Lakeview PM2.5 Advance Program:

Attainment Demonstration

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Oregon DEQ

NW Airquest Annual Meeting
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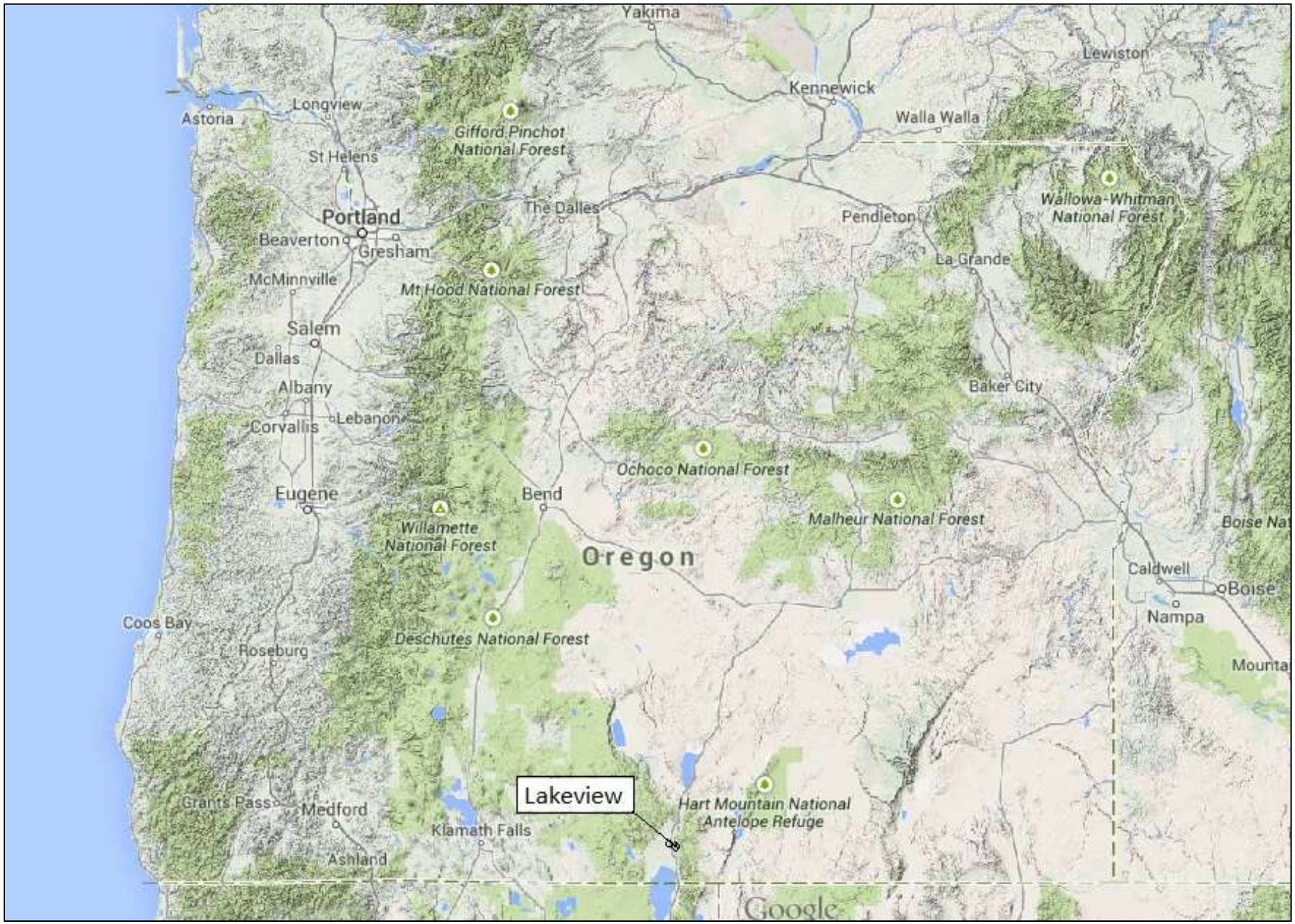
Boise

Lakeview Overiew

1. Overview of Lakeview
2. PM Advance Program
3. Rollback model
4. Industrial and Prescribed Burning sources
5. Modeling and selection of control strategies
6. Stakeholder process and outreach

Lakeview - Oregon



Lakeview Facts

1. Population: 2,526 (1990)
   2,294 (2010)
   2,261 (2012)

2. Elevation: 4,798 ft (“tallest town in Oregon”)

3. Average low temperature Nov-Feb = 21.3 F

4. 2008-2012 DV = 38 ug/m3
   2009-2013 DV = 47 ug/m3

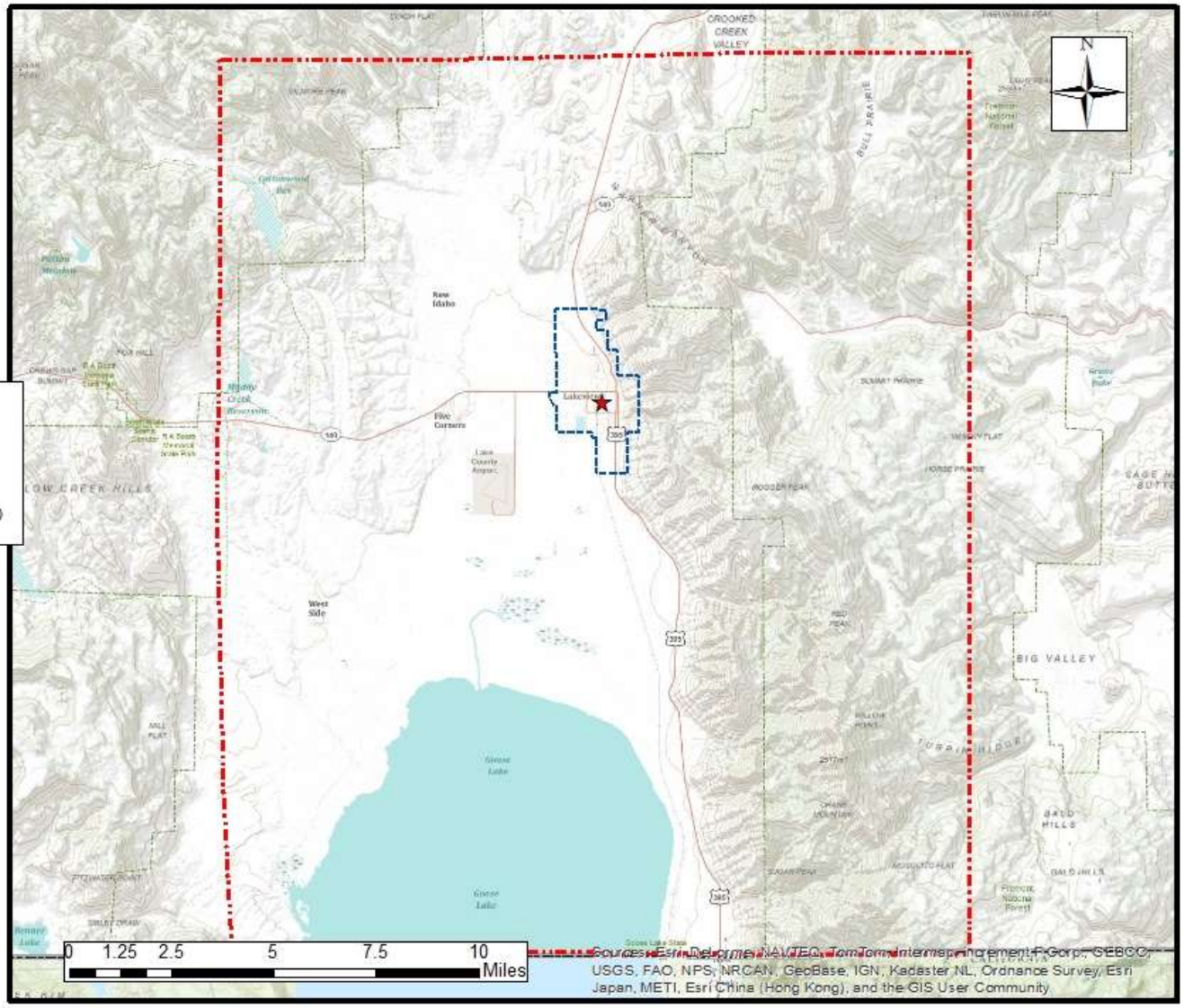
5. EPA has not yet designated as a PM2.5 Nonattainment Area

