	NOX	PM10	PM2.5	SO2	VOC
Biogenic	Biogenics - Vegetation and Soil			1.4E+02								1.9E+02							1,320		66				4,416
Event	Fires - Prescribed Fires	1.4E+00	1.7E-01	6.4E+00	2.3E+00		2.1E+00					1.3E+01			1.9E+00				616		14	68	58	6	147
Nonpoint	Agriculture - Crops & Livestock Dust																					597	119		
Nonpoint	Av Gas Stations						1.2E+00				1.4E-01				6.9E-02					8.6E-04					137
Nonpoint	Commercial Cooking		3.5E-01	8.4E+00			9.7E+00				7.2E-01	9.2E+00			5.0E-01				258			132	101		85
Nonpoint	Dust - Construction Dust																					8,566	857		
Nonpoint	Dust - Paved Road Dust																					1,365	340		
Nonpoint	Dust - Unpaved Road Dust																					4,512	450		
Nonpoint	Fires - Agricultural Field Burning	3.4E-02	2.9E-02	1.4E-01			5.4E-01					2.5E+00							138		3	24	18	1	8
Nonpoint	Fuel Comb - Comm/Institutional - Biomass	3.9E-02	1.6E-02	5.6E-01	2.1E-02		1.3E-01				7.6E-03	3.9E-01			7.5E-02				160		59	138	119	7	5
Nonpoint	Fuel Comb - Comm/Institutional - Natural Gas		1.7E-04	8.1E-05			1.2E-02					4.7E-01			3.8E-03				498	3.0E-03	593	3	3	4	33
Nonpoint	Fuel Comb - Comm/Institutional - Oil	4.2E-04	9.0E-04	8.8E-03	9.9E-04	9.8E-04	1.0E-02	7.2E-04	1.3E-04			1.8E-02	1.5E-03		1.1E-03	2.7E-03			11	1.7E-04	51	4	4	9	3
Nonpoint	Fuel Comb - Comm/Institutional - Other		6.7E-06	3.1E-06			4.8E-04					1.8E-02			1.5E-04				21	1.1E-04	37	0.1	0.1	0.2	1
Nonpoint	Fuel Comb - Industrial Boilers, ICEs - Coal		1.1E-04			7.9E-03		9.9E-04	6.0E-04			4.6E-03			2.5E-04				97	8.1E-03	213	253	47	368	1
Nonpoint	Fuel Comb - Industrial Boilers, ICEs - Natural Gas		3.3E-04	1.6E-04			2.4E-02					9.0E-01			7.3E-03				957	5.7E-03	1,139	6	5	7	63
Nonpoint	Fuel Comb - Industrial Boilers, ICEs - Oil	2.0E-03	4.4E-03	4.7E-02	4.8E-03	4.6E-02	4.9E-02	3.4E-02	1.2E-04			1.1E-01	7.0E-02		6.0E-03	1.0E-01			56	1.1E-01	290	34	27	246	16
Nonpoint	Fuel Comb - Industrial Boilers, ICEs - Other																		33		59	0.2	0.2	0.3	2
Nonpoint	Fuel Comb - Residential - Natural Gas		3.0E-04	1.4E-04			2.3E-02					8.1E-01			6.6E-03				410		964	5	4	6	56
Nonpoint	Fuel Comb - Residential - Oil		1.9E-04	1.5E-02		1.8E-03	6.6E-04	1.3E-03	2.4E-04			1.1E-01	2.6E-03		3.6E-03	1.3E-03			16	4.0E-03	56	7	7	133	2
Nonpoint	Fuel Comb - Residential - Other		9.5E-06	4.5E-06			7.2E-04					2.6E-02			2.1E-04				13		46	0.2	0.1	0.2	2
Nonpoint	Fuel Comb - Residential - Wood	1.7E+01	9.8E+00	4.7E+01	5.0E+00		9.5E+01	7.6E-04				1.0E+02	5.7E-03		1.1E+01	5.6E-04			11,269		177	1,687	1,686	28	1,983
Nonpoint	Industrial Processes - Mining																					134	17		
Nonpoint	Industrial Processes - Storage and Transfer						3.5E-01				4.4E-02				2.2E-04										83
Nonpoint	Miscellaneous Non-Industrial NEC		3.9E-02	2.2E+00			1.0E+01				2.7E+00	3.2E+00			2.2E-01				1,074		23	75	60		372
Nonpoint	Solvent - Consumer & Commercial Solvent Use						7.0E-01				1.8E+00				4.5E+01										8,824
Nonpoint	Solvent - Degreasing						2.0E+00							8.7E+00	6.1E-02		1.5E+01	4.3E+01							1,417
Nonpoint	Solvent - Graphic Arts																								3,670
Nonpoint	Solvent - Industrial Surface Coating & Solvent Use																								1,499
Nonpoint	Solvent - Non-Industrial Surface Coating			1.8E-01							4.5E+00	3.7E-02			8.4E-01										1,832
Nonpoint	Waste Disposal	6.4E-04	2.3E-01	2.8E+00	1.8E-01		6.6E+00			5.7E-03	5.5E+00	2.9E+00		3.3E-01	1.0E-01		9.3E-02	7.8E-03	14,857		456	1,583	1,238	147	1,046
Nonroad	Mobile - Aircraft	4.3E+00	2.2E-01	1.1E+01	6.1E+00		4.7E+00				6.2E-01	3.1E+01			2.9E+00				2,204	1.1E+00	1,093	54	48	123	277
Nonroad	Mobile - Commercial Marine Vessels		2.2E-04	1.7E-02	7.3E-04	1.9E-03	4.3E-03	4.4E-05	9.7E-04		4.2E-04	4.1E-02	3.0E-04		6.5E-04	7.2E-02			18	3.3E-04	154	6	5		6
Nonroad	Mobile - Locomotives	1.1E-01	3.5E-02	6.5E-01	1.1E-01	8.4E-06	8.9E-02	6.6E-04	4.9E-05		9.3E-02	1.5E+00	4.8E-05		6.0E-02	1.5E-04			117	2.0E-03	815	23	22	0.2	46
Nonroad	Mobile - Non-Road Equipment - Diesel	7.4E-01	1.7E+00	3.7E+01	8.7E+00	1.0E-03	1.4E+01		1.9E-05		2.6E+00	1.1E+02	1.7E-03		2.4E+00	2.9E-03			2,453		3,974	330	320	8	443
Nonroad	Mobile - Non-Road Equipment - Gasoline	1.9E+01	2.4E+00	1.5E+01	1.1E+00	1.8E-03	1.0E+02		6.3E-06		6.4E+01	2.8E+01	7.8E-04		5.2E+00	8.7E-04			56,201		669	202	185	5	3,514
Nonroad	Mobile - Non-Road Equipment - Other	5.5E-02	3.1E-03	1.1E+00	4.0E-01	7.3E-04	6.5E-02		7.7E-06		7.3E-03	1.4E+01	3.1E-04		9.6E-03	1.1E-03			2,354		395	13	13	4	87

Table 9. Medford base year AQMA nonpoint, nonroad, biogenic and event source emissions in tons.

Data Category	Sector	1,3-Butadiene	15-PAH	Acetaldehyde	Acrolein	Arsenic	Benzene	Cadmium	Chromium (VI)	Dichlorobenzene	Ethylbenzene	Formaldehyde	Manganese	Methylene Chloride	Napthalene	Nickel	Perchloroethylene	Trichloroethylene	CO	Lead	NOX	PM10	PM2.5	SO2	VOC
Biogenic	Biogenics - Vegetation and Soil			8.7E+01								1.2E+02							829		22				3,853
Event	Fires - Prescribed Fires	3.3E-01	3.8E-02	1.6E+00	5.4E-01		5.3E-01					3.0E+00			5.0E-01				181		3	19	16	1	43
Event	Fires - Wildfires	1.2E-01	1.9E-02	9.4E-01	2.8E-01		3.6E-01					1.6E+00			2.8E-01				65		2	7	6	1	16
Nonpoint	Agriculture - Crops & Livestock Dust																					113	23		
Nonpoint	Av Gas Stations						1.9E-01				2.1E-02				1.1E-02					1.3E-04					21
Nonpoint	Commercial Cooking		4.4E-02	9.8E-01			1.1E+00				7.5E-02	1.1E+00			5.2E-02				30			16	12		10
Nonpoint	Dust - Construction Dust																					346	35		
Nonpoint	Dust - Paved Road Dust																					59	14		
Nonpoint	Dust - Unpaved Road Dust																					2,330	232		
Nonpoint	Fires - Agricultural Field Burning		2.3E-02				4.4E-01					2.1E+00							112		3	19	14	0	7
Nonpoint	Fuel Comb - Comm/Institutional - Biomass	3.9E-03	1.6E-03	5.6E-02	2.1E-03		1.3E-02				7.6E-04	3.9E-02			7.5E-03				16		6	14	12	1	0
Nonpoint	Fuel Comb - Comm/Institutional - Natural Gas		2.0E-05	9.2E-06			1.4E-03					5.3E-02			4.3E-04				57	3.4E-04	68	0.4	0.3	0.4	4
Nonpoint	Fuel Comb - Comm/Institutional - Oil	4.2E-05	9.0E-05	8.9E-04	9.9E-05	9.8E-05	1.0E-03	7.2E-05	1.3E-05			1.8E-03	1.5E-04		1.1E-04	2.7E-04			1	1.8E-05	5	0.4	0.4	1	0.3
Nonpoint	Fuel Comb - Comm/Institutional - Other		6.7E-07	3.1E-07			4.8E-05					1.8E-03			1.5E-05				2	1.1E-05	4	0.01	0.01	0.02	0.1
Nonpoint	Fuel Comb - Industrial Boilers, ICEs - Coal		8.6E-06			6.0E-04		7.4E-05	4.5E-05			3.5E-04			1.9E-05				7	6.1E-04	16	19	4	28	0.1
Nonpoint	Fuel Comb - Industrial Boilers, ICEs - Natural Gas		1.6E-05	7.6E-06			1.2E-03					4.4E-02			3.6E-04				47	2.8E-04	56	0.3	0.2	0.3	3
Nonpoint	Fuel Comb - Industrial Boilers, ICEs - Oil	1.5E-04	3.3E-04	3.5E-03	3.6E-04	3.5E-03	3.7E-03	2.6E-03	9.1E-06			8.6E-03	5.2E-03		4.5E-04	7.5E-03			4	8.0E-03	22	3	2	18	1
Nonpoint	Fuel Comb - Industrial Boilers, ICEs - Other																		3		4	0.02	0.01	0.02	0.16
Nonpoint	Fuel Comb - Residential - Natural Gas		2.7E-05	1.2E-05			2.0E-03					7.2E-02			5.8E-04				36		85	0.5	0.4	1	5
Nonpoint	Fuel Comb - Residential - Oil		8.1E-06	6.7E-04		7.7E-05	2.9E-05	5.8E-05	1.0E-05			4.6E-03	1.2E-04		1.6E-04	5.8E-05			1	1.7E-04	2	0.3	0.3	6	0.1
Nonpoint	Fuel Comb - Residential - Other		1.5E-06	6.9E-07			1.1E-04					4.0E-03			3.2E-05				2		7	0.03	0.02	0.03	0.3
Nonpoint	Fuel Comb - Residential - Wood	2.9E+00	1.6E+00	8.3E+00	8.6E-01		1.6E+01	1.1E-04				1.8E+01	8.6E-04		2.0E+00	8.5E-05			1,903		31	290	290	5	328
Nonpoint	Industrial Processes - Mining																					34	4		
Nonpoint	Industrial Processes - Storage and Transfer						4.2E-03				2.0E-04				1.0E-06										0.4
Nonpoint	Miscellaneous Non-Industrial NEC		5.2E-03	2.9E-01			1.1E+00				2.7E-01	4.2E-01			2.7E-02				142		3	10	8		38
Nonpoint	Solvent - Consumer & Commercial Solvent Use						1.0E-02				2.6E-02				6.6E-01										837
Nonpoint	Solvent - Degreasing						1.6E-01							6.7E-01	4.7E-03		1.1E+00	3.3E+00							108
Nonpoint	Solvent - Graphic Arts																								364
Nonpoint	Solvent - Industrial Surface Coating & Solvent Use																								210
Nonpoint	Solvent - Non-Industrial Surface Coating			1.9E-02							4.7E-01	3.8E-03			8.8E-02										191
Nonpoint	Waste Disposal	4.6E-05	7.6E-02	9.3E-01	5.8E-02		2.1E+00			4.6E-04	6.1E-01	9.7E-01		5.4E-02	2.7E-02		5.5E-03	5.7E-04	822		30	112	93	8	60
Nonroad	Mobile - Aircraft	3.3E-01	3.1E-02	8.0E-01	4.4E-01		3.8E-01				5.7E-02	2.4E+00			3.3E-01				223	1.4E-01	26	5	4	4	20
Nonroad	Mobile - Locomotives	4.3E-03	1.3E-03	2.5E-02	4.1E-03	3.2E-07	3.4E-03	2.5E-05	1.9E-06		2.8E-03	5.7E-02	1.8E-06		2.3E-03	5.9E-06			4	7.5E-05	36	1	1		1
Nonroad	Mobile - Non-Road Equipment - Diesel	5.4E-02	1.3E-01	2.7E+00	6.3E-01	7.6E-05	1.0E+00		1.4E-06		1.9E-01	7.7E+00	1.2E-04		1.7E-01	2.1E-04			172		293	24	23	1	32
Nonroad	Mobile - Non-Road Equipment - Gasoline	2.0E+00	2.7E-01	1.7E+00	1.3E-01	1.7E-04	1.1E+01		5.9E-07		7.8E+00	3.0E+00	7.3E-05		6.3E-01	8.2E-05			5,132		61	20	18	0.4	414
Nonroad	Mobile - Non-Road Equipment - Other	3.4E-03	2.7E-04	8.8E-02	3.2E-02	6.3E-05	4.0E-03		6.7E-07		4.0E-04	1.2E+00	2.7E-05		4.1E-04	9.3E-05			202		32	1	1	0.1	7

2.5 On-Road Mobile Sources

2.5.1 Introduction and Scope

DEQ followed EPA emission inventory preparatory guidelines for state implementation plans and transportation conformity when completing the on-road portion of the project emission inventory.[989] DEQ completed the emission inventory by incorporating several key elements and contributions from Metro for the Portland AQMA, and ODOT for the Medford-Ashland AQMA. Appendix C provides supplemental, technical detail related to the development of the 2015 on-road motor vehicle emission inventory.

The on-road mobile category consists of emissions from all types of highway vehicles, including light and heavy duty diesel and gasoline vehicles, and motorcycles. Light duty includes vehicles up to 8,500 lbs. Heavy duty vehicles are those vehicles with a gross vehicle weight ratings heavier than 8,500 lbs. to vehicles weighing up to 105,000 lbs. Fuel types include gasoline, diesel, and electric. The inventory encompasses exhaust, brake, evaporation and tire emissions.

2.5.2 Methodology: Exhaust, Brake & Tire

The following Figure 5 provides an overview of the methodology for the on-road mobile exhaust, brake, and tire emission estimates. As shown in the figure, the two main steps in developing the vehicle exhaust, brake and tire inventory were (1) the generation of link-based activity estimates using the transportation network travel demand model (TDM), and (2) the modeling of fleet pollutant emission factors using EPA's MOVES2014a emissions model.

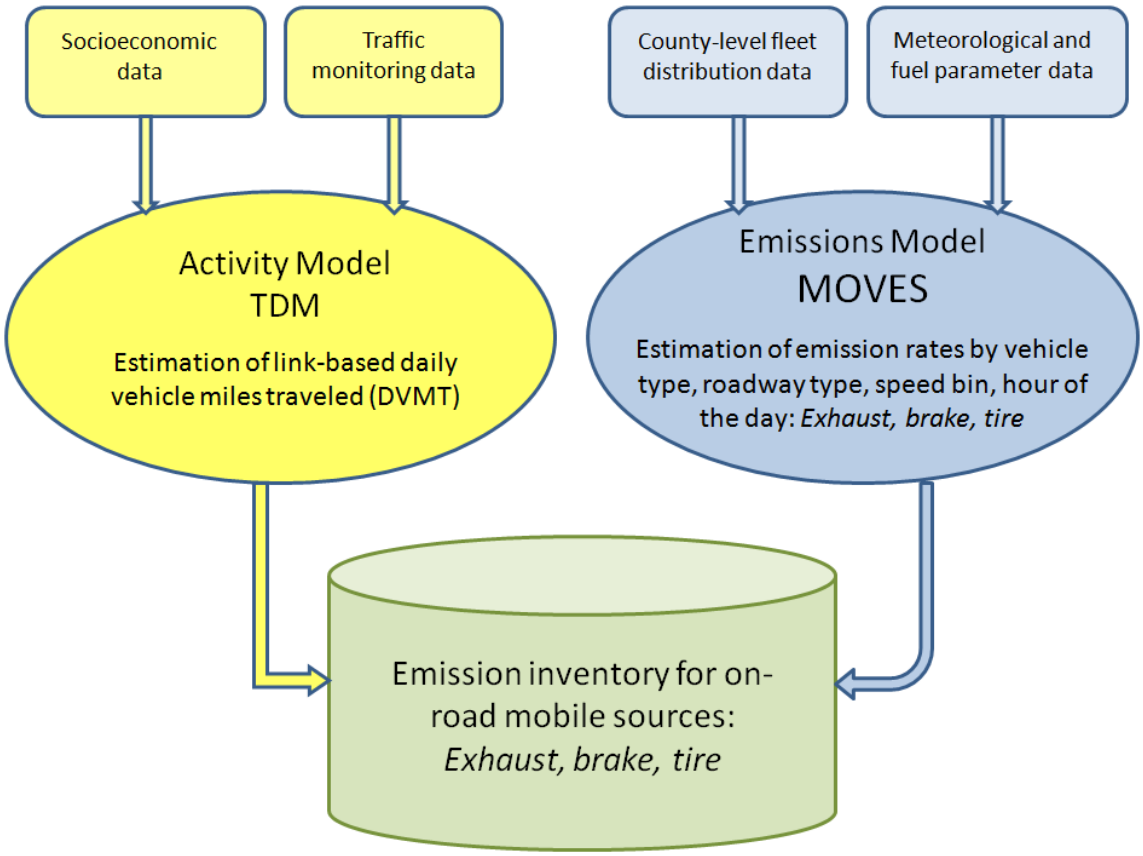


Figure 5. Main processing steps and software: on-road mobile exhaust, brake, and tire EI.

2.5.3 Re-Entrained Road Dust

Re-entrained road dust is the dust resulting from the pulverization and abrasion of the roadway surface by application of mechanical force through vehicle wheels. The source of emissions data for re-entrained road dust was the EPA 2014 NEI version 2 website.[966] Re-entrained road dust data is included in calculations described in Section 2.4 of this document (nonpoint sources).

2.5.4 Vehicle Activity Data

2.5.4.1 Portland AQMA

2.5.4.1.1 Metro Methodology

Metro provided their MOVES2014a RunSpec input files from the 2018 Regional Transportation Plan. The base year for the travel demand model activity was 2015. From the Metro MOVES2014a RunSpec inputs, DEQ prepared emission inventory model runs for the four onroad mobile scenarios being reviewed, representing the same onroad mobile activity and Vehicle Inspection and Maintenance Program settings.

2.5.4.1.2 Metro DVMT Apportionment to Source Type

Metro Daily VMT was apportioned to MOVES vehicle type using estimated fleet percentages, developed by ODOT HPMS coordinator staff local knowledge of DMV registration data. The ODOT DVMT apportionment to MOVES vehicle type is detailed in Table 10.

2.5.4.1.3 Metro DVMT Temporal Allocation – Hour VMT Fraction

Metro provided 2015 DVMT from their 2018 RTP, and a MOVES roadway type was assigned to each link, based on Metro speed bin and link location. The Metro DVMT data was also assigned a MOVES speed bin ID. Metro DVMT values were then adjusted to hourly VMT using MOVES default data, specifically the MOVES default hourly VMT Excel database input table "HourVMTFraction." The input table breaks down daily activity into hourly activity fractions by MOVES roadway and source types.

2.5.4.1.4 MOVES2014a: 2015 Inputs and Scenarios – Portland AQMA

Onroad mobile source emissions were modeled using EPA's MOVES2014a model version. Four MOVES model scenario runs were conducted for the Portland AQMA:

- No Vehicle Inspection and Maintenance (VIP) program
- Current VIP program which includes a 4-yr grace period testing exemption for the newest model year vehicles
- Current VIP program with a 5-yr grace period testing exemption for the newest model year vehicles
- Current VIP program with a 6-yr grace period testing exemption for the newest model year vehicles

2.5.4.2 Medford-Ashland AQMA

2.5.4.2.1 ODOT Methodology: Estimating Daily VMT by Link

ODOT provided DEQ 2015 DVMT by link. Appendix C includes an ODOT Memo[971] that details the Medford Travel Demand Model and describes the generation of link-based daily VMT. DEQ apportioned ODOT DVMT to the AQMA using ODOT supplied DVMT by links within Travel Analysis Zones. The total area for DVMT supplied was slightly larger than the AQMA. DEQ used ArcGIS10 to clip the ODOT data down to the AQMA. Link distance was re-calculated, and VMT re-estimated for the clipped links and TAZs using a ratio of distances or areas.

2.5.4.2.2 ODOT DVMT Apportionment to Source Type

ODOT DVMT was apportioned to MOVES vehicle type using estimated fleet percentages developed by ODOT staff local knowledge of DMV registration data. Table 10 shows the ODOT DVMT apportionment to MOVES vehicle type.

2.5.4.2.3 ODOT DVMT Temporal Allocation – Hour VMT Fraction

DEQ mapped the ODOT DVMT with ArcGIS10, and assigned a MOVES roadway type to each link based on ODOT speed bin and link location. DEQ also assigned the ODOT DVMT data a MOVES speed bin ID, which aligned with ODOT speed bins. ODOT daily VMT values were then adjusted to hourly VMT using MOVES default data, specifically the MOVES default hourly VMT Excel database input table "HourVMTFraction." The input table breaks down daily activity into hourly activity fractions by MOVES roadway and source types.

2.5.4.2.4 MOVES2014a: 2015 Inputs and Scenarios

DEQ modeled onroad mobile source emissions with EPA's MOVES2014a model version.
DEQ completed four MOVES model scenario runs for each AQMA:

- No Vehicle Inspection and Maintenance (VIP) program
- Current VIP which includes a 4-yr grace period testing exemption for the newest model year vehicles
- Current VIP program with a 5-yr grace period testing exemption for the newest model year vehicles
- Current VIP program with a 6-yr grace period testing exemption for the newest model year vehicles

The MOVES model was run in emission inventory mode to output emissions for each road type, fuel type, day type, hour, speed bin, and process. The MOVES2014a modeling Run Specification(s) are detailed in Appendix C: MOVES2014a Mobile Emissions Estimate Steps.

2.5.5 Base Year Summary of Onroad Emissions by Source Type

Tables 11 and 12 display a summary of onroad emissions by source type in tons per year for the Portland and Medford-Ashland AQMAs. DEQ ran the MOVES model with the current VIP pollutant control strategy in place.

Table 10. Fleet percentage breakdown for Portland and Medford VMT estimates.

ID	sourcetypename	Fuel Type	Fleet Percentage	SCC	scc level one	scc level two	scc level three	scc level four
11	Motorcycle	Gasoline	100%	2201080000	Mobile Sources	Highway Vehicles - Gasoline	Motorcycles (MC)	Total: All Road Types
21	Passenger Car	Gasoline	98.5%	2201001000	Mobile Sources	Highway Vehicles - Gasoline	Light Duty Gasoline Vehicles (LDGV)	Total: All Road Types
31	Passenger Truck	Gasoline	88.5%	2201020000 & 2201040000	Mobile Sources	Highway Vehicles - Gasoline	Light Duty Gasoline Trucks 1 through 4 (M6)	Total: All Road Types
32	Light Commercial Truck	Gasoline	50%	2201070000	Mobile Sources	Highway Vehicles - Gasoline	Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)	Total: All Road Types
41	Intercity Bus	Gasoline	20%	2201070000	Mobile Sources	Highway Vehicles - Gasoline	Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)	Total: All Road Types
42	Transit Bus	Gasoline	20%	2201070000	Mobile Sources	Highway Vehicles - Gasoline	Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)	Total: All Road Types
43	School Bus	Gasoline	20%	2201070000	Mobile Sources	Highway Vehicles - Gasoline	Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)	Total: All Road Types
54	Motor Home	Gasoline	85.5%	2201070000	Mobile Sources	Highway Vehicles - Gasoline	Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)	Total: All Road Types
21	Passenger Car	Diesel	1.5%	2230001000	Mobile Sources	Highway Vehicles - Diesel	Light Duty Diesel Vehicles (LDDV)	Total: All Road Types
31	Passenger Truck	Diesel	11.5%	2230060000	Mobile Sources	Highway Vehicles - Diesel	Light Duty Diesel Trucks 1 thru 4 (M6) (LDDT)	Total: All Road Types
32	Light Commercial Truck	Diesel	50%	2230060000	Mobile Sources	Highway Vehicles - Diesel	Light Duty Diesel Trucks 1 thru 4 (M6) (LDDT)	Total: All Road Types
41	Intercity Bus	Diesel	80%	2230070000	Mobile Sources	Highway Vehicles - Diesel	All HDDV including Buses (use subdivisions -071 thru -075 if possible)	Total: All Road Types
42	Transit Bus	Diesel	80%	2230070000	Mobile Sources	Highway Vehicles - Diesel	All HDDV including Buses (use subdivisions -071 thru -075 if possible)	Total: All Road Types
43	School Bus	Diesel	80%	2230070000	Mobile Sources	Highway Vehicles - Diesel	All HDDV including Buses (use subdivisions -071 thru -075 if possible)	Total: All Road Types
51	Refuse Truck	Diesel	100%	2230070000	Mobile Sources	Highway Vehicles - Diesel	All HDDV including Buses (use subdivisions -071 thru -075 if possible)	Total: All Road Types
52	Single Unit Short-haul Truck	Diesel	100%	2230070000	Mobile Sources	Highway Vehicles - Diesel	All HDDV including Buses (use subdivisions -071 thru -075 if possible)	Total: All Road Types
53	Single Unit Long-haul Truck	Diesel	100%	2230070000	Mobile Sources	Highway Vehicles - Diesel	All HDDV including Buses (use subdivisions -071 thru -075 if possible)	Total: All Road Types
54	Motor Home	Diesel	14.5%	2230070000	Mobile Sources	Highway Vehicles - Diesel	All HDDV including Buses (use subdivisions -071 thru -075 if possible)	Total: All Road Types
61	Combination Short-haul Truck	Diesel	100%	2230070000	Mobile Sources	Highway Vehicles - Diesel	All HDDV including Buses (use subdivisions -071 thru -075 if possible)	Total: All Road Types
62	Combination Long-haul Truck	Diesel	100%	2230070000	Mobile Sources	Highway Vehicles - Diesel	All HDDV including Buses (use subdivisions -071 thru -075 if possible)	Total: All Road Types

Table 11. Base Year Summary of Onroad Emissions by Source Type, tons per year: Portland AQMA.

		Motorcycles (MC)	Light Duty Gasoline Vehicles (LDGV)	Light Duty Gasoline Trucks (LDGT)	Heavy Duty Gasoline Vehicles (HDGV)	Light Duty Diesel Vehicles (LDDV)	Light Duty Diesel Trucks (LDDT)	Heavy Duty Diesel Vehicles (HDDV)	**Total**
Air Toxic	1,3-Butadiene	0.1	11.2	11.3	2.3	0.2	3.7	1.4	**30.1**
	Acetaldehyde	0.5	27.5	29.1	6.3	0.4	10.1	16.4	**90.3**
	Acrolein	0.0	1.6	1.8	0.45	2.4E-02	0.7	2.7	**7.3**
	Benzene	2.4	78.4	81.6	16.1	1.2	26.7	6.8	**213.3**
	Dichlorobenzene	--	--	--	--	--	--	--	**--**
	Ethylbenzene	3.1	49.1	46.6	9.3	0.7	15.3	3.8	**128.0**
	Formaldehyde	0.6	21.6	27.5	6.8	0.3	10.4	39.3	**106.5**
	Methylene Chloride	--	--	--	--	--	--	--	**--**
	Napthalene	0.1	3.9	4.5	1.0	0.1	1.6	4.0	**15.2**
	Perchloroethylene	--	--	--	--	--	--	--	**--**
	Trichloroethylene	--	--	--	--	--	--	--	**--**
Air Toxic: 15-PAH	15-PAH	0.0	1.5	1.7	0.4	0.02	0.6	1.2	**5.5**
Air Toxic: Metals	Arsenic	1.0E-04	1.1E-02	7.8E-03	1.5E-03	1.7E-04	2.6E-03	1.4E-03	**0.025**
	Cadmium	--	--	--	--	--	--	--	**--**
	Chromium (VI)	5.3E-07	5.7E-05	4.1E-05	8.0E-06	8.7E-07	1.3E-05	6.5E-06	**0.00013**
	Manganese	--	--	--	--	--	--	--	**--**
	Nickel	--	--	--	--	--	--	--	**--**
Criteria Pollutant	CO	690.1	23,619.1	28,476.6	7,005.4	359.7	10,705.7	4,036.9	**74,893.5**
	Lead	--	--	--	--	--	--	--	**--**
	NOX	38.2	2,892.2	3,898.6	728.8	44.0	1,235.4	4,922.7	**13,759.9**
	PM10	2.0	208.3	173.4	37.1	3.2	59.7	245.0	**728.7**
	PM2.5	1.3	77.4	71.0	16.6	1.2	25.8	173.7	**367.0**
	SO2	0.4	35.8	34.3	6.4	0.5	10.8	8.7	**97.0**
	VOC	182.7	2,917.2	2,679.6	543.6	44.4	891.8	523.4	**7,782.8**

Table 12. Base Year Summary of Onroad Emissions by Source Type, tons per year: Medford AQMA.

		Motorcycles (MC)	Light Duty Gasoline Vehicles (LDGV)	Light Duty Gasoline Trucks (LDGT)	Heavy Duty Gasoline Vehicles (HDGV)	Light Duty Diesel Vehicles (LDDV)	Light Duty Diesel Trucks (LDDT)	Heavy Duty Diesel Vehicles (HDDV)	**Total**
Air Toxic	1,3-Butadiene	0.3	2.1	4.5	0.2	0.03	0.7	0.2	**8.0**
	Acetaldehyde	1.5	5.3	11.5	0.5	0.1	1.9	1.4	**22.3**
	Acrolein	0.1	0.3	0.7	0.04	4.5E-03	0.1	0.2	**1.5**
	Benzene	7.4	15.1	32.5	1.3	0.2	5.4	0.9	**62.8**
	Dichlorobenzene	--	--	--	--	--	--	--	**--**
	Ethylbenzene	5.7	11.1	21.3	0.9	0.2	3.5	0.5	**43.1**
	Formaldehyde	2.5	5.0	11.9	0.6	0.1	2.0	3.0	**25.0**
	Methylene Chloride	--	--	--	--	--	--	--	**--**
	Napthalene	0.3	0.8	1.9	0.1	0.01	0.3	0.3	**3.8**
	Perchloroethylene	--	--	--	--	--	--	--	**--**
	Trichloroethylene	--	--	--	--	--	--	--	**--**
Air Toxic: 15-PAH	15-PAH	0.1	0.3	0.7	0.036	0.005	0.1	0.2	**1.5**
Air Toxic: Metals	Arsenic	3.4E-04	1.1E-03	1.4E-03	6.3E-05	1.7E-05	2.4E-04	1.2E-04	**0.003**
	Cadmium	--	--	--	--	--	--	--	**--**
	Chromium (VI)	1.79E-06	5.83E-06	7.14E-06	3.33E-07	8.88E-08	1.23E-06	6.30E-07	**0.00002**
	Manganese	--	--	--	--	--	--	--	**--**
	Nickel	--	--	--	--	--	--	--	**--**
Criteria Pollutant	CO	2,572.2	4,494.8	11,561.0	552.9	68.4	1,941.3	512.5	**21,703.2**
	Lead	--	--	--	--	--	--	--	**--**
	NOX	128.1	540.0	1,328.6	66.5	8.2	221.8	303.4	**2,596.6**
	PM10	7.6	31.7	44.5	2.9	0.5	7.7	24.7	**119.6**
	PM2.5	4.6	15.7	23.1	1.7	0.2	4.0	16.1	**65.4**
	SO2	1.1	3.9	6.2	0.3	0.1	1.1	0.6	**13.3**
	VOC	336.8	652.5	1,206.6	52.3	9.9	199.0	57.5	**2,514.8**

2.5.6 Estimated Emissions Benefit of VIP Control Strategy

To represent the pollutant emissions prevented by having a vehicle inspection and maintenance program, DEQ ran the MOVES model without including VIP as a pollutant control strategy. Tables 13 and 14 represent the emission increase in on-road emissions if an inspection and maintenance program were not in place in the Portland and Medford-Ashland AQMAs.

Table 13. : Percent increase to onroad emissions from removal of VIP program: Portland AQMA.

		2015 (tpy)	2015 No VIP (tpy)	Emissions Increase (a)
Air Toxic	1,3-Butadiene	30.14	35.71	18%
	Benzene	213.3	255.3	20%
	Ethylbenzene	128.0	148.5	16%
	Acetaldehyde	90.3	103.9	15%
	Napthalene	15.18	17.31	14%
	15-PAH	5.454	6.162	13%
	Formaldehyde	106.51	119.35	12%
	Acrolein	7.286	8.043	10%
Criteria	NOX	13,760	14,698	7%
	CO	74,894	85,748	14%
	VOC	7,783	9,260	19%

(a) % increase = ((2015 tpy no VIP) - (2015 tpy)) / (2015 tpy)

Table 14. Percent increase to onroad emissions from removal of VIP program: Medford AQMA.

		2015 (tpy)	2015 No VIP (tpy)	Emissions Increase (a)
Air Toxic	1,3-Butadiene	8.04	8.73	8%
	Benzene	62.8	67.7	8%
	Ethylbenzene	43.1	45.7	6%
	Acetaldehyde	22.3	24.0	8%
	Napthalene	3.77	4.04	7%
	15-PAH	1.463	1.551	6%
	Formaldehyde	25.03	26.64	6%
	Acrolein	1.458	1.550	6%
Criteria	NOX	2,597	2,767	7%
	CO	21,703	22,920	6%
	VOC	2,515	2,647	5%

(a) % increase = ((2015 tpy no VIP) - (2015 tpy)) / (2015 tpy)

3 STRATEGY and SCENARIO EVALUATION

This section presents modeled effects of existing and modified strategies. DEQ represents the effectiveness of these strategies by showing how much total anthropogenic emissions would increase if these strategies were removed. This project analyzed the effects of only four strategies but analysts could use similar methodology to calculate emissions reductions from other strategies such as parking ratio rules, industrial growth allowance, industrial New Source Review, rules applicable to non-permitted autobody shops or spray paints, and nonroad diesel controls.

