APPENDIX 2 – 2018 BUILDABLE LAND INVENTORY (BLI)

Introduction

This appendix presents the *draft* data in the 2018 Buildable Land Inventory (BLI). This June 18, 2018 BLI draft incorporates two separate versions[1]. The different versions acknowledge uncertainty in future markets for redevelopment by using two different ways of estimating redevelopment capacity for residential and non-residential capacity; indeed the BLI should be considered a forecast in its own right given that uncertainty. Capacity estimates for vacant land are the same in each version. Summary BLI tables are tallied by local jurisdiction for each version. Metro Council's 2018 Urban Growth Boundary decision will adopt one BLI, perhaps with values at or between the two endpoints specified in these versions. The two versions of the 2018 draft BLI plus a third one that "split the difference" provided key inputs to the forecast modeling described in UGR Appendix 3.

Local Review

All cities and counties in the region were given several opportunities to review preliminary versions of this data. This draft incorporates edits submitted by the local jurisdictions as a result of their review. Note that not all of this inventory would necessarily be utilized in the 20-year planning horizon. Additional market feasibility considerations are incorporated in the actual forecast modeling (see UGR Appendix 3) to which the BLI versions were inputs.

Damascus BLI Note

The area formerly known as the City of Damascus is no longer labeled as such in the BLI tables. The capacity of the former Damascus area is now tallied with unincorporated Clackamas County. As in the 2014 UGR, only areas in the west of the former Damascus area are counted as buildable in the 20-year timeframe. This delineation is based on discussions in 2015 between Metro, Clackamas County, Damascus and Happy Valley and remains unchanged.

Map 1, next page, illustrates the zoning and development concepts for the area formerly Damascus.

Table 1, next page, displays the capacity assumptions based on the zoning details shown in the map and buildable land inventory assumptions.

[1] A third version, not detailed in this report, is an extrapolation derived from the statistical regression-analysis method. It is based on a redevelopment rate assumption that is 3 times higher than the statistical analysis method.

Map 1: Zoning and Concept Assumptions of former Damascus City area

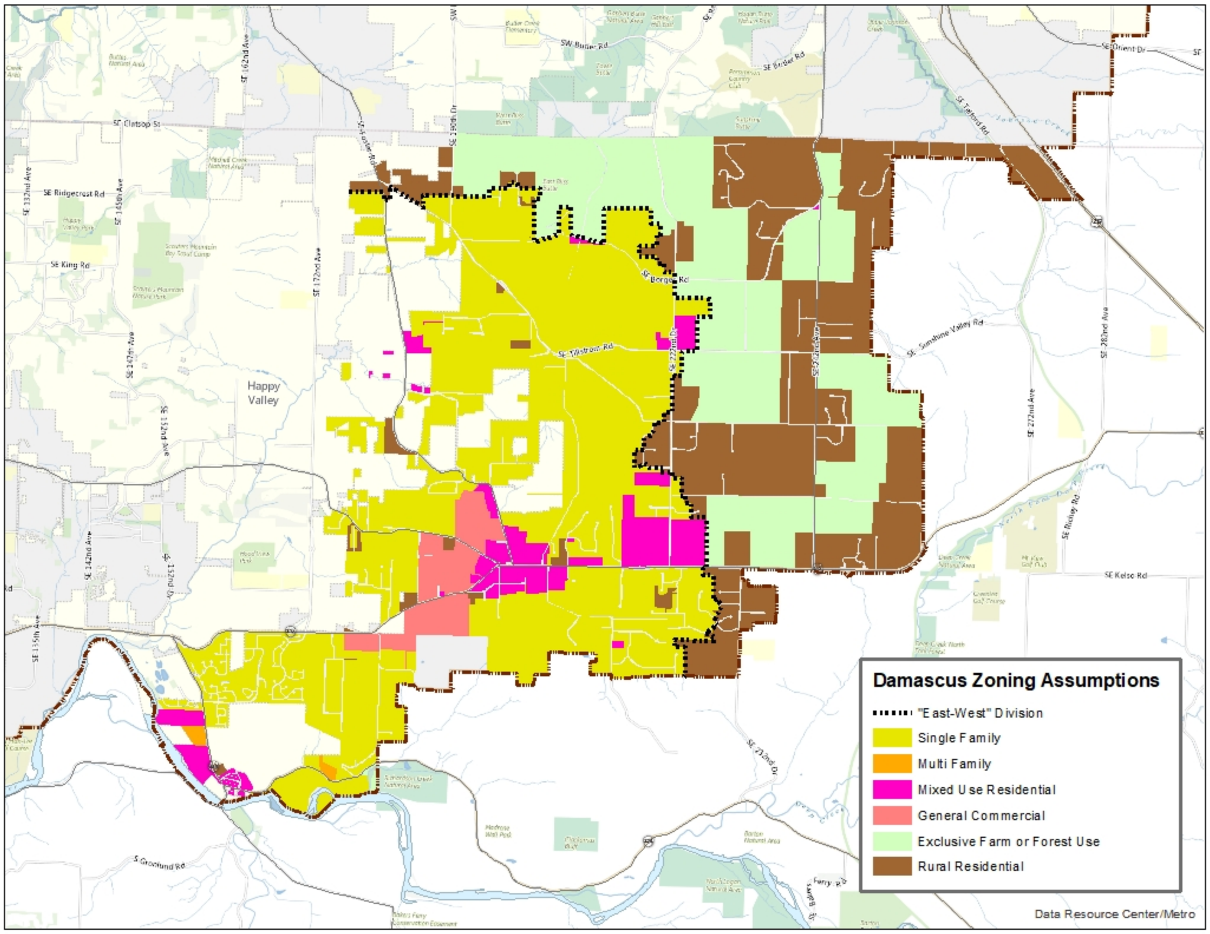


Table 1: Capacity Assumptions for the area formerly Damascus

Description	SRZ	Res Acres	Res Units, High Cap.	Res Units, Low Cap.	Emp Acres, High Cap.	Emp Acres, Low Cap.
Single Family (1 Unit/acre)	SFR1	25	48	48	0	0
Single Family (3 Units/acre)	SFR3	21	97	97	0	0
Single Family (4 Units/acre)	SFR4	1,402	7,278	7,278	0	0
Single Family (5 Units/acre)	SFR5	3	23	23	0	0
Multi Family (4-15 Units/acre)	MFR1	7	129	129	0	0
Multi Family (46+ Units/acre)	MFR7	4	529	310	0	0
Mixed Use Residential (4-15 Unit/acre)	MUR1	18	280	231	90	85
Mixed Use Residential (16-20 Units/acre)	MUR2	7	212	143	35	26
Mixed Use Residential (21-25 Units/acre)	MUR3	0	2	0	1	0
Mixed Use Residential (26-30 Units/acre)	MUR4	11	406	189	60	31
Mixed Use Residential (31-35 Units/acre)	MUR5	2	93	3	13	6
Mixed Use Residential (66-100 Units/acre)	MUR8	0	8	1	1	0
General Commercial	CG	0	0	0	137	137

Single Family, Total	1,451	7,446	7,446	n/a	n/a
Multi Family, Total	11	658	439	n/a	n/a
Mixed Use Residential, Total	39	1,001	566	198	148
General Commercial, Total	n/a	n/a	n/a	137	137
Damascus Total	1,501	9,105	8,451	335	285

Tables

- Residential BLI (Threshold and Statistical methods)
- Employment BLI (Threshold and Statistical methods)

Maps

- Vacant Residential
- Residential Redevelopment and Infill Map - Threshold Price
- Residential Redevelopment and Infill Map – Statistical Regression Method
- Vacant Employment
- Employment Redevelopment and Infill Map - Threshold Price
- Employment Redevelopment and Infill Map - Statistical Regression Method
- Land Banked Employment Land

Residential BLI

2018 Buildable Lands Inventory Housing Units Summary - Threshold Price Method

		Single Family (SF)		Multi-family (MF)		MF - Low (<75DU/acre)		MF - High (>75DU/acre)		Total Capacity by Building Type			Percent of Capacity by Building Type						
Local Government	Total DU	Vacant	Infill	Vacant	Redev	Vacant	Redev	Vacant	Redev	SF	MF - Low	MF - High	% SF	% MF - Low	% MF - High	Vacant Total	Redev Total	% Vacant	% Redev
Clackamas	**65,915**	**13,380**	**19,726**	**12,117**	**20,692**	**9,590**	**15,894**	**2,527**	**4,798**	**33,106**	**25,484**	**7,325**	**50%**	**39%**	**11%**	**25,497**	**40,418**	**39%**	**61%**
GLADSTONE	599	29	158	42	370	42	370	-	-	187	412	-	31%	69%	0%	71	528	12%	88%
HAPPY VALLEY	21,140	2,049	3,363	6,617	9,111	6,164	8,843	453	268	5,412	15,007	721	26%	71%	3%	8,666	12,474	41%	59%
JOHNSON CITY	242	-	-	-	242	-	242	-	-	-	242	-	0%	100%	0%	-	242	0%	100%
LAKE OSWEGO	1,183	335	348	148	352	148	352	-	-	683	500	-	58%	42%	0%	483	700	41%	59%
MILWAUKIE	2,324	479	1,086	518	241	337	53	181	188	1,565	390	369	67%	17%	16%	997	1,327	43%	57%
OREGON CITY	10,066	1,174	1,736	2,507	4,649	614	881	1,893	3,768	2,910	1,495	5,661	29%	15%	56%	3,681	6,385	37%	63%
RIVERGROVE	11	6	5	-	-	-	-	-	-	11	-	-	100%	0%	0%	6	5	55%	45%
WEST LINN	842	456	321	21	44	21	44	-	-	777	65	-	92%	8%	0%	477	365	57%	43%
WILSONVILLE	2,347	609	471	773	494	773	457	-	37	1,080	1,230	37	46%	52%	2%	1,382	965	59%	41%
UNINCORP-CLACK	27,161	8,243	12,238	1,491	5,189	1,491	4,652	-	537	20,481	6,143	537	75%	23%	2%	9,734	17,427	36%	64%
Multnomah	**222,951**	**8,453**	**11,661**	**20,799**	**182,038**	**5,898**	**43,739**	**14,901**	**138,299**	**20,114**	**49,637**	**153,200**	**9%**	**22%**	**69%**	**29,252**	**193,699**	**13%**	**87%**
FAIRVIEW	954	120	155	390	289	390	289	-	-	275	679	-	29%	71%	0%	510	444	53%	47%
GRESHAM	13,076	1,504	3,119	2,893	5,560	2,737	4,966	156	594	4,623	7,703	750	35%	59%	6%	4,397	8,679	34%	66%
MAYWOOD PARK	5	5	-	-	-	-	-	-	-	5	-	-	100%	0%	0%	5	-	100%	0%
PORTLAND	198,203	4,738	6,893	16,279	170,293	1,534	32,588	14,745	137,705	11,631	34,122	152,450	6%	17%	77%	21,017	177,186	11%	89%
TROUTDALE	1,659	663	239	289	468	289	468	-	-	902	757	-	54%	46%	0%	952	707	57%	43%
WOOD VILLAGE	778	12	13	113	640	113	640	-	-	25	753	-	3%	97%	0%	125	653	16%	84%
UNINCORP-MULT	8,276	1,411	1,242	835	4,788	835	4,788	-	-	2,653	5,623	-	32%	68%	0%	2,246	6,030	27%	73%
Washington	**75,435**	**14,618**	**25,457**	**12,911**	**22,449**	**12,100**	**20,098**	**811**	**2,351**	**40,075**	**32,198**	**3,162**	**53%**	**43%**	**4%**	**27,529**	**47,906**	**36%**	**64%**
BEAVERTON	11,768	2,582	1,909	3,316	3,961	2,714	3,470	602	491	4,491	6,184	1,093	38%	53%	9%	5,898	5,870	50%	50%
CORNELIUS	2,316	37	88	1,734	457	1,734	457	-	-	125	2,191	-	5%	95%	0%	1,771	545	76%	24%
DURHAM	41	24	17	-	-	-	-	-	-	41	-	-	100%	0%	0%	24	17	59%	41%
FOREST GROVE	4,823	978	1,754	576	1,515	576	1,515	-	-	2,732	2,091	-	57%	43%	0%	1,554	3,269	32%	68%
HILLSBORO	9,320	1,338	1,133	2,672	4,177	2,672	4,177	-	-	2,471	6,849	-	27%	73%	0%	4,010	5,310	43%	57%
KING CITY	107	24	61	-	22	-	22	-	-	85	22	-	79%	21%	0%	24	83	22%	78%
SHERWOOD	815	86	297	227	205	227	205	-	-	383	432	-	47%	53%	0%	313	502	38%	62%
TIGARD	13,562	1,909	3,604	1,933	6,116	1,908	5,147	25	969	5,513	7,055	994	41%	52%	7%	3,842	9,720	28%	72%
TUALATIN	797	76	336	122	263	122	263	-	-	412	385	-	52%	48%	0%	198	599	25%	75%
UNINCORP-WASH	31,886	7,564	16,258	2,331	5,733	2,147	4,842	184	891	23,822	6,989	1,075	75%	22%	3%	9,895	21,991	31%	69%
Grand Total	**364,301**	**36,451**	**56,844**	**45,827**	**225,179**	**27,588**	**79,731**	**18,239**	**145,448**	**93,295**	**107,319**	**163,687**	**26%**	**29%**	**45%**	**82,278**	**282,023**	**23%**	**77%**

2018 Buildable Lands Inventory Housing Units Summary - Statistical Analysis Method

		Single Family (SF)		Multi-family (MF)		MF - Low (<75DU/acre)		MF - High (>75DU/acre)		Total Capacity by Building Type			Percent of Capacity by Building Type						
Local Government	Total DU	Vacant	Infill	Vacant	Redev	Vacant	Redev	Vacant	Redev	SF	MF - Low	MF - High	% SF	% MF - Low	% MF - High	Vacant Total	Redev Total	% Vacant	% Redev
Clackamas	**59,541**	**13,380**	**19,726**	**12,117**	**14,318**	**9,590**	**10,584**	**2,527**	**3,734**	**33,106**	**20,174**	**6,261**	**56%**	**34%**	**11%**	**25,497**	**34,044**	**43%**	**57%**
GLADSTONE	435	29	158	42	206	42	206	-	-	187	248	-	43%	57%	0%	71	364	16%	84%
HAPPY VALLEY	17,492	2,049	3,363	6,617	5,463	6,164	5,446	453	17	5,412	11,610	470	31%	66%	3%	8,666	8,826	50%	50%
JOHNSON CITY	138	-	-	-	138	-	138	-	-	-	138	-	0%	100%	0%	-	138	0%	100%
LAKE OSWEGO	1,230	335	348	148	399	148	398	-	2	683	546	2	56%	44%	0%	483	747	39%	61%
MILWAUKIE	2,612	479	1,086	518	529	337	121	181	409	1,565	458	590	60%	18%	23%	997	1,615	38%	62%
OREGON CITY	8,935	1,174	1,736	2,507	3,518	614	526	1,893	2,992	2,910	1,140	4,885	33%	13%	55%	3,681	5,254	41%	59%
RIVERGROVE	11	6	5	-	-	-	-	-	-	11	-	-	100%	0%	0%	6	5	55%	45%
WEST LINN	883	456	321	21	85	21	85	-	-	777	106	-	88%	12%	0%	477	406	54%	46%
WILSONVILLE	2,175	609	471	773	322	773	319	-	3	1,080	1,092	3	50%	50%	0%	1,382	793	64%	36%
UNINCORP-CLACK	25,629	8,243	12,238	1,491	3,657	1,491	3,346	-	311	20,481	4,837	311	80%	19%	1%	9,734	15,895	38%	62%
Multnomah	**95,829**	**8,453**	**11,661**	**16,925**	**58,790**	**5,897**	**15,966**	**11,028**	**42,825**	**20,114**	**21,863**	**53,852**	**21%**	**23%**	**56%**	**25,378**	**70,451**	**26%**	**74%**
FAIRVIEW	884	120	155	390	219	390	219	-	-	275	609	-	31%	69%	0%	510	374	58%	42%
GRESHAM	12,237	1,504	3,119	2,893	4,721	2,737	4,239	156	482	4,623	6,976	638	38%	57%	5%	4,397	7,840	36%	64%
MAYWOOD PARK	5	5	-	-	-	-	-	-	-	5	-	-	100%	0%	0%	5	-	100%	0%
PORTLAND	74,815	4,738	6,893	12,406	50,779	1,534	8,436	10,872	42,343	11,631	9,970	53,215	16%	13%	71%	17,144	57,672	23%	77%
TROUTDALE	1,436	663	239	288	246	288	246	-	-	902	534	-	63%	37%	0%	951	485	66%	34%
WOOD VILLAGE	633	12	13	113	495	113	495	-	-	25	608	-	4%	96%	0%	125	508	20%	80%
UNINCORP-MULT	5,820	1,411	1,242	835	2,332	835	2,332	-	-	2,653	3,167	-	46%	54%	0%	2,246	3,574	39%	61%
Washington	**73,835**	**14,618**	**25,457**	**12,911**	**20,849**	**12,100**	**18,464**	**811**	**2,385**	**40,075**	**30,564**	**3,196**	**54%**	**41%**	**4%**	**27,529**	**46,306**	**37%**	**63%**
BEAVERTON	13,071	2,582	1,909	3,316	5,264	2,714	4,598	602	666	4,491	7,312	1,268	34%	56%	10%	5,898	7,173	45%	55%
CORNELIUS	2,109	37	88	1,734	250	1,734	250	-	-	125	1,984	-	6%	94%	0%	1,771	338	84%	16%
DURHAM	48	24	17	-	7	-	7	-	-	41	7	-	85%	15%	0%	24	24	50%	50%
FOREST GROVE	4,882	978	1,754	576	1,574	576	1,574	-	-	2,732	2,150	-	56%	44%	0%	1,554	3,328	32%	68%
HILLSBORO	9,377	1,338	1,133	2,672	4,234	2,672	4,234	-	-	2,471	6,906	-	26%	74%	0%	4,010	5,367	43%	57%
KING CITY	108	24	61	-	23	-	23	-	-	85	23	-	79%	21%	0%	24	84	22%	78%
SHERWOOD	727	86	297	227	117	227	117	-	-	383	344	-	53%	47%	0%	313	414	43%	57%
TIGARD	12,861	1,909	3,604	1,933	5,415	1,908	4,578	25	837	5,513	6,486	862	43%	50%	7%	3,842	9,019	30%	70%
TUALATIN	704	76	336	122	170	122	170	-	-	412	292	-	59%	41%	0%	198	506	28%	72%
UNINCORP-WASH	29,947	7,564	16,258	2,331	3,794	2,147	2,913	184	881	23,822	5,060	1,065	80%	17%	4%	9,895	20,052	33%	67%
Grand Total	**229,205**	**36,451**	**56,844**	**41,953**	**93,958**	**27,587**	**45,014**	**14,366**	**48,943**	**93,295**	**72,601**	**63,309**	**41%**	**32%**	**28%**	**78,404**	**150,802**	**34%**	**66%**

Employment BLI

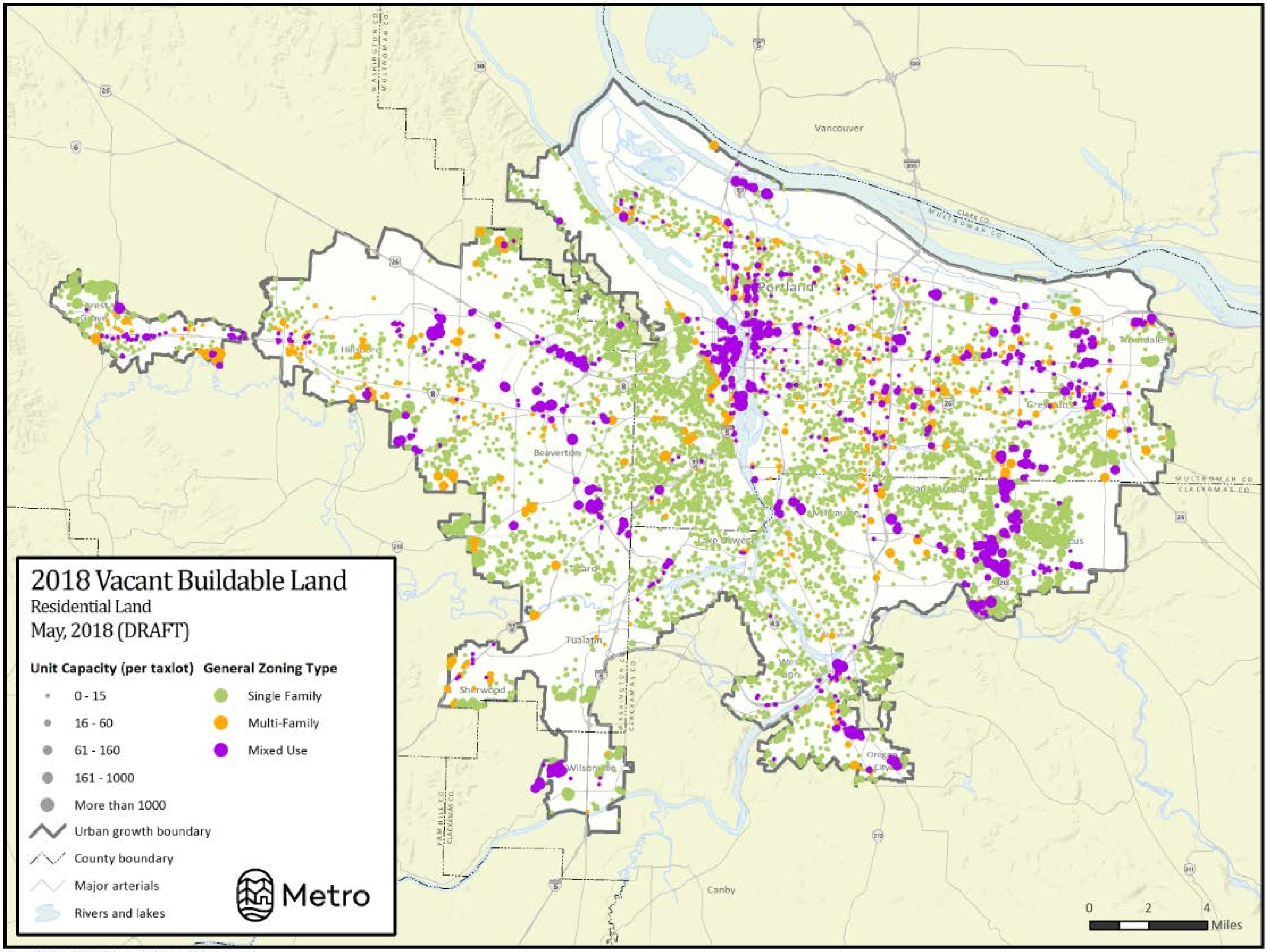
2018 Buildable Lands Inventory Employment Acres Summary - Threshold Price Method