6. Eligible for PM Advance Program

Lakeview Region

Lakeview PM2.5 Attainment Study Area

Lakeview
PM Advance
Path Forward
SPZ and UGB



DEQ

References:
DEQ GIS files

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Lakeville Issues

1. Modeling framework.

2. Estimating – characterizing area source emissions.

3. Characterizing point source emissions.
   - Industrial sources
   - Prescribed burning

4. Residential Wood Heating emission reduction scenarios.

5. Cultural – Political framework to reaching attainment.

Modeling Framework

1. Attainment modeling patterned after Klamath Falls

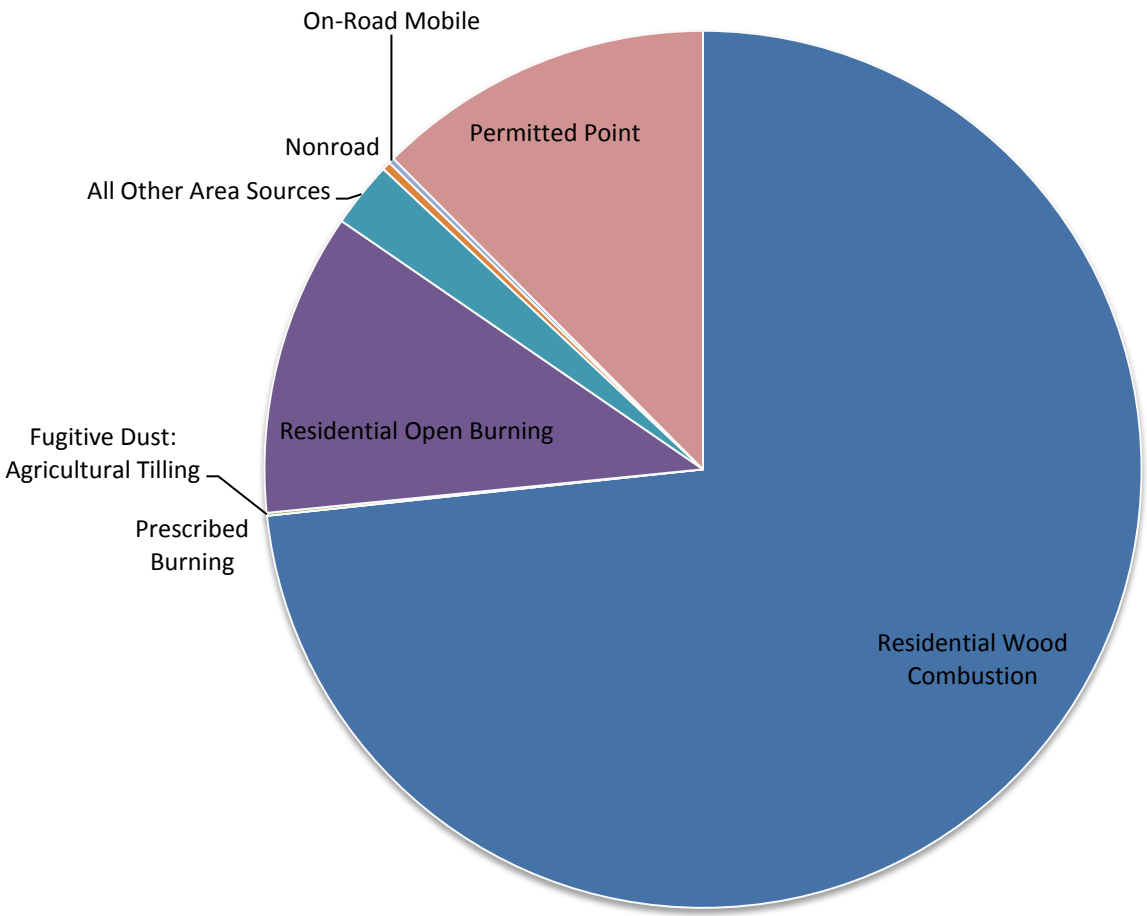
2. Lakeview modeling domain

3. Rollback for distributed – diffuse emissions sources
   Distance weighting to account for dispersion

4. Dispersion modeling for “discrete” point emissions sources

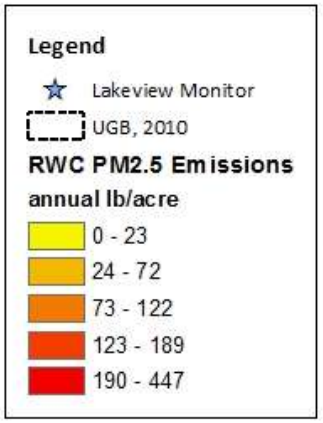
Lakeview Area Potential Emissions Sources

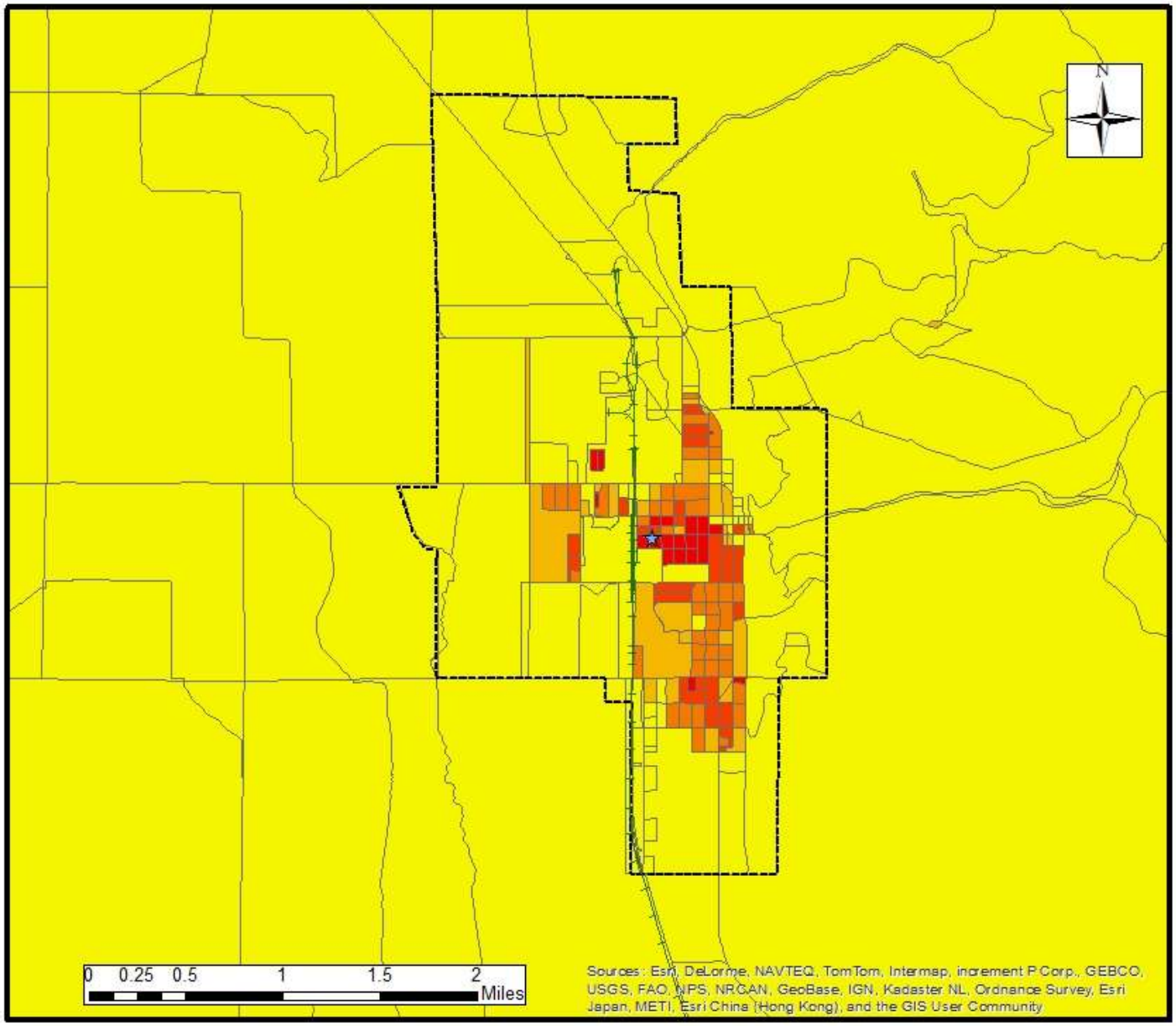
Design Day - UGB (lb/day)



Lakeview Urban Growth Boundary RWC Emissions

Lakeview PM Advance Path Forward: RWC PM2.5 Emissions Estimates by Census Block





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References:

DEQ GIS files

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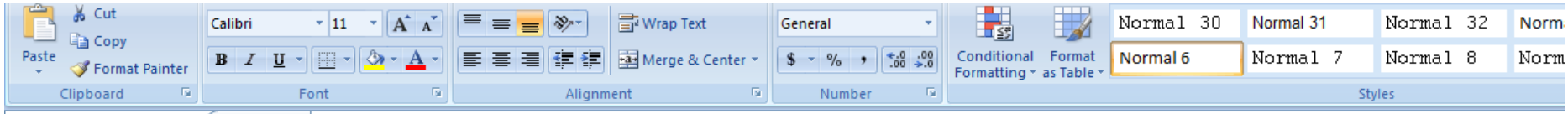
Lakeview PM2.5 RWC Emissions



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Appendix D, Table D-34. Interim and Attainment Year Design Day lbs PM2.5 Residential Wood Combustion Emissions by Census Block: "Emissions reductions due to the weatherization of 20 homes up

Does not include open burning of split wood

Includes reductions from public education (6% flat reduction).

Chris's Scalars: 0.989888, 0.989888, 0.989888

Chris's Scalars: 0.989888, 0.989888, 0.989888

Reduction Scalar

\\DEQHQ1\EI_FILES\2011_Lakeview\EI_F

"Scenarios_3" sheet, cell O47

					Base Year (2011)			2017			2019		
	Census Block GEOID10	Census Block NAME10	Centroid LAT_DD	Centroid LONG_DD	Primary Heat (lbs/day)	Backup Heat (lbs/day)	(lbs/day)	Primary Heat (lbs/day)	Backup Heat (lbs/day)	(lbs/day)	Primary Heat (lbs/day)	Backup Heat (lbs/day)	(lbs/day)
252	410379602007002	Block 7002	42.1778273	-120.3480787	3.219063518	3.854017014	7.0730805	2.8368244	3.396382	6.2332064	2.8324285	3.391119	6.2235475
253	410379602007003	Block 7003	42.1777627	-120.3500989	4.743883079	5.67960402	10.423487	4.1805833	5.0051945	9.1857778	4.1741051	4.9974385	9.1715437
254	410379602007004	Block 7004	42.1778384	-120.3520662	1.355395165	1.622744006	2.9781392	1.1944524	1.4300556	2.624508	1.1926015	1.4278396	2.620441
255	410379602007005	Block 7005	42.177802	-120.3531695	0.338848791	0.405686001	0.7445348	0.2986131	0.3575139	0.656127	0.2981504	0.3569599	0.6551103
256	410379602007006	Block 7006	42.1778056	-120.3542946	1.016546374	1.217058004	2.2336044	0.8958393	1.0725417	1.968381	0.8944511	1.0708797	1.9653308
257	410379602007013	Block 7013	42.1763728	-120.3543204	0.169424396	0.202843001	0.3722674	0.1493065	0.1787569	0.3280635	0.1490752	0.1784799	0.3275551
258	410379602007014	Block 7014	42.1759866	-120.3531850	0.338848791	0.405686001	0.7445348	0.2986131	0.3575139	0.656127	0.2981504	0.3569599	0.6551103
259	410379602007015	Block 7015	42.175983	-120.3520671	1.863668353	2.231273008	4.0949414	1.642372	1.9663264	3.6086984	1.639827	1.9632794	3.6031064
260	410379602007016	Block 7016	42.1759865	-120.3507969	1.863668352	2.231273008	4.0949414	1.642372	1.9663264	3.6086984	1.639827	1.9632794	3.6031064
261	410379602007017	Block 7017	42.1759751	-120.3494729	2.033092748	2.434116008	4.4672088	1.7916786	2.1450834	3.9367619	1.7889022	2.1417594	3.9306616
262	410379602007018	Block 7018	42.1759774	-120.3480981	2.710790331	3.245488011	5.9562783	2.3889047	2.8601112	5.2490159	2.3852029	2.8556792	5.2408821
263	410379602007019	Block 7019	42.1759809	-120.3467028	3.219063518	3.854017014	7.0730805	2.8368244	3.396382	6.2332064	2.8324285	3.391119	6.2235475
264	410379602007020	Block 7020	42.177467	-120.3465208	0.338848791	0.405686001	0.7445348	0.2986131	0.3575139	0.656127	0.2981504	0.3569599	0.6551103
265	410379602007021	Block 7021	42.1776358	-120.3453587	2.033092748	2.434116009	4.4672088	1.7916786	2.1450834	3.9367619	1.7889022	2.1417594	3.9306616
266	410379602007022	Block 7022	42.1759503	-120.3453595	1.694243957	2.028430007	3.722674	1.4930655	1.7875695	3.2806349	1.4907518	1.7847995	3.2755513
267	410379602007023	Block 7023	42.1740884	-120.3454329	1.524819561	1.825587006	3.3504066	1.3437589	1.6088125	2.9525715	1.3416766	1.6063195	2.9479962
268	410379602007024	Block 7024	42.17462	-120.3463563	2.371941539	2.83980201	5.2117435	2.0902917	2.5025973	4.5928889	2.0870526	2.4987193	4.5857718
269	410379602007025	Block 7025	42.1740194	-120.3469370	0.508273187	0.608529002	1.1168022	0.4479196	0.5362708	0.9841905	0.4472255	0.5354398	0.9826654
270	410379602007026	Block 7026	42.1741702	-120.3481021	1.016546374	1.217058004	2.2336044	0.8958393	1.0725417	1.968381	0.8944511	1.0708797	1.9653308
271	410379602007027	Block 7027	42.1741684	-120.3494728	2.033092748	2.434116008	4.4672088	1.7916786	2.1450834	3.9367619	1.7889022	2.1417594	3.9306616
272	410379602007028	Block 7028	42.1692892	-120.3510239	4.405034287	5.273918018	9.6789523	3.8819702	4.6476807	8.5296509	3.8759547	4.6404786	8.5164334
273	410379602007037	Block 7037	42.1724963	-120.3460548	0.169424396	0.202843001	0.3722674	0.1493065	0.1787569	0.3280635	0.1490752	0.1784799	0.3275551
274	410379602007038	Block 7038	42.1678765	-120.3461161	0.508273187	0.608529002	1.1168022	0.4479196	0.5362708	0.9841905	0.4472255	0.5354398	0.9826654
275	410379602007039	Block 7039	42.1783265	-120.3501069	1.355395165	1.622744005	2.9781392	1.1944524	1.4300556	2.624508	1.1926015	1.4278396	2.620441
276							--------			--------			--------
277	*QC Check*						*946.7*	*423.0*	*411.2*	*834.2*	*422.4*	*410.6*	*833.0*
278	*Table 2.4.5*						*946.7*						
279													