3.1 Strategies and Scenarios Evaluated

Strategies and scenarios evaluated for the Portland-Medford SIP-VIP Updates Project include:

- MOVES run with No Vehicle Inspection and Maintenance Program included
- Current VIP (4 year grace period for new vehicles)
- VIP with a 5 year grace period for new vehicles
- VIP with a 6 year grace period for new vehicles
- Employee Commute Options program
- Gasoline Dispensing Facility Stage II VRS controls
- Marine Loading (barge) controls

3.1.1 Onroad mobile: VIP scenarios

VIP ensures that motorists maintain emission control systems to keep pollution levels within EPA's allowable standards over the life of a vehicle. The current program requires a vehicle emissions test before DMV registration in the Portland-Metro and Medford-Ashland areas every two years. Vehicles 4-years and newer are exempted from testing.

To demonstrate existing VIP control strategy effectiveness, DEQ changed base year MOVES input settings to "uncheck" the inspection and maintenance (I/M) program. MOVES model results show how much onroad emissions would increase under this scenario. DEQ then input MOVES results into the emissions inventory and geographic analysis of total anthropogenic emissions. DEQ also modeled how much total anthropogenic emissions would increase from expanding the current exemption (4-year grace period) to a 5- or 6-year exemption. All other settings were unchanged from the base year run.

Tables 15 and 16 show the increase in total anthropogenic emissions under the differing grace period years and No VIP scenarios. The tables include only those pollutants that increase with changes to VIP implementation. The emissions shown are for nonpoint, nonroad, point and onroad emissions totals for each AQMA. Event (e.g. wildfires and prescribed burning) and biogenic (e.g. vegetation) emissions are not included in the totals.

Table 15. Emissions growth from VIP scenarios: Portland AQMA.

	Anthropogenic emissions, tpy				(a)	(b)	(c)
	VIP in effect				Emissions Increase		
	Base Year: 4 yr grace	5 yr grace	6 yr grace	No VIP	5 yr grace	6 yr grace	No VIP
1,3-Butadiene	71.61	71.65	71.69	77.18	0.06%	0.12%	8%
Benzene	469.4	469.7	470.0	511.4	0.07%	0.14%	9%
Ethylbenzene	225.9	226.0	226.2	246.3	0.06%	0.13%	9%
Acetaldehyde	216.5	216.6	216.7	230.2	0.05%	0.10%	6%
Napthalene	84.12	84.14	84.15	86.25	0.02%	0.03%	3%
15-PAH	20.318	20.323	20.328	21.027	0.02%	0.05%	3%
Formaldehyde	412.27	412.33	412.40	425.11	0.02%	0.03%	3%
Acrolein	28.86	28.87	28.88	29.62	0.02%	0.05%	3%
NOX	26,184	26,198	26,212	27,122	0.05%	0.11%	4%
CO	168,525	168,722	168,928	179,380	0.12%	0.24%	6%
VOC	35,074	35,082	35,091	36,551	0.02%	0.05%	4%

(a) % increase = ((5 yr grace VIP) - (base year)) / (base year)

(b) % increase = ((6 yr grace) - (base year)) / (base year)

(c) % increase = ((no VIP) - (base year)) / (base year)

Table 16. Emissions growth from VIP scenarios: Medford AQMA.

	Anthropogenic emissions, tpy				(a)	(b)	(c)
	VIP in effect				Emissions Increase		
	Base Year: 4 yr grace	5 yr grace	6 yr grace	No VIP	5 yr grace	6 yr grace	No VIP
1,3-Butadiene	13.299	13.302	13.304	13.982	0.02%	0.04%	5%
Benzene	99.63	99.66	99.68	104.55	0.02%	0.04%	5%
Ethylbenzene	54.11	54.12	54.13	56.62	0.02%	0.04%	5%
Acetaldehyde	43.11	43.12	43.13	44.82	0.02%	0.03%	4%
Napthalene	8.280	8.281	8.282	8.544	0.01%	0.02%	3%
15-PAH	3.6491	3.6494	3.6497	3.7371	0.01%	0.02%	2%
Formaldehyde	76.582	76.586	76.591	78.193	0.01%	0.01%	2%
Acrolein	4.4841	4.4846	4.4850	4.5763	0.01%	0.02%	2%
NOX	4,134	4,135	4,136	4,305	0.03%	0.05%	4%
CO	32,967	32,982	32,996	34,183	0.05%	0.09%	4%
VOC	6,490	6,490	6,491	6,622	0.01%	0.02%	2%

(a) % increase = ((5 yr grace VIP) - (base year)) / (base year)

(b) % increase = ((6 yr grace) - (base year)) / (base year)

(c) % increase = ((no VIP) - (base year)) / (base year)

3.1.2 Onroad mobile: Employee Commute Options (ECO)

The Employee Commute Options or "ECO" Program requires large employers in the Portland area with more than 100 employees reporting to a work site to provide commute options to encourage employees to reduce auto trips to the work site. ECO is part of a federally required plan to reduce smog levels. ECO is one of several strategies included in the Ozone Maintenance Plan for the Portland Air Quality Maintenance Area.

DEQ requires employers to survey to determine current commute methods, prepare a plan to meet the target reduction and submit the plan to DEQ for approval, and perform follow-up surveys every two years to measure progress toward the 10% trip reduction goal. The plan needs to include commute option plan incentives. The incentives must have the potential to reduce commute trips to work site by 10% from an established baseline. Common commute option incentives include: Transit and vanpool subsidies, allowing employees to purchase transit passes with pre-tax dollars, carpool matching and preferential parking for carpools, compressed work weeks, telecommuting, bike/walk incentives, emergency ride home program.

The main goal of ECO is to protect public health by reducing air pollution from motor vehicles. Car exhaust is one of our region's largest single sources of air pollution. ECO also helps offset transportation congestion caused by the use of single passenger vehicles.

ECO also helps reduce traffic congestion. Car exhaust is a main ingredient in ground-level ozone, also called smog. Breathing even low levels of smog can decrease lung function and aggravate asthma. Smog hurts everyone but is especially harmful to children, older adults and people with heart disease and breathing problems like asthma. According to the Oregon Health Authority, approximately 10.2 percent of adults and 9.5 percent of children in Oregon have asthma. This is higher than the national average. More than a quarter of adults with asthma report missing at least one day of work per year due to their condition. Car exhaust is a primary source of carbon dioxide, a global warming gas. Car exhaust also is a major source of air toxics - chemicals known or suspected to cause cancer and other serious health effects. A recent DEQ study shows unhealthy levels of benzene and other air toxics in Portland's air.

Table 17 outlines the emissions growth from ECO removal on the base year nonpoint, nonroad, point and onroad emissions totals.

Table 17. Anthropogenic emissions growth from removal of ECO program: Portland AQMA.

	---- Nonpoint, Nonroad, Point and Onroad Totals (TPY) ---- - Base Year: VIP in effect, 4 yr grace -		Emissions Increase
		With ECO	Without ECO	Without ECO (a)
Air Toxic	1,3-Butadiene	71.6	72.0	0.5%
	Acetaldehyde	216.5	217.4	0.4%
	Acrolein	28.86	28.92	0.2%
	Benzene	469.4	471.7	0.5%
	Dichlorobenzene	1.0E-02	1.0E-02	0%
	Ethylbenzene	225.9	227.1	0.5%
	Formaldehyde	412.3	412.8	0.1%
	Methylene Chloride	9.2	9.2	0%
	Napthalene	84.1	84.2	0.1%
	Perchloroethylene	31.5	31.5	0%
	Trichloroethylene	42.9	42.9	0%
Air Toxic: 15-PAH	15-PAH	20.3	20.4	0.2%
Air Toxic: Metals	Arsenic	8.7E-02	8.8E-02	1.5%
	Cadmium	0.04	0.04	0%
	Chromium (VI)	1.6698E-02	1.6705E-02	0.04%
	Manganese	1.4	1.4	0%
	Nickel	0.4	0.4	0%
Criteria Pollutant	CO	168,525	169,865	0.8%
	Lead	1.5	1.5	0%
	NOX	26,184	26,287	0.4%
	PM10	20,883	20,888	0.03%
	PM2.5	6,412	6,415	0.05%
	SO2	1,379	1,383	0.3%
	VOC	35,074	35,127	0.2%
	Shaded rows indicate no impact			

(a) % increase = ((Without ECO) - (base year)) / (base year)

3.2 Point sources: Gasoline Dispensing Facility Stage II Controls

DEQ permits GDFs, resulting in location, activity and controls data specific to each station. In addition to total annual throughput data from facility annual reporting to DEQ, facility-specific inspection data includes control types for storage tanks and pumps at each GDF. This data allows for emissions estimates with and without Stage II Vapor Recovery System controls at the gasoline dispensing pump. Table 18 outlines the emissions growth from VRS removal on the base year (2014) nonpoint, nonroad, point and onroad emissions totals.

Table 18. Anthropogenic emissions growth from VRS removal: Portland AQMA.

	Nonpoint, Nonroad, Point and Onroad Totals (TPY)		
	Base Year: VRS	Base Year: No VRS	Emissions Increase (a)
Benzene	469.4	474.2	1.0%
Ethylbenzene	225.9	229.7	1.7%
VOC	35,074.0	35,654.5	1.7%

(a) % increase = ((no VRS) - (base year)) / (base year)

3.3 Point sources: Marine loading (barge) controls

Oregon rule OAR 340-232-0110 is applicable to loading gasoline into marine tank vessels, including marine loading racks. In Oregon, gasoline is loaded into barges at Portland ports for transport to eastern areas of the state. Control consists of a vapor collection system. Part 4 of the rule specifies "*Vapors that are displaced and collected during marine tank vessel loading events must be reduced from the uncontrolled condition by at least 95 percent by weight…"* Uncontrolled emissions estimates from barge loading were estimated using the formula

Uncontrolled emissions, tpy = (Controlled emissions, tpy) / (1-0.95)

Table 19 details uncontrolled emissions estimates for barge loading. Table 20 outlines the emissions growth from removal of barge loading controls on the base year (2014) nonpoint, nonroad, point and onroad emissions totals.

Table 19. Controlled vs. uncontrolled emissions details: Barge loading.

Source Number	Source Name	Emission Description	(1) VOC (tpy)	(2) Benzene (tpy)	(2) Ethylbenzene (tpy)	(3) VOC (tpy)	(2) Benzene (tpy)	(2) Ethylbenzene (tpy)
			--------- Controlled ---------			------- Uncontrolled -------		
26-2027	Chevron U.S.A. Inc.	Marine loading racks	59.00	0.48	0.39	1,180.00	9.68	7.79
26-2028	Kinder Morgan Liquids Terminals LLC	Marine loading racks	0.67	0.01	4.E-03	13.40	0.11	0.09
26-2029	Shore Terminals LLC	Marine loading racks	0.01	8.E-05	7.E-05	0.20	2.E-03	1.E-03
26-2030	Seaport Midstream Partners, LLC	Marine loading racks	0.80	0.01	0.01	16.00	0.13	0.11
			-------	-------	-------	-------	-------	-------
	Total		60.48	0.50	0.40	1,209.60	9.93	7.98

Notes

(1) DEQ TRAACS data

(2) HAP emissions = (VOC tpy) * (VOC Weight Percent)

CAS	NAME	Weight Percent	
71-43-2	Benzene	0.82%	(a)
100-41-4	Ethylbenzene	0.66%	(b)

(a) Benzene wt% from EPA PADD 5 Vol % data: EPA-420-R-10-029, Table 16, p.14 (AQ-TS ref. 973)

(b) Ethylbenzene from EPA Speciate 4.5: Profile 2455 (Composite Gasoline Vapor from Seattle (5 brands, 3 grades) - 1997)

(3) Barge loading controls estimated to be 95% effective (OAR 340-232-0110).

Uncontrolled emissions = (Controlled emissions, tpy) / (1-0.95)

Table 20. Anthropogenic emissions growth from removal of barge loading controls: Portland AQMA.

	Nonpoint, Nonroad, Point and Onroad Totals (TPY)		
	Base Year: Loading controls	Base Year: No loading controls	Emissions Increase (a)
Benzene	469.4	478.8	2.0%
Ethylbenzene	225.9	233.5	3.4%
VOC	35,074.0	36,223.7	3.3%

(a) % increase = ((no barge loading controls) - (base year)) / (base year)

4 Conclusions

In this emission inventory demonstration and analysis, DEQ evaluated several emission control strategies in the Portland and Medford areas, including different scenarios of the vehicle inspection and maintenance program. Other strategies analyzed were the employee commute options program, barge loading controls, and vapor recovery systems at gasoline dispensing facilities. DEQ analyzed strategies' effects on absolute emissions of criteria and toxics pollutants, and compared pollutant contributions among various sources: onroad vehicles and nonroad equipment, nonpoint sources, biogenic sources, events, and permitted point sources.

The emission inventory shows that onroad sources may contribute from 20% to more than 50% of criteria and air toxics pollutant emissions to the Portland and Medford AQMAs, predominantly NO_X, CO, VOCs, and the air toxics ethylbenzene, benzene, 1,3-butadiene, and acetaldehyde. DEQ's analysis shows that the vehicle inspection and maintenance program prevents hundreds of tons per year of pollutant emissions into the Portland and Medford areas. Criteria and air toxics emissions from onroad sources would increase by 5% to 20% if DEQ did not operate a Vehicle Inspection Program in the Portland and Medford areas.

DEQ's emission inventory and analysis demonstrate that each of the non-VIP controls (ECO, GDF vapor recovery, barge loading) achieve overall pollutant reductions between < 1% and 3.3%. The currently operated VIP achieves reduction to overall anthropogenic emissions, ranging from 2% to 9%.

5 QUALITY CONTROL

5.1 Introduction

The purpose of this section of the document is to describe the quality control procedures utilized in preparing the emission inventory demonstration. QC is an internal system of routine technical activities implemented by inventory development personnel to measure and control the quality of the inventory as it is developed, as well as actually checking the data generated.

The bulk of the nonpoint, point, nonroad, biogenic and event data was limited to a single source of information, the EPA 2014 NEI v.2. Therefore, many of the standard QA/QC procedures DEQ staff typically use for SIP emissions inventories were not applicable. Instead, DEQ relies upon EPA QA/QC procedures for any data generated by EPA, and on EPA QC procedures for any data submitted to EPA by DEQ. The following sections present QC procedures for the DEQ-generated parts of the project inventory.

5.2 Organization and Personnel

Christopher Swab, Wes Risher and Brandy Albertson performed QC procedures on DEQ generated emissions inventory data. Gary Beyer from the DEQ Vehicle Inspection Program performed extensive QC on the MOVES emissions inventory output and conversions.

5.3 Data collection and analysis

To ensure the comprehensive nature of the emission inventory, EPA Emission Inventory Improvement Program (EIIP) QA/QC guidance was used, specifically the guidance found in EIIP Volume VI, Chapter 3.[321] The inventoried sources are marked under the appropriate pollutant category. Only those sources that have been determined to operate in the inventoried areas were included.

As detailed in Section 2.4, area, nonroad and biogenic source emissions estimates were based on three sources of data:

- EPA 2014 NEI Data
- DEQ Permitted Point data submittals and DEQ emissions estimates for GDF and perc drycleaners
- Emissions estimates from residential wood combustion survey results

As part of the NEI submittal process for those data not generated by EPA, DEQ performs QA/QC steps according to EPA requirements. Examples include reconciliation of point and area source fuel and solvent use, and QC procedures embedded in the submittal process for permitted point source emissions estimates. The statewide residential wood combustion survey that served as a basis for estimating RWC emissions for this inventory was conducted in 2014 by the Portland State University Survey Research Lab (SRL). [939] Analysis and QC of the survey data was conducted by the SRL, and occurred at the database level. GDF emissions data were submitted to peer review as part of the DEQ Cleaner Air Oregon project.

On-road emissions data, generated by the newly developed DEQ MOST application, were subjected to rigorous QC through range-checks against on-road emissions generated for previous projects, specifically those projects utilizing the MOVES model. Additionally, peer review of MOST code on a step-by-step process occurred during application development via meetings of DEQ HQ and VIP staff.

5.4 QC Components

The QC components of the emissions inventory included results evaluation, location review, data handling, and peer review. Table 21 below details the processes and description for each

QC component. These QC components were applied to all emissions data allocated to AQMA boundaries.

Table 21. Quality Control components.

QC component	Process	Description
Results Evaluation	Range Check	Comparison of project EI data against NEI
	Ranking Check	Does the comparison of results by source and EI categories look reasonable?
	Outlier Analysis	What do the outliers signify?
Location review	GIS analysis	Are spatial surrogates accurate?
Reference data verification	DEQ reference database	Thorough documentation of all references and sources of data.
Data Handling	MS Access databases	Value and structure errors:
Peer review	Peer review	GDF emissions reviewed by DEQ modeling and toxicology staff.

6 REFERENCES

Numbers are DEQ Air Quality Technical Services Section internal reference numbers.

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7 APPENDICES

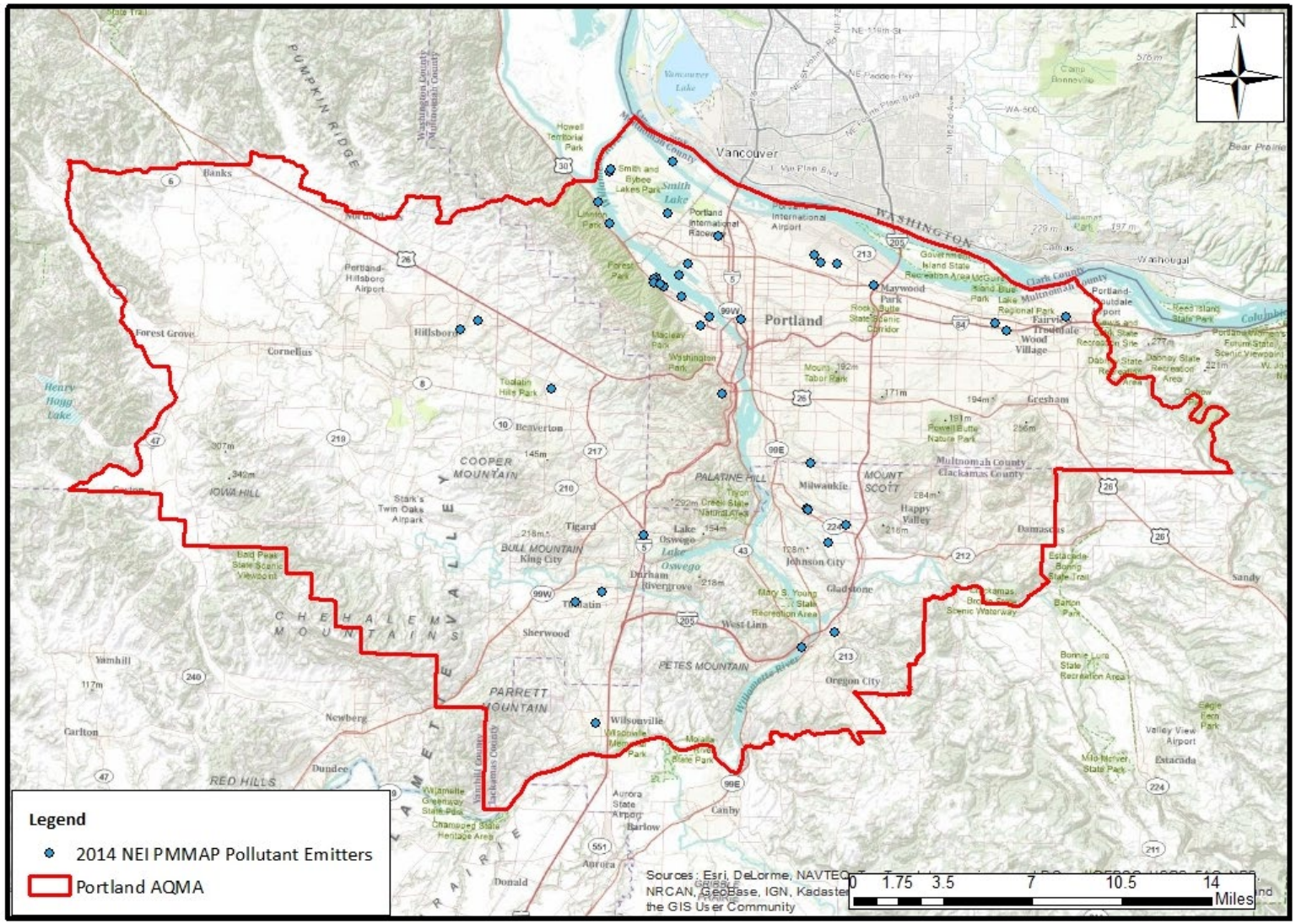
APPENDIX A: STATIONARY POINT LOCATIONS

APPENDIX B: SPATIAL SURROGATE DATA AND MAPS

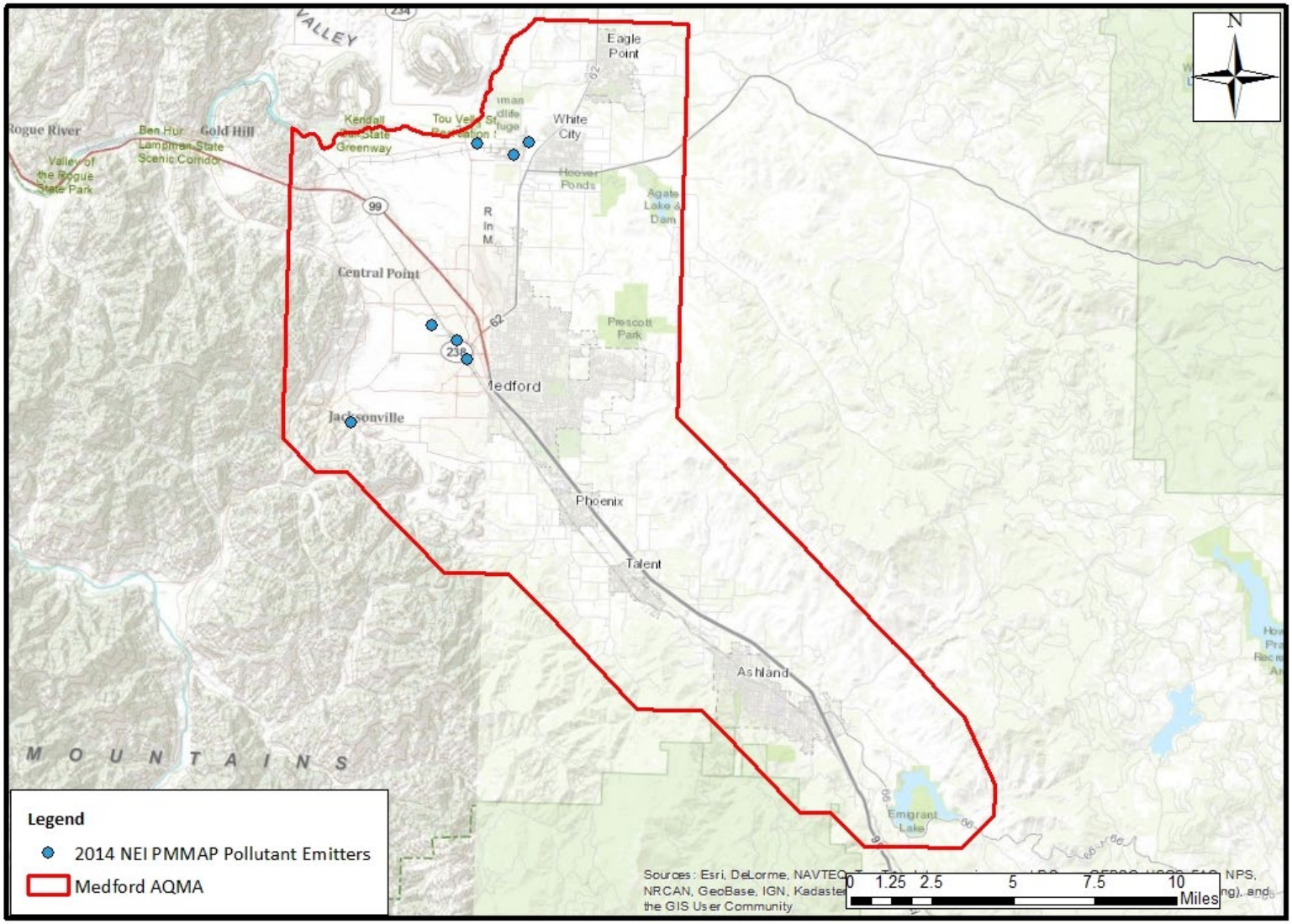
APPENDIX C: ONROAD

APPENDIX A: STATIONARY POINT LOCATIONS

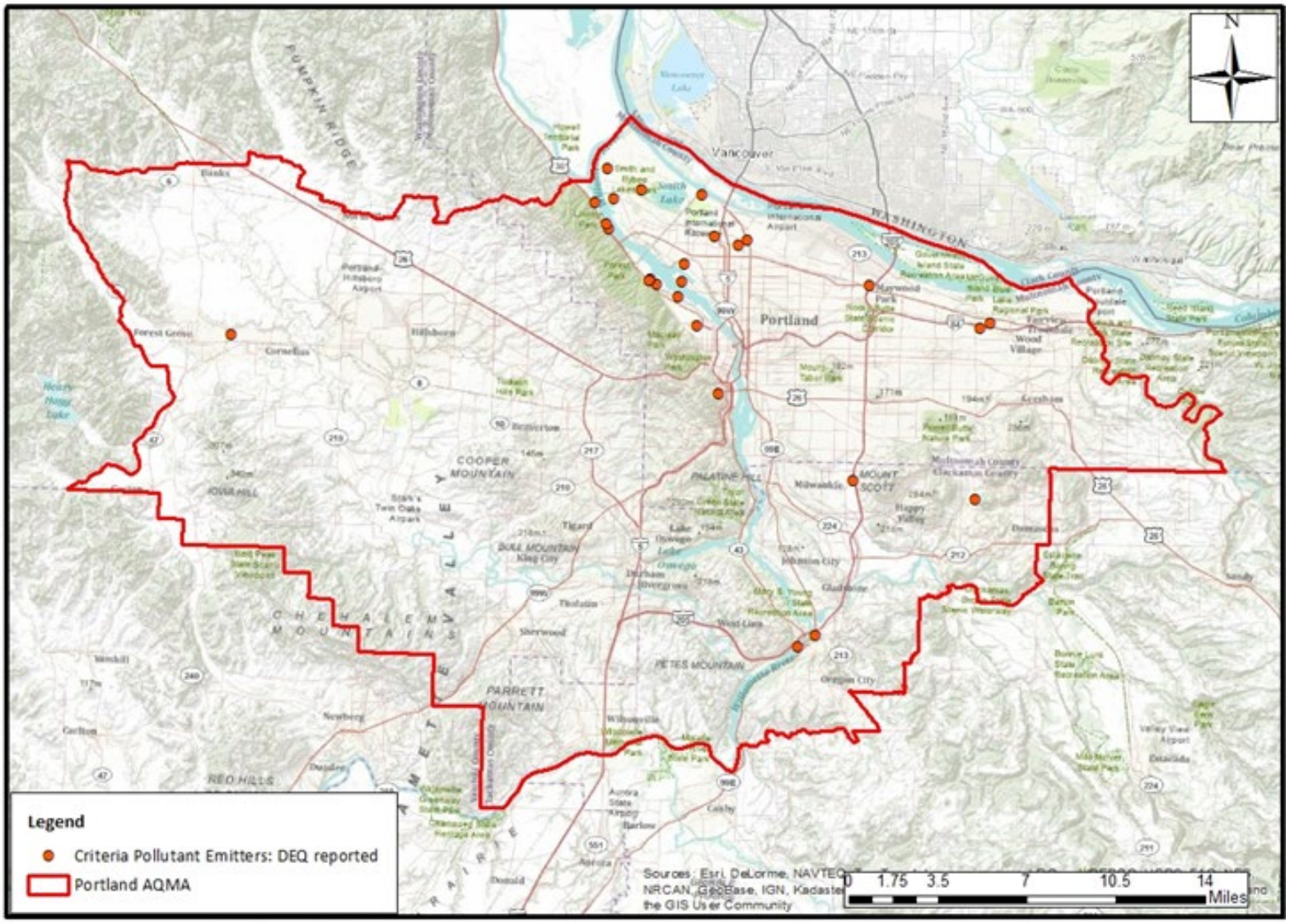
- Figure A-1: Portland AQMA point source locations, air toxics
- Figure A-2: Medford AQMA point source locations, air toxics
- Figure A-3: Portland AQMA point source locations, criteria pollutants
- Figure A-4: Medford AQMA point source locations, criteria pollutants
- Figure A-5: Gasoline dispensing facility locations in relation to the Portland AQMA
- Figure A-6: Gasoline dispensing facility locations in relation to the Medford AQMA
- Figure A-7: Portland AQMA perchloroethylene dry cleaner locations
- Figure A-8 Portland AQMA perchloroethylene dry cleaner locations



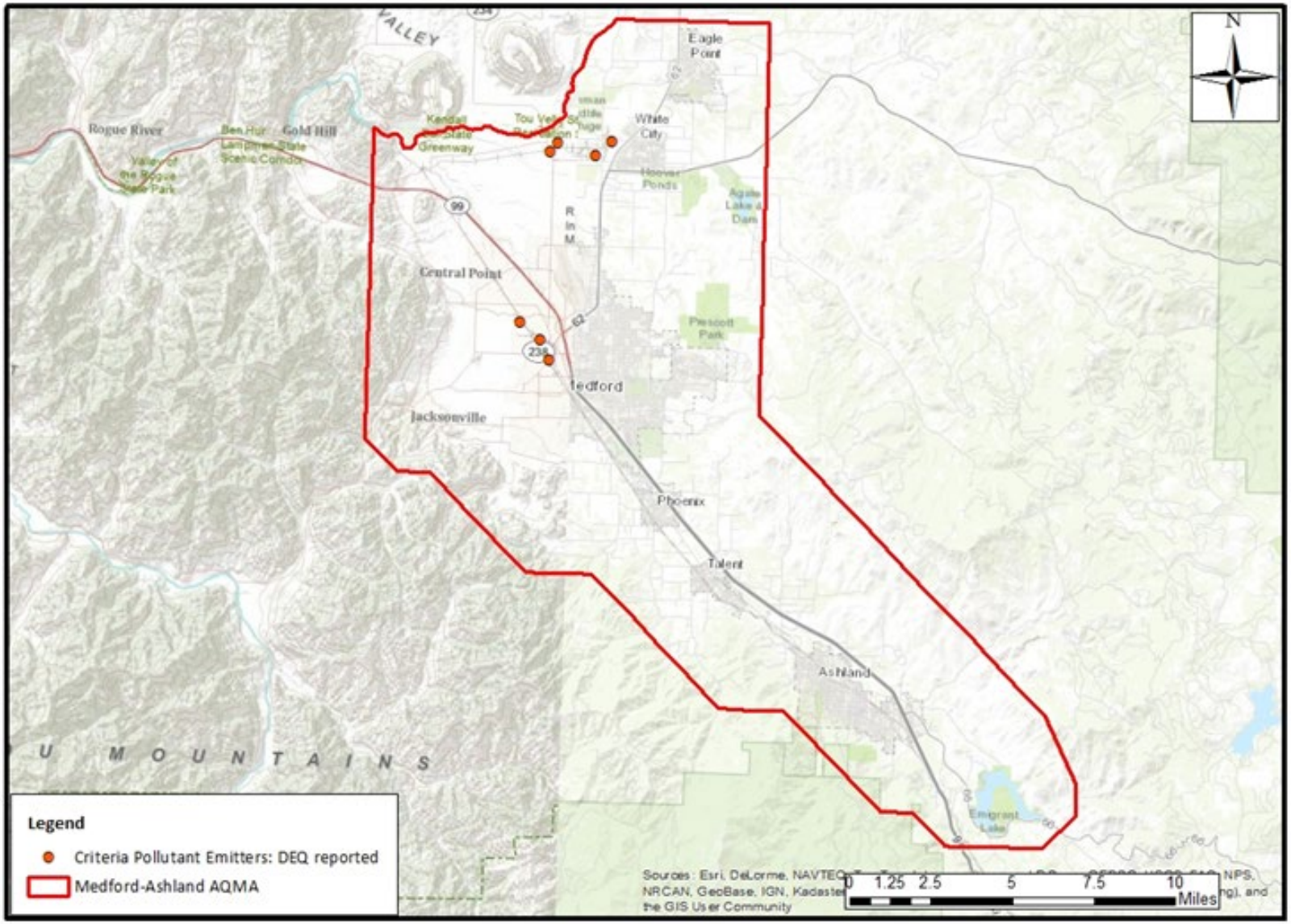
Appendix A, Figure A- 1. Portland point source locations, air toxics