		Industrial		Commercial		Commercial on COM		Commercial on MUR		Total Capacity by Building Type			Percent of Capacity by Building Type						
Local Government	Total Acres	Vacant	Redev	Vacant	Redev	Vacant	Redev	Vacant	Redev	IND	COM	MUR	% IND	% COM	%MUR	Vacant Total	Redev Total	% Vacant	% Redev
Clackamas	1,877	385	713	258	520	71	172	187	349	1,099	243	535	59%	13%	29%	643	1,233	34%	66%
GLADSTONE	66	1	60	5	-	5	-	-	-	61	5	-	93%	7%	0%	5	60	8%	92%
HAPPY VALLEY	386	164	42	63	116	-	-	63	116	206	-	180	53%	0%	47%	227	159	59%	41%
JOHNSON CITY	-	-	-	-	-	-	-	-	-	-	-	-				-	-		
LAKE OSWEGO	7	1	3	2	1	-	-	2	1	4	-	3	58%	0%	42%	3	4	37%	63%
MILWAUKIE	21	5	10	4	2	0	-	4	2	15	0	6	72%	1%	27%	9	12	44%	56%
OREGON CITY	203	30	113	29	30	-	-	29	30	144	-	59	71%	0%	29%	59	144	29%	71%
RIVERGROVE	-	-	-	-	-	-	-	-	-	-	-	-				-	-		
WEST LINN	20	4	8	6	2	-	-	6	2	12	-	9	57%	0%	43%	10	10	50%	50%
WILSONVILLE	266	70	174	18	4	8	-	10	4	244	8	14	92%	3%	5%	87	178	33%	67%
UNINCORP-CLACK	909	112	301	131	365	58	172	73	193	413	230	266	45%	25%	29%	243	666	27%	73%
Multnomah	5,240	1,715	2,204	306	1,015	154	273	151	742	3,919	428	893	75%	8%	17%	2,021	3,219	39%	61%
FAIRVIEW	139	63	31	26	19	20	14	6	4	94	34	11	68%	25%	8%	89	49	64%	36%
GRESHAM	999	326	416	88	169	1	15	87	155	742	16	241	74%	2%	24%	414	585	41%	59%
MAYWOOD PARK	-	-	-	-	-	-	-	-	-	-	-	-				-	-		
PORTLAND	2,505	658	956	145	745	109	207	36	538	1,614	316	574	64%	13%	23%	804	1,701	32%	68%
TROUTDALE	577	223	322	22	10	13	6	9	4	545	19	13	94%	3%	2%	245	333	42%	58%
WOOD VILLAGE	44	2	20	7	16	1	-	6	16	21	1	22	48%	3%	49%	8	36	19%	81%
UNINCORP-MULT	976	444	459	17	56	10	31	7	24	903	41	32	93%	4%	3%	461	515	47%	53%
Washington	4,009	1,488	2,091	190	240	89	52	101	188	3,579	141	289	89%	4%	7%	1,678	2,331	42%	58%
BEAVERTON	116	24	42	20	30	2	0	18	30	66	3	47	57%	2%	41%	44	72	38%	62%
CORNELIUS	118	33	40	20	26	18	20	2	6	72	38	8	61%	32%	7%	53	65	45%	55%
DURHAM	1	1	-	-	-	-	-	-	-	1	-	-	100%	0%	0%	1	-	100%	0%
FOREST GROVE	211	121	88	0	2	-	-	0	2	209	-	3	99%	0%	1%	121	90	57%	43%
HILLSBORO	598	244	239	72	42	25	2	48	40	484	27	88	81%	4%	15%	317	281	53%	47%
KING CITY	2	-	-	-	2	-	2	-	-	-	2	-	0%	100%	0%	-	2	0%	100%
SHERWOOD	151	58	66	13	15	7	8	6	6	123	15	12	82%	10%	8%	71	80	47%	53%
TIGARD	119	16	57	15	31	9	6	6	25	73	15	31	61%	13%	26%	31	88	26%	74%
TUALATIN	440	177	249	9	4	9	4	-	-	427	14	-	97%	3%	0%	186	254	42%	58%
UNINCORP-WASH	2,253	814	1,310	40	88	19	9	21	79	2,125	29	100	94%	1%	4%	854	1,399	38%	62%
	11,126	3,588	5,008	754	1,776	315	497	439	1,278	8,596	812	1,718	77%	7%	15%	4,342	6,783	39%	61%

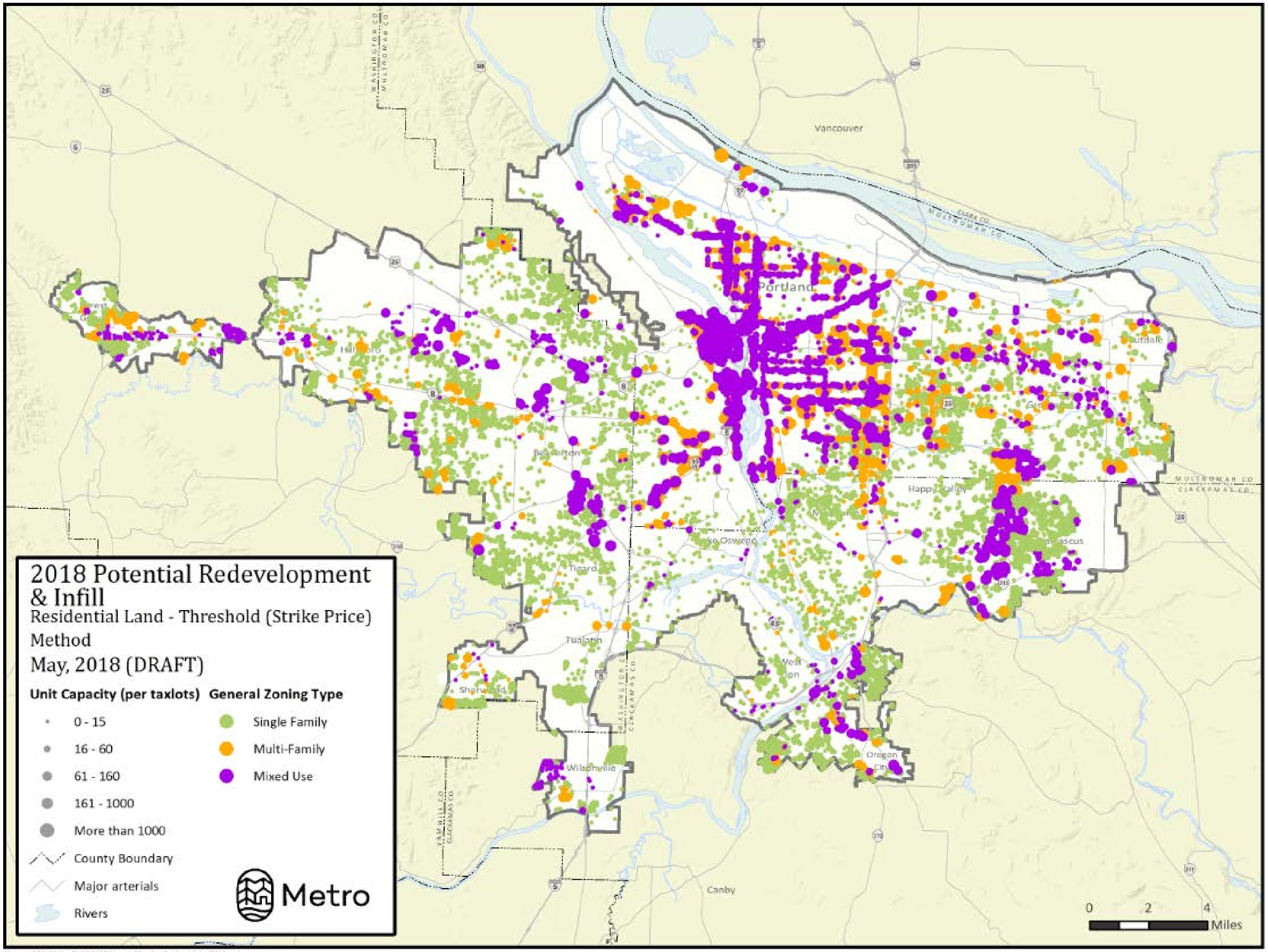
2018 Buildable Lands Inventory Employment Acres Summary - Statistical Analysis Method

		Industrial		Commercial		Commercial on COM		Commercial on MUR		Total Capacity by Building Type			Percent of Capacity by Building Type						
Local Government	Total Acres	Vacant	Redev	Vacant	Redev	Vacant	Redev	Vacant	Redev	IND	COM	MUR	% IND	% COM	%MUR	Vacant Total	Redev Total	% Vacant	% Redev
Clackamas	**1,841**	**385**	**713**	**258**	**484**	**71**	**172**	**187**	**313**	**1,099**	**243**	**500**	**60%**	**13%**	**27%**	**643**	**1,198**	**35%**	**65%**
GLADSTONE	66	1	60	5	-	5	-	-	-	61	5	-	93%	7%	0%	5	60	8%	92%
HAPPY VALLEY	353	164	42	63	84	-	-	63	84	206	-	147	58%	0%	42%	227	126	64%	36%
JOHNSON CITY	-	-	-	-	-	-	-	-	-	-	-	-				-	-		
LAKE OSWEGO	12	1	3	2	6	-	-	2	6	4	-	8	32%	0%	68%	3	10	21%	79%
MILWAUKIE	23	5	10	4	4	0	-	4	4	15	0	8	66%	1%	34%	9	14	40%	60%
OREGON CITY	194	30	113	29	22	-	-	29	22	144	-	50	74%	0%	26%	59	135	30%	70%
RIVERGROVE	-	-	-	-	-	-	-	-	-	-	-	-				-	-		
WEST LINN	25	4	8	6	7	-	-	6	7	12	-	14	46%	0%	54%	10	15	40%	60%
WILSONVILLE	273	70	174	18	12	8	-	10	12	244	8	21	89%	3%	8%	87	186	32%	68%
UNINCORP-CLACK	894	112	301	131	350	58	172	73	178	413	230	251	46%	26%	28%	243	651	27%	73%
Multnomah	**4,905**	**1,715**	**2,204**	**306**	**680**	**154**	**273**	**151**	**407**	**3,919**	**428**	**558**	**80%**	**9%**	**11%**	**2,021**	**2,884**	**41%**	**59%**
FAIRVIEW	139	63	31	26	19	20	14	6	4	94	34	11	67%	25%	8%	89	50	64%	36%
GRESHAM	965	326	416	88	135	1	15	87	120	742	16	207	77%	2%	21%	414	551	43%	57%
MAYWOOD PARK	-	-	-	-	-	-	-	-	-	-	-	-				-	-		
PORTLAND	2,220	658	956	145	460	109	207	36	253	1,614	316	289	73%	14%	13%	804	1,416	36%	64%
TROUTDALE	575	223	322	22	8	13	6	9	2	545	19	11	95%	3%	2%	245	331	43%	57%
WOOD VILLAGE	44	2	20	7	16	1	-	6	16	21	1	21	49%	3%	49%	8	36	19%	81%
UNINCORP-MULT	963	444	459	17	42	10	31	7	11	903	41	18	94%	4%	2%	461	501	48%	52%
Washington	**4,004**	**1,488**	**2,091**	**190**	**235**	**89**	**52**	**101**	**182**	**3,579**	**141**	**284**	**89%**	**4%**	**7%**	**1,678**	**2,325**	**42%**	**58%**
BEAVERTON	132	24	42	20	46	2	0	18	46	66	3	64	50%	2%	48%	44	88	33%	67%
CORNELIUS	117	33	40	20	25	18	20	2	5	72	38	7	62%	32%	6%	53	64	45%	55%
DURHAM	1	1	-	-	-	-	-	-	-	1	-	-	100%	0%	0%	1	-	100%	0%
FOREST GROVE	218	121	88	0	9	-	-	0	9	209	-	9	96%	0%	4%	121	96	56%	44%
HILLSBORO	605	244	239	72	49	25	2	48	47	484	27	95	80%	4%	16%	317	288	52%	48%
KING CITY	2	-	-	-	2	-	2	-	0	-	2	0	0%	100%	0%	-	2	0%	100%
SHERWOOD	150	58	66	13	13	7	8	6	5	123	15	11	82%	10%	8%	71	79	47%	53%
TIGARD	118	16	57	15	30	9	6	6	24	73	15	30	62%	13%	26%	31	87	26%	74%
TUALATIN	440	177	249	9	4	9	4	-	-	427	14	-	97%	3%	0%	186	254	42%	58%
UNINCORP-WASH	2,221	814	1,310	40	56	19	9	21	46	2,125	29	67	96%	1%	3%	854	1,366	38%	62%
	10,750	**3,588**	**5,008**	**754**	**1,399**	**315**	**497**	**439**	**902**	**8,596**	**812**	**1,342**	**80%**	**8%**	**12%**	**4,342**	**6,407**	**40%**	**60%**

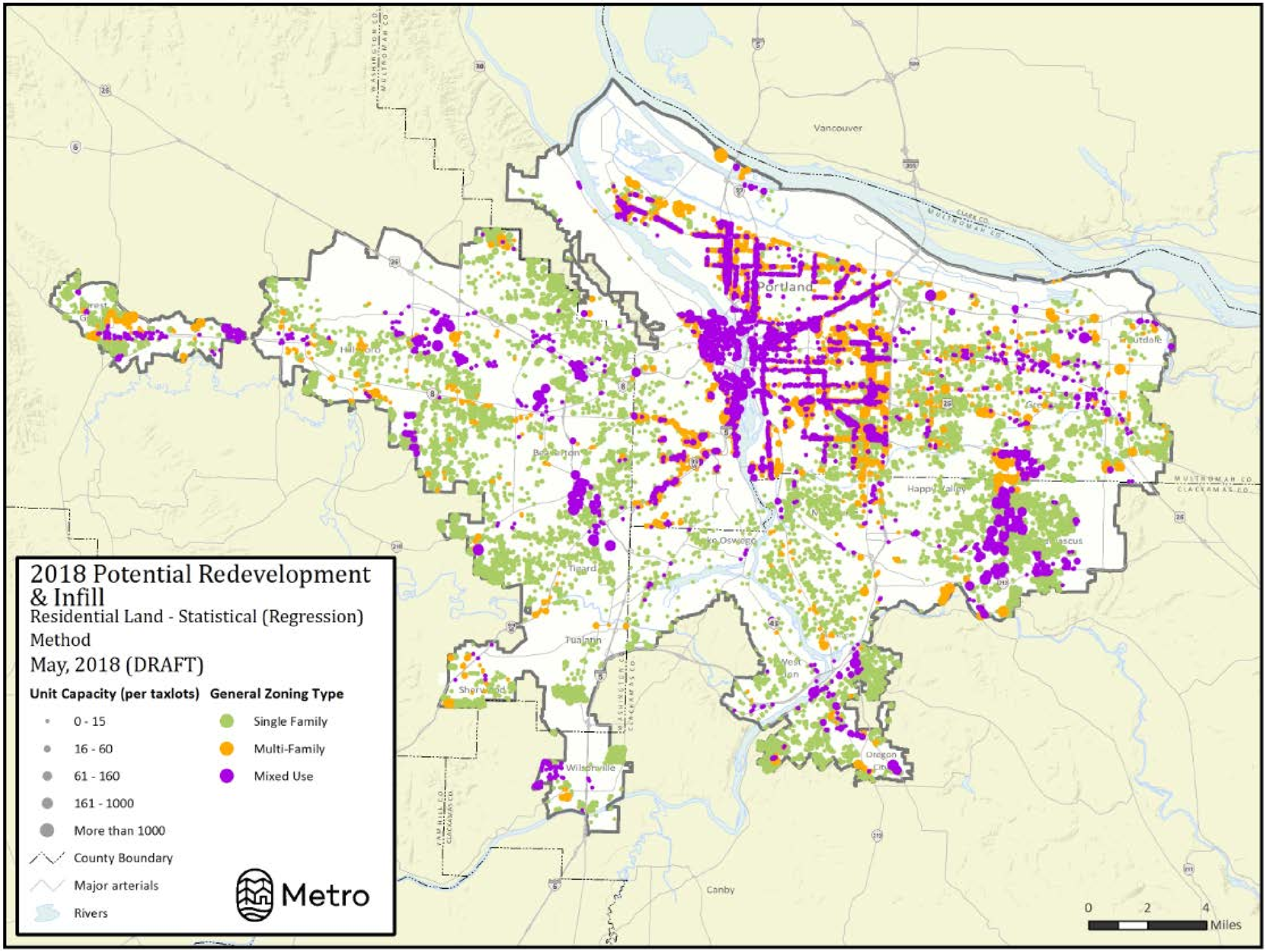
Vacant Residential Map



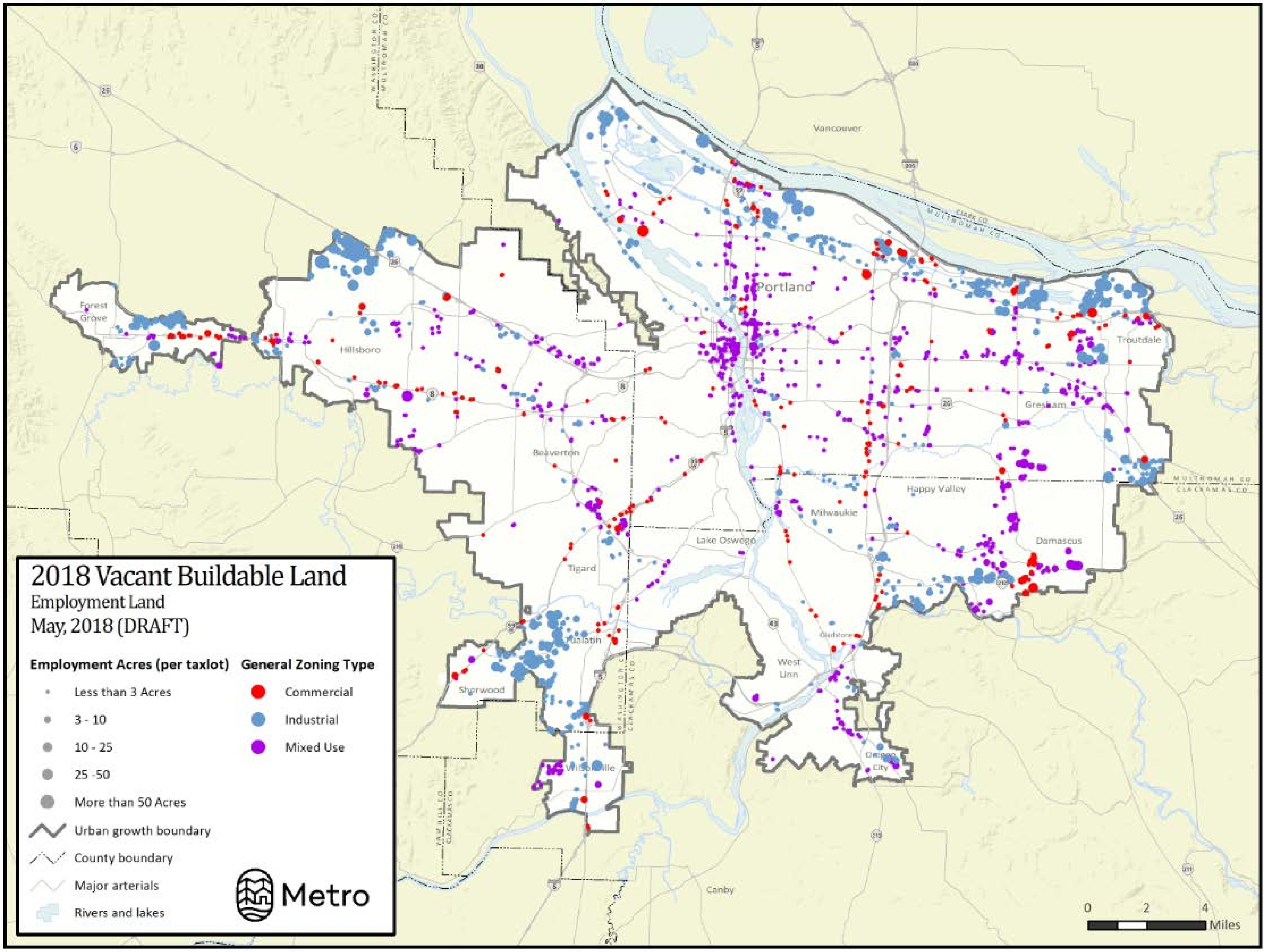
Residential Redevelopment and Infill Map - Threshold Price