Lakeview PM2.5 RWC Emissions:
Prep for Rollback Model Input

						Distance Weighted Emissions (Q/D^2 or Q/D)																			
							Base Year (2011)		D19				D20				D21				D22			
				0.5 km limit					2017		2019		2017		2019		2017		2019		2017		2019	
Census Block	Centroid LAT_DD	Centroid LONG_DD	dist km	dist km	D^2	Distance Wt	Primary (lbs/day)	Backup (lbs/day)	Primary (lbs/day)	Backup (lbs/day)	Primary (lbs/day)	Backup (lbs/day)	Primary (lbs/day)	Backup (lbs/day)	Primary (lbs/day)	Backup (lbs/day)	Primary (lbs/day)	Backup (lbs/day)	Primary (lbs/day)	Backup (lbs/day)	Primary (lbs/day)	Backup (lbs/day)	Primary (lbs/day)	Backup (lbs/day)
6148	42.081952	-120.5110202	17.62	17.62	310.63	Q/D^2	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001
6152	42.058213	-120.5214576	20.09	20.09	403.66	Q/D^2	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6154	42.178126	-120.4526528	8.25	8.25	67.99	Q/D^2	0.001	0.003	0.001	0.003	0.001	0.003	0.001	0.003	0.001	0.003	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002
6155	42.176658	-120.4587000	8.77	8.77	76.83	Q/D^2	0.005	0.013	0.004	0.013	0.004	0.013	0.004	0.012	0.004	0.012	0.003	0.010	0.003	0.010	0.002	0.007	0.002	0.007
6156	42.133315	-120.3322980	6.46	6.46	41.77	Q/D^2	0.017	0.049	0.016	0.047	0.016	0.047	0.015	0.044	0.015	0.044	0.013	0.038	0.013	0.037	0.009	0.025	0.009	0.025
6159	42.096134	-120.2981565	11.32	11.32	128.23	Q/D^2	0.004	0.011	0.004	0.011	0.004	0.011	0.003	0.010	0.003	0.010	0.003	0.009	0.003	0.008	0.002	0.006	0.002	0.006
6163	42.070004	-120.3129989	13.67	13.67	186.86	Q/D^2	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001
6164	42.105861	-120.3240276	9.58	9.58	91.87	Q/D^2	0.002	0.007	0.002	0.006	0.002	0.006	0.002	0.006	0.002	0.006	0.002	0.005	0.002	0.005	0.001	0.003	0.001	0.003
6165	42.092238	-120.3236132	11.06	11.06	122.37	Q/D^2	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001
6166	42.075379	-120.3220052	12.92	12.92	166.93	Q/D^2	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001
6169	42.067854	-120.3082588	14.00	14.00	196.08	Q/D^2	0.001	0.004	0.001	0.004	0.001	0.004	0.001	0.004	0.001	0.004	0.001	0.003	0.001	0.003	0.001	0.002	0.001	0.002
6170	41.999053	-120.5008544	24.37	24.37	593.96	Q/D^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6175	42.057498	-120.2904735	15.55	15.55	241.70	Q/D^2	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000
6184	41.993567	-120.2963907	22.25	22.25	495.15	Q/D^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6185	41.993651	-120.2989167	22.20	22.20	492.78	Q/D^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6207	42.186018	-120.3427849	0.99	0.99	0.98	Q/D^2	2.367	6.959	2.241	6.590	2.238	6.580	2.107	6.195	2.104	6.185	1.795	5.278	1.778	5.228	1.214	3.570	1.212	3.565
6211	42.177077	-120.3434719	1.60	1.60	2.57	Q/D^2	0.055	0.161	0.052	0.152	0.052	0.152	0.049	0.143	0.049	0.143	0.042	0.122	0.041	0.121	0.028	0.083	0.028	0.082
7000	42.178586	-120.3452587	1.38	1.38	1.91	Q/D^2	0.798	0.956	0.756	0.905	0.755	0.904	0.711	0.851	0.710	0.850	0.606	0.725	0.600	0.718	0.410	0.490	0.409	0.490
7001	42.178256	-120.3468619	1.35	1.35	1.83	Q/D^2	0.371	0.444	0.352	0.421	0.351	0.420	0.330	0.396	0.330	0.395	0.282	0.337	0.279	0.334	0.190	0.228	0.190	0.228
7002	42.177827	-120.3480787	1.36	1.36	1.84	Q/D^2	1.753	2.098	1.660	1.987	1.657	1.984	1.560	1.868	1.558	1.865	1.329	1.592	1.317	1.577	0.899	1.077	0.898	1.075
7003	42.177763	-120.3500989	1.31	1.31	1.72	Q/D^2	2.760	3.304	2.614	3.129	2.610	3.124	2.457	2.941	2.453	2.937	2.093	2.506	2.073	2.482	1.416	1.695	1.414	1.692
7004	42.177838	-120.3520662	1.27	1.27	1.62	Q/D^2	0.836	1.001	0.792	0.948	0.790	0.946	0.744	0.891	0.743	0.890	0.634	0.759	0.628	0.752	0.429	0.513	0.428	0.513
7005	42.177802	-120.3531695	1.27	1.27	1.61	Q/D^2	0.210	0.252	0.199	0.238	0.199	0.238	0.187	0.224	0.187	0.224	0.160	0.191	0.158	0.189	0.108	0.129	0.108	0.129
7006	42.177806	-120.3542946	1.27	1.27	1.61	Q/D^2	0.633	0.758	0.600	0.718	0.599	0.717	0.564	0.675	0.563	0.674	0.480	0.575	0.476	0.570	0.325	0.389	0.324	0.388
7013	42.176373	-120.3543204	1.43	1.43	2.03	Q/D^2	0.083	0.100	0.079	0.094	0.079	0.094	0.074	0.089	0.074	0.089	0.063	0.076	0.063	0.075	0.043	0.051	0.043	0.051
7014	42.175987	-120.3531850	1.47	1.47	2.16	Q/D^2	0.157	0.188	0.148	0.178	0.148	0.177	0.140	0.167	0.139	0.167	0.119	0.142	0.118	0.141	0.080	0.096	0.080	0.096
7015	42.175983	-120.3520671	1.48	1.48	2.18	Q/D^2	0.853	1.021	0.808	0.967	0.807	0.966	0.760	0.909	0.758	0.908	0.647	0.775	0.641	0.767	0.438	0.524	0.437	0.523
7016	42.175987	-120.3507969	1.49	1.49	2.23	Q/D^2	0.837	1.002	0.793	0.949	0.792	0.948	0.745	0.892	0.744	0.891	0.635	0.760	0.629	0.753	0.429	0.514	0.429	0.513
7017	42.175975	-120.3494729	1.52	1.52	2.30	Q/D^2	0.884	1.058	0.837	1.002	0.836	1.001	0.787	0.942	0.786	0.941	0.671	0.803	0.664	0.795	0.454	0.543	0.453	0.542
7018	42.175977	-120.3480981	1.55	1.55	2.40	Q/D^2	1.131	1.355	1.071	1.283	1.070	1.281	1.007	1.206	1.006	1.204	0.858	1.027	0.850	1.018	0.580	0.695	0.580	0.694
7019	42.175981	-120.3467028	1.59	1.59	2.52	Q/D^2	1.277	1.529	1.210	1.449	1.208	1.446	1.137	1.362	1.136	1.360	0.969	1.160	0.960	1.149	0.655	0.785	0.654	0.783
7020	42.177467	-120.3465208	1.44	1.44	2.08	Q/D^2	0.163	0.195	0.154	0.185	0.154	0.184	0.145	0.174	0.145	0.173	0.123	0.148	0.122	0.146	0.084	0.100	0.083	0.100
7021	42.177636	-120.3453587	1.47	1.47	2.16	Q/D^2	0.942	1.127	0.892	1.068	0.890	1.066	0.838	1.004	0.837	1.002	0.714	0.855	0.707	0.847	0.483	0.578	0.482	0.577
7022	42.17595	-120.3453595	1.64	1.64	2.68	Q/D^2	0.633	0.758	0.600	0.718	0.599	0.717	0.564	0.675	0.563	0.674	0.480	0.575	0.476	0.570	0.325	0.389	0.324	0.388
7023	42.174088	-120.3454329	1.82	1.82	3.32	Q/D^2	0.459	0.550	0.435	0.521	0.434	0.520	0.409	0.490	0.408	0.489	0.348	0.417	0.345	0.413	0.236	0.282	0.235	0.282
7024	42.17462	-120.3463563	1.74	1.74	3.02	Q/D^2	0.784	0.939	0.743	0.889	0.742	0.888	0.698	0.836	0.697	0.835	0.595	0.712	0.589	0.705	0.402	0.482	0.402	0.481
7025	42.174019	-120.3469370	1.79	1.79	3.19	Q/D^2	0.159	0.191	0.151	0.181	0.151	0.181	0.142	0.170	0.142	0.170	0.121	0.145	0.120	0.143	0.082	0.098	0.082	0.098
7026	42.17417	-120.3481021	1.74	1.74	3.03	Q/D^2	0.336	0.402	0.318	0.381	0.318	0.380	0.299	0.358	0.298	0.357	0.255	0.305	0.252	0.302	0.172	0.206	0.172	0.206
7027	42.174168	-120.3494728	1.71	1.71	2.93	Q/D^2	0.693	0.830	0.657	0.786	0.656	0.785	0.617	0.739	0.616	0.738	0.526	0.630	0.521	0.624	0.356	0.426	0.355	0.425
7028	42.169289	-120.3510239	2.23	2.23	4.96	Q/D^2	0.888	1.063	0.841	1.007	0.840	1.006	0.791	0.947	0.790	0.945	0.674	0.807	0.667	0.799	0.456	0.546	0.455	0.545
7037	42.172496	-120.3460548	1.97	1.97	3.88	Q/D^2	0.044	0.052	0.041	0.050	0.041	0.049	0.039	0.047	0.039	0.046	0.033	0.040	0.033	0.039	0.022	0.027	0.022	0.027
7038	42.167877	-120.3461161	2.46	2.46	6.04	Q/D^2	0.084	0.101	0.080	0.095	0.080	0.095	0.075	0.090	0.075	0.090	0.064	0.076	0.063	0.076	0.043	0.052	0.043	0.052
7039	42.178327	-120.3501069	1.25	1.25	1.57	Q/D^2	0.806	1.037	0.820	0.982	0.819	0.980	0.771	0.923	0.770	0.922	0.657	0.787	0.651	0.779	0.444	0.532	0.444	0.531
		Total					644.534	568.649	615.720	538.559	514.921	537.725	484.777	506.246	484.026	505.461	413.054	431.346	409.113	427.231	279.373	291.745	278.940	291.293