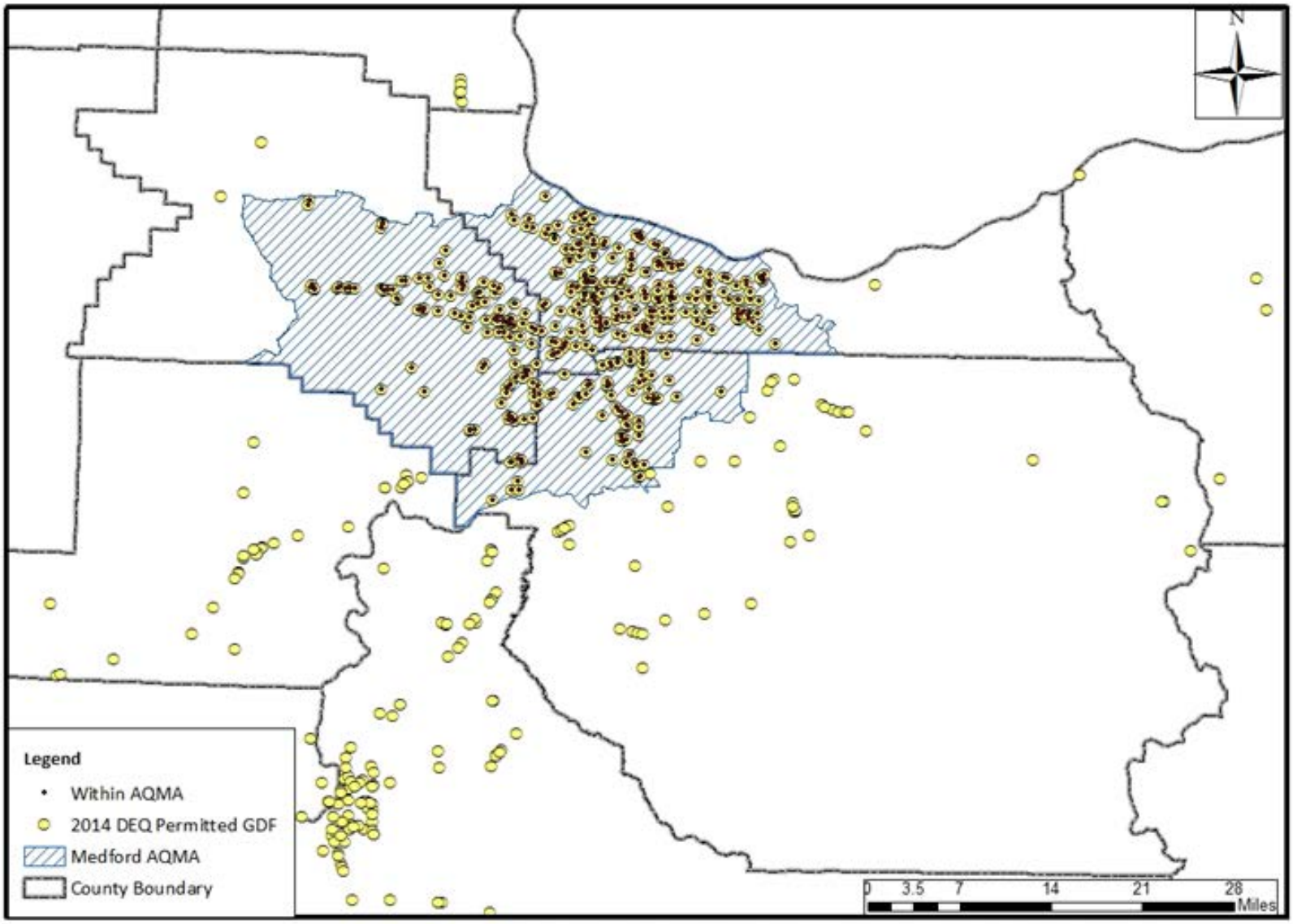
Appendix A, Figure A- 2. Medford-Ashland point source locations, air toxics



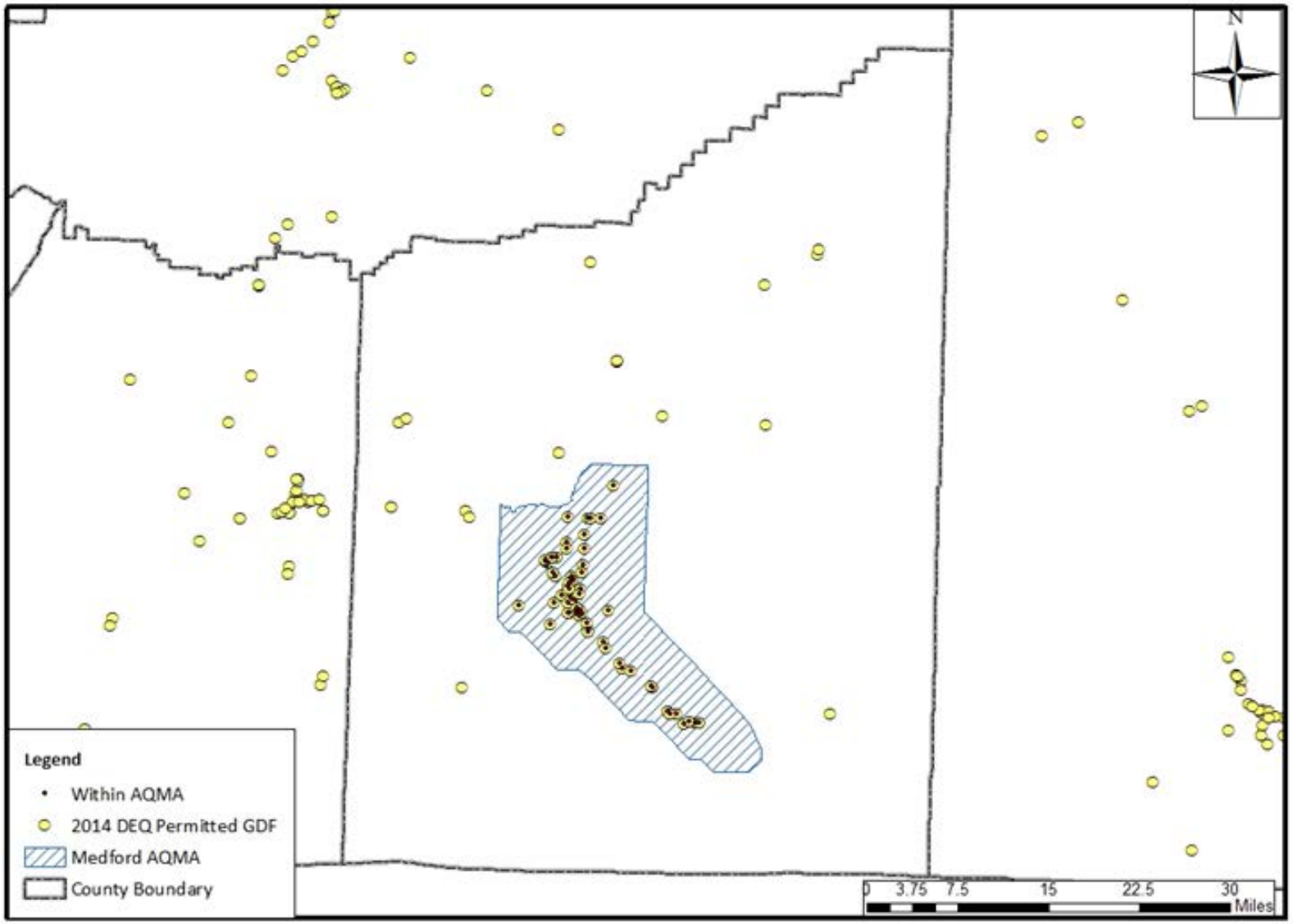
Appendix A, Figure A- 3. Portland point source locations, criteria pollutants



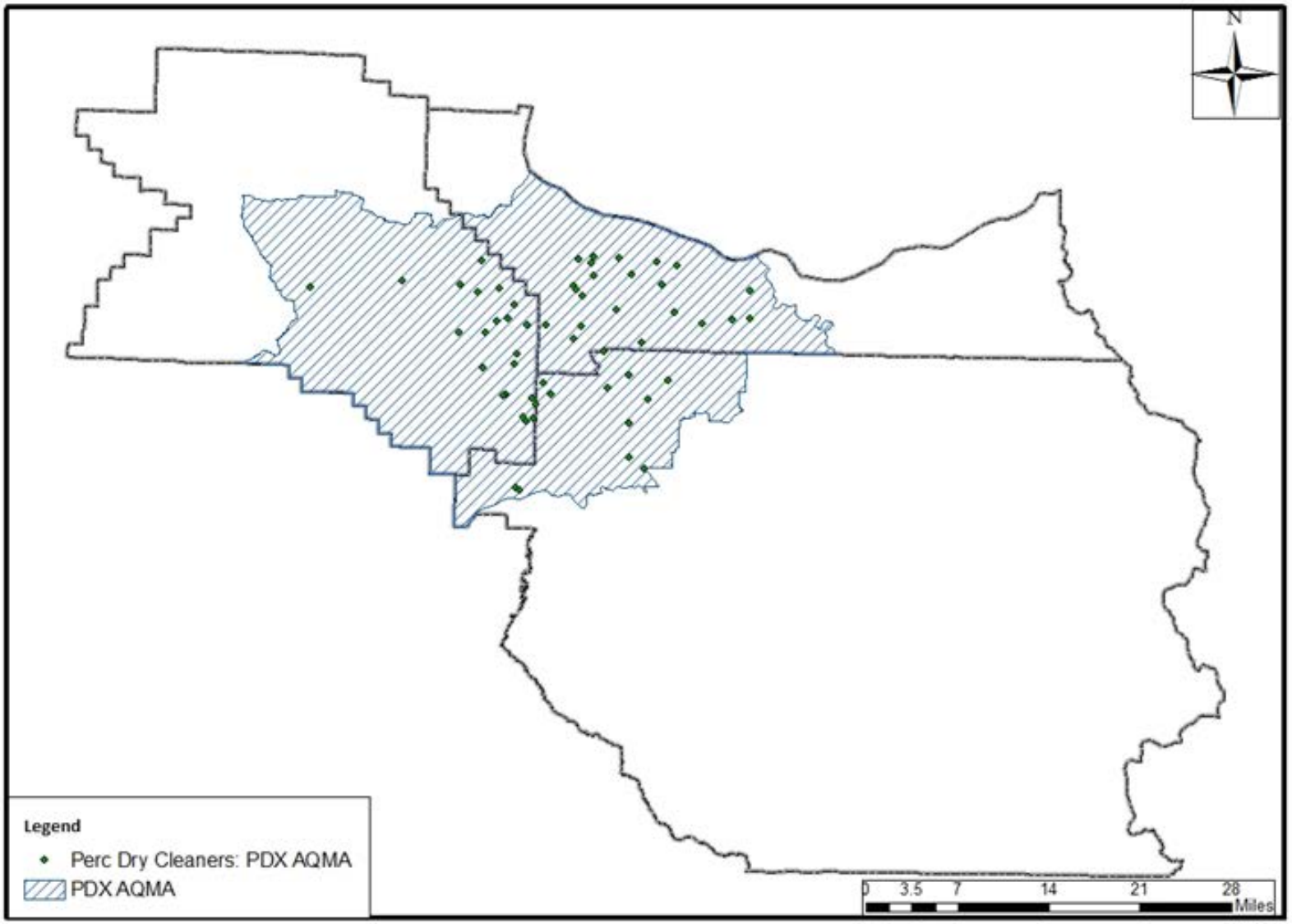
Appendix A, Figure A- 4. Medford point source locations, criteria pollutants



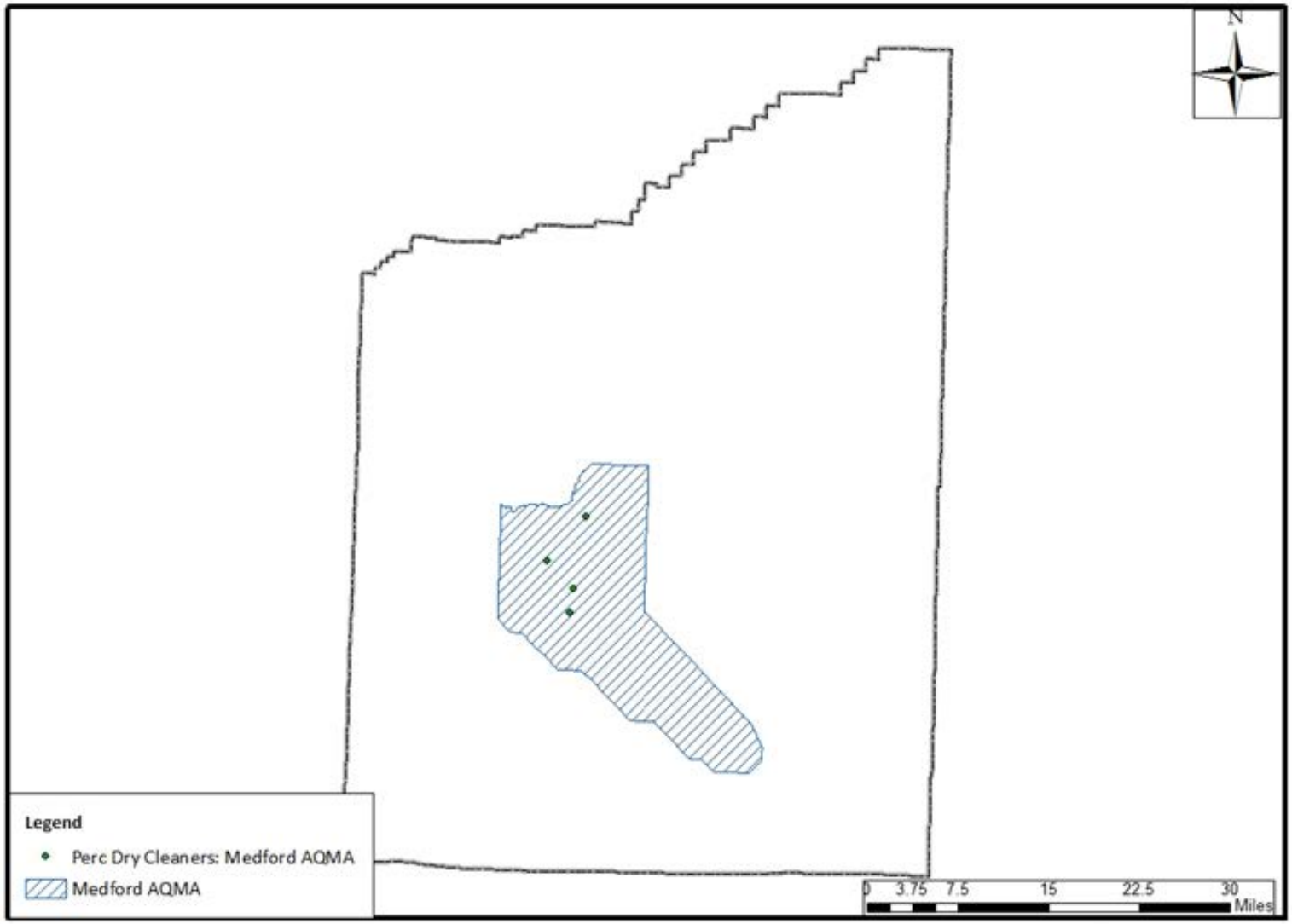
Appendix A, Figure A-5. Gasoline dispensing facility locations in relation to the Portland AQMA



Appendix A, Figure A-6. Gasoline dispensing facility locations in relation to the Medford AQMA



Appendix A, Figure A-7. Portland AQMA perchloroethylene dry cleaner locations



Appendix A, Figure A-8. Medford AQMA perchloroethylene dry cleaner locations

APPENDIX B: SPATIAL SURROGATE DATA AND MAPS

Appendix B contains spatial surrogate data for nonpoint (area), nonroad, biogenic, event (wildfire and prescribed burning) and stationary non-permitted facility (airports and railyards) emissions sources.

- Appendix B Tables
  - B-i. Spatial surrogates by EI category and sector
  - B-ii. Spatial Surrogate ID (SSID), value, description, basis and Appendix references
  - B-iii. Description of location-specific source types
  - B-1. Multnomah County & AQMA nonpoint spatial surrogates
  - B-2. Washington County & AQMA nonpoint spatial surrogates
  - B-3. Clackamas County & AQMA nonpoint spatial surrogates
  - B-4. Jackson County & AQMA nonpoint spatial surrogates
  - B-5. Ethyl benzene emissions by airport (facility) and process.
  - B-6. Biogenic spatial surrogates, estimated using land cover raster cell counts
  - B-7. Additional spatial surrogate references and appendix figures of relevant maps

- Appendix B Figures
  - B-1. Portland Metro zoning
  - B-2. Multnomah County building footprint
  - B-3a. Tri-County roadway
  - B-3b. Tri-County unpaved roadway
  - B-4. Tri-County airport locations
  - B-5. Tri-County railway
  - B-6a. DOGAMI oil and gas permit locations, northern Willamette Valley
  - B-6b. DOGAMI surface mining permit locations, northern Willamette Valley
  - B-7. Tri-County boat launch locations
  - B-8. Washington County building footprint
  - B-9. Clackamas County building footprint
  - B-10. Jackson County zoning
  - B-11. Jackson County building footprint
  - B-12. Jackson County roadway
  - B-13. Jackson County census block groups
  - B-14. Jackson County airport locations
  - B-15a. DOGAMI oil and gas permit locations, Jackson County
  - B-15b. DOGAMI surface mining permit locations, Jackson Count
  - B-16. Tri-County 2014 agricultural and prescribed burning locations
  - B-17. Jackson County 2014 agricultural and prescribed burning locations
  - B-18. Jackson County boat launch locations
  - B-19. Tri-County land cover
  - B-20. Jackson County land cover

- B-21. Multnomah County shipping lanes
- B-22. Tri-County shipping lanes
- B-23. Tri-County port locations
- B-24. Jackson County line-haul locomotive track location
- B-25. Rail yards within the Portland AQMA
- B-26. Portland area residential wood combustion PM2.5 emissions by block group
- B-27. Medford area residential wood combustion PM2.5 emissions by block group
- B-28. Tri-county US Census block groups

Appendix B, Table B-i. Spatial surrogates by EI category and sector (SSID = Yes indicates that the EI sector has been spatially allocated to AQMA using a spatial surrogate).

EI Category	EI Sector	Spatial Surrogate	SSID?	Comment
Nonpoint	Commercial Cooking	Zone	Yes	
Nonpoint	Dust - Agriculture - Crops & Livestock	Zone	Yes	
Nonpoint	Dust - Building Construction	Zone	Yes	
Nonpoint	Dust - Mining & Quarrying	DOGAMI permit location	Yes	
Nonpoint	Dust - Paved Roads	Roadway	Yes	
Nonpoint	Dust - Road Construction	Roadway	Yes	
Nonpoint	Dust - Unpaved Roads	Roadway	Yes	
Nonpoint	Fires - Agricultural Field Burning	Zone and Point (location specific)	Varies	
Nonpoint	Fires - Open Burning, Land Clearing Debris	Building Footprint & Roadway	Yes	
Nonpoint	Fires - Prescribed burning and Wildfires	Location Specific - Point	No	Location mapped in GIS
Nonpoint	Fires - Residential Open Burning	Zone	Yes	
Nonpoint	Fuel Combustion - Non-Permitted Industrial, Commercial, Institutional	Zone	Yes	
Nonpoint	Fuel Combustion - Residential - Wood: DEQ Surveyed categories	US Census block group	No	
Nonpoint	Fuel Combustion - Residential - Wood: non DEQ surveyed categories	Population & Zone	Yes	Survey results allocated
Nonpoint	Fuel Combustion - Residential Fossil Fuel	Population & Zone	Yes	
Nonpoint	Fuel Distribution - Aircraft Fuel Dispensing	Location Specific - Point	Yes	
Nonpoint	Fuel Distribution - Fugitive leaks from fuel pipelines	GIS - Location proprietary	N/A	
Nonpoint	Fuel Distribution - Gasoline Dispensing Facilities, all processes	DEQ Permit - Location Specific	No	Location mapped in GIS
Nonpoint	Fuel Distribution - Portable Gas Cans - Filling	Location Specific - Point (DEQ permit)	Yes	
Nonpoint	Fuel Distribution - Portable Gas Cans - Transportation	Roadway	Yes	
Nonpoint	Fuel Distribution - Truck Transport	Roadway	Yes	
Nonpoint	Publicly Owned Treatment Works (sewage treatment)	Zone	Yes	
Nonpoint	Residential - Charcoal grilling, gas can storage	Population & Zone	Yes	
Nonpoint	Solvent Use - Architectural Surface Coating	Building Footprint	Yes	
Nonpoint	Solvent Use - Asphalt production & application	Roadway	Yes	
Nonpoint	Solvent Use - Consumer & Commercial	Population, Census Blocks, Zone	Yes	
Nonpoint	Solvent Use - Degreasing	Zone	Yes	
Nonpoint	Solvent Use - Graphic Arts	Zone	Yes	
Nonpoint	Solvent Use - Perc Dry Cleaners	DEQ Permit - Location Specific	No	Location mapped in GIS
Nonpoint	Solvent Use - Surface Coating	Zone	Yes	
Nonpoint	Solvent Use - Traffic Markings	Roadway	Yes	
Biogenic	Biogenic Emissions	Raster (pixels)	Yes	
Nonroad	Aircraft (to 3000 feet) and Airport Ground Support Equipment	Location Specific - Point	No	Location mapped in GIS
Nonroad	Locomotives - Line-Haul	Rail Line	Yes	EPA shapefile fraction
Nonroad	Locomotives - Yard	Location Specific - Polygon	No	Location mapped in GIS
Nonroad	Marine - Commercial	Location Specific - Polygon	No	EPA shapefile fraction
Nonroad	Marine - Recreational	Launch Location - Boating Use Days	Yes	
Nonroad	Vehicles & Equipment: Agricultural, Recreational, Light Industrial, Lawn & Garden, Logging,	Zone	Yes	
Nonroad	Vehicles & Equipment: Construction	Building Footprint & Roadway	Yes	
Nonroad	Vehicles & Equipment: Onshore Oil and Gas Production	DOGAMI permit location	Yes	

Appendix B, Table B-ii. Spatial Surrogate ID (SSID), value, description, basis and Appendix references, ordered descending by spatial surrogate ID (SS_ID). Table B-ii continues on pages B-4 through B-6.

FIPS	SS_ID	SS_Value	SS_Description	Spatial Surrogate Basis	Appendix Table	Appendix Ref. Table	Appendix Figure
41005	**4100501**	0.02620	Exclusive Farm and Forest	Zone	B-3	--	Fig. B-1
41005	**4100502**	0.55772	Commercial	Zone	B-3	--	Fig. B-1
41005	**4100503**	0.64824	Building Footprint and Paved Roadway	Building Footprint & Roadway	B-3	--	Fig. B-10 & B-3a
41005	**4100504**	0.72477	Industrial	Zone	B-3	--	Fig. B-1
41005	**4100505**	0.02755	Farm or Forest + Parks and Open Space	Zone	B-3	--	Fig. B-1
41005	**4100506**	0.51170	Residential Lawn & Garden	Zone	B-3	--	Fig. B-1
41005	**4100507**	0.51867	Residential	Zone	B-3	--	Fig. B-1
41005	**4100508**	0.68595	Commercial & Industrial	Zone	B-3	--	Fig. B-1
41005	**4100509**	0.73432	Building Footprint	Building Footprint	B-3	--	Fig. B-9
41005	**4100510**	0.43016	Paved Road	Roadway	B-3	--	Fig. B-3a
41005	**4100511**	0.67503	Publicly Owned	Zone	B-3	--	Fig. B-1
41005	**4100512**	0.01769	Airport Location - Avgas Storage	Airport Location	B-3	B-5	Fig. B-4
41005	**4100513**	0.64690	Active Rail Line	Rail Line	B-3	--	Fig. B-5
41005	**4100514**	0.62309	Boat Launch Location - Boating Use Days	Launch Location - Boating Use Days	B-3	--	Fig. B-7
41005	**4100515**	0.33333	On-Shore Oil and Gas Permit location	DOGAMI permit location	B-3	--	Fig. B-6a
41005	**4100516**	0.12589	Biogenic: Vegetation landcover	Raster	B-6	--	Fig. B-19
41005	**4100517**	0.72385	Pipeline transmission of gasoline	GIS - Location proprietary	Location proprietary	--	Location proprietary
41005	**4100518**	0.73350	GDF permit location	DEQ Permit - Location Specific	B-3	--	Fig A-5
41005	**4100519**	0.71913	Population	US Census blocks	B-3	--	Fig. B-28
41005	**4100520**	0.00010	Unpaved Roadway Miles	Unpaved Roadway	B-3	--	Fig. B-3b
41005	**4100521**	0.17424	Surface Mining & Quarrying Permit Location	DOGAMI permit location	B-3	--	Fig. B-6b
41029	**4102901**	0.30185	Agricultural	Zone	B-4	--	Fig. B-10
41029	**4102902**	0.91518	Commercial	Zone	B-4	--	Fig. B-10
41029	**4102903**	0.43814	Building Footprint and Streets	Building Footprint & Roadway	B-4	--	Fig. B-11 & B-12
41029	**4102904**	0.97233	Industrial	Zone	B-4	--	Fig. B-10
41029	**4102905**	0.01955	Forest Land	Zone	B-4	--	Fig. B-10
41029	**4102906**	0.32437	Farm/Rural and Low-Density Residential Zoning Mix	Zone	B-4	--	Fig. B-10
41029	**4102907**	0.91518	Commercial Lawn & Garden	Zone	B-4	--	Fig. B-10
41029	**4102908**	0.69248	Residential Lawn & Garden	Zone	B-4	--	Fig. B-10
41029	**4102909**	0.94969	Commercial & Industrial	Zone	B-4	--	Fig. B-10
41029	**4102910**	0.82776	Population	Population	B-4	--	Fig_B-13

Table B-ii Continued

FIPS	SS_ID	SS_Value	SS_Description	Spatial Surrogate Basis	Appendix Table	Appendix Ref. Table	Appendix Figure
41029	**4102911**	0.78652	Building Footprint	Building Footprint	B-4	--	Fig_B-11
41029	**4102912**	0.16231	Streets	Roadway	B-4	--	Fig_B-12
41029	**4102913**	0.54897	Public	Zone	B-4	--	Fig. B-10
41029	**4102914**	1.00000	Airport location - Jet Naphtha Storage	Airport Location	B-4	B-5	Fig. B-14
41029	**4102915**	0.94040	Airport Location - Avgas Storage	Airport Location	B-4	B-5	Fig. B-14
41029	**4102916**	1.00000	On-Shore Oil and Gas Permit location	DOGAMI permit location	B-4	--	Fig. B-15a
41029	**4102917**	0.14704	Boat Launch Location - Boating Use Days	Launch Location - Boating Use Days	B-4	--	Fig. B-18
41029	**4102918**	0.07082	Biogenic: Vegetation landcover	Raster	B-6	--	Fig. B-20
41029	**4102919**	0.00000	Pipeline transmission of gasoline	GIS - Location proprietary	Location proprietary	--	Location proprietary
41029	**4102920**	0.69923	Active Rail Line	Rail Line	B-4	--	Fig B-24
41029	**4102921**	0.88416	GDF permit location	DEQ Permit - Location Specific	B-4	--	Fig A-6
41029	**4102922**	0.61780	Residential	Zone	B-4	--	Fig. B-10
41029	**4102923**	0.13694	Unpaved Roadway Miles	Roadway	B-4	--	Fig. B-12
41029	**4102924**	0.37143	Surface Mining & Quarrying Permit Location	DOGAMI permit location	B-4	--	Fig. B-15b
41051	**4105101**	0.11664	Exclusive Farm and Forest	Zone	B-1	--	Fig. B-1
41051	**4105102**	0.89234	Commercial	Zone	B-1	--	Fig. B-1
41051	**4105103**	0.96649	Building Footprint and Paved Roadway	Building Footprint & Roadway	B-1	--	Fig. B-2 & B-3a
41051	**4105104**	0.99834	Industrial	Zone	B-1	--	Fig. B-1
41051	**4105105**	0.20210	Farm or Forest + Parks and Open Space	Zone	B-1	--	Fig. B-1
41051	**4105106**	0.97068	Residential Lawn & Garden	Zone	B-1	--	Fig. B-1
41051	**4105107**	0.97392	Residential	Zone	B-1	--	Fig. B-1
41051	**4105108**	0.57940	Shipping Lanes	Shipping Lanes	B-1	--	Fig. B-21
41051	**4105109**	0.98108	Building Footprint	Building Footprint	B-1	--	Fig. B-2
41051	**4105110**	0.90346	Paved Road	Roadway	B-1	--	Fig. B-3a
41051	**4105111**	0.99360	Publicly Owned	Zone	B-1	--	Fig. B-1
41051	**4105112**	1.00000	Airport location - Jet Naphtha Storage	Airport Location	B-1	B-5	Fig. B-4
41051	**4105113**	0.99912	Airport Location - Avgas Storage	Airport Location	B-1	B-5	Fig. B-4
41051	**4105114**	0.82440	Active Rail Line	Rail Line	B-1	--	Fig. B-5
41051	**4105115**	0.41423	Boat Launch Location - Boating Use Days	Launch Location - Boating Use Days	B-1	--	Fig. B-7
41051	**4105116**	0.98910	Commercial & Industrial	Zone	B-1	--	Fig. B-1
41051	**4105117**	0.12589	Biogenic: Vegetation landcover	Raster	B-6	--	Fig. B-19

Table B-ii continued

FIPS	SS_ID	SS_Value	SS_Description	Spatial Surrogate Basis	Appendix Table	Appendix Ref. Table	Appendix Figure
41051	**4105118**	0.89897	Pipeline transmission of gasoline	GIS - Location proprietary	Location proprietary	--	Location proprietary
41051	**4105119**	0.99960	GDF permit location	DEQ Permit - Location Specific	B-1	--	Fig A-5
41051	**4105120**	0.50000	On-Shore Oil and Gas Permit location	DOGAMI permit location	B-1	--	Fig. B-6a
41051	**4105121**	0.99067	Population	US Census blocks	B-1	--	Fig. B-28
41051	**4105122**	0.29322	Unpaved Roadway Miles	Unpaved Roadway	B-1	--	Fig. B-3b
41051	**4105123**	0.74510	Surface Mining & Quarrying Permit Location	DOGAMI permit location	B-1	--	Fig. B-6b
41067	**4106701**	0.79547	Agricultural	Zone	B-2	--	Fig. B-1
41067	**4106702**	0.99643	Commercial	Zone	B-2	--	Fig. B-1
41067	**4106703**	0.98807	Building Footprint	Building Footprint	B-2	--	Fig. B-8
41067	**4106704**	0.95263	Industrial	Zone	B-2	--	Fig. B-1
41067	**4106705**	0.01043	Forest Land: Excusive Forest Use	Zone	B-2	--	Fig. B-1
41067	**4106706**	0.99900	Publicly owned	Zone	B-2	--	Fig. B-1
41067	**4106707**	1.00000	Recreational	Zone	B-2	--	Fig. B-1
41067	**4106708**	0.99745	Commercial Lawn & Garden	Zone	B-2	--	Fig. B-1
41067	**4106709**	0.98108	Residential and Residential Lawn & Garden	Zone	B-2	--	Fig. B-1
41067	**4106710**	0.01706	Boat Launch Location - Boating Use Days	Launch Location - Boating Use Days	B-2	--	Fig. B-7
41067	**4106711**	0.97254	Building Footprint and Paved Roadway	Building Footprint & Roadway	B-2	--	Fig. B-8 & B-3a
41067	**4106712**	0.90119	Paved Road	Roadway	B-2	--	Fig. B-3a
41067	**4106713**	0.99704	Commercial & Institutional	Zone	B-2	--	Fig. B-1
41067	**4106714**	1.00000	On-Shore Oil and Gas Permit location	DOGAMI permit location	B-2	--	Fig. B-6a
41067	**4106715**	0.72873	Active Rail Line	Rail Line	B-2	--	Fig. B-5
41067	**4106716**	0.00000	Airport location - Jet Naphtha Storage	Airport Location	B-2	B-5	Fig. B-4
41067	**4106717**	0.99621	Airport Location - Avgas Storage	Airport Location	B-2	B-5	Fig. B-4
41067	**4106718**	0.97369	Commercial, Institutional and Industrial	Zone	B-2	--	Fig. B-1
41067	**4106719**	0.12589	Biogenic: Vegetation landcover	Raster	B-6	--	Fig. B-19
41067	**4106720**	1.00000	Pipeline transmission of gasoline	GIS - Location proprietary	Location proprietary	--	Location proprietary
41067	**4106721**	0.99590	GDF permit location	DEQ Permit - Location Specific	B-2	--	Fig A-5
41067	**4106722**	0.98767	Population	US Census blocks	B-2	--	Fig. B-28
41067	**4106723**	0.25804	Unpaved Roadway Miles	Unpaved Roadway	B-2	--	Fig. B-3b
41067	**4106724**	0.55556	Surface Mining & Quarrying Permit Location	DOGAMI permit location	B-2	--	Fig. B-6b

Appendix B, Table B-iii. Description of location-specific source types.

Source Type	Surrogate Source	Unit	Figures
Perc Dry Cleaners	DEQ Coordinates	Location	A-7 & A-8
Gasoline Dispensing Facilities	DEQ Coordinates	Location	A-5 & A-6
Commercial Marine Vessels: In-Transit	EPA shapefile	Acres	B-22
Commercial Marine Vessels: In-Port	EPA shapefile	Acres	B-23
Line-Haul Locomotives	EPA shapefile	Length	B-5 & B-24
RailYards	EPA coordinates	Location	B-25
Airports	EPA coordinates	Location	B-4 & B-14
Rx, Ag burning and Wildfires	EPA coordinates	Location	B-17 & B-18
Residential Wood Combustion	Census Block Group	Location	B-26 & B-27

Appendix B, Table B-1. Multnomah County & AQMA nonpoint spatial surrogate values.

County Zoning File (1)	(1,2)	(1,2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(9)	(3)	(3)	(3)	(3)	(5)	(5)	(6)	(7)	(8)	(10)	(3)	(3)	(11)	(12)
	Total	AQMA	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*
General Class Description	Acres	Acres	4105101	4105102	4105103	4105104	4105105	4105106	4105107	4105108	4105109	4105110	4105111	4105120	4105112	4105113	4105114	4105115	4105116	4105119	4105121	4105122	4105123
Commercial	2,190.6	1,954.8		X															X				
Farm or Forest	167,378.0	19,523.3	X				X																
Industrial	22,954.2	22,916.0				X													X				
Mixed-Use Residential	12,102.9	12,052.2						X	X														
Multi-Family Residential	9,673.4	9,642.2							X														
Parks and Open Space	18,072.2	17,956.5					X						X										
Residential	3,895.1	2,118.2						X	X														
Single Family	52,236.2	52,063.1						X	X														
Building Footprint	14,986.2	14,702.7			X						X												
Other Spatial Surrogate Data																							
Paved Road (miles)	3,469.7	3,134.8			X							X											
Oil and Gas Permits	2	1												X									
Railway Miles	188.0	155.0															X						
Jet Naphtha storage	1	1													X								
AVGas storage	1	0.999														X							
Recreational Marine	286,985	118,879																X					
Shipping Lanes (acres)	15,116	8,758								X													
GDF Throughput (1000 gal)	227,070	226,979																		X			
Population	751,125	744,120																			X		
Unpaved Roadway (miles)	242.8	71.2																				X	
Mining/Quarrying (permits)	51	38																					X
			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Multnomah County Total			167,378.0	2,190.6	18,456.0	22,954.2	185,450.2	68,234.2	77,907.7	15,115.8	14,986.2	3,469.7	18,072.2	2	1	1.0	188.0	286,985	25,145	227,070	751,125	242.8	51
AQMA Boundary Total			19,523.3	1,954.8	17,837.4	22,916.0	37,479.8	66,233.6	75,875.8	8,758.0	14,702.7	3,134.8	17,956.5	1	1	0.9991	155.0	118,879	24,871	226,979	744,120	71.2	38
AQMA Spatial Surrogate (13)			0.1166	0.8923	0.9665	0.9983	0.2021	0.9707	0.9739	0.5794	0.9811	0.9035	0.9936	0.5	1	0.9991	0.8244	0.4142	0.9891	0.9996	0.9907	0.2932	0.7451

Notes for Table B-1 are found on page B-9

Notes for Table B-1:

(1) Multnomah County Zoning shapefile from DEQ internal files.
Appendix B, Figure B-1 illustrates zoning in Multnomah County

(2) The GIS projects used to calculate acreages, and other units via clipping from DEQ internal files.