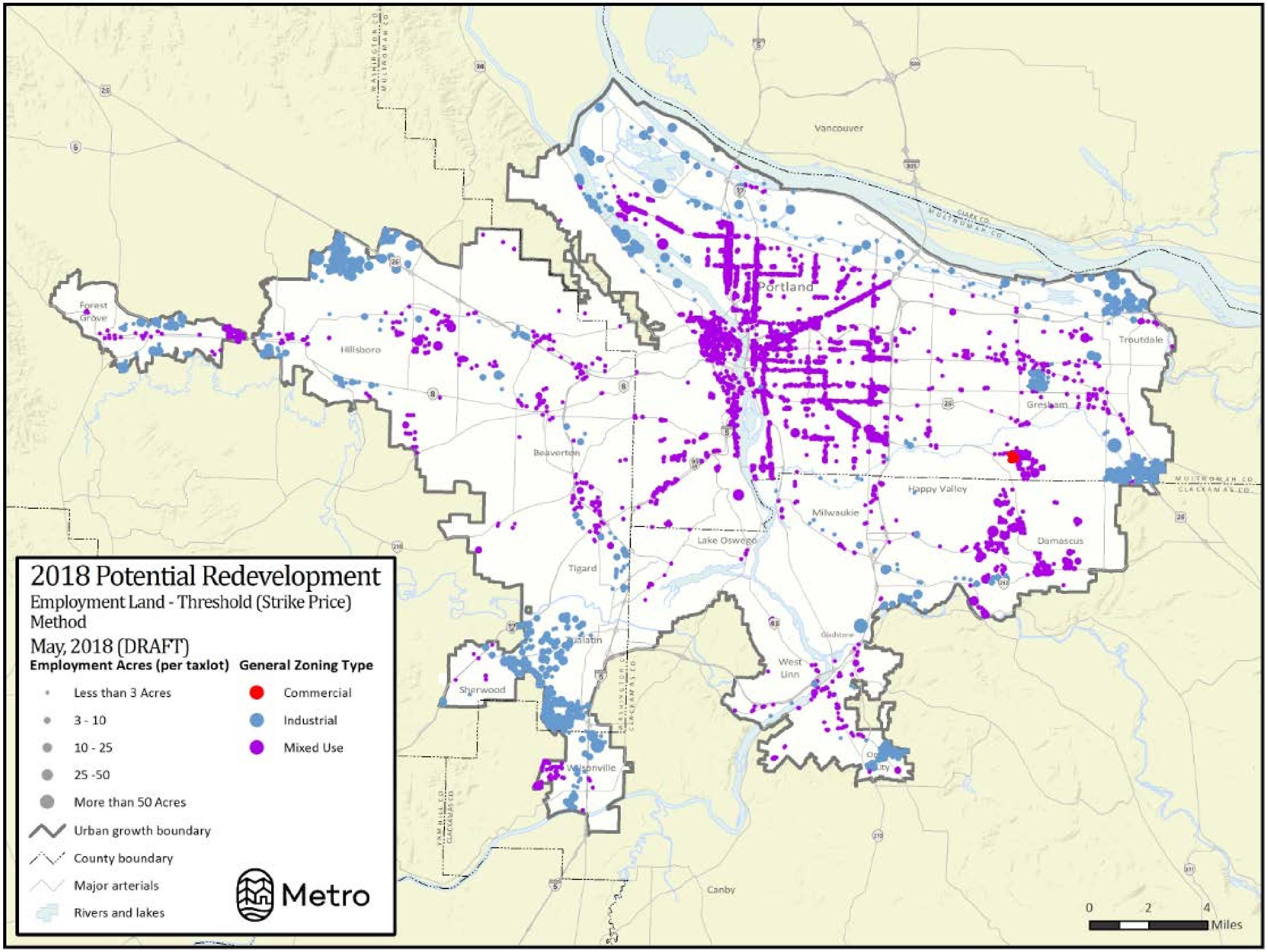
Residential Redevelopment and Infill Map – Statistical Regression Method



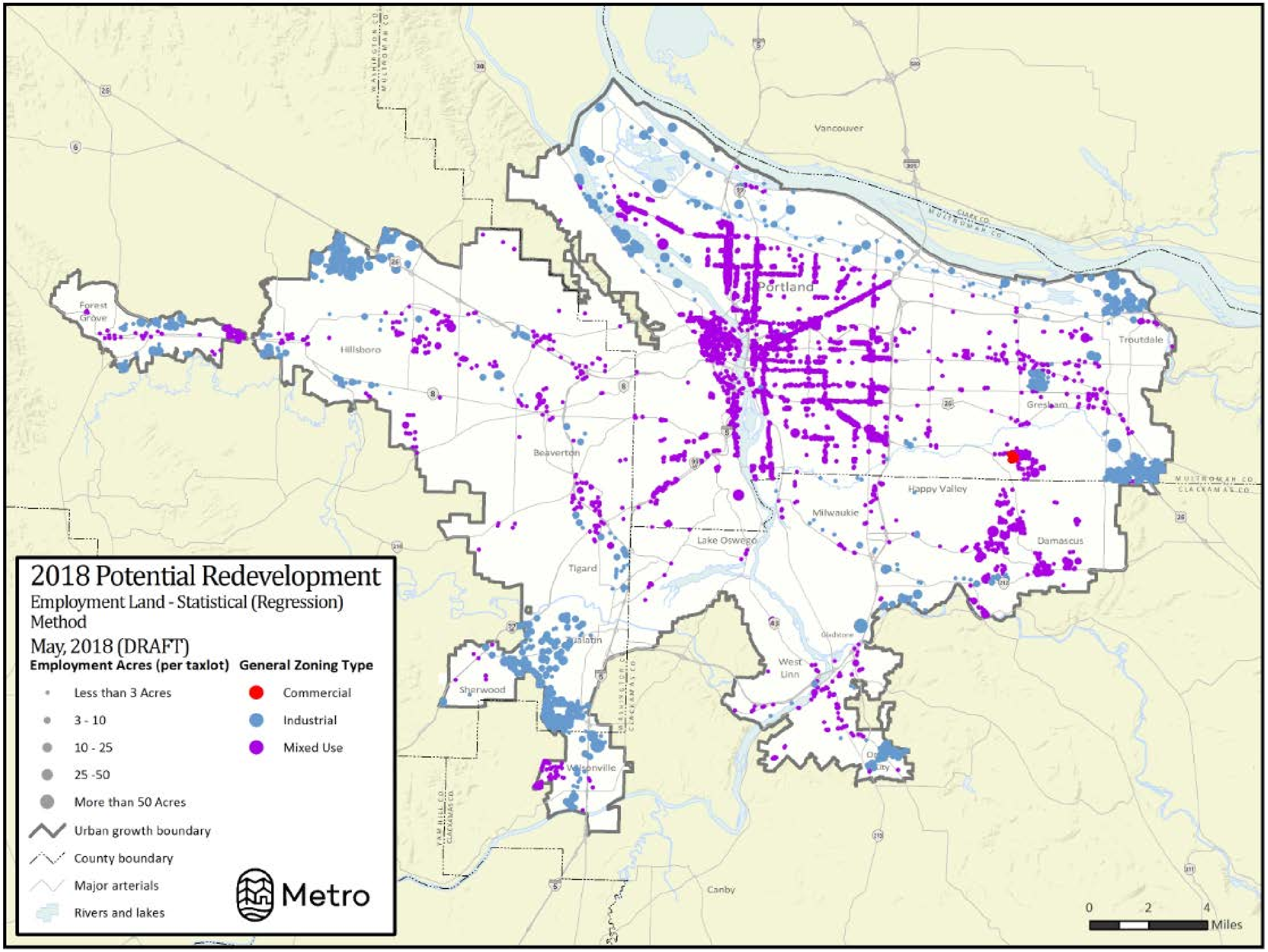
Vacant Employment Map



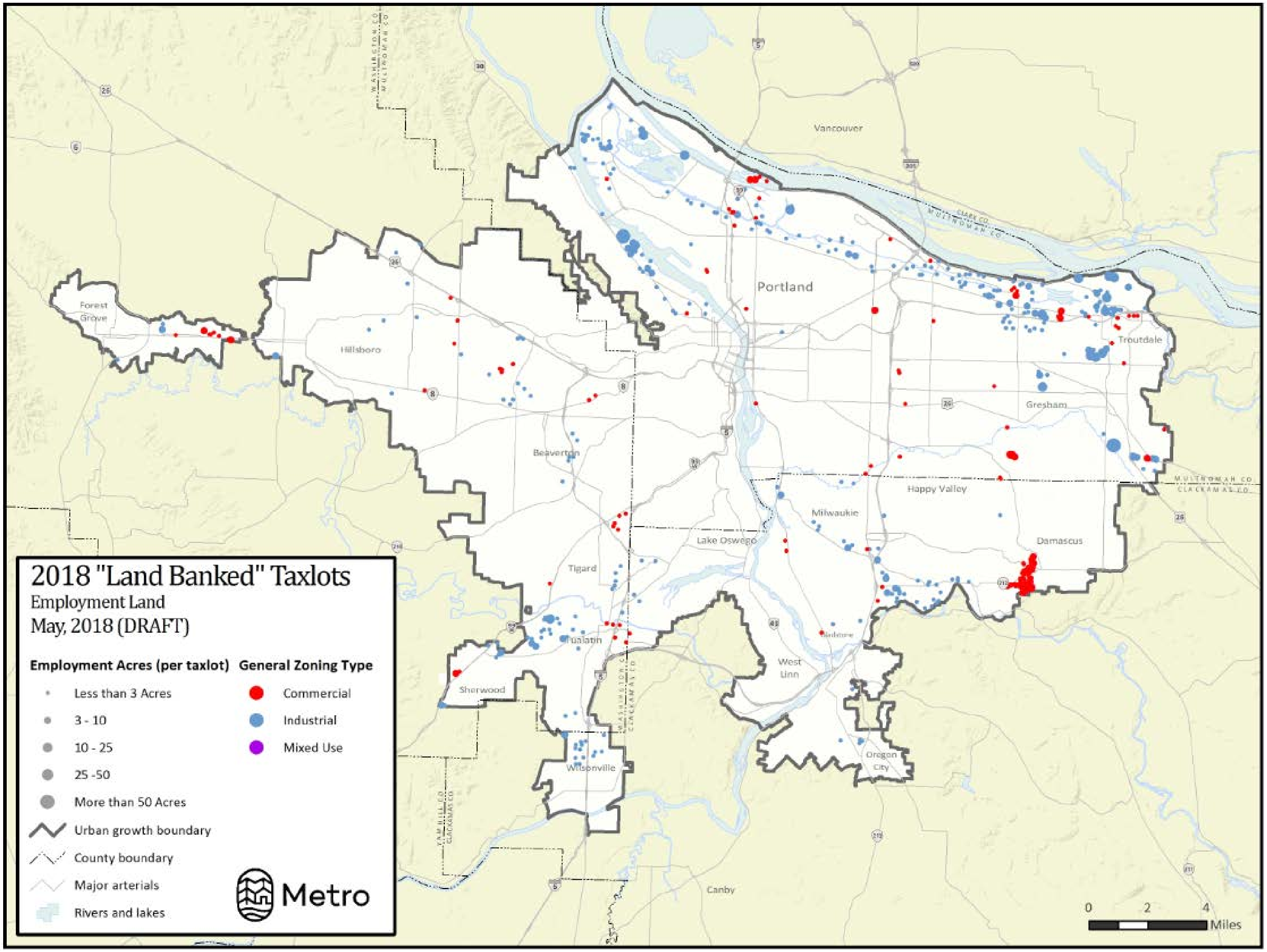
Employment Redevelopment and Infill Map - Threshold Price



Employment Redevelopment and Infill Map – Statistical Regression Method



Land Banked Employment Land Map



2018 BLI DATA DICTIONARY AND GUIDANCE FOR USERS

Field Name	Description	Page in this appendix
Field Name	**Description**	**Page in this document**
TLID	From Assessor Files Notes: TLID records starting with "MFR" are aggregated taxlots based on Metro's Multifamily database. Values and square footage are summarized for the entire complex In some cases, the Jurisdiction City has been modified to place all taxlots for a city within the same county	N/A
OWNER1		
OWNER2		
SITESTRNO		
SITEADDR		
SITECITY		
SITEZIP		
LANDVAL		
BLDGVAL		
TOTALVAL		
BLDGSQFT		
YEARBUILT		
COUNTY		
JURIS_CITY	Existing Units (from Multifamily Database and Metro's internal singlefamily database)	N/A
UNITS	Existing Units (from Multifamily Database and Metro's internal singlefamily database)	N/A
Vac_Area	The vacant area of the parcel (as determined by Metro's Vacant Land Inventory)	18
Vac_Pct	The percent of taxlot that is identified as vacant	18
slope25_Area	Environmental Takeouts. In order to not double-count area, the following hierarchy is established: Floodway, Slopes >25%, Title 3, Title 13, Floodplain. **	20
T3_Area		
T13_Area		
floodway_Area		
floodplain_Area		
unconstrained	Taxlot area minus constraints	21
net_no_ROW	unconstrained minus an allowance for Right-of-way and other set-asides.	22
min_lot_size	the minimum lot size as determined by Metro's Zoning Classifications****	N/A
max_lot_size	the maximum lot size as determined by Metro's Zoning Classifications****	N/A
unit_density	the expected unit density for multifamily development as determined by Metro's Zoning Classification****	N/A

Field Name	Description	Page in this appendix
MUR_MFR_District	Determines Strike Price by area. MFR/MUR: Central City: 130/130; Corridors: 70/80; Eastside Urban: 70/80; Suburban: 10/12; Gateway: 24/24	26
PDX_Harbor	Portland Harbor Access Land [yes/no*]	22
Subarea_3	Subarea #3 for Industrial Land strike price designation	31
max_cap	Does a taxlot mean the Maximum Capacity rule [yes/no*]	23
max_units	The maximum zoned capacity of a taxlot as determined by unit_density or min_lot_size and unconstrained area.	22-26
MUR_MFR_Redev	does a MUR/MFR taxlot qualify under the strikeprice for redevelopment [yes/no*]	26
COM_IND_Redev	does a COM/IND taxlot qualify under the strikeprice for redevelopment [yes/no*]	30-31
RES_PCT	MUR Residential/non-residential split	32 (splits modified in 2018)
LAND_BANK	How many Sq Ft of vacant land are land banked in developed COM/IND properties (converted to acres in net_emp_acres for these taxlots.)	29 N/A - Model Outputs
infill_units	units available through infill or redevelopment.	
net_new_units	output of BLI Model (Strike Price) note: this field will be identical to the "net_units_strike_price" but is left in the database for scripting purposes.	
net_units_strike_price	output of BLI Model (Strike Price)	
net_units_regression	output of BLI Model with regression analysis on MUR/MFR Redev parcels	
net_res_acres	output of BLI Model (Strike Price)	
net_emp_acres	output of BLI Model (Strike Price) note: this field will be identical to the "net_emp_acres_strike_price" but is left in the database for scripting purposes.	
net_emp_acres_strike_price	output of BLI Model (Strike Price)	
net_emp_acres_regression	output of BLI Model with regression analysis on MUR/MFR Redev parcels	N/A
ZONE_CLASS	Metro's Zone Classifications	N/A
ZONE_GEN	Metro's Generalized Zoning	

Field Name	Description	Page in this appendix
centers	is the tax lot in a designated Regional or Town Center [yes/no*] Used in Commercial Land Redev strike price determination	30
VAC_DEV	Is the tax lot classified as Vacant or Developed or to be ignored by model ***	N/A
VAC_DEV2	Is the tax lot classified as Vacant or Developed (Generalized)	N/A
FIPS	Census Tract	N/A
NOTES	Note for special cases/manual edits	N/A
Shape_Length	GIS shape perimeter	N/A
Shape_Area	GIS shape area	N/A
regression_prob_9year	Probability of tax lot redeveloping in the next 9 years	N/A
regression_prob_20year	Probability of tax lot redeveloping in the next 20 years	N/A
TAZ	Transportation Analysis Zone Designation Fields to collect input from Local Review of database	N/A N/A
Local_Units		
Local_Emp_Acres		
Local_ZONE_GEN		
Local_ZONECLASS		
Local_Comment		
Local_Reviewer_Name	An override of the regression probability based on local input	
Local_probability	An override of the regression probability based on local input	
Local_update	Was the record updated by a local jurisdiction [yes/no*]	
Local_rerun_model	Did the local jurisdiction provide new information that required a rerun of the model. (i.e. a change in zoning class) [yes/no*]	
Local_override	Did the local jurisdiction provide numbers that should override model output [yes/no*]	
Adu_probability	The probability that a single family tax lot could accommodate an ADU	25

* 1=yes, 0=no

** for 2018 BLI, Floodplain has been added and are treated the same as Title 3 in terms of deduction.

*** VAC_DEV2 has only "VAC","DEV","IGNORE". VAC_DEV has more detail about why a taxlot is classified as "IGNORE"

- CEM Cemetery (RLIS ORCA**** subcategory)
- EXEMPT Tax Exempt properties from County Assessors
- GOLF Golf Course (RLIS ORCA**** subcategory)
- HOA Home owner association (RLIS ORCA**** subcategory)
- ORCAO* Other open space ((RLIS ORCA**** subcategory)
- PARK Park (RLIS ORCA**** subcategory)
- RAIL Rail yards and properties

- ROW Private Drives and Rights-of-way
- SCHOOL School
- SML Small tax lots (less than 1000 sq ft.)
- UTILI* Utility owned properties.

The regression-based redevelopment capacity is a more statistical approach than the threshold method, and thus requires more interpretation at the individual tax lot level. The regression analysis was designed to produce capacity estimates that make sense in aggregate. To understand the results of the regression analysis at the tax lot level, data users may wish to examine the two primary fields that are used to calculate the "expected" residential capacity, i.e. the maximum zoned capacity (**max_units**) and the probability of redevelopment for each lot (**regression_prob_20year**). For developed lots, we also account for existing units on the site (**UNITS**) and for MUR zoned lots the calculation also factors in the MUR split (**RES_PCT**).

ADU capacity is also reported in probabilistic terms. Each single family tax lot in Portland is assigned a small probability of having an ADU built there. These numbers make more sense in aggregate than for each individual tax lot.

General Methodology for determining the 2018 Urban Growth Report's Buildable Land Inventory (BLI)

Background

Under state land use regulations, Metro is required to ensure that its regional plan contains sufficient buildable land within the urban growth boundary (UGB) to accommodate estimated housing needs for 20 years. Metro is mandated to conduct this analysis at least every 6 years in its Urban Growth Report (UGR). The UGR is a basis for the Metro Council's urban growth management (UGM) decision. A technical underpinning of the UGR is its buildable land inventory (BLI) which includes vacant and redevelopable land supply estimates. This document provides a summary of the capacity assumptions and a methodology description of how land supplies are estimated.

During the winter of 2017/2018, all local governments in the region were given an opportunity to review the draft BLI and to suggest revisions to the results. These revisions reflect local knowledge about specific tax lots and properties. More detailed information on changes to the 2018 BLI methods and recent development trends can be found in a separate UGR appendix.

Forecast analytics for the UGR go through additional steps to determine how much of this buildable land inventory may be market feasible in the 20-year planning timeframe. See Appendix 3 for forecast results.

Peer review of methods

During the fall and winter of 2017 and 2018, Metro staff worked closely with a land use technical advisory group (LUTAG) that included about 20 planners from jurisdictions around the region as well as other stakeholders to update the regional BLI methodology originally developed in 2014. This work built on efforts undertaken to develop a BLI that was an input assumption for the 2035 Distributed Growth Forecast, which was adopted by the Metro Council in the fall of 2016 (ordinance #16-1371). The 2018 BLI benefited from that extensive engagement with local jurisdiction planners. In many instances, the advisory group discussed the ambiguity inherent in developing 20-year capacity estimates, particularly on a regional scale. On several topics, the group advised Metro that there was not a clear “right” or “wrong” answer, but helped Metro staff to arrive at methods that are, on the whole, reasonably sound for a regional analysis, and that use the best available information.

Uncertainty in the BLI

Metro produced two versions of the multifamily and mixed use capacity for the 2018 BLI using two different methods, to produce a range of possible outcomes. These two versions of the BLI are used to develop different scenarios in the UGR forecast analysis. The range BLI acknowledges the uncertainty around future market conditions as well as how developers and property owners will respond to those conditions. The low end of the range BLI is based on a statistical analysis of recently observed development trends, while the high end is estimated using the same methods as the 2014 UGR.

General methodology

Step 1: Identify vacant tax lots (and complement developed tax lots) by zoning class

Step 2: Remove tax lots from the BLI that don’t have the potential to provide residential or employment growth capacity (e.g., parks)

Step 3: Calculate deductions for environmental resources[2]

Step 4: Calculate deductions for “future streets”[3]

Step 5: Calculate BLI estimates (BLI includes capacity estimates for vacant and redevelopment)

a) Single Family Residential (SFR)
b) Multifamily residential (MFR) and Mixed Use Residential Capacity (MUR)
c) Employment (industrial[4] and commercial)

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[2] Environmental resources considered include Metro’s Title 3, Title 13, FEMA flood way and flood plain, and steep slopes over 25%.

[3] The BLI accounts for future streets on a tax lot-by-tax lot basis. The buildable area of each tax lot is reduced on the basis of individual tax lot size.

[4] Large, vacant industrial sites (25 or more net buildable acres) were inventoried in a separate process that relied on work done as part of the 2017 Regional Industrial Site Readiness Project, which was a partnership between Metro, the Port of Portland, Business Oregon, the Portland Business Alliance, NAIOP, and local jurisdictions. The inventory of large industrial sites was updated in the fall of 2017. It is included as Appendix 8 to the UGR.

Identify vacant and developed land by zoning (or comp plan)

Issue:

The BLI methodology treats vacant and redevelopment as separate categories for clarity and to avoid any double counting of capacity on the partially vacant lots. However, Metro's vacant lands inventory (a basis for the BLI) includes some "partially vacant" land.

Solution:

The region's buildable land inventory is sorted into *redevelopment* and *vacant* capacity (the identification screens / filters are inherently different). Tax lots that were previously categorized as "partially vacant" are categorized into one or the other condition (i.e., vacant or developed for purposes of counting regional capacity). Developed tax lots are subjected to economic screens (described in this document) to determine whether they should be counted as **potential** redevelopment capacity.

Vacant land definition[5]:

- Any tax lot that is fully vacant (Metro aerial photo)
- Tax lot with less than 2,000 sq. ft. developed AND developed part is under 10% of entire tax lot
- Tax lots that are 95% or more "vacant" from the GIS vacant land inventory[6]

Developed land definition:

- Part vacant / part developed tax lots are considered developed and will be treated in the redevelopment filter

Rationale:

Categorizing tax lots as vacant or developed (and potentially redevelopable) more closely aligns the inventory approach with that of other local governments and state administrative rules, which refer to vacant and redevelopable land. Lands previously defined as "partially vacant" are still inventoried, but are simply redefined to fit into the vacant or developed categories. Tax lots with fewer than 2,000 sq. ft. developed and a developed part that is less than 10% of the entire tax lot are considered completely vacant with the understanding that tax lots with this condition resemble a fully vacant tax lot. The developed portion would minimally impact new development. In case of tax lots in employment zones that do not pass through various redevelopment filters, for relatively large tax lots greater than 1 acre, we apply a final screen to include "land banked" parcels into the BLI.

Remove tax-exempt lots, parks

Issue:

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[5] Small inconsistencies in the alignment of the tax lot GIS layer and the vacant/developed GIS layer create slivers along property boundaries. In order to deal with this issue, any tax lot that is 95% or more vacant is considered "fully vacant".

[6] GIS tax lot layers change over time as the counties update their parcel base. Because of this, over time, the vacant land layer may develop inconsistencies, resulting in slivers of vacant or developed land that intrude on adjacent tax lots. Setting a 95% threshold prevents full vacant tax lots from being categorized as "developed".

Some vacant tax lots (e.g., parks) should not be recognized as carrying capacity for employment and/or housing going into the future.