Emission Category	DV = 47 100% PM2.5 ug/m3
Background	***5.0***
Other	*0.0*
Total Bkg+Other	*5.0*
Calculated DV Mass	*47.0*
Net Mass for Rollback	***42.0***
Total Roll + Non-roll	*47.0*

Lakeview PM2.5 Rollback Model

Rollback: proportional relationship between emissions and concentrations
Thus,

Reductions in emissions gives reductions in concentrations!

2011																
		Design Day					Distance			Effective Emissions (Q/D^2)				Total		Effective
DEQ ID	Source Category (3)	Points lbs/day	UBG lbs/day	SPZ lbs/day	Blocks lbs/day	Total lbs/day	Points km	UBG km	SPZ km	Points lbs/day	UBG lbs/day	SPZ lbs/day	Blocks lbs/day	Effective Emissions lbs/day	%	Conc ug/m3
1	Waste Disposal: Open Burning		25.95	8.34		34.29		1.2	4.8		17.81	0.36		18.2	1.5%	0.63
2	Small Stationary Fossil Fuel Combustion		3.54	0.819		4.36		1.2	4.8		2.43	0.04		2.5	0.2%	0.09
3	Residential Wood Heating-Primary				480.01	480.01							544.5	544.5	45.3%	19.02
4	Residential Wood Heating-Secondary				466.65	466.65							568.6	568.6	47.3%	19.86
5	Prescribed Burns-Aermod modeled impacts															
	Prescribed Burns-dist weighting (not used)			*100*					*8.0*			*1.54*		*1.5*	*0.1%*	*0.05*
6	Other Burning/Cooking		1.96			1.96		1.2	8.0		1.35			1.3	0.1%	0.05
7	Fugitive Dust (road agg piles, sanding, dust)		7.82	147.76		155.58		1.2	8.0		5.37	2.28		7.7	0.6%	0.27
8	Nonroad: vehicles and equipment		1.98	5.97		7.95		1.2	8.0		1.36	0.09		1.4	0.1%	0.05
9	Aircraft		0.00	0.22		0.22			4.0			0.01		0.0	0.0%	0.00
10	Rail		0.90	2.52		3.42		1.2	8.0		0.62	0.04		0.7	0.1%	0.02
11	Marine		0.00	22.96		22.96			14.0			0.12		0.1	0.0%	0.00
19	On-road Mobile		1.51	32.50		34.01		1.2	8.0		1.03	0.50		1.5	0.1%	0.05
20	Permitted Point: Cornerstone	23				23.00	2			5.8				5.8	0.5%	0.20
21	Permitted Point: Collins	95				95.00	1.4			48.5				48.5	4.0%	1.69
	Total Points					118										
	Total RWH					946.66										
	Total Area					382.74										
	Total					1447.40				54.2	30.0	5.0		1202.4	100.0%	**42.0**
	Background															5.0
	Total + Background															**47.0**

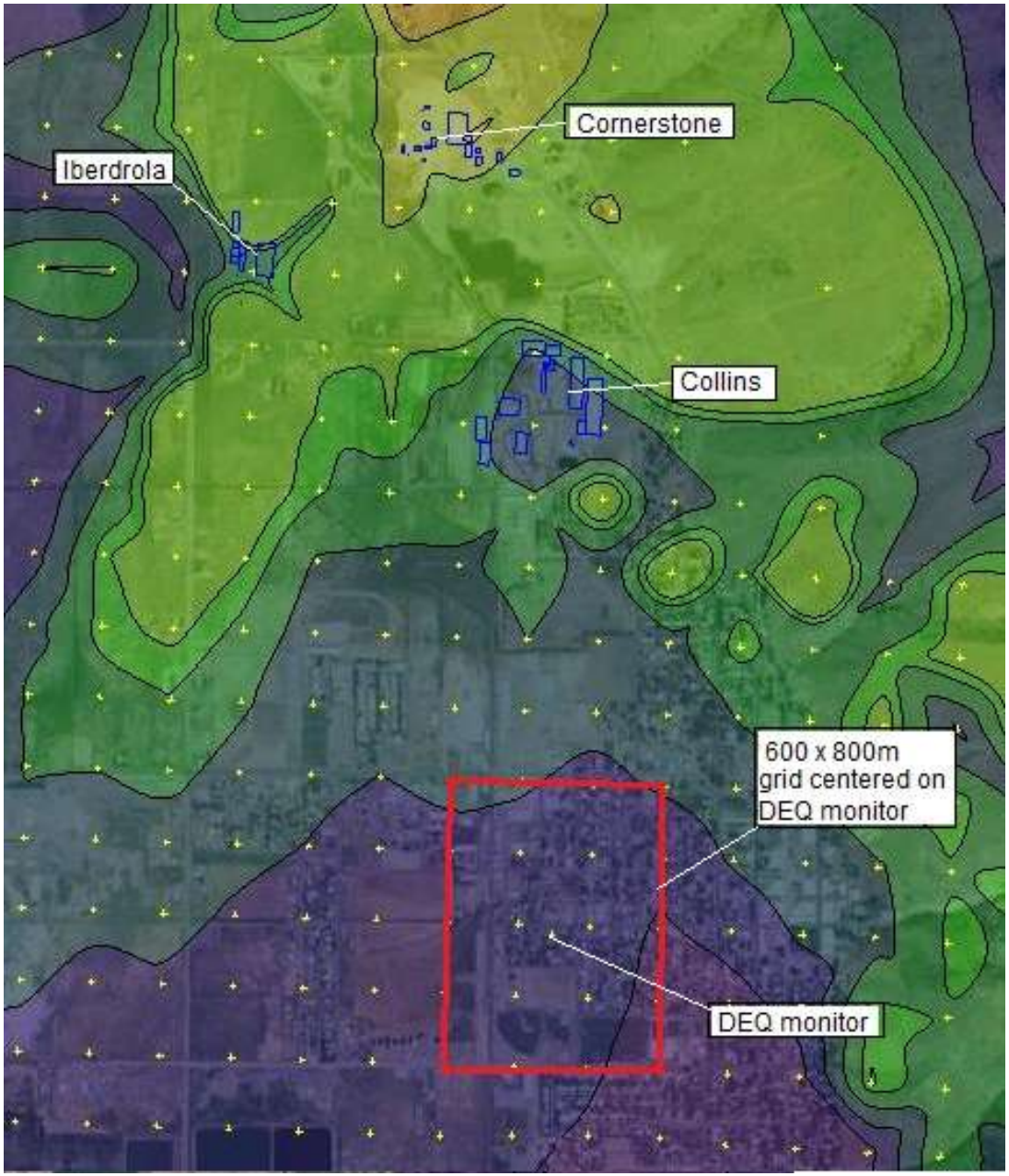
Dispersion Modeling of Industrial Sources