(3) IDs are as follows: An "X" indicates value used to estimate AQMA spatial surrogate factors

Spatial Surrogate ID descriptions

4105101 = EFU: Exclusive farm and forest use
4105102 = Commercially Zoned
4105103 = Building footprint + paved road
Appendix B, Figures B-2 and B-3 illustrate building footprint and roadway.
4105104 = Industrially Zoned
4105105 = Farm or Forest + Parks and Open Space
4105106 = Residential - Mixed use, single family, residential
4105107 = Residential (all types)
4105109 = Building Footprint
4105110 = Paved Road (Appendix B, Figure 3a)
4105111 = Publicly Owned
4105120 = On-shore oil and gas production: Locations from DOGAMI website, see Appendix B, Figure B-6a
4105121 = Population (from 2010 US census by census block)

(5) IDs 4105112 & 4105113: Aircraft fuel storage based on 2011 NEI data of aircraft emissions of ethylbenzene by airport location and aircraft type. Appendix B, Table B-5 details aircraft fuel storage spatial surrogate estimates. Appendix B, Figure B-4 shows the location of airports / heliports within the tri-county area.

(6) 4105114 = Active Rail Line. Appendix B, Figure B-5 shows active rail line (note: the rail line shapefile used is from the EPA 2014 NEI)

(7) 4105115 = Recreational Marine= Boating Use Days. Boating use days taken from Oregon State Marine Board 2010 survey data. GIS clipping used to determine use days for launches/ramps located with the AQMA. Appendix B, Figure B-7 shows location of launch/ramp sites. ArcGIS desktop application used to clip data located here:

(8) 4105116 = Commercial and Industrial: Commercial Roofing Asphalt Production and specific fugitive dust

(9) 4105108 = Marine transport of petrol and petrol products: Based on GIS clipping of the EPA 2014 NEI shipping lane shapefile: GIS clipping used to determine area of shipping lanes for Multnomah County and AQMA. Appendix B, Figure B-21 shows location of shipping lanes.

(10) 4105119: DEQ permitting data used to calculate Gasoline Dispensing Facility (GDF) throughput - please see Appendix A, Figure A-5

(11) 4105122 = Unpaved Roadway estimated using Metro RLIS roadway GIS files (roadway type = 9000 or 2000)
See Appendix B, Figure B-3b

(12) 4105123 = Surface Mining & Quarrying: DOGAMI data downloaded from
http://www.oregongeology.org/mlrr/permitviewer.htm
Active and closed permit data included. see Appendix B, Figure B-6b

(13) AQMA spatial surrogate = (AQMA Boundary Total) / (County Total)

Appendix B, Table B-2. Washington County & AQMA nonpoint spatial surrogate values.

(1)	(1,2)	(1,2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(4)	(5)	(6)	(7)	(3)	(3)	(8)	(8)	(9)	(10)	(3)	(11)	(12)
	Total	AQMA	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*
City and County Zone Description	Acres	Acres	4106701	4106702	4106703	4106704	4106705	4106706	4106707	4106708	4106709	4106710	4106711	4106712	4106713	4106714	4106715	4106716	4106717	4106718	4106721	4106722	4106723	4106724
	Acres	Acres																						
Agriculture and Forest	58,988	43,466	X																					
Agriculture: Exclusive Farm Use	96,217	79,995	X																					
Commercial / Residential	4,791	4,791		X											X					X				
Commercial: Central	445	445		X											X					X				
Commercial: Community Business District	236	236		X											X					X				
Commercial: General	2,079	2,079		X						X					X					X				
Commercial: Neighborhood	254	254		X						X					X					X				
Commercial: Office	181	181		X						X					X					X				
Commercial: Rural	62	32		X											X					X				
Commercial: Transit Oriented	374	374		X											X					X				
Exclusive Forest and Conservation	220,785	2,302					X																	
Industrial	452	447				X														X				
Industrial: Heavy	2,287	2,286				X														X				
Industrial: Light	8,817	8,741				X														X				
Industrial: Rural	713	213				X														X				
Institutional	1,607	1,605						X							X					X				
Parks and Open Space	569	569							X															
Public / Government / Institutional	1,034	1,033						X							X					X				
Residential: Multi-Family	20,127	20,069								X														
Residential: Rural	530	430									X													
Residential: Single Family	22,554	22,526									X													
Residential: Transit Oriented	513	513									X													
Other Spatial Surrogate Data																								
Recreational Marine (Boating Use Days)	39,146	668										X												
Paved Roadway (miles)	2,445	2,203											X	X										
Oil and Gas Permits	4	4														X								
Railway Miles	135.2	98.5															X							
Jet Naphtha storage	1	0																X						
AVGas storage	1	0.996																	X					
Building Footprint Acreage	11,787	11,638			X								X											
GDF Throughput (1000 gal)	208,377	207,522																			X			
Population	536,653	530,038																				X		
Unpaved Roadway (miles)	220.3	56.9																					X	
Mining/Quarrying (permits)	54	30																						X
			-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Washington County Total			155,205	8,422	67,055	12,268	220,785	2,641	569	22,641	23,597	39,146	14,232	2,445	11,063	4	135	1	1	23,331	208,377	536,653	220.3	54
AQMA Boundary Total			123,460	8,392	66,255	11,687	2,302	2,638	569	22,583	23,469	668	13,841	2,203	11,030	4	99	0	0.996	22,717	207,522	530,038	56.9	30
AQMA Spatial Surrogate (13)			0.7955	0.9964	0.9881	0.9526	0.0104	0.9990	1	0.9974	0.9946	0.0171	0.9725	0.9012	0.9970	1	0.7287	0	0.9962	0.9737	0.9959	0.9877	0.2580	0.5556

Notes for Table B-2 found on page B-11

Notes for Table B-2

(1) The Washington County Zoning shapefile, provided to DEQ by the Washington County Department of Land Use & Transportation from DEQ internal files.
Appendix B, Figure B-1 illustrates zoning in Washington County

(2) The GIS projects used to calculate acreages, and other units via clipping from DEQ internal files.

(3) An "x" indicates value used to estimate AQMA spatial surrogate factors

Spatial Surrogate ID descriptions

4106701 = Agricultural
4106702 = Commercial
4106703 = Building Footprint (architecture): Structure fires, architectural surface coating. See Appendix B, Figure B-8
4106704 = Industrial
4106705 = Forest Land: Excusive Forest Use: Logging
4106706 = Institutional
4106707 = Recreational
4106708 = Commercial Lawn & Garden
4106709 = Residential and Residential Lawn & Garden
4106714 = On-shore oil and gas production: Locations from DOGAMI website, see Appendix B, Figure B-6a
4106715 = Active Rail Line. Appendix B, Figure B-5 shows active rail line (note: the rail line shapefile used is from the EPA 2014 NEI)
4106722 = Population (from 2010 US census by census block)

(4) 4106710 = Recreational Marine= Boating Use Days. Boating use days taken from Oregon State Marine Board 2010 survey data.
GIS clipping used to determine use days for launches/ramps located with the AQMA. Appendix B, Figure B-7 shows location of launch/ramp sites.

(5) 4106711 = Building footprint and Paved Roadway Miles = Construction & Mining
Appendix B, Figures B-8 and B-3 illustrate building footprint and roadway.

(6) 4106712 = Paved Roadway Miles. Appendix B, Figure B-3a illustrates roadway.

(7) 4106713 = Commercial / Institutional

(8) 4106716 & 4106717: Aircraft fuel storage based on 2011 NEI data of aircraft emissions of ethylbenzene by airport location and aircraft type. Appendix B, Table B-5 details aircraft fuel storage spatial surrogate estimates. Appendix B, Figure B-4 shows the location of airports / heliports within the tri-county area.

(9) 4106718 = Commercial, Institutional and Industrial zoned = Commercial Roofing Asphalt production/application & specific fugitive dust

(10) 4106721: DEQ permitting data used to calculate Gasoline Dispensing Facility (GDF) throughput - please see Appendix A, Figure A-5

(11) 4106723 = Unpaved Roadway estimated using Washington County roadway GIS files (see note 1)
See Appendix B, Figure B-3b

(12) 4106724 = Surface Mining & Quarrying: DOGAMI data downloaded from: http://www.oregongeology.org/mlrr/permitviewer.htm
Active and closed permit data included. see Appendix B, Figure B-6b

(13) AQMA spatial surrogate = (AQMA Boundary Total) / (County Total)

Appendix B, Table B-3. Clackamas County & AQMA nonpoint spatial surrogate values.

County Zoning File (1)	(1,2)	(1,2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(4)	(3)	(4)	(3)	(5)	(6)	(7)	(8)	(9)	(3)	(10)	(11)
	Total	AQMA	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*
General Class Description	Acres	Acres	4100501	4100502	4100503	4100504	4100505	4100506	4100507	4100508	4100509	4100510	4100511	4100512	4100513	4100514	4100515	4100518	4100519	4100520	4100521
Commercial	2,458.6	1,371.2		X						X											
Farm or Forest	1,073,738.8	28,130.4	X				X														
Industrial	8,123.0	5,887.3				X				X											
Mixed-Use Residential	3,911.5	3,822.6						X	X												
Multi-Family Residential	3,124.6	2,369.1							X												
Parks and Open Space	2,248.3	1,517.6					X						X								
Public Facilities	1,175.3	1,169.3																			
Residential	67,917.3	20,569.2						X	X												
Single Family	35,513.5	30,535.1						X	X												
Building Footprint	9,311.5	6,837.6			X						X										
Other Spatial Surrogate Data																					
Paved Road	3,675.9	1,581.2			X							X									
Oil and Gas Permits	3	1															X				
Railway Miles	69.0	44.6													X						
AVGas storage	1.0	0.018												X							
Recreational Marine	221,615	138,086														X					
GDF Throughput (1000 gal)	163,820	120,162																X			
Population	385,502	277,227																	X		
Unpaved Roadway (miles)	1,269	0.13																		X	
Mining/Quarrying (permits)	132	23																			X
			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Clackamas County Total			1,073,738.8	2,458.6	12,987.4	8,123.0	1,075,987.1	107,342.3	110,467.0	10,581.6	9,311.5	3,675.9	2,248.3	1.0	69.0	221,615	3	163,820	385,502	1,269	132
AQMA Boundary Total			28,130.4	1,371.2	8,418.9	5,887.3	29,648.0	54,926.9	57,296.0	7,258.5	6,837.6	1,581.2	1,517.6	0.0177	44.6	138,086	1	120,162	277,227	0.13	23
AQMA Spatial Surrogate (12)			0.0262	0.5577	0.6482	0.7248	0.0276	0.5117	0.5187	0.6860	0.7343	0.4302	0.6750	0.0177	0.6469	0.6231	0.3333	0.7335	0.7191	0.0001	0.1742

Notes for Table B-3 found on page B-13

Notes for Table B-3

(1) Clackamas County Zoning shapefile from DEQ internal files.
Appendix B, Figure B-1 illustrates zoning in Clackamas County

(2) The GIS projects used to calculate acreages, and other units via clipping from DEQ internal files.

(3) IDs are as follows: An "X" indicates value used to estimate AQMA spatial surrogate factors

Spatial Surrogate ID descriptions

4100501 = EFU: Exclusive farm and forest use

4100502 = Commercially Zoned: Commercial and Commercial Lawn and Garden

4100503 = Construction & Mining: Aggregate removal, building footprint and street mix:
Appendix B, Figures B-9 and B-3 illustrate building footprint and roadway.

4100504 = industrially zoned

4100505 = Recreational: Farm or Forest + Parks and Open Space

4100506 = Residential Lawn & Garden

4100507 = Residential

4100509 = Building Footprint, see Appendix B, Figure B-9

4100510 = Streets

4100511 = Publicly Owned

4100519 = Population (from 2010 US census by census block)

(4) 4100508 = Commercial and Industrial zoned = Commercial Roofing Asphalt production/application

(5) 4100512: Aircraft fuel storage based on 2011 NEI data of aircraft emissions of
ethylbenzene by airport location and aircraft type. Appendix B, Table B-5 details aircraft fuel storage spatial surrogate estimates.
Appendix B, Figure B-4 shows the location of airports / heliports within the tri-county area.

(6) 4100513 = Active Rail Line. Appendix B, Figure B-5 shows active rail line (note: the rail line shapefile used is from the EPA 2014 NEI)

(7) 4100514 = Recreational Marine= Boating Use Days. Boating use days taken from Oregon State Marine Board 2010 survey data.
GIS clipping used to determine use days for launches/ramps located with the AQMA. Appendix B, Figure B-7 shows location of launch/ramp sites. ArcGIS desktop application used to clip data located in DEQ internal files.

(8) 4100515 = On-shore oil and gas production: Locations from DOGAMI website, see Appendix B, Figure B-6a

(9) 4100518: DEQ permitting data used to calculate Gasoline Dispensing Facility (GDF) throughput - please see Appendix A, Figure A-5

(10) 4100520 = Unpaved Roadway estimated using Metro RLIS roadway GIS files (roadway type = 9000 or 2000)
Please see Appendix B, Figure B-3b

(11) 410521 = Surface Mining & Quarrying: DOGAMI data downloaded from http://www.oregongeology.org/mlrr/permitviewer.htm
Active and closed permit data included. see Appendix B, Figure B-6b

(12) AQMA spatial surrogate = (AQMA Boundary Total) / (County Total)

Appendix B, Table B-4. Jackson County & AQMA nonpoint spatial surrogates (note – this table is continued on page B-14).

County Zoning File (1)	(1)	(1)	(1)	(2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(4)	(3)	(3)	(3)	(5)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			Total	AQMA	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*
ZON_GEN	COMP_PLAN	ZON_DESC	Acres	Acres	4102901	4102902	4102903	4102904	4102905	4102906	4102907	4102908	4102909	4102910	4102911	4102912	4102913	4102914	4102915	4102916	4102917	4102920	4102921	4102922	4102923	4102924
aggregate	Aggregate Removal Land	Aggregate Removal (AR)	6,371.9	2,340.1			X																			
commercial	Commercial Land	Applegate Rural Service Commercial	16.7			X					X		X													
commercial	Commercial Land	General Commercial (GC)	586.7	585.4		X					X		X													
commercial	Commercial Land	Interchange Commercial (IC)	112.2	38.5		X					X		X													
commercial	Commercial Land	Neighborhood Commercial (NC)	1.4	1.4		X					X		X													
commercial	Commercial Land	Ruch Rural Service Commercial	41.4			X					X		X													
commercial	Commercial Land	Rural Service Commercial (RS)	151.3	34.3		X					X		X													
commercial	Commercial Land	Sams Valley Rural Service Commercial	24.8			X					X		X													
efu and ar	CITY	CITY OF CENTRAL POINT	53.1	53.1		X		X			X		X													
farm	Aggregate Removal Land	Exclusive Farm Use (EFU)	20.1	20.1	X																					
farm	Agricultural Land	Exclusive Farm Use (EFU)	249,802.1	75,073.2	X					X																
farm	Rural Residential Land	Rural Residential - 5 (RR-5)	7.7		X					X																
farm, cmrcl, industr	CITY OF MEDFORD	CITY	152.2	152.2		X					X		X													
forest	Forestry / Open Space Land	Forest Resource (FR)	1,244,847.4	4,795.5					X																	
forest	Forestry / Open Space Land	Open Space Reserve (OSR)	37,983.7	12,115.0					X																	
forest	Forestry / Open Space Land	Woodland Resource (WR)	171,302.4	11,432.0					X																	
forest	Industrial Land	Open Space Reserve (OSR)	85.1	85.1					X																	
industrial	Industrial Land	General Industrial (GI)	3,291.4	3,291.4				X					X													
industrial	Industrial Land	Light Industrial (LI)	772.7	769.6				X					X													
industrial	Industrial Land	Rural Light Industrial (RLI)	22.7	10.3				X					X													
limited	Limited Use Land	Limited Use (LU)	239.9	219.9																						
rural	Commercial Land	Rural Residential - 5 (RR-5)	1.3	1.3		X					X		X													
rural	Industrial Land	Rural Residential - 5 (RR-5)	1.5	1.5																						
rural	Rural Residential Land	Applegate Rural Residential - 5	141.0							X		X												X		
rural	Rural Residential Land	Rural Residential - 00 (RR-00)	5,418.3	2,350.7						X		X												X		
rural	Rural Residential Land	Rural Residential - 10 (RR-10)	891.2	568.4						X		X												X		
rural	Rural Residential Land	Rural Residential - 5 (RR-5)	29,716.0	14,069.8						X		X												X		
suburban	CITY OF MEDFORD	CITY	4.8	4.8		X		X			X	X	X											X		
suburban	Limited Use Land	Rural Residential - 2.5 (RR-2.5)	7.6									X												X		
suburban	Rural Residential Land	Rural Residential - 2.5 (RR-2.5)	6,470.7	2,909.5								X												X		
suburban	Urban Residential Land	Urban Residential (UR-1)	2,527.9	1,481.2								X												X		
urban	Urban Residential Land	Urban Residential - 10 (UR-10)	134.3	134.3								X														
urban	Urban Residential Land	Urban Residential - 30 (UR-30)	30.2	30.2								X														
urban	Urban Residential Land	Urban Residential - 8 (UR-8)	25.0	25.0								X														
White City Urban Resident	Urban Residential Land	White City Urban Residential - 10	97.6	97.6								X														
White City Urban Resident	Urban Residential Land	White City Urban Residential - 30	87.0	87.0								X														
White City Urban Resident	Urban Residential Land	White City Urban Residential - 4	150.0	150.0								X														
White City Urban Resident	Urban Residential Land	White City Urban Residential - 6	410.3	410.3								X														
White City Urban Resident	Urban Residential Land	White City Urban Residential - 8	296.6	296.6								X														

Appendix B, Table B-4. Jackson County & AQMA nonpoint spatial surrogates (continued).

City Zoning File (1)	(1)	(1)	(1)	(2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(4)	(3)	(3)	(3)	(5)	(5)	(6)	(7)	(8)	(9)			
					SSID	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*
GENZONE	ZONE	DETZONE	Total Acres	AQMA Acres	4102901	4102902	4102903	4102904	4102905	4102906	4102907	4102908	4102909	4102910	4102911	4102912	4102913	4102914	4102915	4102916	4102917	4102920	4102921	4102922	4102923	4102924
NULL	AD-MU	unknown - assume ind-comm-inst-res	232.3	232.3		X					X		X													
NULL	I5	assume industrial	102.6	102.6				X					X													
NULL	I5OUT	assume industrial	34.0	34.0				X					X													
NULL	LMR	Low Mix Residential (TOD)	146.5	146.5						X		X												X		
NULL	MMR	Medium Mix Residential (TOD)	66.7	66.7								X												X		
NULL	ODOT	assume roadway	11.2	11.2																						
Agriculture	--	--	568.8	489.1	X					X																
Business Park	--	--	28.3	28.3		X					X		X													
Civic	--	--	90.1	90.1																						
Commercial	--	--	3,526.1	3,382.8		X					X		X													
Industrial	--	--	3,232.8	3,093.4				X					X													
Light Industrial	--	--	1.5	1.5				X					X													
MF Residential	--	--	1,180.4	1,054.9								X												X		
Mixed Use	--	--	0.2	0.2																						
Not In City	--	--	0.2	0.2																						
Open Space	--	--	727.5	507.1						X																
Other	--	--	550.7	550.7																						
Park	--	--	33.6	33.6																						
Public	--	--	155.2	85.2																						
Residential	--	--	3,366.4	3,358.8								X												X		
Residential Farm	--	--	142.3	142.3								X												X		
Rural	--	--	37.2	37.2						X																
SF Residential	--	--	15,438.1	14,323.2								X												X		

Other Spatial Surrogate Data (1)	(1)	(2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(4)	(3)	(3)	(3)	(5)	(5)	(6)	(7)	(8)	(9)			
			SSID	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*	*SSID*
	Total	AQMA	4102901	4102902	4102903	4102904	4102905	4102906	4102907	4102908	4102909	4102910	4102911	4102912	4102913	4102914	4102915	4102916	4102917	4102920	4102921	4102922	4102923	4102924
Population (4)	181,269	150,047										X												
Streets, miles (1)	6,910.5	1,121.6			X									X	X									
Building Footprint, Acres (1)	6,767.8	5,323.0			X						X		X											
Jet Naphtha storage	1	0														X								
AVGas storage	1	0.940															X							
On-Shore Oil and Gas Production	1	1																X						
Recreational Marine	294,035	43,235																	X					
Railway Miles	133.6	93.4																		X				
GDF Throughput (1000 gal)	76,941	68,029																			X			
Rural and Suburban Residential	65,518	40,477																						
Unpaved Roadway (miles)	11,621.5	1,591.4																					X	
Mining/Quarrying (permits)	210	78																						X

	4102901	4102902	4102903	4102904	4102905	4102906	4102907	4102908	4102909	4102910	4102911	4102912	4102913	4102914	4102915	4102916	4102917	4102920	4102921	4102922	4102923	4102924
Jackson County Total	250,398.8	4,932.8	20,050.2	7,515.7	1,454,218.6	287,456.4	4,932.8	66,749.3	12,448.4	181,269.0	6,767.8	6,910.5	155.2	1.0	1.0	1.0	294,035	133.6	76,941	65,518	11,622	210
AQMA Total	75,582.4	4,514.4	8,784.8	7,307.7	28,427.6	93,242.1	4,514.4	46,222.5	11,822.1	150,047.0	5,323.0	1,121.6	85.2	1.0	0.94	1.0	43,235	93.4	68,029	40,477	1,591	78
AQMA % of County Total (13)	0.3018	0.9152	0.4381	0.9723	0.0195	0.3244	0.9152	0.6925	0.9497	0.8278	0.7865	0.1623	0.5490	1	0.9404	1	0.1470	0.6992	0.8842	0.6178	0.1369	0.3714

Notes for Table B-4 found on page B-16:

Notes for Table B-4

(1) Jackson County Zoning Shapefiles downloaded from http://gis.jacksoncounty.org/Portal/gis-data.aspx
Appendix B, Figure B-10 illustrates zoning in Jackson County

(2) The GIS project used to calculate acreages & miles in DEQ internal files.

(3) An "X" indicates value used to estimate AQMA spatial surrogate factors

Spatial Surrogate ID descriptions

4102901 = Agriculturally Zoned

4102902 = Commercially Zoned

4102903 = Construction & Mining: Aggregate removal, building footprint and street mix: Appendix B Figures B-11 and B-12 illustrate building footprint and roadway.

4102904 = Industrially Zoned

4102905 = Forest Land

4102906 = Recreational Vehicles & Equipment: Farm/Rural and Low-Density Residential Zoning Mix

4102907 = Commercial Lawn & Garden

4102908 = Residential Lawn & Garden

4102909 = Commercial and Industrial zoned = Commercial Roofing Asphalt production/application & specific fugitive dust

4102911 = Architecture: See Appendix B, Figure B-11 for Jackson County building footprint illustration

4102912 = Streets: See Appendix B, Figure B-12 for Jackson County roadway illustration

(4) 4102910 = Population, DEQ GIS files, 2010 US Census. Population based on US Census blockgroup data. GIS project used to calculate population is same as in note (2).
Appendix B, Figure B-13 illustrates Jackson County census blockgroups.

(5) 4102914 & 4102915: Aircraft fuel storage based on 2011 NEI data of aircraft emissions of ethylbenzene by airport location and aircraft type. Appendix B, Table B-5 details aircraft fuel storage spatial surrogate estimates. Appendix B, Figure B-14 shows the location of airports / heliports within the tri-county area.

(6) 4102916= On-shore oil and gas production: Locations from DOGAMI website, see Appendix B, Figure B-15a

(7) 4102917 = Recreational Marine= Boating Use Days. Boating use days taken from Oregon State Marine Board 2010 survey data. GIS clipping used to determine use days for launches/ramps located with the AQMA. Appendix B, Figure B-18 shows location of launch/ramp sites.

(8) 4102920 = Active Rail Line. Appendix B, Figure B-24 shows Jackson Co. active rail line (note: the rail line shapefile used is from the EPA 2014 NEI)

(9) 4102921: DEQ permitting data used to calculate Gasoline Dispensing Facility (GDF) throughput - please see Appendix A, Figure A-6

(10) 4102922 = Rural and Suburban Residential - (residential open burning, fire pits, chimneys)

(11) 4102923 = Unpaved Roadway estimated using …Reference X (email from Matthew Bell, Kittelson & Associates, Inc.)

(12) 4102924 = Surface Mining & Quarrying: DOGAMI data downloaded from http://www.oregongeology.org/mlrr/permitviewer.htm Active and closed permit data included. Appendix B, Figure B-15b

(13) AQMA spatial surrogate = (TSD: AQMA Boundary Total) / (County Total)

Appendix B, Table B-5. Ethyl benzene emissions by airport (facility) and process.

county_name	facility_site_name	eis_facility_site_id	LAT_DD	LONG_DD	Air Taxi	Aircraft Auxiliary Power Units	Commercial Aircraft	General Aviation	Military Aircraft	Jet Naptha	Aviation Gasoline	Within AQMA
Clackamas	AEROACRES	12204011	45.3165	-122.6054				0.3121		0	0.0043	Yes
Clackamas	AUBERGE DES FLEURS	11919711	45.4498	-122.2543				0.3492		0	0.0048	No
Clackamas	BEAVER OAKS	12218111	45.3040	-122.3609				0.4235		0	0.0058	No
Clackamas	BONNEY ACRES	11715811	45.3243	-122.4720				0.2749		0	0.0038	No
Clackamas	BRUCES	11508211	45.4218	-122.6204				0.2749		0	0.0038	Yes
Clackamas	COMPTON	11150411	45.2223	-122.7268				0.3121		0	0.0043	No
Clackamas	COUNTRY SQUIRE AIRPARK	12083711	45.3544	-122.2681				2.3840		0	0.0328	No
Clackamas	DIETZ AIRPARK	12202111	45.2557	-122.6509				1.1851		0	0.0163	No
Clackamas	EAGLE NEST RANCH	12218011	45.3548	-122.3459				0.6464		0	0.0089	No
Clackamas	FAIRWAYS	12203311	45.3207	-122.5512				12.4130		0	0.1709	No
Clackamas	FLYING K BAR J RANCH	12201711	45.4426	-122.3206				0.2749		0	0.0038	No
Clackamas	HAPPY VALLEY	12183711	45.4482	-122.4995				0.2894		0	0.0040	Yes
Clackamas	HELITRADEWINDS	11742511	45.1412	-122.6215				0.0914		0	0.0013	No
Clackamas	KRUEGER	12218711	45.4421	-122.3231				0.2935		0	0.0040	No
Clackamas	LENHARDT AIRPARK	11731411	45.1804	-122.7434				7.1518		0	0.0985	No
Clackamas	MC KINNON AIRPARK	12203911	45.4307	-122.2420				0.3307		0	0.0046	No
Clackamas	MERIDIAN PARK HOSPITAL	11238311	45.3779	-122.7404				0.0914		0	0.0013	Yes
Clackamas	NIELSEN	11955011	45.3443	-122.5179				0.3307		0	0.0046	No
Clackamas	Portland-Mulino	9238211	45.2163	-122.5901				25.5565		0	0.3518	No
Clackamas	PYNN	11671111	45.3365	-122.6648				0.0914		0	0.0013	Yes
Clackamas	SANDY RIVER	10945811	45.4018	-122.2287				13.7076		0	0.1887	No
Clackamas	SCHMIDT	11743011	45.4529	-122.3211				0.3121		0	0.0043	No
Clackamas	SKYDIVE OREGON	12183911	45.1462	-122.6176				0.4341		0	0.0060	No
Clackamas	SKYHILL	11906311	45.2879	-122.4561				0.2749		0	0.0038	No
Clackamas	VALLEY VIEW	11759311	45.3082	-122.3187				3.5342		0	0.0487	No
Clackamas	WARNERS	11497311	45.3250	-122.4242				0.3121		0	0.0043	No
Clackamas	WILEYS	11943511	45.4310	-122.6495				0.1345		0	0.0019	Yes
Clackamas	WILLAMETTE FALLS COMMUNITY HOSPITAL	11906511	45.3576	-122.5859				0.0914		0	0.0013	Yes
Clackamas	WORKMAN AIRPARK	12202211	45.2076	-122.6693				0.7579		0	0.0104	No

Continued on page B-17

Table B-5 continued

county_name	facility_site_name	eis_facility_site_id	LAT_DD	LONG_DD	Air Taxi	Aircraft Auxiliary Power Units	Commercial Aircraft	General Aviation	Military Aircraft	Jet Naptha	Aviation Gasoline	Within AQMA
Jackson	Ashland Muni-Sumner Par	9226211	42.1903	-122.6606	1.4911			29.1170	0.0623	0.0056	0.3220	Yes
Jackson	BEAGLE SKY RANCH	12222411	42.5390	-122.9039				0.6106		0	0.0064	No
Jackson	BURRILL	12222511	42.4387	-122.8637				0.4806		0	0.0051	Yes
Jackson	CROMAN	12043711	42.4292	-122.8756				0.0914		0	0.0010	Yes
Jackson	EAST OREGON CATTLE CO	11536511	42.5035	-122.8548				0.2577		0	0.0027	No
Jackson	ERICKSON AIR-CRANE ADMIN OFFICES	12206211	42.4300	-122.9049				0.0914		0	0.0010	Yes
Jackson	ERICKSON AIR-CRANE WHETSTONE	11072611	42.4300	-122.9049				0.0914		0	0.0010	Yes
Jackson	FIREFLY RANCH AIRFIELD	12203711	42.5112	-122.9242				0.3691		0	0.0039	No
Jackson	FLY BY NIGHT	12202911	42.2461	-123.0700				0.0028		0	0.0000	No
Jackson	LIGHT VALLEY TREE FARM	11196511	42.3593	-122.5111				0.0914		0	0.0010	No
Jackson	MUCKY FLAT	11272711	42.5979	-122.7125				0.2577		0	0.0027	No
Jackson	OAKRIDGE RANCH	16139111	42.4632	-122.7340				0.2763		0	0.0029	No
Jackson	PINEHURST STATE	11063611	42.1102	-122.3832				0.7003		0	0.0074	No
Jackson	PROSPECT STATE	11221611	42.7432	-122.4881	0.1988			1.2028		0	0.0147	No
Jackson	PROVIDENCE HOSPITAL	11536411	42.3387	-122.8623				0.0914		0	0.0010	Yes
Jackson	Rogue Valley Internatio	9226311	42.3796	-122.8802	27.2276	0.4230	10.2355	30.1947	0.7460	0.9944	0.6085	Yes
Jackson	ROGUE VALLEY MEDICAL CENTER	12222711	42.3179	-122.8306				0.0914		0	0.0010	No
Jackson	SHADY COVE AIRPARK	12204111	42.6082	-122.8262	0.0119			0.7473		0	0.0080	No
Jackson	SNIDER CREEK	12199811	42.5390	-122.9229				0.2948		0	0.0031	No
Jackson	SPRINGBROOK	11172511	42.5551	-123.2045				0.2577		0	0.0027	No
Jackson	SUTTON ON ROGUE	11536611	42.4848	-122.8662				0.2948		0	0.0031	No
Jackson	TIMBERLAND SHOP	11223011	42.2054	-122.6336				0.0914		0	0.0010	Yes

Table B-5 continued on page B-19

Table B-5 continued

county_name	facility_site_name	eis_facility_site_id	LAT_DD	LONG_DD	Air Taxi	Aircraft Auxiliary Power Units	Commercial Aircraft	General Aviation	Military Aircraft	Jet Naptha	Aviation Gasoline	Within AQMA
Multnomah	EMANUEL HOSPITAL	11715511	45.5432	-122.6701				0.0914		0	0.0003	Yes
Multnomah	HESSEL TRACTOR	11991511	45.5887	-122.6540				0.0914		0	0.0003	Yes
Multnomah	KATU	11933911	45.5271	-122.6440				0.0914		0	0.0003	Yes
Multnomah	LEHMAN FIELD	12216911	45.4857	-122.2340				0.0028		0	0.0000	No
Multnomah	MOUNT HOOD MEDICAL CENTER	11188211	45.5169	-122.4067				0.0914		0	0.0003	Yes
Multnomah	OREGON HEALTH SCIENCES UNIVERSITY EMERG	11573711	45.4957	-122.6873				0.0914		0	0.0003	Yes
Multnomah	PARRETT MOUNTAIN	11076511	45.4790	-122.2343				0.2473		0	0.0009	No
Multnomah	PGE SERVICE CENTER	11991311	45.4960	-122.6479				0.0914		0	0.0003	Yes
Multnomah	PORTLAND ADVENTIST MEDICAL CENTER	11573611	45.5133	-122.5569				0.0914		0	0.0003	Yes
Multnomah	Portland Downtown	9250711	45.5253	-122.6709	1.7853			2.6971	0.1245	0.0003	0.0158	Yes
Multnomah	Portland Intl	9246511	45.5916	-122.6142	166.0988	6.4038	420.7232	30.0659	4.4683	0.9973	0.7119	Yes
Multnomah	Portland-Troutdale	9246411	45.5494	-122.4013	1.3151		0.0433	75.0210	0.9826	0.0024	0.2683	Yes
Multnomah	PROVIDENCE MEDICAL CENTER	11883611	45.5280	-122.6121				0.0914		0	0.0003	Yes
Multnomah	ROSE GARDEN	12202811	45.5328	-122.6661				0.0914		0	0.0003	Yes
Multnomah	WORLD TRADE CENTER	11955311	45.5171	-122.6737				0.0914		0	0.0003	Yes

Table B-5 continued on page B-20

Table B-5 continued

county_name	facility_site_name	eis_facility_site_id	LAT_DD	LONG_DD	Air Taxi	Aircraft Auxiliary Power Units	Commercial Aircraft	General Aviation	Military Aircraft	Jet Naptha	Aviation Gasoline	Within AQMA
Washington	AMBER GLEN BUSINESS CENTER HP	11569911	45.5304	-122.8832				0.0914		0	0.0003	Yes
Washington	APPLE VALLEY	12217811	45.6784	-123.1862				0.4946		0	0.0017	No
Washington	CHADWICK	12201211	45.6332	-123.1679				0.2902		0	0.0010	No
Washington	CHEHALEM MOUNTAIN	11905911	45.3554	-122.9462				0.0914		0	0.0003	Yes
Washington	FISHBACK	11573811	45.6039	-123.0786				0.0914		0	0.0003	Yes
Washington	FLYING K RANCH	12199211	45.4345	-122.8800				0.3460		0	0.0012	Yes
Washington	GILBERT	12206411	45.6489	-123.0394				0.2902		0	0.0010	No
Washington	HARVEYS ACRES	12201311	45.4415	-122.8929				0.2902		0	0.0010	Yes
Washington	LINCOLN TOWER	12201811	45.4451	-122.7737				0.0914		0	0.0003	Yes
Washington	MEYER RIVERSIDE AIRPARK	12204311	45.3998	-122.8290				0.3460		0	0.0012	Yes
Washington	NORTH PLAINS	11906111	45.6040	-123.0248				0.5318		0	0.0019	Yes
Washington	OLINGER AIRPARK	12221611	45.5598	-123.0196				0.5318		0	0.0019	Yes
Washington	Portland-Hillsboro	9238011	45.5404	-122.9498	6.2010	0.0002	0.0216	243.8267	0.5131	1.0000	0.8819	Yes
Washington	RIEBEN	12188411	45.6103	-123.0800				0.2902		0	0.0010	Yes
Washington	SKYPORT	11931811	45.5826	-123.0529				2.3469		0	0.0083	Yes
Washington	ST VINCENT HOSPITAL	11996611	45.5101	-122.7734				0.0914		0	0.0003	Yes
Washington	STARKS TWIN OAKS AIRPARK	11731111	45.4285	-122.9422				26.4557		0	0.0933	Yes
Washington	SUNSET AIR STRIP	11906011	45.5915	-123.0096				0.5503		0	0.0019	Yes
Washington	TEUFEL	16139711	45.5308	-123.0856				0.0914		0	0.0003	Yes
Washington	TEUFELS	16139811	45.5314	-123.0845				0.0914		0	0.0003	Yes
Washington	TUALITY HOSPITAL	12205411	45.5279	-122.9798				0.0914		0	0.0003	Yes

Notes for Table B-5:

Source: EPA NEI

Appendix B, Table B-6. Biogenic spatial surrogates, estimated using land cover raster cell counts.