Solution:
Remove the following types of tax lots from the residential (and employment) BLI based on Assessor PCA code designations, owner names, assessed values and other data sources:

- Tax exempt with property codes for city, state, federal and Native American designations
- Schools
- Churches and social organizations[7]
- Private[8] "streets"
- Rail properties
- Tax lots under 1,000 sq. ft. (0.023 gross acres)
- Parks, open spaces and where possible private residential common areas

Use the best available GIS data to remove parks, rail yards and railroad properties, major petroleum, natural gas lines and BPA power line right of ways. Parks is a data layer maintained by Metro that includes all parks in the region (e.g., community parks, regional parks, open space areas, golf courses, private common areas, and cemeteries).

EXCEPTIONS:
Included in Residential Capacity Calculations the following list of exemptions:

- Housing Authorities (not just Portland)

Included in Employment Capacity Calculations the following list of exemptions:

- Port of Portland
- Portland Development Commission

Rationale:
Tax lots that are not capable of supporting future employment and/or housing because of use restrictions should be removed from the BLI.

Calculate Environmental Constraints

Issue:
Local governments vary in how they implement environmental regulations found in Urban Growth Management Functional Plan Title 3 (Water Quality and Flood Management) and Title 13 (Nature in Neighborhoods). Moreover, estimation of residential housing capacity of tax lots (TL) with environmental impact may vary substantially on a case by case basis. Typically, ***density transfers*** from the environmentally impacted portion of a tax lot to the unconstrained part of the tax lot may vary significantly depending on the environmental impact and city regulations.

[7] Based solely on tax exempt codes.
[8] This was used for SFR, MFR and MUR zoning only. It proved problematic for COM and IND zoning

The capacity calculations for environmentally constrained tax lots recognize residential density transfers and Title 13's more flexible protections, which are applied on a site-by-site basis during the development review process. Generally, under Title 13, development is to avoid, minimize, or mitigate (in that order) designated habitat areas. Typically, precise delineations of habitat conservation areas are identified during the site development process. Therefore, the data and BLI calculation methods are more appropriate at a higher geographic scale than individual tax lots. The residential capacity computation (though accurate at a regional or subregional scale) may **NOT** accurately portray the precision needed to calculate the environmental deduction for each tax lot. This may also affect the calculation for the transfer of density from the environmentally constrained area to the unconstrained part for individual tax lots, but we believe that on balance, the variance in the calculation of net density and net residential capacity offset each other over the entire region.

A BLI technical working group was asked to provide advice on how to handle capacity assumptions in Title 13 areas. The group agreed that counting full residential capacity was not appropriate, but that discounting all capacity was not appropriate either. Metro staff then sent an e-mail inquiry out to all local jurisdictions in the region to determine their jurisdictions' historic development experience in Title 13 areas. Metro staff received varied responses with many caveats that preclude meaningful summarization. In the end, this inquiry did not produce a clear answer. Aside from the fact that Title 13 gets interpreted on a site-by-site basis, another challenge is that local implementation of Title 13 is fairly recent, which means that there is not a lot of development experience from which to draw (particularly in light of the Great Recession). Given this ambiguity and the fact that Title 13 areas comprise a relatively small portion of the region's single-family zoned vacant land (approximately 5.5%) and even less of its multi-family zoned vacant land (approximately 0.5%), Metro staff determined that the most reasonable approach was to rely on percentages found in the Title 13 Model Ordinance. This is the best available information and is being used on the advice of the BLI technical working group.

Solution:
Most areas that are considered environmentally sensitive fall into multiple categories of overlap including Titles 3 and 13, or are in a floodway or flood prone soils, or include steep slopes or some other ecosystem feature. Metro employs an environmental hierarchy to classify the environmental features to avoid double counting the capacity deduction for the BLI. BLI reductions will reflect the higher assumed protections when environmental features are overlapping.

Methods differ for single-family, multi-family, and employment lands. Generally, using the best available GIS data:

- Remove 100% of the area of floodways
- Recognize environmental constraints such as slopes over 25% and as defined by cities and counties under Title 3 and Title 13. In many instances, the delineation of the environmental buffers are GIS modeled data; where available we utilize environmental buffers from local government GIS data

- By assumption, permit 1 dwelling unit (DU) per residentially-zoned (SFR, MFR, MUR) tax lot if environmental encumbrances would limit development such that by internal calculations no (zero) dwelling units would otherwise be permitted ("essentially avoid takings")

As a result, we define the following land area calculations (used in formulas below):
Vacant buildable = Calculated area of TL – utility easements – parks – railroads – tax exempt sites
Net unconstrained[9] = vacant buildable – environmental constraints

The "calculated area of TL" is the GIS calculation of area (sq. ft.) of the tax lot as defined in Metro's GIS tax lot data layer. (Generally, individual tax lots are not affected by utility easements, parks, railroads or other tax exempt uses, but on a regional scale, these factors add up to be somewhat significant and therefore handled in the regional BLI calculations for the UGR capacity estimates.) Environmental constraints are handled as follows (by land use type):

<u>Single-family residential</u>

1. Floodways: 100% removed
2. Slopes > 25% and Title 3 treated the same way: 100% removed
    a. If tax lot > (or equal to) 50% constrained, follow the "maximum capacity rule" (defined below) to add back units[10]
    b. If tax lot is <50% constrained, assume 90% of unconstrained area is in BLI (i.e., apply 10% discount to vacant buildable acres)[11]
3. Title 13: 50% of Title 13 constrained acres removed from BLI (consistent with Title 13 model Ordinance).
4. Floodplain: 100% removed
5. Assume at least one unit per tax lot, even if fully constrained

<u>Multi-family residential</u>

1. Floodways: 100% removed
2. Slopes > 25%: 100% removed
3. Title 3: remove 50% of the constrained land with the other 50% considered buildable
4. Title 13: 15% of Title 13 constrained acres removed from BLI (consistent with Title 13 Model Ordinance)
5. Floodplain: 50% removed
6. Assume at least one unit per tax lot, even if fully constrained

<u>Industrial and commercial</u>

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[9] This is the calculation for SFR, MFR and MUR. The calculation for COM and IND is a 100% deduction of environmental constraints.

[10] This add back represents Metro's approach for estimating / calculating the density transfer to mitigate the loss of potential development productivity for dwelling units.

[11] Based on feedback from BLI working group, including local experience.

Employment zoned land applies a simple approach of netting out all constrained land. This is based on the input of the BLI technical working group, which indicated that constrained areas are typically avoided altogether by new commercial or industrial employment uses.

1. Floodways: 100% removed
2. Slopes >25%: 100% removed[12]
3. Title 3: 100% removed with the exception of the Portland Harbor Access Land where a 70% discount rate is applied[13]
4. Title 13: 100% removed

Calculate deductions for "future streets"

This BLI methodology sets aside a portion of the vacant land supply (not redevelopment supply) in order to accommodate future streets and sidewalks. This assumption is calculated on a per tax lot basis:

- Tax lots under 3/8 acre assume 0% set aside for future streets
- Tax lots between 3/8 acre and 1 acre assume a 10% set aside for future streets
- Tax lots greater than an acre assume an 18.5% set aside for future streets
- Industrial (IND) zoning assumes a 10% set aside regardless of size.

The basis for these net street deduction ratios derive from previous research completed by the Data Resource Center and local jurisdictions for the 2002 UGR.

Calculate single-family residential capacity

Rationale: A multi-step approach has been developed that accounts for environmental impacts and provides a means for explicitly estimating potential transfer of density from the constrained portion of a tax lot to the unconstrained portion. The approach corrects for over estimation of partial single-family (SF) capacity by rounding down capacity estimates to a whole number.

If a vacant tax lot is unconstrained by environmental impacts, the formula is simply to compute the maximum number of whole dwelling units permitted by the zoning district.

Example: 10,500 sq. ft. tax lot and zoning district allows a minimum lot size of 5,000 sq. ft. → (10,500 / 5,000) = 2.1 dwelling unit capacity rounded down to 2.0 DU

Our approach for both redevelopment and vacant tax lots otherwise considers the potential to achieve transfer of density from areas in a tax lot constrained by environmental considerations. Two (2) different capacity calculations are made on vacant SF tax lots to account for environmental constraints. The DU capacity for each tax lot is the ***minimum*** calculated by the two methods, with a floor of at least 1 SF unit

[12] For the large industrial sites inventoried in Appendix 8, a threshold slope of >10% was used.

[13] Based on input from City of Portland staff.

per tax lot[14]. The floor is an allowance for any vacant and fully constrained tax lot in order to recognize the development potential of 1 DU capacity in the BLI.

Calculations:
The *maximum capacity rule* is applied to single-family tax lots with environmental constraints (slopes greater than 25% and/or Title 3 constraints and/or Title 13 constraints). The rule would take the ***minimum*** number of units based on these guidelines:

1. Tax lot size / minimum zoned lot size; or
2. Unconstrained portion of lot / 2000 sq. ft. (1000 sq. ft. in Portland) [15]

Example of environmental conditions of one tax lot given two different constraint scenarios:

- 11,000 sq ft lot
- 5,000 sq ft minimum lot size zoning

Scenario A:

- 6,500 sq ft unconstrained
- 4,500 sq ft environmentally constrained
- If unconstrained: 11,000/5,000 = 2 units maximum
- With constraint: 6,500/2,000 = 3 units possible
- Applying maximum capacity rule: 2 units (zoning maximum takes precedence)

Scenario B:

- 2,500 sq ft unconstrained
- 8,500 sq ft environmentally constrained
- If unconstrained: 11,000/5,000 = 2 units maximum
- With constraint: 2,500/2,000 = 1 unit possible
- Applying maximum capacity rule: 1 unit possible (constraint overrides zoning maximum)

Single-family residential developed land methods (infill):

Rationale: There are a finite number of single-family tax lots in the region. As a result, over the next 20-year period, it may become increasingly attractive for homeowners of oversized SF tax lots to subdivide. Any single family zoned tax lot with a developed SF home was subjected to 1) an oversize tax lot screen to determine if the tax lot exceeded today's zoned minimum lot size (per Metro's regionalized zoning crosswalk table); 2) if the ratio of entire tax lot square footage to the minimum zoned lot size is between 2.5 and 5, an additional economic-based filter is used to remove from the BLI any lots with high-valued SF homes meeting this criteria. A $300,000 building value is assumed as an appropriate threshold for

[14] Note: This only applies to vacant tax lots. If a tax lot is already developed and environmental constraints would not allow any additional units to be built, it can have a minimum capacity of zero additional units.

[15] Assuming 2,000 sq. ft. in the above calculations was a recommendation of the 2035 Growth Distribution subcommittee (and 1,000 sq. ft. for areas in Portland), which was based in part on a review of regulation, physical dimensions (i.e., building footprint) of a prototypical higher density SFR development form, and practical development knowledge.

removal from the SF infill supply. The intent is to recognize that owners of large tax lots with relatively expensive homes are not likely to subdivide their tax lot.

SF Infill Filters:

- Must have single family zoning (per Metro's standardized regional zone class)
- If the tax lot is zoned SFR and classified by Metro as developed, it was assumed that one (1) SF unit presently exists on the tax lot regardless of what's indicated on the assessor's land use code. The one exception to this rule is for tax lots in SFR zoning that have current land use for an apartment (according to Metro's MF database), and these parcels were not considered in calculating infill potential for single family infill supply (Rationale for this was that any infill of such land use would by zoning yield a SFR unit with the concomitant loss of the MFR units, which we believed unlikely).
- Lot size threshold > 2.5 times the minimum zoned lot size (2.2 for City of Portland only); lots greater than 2.5 times (or 2.2 for Portland) would be added to the SF infill supply, except:
- Lots that meet the size thresholds are run through an additional economic eligibility filter before being included in the SF infill supply. In addition to meeting the size threshold, the assessor's real market building value must be below $300,000 to be counted in the SF infill supply. Rationale: lots with really expensive homes would be excluded from the SF infill supply.
- Tax lots with an oversize threshold exceeding 5 (anywhere in region) are passed through into the infill supply regardless of building value. Rationale is that the remaining buildable area is close to an acre or more and real estate economics being what we expect would very likely see significant infill pressures.

Example: an existing developed SF tax lot that's 13,000 sq. ft. and a minimum lot size for the zone class of 5,000 sq. ft. ➔ 13,000 / 5,000 = 2.6; this TL is eligible for infill with the capacity for 1 more DU (2.6 – 1 = 1.6 ➔ rounded down yields 1 more infill unit).

Calculations of eligible infill tax lots and the additional net DU added:
The net additional infill SF DU is the <u>minimum</u> of calculated by the following 2 computations. Many SF tax lots end up with zero additional infill units.

1. Additional DU infill= (Calculated area of TL – max lot size) / min lot size (rounded down to a whole number); can equal 0

2. Additional DU infill = (net unconstrained sq. ft. / 2,000 sq. ft. (1000 sq. ft. in Portland)), rounded down to a whole number; can equal 0

Calculated area of TL = GIS calculation of the tax lot
Max lot size = in the GIS tax lot layer database, each single family zone class has, by definition, a top-end value for lots to be classified for each SF residential category
Min lot size = in the GIS tax lot layer database, each single family zone class has, by definition, a low-end value for lots to be classified for each SF residential category (please refer to the Metro "Standardized Regional Zone Class" table.

Net unconstrained sq. ft. [16] = vacant buildable – environmental constraints

Single-family residential Accessory Dwelling Units (ADUs):

Over the past several years, the construction of Accessory Dwelling Units, particularly in the City of Portland has increased. These units are limited in size (800 sq. ft. maximum in the City of Portland) and provide an additional unit on single-family lots. In order to estimate a future supply of ADUs, Metro undertook an analysis of existing ADUs and used these locations to estimate new ADU construction by geographic location. The resulting probabilities of ADU development range from 0% in some zones to 9% in others, with higher concentrations in inner neighborhoods of N, NE, and SE Portland. These results in the database are represented as a percent probability (i.e. “0.15” units equates to a 15% chance that a single ADU will develop on a property.) Taken together, the total projection is around 4,400 new ADUs over 20 years, which are treated as multifamily long term rental housing units for modeling purposes.

Calculate multi-family residential capacity (including mixed-use residential)

Method for Vacant and Redevelopment Capacity Calculation (MFR and MUR)

If the tax lot is zoned MF (or MUR) and vacant, the BLI capacity estimate is simply the number of units per acre permitted by the zoning class multiplied by the vacant buildable acres, which in the case of the unconstrained tax lot is the area of the tax lot.

If the tax lot is zoned MF and vacant, but it is partly constrained by an identified environmental set aside (such as local ordinances implementing Title 3 or Title 13), the formula for estimating the BLI capacity tests the available size of the unconstrained part of tax lot to determine how much *theoretically* permissible density could be transferred to the unconstrained half. (See formula in this section.)

Redevelopment Rationale: In order to meet the goals of the “range BLI” described above, two different types of redevelopment filters are applied to each developed tax lot within a regional MF or MUR zone class. These filters are:

1. Threshold or “Strike” Price, a term-of-art used to indicate the price at which it becomes cost effective for a developer to consider a site for redevelopment, and
2. “Historic Probability”, referring to a statistical regression analysis based on historic observations to determine the ***probability*** that a property will redevelop based on recent trends of observed redevelopment.

Threshold or “Strike” Price Method

In order to be added to the multifamily redevelopment BLI, the redevelopment would have to add at least 50% more units over the number of units which already exist, or produce at least 3 units total. The

[16] This is the calculation for SFR, MFR and MUR. The calculation for COM and IND is a 100% deduction of environmental constraints.

rationale is that developers would not tear down and redevelop an apartment or condo units unless he could yield a significant gain in rents and dwelling units. A threshold of 50% was recommended by the land use committee that advised Metro staff on the BLI assumptions for the distributed growth forecast.

- Redevelopment of multi-family structure must add at least 50% more units; if it doesn't, the tax lot is not counted
- If the structure is a commercial (or industrial) building or single family dwelling unit (in an MFR or MUR zone), the redevelopment must yield at least 3 or more dwelling units
- Redevelopment must pass through an economic filter first before evaluation of additional DU through redevelopment (see below for economic filter thresholds)

Different economic redevelopment thresholds are assumed to determine which sites in today's MUR or MFR zone classes might be eligible for adding to the redevelopment portion of the BLI. These economic filter thresholds are described next.

Multifamily and Mixed Use Residential Redevelopment filter:
The economic screen for determining which tax lots could potentially be candidates for redevelopment is based on a ratio of total real market value[17] (land and improvements) divided by area of the tax lot (square feet). If the real market value per square foot is less than the threshold price, the tax lot is assumed eligible for redevelopment. The rationale for the thresholds is that developers have a profit motive. For the purposes of this BLI, it is assumed that developers may want to redevelop a property if the potential profit justifies property acquisition costs. Strike price values were developed in consultation with economic consultants and the BLI technical advisory group, which included developers with market knowledge. The strike prices are based on current market conditions, but are pushed to a modest degree to acknowledge that demand (and willingness to pay) will increase over the 20-year timeframe. As depicted in Table 2 and Figure 1 below, strike prices vary by market subarea.

Table 2: Residential redevelopment strike prices by market subarea (for MFR and MUR zone classes)

	Redevelopment threshold price per square foot (land and improvements)	
Market Subarea[18]	**Multi-family zoning**	**Mixed-use residential zoning**
Central City	$130	$130
N/NE Portland central corridors	$70	$80
Eastside urban	$70	$80
Gateway	$24	$24
Suburban	$10	$12

[17] Source: county tax assessors

[18] During 2014 Local Review, the City of Portland identified the Gateway district as an area that did not fit these general rules for redevelopment. Therefore, a strike price of $24/sq. ft. was applied in Gateway based on several real-world redevelopments that have recently occurred in Gateway.

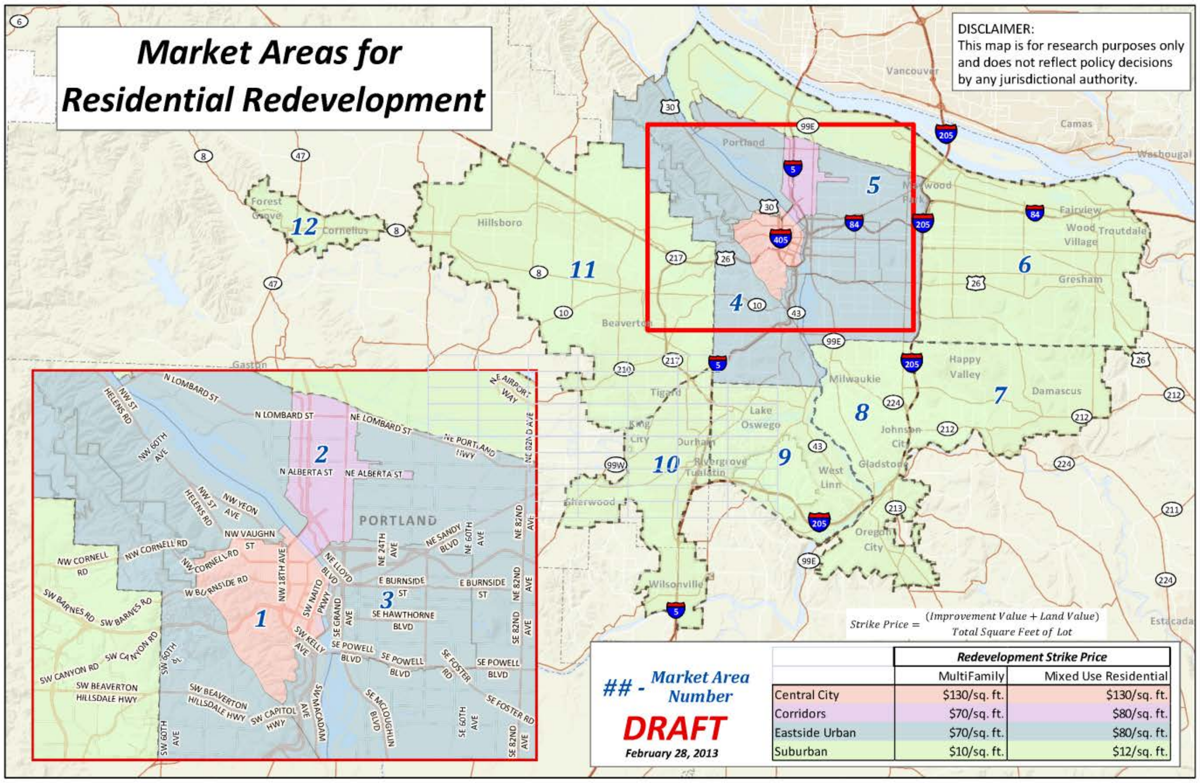

Figure 1: Mixed-Use Residential and Multi-Family Residential redevelopment market subarea analysis geographies

These economic filters define the BLI's supply of tax lots that <u>may</u> redevelop over a 20-year timeframe. The UGR goes through a separate step of using land use and transportation modeling to estimate what portion of that redevelopment supply is <u>likely</u> to redevelop over the 20-year timeframe. Using these numbers, this redevelopment supply is then expressed in the UGR needs analysis.

Formula for calculating density transfers on environmentally constrained tax lots (for MFR and MUR Redevelopment and Vacant tax lots):

If (unconstrained > 50% of total lot) => apply zoning density to entire tax lot.

Else the **buildable** area = unconstrained area * 2: Apply zoning density to **buildable** area.

Note: the deduction for environmental constraints is defined in previous sections of this report.

Density Transfer Rationale:
A tax lot with a majority of it unconstrained, a full density transfer is assumed from the constrained portion to the unconstrained. Therefore capacity is estimated as the zoned density and the lot size of the entire site.

The capacity estimated for a highly constrained tax lot is calculated differently. In this case, a density transfer is allowed, but the adjusted buildable capacity is based on the unconstrained area and multiplied by a factor of 2 and then applying the zoned density to this adjusted buildable area. For example, if a 10,000 sq. ft lot has a constrained area of 6,000 sq. ft., the method would assume that the zoned density would be applied to 8,000 sq. ft.

This approach is a modification to the previous BLI which set a minimum threshold of 10,000 sq. ft. in order for a density transfer to be allowed. Research indicated this was having the effect of limiting development capacity on urban lots with high-density zoning where an *unconstrained* lot with a size of 9,999 sq. ft would get low density capacity, whereas a lot with 10,000 sq. ft. would get full capacity.

Historic Probability (Regression) Method

Discrete choice regression analysis is a statistical method to determine which characteristics affect the likelihood of a particular outcome, positively or negatively, and by how much. This analysis uses observations of past redevelopment to predict future redevelopment, as a function of tax lot and neighborhood attributes. The output of the analysis is a tax lot-based probability that the specific tax lot will develop. This probability is then multiplied by the zoned capacity of the tax lot. For instance, if a tax lot has a zoned capacity of 200 units, and the historic analysis produces a probability of 0.07 (7% likelihood of redevelopment), the number of units assigned to the tax lot would be 14 (7% of 200).