1. AERMOD modeling of 2019 industrial sources

2. Modeled concentrations averaged over a 600x800 meter grid centered on the DEQ monitor.

3. Grid provides a fairly robust average of concentrations at the monitor.

Lakeview PM2.5 Attainment Study Area



Lakeview PM2.5 Industrial Source Modeling : Scenario 2

Summary_98+100th%tiles: Industrial Scenario 2

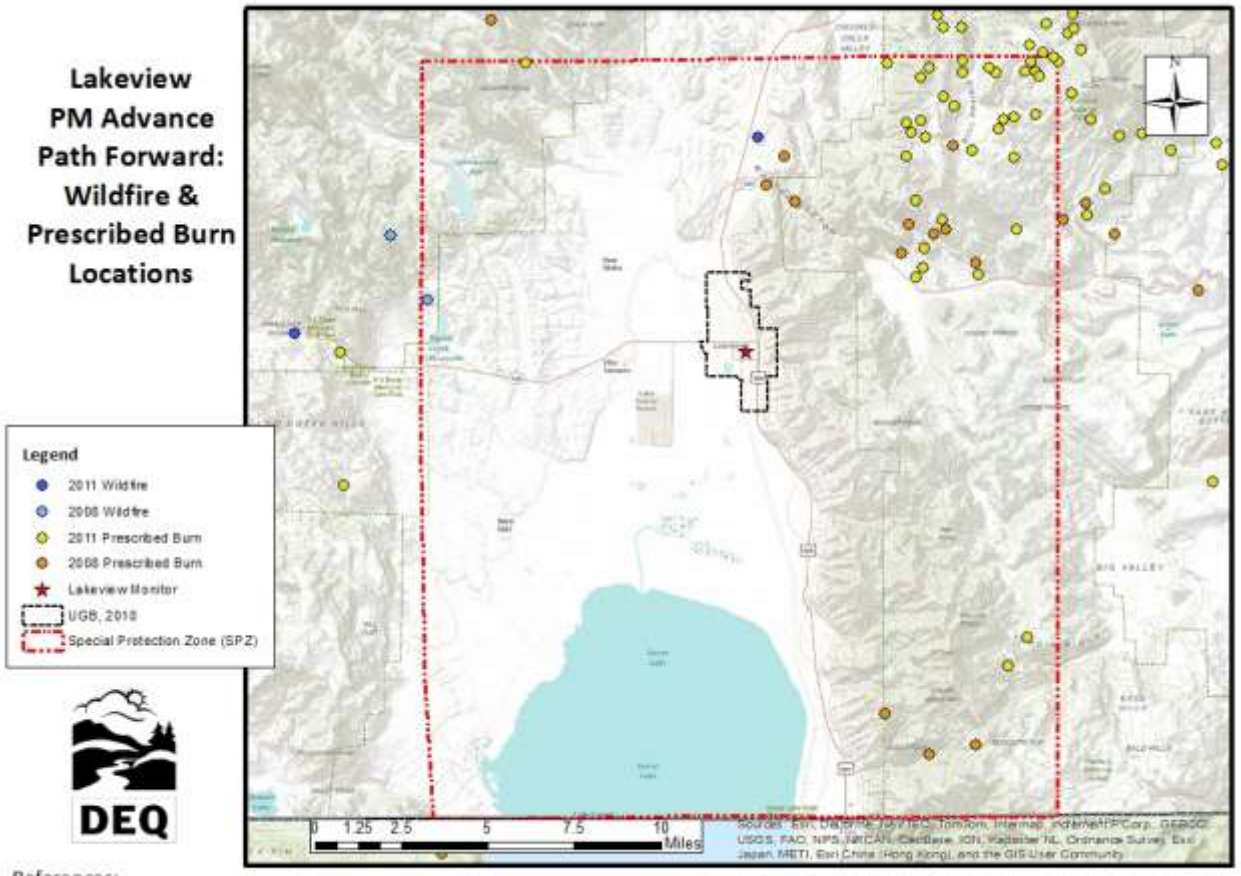
98th %tile 600 x 800 m box surrounding Lakeview Monitor

Recpt ID	x	y	2009 ug/m3	2008 ug/m3	2007 ug/m3	2006 ug/m3	2004 ug/m3	5-year avg ug/m3
159	718200	4674600	1.0444	1.05517	1.15902	0.9592	1.1042	1.064
160	718400	4674600	1.12722	0.99302	1.16739	0.98088	1.10693	1.075
161	718600	4674600	1.05455	0.7827	0.98562	0.889	0.84915	0.912
162	718800	4674600	1.15924	0.67578	0.61661	0.80305	0.70243	0.791
176	718200	4674400	0.96052	0.8696	0.96212	0.77254	0.92324	0.898
177	718400	4674400	0.92173	0.84129	0.96677	0.84014	0.88057	0.890
178	718600	4674400	0.79174	0.64517	0.84526	0.76877	0.71895	0.754
179	718800	4674400	0.96613	0.55263	0.57652	0.6487	0.64111	0.677
193	718200	4674200	0.81904	0.7236	0.80382	0.63704	0.84194	0.765
194	718400	4674200	0.77471	0.70052	0.78801	0.71203	0.69775	0.735
195	718600	4674200	0.64944	0.55704	0.736	0.67878	0.64203	0.653
196	718800	4674200	0.78369	0.50681	0.53828	0.55322	0.56596	0.590
209	718200	4674000	0.71088	0.609	0.67628	0.55897	0.74619	0.660
210	718400	4674000	0.67932	0.58608	0.66211	0.59896	0.59102	0.623
211	718600	4674000	0.61101	0.51157	0.63392	0.61349	0.58863	0.592
212	718800	4674000	0.66103	0.46554	0.50385	0.51015	0.50323	0.529
225	718200	4673800	0.6226	0.54823	0.57917	0.51143	0.67281	0.587
226	718400	4673800	0.60391	0.51994	0.61309	0.5263	0.51725	0.556
227	718600	4673800	0.5284	0.47585	0.55449	0.53088	0.54031	0.526
228	718800	4673800	0.55636	0.44528	0.45574	0.4615	0.49145	0.482
281	718495	4674174	0.69831	0.67786	0.75992	0.65597	0.64147	0.687
		Average =	0.796	0.654	0.742	0.677	0.713	**0.716**

If DV = 47 ug/m3 = 42 + 5 (background)

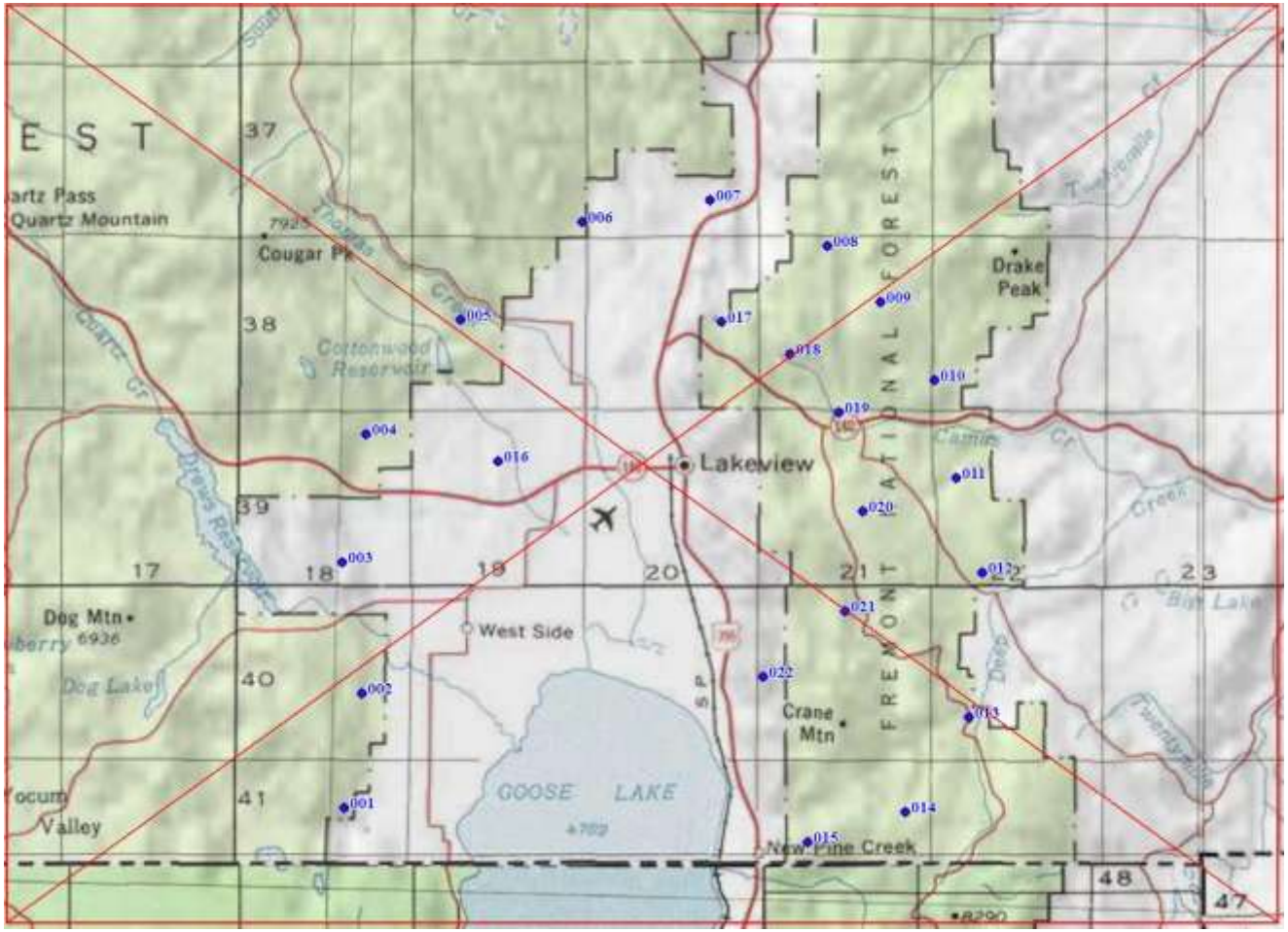
then Industrial component = 0.716/42 = **1.7%**

Lakeview PM2.5 Prescribed Burning Locations



References:
DEQ GIS files
EPA Smartfire Data

Lakeview PM2.5 Attainment Study Area



Lakeview PM2.5: Prescribed Burning Modeled Impacts

	Maximum 24-hr avg @ 1 g/s emit rate						Emit at			as % of 47 ug/m3		
			Year				95%tile	90%tile	Mean			
Fire	2004	2006	2007	2008	2009	Avg	**1991.2**	**338.4**	**328.4**	95%tile	90%tile	Mean
Location	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	%	%	%
1	0.00503	0.00357	0.00475	0.00606	0.00399	0.00468	9.32	1.58	1.54	19.8%	3.4%	3.3%
2	0.00442	0.00482	0.00372	0.00382	0.00462	0.00428	8.52	1.45	1.40	18.1%	3.1%	3.0%
3	0.00377	0.00432	0.00341	0.00552	0.00611	0.00463	9.21	1.57	1.52	19.6%	3.3%	3.2%
4	0.00359	0.00481	0.00708	0.00485	0.00710	0.00548	10.92	1.86	1.80	23.2%	3.9%	3.8%
5	0.00382	0.00290	0.00375	0.00337	0.00417	0.00360	7.17	1.22	1.18	15.3%	2.6%	2.5%
6	0.00411	0.00442	0.00287	0.00275	0.00497	0.00382	7.61	1.29	1.26	16.2%	2.8%	2.7%
7	0.00739	0.00413	0.00559	0.00632	0.00354	0.00540	10.74	1.83	1.77	22.9%	3.9%	3.8%
8	0.00278	0.00209	0.00226	0.00412	0.00170	0.00259	5.16	0.88	0.85	11.0%	1.9%	1.8%
9	0.00174	0.00170	0.00243	0.00291	0.00215	0.00219	4.36	0.74	0.72	9.3%	1.6%	1.5%
10	0.00142	0.00390	0.00233	0.00199	0.00197	0.00232	4.63	0.79	0.76	9.8%	1.7%	1.6%
11	0.00340	0.00580	0.00567	0.00364	0.00294	0.00429	8.54	1.45	1.41	18.2%	3.1%	3.0%
12	0.00135	0.00186	0.00234	0.00129	0.00331	0.00203	4.04	0.69	0.67	8.6%	1.5%	1.4%
13	0.00134	0.00183	0.00207	0.00131	0.00257	0.00182	3.63	0.62	0.60	7.7%	1.3%	1.3%
14	0.00161	0.00187	0.00308	0.00250	0.00360	0.00253	5.04	0.86	0.83	10.7%	1.8%	1.8%
15	0.00331	0.00347	0.00384	0.00388	0.00499	0.00390	7.76	1.32	1.28	16.5%	2.8%	2.7%
16	0.00460	0.00518	0.01061	0.00767	0.00916	0.00745	14.83	2.52	2.45	31.5%	5.4%	5.2%
17	0.00414	0.00503	0.00308	0.00357	0.00348	0.00386	7.68	1.31	1.27	16.3%	2.8%	2.7%
18	0.00203	0.00145	0.00254	0.00313	0.00228	0.00229	4.55	0.77	0.75	9.7%	1.6%	1.6%
19	0.00171	0.00397	0.00294	0.00193	0.00223	0.00256	5.09	0.87	0.84	10.8%	1.8%	1.8%
20	0.00176	0.00202	0.00295	0.00154	0.00282	0.00222	4.42	0.75	0.73	9.4%	1.6%	1.5%
21	0.00205	0.00236	0.00298	0.00188	0.00331	0.00252	5.01	0.85	0.83	10.7%	1.8%	1.8%
22	0.00409	0.00477	0.00488	0.00430	0.00700	0.00501	9.97	1.69	1.64	21.2%	3.6%	3.5%
Avg	0.00316	0.00347	0.00387	0.00356	0.00400	0.00361	7.19	1.22	**1.19**	15.3%	2.6%	**2.5%**