(1) VALUE	(1) LAND_COVER	(1), (2) -- Jackson County: Medford AQMA -- Cell COUNT County	(1), (2) Cell COUNT AQMA	(3) Spatial Surrogate AQMA / County	(1), (2) -- Tri-County Area: PDX AQMA -- Cell COUNT County	(1), (2) Cell COUNT AQMA	(3) Spatial Surrogate AQMA / County
41	Deciduous Forest	24,853	510		83,197	28,276	
42	Evergreen Forest	4,451,319	46,609		4,191,712	139,489	
43	Mixed Forest	151,547	10,790		447,363	104,107	
52	Shrub/Scrub	2,092,835	148,543		938,694	28,855	
71	Herbaceuous	403,522	68,547		307,094	33,134	
81	Hay/Pasture	352,011	186,863		676,865	240,109	
82	Cultivated Crops	125,109	69,057		646,387	299,579	
90	Woody Wetlands	29,020	8,075		100,339	45,231	
95	Emergent Herbaceuous Wetlands	11,980	2,191		31,165	15,687	
		-------	-------		-------	-------	
	Vegetation Land Cover	7,642,196	541,185	7.08%	7,422,816	934,467	12.59%

Notes:

(1) The GIS project used to generate raster cell counts for landcover is located in DEQ internal files.

Source data: 2011 National Land Cover Database (NLCD) raster file from DEQ GIS Library.

(2) Please see Appendix B, Figures B-19 (PDX area) and B-20 (Medford) for landcover maps.

(3) Spatial Surrogate = Vegetation Land Cover (County total count / AQMA total count)

Appendix B, Table B-7. Additional spatial surrogate references and appendix figures of relevant maps.

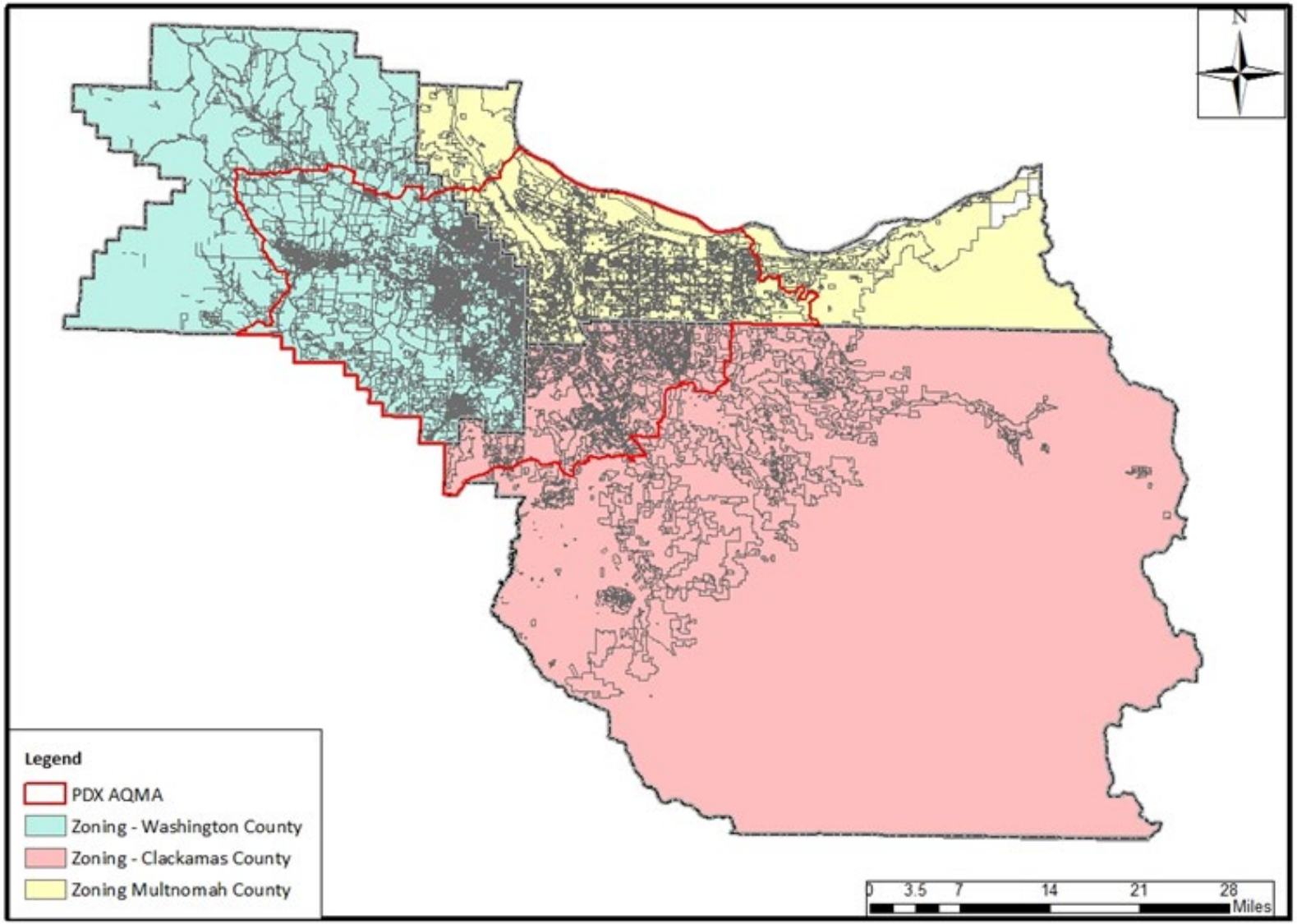
Source Type	Surrogate Source	Unit	Figures
Commercial Marine Vessels: In-Transit	EPA shapefile	Acres	B-22
Commercial Marine Vessels: In-Port	EPA shapefile	Acres	B-23
Line-Haul Locomotives	EPA shapefile	Length	B-5 & B-24
Rail Yards	EPA coordinates	Location	B-25
Airports	EPA coordinates	Location	B-24 & B-14
Rx, Ag burning and Wildfires	EPA coordinates	Location	B-16 & B-17
Residential Wood Combustion	Census Block Group	Location	B-26 & B-27

Permitted point: Location specific

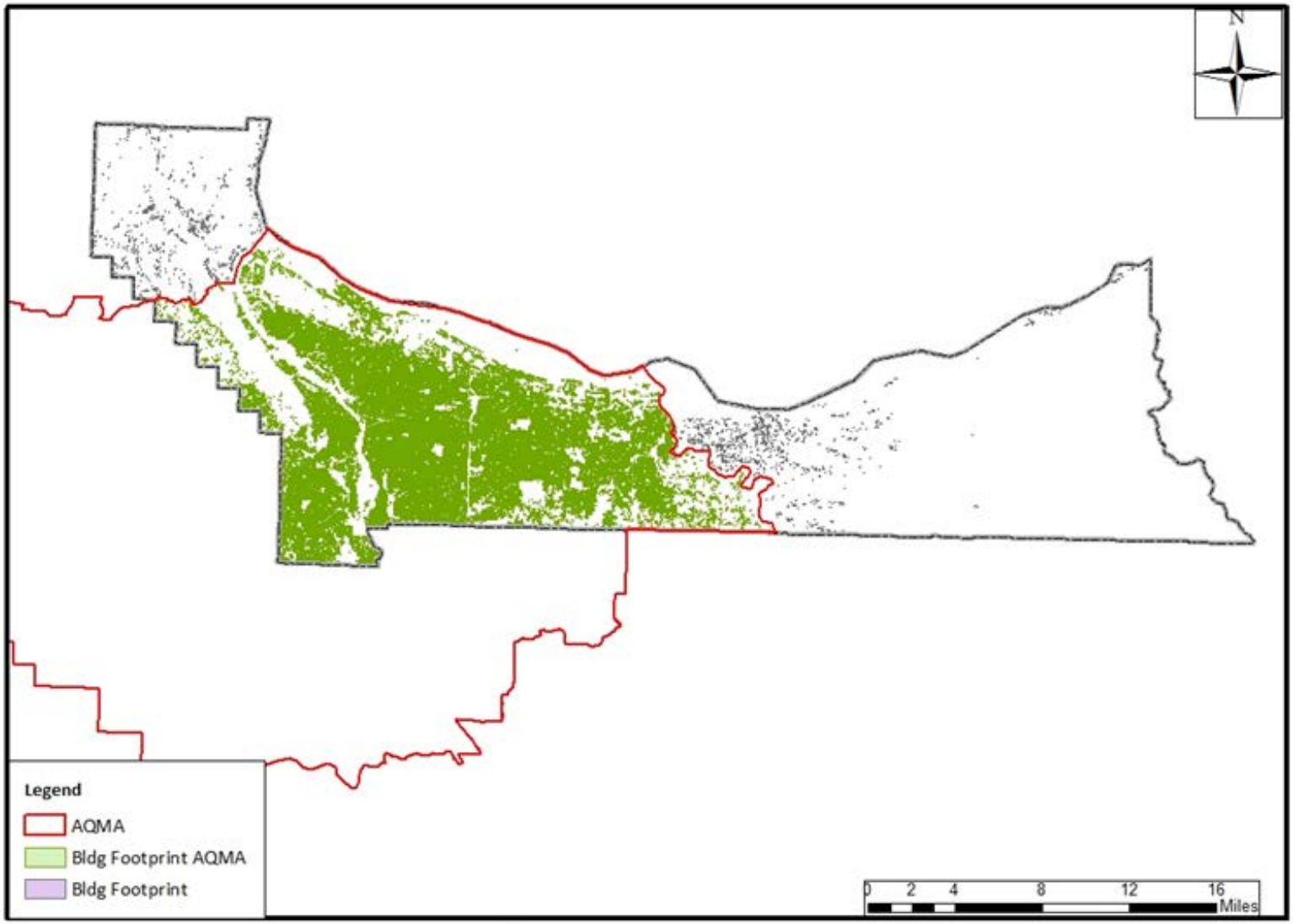
Point (2014 NEI v.2)	EPA coordinates	Location	Appendix A: A-1 through A-4
Gasoline Dispensing Facilities	DEQ coordinates	Location	Appendix A: A-5 and A-6
Perc Dry Cleaners	DEQ coordinates	Location	Appendix A: A-7 and A-8

Notes for Table B-7

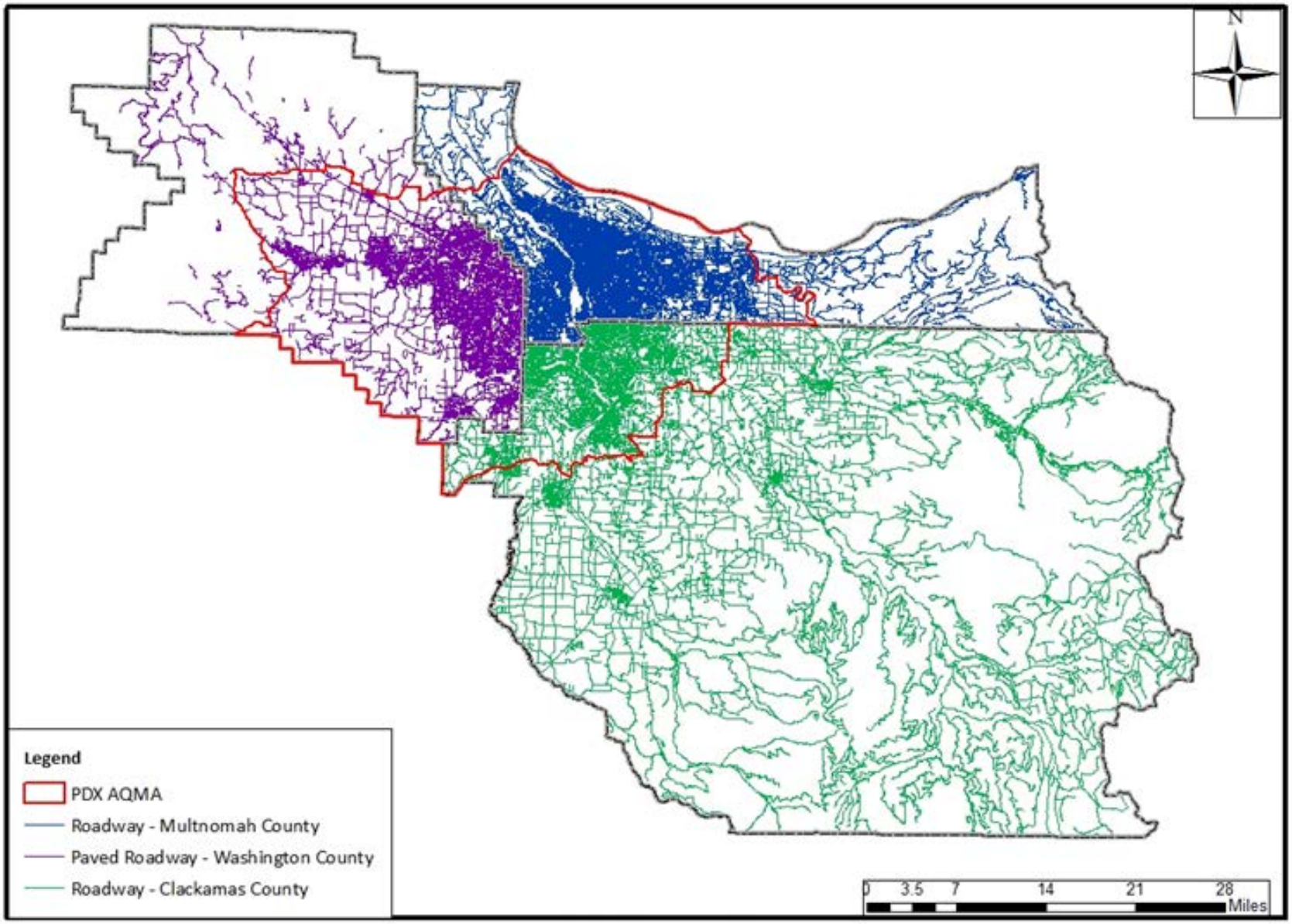
GIS projects for SS estimates in DEQ internal files.



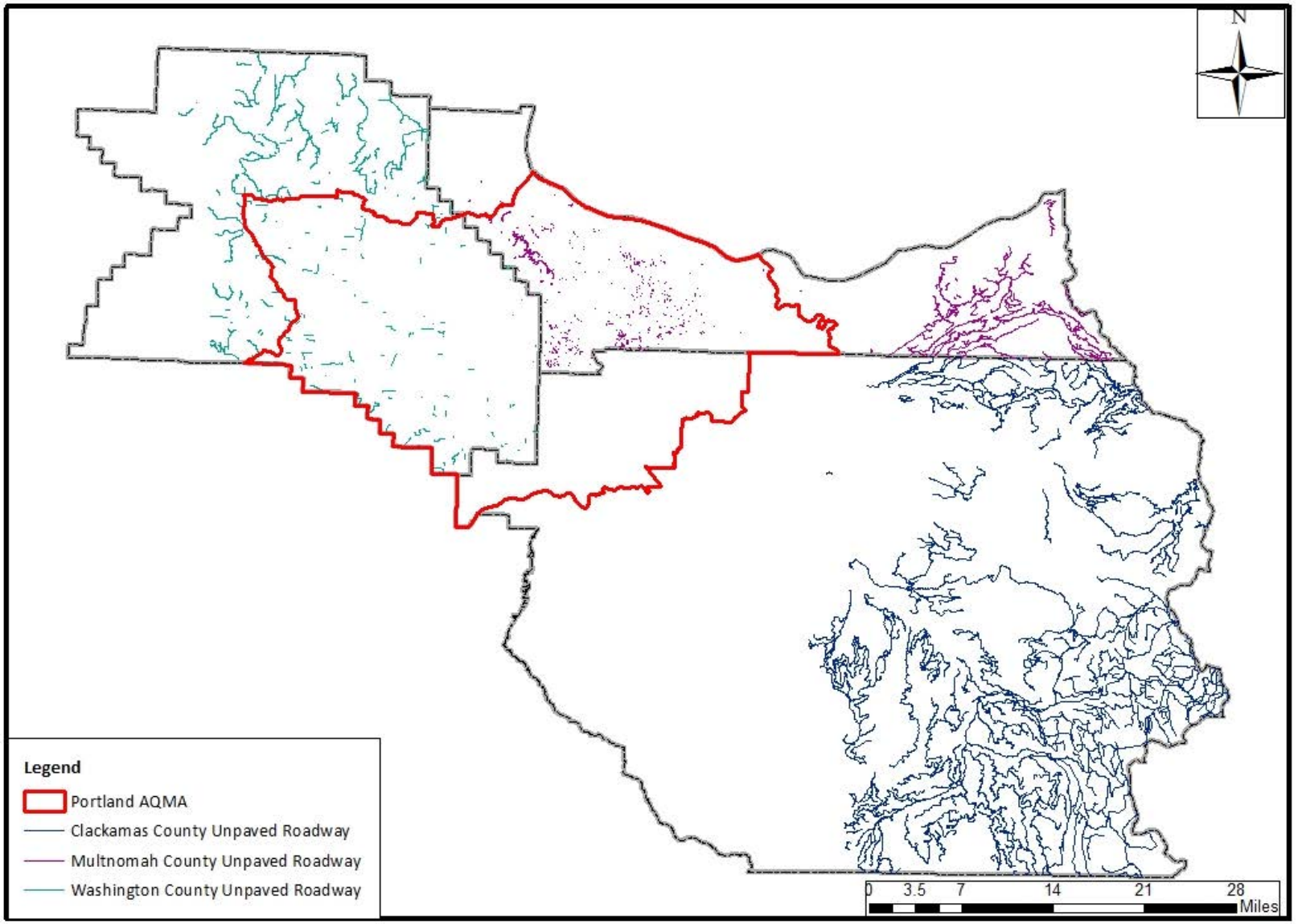
Appendix B, Figure B-1. Tri-county zoning



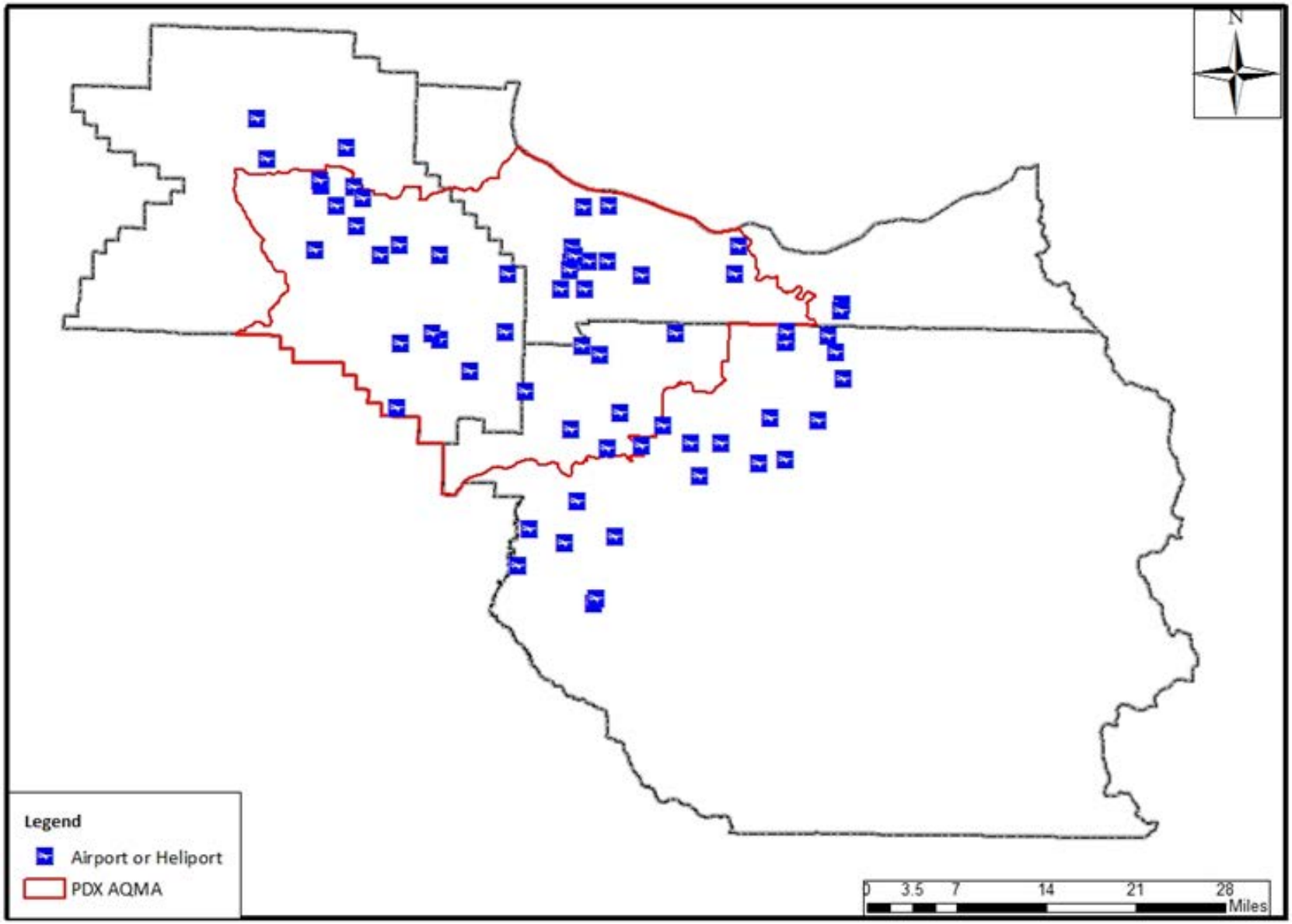
Appendix B, Figure B-2. Multnomah County building footprint



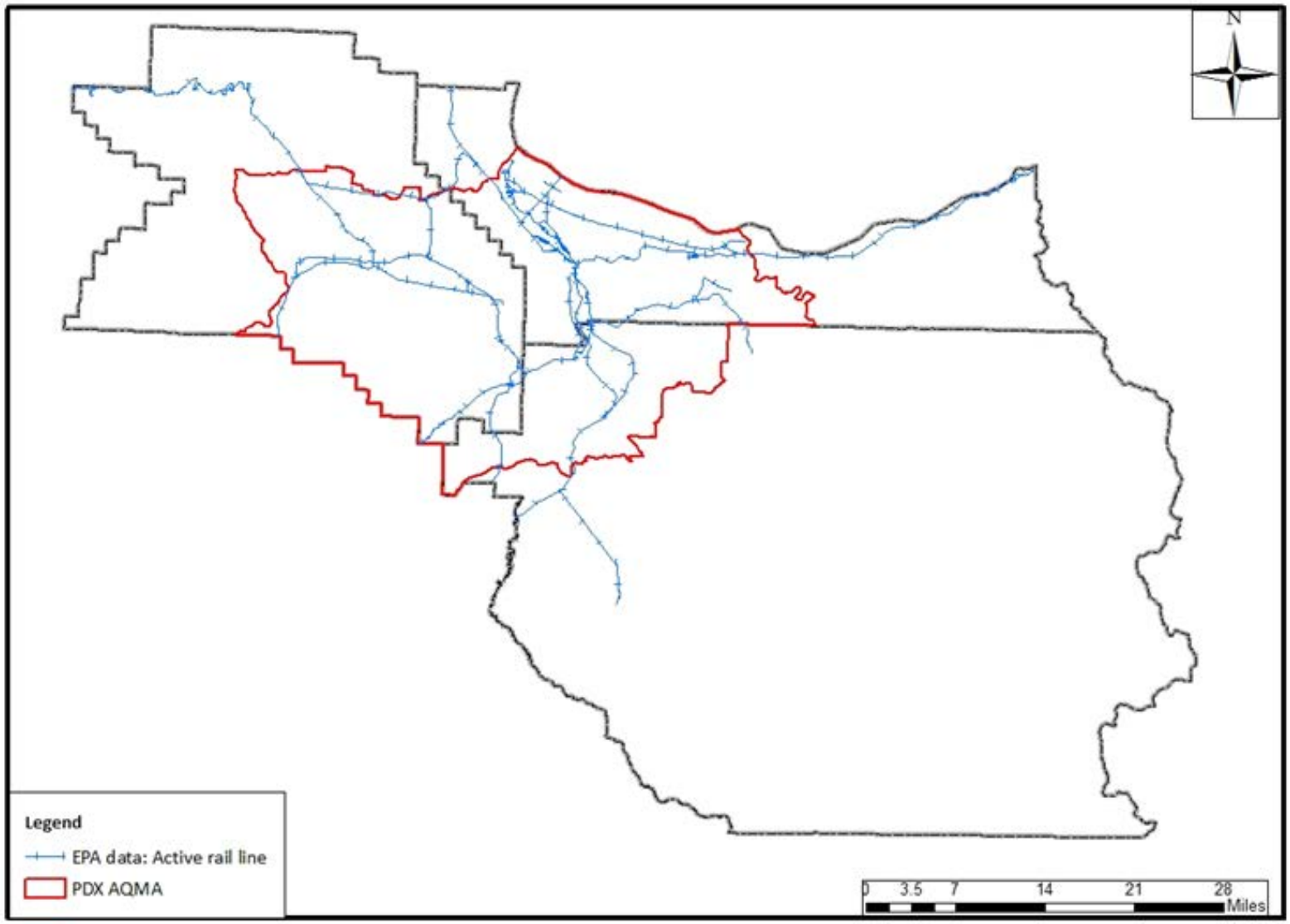
Appendix B, Figure B-3a. Tri-county roadway



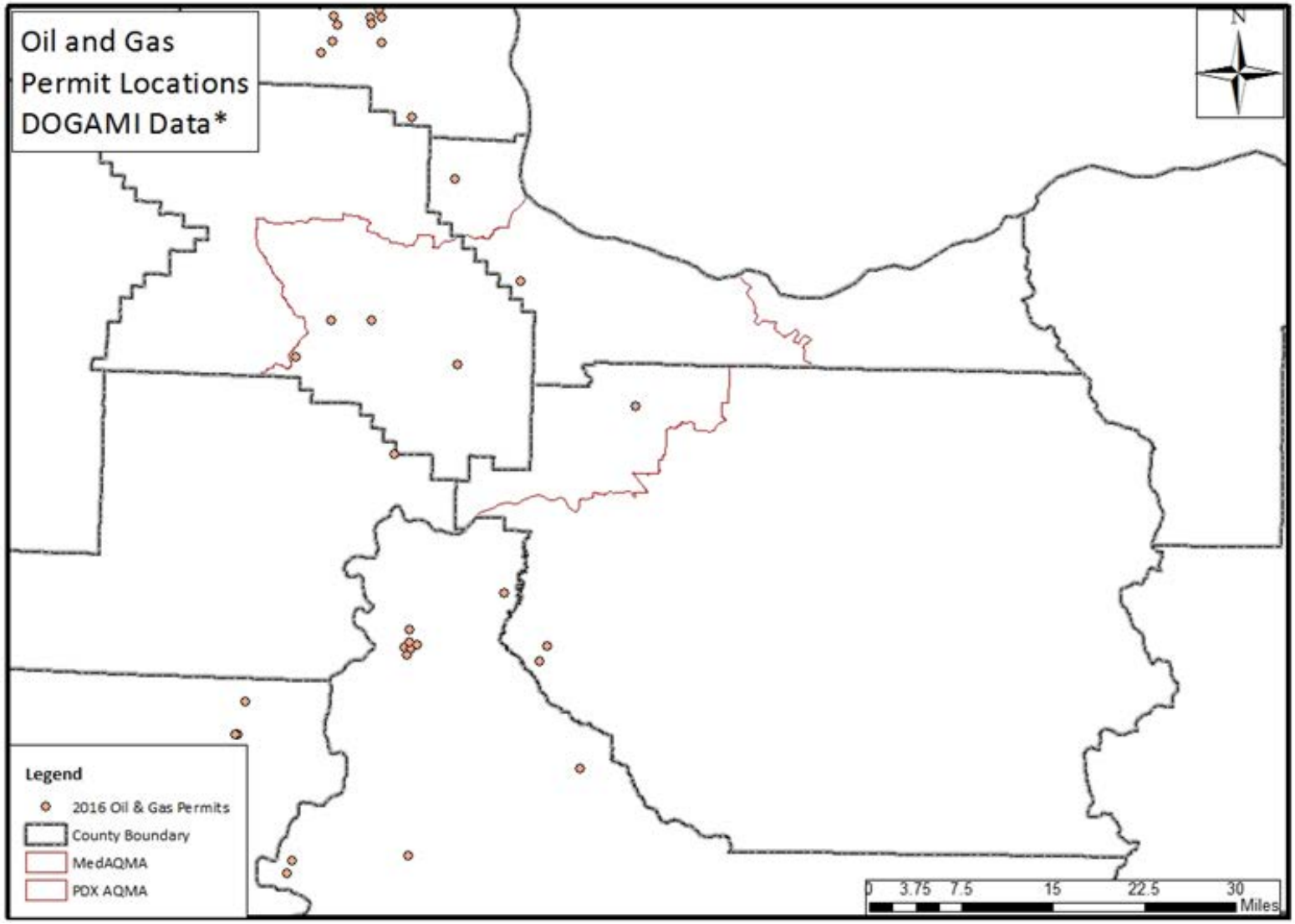
Appendix B, Figure B+3b. Tri-county unpaved roadway



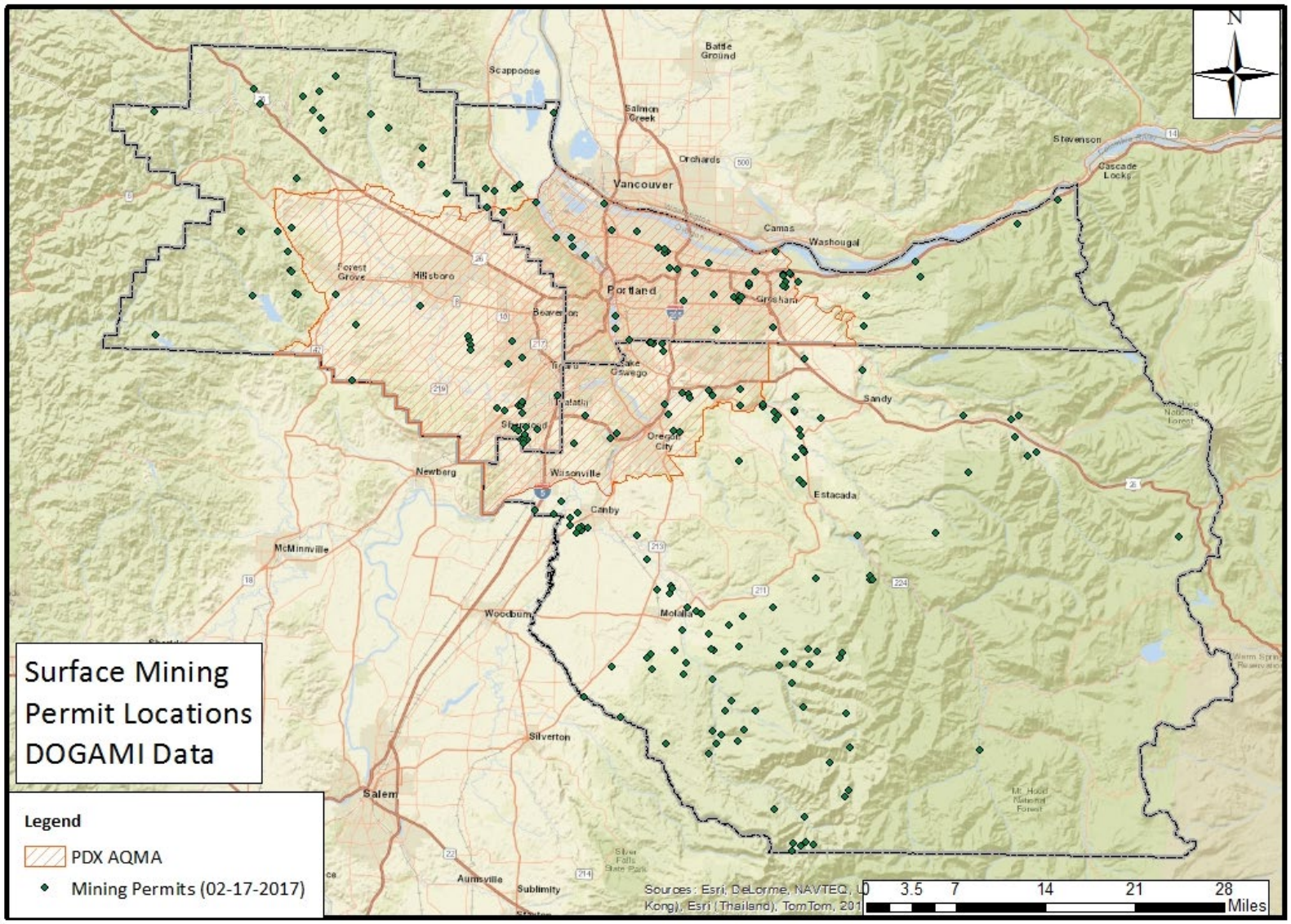
Appendix B, Figure B-4. Tri-County airport locations