Additionally, unlike the threshold method, which is either a “yes it has capacity” or “no it does not have capacity”, the historic approach assigns a capacity to MUR/MFR zoned tax lots that are currently not built to full zoned capacity, even when the likelihood is very small. Because of this, the totals need to be aggregated to a larger geography. As an example, if there is a subdivision of 10 existing single family homes, but the zoning allows for duplexes (one extra unit), the historic method might assign a 10% probability that each of those would develop as a duplex. The output would be a net of 0.1 units to each of the ten tax lots. When aggregated as a whole, a net result is 1 new unit for the entire subdivision. For more information on the historic approach, please see the “Historical Redevelopment Analysis” section below.

Employment Capacity Calculations for Commercial and Industrial

Method for Vacant and Redevelopment Capacity Calculation

The vacant land supply is identified using Metro’s vacant land inventory, which is derived annually from aerial photo information. Capacity to accommodate employment is determined by zoning (i.e., industrial, commercial, multiple use employment and mixed use residential zone classes). Similar to the residential BLI, the employment BLI estimate includes capacity from vacant land and potential redevelopment.

The employment BLI removes a select set of tax lots (vacant and developed) that for a variety of reasons should not receive any capacity calculations (e.g., parks and open spaces and other defined easements). These tax lots are removed from the employment inventory much like the residential inventory. They receive no carrying capacity for employment (or residential) uses.

The supply of employment land is measured in acres. All tax lots with commercial and industrial zoning were subjected to a series of preliminary screens first, as for residential, to exclude the following types of properties, for example:

- Tax exempt properties (except for Port and PDC codes)
- Schools[19]
- Rail properties
- Parks and open spaces[20]

The unconstrained buildable area, net of environmental and other constraints was calculated as follows:

Vacant buildable = Calculated area of TL – utility easements – parks
Net unconstrained = Vacant buildable –100% of environmentally constrained area

Tax lots that have been identified as part vacant (at least ½ an acre undeveloped) are considered developed and go through a set of redevelopment screens/filters in order to identify which tax lots have the potential to redevelop during the next 20-year time horizon.

Because "part vacant" land is now being classed as "developed" in this approach, there remain some tax lots with large vacant pieces that do not get through the economic filters and into the redevelopment supply. The assumed economic threshold values which identify which tax lots have potential to be redeveloped are not well suited and calibrated to identify partially developed tax lots with significant amounts of undeveloped real estate. A final screen for these so called "land banked" parcels was applied by adding back into the redevelopment supply the *net unconstrained* vacant portion of any lot with at least 1 acre of unconstrained vacant land.

In these cases, these two steps, the preliminary screening calculation of unconstrained area, are sufficient to identify the employment capacity on vacant land. For the redevelopment supply, the developed tax lots are subjected to a set of economic criteria shown in Table 3 and Table 4. Tax lots must meet both criteria (size and strike price) to be considered eligible for the redevelopment supply in the BLI. To be included in the BLI, the unconstrained area of a tax lot must be larger than the threshold acreage AND it must have a square foot value less than the applicable strike price.

The rationale for the tax lot size thresholds is that a developer would be less likely to redevelop a small tax lot because there are likely to be higher construction costs associated with fitting the development on a small parcel. Additionally, by their very nature, small parcels are not likely to produce redevelopment supply that is significant in the context of a regional BLI.

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[19] Metro maintains a school GIS data layer which will be used in screening out land for the BLI. Note: abandoned school properties or school sites that are no longer actively used as a school (and considered surplus) will be included in the BLI.

[20] Metro maintains a parks and open spaces GIS data layer (i.e., ORCA = open recreation and conservation area) which will be the data source used in screening out land for the BLI.

The rationale for the strike price thresholds is that developers have a profit motive. They may redevelop a property if the potential profit justifies property acquisition costs. Redevelopment strike prices were developed with the assistance of economic consultants and the BLI technical working group.

Table 3: Commercial redevelopment economic filter by market subarea

COMMERCIAL LAND			
		Redevelopment strike price ($/sq ft for land and improvements)	
Zone class	**Tax lot size (acres) greater than**	**Regional Centers, Town Centers, Station Communities[21]**	**Everywhere else in UGB**
Central Commercial (CC)	.249	$15	$12
General Commercial (CG)	.249	$15	$12
Commercial Neighborhood (CN)	.249	$15	$12
Commercial Office (CO)	.249	$15	$12

Note: Downtown Portland is zoned MUR, so is handled with the residential redevelopment methods.
Real market value from county assessors is used for calculating values

Table 4: Industrial redevelopment economic filter by market subarea

INDUSTRIAL LAND				
		Redevelopment strike price ($/sq ft for land and improvements)		
Zone class	**Tax lot size (acres) greater than**	**Entire UGB**	**Subarea #3[22]**	**Everywhere else in UGB**
Light Industrial (IL)	.99	$5	-	-
Heavy Industrial (IH)	.99	$5	-	-
Office Industrial (IO)	.99	-	$10	$7
Campus (business park) Industrial (IC)	.99	-	$10	$7

Note: Real market value from county assessors is used for calculating values

These economic filters define the BLI's supply of tax lots that may redevelop over a 20-year timeframe. The UGR goes through a separate step of using land use and transportation modeling and historic data to estimate what portion of that redevelopment supply is likely to redevelop over the 20-year timeframe. Using these numbers, this redevelopment supply is then expressed as a range in the UGR.

[21] Officially adopted center boundaries were used where possible. In other cases, analysis geographies were used. In the case of Station Communities, the Station Community buffers, as depicted on the 2040 Map, were used.

[22] As depicted in Figure 1.

Mixed Use capacity estimates (splitting residential and commercial capacity on MUR zoned tax lots)

More and more tax lots in the region are designated in mixed use residential (MUR) zones. Predicting whether MUR-zoned areas throughout the region will be developed as residential or commercial (or what mix of the two) is a challenge. MUR districts in the Metro region almost universally do not require *vertical mixed use*, which is to say ground floor retail/service or office uses with above floor apartments (or condos). Horizontal mixed use, on the other hand, are a mix of retail, service, office and residential apartments – a mix then of employment and residential land uses usually on separate tax lots.

MUR residential/non-residential capacity split formula:
Employment capacity in mixed use residential areas, measured in acres, is calculated from the dwelling unit capacity determined in the residential supply. For tax lots with MUR zoning:

- Total effective acres = Total additional units allowed if 100% of lot is used for residential * acres per unit required at maximum zoned density
- Residential effective acres = ResSplit * Total effective acres
- Employment effective acres = EmpSplit * Total effective acres

For the purposes of determining the residential/non-residential split, Metro performed an analysis of observed development from 2007 through 2015 in mixed use zones. Sub-regions were developed (in consultation with local jurisdictions) as displayed in the Figure 2 below.

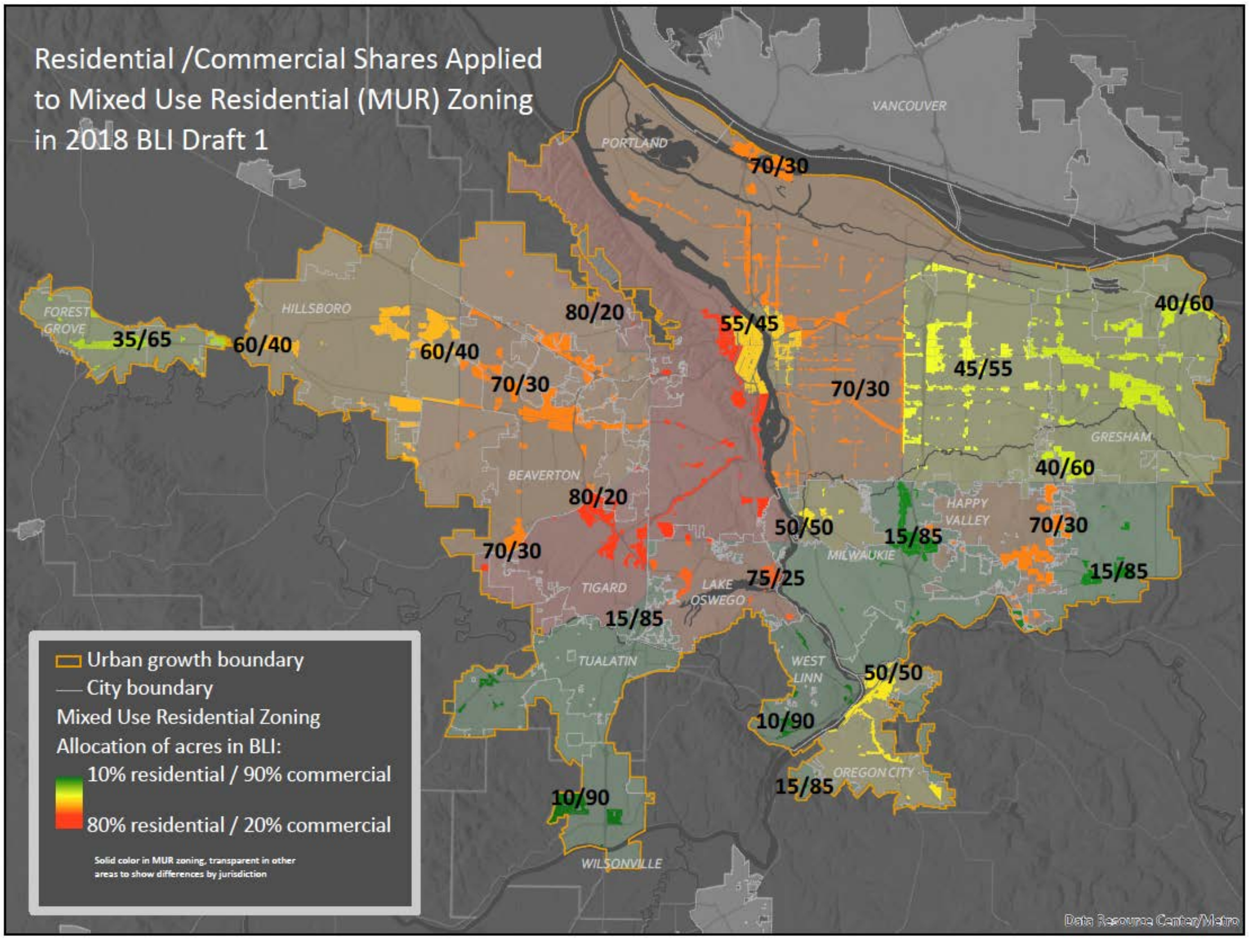


Figure 2: Residential/Commercial Shares Applied to Mixed Use Residential (MUR) zoning in 2018 BLI Draft

New urban area capacity

"New urban areas" are those areas that have been added to the UGB in recent years that do not yet have urban zoning or adopted comprehensive plans[23]. Consequently, planning documents, rather than GIS analysis, are typically the basis for how capacity in new urban areas is handled in the BLI. Possible sources of information include:

- Draft comprehensive plans
- Adopted concept plans
- Draft concept plans
- Conditions of approval that were attached to the UGB expansion.

[23] This marks a change from the 2009 UGR, which asserted that any area that was added to the UGB from 1998 onward was a new urban area, even if zoning ordinances had been adopted. The new method considers a narrower set of areas to be new urban areas. All other areas are handled according to the standard BLI methods described in this paper.

The UGR goes through a subsequent step of determining, in consultation with local jurisdictions, what portion of the region's capacity is likely to be developed in the 20-year timeframe. Examples of sources of information that can inform those determinations are local staff knowledge, status of planning and infrastructure provisions, market-based modeling, and the 2035 Growth Distribution. Please refer to the GIS shapefile for case-by-case capacity estimates when comprehensive plans or zoning plans were not used in calculations (i.e., in deference to other local input).

Historical Redevelopment Analysis

Background

This section supplements the "General Methodology" section above by providing more detail on an historic analysis of redevelopment within the Metro region and how that historic knowledge informed the creation of the two versions in this draft of the 2018 BLI. The previous 2015 BLI threshold or "strike" price redevelopment capacity estimation method was an evolutionary step that staff repeated in the 2018 BLI to create one version (or endpoint). Staff supplemented the threshold approach with a separate statistical analysis of multiple years of historical observed data. The historical analysis more-explicitly meets state law requirements for looking back over at least five years of data, responds to stakeholder and expert review advice that Metro's process take a robust look at redevelopment potential, and acknowledges uncertainty about the future by providing another BLI endpoint across a range of potential existing capacity. The historical analysis also gives a more nuanced picture of factors that influence redevelopment because it avoids the so-called "cliff effects" in the threshold approach (e.g. that threshold approaches either count lots as redevelopable or exclude them entirely based solely on a single price point). As shown below, redevelopment is a critical part of future housing capacity in the Metro region so understanding its history helps Metro plan for the future.

2007-2015 redevelopment and infill trends in the Metro region

Findings Summarized

In general the region depends increasingly on production of residential units on re-developable land and on producing more housing from multifamily (MF) development forms. These trends are important for analysts and policy-makers to recognize; it takes both specific private investments and public policy enablement to re-utilize already-built lands in ways that increase housing production. The private and public choices affecting redevelopment occur in a market environment where the laws of supply and demand interact to determine whether home-builders actually build and consumers actually buy or rent. For example, recent market reporting in the general media suggests that the production of multi-family housing may not continue at its recently intense rate due to typical real estate business cycles. In fact, the typical cyclicality of the multifamily market (and by Metro's definition all redevelopment produces MF) motivated Metro staff to choose 2007-2015 as the analysis period to cover pre-recession through post-recession years and by so doing to capture a complete business cycle.

Notable observations gleaned from analysis of the 2007-2015 observed redevelopment activity include:

- Post-recession annual housing production in the Metro UGB continues to trend toward pre-recession levels: in 2015 the region produced about 9,000 total dwelling units vs. a pre-recession peak of about 12,000 units per year (up from the 2010 low of about 3,000 units/year)
- Production of housing in Mixed-Use/Residential (MUR) and multifamily (MF) zoned areas continues to rise: in 2015 MUR+MF production together was twice that of SF production (in 2007 SF production was more than MUR+MF combined)

- In the three years ending 2015 the region increased the efficiency of its land utilization—annual acreage developed and redeveloped remained fairly flat while number of units in both infill/redevelopment and vacant land development increased.
- In the nine-year period 2007-2015 the region produced almost 27,000 housing units through redevelopment (about 3,000 per year on average), almost 14,000 from infill, and about 13,000 from vacant land development for a total of about 54,000 units in that span of time.
- Portland contributed the vast majority of redevelopment and infill units but redevelopment (and infill) has added to overall residential production in many cities throughout the region.

Background

In 2015 the Research Center (RC) began development of a Land Development Monitoring System (LDMS, part of the Regional Land Information System) to examine development trends in the Portland metropolitan region over time. The 2018 version of LDMS examines land change over time via a "look forward" approach. This approach starts with the earliest year in which none of the concerned lands changed and tracks every concerned taxlot through 2015 data to assess how "parent" parcels developed into "children" as a dynamic measure of land change.

This analysis has some limitations given its sourcing in assessor records and Metro's ability to "clean" the data: in general readers should assume a plus or minus five percent uncertainty when looking at the historical figures.

Note that the 2014 Urban Growth Report (2014 UGR) used a slightly different definition of redevelopment while this 2018 report uses definitions adopted for BLI development, so numbers below are not exactly comparable to the 2014 UGR.

Findings in Detail

Observed Housing Unit Production inside the 2016 UGB

In general, the data in figure 3 show that, during the recession, building slowed, but is climbing back up toward pre-recession levels.[24]

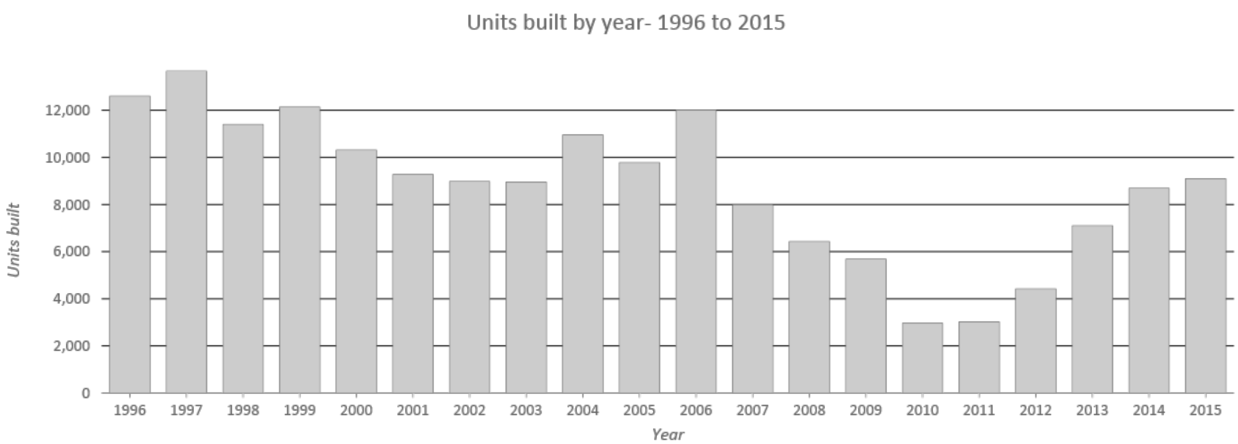


Figure 3: Housing units built from 1996 to 2015 inside the current Urban Growth Boundary. Source: LDMS child dataset.

[24] The time period of this graph overlaps with the graph of new housing by year shown in the 2014 Urban Growth Report, appendix 5. The data above shows a slightly higher total housing count by year than the 2014 UGR due to improvement of methods and refinement of available data sources.

Observed Single-Family and Multi-Family Production

From 2007 to 2015, the market produced about 54,000 new housing units inside the Urban Growth Boundary. This production level is below the historic norm.

During the recession, slightly more single family (SF) housing was built than multifamily housing, but the latest up-swing in the real estate cycle produced a higher proportion of mixed-use-residential (MUR) and multifamily (MF) development than SF. The general trend of mixed use and multifamily post-recession is up; single-family has trended up but at a slower rate. In year 2015, for example, MUR plus MF production taken together was about twice SF production. This is notable change from pre-recession patterns. Note that the difference between multifamily and mixed-use, as defined in this study, is that mixed-use has on-site commercial in addition to residential units on a single development site (from mixed-use field in the multifamily housing inventory).

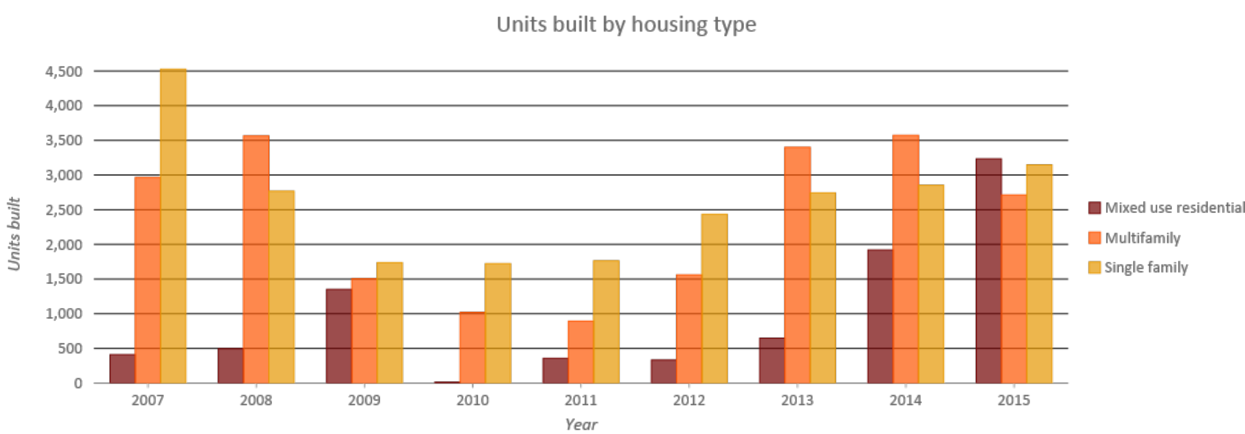


Figure 4: New units built from 2007 to 2015 inside the current Urban Growth Boundary, by housing type. Source: LDMS child dataset. Multifamily defined as properties in multifamily database (including ADUs) with no on-site commercial. Mixed use residential defined as properties in multifamily database with on-site commercial. Single family defined from property codes in tax lot data. Note that ADU's appear in the Multifamily category in this chart, while ADU parent structures appear in the Single Family bars.

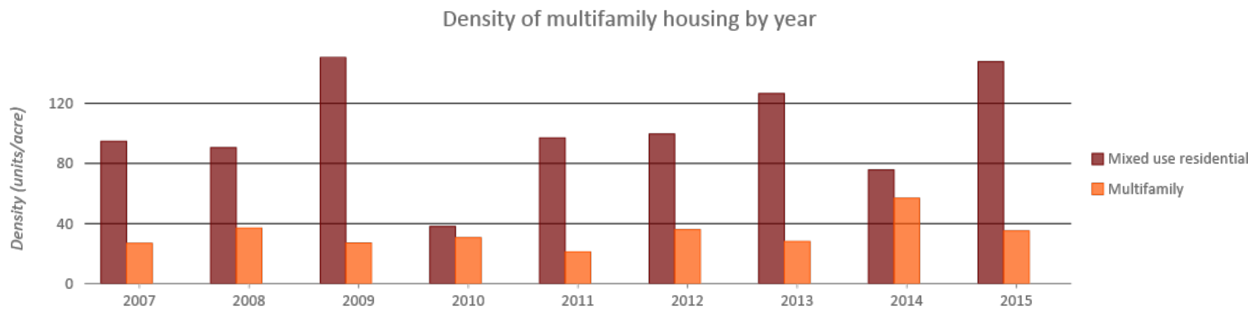
Observed Housing Density

Build density of single family housing varied slightly over the study period, with a peak of 7.6 units per gross acre in 2015, and a low of 6.7 units per gross acre in 2009.[25] The average density of SF built over the study period was 7.2 units per acre. Comparatively, the overall density for all existing single-family housing inside the UGB is 4.1 units per acre (or 4.7 units/acre excluding rural residences).