Lakeview RWC Emission Reduction Strategies

D19	*No scenario, no 6% pub ed reduction*
D20	*6% pub ed reduction*
D21	*Replace Non-cert with Cert + 6%*
D22	*Replace Non-cert with Electric + 6%*
D23	*Mandatory Advisory + 6%*
D24	*No FP-WS in new const + 6%*
D25	*Highest standard WS in new/existing house + 6%*
D26	*Ban use of fireplaces during heating season + 6%*
D27	*Ban uncert WS except low-income wood primary + 6%*
D28a	*Replace all wood heating with NG + 6%*
D28b	*Replace all wood heating with distillate oil + 6%*
D29	*Ban open burning in UGB + 6%*
D30	*Eliminate WS and inserts for renters + 6%*
D31	*Eliminate WS and inserts for low-income HU +6%*
D32	*Trigger for red-day enforcement calls is 30 ug/m^3 + 6%*
D33	*Additional 8 uncertified WS changed out in 2013 +6%*
D34	*Weatherization of 20 homes upon WS changeout in 2013 + 6%*
D35	Ban UGB open burn + Weatherization + 6 %

Lakeview PM2.5 Rollback Model Results: Scenarios 19-35

2019 Effective Concentrations
Table D Scenarios

DEQ ID	Source Category	19 ug/m3	20 ug/m3	21 ug/m3	22 ug/m3	23 ug/m3	24 ug/m3	25 ug/m3	26 ug/m3	27 ug/m3	28a ug/m3	28b ug/m3	29 ug/m3	30 ug/m3	30a ug/m3	31 ug/m3	32 ug/m3	33 ug/m3	34 ug/m3	35 ug/m3
1	Waste Disposal: Open Burning	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.14	0.66	0.66	0.66	0.66	0.66	0.66	0.14
2	Small Stationary Fossil Fuel Combustion	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
3	Residential Wood Heating-Primary	18.14	17.05	14.42	9.83	12.15	17.04	16.95	16.01	10.96	0.01	0.18	17.05	11.60	16.73	11.11	16.69	16.94	16.88	16.88
4	Residential Wood Heating-Secondary	18.95	17.81	15.05	10.26	12.69	17.79	17.70	16.72	11.44	0.01	0.18	17.81	12.11	17.47	11.60	17.43	17.69	17.63	17.63
5	Other Burning/Cooking	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
6	Fugitive Dust (road agg piles, sanding, dust)	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
7	Nonroad: vehicles and equipment	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
8	Aircraft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Rail	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
10	Marine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	On-road Mobile	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Prescribed Burns-Aermod modeled impacts	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19
	S1_Permitted: Collins (no boil)+Cornerstone+Iber	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
	S2_Permitted: Collins+Cornerstone	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
	S3_Permitted: Collins (w/ boil)+Cornerstone+Iber	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
	S1 Total	**39.8**	**37.5**	**32.1**	**22.8**	**27.5**	**37.5**	**37.3**	**35.4**	**25.1**	**2.7**	**3.0**	**37.0**	**26.4**	**36.9**	**25.4**	**36.8**	**37.3**	**37.2**	**36.7**
	Background	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	Total + Background	**44.8**	**42.5**	**37.1**	**27.8**	**32.5**	**42.5**	**42.3**	**40.4**	**30.1**	**7.7**	**8.0**	**42.0**	**31.4**	**41.9**	**30.4**	**41.8**	**42.3**	**42.2**	**41.7**
	Net reduction from Strategy	2.2	4.5	9.9	19.2	14.5	4.5	4.7	6.6	16.9	39.3	39.0	5.0	15.6	5.1	16.6	5.2	4.7	4.8	5.3
	Net reduction from Strategy no 6%	2.2	**4.5**	5.4	14.8	**10.0**	0.0	0.2	2.1	12.5	34.9	34.5	**0.5**	11.2	0.7	12.1	**0.7**	0.2	**0.4**	**0.9**
	Reduction as % of DV	4.8%	9.6%	11.5%	31.4%	21.3%	0.1%	0.5%	4.6%	26.5%	74.2%	73.4%	1.1%	23.7%	1.4%	25.8%	1.6%	0.5%	0.8%	1.9%
	S2 Total	**40.2**	**38.0**	**32.6**	**23.2**	**28.0**	**37.9**	**37.8**	**35.8**	**25.5**	**3.1**	**3.5**	**37.5**	**26.8**	**37.3**	**25.8**	**37.2**	**37.7**	**37.6**	**37.1**
	Background	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	Total + Background	**45.2**	**43.0**	**37.6**	**28.2**	**33.0**	**42.9**	**42.8**	**40.8**	**30.5**	**8.1**	**8.5**	**42.5**	**31.8**	**42.3**	**30.8**	**42.2**	**42.7**	**42.6**	**42.1**
	Net reduction from Strategy	1.8	4.0	9.4	18.8	14.0	4.1	4.2	6.2	16.5	38.9	38.5	4.5	15.2	4.7	16.2	4.8	4.3	4.4	4.9
	Net reduction from Strategy no 6%	1.8	**4.0**	5.4	14.8	**10.0**	0.0	0.2	2.1	12.5	34.9	34.5	**0.5**	11.2	0.7	12.1	**0.7**	0.2	**0.4**	**0.9**
	Reduction as % of DV	3.8%	8.5%	11.5%	31.4%	21.3%	0.1%	0.5%	4.6%	26.5%	74.2%	73.4%	1.1%	23.7%	1.4%	25.8%	1.6%	0.5%	0.8%	1.9%

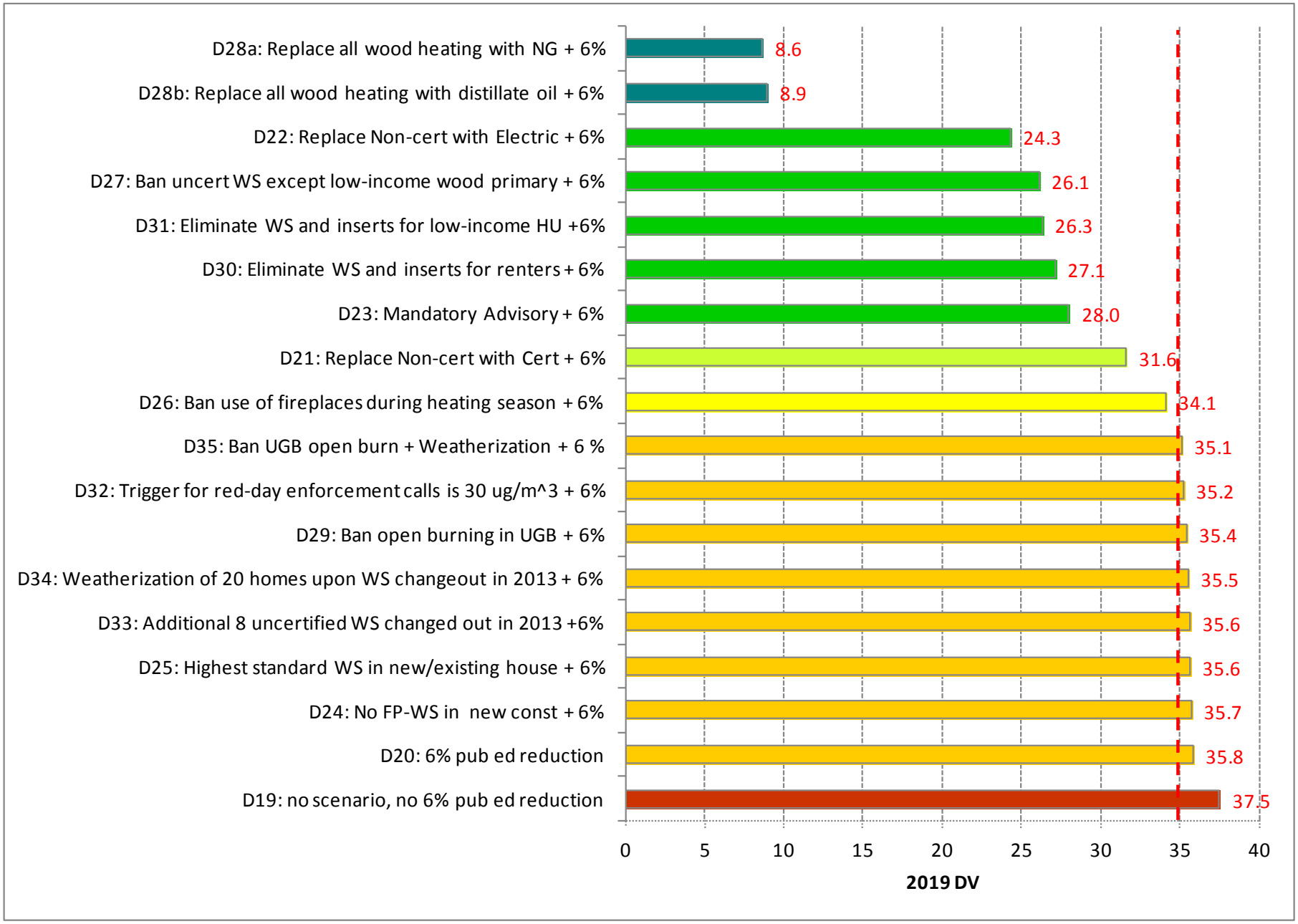
pallen: RWH concentrations same as Scenario 20 which only has reductions from 6% public

pallen: Reflects reduction from UGB open burn ban from Scenario 29.