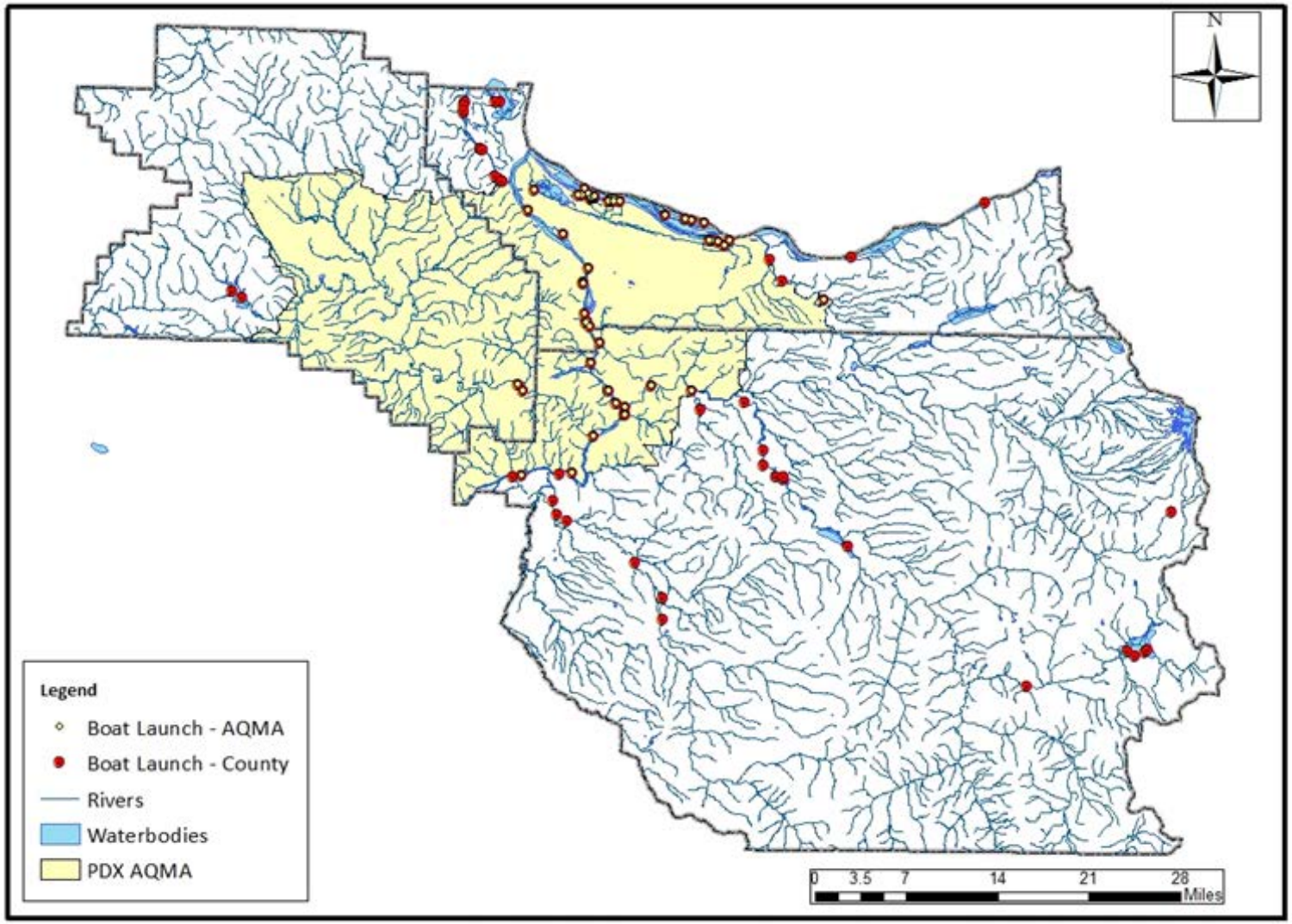
Appendix B, Figure B-5. Tri-County railway



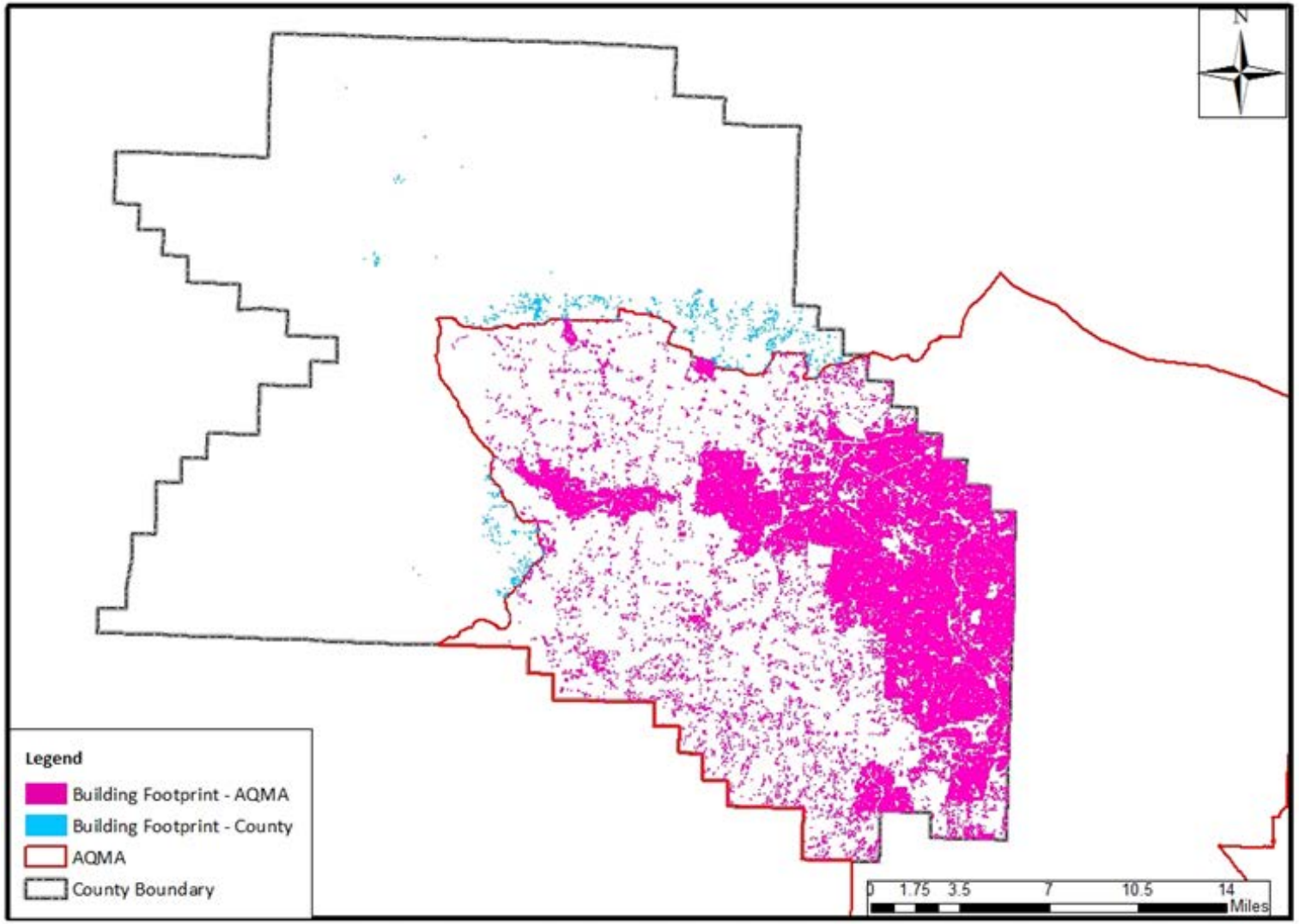
Appendix B, Figure B-6a. DOGAMI oil and gas permit locations, northern Willamette Valley



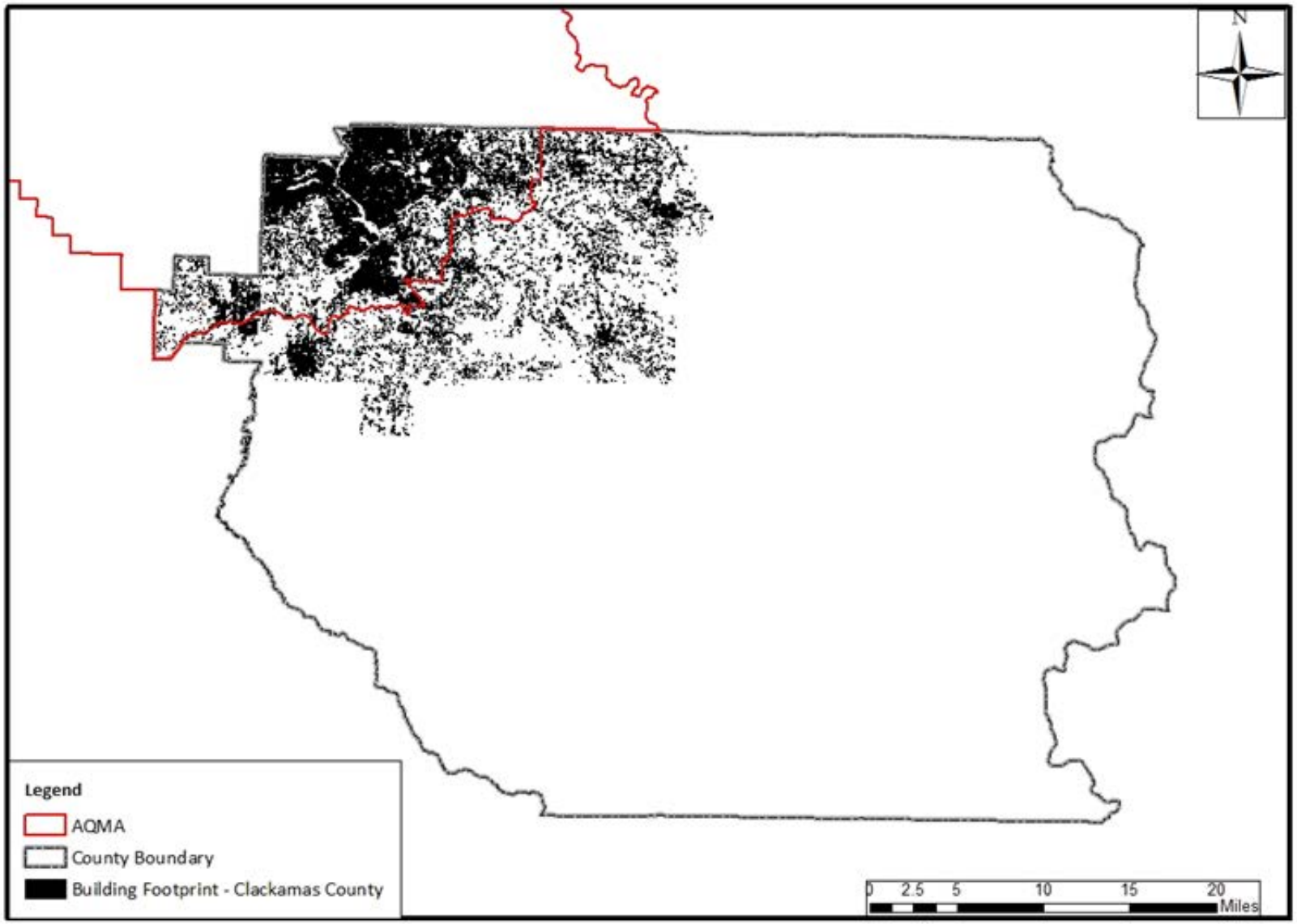
Appendix B, Figure B-6b. DOGAMI surface mining locations, northern Willamette Valley



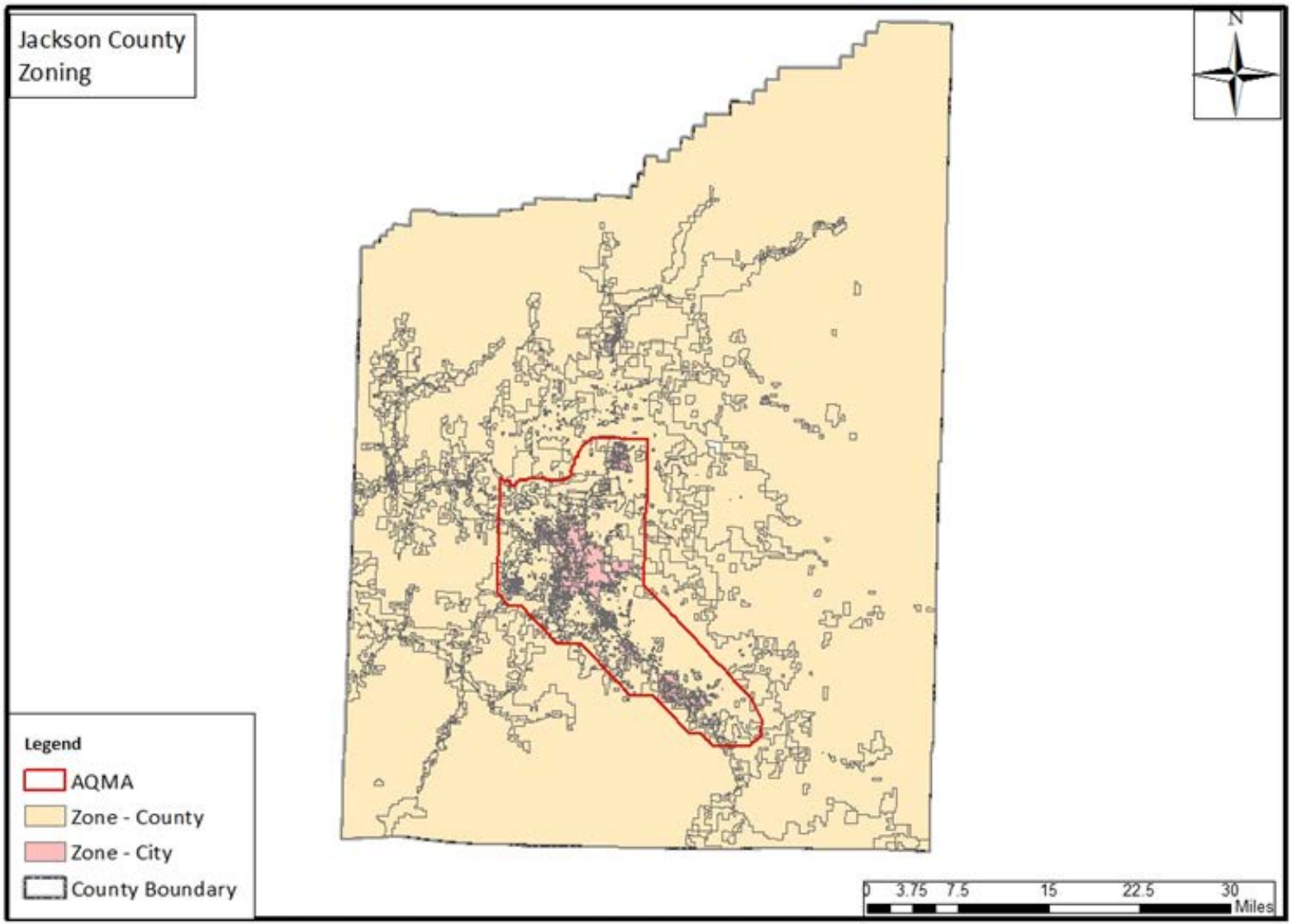
Appendix B, Figure B-7. Tri-County boat launch locations



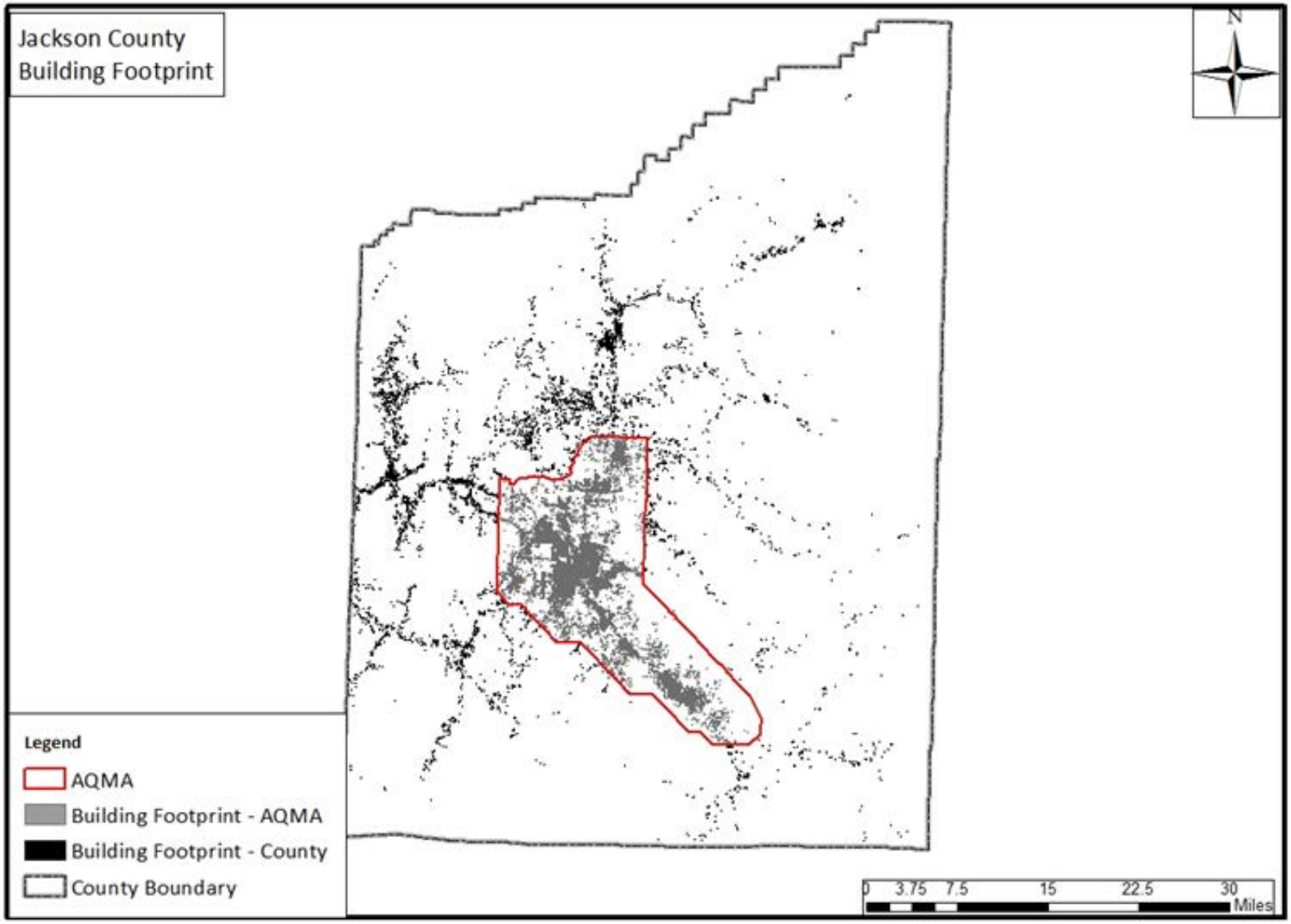
Appendix B, Figure B-8. Washington County building footprint



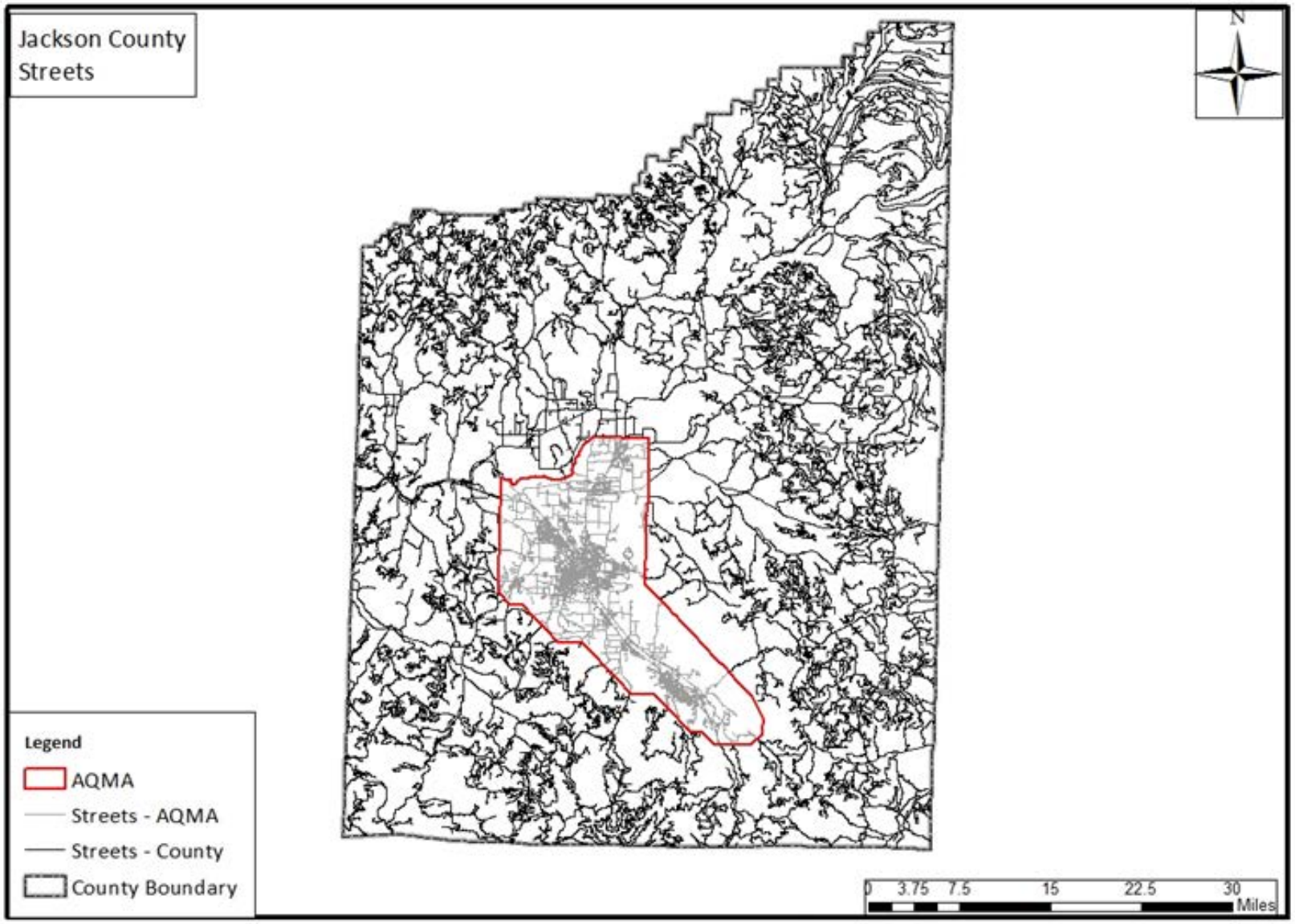
Appendix B, Figure B-9. Clackamas County building footprint



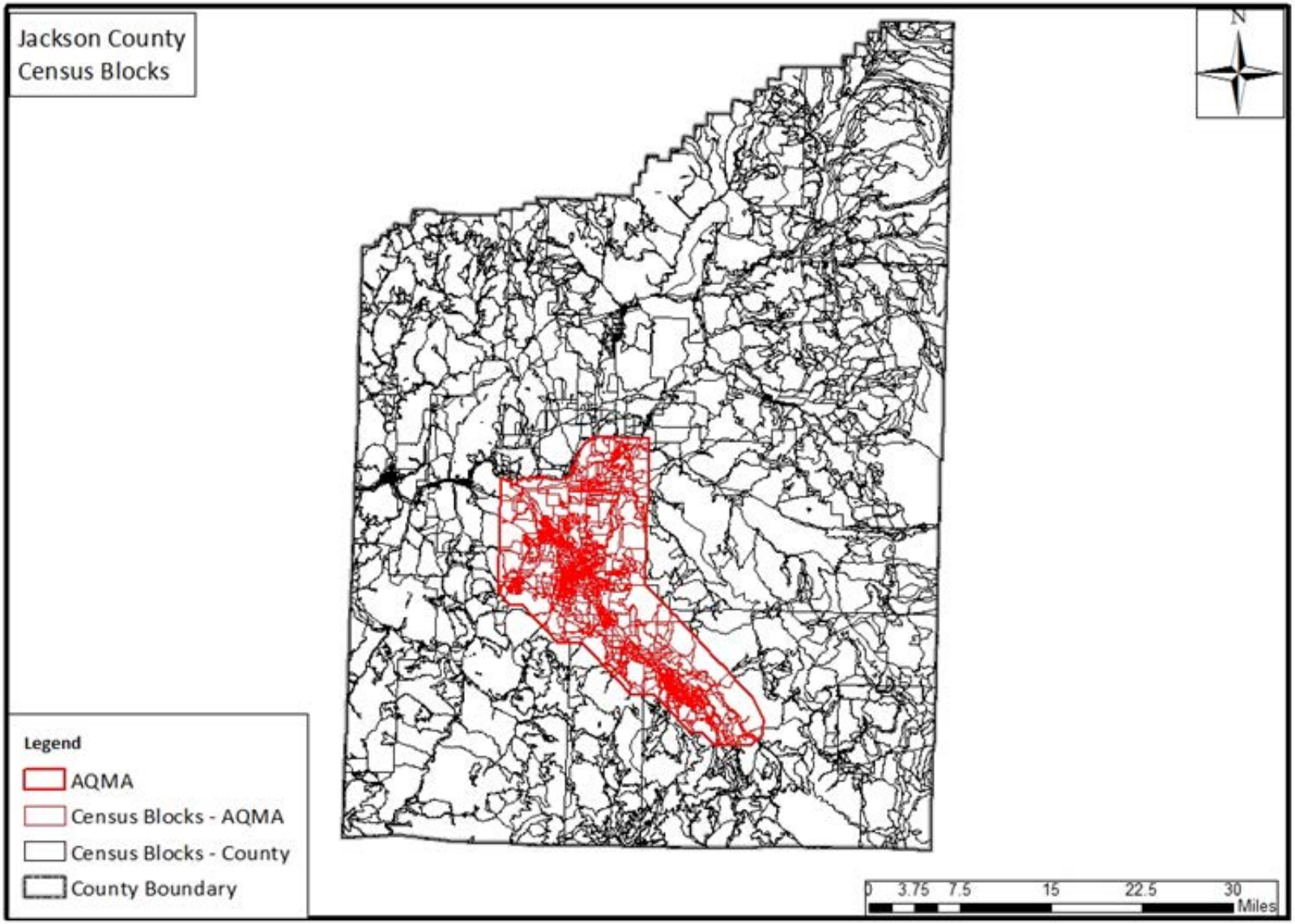
Appendix B, Figure B-10. Jackson County zoning



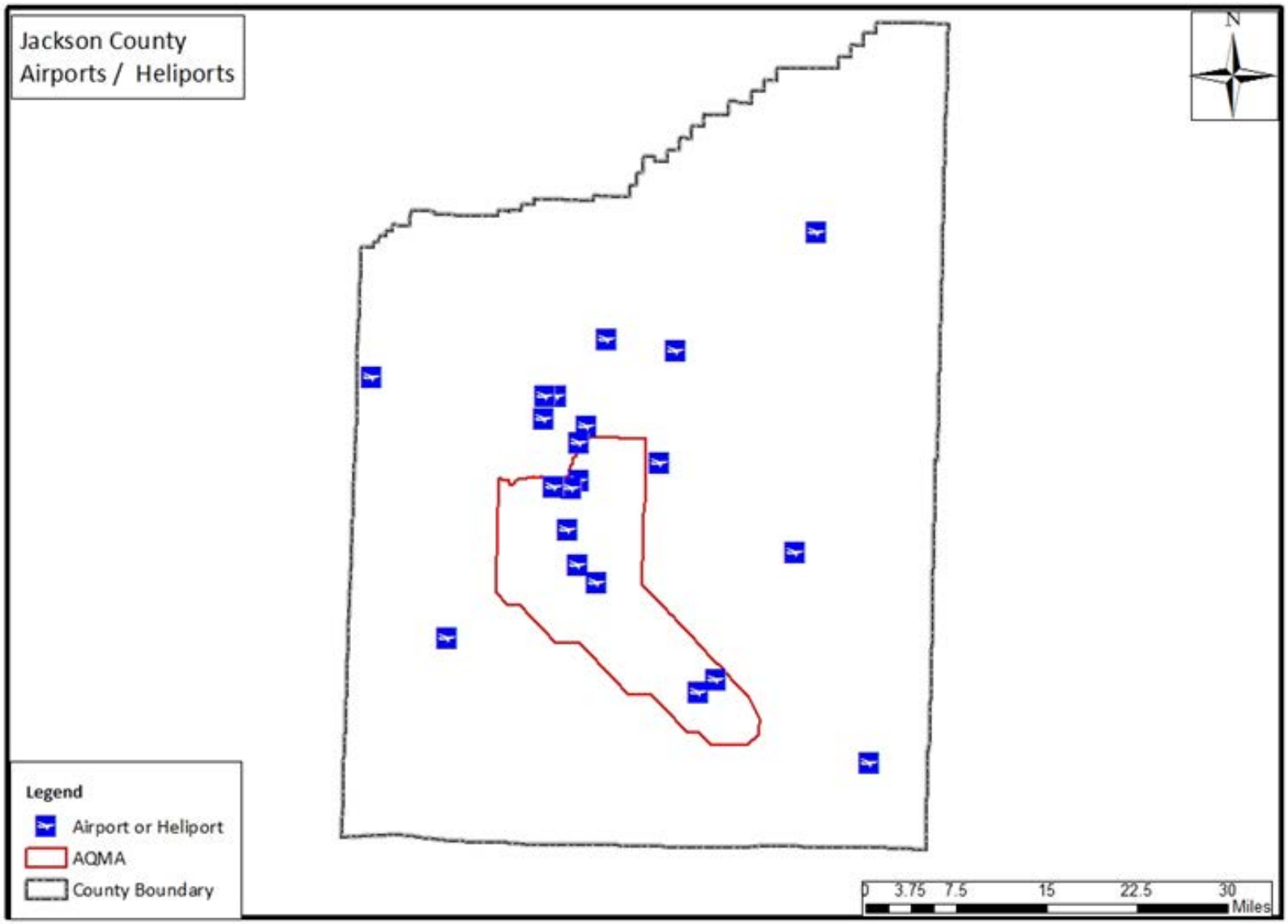
Appendix B, Figure B-11. Jackson County building footprint



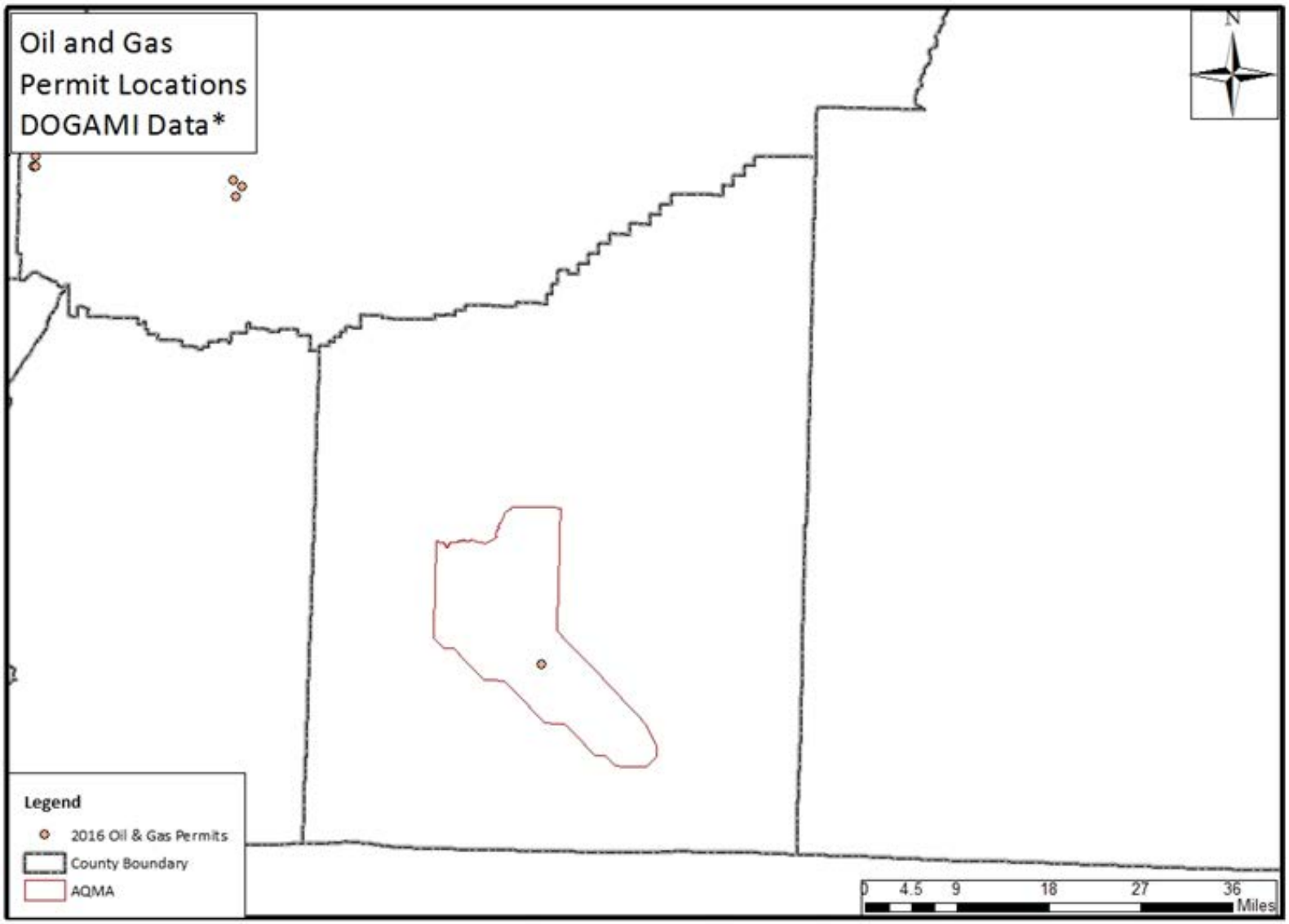
Appendix B, Figure B-12. Jackson County roadway