The density of multifamily and mixed-use units can be highly variable by year, as the total number of projects is relatively small and a single high-density development can greatly influence the average in a given year. During the period of 2007-2015, the average density of non-mixed-use multifamily housing units was 34 units per acre, and the average density of mixed-use was 112 units per acre. (Mixed-use is again defined as commercial and residential on a single property, and the density as reported here

[25] While these density values differ from the 2014 UGR, the trend and the average are comparable

reflects the density on a single property site, not the overall density of zoning classes, as discussed below in the MUR splits.)



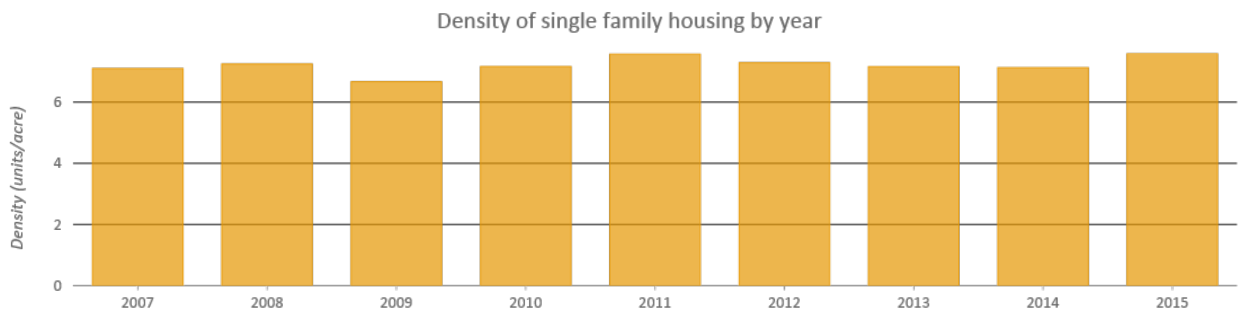


Figure 5: Housing density (per gross acre) by year from 2007 to 2015 inside the current Urban Growth Boundary, by housing type. Source: LDMS child dataset. Multifamily defined as properties in multifamily database with no on-site commercial. Mixed use residential defined as properties in multifamily database with on-site commercial. Single family defined from prop codes in tax lot data.

Observed Vacant Land and Redeveloped Land Usage

For the purposes of this study (gathering information to enhance BLI methods) the same definitions were used as in the BLI process. In the BLI, if a property is more than 5% developed (more than 5% of its area is developed in the vacant land inventory) then it goes through a series of redevelopment filters to assess its redevelopment potential. The same definition was made for this analysis, using the developed area of the parent lot (Table 1): If more than 5% of the parent lot was considered developed in the 2001 vacant land inventory, then any new construction was classified as either redevelopment or infill. Any new construction on a parent lot that was less than or equal to 5% developed was classified as vacant land consumption.[26] Also in the BLI, on developed land, infill is only possible within land zoned SFR, and any construction on previously developed land in all other zoning categories are defined as redevelopment. This results in all construction in SFR zoning being designated as either a vacant land consumption or infill, and construction in all other types of zoning classified as vacant land consumption or redevelopment.

[26] This definition differs from that of the 2014 Urban Growth Report, and produces a very different result. The 2014 UGR describes how its methods differ from that of the BLI.

Within this definition, 24% of new units were built on vacant land, while 50% were redevelopment and 26% were infill. In terms of consumed land area, the majority of the land for residential construction was used by infill projects (51%), vacant land accounted for 29% of land consumed. Redevelopment used the least amount of land (21%, 790 acres), but in this same area it contains half of the total units built (over 26,000) from 2007 to 2015 because MF and MUR construction can typically attain much higher densities than SF new and infill construction. See Table 1 for a summary of land absorption and unit production by type.

Table 5: Housing acres and units built from 2007 to 2015 by BLI land development type, from zoning-based classification

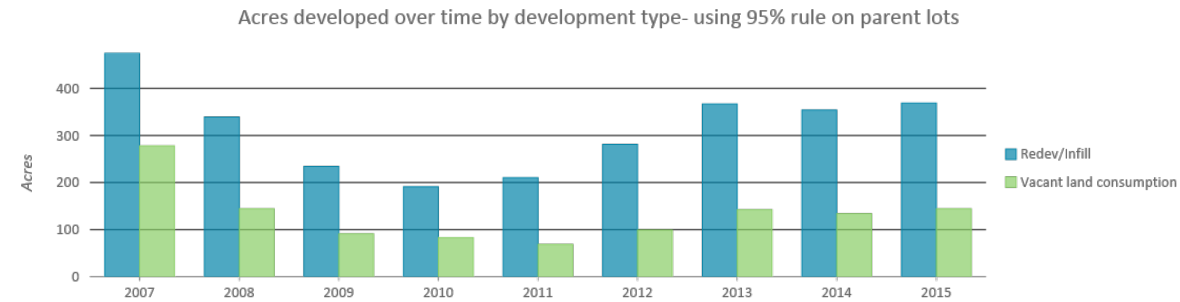
	Redevelopment	Infill	Vacant land	Total
units	26,750	13,850	13,100	53,700
acres	790	1,925	1,085	3,800
percent of units	50%	26%	24%	100%
percent of land	21%	51%	29%	100%

BLI Land development type definitions (based on zoning classification)

The 2014 Buildable Land Inventory used the development type definitions shown in Table 2, which are based on the zoning of each tax lot. The 2018 BLI retains these definitions. Most accessory dwelling units (ADUs) are constructed on SFR-zoned, previously-developed single-family lots and therefore classified as infill.

Table 6: Definitions of land development types, based on current zoning and % of parent lot that was developed in 2001.

<table>
<tr><th></th><th>>5% of ‘parent’ property developed in 2001 vacant land inventory</th><th>>=95% of ‘parent’ property vacant in 2001 vacant land inventory</th></tr>
<tr><td>2001 parent lot currently zoned SFR</td><td>All ‘child’ lots are infill</td><td rowspan="2">All ‘child’ lots are vacant land consumption</td></tr>
<tr><td>All other parent lots</td><td>All ‘child’ lots are redevelopment</td></tr>
</table>



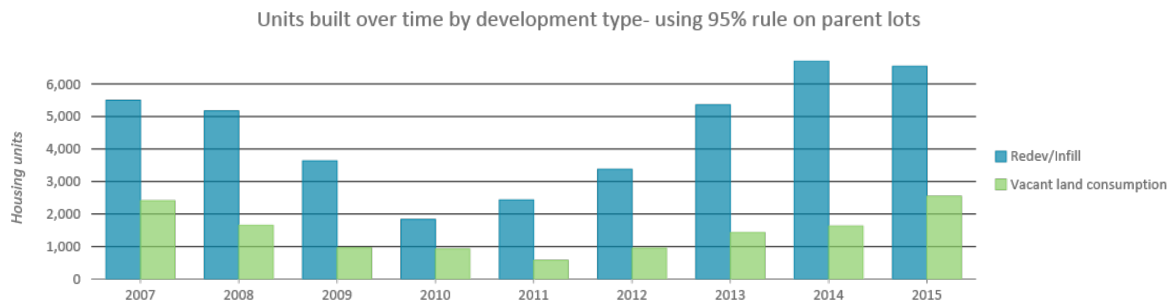


Figure 6: Total residential acres (top) and Housing units (bottom) built from 2007 to 2015 inside the current UGB by BLI-defined development type based on current zoning. Source: LDMS child dataset, with % developed from parent property. Accessory dwelling units are primarily included as infill, as they are most often built on previously developed single-family lots.

Real-world Examples Illustrate the Redevelopment Typology

Below are three examples of the types of observed redevelopment and how they are classified in this study. The first (Figure 7) shows an area of Happy Valley that was mostly rural in 2007 and saw many new single family homes built in recent years, as well as an apartment complex (bottom right) and some commercial development (bottom left). Only the large parcels that had no previous developed area (no old farm buildings) are being classified as vacant land consumption (shaded green area, threshold set at 95% vacant in 2001 vacant land inventory). 2001 tax lots that were more than 5% developed in 2001 have children classified as redevelopment (shaded purple), or infill (shaded blue). The distinction between infill and redevelopment is based on the current zoning of the parent lot. Previously developed lots that had their largest area zoned as SFR are classified as infill while lots that had their largest area zoned anything else are classified as redevelopment. This method of classification is consistent with the BLI, which necessarily only includes parent lots and predicts the types of children that may be developed.

Figure 7: Example of rural development- The left side shows aerial imagery from 2001 and the right side imagery from 2017. Parent properties that saw some type of development from 2007 to 2015 are outlined. Areas outlined in green were considered vacant in 2001. Areas outlined in blue were developed prior to 2001. Only new construction that occurred on parent lots with very little prior development (>95% vacant land in 2001) are considered as a vacant land consumption (child lots shaded green). Other new construction on previously developed parent lots (parent >5% developed in 2001) are classified as infill (parent with current zoning mostly SFR), or redevelopment (parent with current zoning mostly MFR/MUR). Source: LDMS parent and child lots, development types using the zoning-based definitions and 95% rule described above.

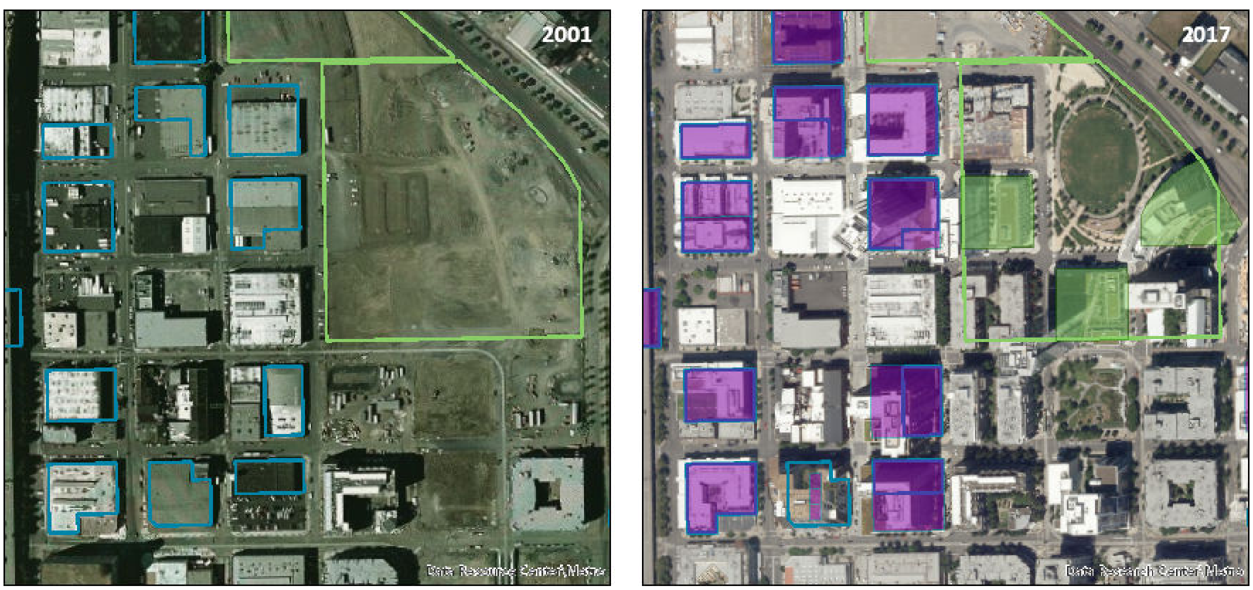


Figure 8: Example of downtown Portland high-density development. The left side shows aerial imagery from 2001 and the right side imagery from 2017. Parent properties that saw some type of development from 2007 to 2015 are outlined. Properties outlined in green were considered vacant in 2001. Properties outlined in blue were developed prior to 2001. The north portion of the Pearl District was considered vacant land, but most of the downtown area was developed prior to 2001. Many new high-rise buildings were constructed between 2007 and 2015, and are classified as either redevelopment (shaded purple) or vacant land consumption (shaded green). Source: LDMS parent and child lots, development types using the zoning-based definitions and 95% rule described above.

The second example is the Pearl District in north Portland. The northeast portion of the area shown was considered vacant in 2001 (child lots shaded green). Note the majority of the rest of this downtown Portland area was developed prior to 2001. Several new high-rise apartment/condo buildings are visible, as well as new commercial buildings (both shaded purple). Note that in this image, while the entire area is currently zoned MUR, the child lots pictured include some commercial-only lots with no housing.

The final example is in southeast Portland. Many single family homes have been added as infill between other existing homes, including accessory dwelling units in addition to many older homes that have been replaced with a newer, often larger, home on the same lot (all shaded blue). Only one lot in this image was classified as vacant land consumption (shaded green). Some commercial and mixed-use redevelopments in MUR/MFR zoning are also visible along the major roadway (shaded purple).

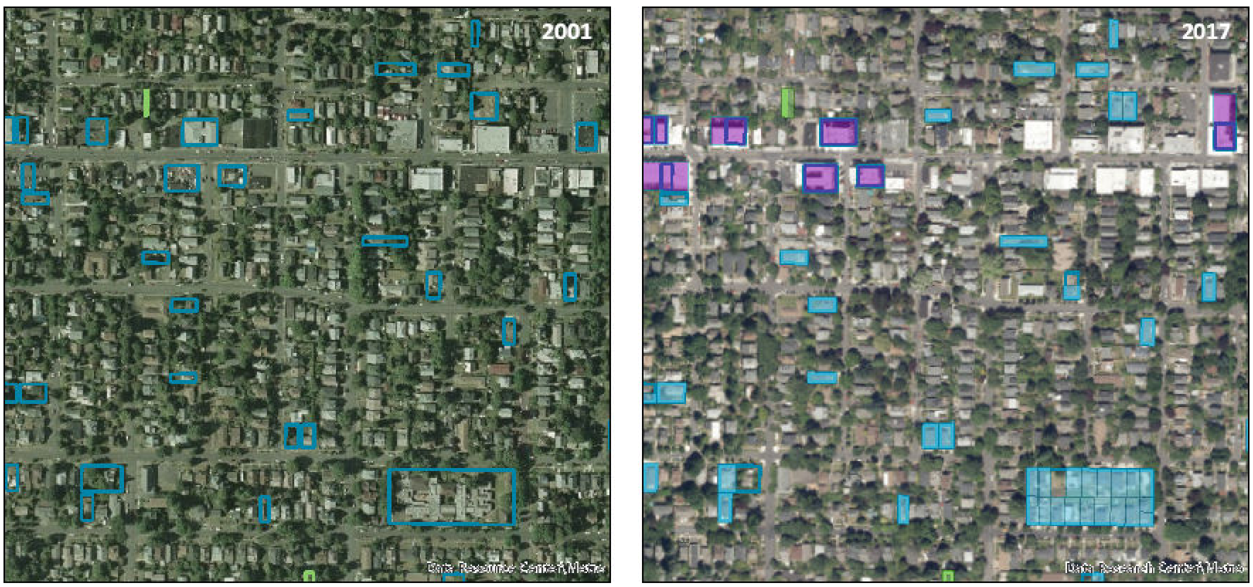


Figure 9: Example of infill and redevelopment in SE Portland. The left side shows aerial imagery from 2001 and the right side imagery from 2017. Parent properties that saw some type of development from 2007 to 2015 are outlined. Properties outlined in green were considered vacant in 2001. Properties outlined in blue were developed prior to 2001. Only one single family home in this example is classified as a vacant land consumption (shaded green), the majority of new single family homes built in this area are considered infill (shaded blue), whether they were a 1:1 replacement home, a group of homes on a subdivided planned development, an ADU added to a previously existing home, or a single home built on a single lot split from an older home. Some redevelopment is also present (shaded purple), and includes construction of new commercial and multifamily properties. Source: LDMS parent and child lots, development types using the zoning-based definitions and 95% rule described above.

Housing Unit Production by Standardized Regional Zoning Class

Over the past 9 years, the most residential units built have been in the regional MUR9 and MUR10 standardized zone classes (most of which lie in Portland), the highest density zoning for multifamily housing in the region. This zoning class tends to see mostly redevelopment rather than new construction on vacant land. However, the largest area of land consumed by residential development has been by single family housing in zone classes SFR4, 5, and 6. In general, the higher zoning classes saw higher density zoning, as expected. See the [metadata in RLIS Discovery]() for definitions of zoning classifications.

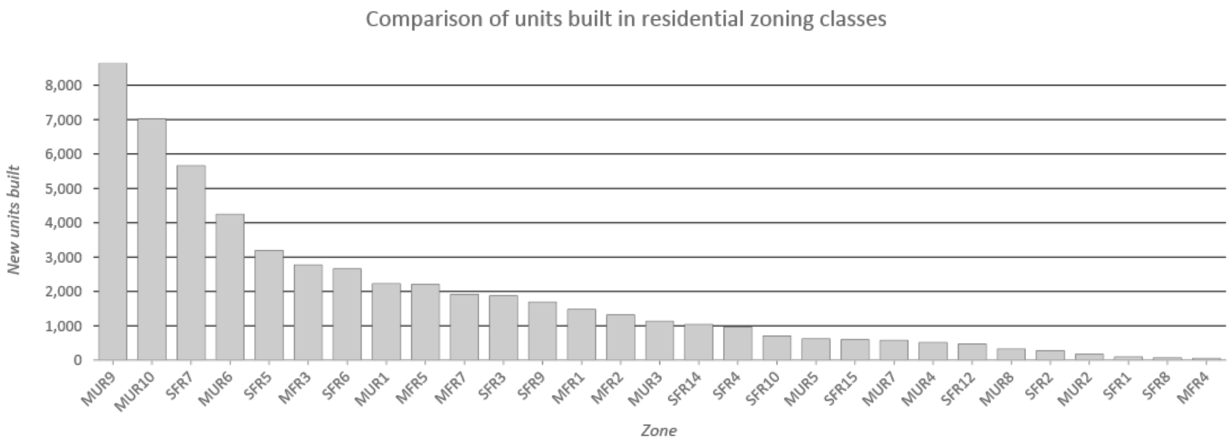


Figure 10: Units built 2007 to 2015 by current zoning classification. Source: LDMS parent dataset.

Housing Unit Production by Jurisdiction

Over the past 10 years, the largest producer of new housing units is the City of Portland (~1/2 of all new units).

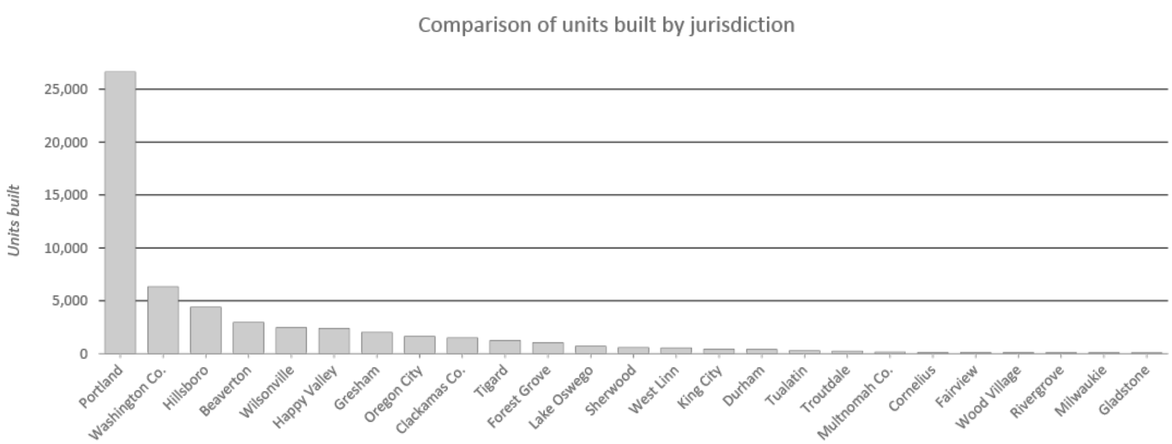


Figure 11: Housing units built by city/unincorporated county for areas inside the Urban Growth Boundary from 2007 to 2015. Source: LDMS parent dataset. Jurisdiction based on current city boundaries.

Under the definitions of this study most recent Portland housing construction is classified as infill or redevelopment. A small proportion of the new housing inside the City of Portland is classified as vacant land consumption, but other jurisdictions have a greater proportion of their total new units built on vacant land.

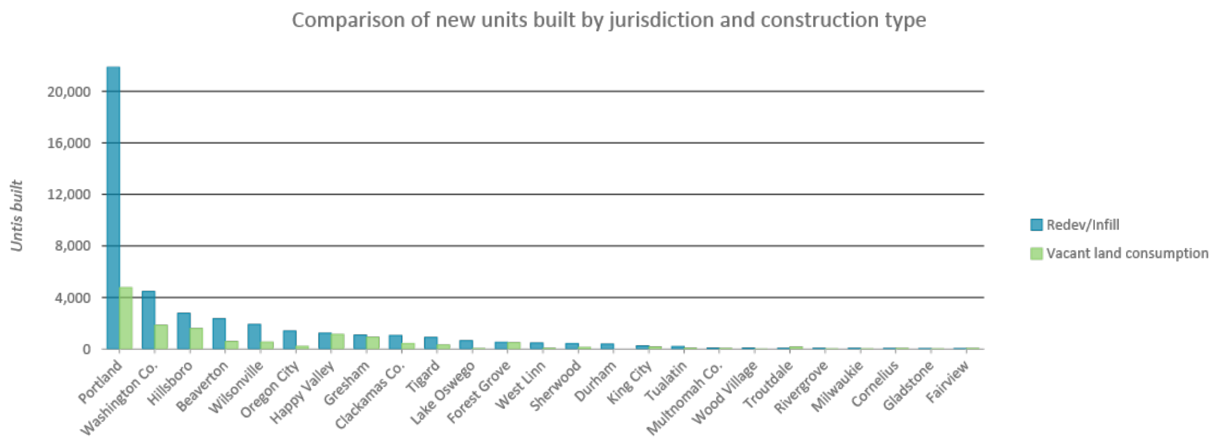


Figure 12: Units built by city/unincorporated county for areas inside the UGB from 2007 to 2015, by development type. Source: LDMS parent dataset. Jurisdiction based on current city boundaries, development type from zoning-based classification consistent with BLI methods.

2007-2015 Data Collection Methods and Caveats

Methods

The LDMS "look-forward" approach uses ArcGIS scripting in Python to make comparisons between past and present data layers through spatial relationships. The Metro Research Center maintains historical archives of RLIS publications (Regional Land Information System). The main layers used for this analysis are the tax lot parcel data, the Multifamily Housing Inventory (first published in 2010), and the Vacant Land Inventory, with other layers being added as needed for summarization. These layers taken together with added data (e.g. rental price information) comprise the Land Development Monitoring System (LDMS).