pallen: 1.19 ug/m3 is mean of 98th%tile modeled concentrations on a grid centered on the DEQ monitor of 22 hypothetical prescribed fires over 5 years of met.

pallen: Industrial impacts are mean of 98th%tile modeled concentratinsat on a grid centered on the DEQ monitor over 5 years of met

Lakeview Rollback Results



Lakeview PM2.5 Rollback Model Results: Summary of Reduction Scenarios

Assumed Reductions in 2019 (ug/m3)						
	Increased Public Education	**Mandatory WS Curtailment + 30ug/m3 trigger**		**Weatherization of Homes**	**No Open Burning in UGB during Heating Season**	
Rollback Scenarios:	D20	D23	+D32	D34	D35	- D34
Component Reductions	4.0	10.0	0.7	0.4	0.9	0.4
Total Reductions	**4.0**	**10.7**		**0.4**	**0.5**	
Based on S2 Industrial Source configuration						

Scenario Reductions as presented to Lakeview Commissioners

Potential Reduction Strategy Scenarios	(ug/m^3) reduction
Scenario 1: Mandatory Woodstove Curtailment Advisory + Public Awareness	13
Scenario 2: Ban fireplaces during heating season + Public Awareness *If mandatory curtailment is added to this scenario, the emissions reduction would increase to 15 ug/m^3*	5
Scenario 3: Ban all uncertified stoves except low income + Public Awareness *If mandatory curtailment is added to this scenario, the emissions reduction would increase to 25 ug/m^3*	15
Scenario 4: Replace Remaining Uncertified Woodstoves with Certified Woodstoves + Public Awareness *If mandatory curtailment is added to this scenario, the emissions reduction would increase to 19 ug/m^3*	9
Other options identified by the community	DEQ calculate the reduction

The Case by the Mayor the Commissioners

- In a recent Lakeview survey, about 80% of people suggested there was no air quality problem
- Others said there was a problem but that it was caused by forest burning
- **But,** wood smoke pollution is the biggest cause of the air quality problem in Lakeview

What about other pollution sources?

- **Wildfires --** forest fires occur in summer, air is dispersed
- **Prescribed burns –** we are working with state and federal forestry agencies and the forestry industry to limit impacts of prescribed burns on red and yellow days.
  - A formal Agreement has been signed by USFS, the County and the Town Council.
  - Collins is working with the Town Council and County to finalize a MOU.
  - The Oregon Department of Forestry will be providing more information to forest landowners and operators to enlist cooperation regarding forestland burning to better minimize smoke impacts. Goal is to voluntarily not burn on red and yellow days.

What about other pollution sources? -- continued

- **Open burning --** The Advisory Committee recommends expanding the area for restrictions on open burning so that:
  - The rules inside the Lakeview Urban Growth Boundary (UGB) are the same as the Town; and
  - There is an emphasis to voluntarily not burn outside the UGB on red and yellow days when there is an inversion and the air is stagnant. That doesn't end open burning outside the UGB. It just asks neighbors to work together to stay away from burning on those days when we are exceeding the federal standard.

If economy further declines

Advisory Committee Identified a 2-Phased Approach

- Phase 1: Implement immediately:
  - Open burning restrictions
  - Continue search for woodstove change-out funding
  - Prescribed burn agreement with the USFS
  - Public outreach to develop stronger strategies to clean up the air

- Phase 2: Implement the stronger strategies developed through the community outreach (Spring/Summer, 2014)

Lakeview Homepage

Conclusions

1. PM Advance is useful program.

2. Rollback coupled with selective dispersion modeling appears to be an effective method to evaluate emission reduction scenarios and to demonstrate attainment.

3. Based on modeling, RWC emission reductions result in a 2019 Future Year reductions of

4. Stakeholder issues are very important in implementing RWC emissions reductions and it is important start early as it will take time and there will be surprises.

Additional slides

Lakeview PM2.5 RWC Emissions

Scenarios *(Phil will need all emissions by Census block)*

(D24) Amend building codes to ban fireplaces and wood stoves in new construction

(D25) Require county building permits only for the highest standard wood stoves in new and existing residences

(D26) Ban fireplaces during the PM season

(D27) Ban uncertified devices except for low-income primary users - wood for non-wood, except primary users. (25% people there are below poverty) - use conservative

For uncertified devices - remove 69% of the emissions for uncertified primary users, and all emissions for uncertified backup users.

Results: 2019 year, 6% reduction due to public education included

Scenario	Boundary	Sheet	Row	Comment	Base	Scenario	Change	QC Check	Comment
D24	SPZ	D14_SPZ	9	Set to 0 beginning 2014	805.0	804.1	-0.1%	100%	Calculated this sheet, applied to block data
D25	SPZ	D14_SPZ	17, 32	81% reduction					Calculated this sheet, applied to block data
			23, 38	77% reduction					See the Per HU Estimates table below
			Scenario Total Reduction		805.0	799.9	-0.6%	100%	
D26	SPZ	D12_SPZ	72	Set SAF to 0	805.0	755.5	-6.1%	100%	Calculated this sheet, applied to block data
D27	SPZ	Reduction scalar applied to final block data			805.0	507.2	-37.0%	100%	See the Ban Uncertified Devices Table below

Note: The "Base" value shown here is from D9_SPZ, and does not include emissions from fireplog combustion or from outdoor hydronic heaters. Flat reductions shown in this table are applied to block dat

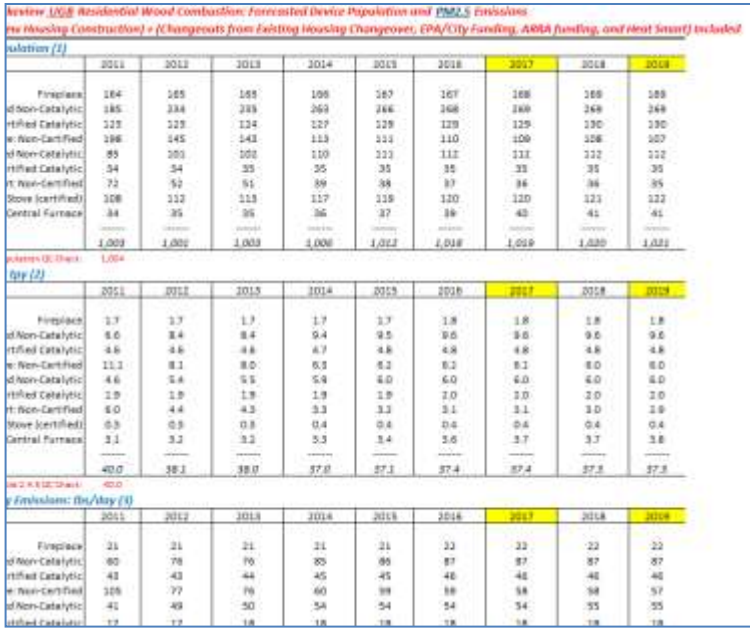
Per HU Estimates (calculation of reduction scalars for scenario 2)

	(1)	(1)	(2)	(1)	(1)	(5)	(4)	(5)	(6)		(7)	(8)	(9)
Certified Device	Emission Rate (avg. g/hr)	Emission Rate (avg. lb/hr)	Heat Output BTU/hr (avg)	Default Efficiency (avg)	Wood Heating Value (BTU/ton)	Fuel Consumption (ton/hr)	Fuel Consumption (lb/hr)	Avg. Annual Fuel Consumption (amt)	(unit)	Typical Cord Density (ton/cord)	Annual Fuel Use (ton)	Annu Device (hrs)
Catalytic	3.03	0.00668	22,187	71.9%	18,000,000	0.0017	3.4	3.5	cord	1.107	3.9	2,26
Non-Catalytic	4.13	0.00909	22,859	63.0%	18,000,000	0.0020	4.0	3.5	cord	1.107	3.9	1,92
Pellet	3.88	0.00855	20,337	78.0%	18,000,000	0.0014	2.9	2.0	ton	N/A	2.0	1,38
Avg												

Notes:

(1) Source: "List of EPA Certified Woodstoves, August 2013" (DEQ AQ-TS Ref. 896)

(2) (lb/hr) = (g/hr) * (0.002046 lb/gram)