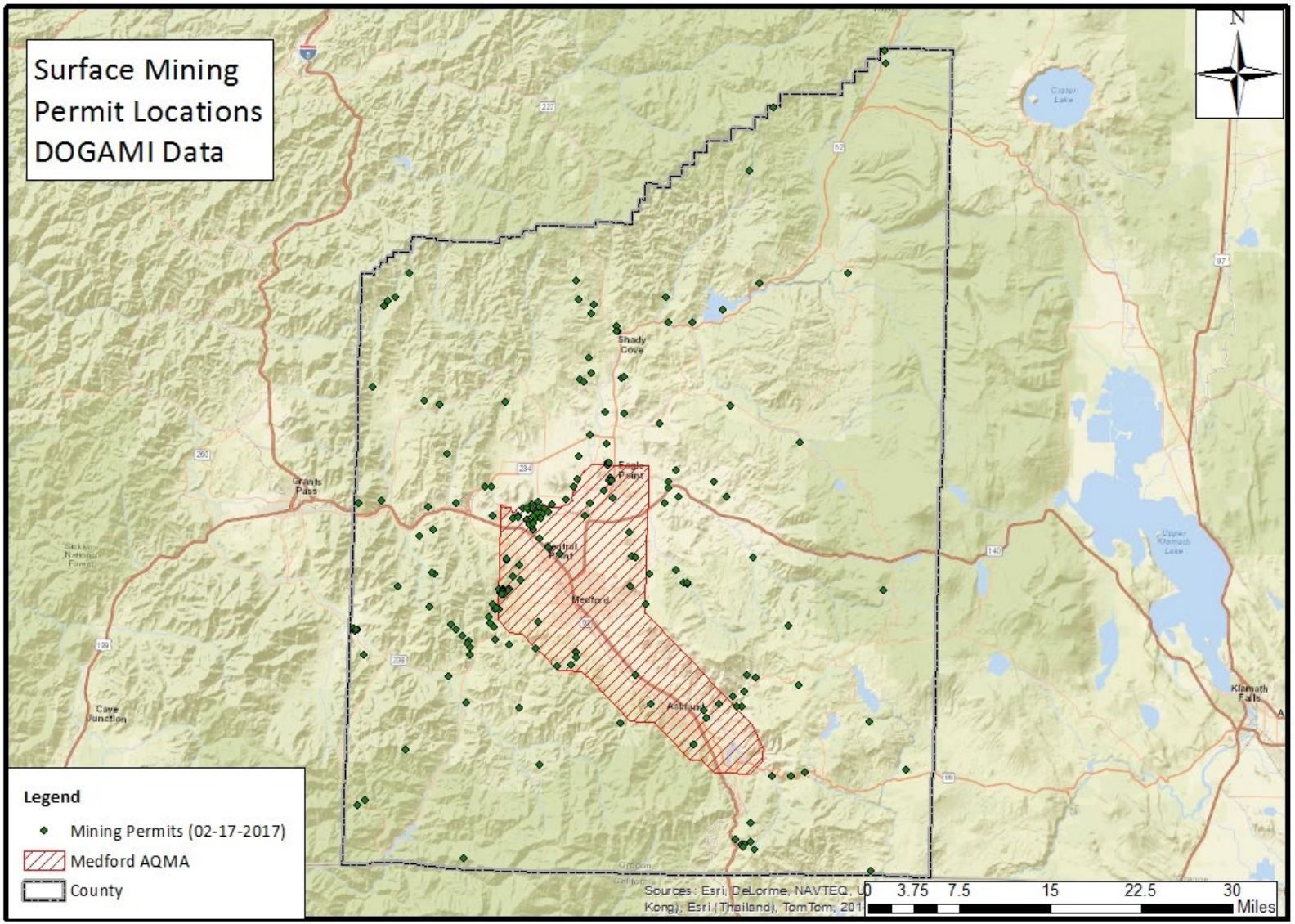
Appendix B, Figure B-13. Jackson County census block groups



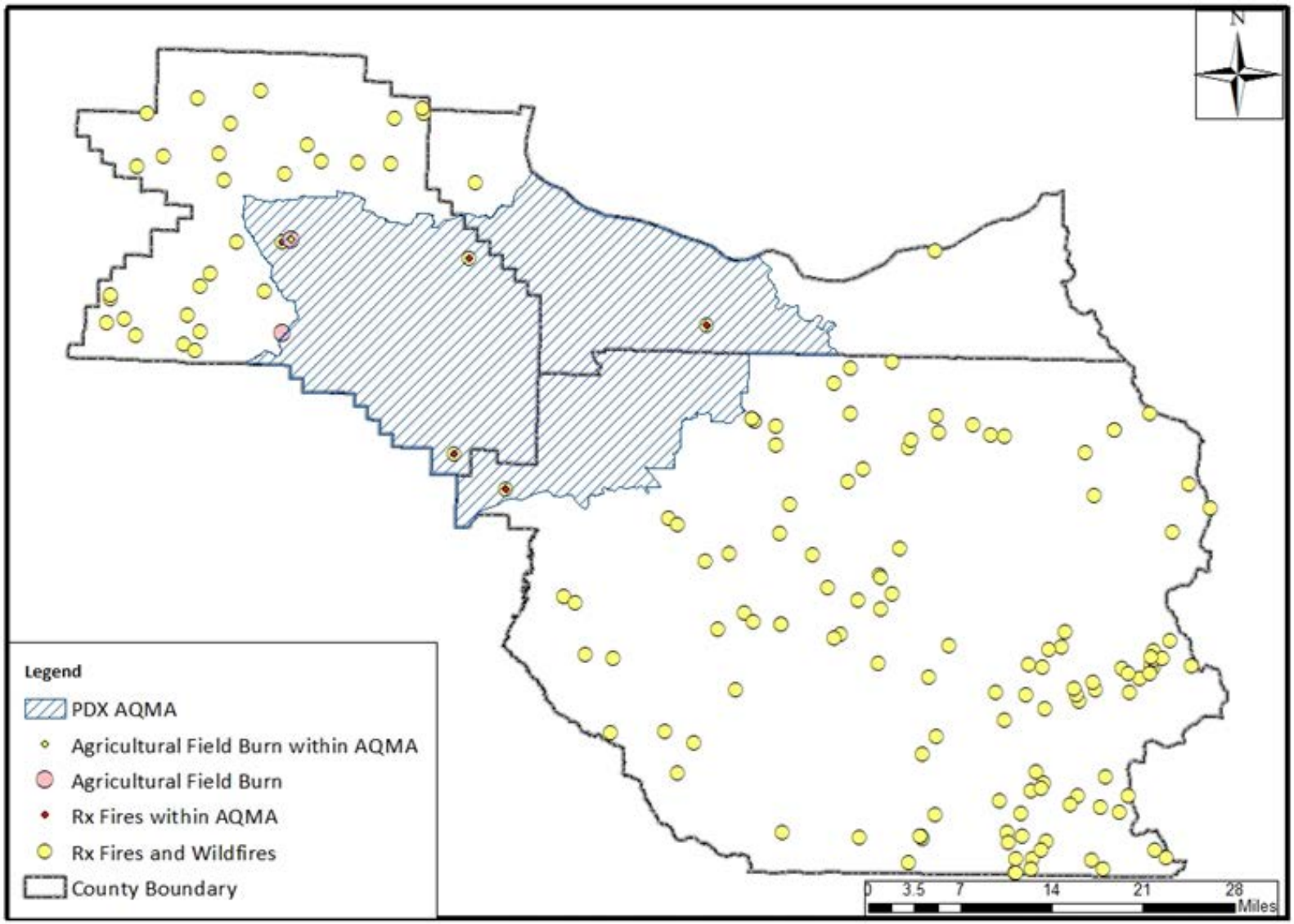
Appendix B, Figure B-14. Jackson County airport locations



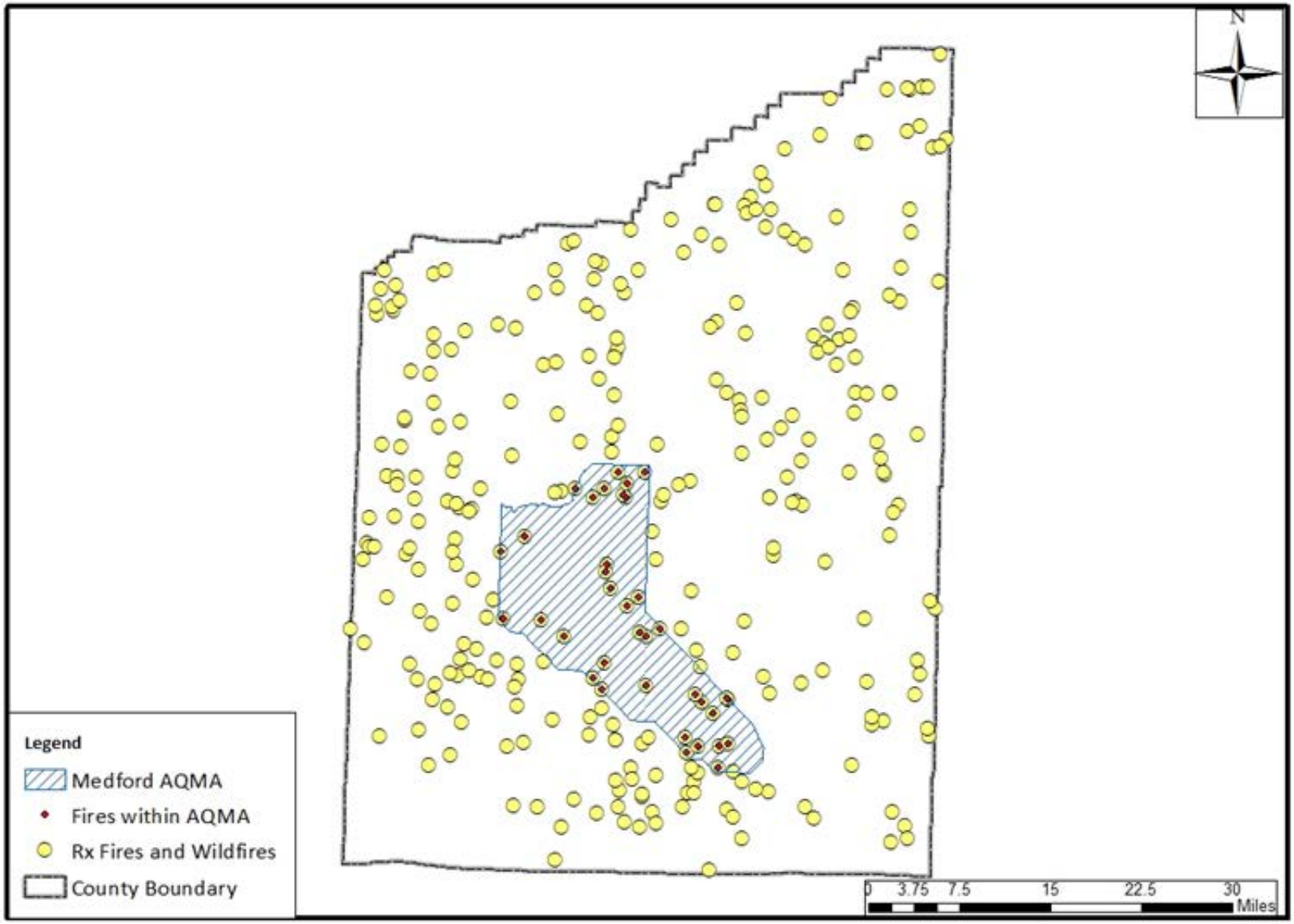
Appendix B, Figure B-15a. DOGAMI oil and gas permit locations, Jackson County



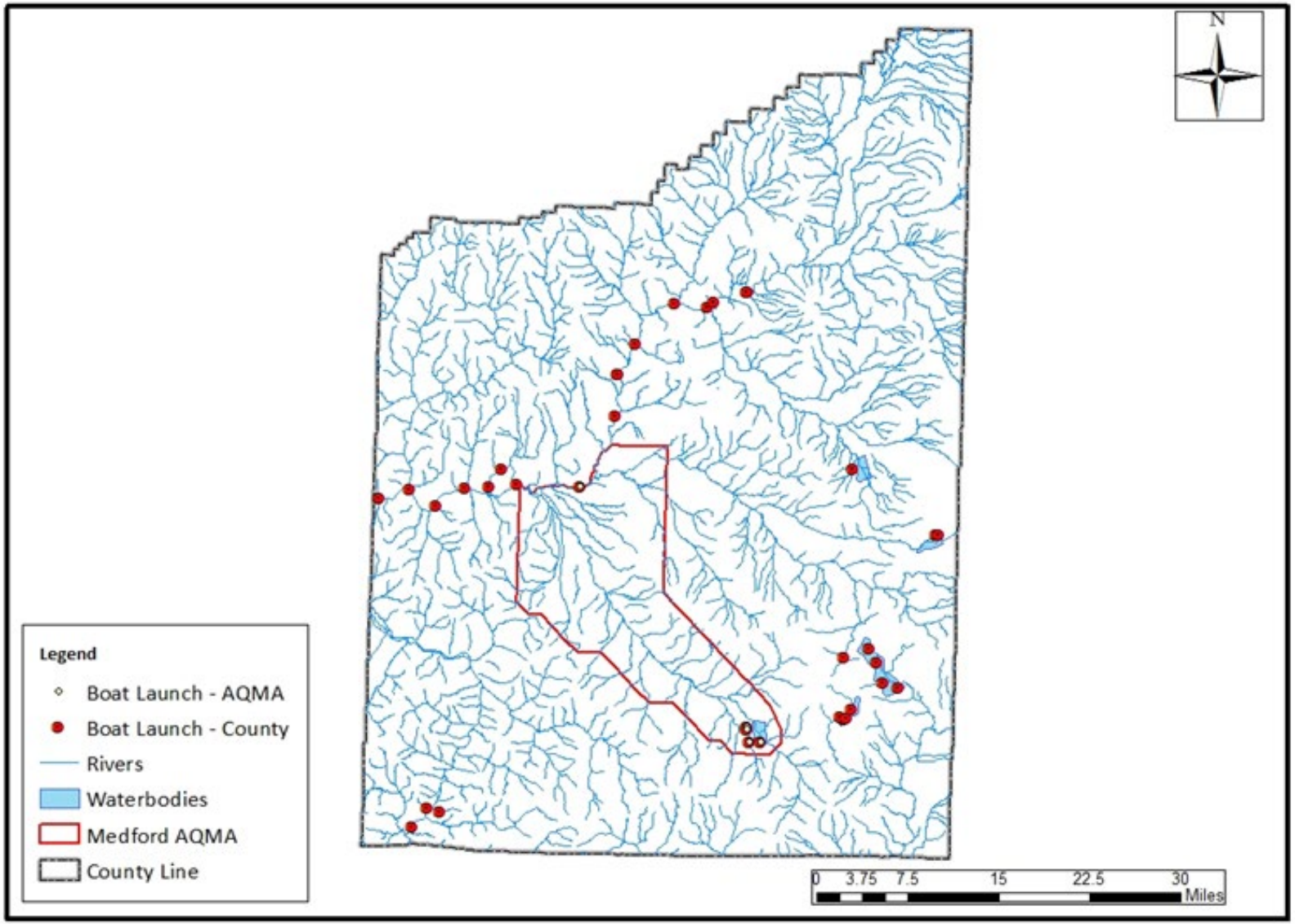
Appendix B, Figure B-15b. DOGAMI surface mining locations, Jackson County



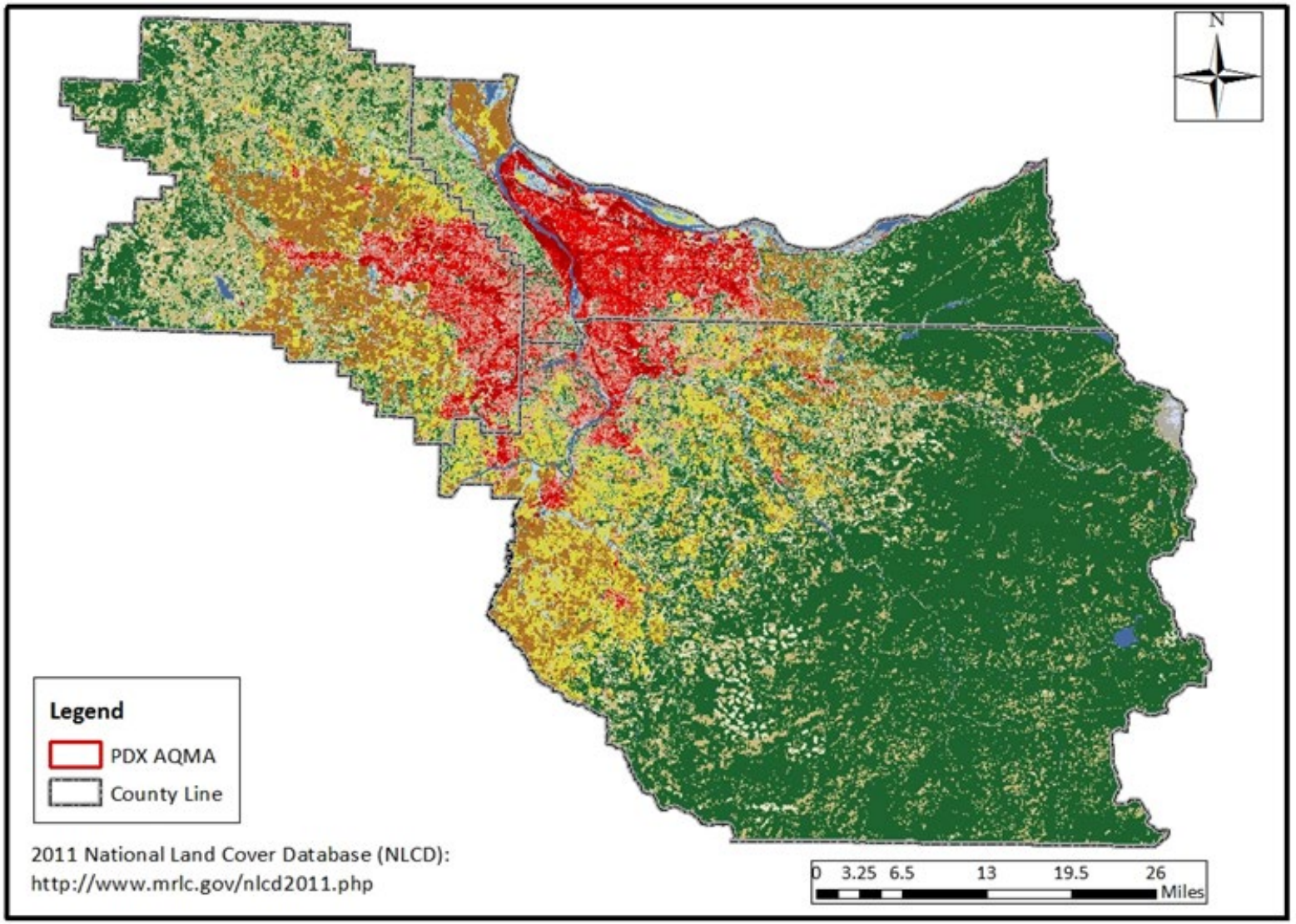
Appendix B, Figure B-16. Tri-County 2014 agricultural and prescribed burning locations



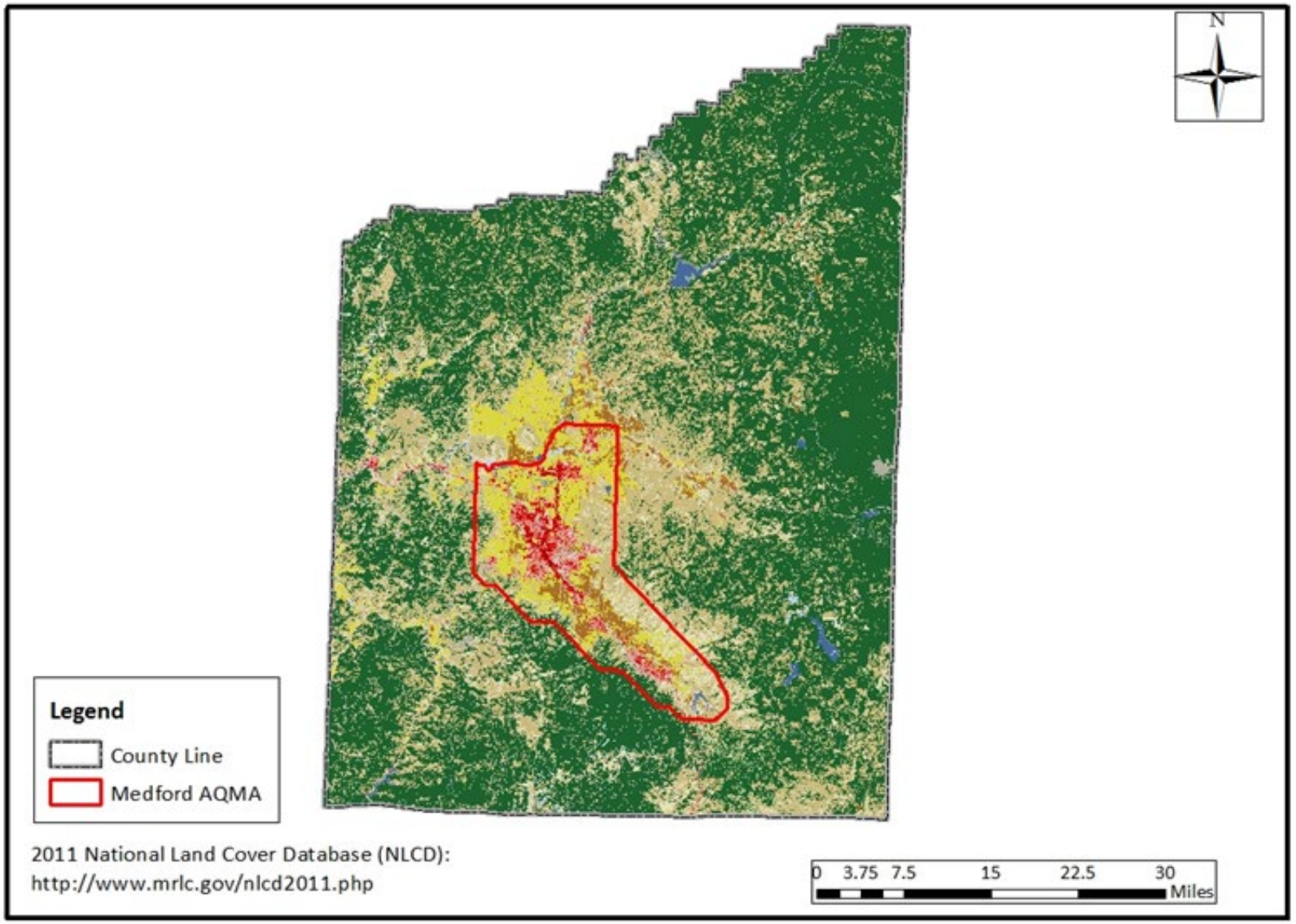
Appendix B, Figure B-17. Jackson County 2014 agricultural and prescribed burning locations



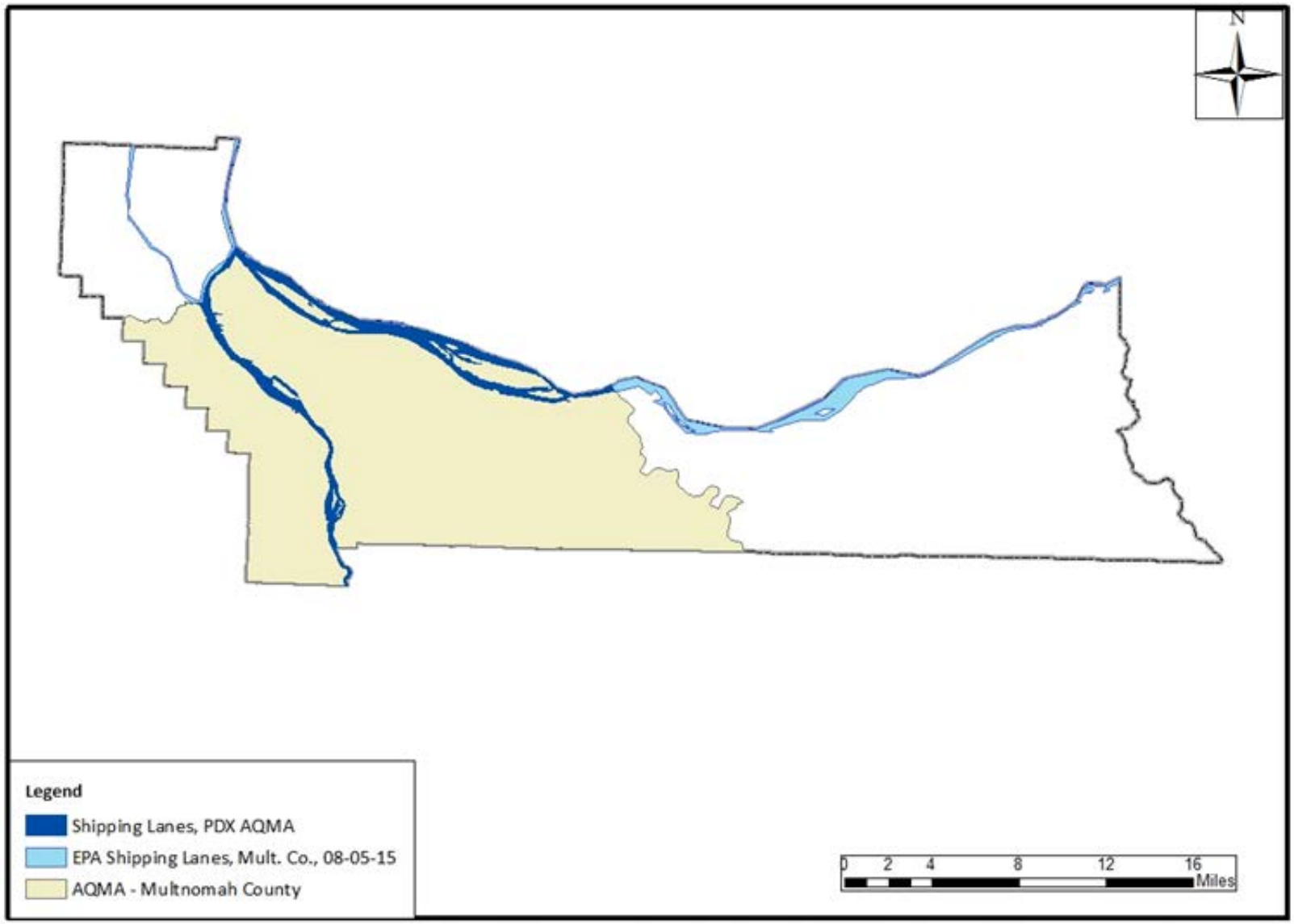
Appendix B, Figure B-18. Jackson County boat launch locations



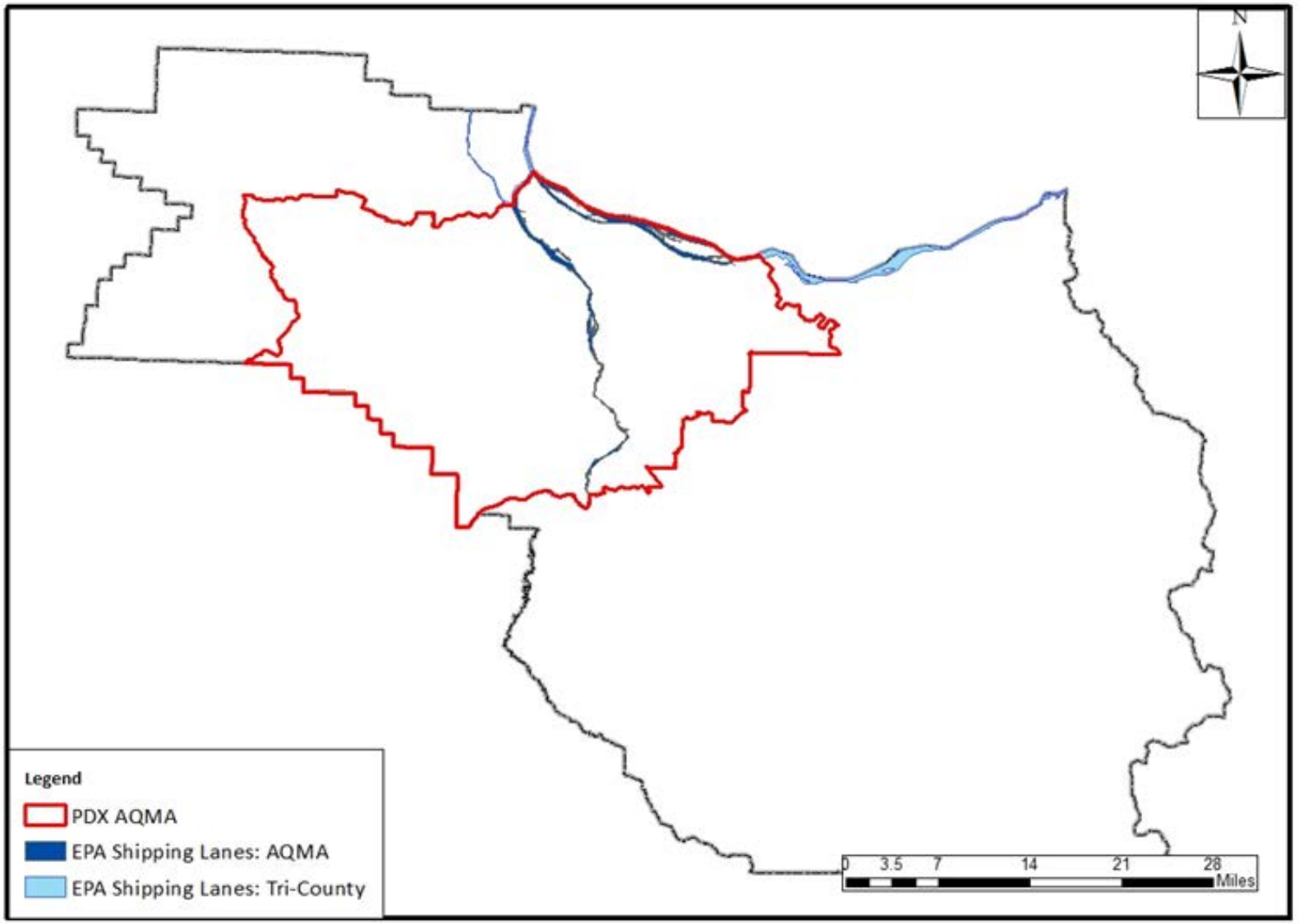
Appendix B, Figure B-19. Tri-County land cover – Raster data used for biogenic spatial allocation



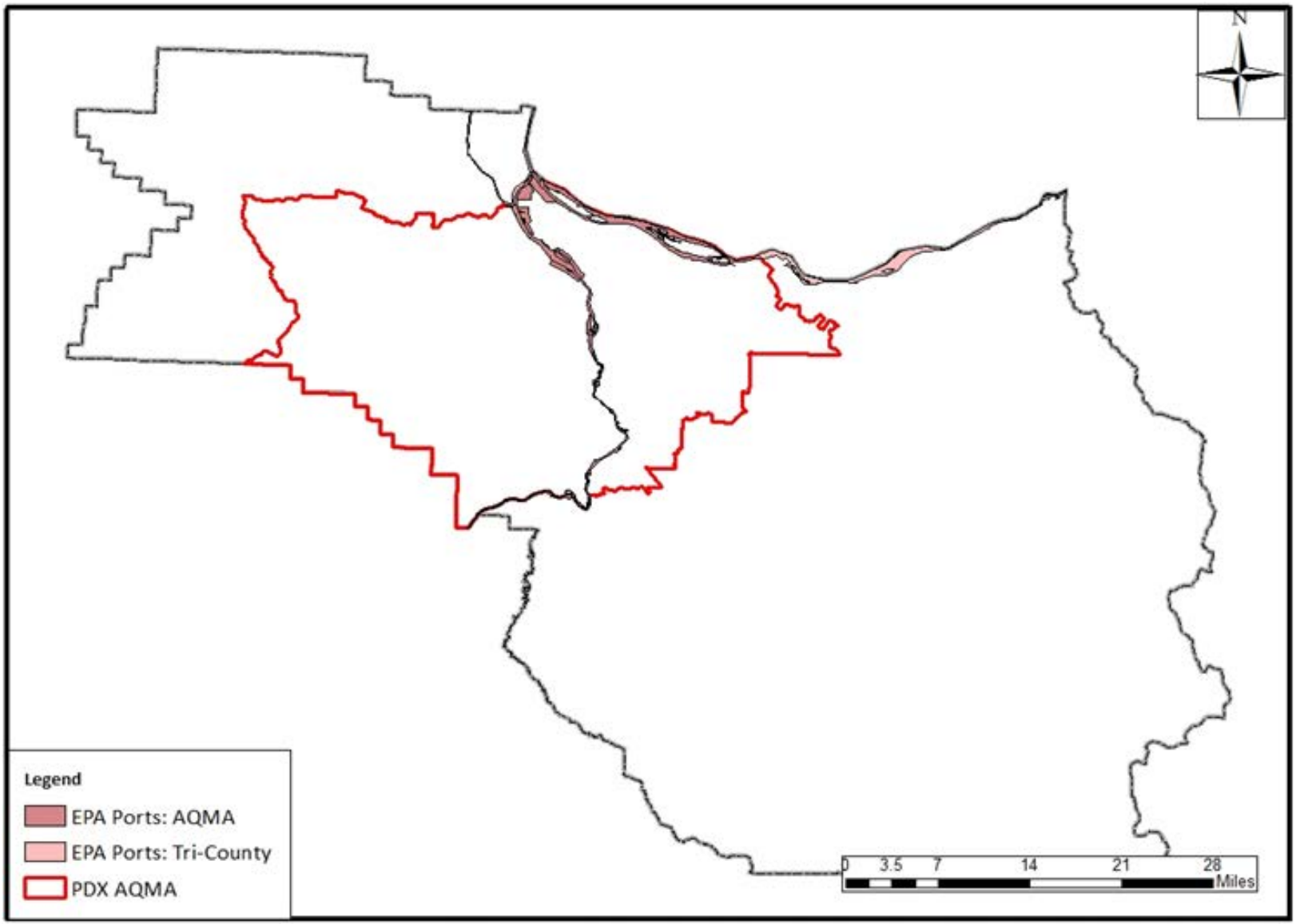
Appendix B, Figure B-20. Jackson County land cover – Raster data used for biogenic spatial allocation