The first process step for the look-back approach is a year-by-year combination of the Vacant Land Inventory. The process starts with the most recent vacant land, and progressively adds in where areas were vacant in previous years. The Vacant Land Inventory is tax lot-based and the rules applied to the data state that "once an area is developed, it stays developed". The data layer produced is a year-by-year record of vacant land consumption for the region (see limitations section below for caveats).

The next step combines the current tax lot data and the current Multifamily Housing Inventory into a single layer. Using the multifamily housing polygon instead of the tax lot avoids the problems that arise (in evaluating the assessed value per unit, for example) when a single multifamily complex spans multiple tax lots. The same is done to the 2001 tax lot layer, replacing multifamily built up to 2001 into the 2001 tax lots. Comparisons are then run forward and back to quantify the changes between the two time periods (e.g. total # of units built on parent tax lot, total acres developed).

Each new development is classified as VACANT LAND CONSUMPTION (construction on vacant land), INFILL (single-family construction on previously developed land), or REDEVELOPMENT (any other type of construction on previously developed land). To qualify as vacant land consumption, the "parent" lot must have been at least 95% vacant in the 2001 vacant and developed lands.

The "takeouts" for right-of-way and parks are calculated for each "parent" lot by comparing to current parks and tax lot right-of-way data. An "unaffected acres" is calculated for lots where the sum of the newly developed lots, the right-of-ways and the parks acreage sums to less than the total parent acreage. This unaffected area could be a previous structure that wasn't touched, or a portion of the lot remaining vacant.

Known limitations in the observed dataset

There are known errors in the Vacant Land Inventory that can be categorized into two groups: (1) developed lots that have reverted back to vacant and (2) vacant lots that have changed to "developed" without any documentation. These two types of errors account for a small percentage of the overall data, but at a tax lot-level analysis (as LDMS is) single-site errors become apparent. The first type of error (developed becomes vacant again) can lead to land that was actually developed at a point in the past being labeled as a vacant land consumption when it converts to developed a second time. The second type of error (vacant becomes developed for no reason) is mostly filtered out in this analysis by other factors, but can lead to overestimation of the total acres consumed by development in a year. Staff estimates the total error due to these situations to be less than +/-5%.

Research Center staff built the process largely around the tax lot parcel data and particularly the YEARBUILT field as an indicator of change. There is a time lag in the recording of many tax lot attributes of at least 1 year, and therefore only data up through 2015 was used for the BLI work even though 2016 data is now available and reported in UGR Appendix 5.

For some commercial and industrial properties, year of construction is not present in the tax lot data. Vacant land consumption can be a stand-in for the year of construction in greenfield development, but there are few indicators for change on already developed commercial and industrial land. Therefore, this study likely underestimates the amount of commercial/industrial redevelopment that has occurred.

Producing the range BLI

As noted, the 2018 BLI includes two versions of multifamily and mixed-use redevelopment capacity that were estimated using two different methods. This creates a range of potential housing capacity to acknowledge the uncertainty around future market conditions as well as developer and property owner response to those conditions. The low end of the range BLI is based on the historical analysis described above while the high end is estimated using the same threshold method as the 2014 UGR.

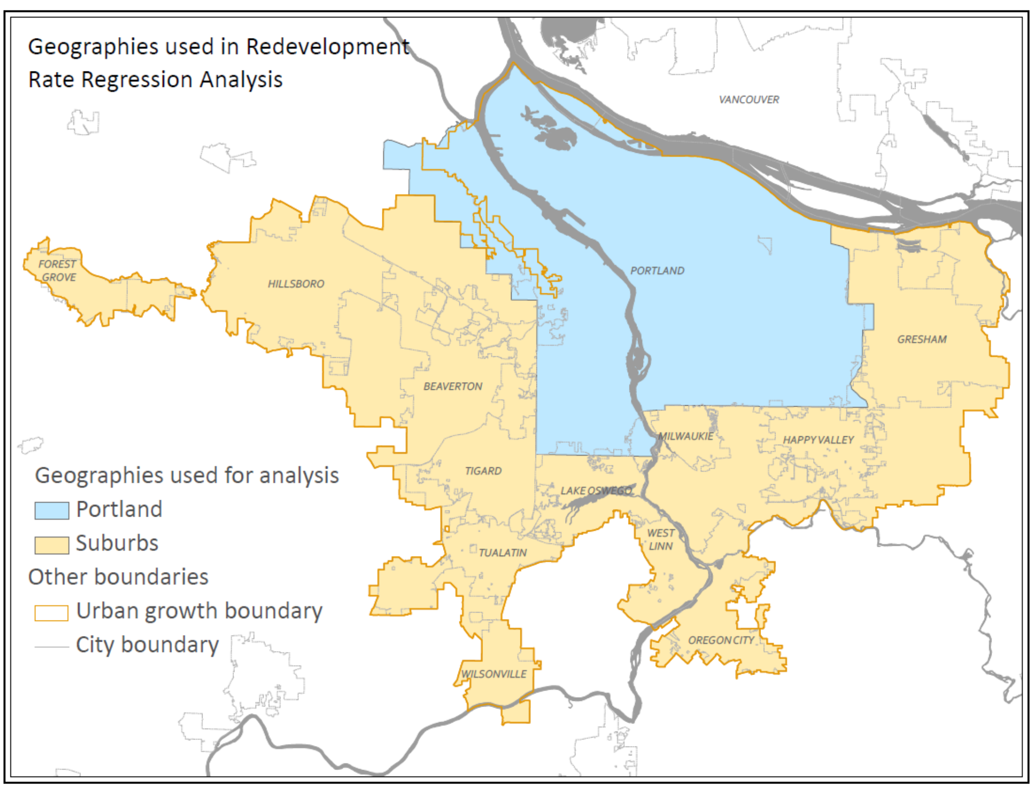
Estimating Redevelopment for Lower Endpoint of BLI Range

To estimate the statistical redevelopment capacity in the 2018 BLI, Metro analyzed the LDMS redevelopment data summarized in a prior section of this report using binomial logistic regression models with Census tracts as zones and tax lots as the units of analysis. Metro tested several models then presented one with the best fit to LUTAG for discussion. Metro staff refined the model in light of LUTAG feedback (although Metro lacked sufficient time to incorporate some good suggestions such as including an explanatory variable of distance-to-nearest-regional-center for non-Portland locations). A separate section below provides full mathematical documentation and validation of the regression model.

Redevelopment occurs differently in different places

The redevelopment regression model found that 2007-2015 redevelopment in the Metro region differs across two broad geographies—Portland and close-in small cities vs. all other areas.

Figure 13: Redevelopment Market Geographies



Redevelopment in Portland is driven by four main factors

Regression modeling of the historical data found four highly-significant variables that explained the likelihood of a tax lot developing within Portland proper: (1) the distance to the Portland CBD in miles, (2) the size of the property, (3) the property's value (land + improvement value) relative to the average value of all lots in its neighborhood (Census tracts represented neighborhoods), and (4) the average value of properties in the neighborhood relative to the average values of all neighborhoods in the region. Those four factors had approximately the following effects as shown in the 2007-2015 data:

1. The closer to the CBD the more likely built lands are to redevelop.
    a. The average observed distance of a lot within Portland from the CBD is 4 miles;
    b. For example, a lot ¼ that distance (one mile) from the CBD is almost twice as likely to redevelop.
2. Larger lots are more likely to redevelop.
    a. The median observed redeveloped lot size (prior to redeveloping) was 0.116 acres;
    b. For example, a lot nine times that big is twice as likely to redevelop.
3. Properties lower-valued than their neighbors are more likely to redevelop.
    a. For example, relative to a property with an average value for its neighborhood…
    b. …a property with assessed value per square foot half that is 30% more likely to redevelop.
4. Properties in neighborhoods with the average neighborhood property value lower than the regional average property value are more likely to redevelop.
    a. For example, a property in a neighborhood within which the average property value is half that of the regional average…
    b. …is 45% more likely to develop.

Redevelopment outside Portland is driven by three main factors

1. Larger lots are more likely to redevelop…
    a. …with larger lot size more strongly increasing redevelopment likelihood than in Portland
2. Properties lower-valued than their neighbors are more likely to redevelop…
    a. …with local value differences having a weaker effect than in Portland (lots with a slightly higher value outside Portland would have the same probability of redevelopment, all else being equal).
3. Properties in neighborhoods with average property values lower than the regional average property value are more likely to redevelop…
    a. …with differences to regional values having a stronger effect than in Portland (lots in higher-value neighborhoods outside Portland are slightly less likely to redevelop than lots in Portland in similar value neighborhoods, all else being equal).

In future UGM cycles Metro proposes to test additional models. The idea of including the distance to the nearest regional center for non-Portland geographies has merit but requires careful thinking and model iteration to determine which centers matter to which geographies, requiring more time than available in the 2018 UGM cycle.

Historical analysis applied to create the 2018 BLI Lower End

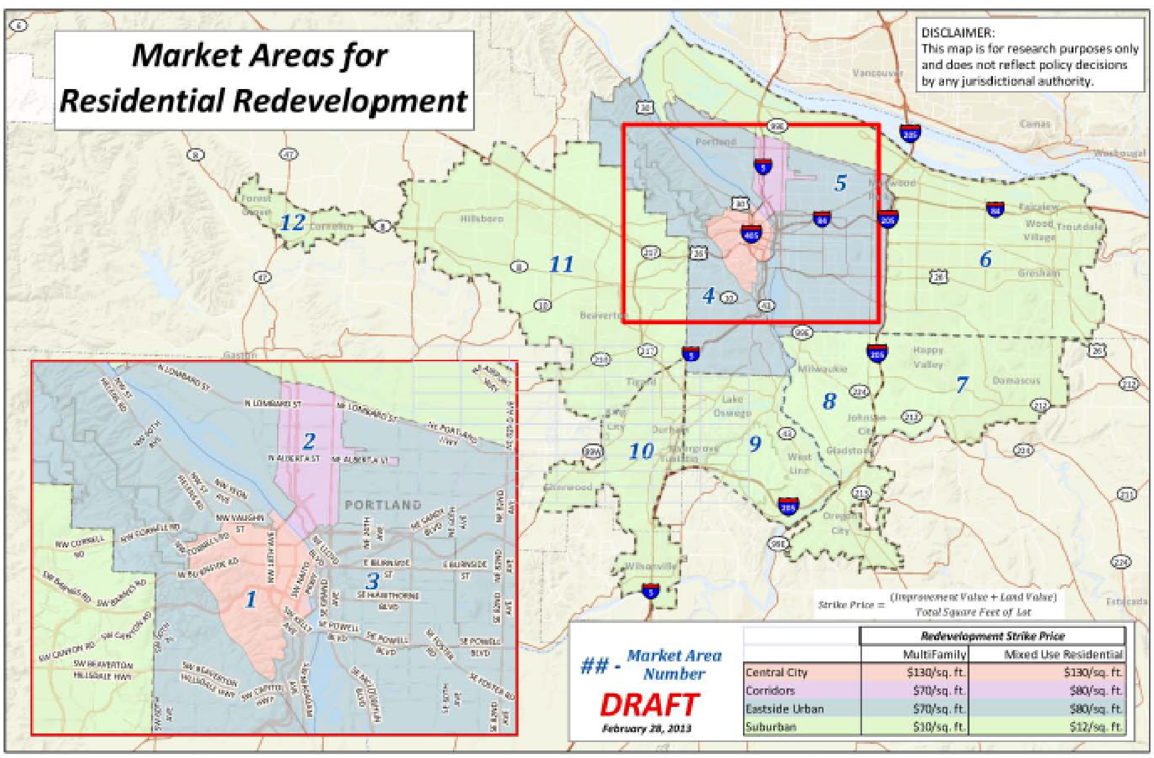
Metro applied the historically-based, probabilistic redevelopment forecasting method to the raw BLI inputs using an expected value approach. This applies to each tax lot the regression-estimated probability (number between zero and one) that the lot will redevelop, multiplied first by the lot's maximum zoned capacity then by a factor to expand to a twenty-year time frame (since the probability is only for an observed nine-year time span). For example, this method forecasts that a lot with a zoned capacity of 100 units and a fifteen percent probability of redeveloping within nine years would produce 33.3 dwelling units over a 20-year time (0.15 x 100 x 20 / 9). The method uses the maximum zoned capacity to account for the likelihood that as the region continues to grow and densify, developers will more likely build additional units per tax lot.

Estimating Redevelopment for the for Upper Endpoint of BLI Range

For the high endpoint of the 2018 BLI Metro applied the method from the 2014 BLI. That approach compares the current real market value per the tax lot's area in square foot to a "strike price": if the real market value (RMV) is less than the strike price then the tax lot is considered to be part of the redevelopment capacity at the maximum zoned capacity. Figure 14 below reproduces the 2014 BLI strike prices[27] and the geographies at which they apply.

Figure 14: Threshold Strike-Price Method Adopted from the 2014 BLI

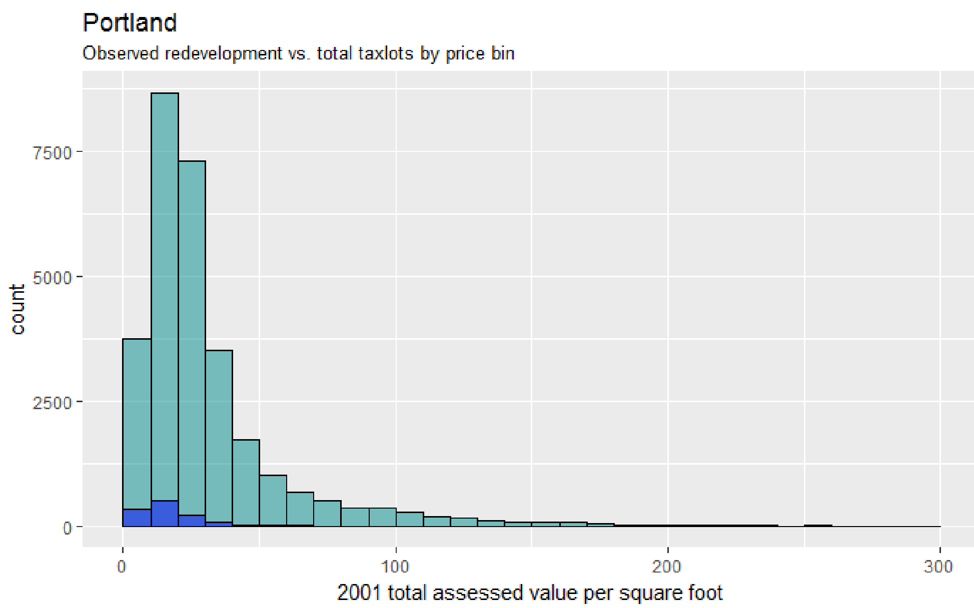
	Redevelopment strike price per square foot (land and improvements)	
Market Subarea[18]	Multi-family zoning	Mixed-use residential zoning
Central City	$130	$130
N/NE Portland central corridors	$70	$80
Eastside urban	$70	$80
Suburban	$10	$12



[27] For more detail on the strike price method see *2014 Urban Growth Report, Appendix 2: Methodology for determining the 2014 Urban Growth Report's buildable land inventory.* Available at https://www.oregonmetro.gov/urban-growth-report

Historical and threshold methods compared

Metro developed the historically-based regression analysis approach to leverage the new data in LDMS which was not available at the time the 2014 "threshold" method was developed. The relative effects of the two methods can be seen in the following three histograms showing the number of lots that redeveloped over the observed time period (blue), overlaid on the total number of developed tax lots in MFR and MUR zoned areas (green) by total assessed value per square foot. The charts show that only a very small fraction of the developed lots in any assessed value category actually redeveloped over the nine year period. There is evidence that a larger share of lower valued lots redevelops, but redevelopment is not assured for all potentially re-developable tax lots. Redevelopment is observed at higher assessed property values, but again not all tax lots re-develop.



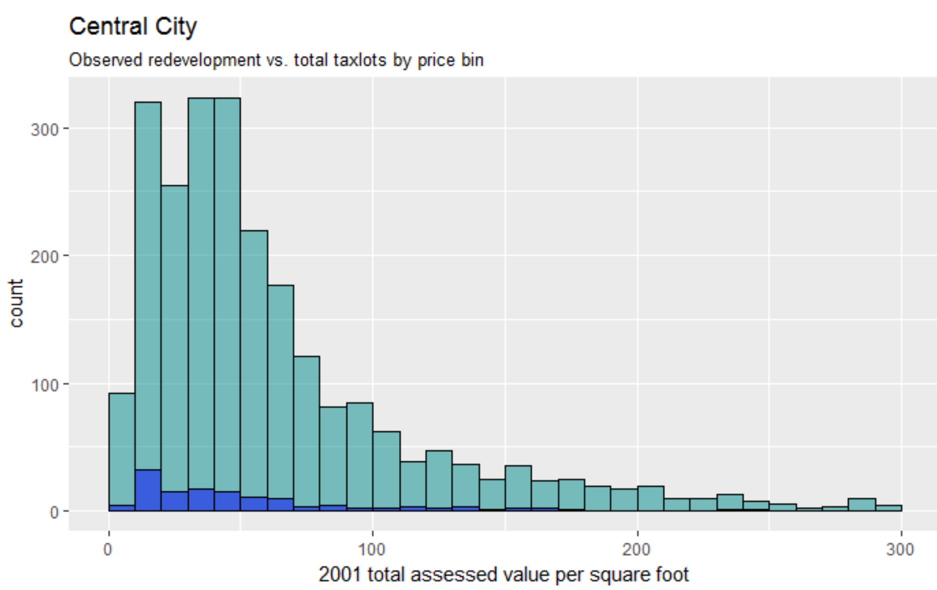
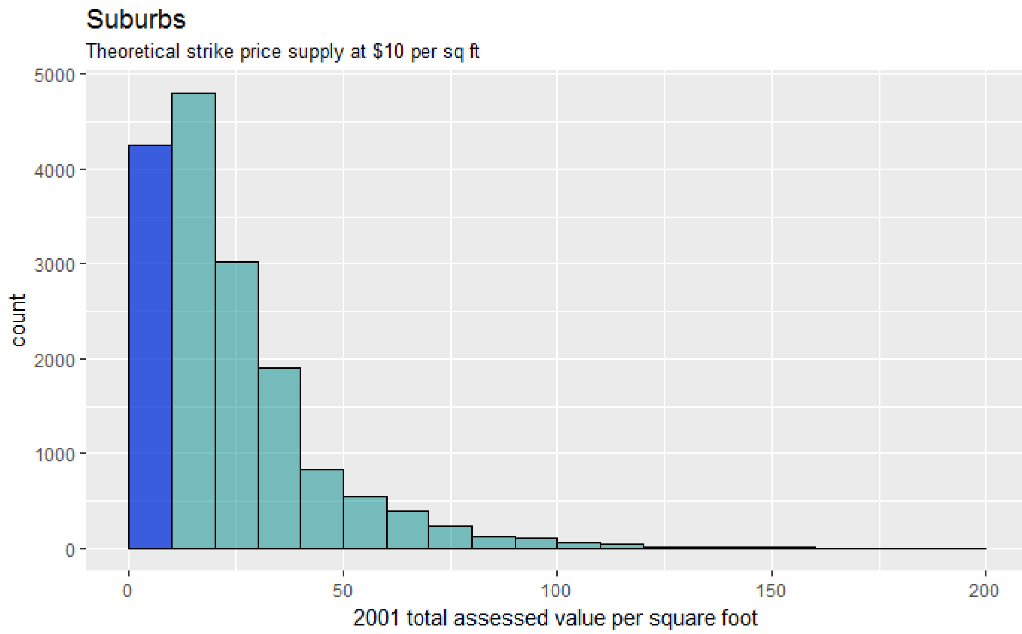


Figure 15: Histograms of 2007-2015 Observed Tax lot Redevelopments for Portland (top), Areas Outside Portland (middle), and Portland CBD (bottom)

In contrast, the strike price method assumes that all of the properties below a price threshold are eligible for redevelopment while no properties above the price threshold would redevelop. The histograms below repeat the total tax lots histograms for the suburbs and central city overlaid with the properties that meet a hypothetical strike price threshold. Note that this analysis uses 2001 property values per square foot, so these numbers are not directly comparable to threshold prices used in recent iterations of the BLI, but any threshold demonstrates how the strike price methodology works in practice. For illustration purposes the histograms below apply strike prices of $10 per square foot in the suburbs and $20 per square foot in the central city.



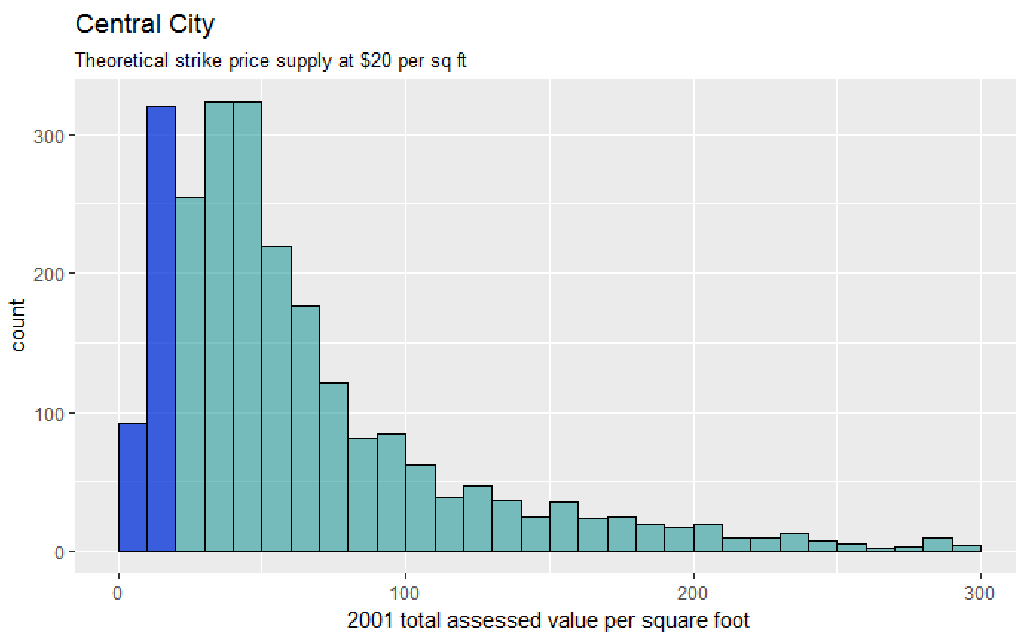


Figure 16: Histograms of Hypothetical Strike Price Estimate of Lots that would Redevelop for Areas Outside Portland (top), and Portland CBD (bottom)

The following two histograms show the application of the expected value regression approach described above to 2018 BLI tax lot inputs (note that these are not comparable to the historic data shown above). These plots clearly illustrate that the regression estimates a distribution of potential redevelopment across a spectrum of assessed values.