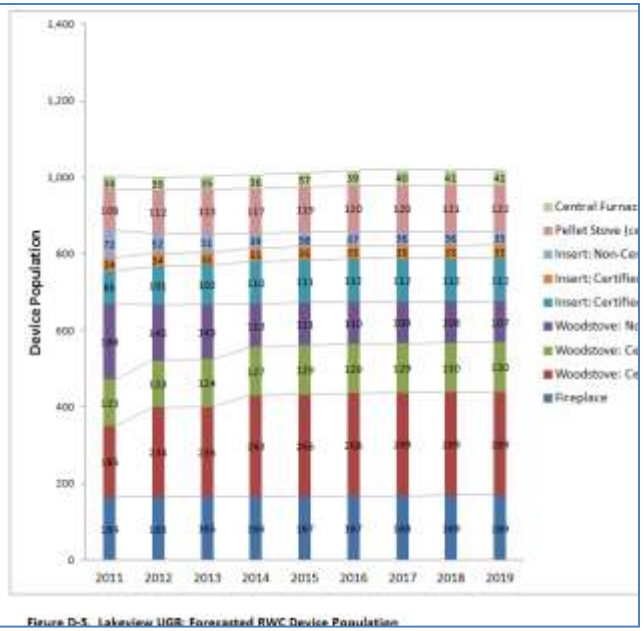


Figure D-5. Lakeview UGB: Forecasted RWC Device Population

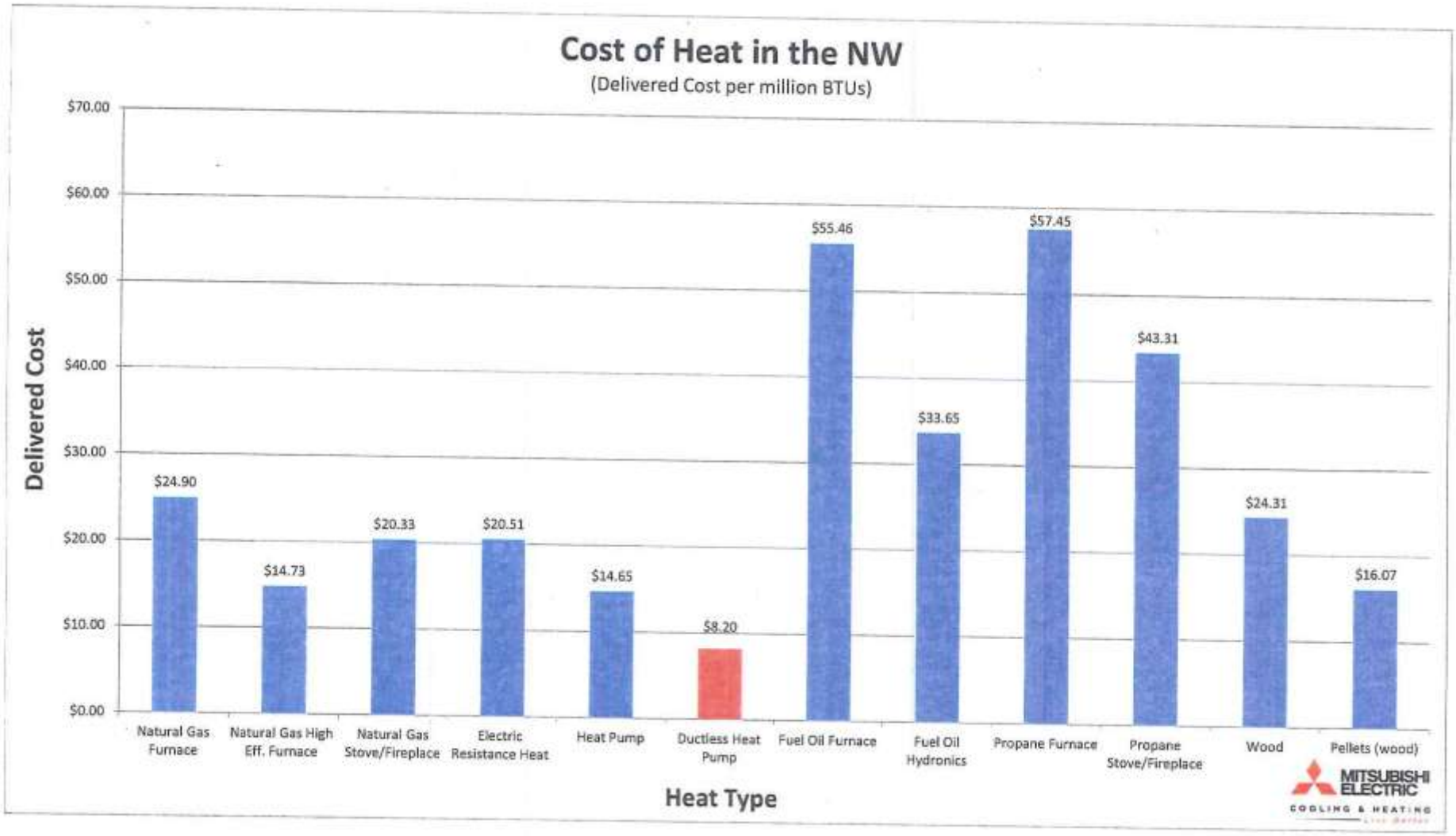
Emission Category	DV = 47 100% PM2.5 ug/m3
Background	***5.0***
Other	*0.0*
Total Bkg+Other	*5.0*
Calculated DV Mass	*47.0*
Net Mass for Rollback	***42.0***
Total Roll + Non-roll	*47.0*

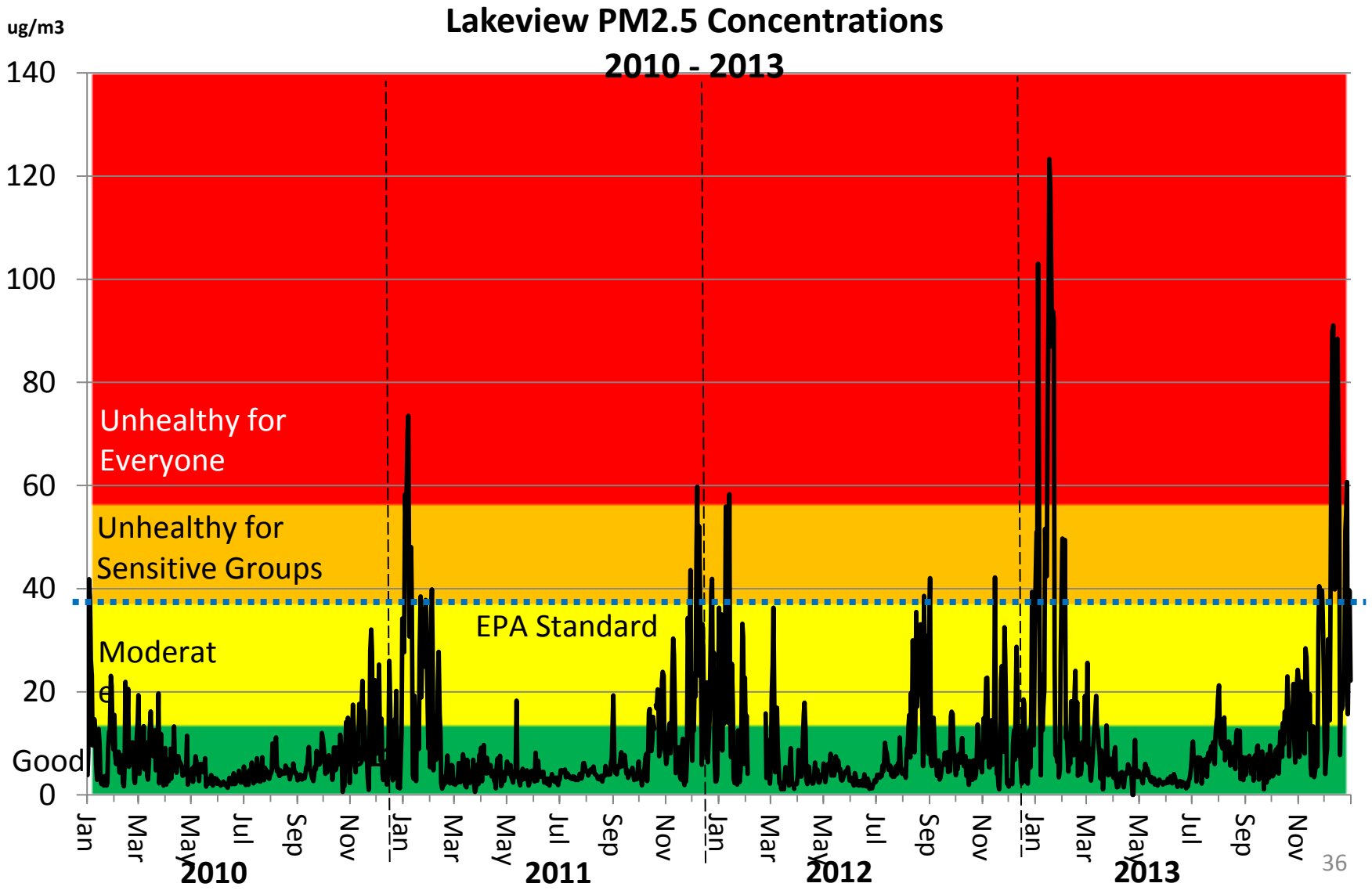
Lakeview PM2.5 Rollback Model

Rollback: proportional relationship between emissions and concentrations
Thus,

Reductions in emissions gives reductions in concentrations!

2011																
		Design Day					Distance			Effective Emissions (Q/D^2)				Total		Effective
DEQ ID	Source Category (3)	Points lbs/day	UBG lbs/day	SPZ lbs/day	Blocks lbs/day	Total lbs/day	Points km	UBG km	SPZ km	Points lbs/day	UBG lbs/day	SPZ lbs/day	Blocks lbs/day	Effective Emissions lbs/day	%	Conc ug/m3
1	Waste Disposal: Open Burning		25.95	8.34		34.29		1.2	4.8		17.81	0.36		18.2	1.5%	0.63
2	Small Stationary Fossil Fuel Combustion		3.54	0.819		4.36		1.2	4.8		2.43	0.04		2.5	0.2%	0.09
3	Residential Wood Heating-Primary				480.01	480.01							544.5	544.5	45.3%	19.02
4	Residential Wood Heating-Secondary				466.65	466.65							568.6	568.6	47.3%	19.86
5	Prescribed Burns-Aermod modeled impacts															
	Prescribed Burns-dist weighting (not used)			*100*					*8.0*			*1.54*		*1.5*	*0.1%*	*0.05*
6	Other Burning/Cooking		1.96			1.96		1.2	8.0		1.35			1.3	0.1%	0.05
7	Fugitive Dust (road agg piles, sanding, dust)		7.82	147.76		155.58		1.2	8.0		5.37	2.28		7.7	0.6%	0.27
8	Nonroad: vehicles and equipment		1.98	5.97		7.95		1.2	8.0		1.36	0.09		1.4	0.1%	0.05
9	Aircraft		0.00	0.22		0.22			4.0			0.01		0.0	0.0%	0.00
10	Rail		0.90	2.52		3.42		1.2	8.0		0.62	0.04		0.7	0.1%	0.02
11	Marine		0.00	22.96		22.96			14.0			0.12		0.1	0.0%	0.00
19	On-road Mobile		1.51	32.50		34.01		1.2	8.0		1.03	0.50		1.5	0.1%	0.05
20	Permitted Point: Cornerstone	23				23.00	2			5.8				5.8	0.5%	0.20
21	Permitted Point: Collins	95				95.00	1.4			48.5				48.5	4.0%	1.69
	Total Points					118										
	Total RWH					946.66										
	Total Area					382.74										
	Total					1447.40				54.2	30.0	5.0		1202.4	100.0%	**42.0**
	Background															5.0
	Total + Background															**47.0**


Cost of Heat in the NW
(Delivered Cost per million BTUs)
Delivered Cost
$70.00
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00
$0.00
$24.90
$14.73
$20.33
$20.51
$14.65
$8.20
$55.46
$33.65
$57.45
$43.31
$24.31
$16.07
Natural Gas Furnace
Natural Gas High Eff. Furnace
Natural Gas Stove/Fireplace
Electric Resistance Heat
Heat Pump
Ductless Heat Pump
Fuel Oil Furnace
Fuel Oil Hydronics
Propane Furnace
Propane Stove/Fireplace
Wood
Pellets (wood)
Heat Type
MITSUBISHI ELECTRIC
COOLING & HEATING


Lakeview PM2.5 Concentrations
2010 - 2013
ug/m3
140
120
100
80
60
40
20
0
Unhealthy for Everyone
Unhealthy for Sensitive Groups
Moderat
e
Good
EPA Standard
Jan
Mar
May
Jul
Sep
Nov
2010
2011
2012
2013