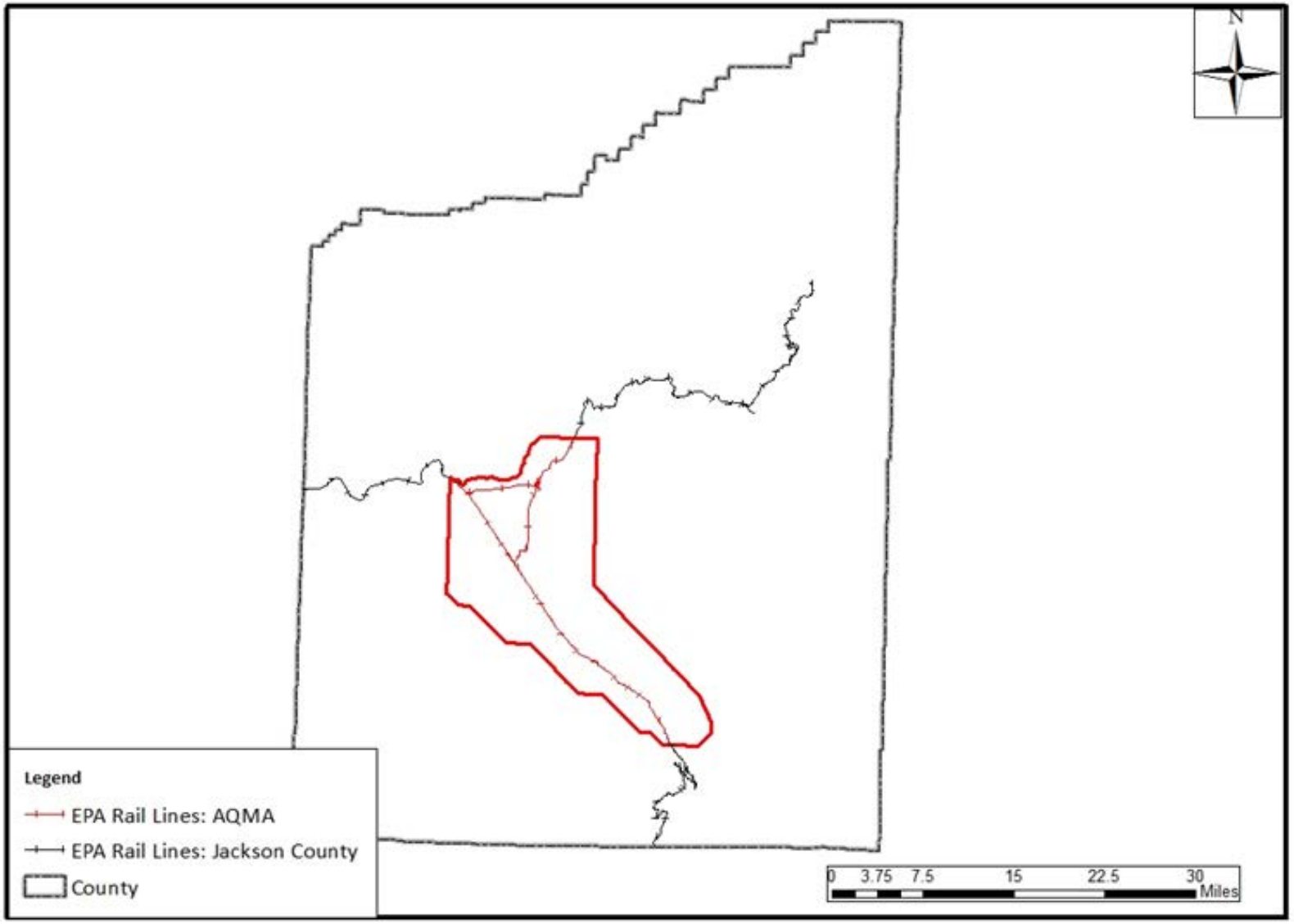
Appendix B, Figure B-21. Multnomah County shipping lanes



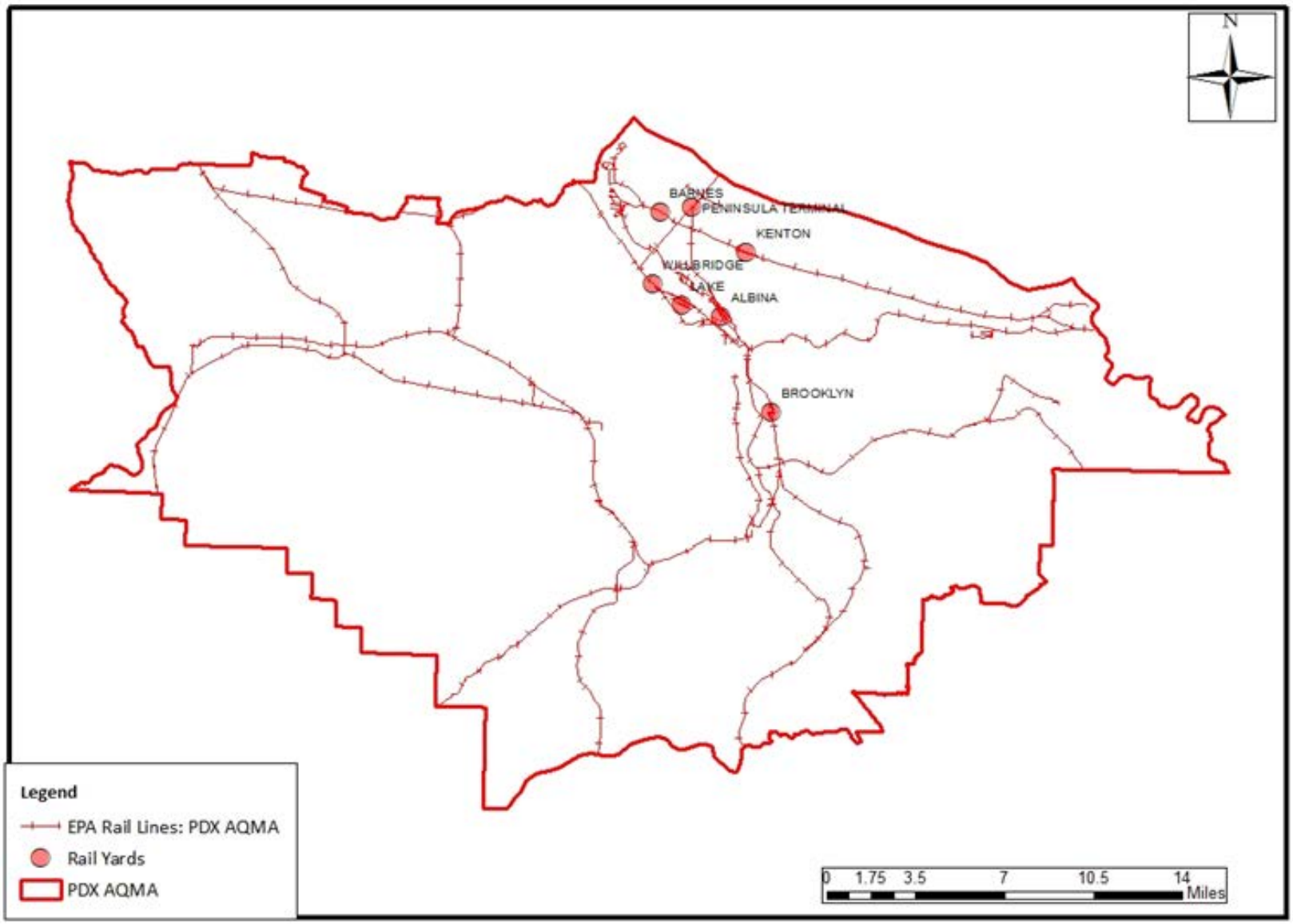
Appendix B, Figure B-22. Tri-County commercial marine vessel shipping lanes



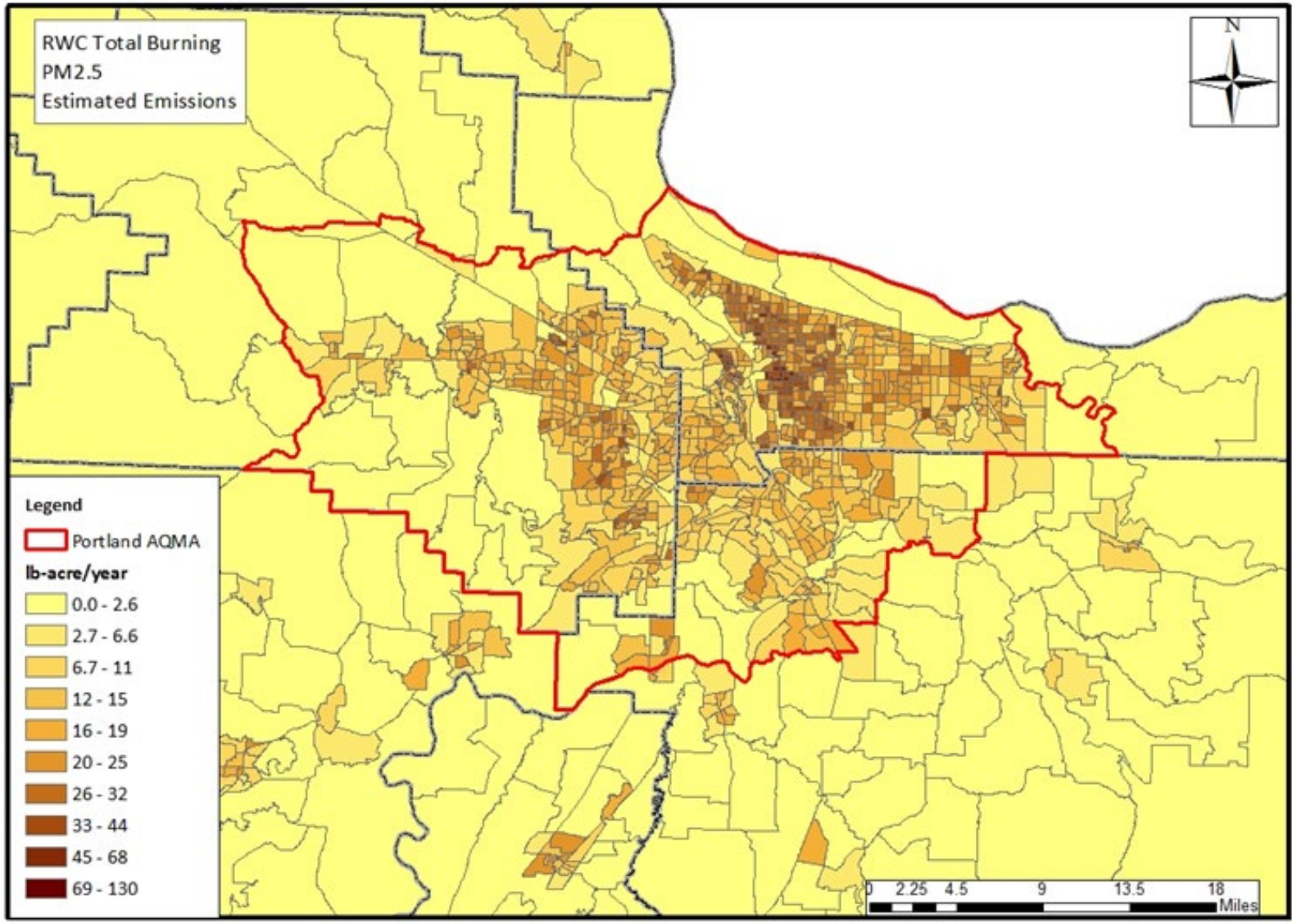
Appendix B, Figure B-23. Tri-County commercial marine vessel port locations



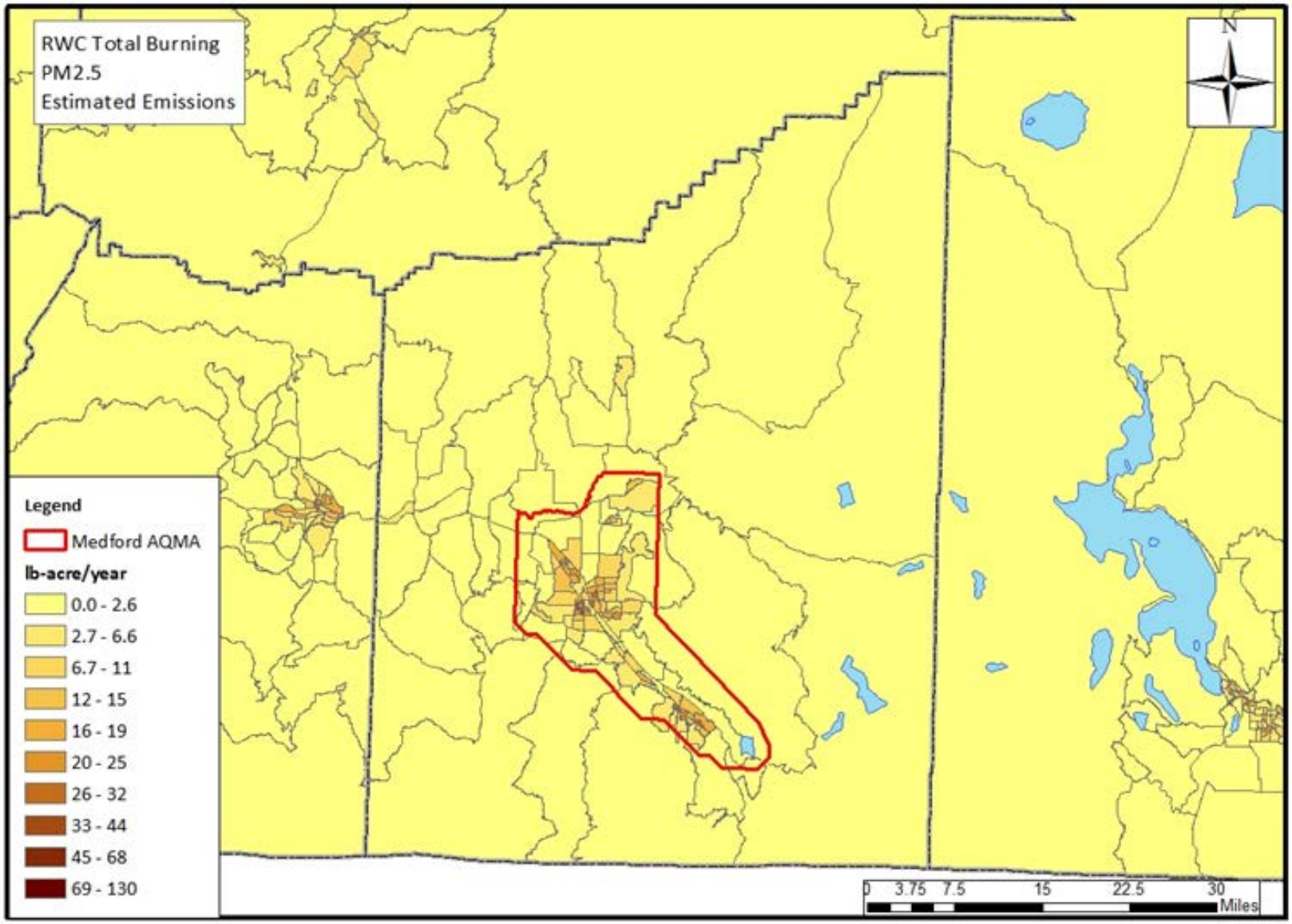
Appendix B, Figure B-24. Jackson County line-haul locomotive track location



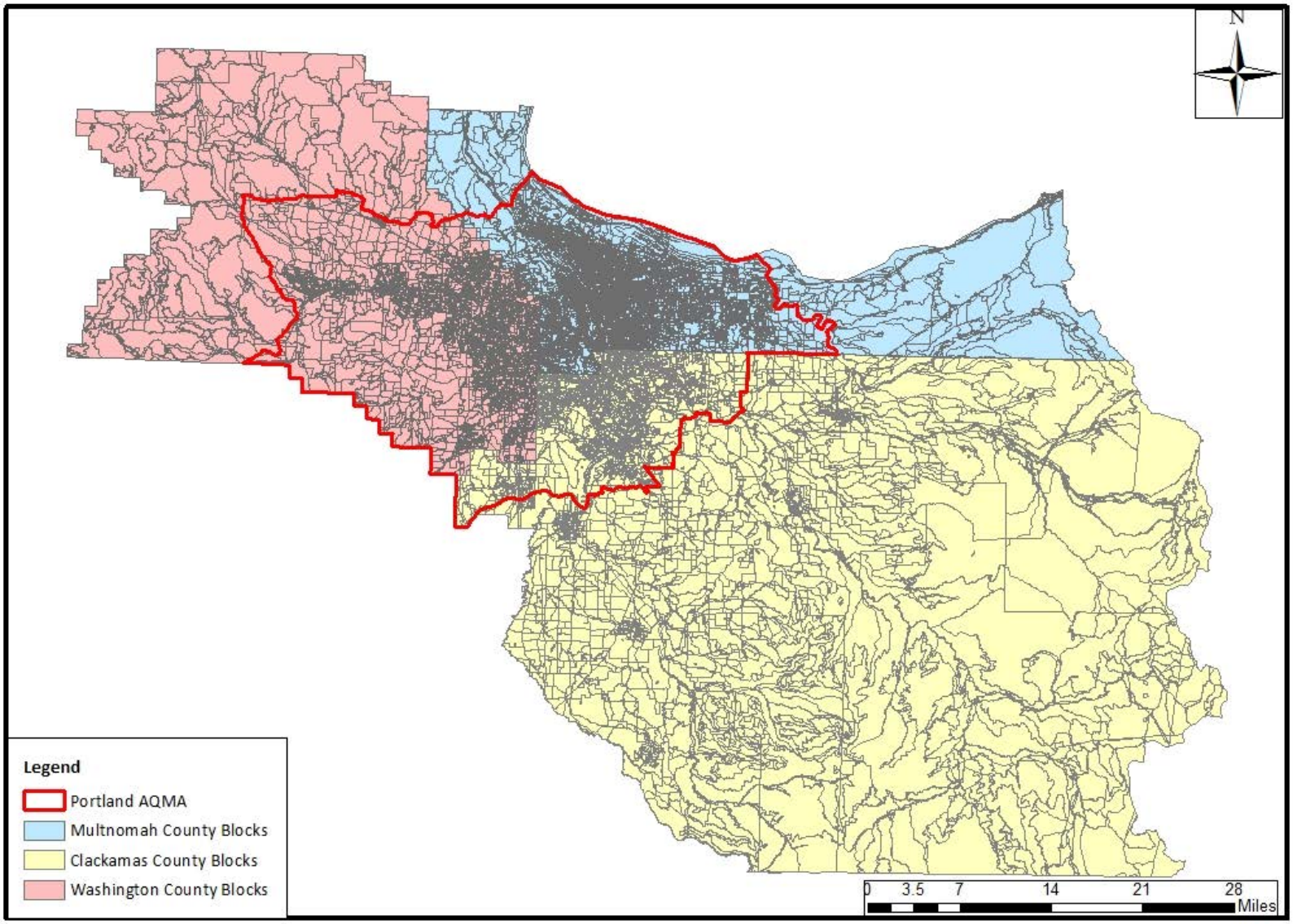
Appendix B, Figure B-25. Rail yards within the Portland AQMA



Appendix B, Figure B-26. Portland area residential wood combustion PM2.5 emissions by block group



Appendix B, Figure B-27. Medford area residential wood combustion PM2.5 emissions by block group



Appendix B, Figure B-28. Tri-county US Census block groups

APPENDIX C: ONROAD

Oregon
Kate Brown, Governor

Department of Transportation
Transportation Development Division
Transportation Planning Analysis Unit (TPAU)
Mill Creek Office Park
555 13th Street NE Suite 2
Salem, Oregon, 97301-4178
Phone: (503) 986-4120
Fax: (503) 986-4174

Date: January 22, 2016

To: Wesley Risher, Oregon Department of Environmental Quality

From: Jin Ren, P.E., Senior Transportation Modeler/Analyst
ODOT Transportation Planning Analysis Unit (TPAU)

Cc: Brian Dunn, P.E., Transportation Planning Analysis Manager, ODOT TPAU
Dan Moore, AICP, Planning Program Manager, RVMPO
Peter Schuytema, P.E., Senior Transportation Engineer, ODOT TPAU
Ian Horlacher, MPO Senior Planner, ODOT Regional 3, District 8

RE: Medford Multipollutant Analysis Project
– Potential Multipollutant Emission Effects/Benefits of Various On-road Emission Control Scenarios

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Brief Description

A model request was submitted by Oregon Department of Environmental Quality (DEQ) to utilize the RVMPO Travel Demand Models (TDM)[2] to forecast the base year 2014 and future year 2024 scenario daily link vehicle miles traveled (VMT).

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[2] *Note that travel models provide only generalized travel forecasts because they are based on generalized land use patterns and transportation networks. Since models do not represent individual land uses, driveways or neighborhood-scale streets, the forecasts produced are not sensitive to these specific land use and transportation characteristics.*

*It is inappropriate to use raw model outputs as the basis for transportation and land use decisions that require consideration of detailed transportation and land use characteristics. Therefore, post-processing of model outputs to account for the influence of specific transportation and land use characteristics is mandatory. Methods used for post-processing must conform to specifications provided within the ODOT Analysis Procedures Manual (*http://www.oregon.gov/ODOT/TD/TP/pages/APM.aspx*).*

The purpose of the request is for DEQ to post process the travel demand model outputs with MOVES2014a emission rates to estimate base year 2014 and future year 2024 on-road pollutant emissions for the Medford-Ashland Air Quality Management Area (AQMA).

Land Use & Network Assumptions

The decision was made to use the RVMPO-Version 3.0 models for base year 2015 scenario and future year 2028 scenario as they were previously used for the RVMPO air quality studies. DEQ will use their interpolation method to estimate 2014 base year and 2024 future year daily and annual VMT in the RVMPO selected study areas, such as: Medford and Ashland.

Both base year 2015 scenario and future year 2028 scenario land use/network forecasting assumptions were kept the same as in the respective 2015 and 2028 RVMPO-v3.0 models. In other words, no land use or network changes were made to the original base year 2015 scenario or future year 2028 scenario RVMPO-v3.0 models. Note that the RVMPO-v3.0 models do not include all local or neighborhood streets; therefore, usually daily VMT for model centroid connectors and local streets should be combined to roughly represent no more than 10% of local street VMT in the respective study areas.

Modeling Methods and Assumptions

Since there were no changes to land use or network assumptions, based on the previous model runs the daily model link VMT attributes were calculated by multiplying the daily link vehicle volumes with the link lengths for both base year 2015 scenario and future year 2028 scenario.

Other requested TDM link attributes were directly output from the daily scenario models and made into GIS shape files. The 2015 base year scenario and 2028 future scenario land use data attributes were tabulated by TAZ and made into respective TAZ shape files as requested.

Requested Output

After clarifying with DEQ staff, TPAU staff received the “following TDM request specifics;

- Shapefile data
- Rogue Valley MPO area
- On each link
    - Posted speed
    - Functional classifications
    - Link length
    - VMT
- 2015 and 2028 years
- TAZ data
    - Include population (& household) by TAZ
    - We don’t need employment data”

The attached zipped file "Ashland_Medford_DEQ_ES_AQ.zip" includes a tech memo (in MS-Word and PDF formats) and the model output GIS shapefiles (as shown below).

Tech Memo response files to this model request:

1. Tech_Memo_Request066.doc
2. Tech_Memo_Request066.pdf

For Base year 2015 RVMPO-v3.0 Model Outputs:

1. Links_2015_Daily_With_VMT_AutoOnly.dbf
2. Links_2015_Daily_With_VMT_AutoOnly.prj
3. Links_2015_Daily_With_VMT_AutoOnly.sbn
4. Links_2015_Daily_With_VMT_AutoOnly.sbx
5. Links_2015_Daily_With_VMT_AutoOnly.shp
6. Links_2015_Daily_With_VMT_AutoOnly.shx

For Future year 2028 Scenario RVMPO-v3.0 Model Outputs:

1. Links_2028_Daily_With_VMT_AutoOnly.dbf
2. Links_2028_Daily_With_VMT_AutoOnly.prj
3. Links_2028_Daily_With_VMT_AutoOnly.sbn
4. Links_2028_Daily_With_VMT_AutoOnly.sbx
5. Links_2028_Daily_With_VMT_AutoOnly.shp
6. Links_2028_Daily_With_VMT_AutoOnly.shx

TAZ Households and Population for Base year 2015 Scenario and Future year 2028 Scenario:

1. TAZv3_PopHH.dbf
2. TAZv3_PopHH.prj
3. TAZv3_PopHH.sbn
4. TAZv3_PopHH.sbx
5. TAZv3_PopHH.shp
6. TAZv3_PopHH.shx

Descriptions about a list of model output attribute:

1. Posted speed: “DATA1” in miles per hour
2. Functional classifications: “TYPE”
   Type 1 = freeway
   Type 2 = major arterial
   Type 3 = minor arterial
   Type 4 = collector
   Type 5 = local street
   Type 30 = freeway ramp, and
   Type 99 = centroid connector.
3. Link length: “LENGTH” in miles
4. VMT: “@DYVMT” in miles
5. Daily Vehicle Volumes: “@od24”
6. Base year 2015 households by TAZ: “HHBASE15”
7. Base year 2015 population by TAZ: “POPBASE15”
8. Base year 2028 households by TAZ: “HHBASE28”
9. Base year 2028 population by TAZ: “POPBASE28”

Please feel free to contact Jin Ren at 503-986-4120 Jinxiang.ren@odot.state.or.us if you have any questions or comments.

Medford-Ashland AQMA and the Portland AQMA MOVES2014a Mobile Emissions Estimate Steps

Medford-Ashland AQMA - 2015

2015 Medford-Ashland Base Year RunSpec
Jackson County
4 Month (January, April, July, October)
Weekday (5) and Weekend (2)
24hrs

Ran in INVENTORY Calculation Type.

- **Edit the MyLEVs database** to reflect Oregon adoption of the LEV and ZEV program in 2009 forward, run script and reference edited database within RunSpec.

- **Road Type Distribution** – work with Chris Swab to determine what the VMT fraction is upon the various road types present in the Medford-Ashland area by the various source types

- **Source Type Population**, use DMV Jackson county vehicle registration file to get the population count

- **Age Distribution** - Jackson county 30 year fleet ages mix for Source Type 25.

- **Vehicle Type VMT** – determine from the provided TDM VMT from RVCOG/ODOT what input VMT to allocate to the various source types or to the HPMS vehicle type on the road network, one of the more difficult MOVES inputs to estimate as VMT is not usually recorded by source type. Export the MOVES default hourly VMT fraction rates from MOVES2014a for Jackson County for Chris Swab's use to adjust ODOT TDM daily VMT by link to hourly.

  DEQ Vehicle Inspection and Maintenance (IM) program scenarios Medford-Ashland AQMA: Each I/M scenario will require a separate MOVES Run Spec to generate different emissions outputs that can be compared to other scenarios to determine the benefit of the I/M program.
  - Current I/M scenario with **4 year grace period** for new vehicles, rolling 20 year fleet exemption for older vehicles
  - I/M with **5 year grace period** for new vehicles, rolling 20 year fleet exemption for older vehicles
  - I/M with **6 year grace period** for new vehicles, rolling 20 year fleet exemption for older vehicles
  - **No I/M**

  I/M program scenario settings confirmed with Gary Beyer at the VIP Tech Center.

Pollutants selected for inventory output from MOVES2014a RunSpec for each scenario:

✓	Total Gaseous Hydrocarbons	
✓	Non-Methane Hydrocarbons	
✓	Non-Methane Organic Gases	
✓	Volatile Organic Compounds	
✓	Methane (CH4)	
✓	Carbon Monoxide (CO)	
✓	Oxides of Nitrogen (NOx)	
✓	Ammonia (NH3)	
✓	Nitrous Oxide (N2O)	
✓	Primary Exhaust PM2.5 - Total	
✓	(+) Primary Exhaust PM2.5 - Species	
	✓	Composite - NonECPM
	✓	Elemental Carbon
	✓	H2O (aerosol)
	✓	Organic Carbon
	✓	Sulfate Particulate
✓	Primary PM2.5 - Brakewear Particulate	
✓	Primary PM2.5 - Tirewear Particulate	
✓	Primary Exhaust PM10 - Total	
✓	Primary PM10 - Brakewear Particulate	
✓	Primary PM10 - Tirewear Particulate	
✓	Sulfur Dioxide (SO2)	
✓	Total Energy Consumption	
✓	Atmospheric CO2	
✓	CO2 Equivalent	
✓	Benzene	
✓	Ethanol	
✓	MTBE	
✓	1,3-Butadiene	
✓	Formaldehyde	
✓	Acetaldehyde	
✓	Acrolein	
✓	(+) Additional Air Toxics	
	✓	2,2,4-Trimethylpentane
	✓	Ethyl Benzene
	✓	Hexane
	✓	Propionaldehyde
	✓	Styrene
	✓	Toluene

	✓	Xylene
✓	(+) Polycyclic Aromatic Hydrocarbons (PAH)	
	✓	Acenaphthene gas
	✓	Acenaphthene particle
	✓	Acenaphthylene gas
	✓	Acenaphthylene particle
	✓	Anthracene gas
	✓	Anthracene particle
	✓	Benz(a)anthracene gas
	✓	Benz(a)anthracene particle
	✓	Benzo(a)pyrene gas
	✓	Benzo(a)pyrene particle
	✓	Benzo(b)fluoranthene gas
	✓	Benzo(b)fluoranthene particle
	✓	Benzo(g,h,i)perylene gas
	✓	Benzo(g,h,i)perylene particle
	✓	Benzo(k)fluoranthene gas
	✓	Benzo(k)fluoranthene particle
	✓	Chrysene gas
	✓	Chrysene particle
	✓	Dibenzo(a,h)anthracene gas
	✓	Dibenzo(a,h)anthracene particle
	✓	Fluoranthene gas
	✓	Fluoranthene particle
	✓	Fluorene gas
	✓	Fluorene particle
	✓	Indeno(1,2,3,c,d)pyrene gas
	✓	Indeno(1,2,3,c,d)pyrene particle
	✓	Naphthalene gas
	✓	Naphthalene particle
	✓	Phenanthrene gas
	✓	Phenanthrene particle
	✓	Pyrene gas
	✓	Pyrene particle
✓	(+) Metals	
	✓	Arsenic Compounds
	✓	Chromium 6+

Portland AQMA – 2015

2015 Portland Metro Base Year RunSpec
Multnomah County as representative county for area
4 Month (January, April, July, October)
Weekday (5) and Weekend (2)
24hrs

Ran in INVENTORY Calculation Type.

- Edit the **MyLEVs database** to reflect Oregon adoption of the LEV and ZEV program in 2009 forward, run script and reference edited database within RunSpec.

- **Road Type Distribution** – work with Chris Swab to determine what the VMT fraction is upon the various road types present in the Metro provided TDM area by the various source types

- **Source Type Population**, use DMV Multnomah county vehicle registration file to get the population count. There are problems with the 2014 database whereby we will be using the Dec. 2016 DMV vehicle registration file as a surrogate for 2015 fleet mix.

- **Age Distribution -** Multnomah county 30 year fleet ages mix for Source Type 25.

- **Vehicle Type VMT** – determine from the provided TDM VMT from Metro what input VMT to allocate to the various source types or to the HPMS vehicle type on the road network, one of the more difficult MOVES inputs to estimate as VMT is not usually recorded by source type. Export the MOVES default hourly VMT fraction rates from MOVES2014a for Multnomah County for Chris Swab's use to adjust Metro TDM daily VMT by link to hourly.

  DEQ Vehicle Inspection and Maintenance (IM) program scenarios- Portland AQMA:
  Each I/M scenario will require a separate MOVES Run Spec to generate different emission rate outputs that can be compared to other scenarios to determine the benefit of the I/M program.
  - Current I/M scenario with newest **4 year grace period** for new vehicles, no rolling 20 year fleet exemption for older vehicles, 1975 and newer subject to the I/M program
  - I/M with **5 year grace period** for new vehicles, no rolling 20 year fleet exemption for older vehicles, 1975 and newer subject to the I/M program
  - I/M with **6 year grace period** for new vehicles, no rolling 20 year fleet exemption for older vehicles, 1975 and newer subject to the I/M program
  - **No I/M**

  I/M program scenario settings confirmed by Gary Beyer at the VIP Tech Center.

Pollutants selected for inventory output from MOVES2014a RunSpec for each scenario:

✓	Total Gaseous Hydrocarbons	
✓	Non-Methane Hydrocarbons	
✓	Non-Methane Organic Gases	
✓	Volatile Organic Compounds	
✓	Methane (CH4)	
✓	Carbon Monoxide (CO)	
✓	Oxides of Nitrogen (NOx)	
✓	Ammonia (NH3)	
✓	Nitrous Oxide (N2O)	
✓	Primary Exhaust PM2.5 - Total	
✓	(+) Primary Exhaust PM2.5 - Species	
	✓	Composite - NonECPM
	✓	Elemental Carbon
	✓	H2O (aerosol)
	✓	Organic Carbon
	✓	Sulfate Particulate
✓	Primary PM2.5 - Brakewear Particulate	
✓	Primary PM2.5 - Tirewear Particulate	
✓	Primary Exhaust PM10 - Total	
✓	Primary PM10 - Brakewear Particulate	
✓	Primary PM10 - Tirewear Particulate	
✓	Sulfur Dioxide (SO2)	
✓	Total Energy Consumption	
✓	Atmospheric CO2	
✓	CO2 Equivalent	
✓	Benzene	
✓	Ethanol	
✓	MTBE	
✓	1,3-Butadiene	
✓	Formaldehyde	
✓	Acetaldehyde	
✓	Acrolein	
✓	(+) Additional Air Toxics	
	✓	2,2,4-Trimethylpentane
	✓	Ethyl Benzene
	✓	Hexane
	✓	Propionaldehyde
	✓	Styrene
	✓	Toluene
	✓	Xylene

✓	(+) Polycyclic Aromatic Hydrocarbons (PAH)	
	✓	Acenaphthene gas
	✓	Acenaphthene particle
	✓	Acenaphthylene gas
	✓	Acenaphthylene particle
	✓	Anthracene gas
	✓	Anthracene particle
	✓	Benz(a)anthracene gas
	✓	Benz(a)anthracene particle
	✓	Benzo(a)pyrene gas
	✓	Benzo(a)pyrene particle
	✓	Benzo(b)fluoranthene gas
	✓	Benzo(b)fluoranthene particle
	✓	Benzo(g,h,i)perylene gas
	✓	Benzo(g,h,i)perylene particle
	✓	Benzo(k)fluoranthene gas
	✓	Benzo(k)fluoranthene particle
	✓	Chrysene gas
	✓	Chrysene particle
	✓	Dibenzo(a,h)anthracene gas
	✓	Dibenzo(a,h)anthracene particle
	✓	Fluoranthene gas
	✓	Fluoranthene particle
	✓	Fluorene gas
	✓	Fluorene particle
	✓	Indeno(1,2,3,c,d)pyrene gas
	✓	Indeno(1,2,3,c,d)pyrene particle
	✓	Naphthalene gas
	✓	Naphthalene particle
	✓	Phenanthrene gas
	✓	Phenanthrene particle
	✓	Pyrene gas
	✓	Pyrene particle
✓	(+) Metals	
	✓	Arsenic Compounds
	✓	Chromium 6+