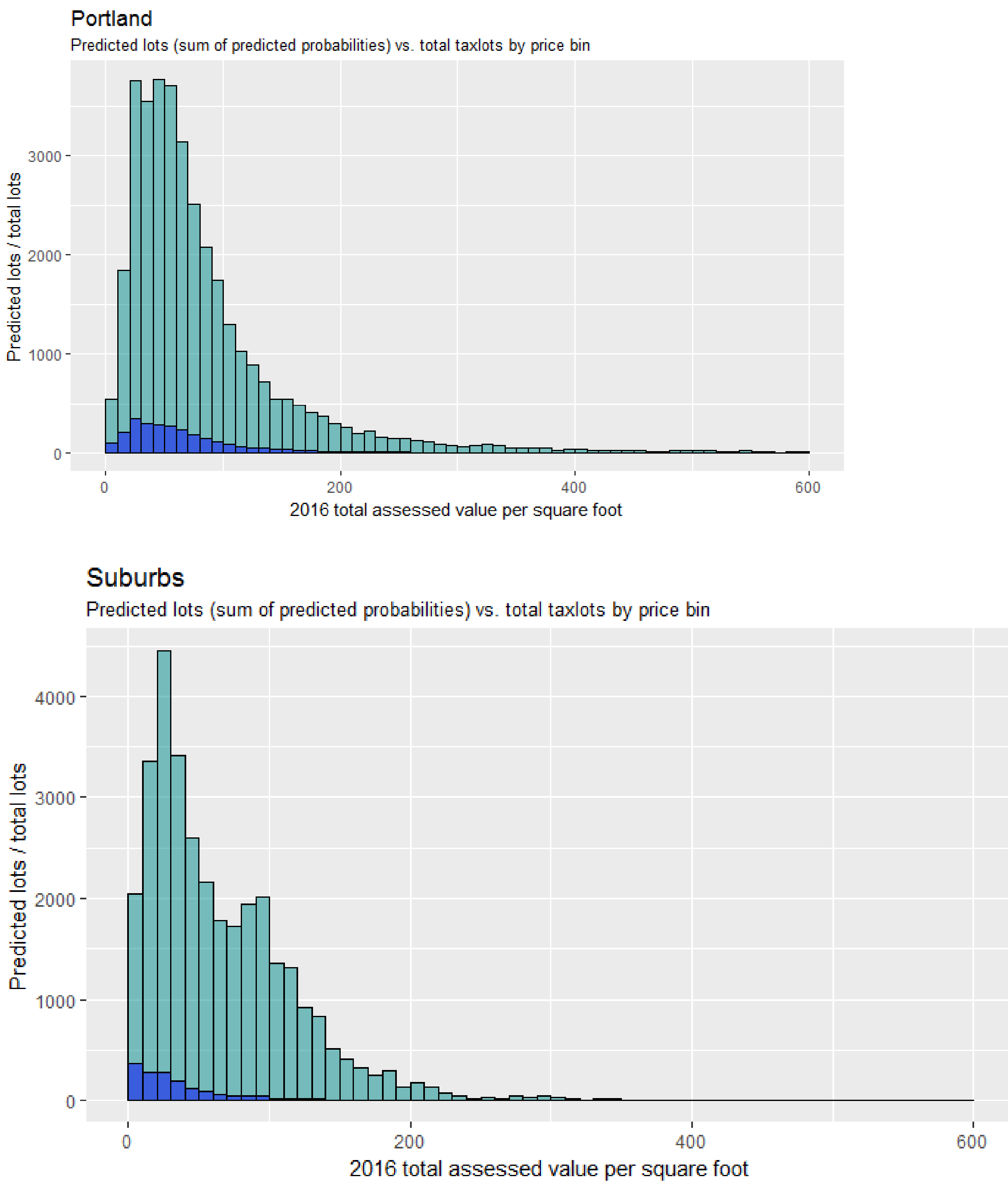


Figure 17: Histograms of Estimated 2018 BLI "statistical analysis" Version Redevelopable Tax lots by Price Bin

Mixed-Use-Residential (MUR) proportion assumptions

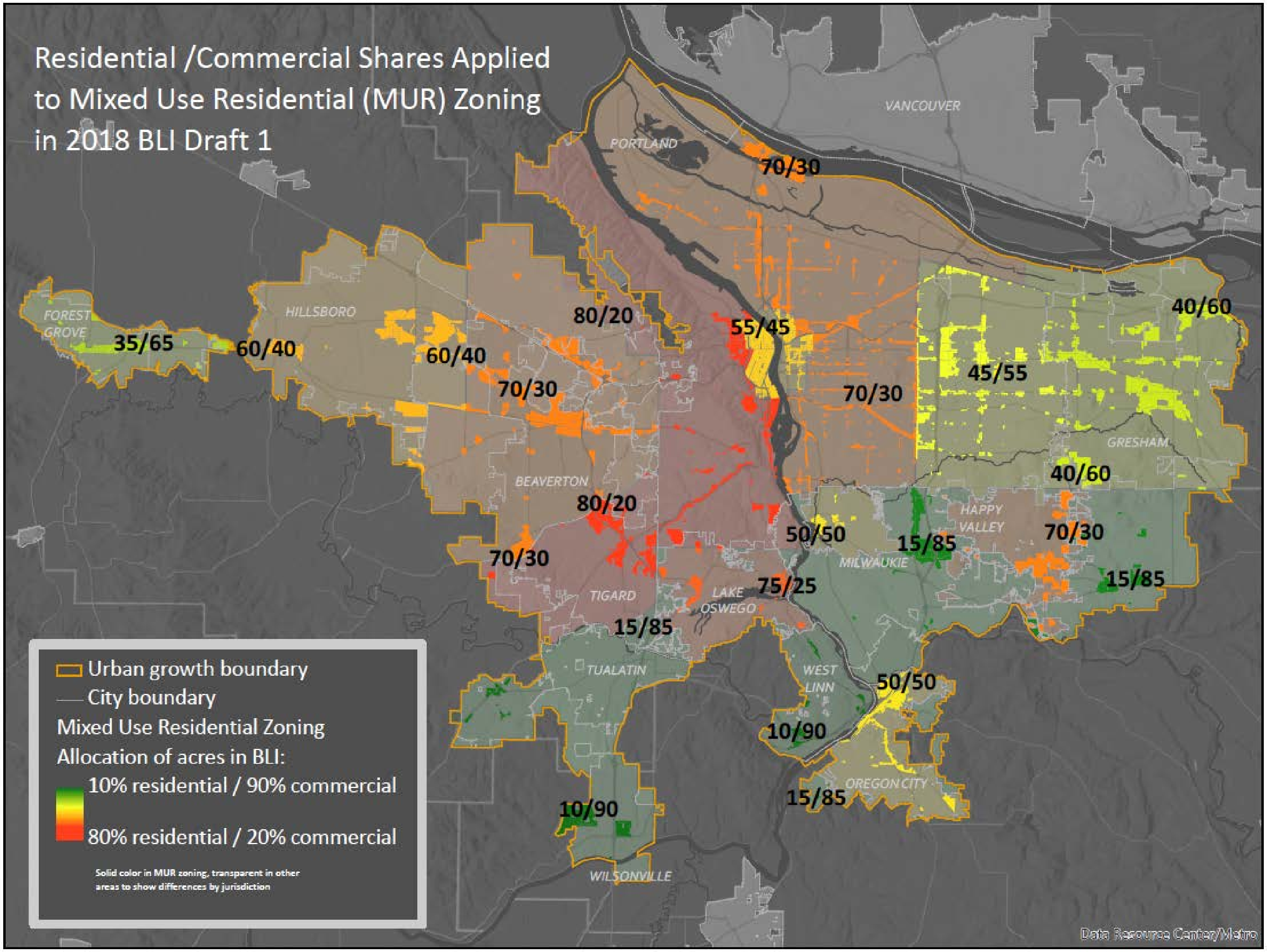
Metro staff analyzed the observed development data from LDMS to update the assumed proportion of land zoned mixed-use-residential (MUR) that would develop as housing units. Metro applies this assumption to all developable or re-developable MUR lands to estimate the maximum possible residential and employment capacity in those lands for the BLI. Staff generally refer to these assumptions as the "MUR splits."

Metro first used the 2007-2015 LDMS data to summarize and compute observed average proportions by jurisdiction, then reviewed those results with a Land Use Technical Advisory Group (LUTAG) made up of staff representing county, city, state, and private organizations. The review produced consensus that the 2018 BLI should apply different MUR splits at somewhat finer geographic detail than in the 2014 BLI but not at the level of all individual cities. The resulting assumptions appear in map form below. Jurisdiction review of these assumptions beyond LUTAG participants resulted in some minor adjustments for small areas that are not reflected in this map (e.g. Villebois in Wilsonville).

In general the underlying analysis examined all tax lots within the MUR zoning type that changed in the period 2007-2015. Staff summarized the identified tax lots by geography to compute the total acres and units (if applicable) of residential and non-residential properties by geography. Residential properties with on-site commercial space had their area counted only as residential acres. Staff computed the share of commercial and residential land within each geography from total acreage rounded to the nearest 5%. Staff made minor adjustments to some proportions based on input from LUTAG members based on their local knowledge of recent trends and future plans.

Both 2018 BLI versions were produced using these MUR proportions.

Figure 18: Thumbnail Map of MUR Residential/Commercial Proportions (see separate attachment for large scale version)



Accessory dwelling units (ADUs)

Observed accessory dwelling unit production

Metro's ADU analysis is based on data provided by city governments for 1995 to mid-2017. Roughly 98% of permitted ADU development over this time period has occurred within the City of Portland (see Table 3 below). Note that the City of Portland has created ADU development incentives and is also on the upper margins of achievable rents. ADU development represents roughly 3% of the total residential unit development in Portland-Vancouver MSA (total MSA permitted residential units / permitted ADUs).

Table 7: Observed Accessory Dwelling Unit Production in Metro UGB, 1995 through mid-2017

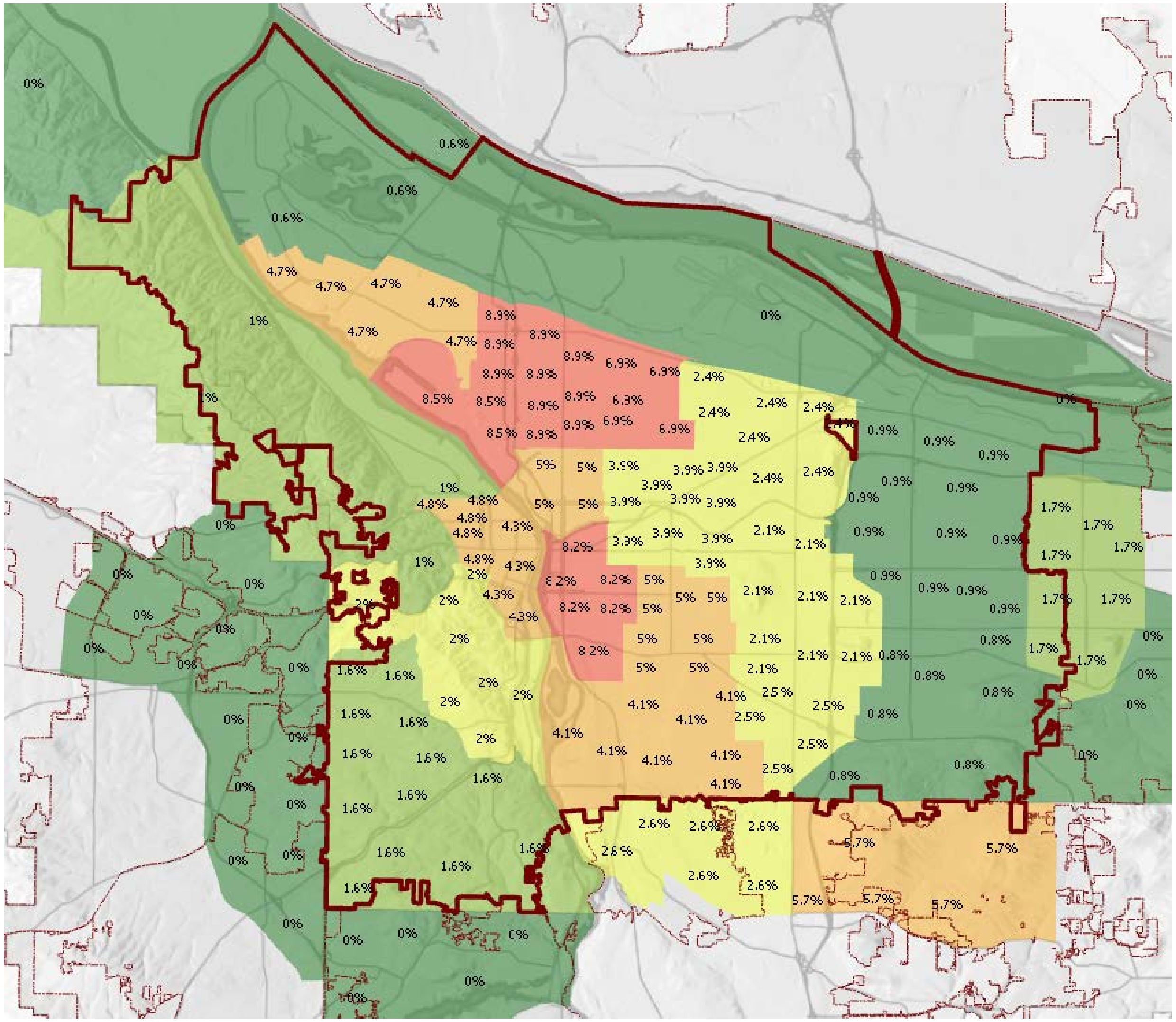
YEAR	PORTLAND	HILLSBORO	OREGON CITY	GRESHAM	LAKE OSWEGO	TROUTDALE	WILSONVILLE	BEAVERTON
1995	10							
1996	3							
1997	7							
1998	26							
1999	32							
2000	26					1		1
2001	30							1
2002	25							2
2003	30							1
2004	39							1
2005	30		2					2
2006	38		2					2
2007	38							1
2008	31							3
2009	26							1
2010	86							1
2011	133				1			
2012	164	2						
2013	201			1			4	1
2014	263	3		1	1			
2015	483	2	1					1
2016	615	1		2			3	
Mid-2017	350	2		3				1
	2686	**10**	**5**	**7**	**2**	**1**	**7**	**19**

Estimating future capacity for accessory dwelling unit (ADUs)

There is uncertainty around the future of ADUs as a source of long term housing in the region. Some state and local policies have recently changed; for example Portland waives system-development charges (SDC) for ADUs and state law was updated to require permit approval within 100 days for ADUs purposed for affordable housing. Likewise, in its Residential Infill Project, the City of Portland is considering allowing more than one ADU per single-family home. The potential for ADU development outside of inner Portland is unknown and, per a PSU survey of ADU owners – a minority of units are currently used for temporary lodging (e.g. Airbnb) rather than longer term housing. In the long term Metro plans to more closely track ADUs and in the future to perform analysis similar to that described above for redevelopment.

In the short term, Metro staff included ADUs in the 2018 BLI by using observed data to calculate a rate of ADU development that varies spatially. This method was only applied for the City of Portland, as other cities do not yet have a track record of producing significant numbers of ADUs even though their plans allow for ADU construction. The rate of ADU development is based on five years of data (2012-2016) and varies geographically across groups of census tracts (Ezones). The five-year rate of ADU development was calculated as the number of ADUs built divided by the number of single family homes in each zone. These were converted to 20-year rates (multiplied by 4) and then applied to all eligible single family homes, meaning homes that were not already counted as potential infill or redevelopment in the BLI. The resulting probabilities of ADU development range from 0% in some zones to 9% in others, with higher concentrations in inner neighborhoods of N, NE, and SE Portland. The total projection is around 4,400 new ADUs over 20 years, which are treated as multifamily long term rental housing units for forecasting purposes.

Figure 19: 2018 BLI 20-Year Probability of ADU Development



Derivation of the "Historical Redevelopment Analysis" method

Discrete Choice Regression Concepts

Discrete choice regression analysis is a statistical method to determine which characteristics affect the likelihood of a particular outcome, positively or negatively, and by how much. This analysis uses observations of historical redevelopment to predict future redevelopment, as a function of tax lot and neighborhood attributes. There are many unobserved factors in redevelopment decisions; for example, is a property owner ready to cash in on price appreciation so they can retire or relocate? Is the lease for a large tenant in a commercial property expiring? Is a business planning to relocate within or outside of the region? These idiosyncratic attributes cannot be measured, so we should not expect to be able to predict exactly which tax lots will redevelop over time with a high degree of accuracy. But we can use a discrete choice model to estimate which properties have a higher probability of redeveloping over time based on measurable variables like lot size, price, and location attributes.

Estimating the Redevelopment Regression Model

Using the LDMS data set of observed land use changes over the last nine years, we evaluate the tax lot and neighborhood characteristics that make redevelopment more likely to occur in the future. The regression analysis is based on 2001 tax lots and the land use changes observed in the forward looking LDMS approach. We limited the data set to tax lots that were "developed" by the 95% rule in 2001, and also fall within mixed use or multifamily zoning (based on current 2017 zoning and Metro's crosswalk from local to regional zone classes). All records within this set of developed tax lots that saw new development happen between 2007 and 2015 were flagged as "redevelopment" while the remaining lots saw no change. This data set was analyzed using binomial logistic regression with the outcome variables "redevelopment" coded as 1 and "no change" coded as 0. While the tax lot is the unit of analysis, several of the explanatory variables were defined at or relative to the neighborhood surrounding the tax lot. The census tract is used as a proxy for neighborhood attributes.

For the final regression model, we divided the data into two regions, Portland and the suburbs. Portland has experienced a higher rate of redevelopment than the surrounding cities, so it is important for the analysis to allow for this higher baseline level of redevelopment independent of tax lot characteristics. We tested a variety of geographic configurations for the regression data sets and found the two broad categories to provide a good balance of geographic specificity and sufficient observations. The explanatory variables included in the model are:

1. LogRelValue – the total assessed value of the tax lot relative to the average assessed value for all lots in MFR or MUR zoning in the surrounding census tract (zero values excluded)
2. LogTractValue – the average assessed value for the census tract in which the tax lot is located relative to the average tax lot value in the region (all zoning, zero values excluded)
3. LogLotSize – acreage of the tax lot prior to any subdivision or redevelopment

4. Miles – distance to the Portland CBD (calculated as the centroid of 2010 Census tract number 41051005100 in the Pearl District)

The first three variables are included in the model as natural logs to correct for skewed distributions in these attributes. The distance variable is important for the Portland model, but not meaningful for the suburban jurisdictions so it is excluded from the final model for the suburbs. Future analysis might explore including a distance term to suburban regional centers for the suburbs model. Summary statistics for the data sets show that redeveloped parcels are on average larger and cheaper per square foot relative to parcels that did not redevelop over the observed time period.

Figure 20: Summary statistics for the analyzed data sets

Portland	No change	Redeveloped	Total
Observations	28,228	1,309	29,537
Mean lot size (acres)	0.257	0.353	0.261
Median lot size (acres)	0.116	0.168	0.116
Mean value per square foot (2001)	\$40.11	\$21.51	\$39.29
Median value per square foot (2001)	\$22.97	\$15.98	\$22.60

Suburbs	No change	Redeveloped	Total
Observations	15,919	513	16,432
Mean lot size (acres)	0.568	2.747	0.636
Median lot size (acres)	0.172	0.537	0.176
Mean value per square foot (2001)	\$24.62	\$9.27	\$24.14
Median value per square foot (2001)	\$18.27	\$6.91	\$17.78

Figure 21: Parameter Estimates from the Regression

```
Suburb Coefficients:
               Estimate Std. Error z value Pr(>|z|)
(Intercept)    -3.49263    0.08497 -41.105  < 2e-16 ***
LogRelValue    -0.40199    0.03312 -12.139  < 2e-16 ***
LogLotSize      0.44765    0.03293  13.595  < 2e-16 ***
LogTractValue -0.60083    0.12665  -4.744  2.1e-06 ***
```

```
Portland Coefficients:
               Estimate Std. Error z value            Pr(>|z|)
(Intercept)    -1.87405    0.10060 -18.628 <0.0000000000000002 ***
Miles          -0.20010    0.01813 -11.035 <0.0000000000000002 ***
LogRelValue    -0.42255    0.02690 -15.710 <0.0000000000000002 ***
LogLotSize      0.35714    0.02961  12.061 <0.0000000000000002 ***
LogTractValue -0.55361    0.06314  -8.768 <0.0000000000000002 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

All variables are highly statistically significant in both models. The distance variable was dropped from the suburban model because the estimated coefficient was very small and not statistically significant. Both of the price variables have a negative effect on redevelopment, so more expensive land is less likely to redevelop. Lot size has a positive effect on redevelopment, so larger lots are more likely to redevelop. In Portland, properties that are closer to the city center are more likely to redevelop.

The intercept term has the interpretation of being the baseline rate of redevelopment, while the other explanatory variables allow the probability of redevelopment to vary across tax lots. Ideally, we would like to have more explanatory power in the other variables instead of the intercept, but redevelopment is difficult to predict on a limited set of attributes that are consistently observable across properties. The following examples illustrate how the probability of redevelopment would vary with tax lot attributes in Portland. The first example indicates that a hypothetical average tax lot in an average tract would have about a 3% probability of redevelopment. The other examples show that as the tax lot gets bigger, closer to the city center, or cheaper for a developer to purchase, this probability increases.

Figure 22: Examples of Parameter Effects on Redevelopment Probability

Example 1 (median lot size)	
Lot size (acres)	0.116
Relative tax lot value	1
Relative tract value	1
Miles	4.07

Example 2 (1 acre lot)	
Lot size	1
Relative tax lot value	1
Relative tract value	1
Miles	4.07

Probability of redevelopment	3.05%

Probability of redevelopment	6.37%

Example 3 (1 mile from city center)	
Lot size (median)	0.116
Relative tax lot value	1
Relative tract value	1
Miles	1
Probability of redevelopment	5.50%

Example 4 (value 50% of average in tract & 1 mile from city center)	
Lot size (median)	0.116
Relative tax lot value	0.5
Relative tract value	1
Miles	1
Probability of redevelopment	7.24%

Example 5 (tract value 50% of average in region)	
Lot size (median)	0.116
Relative tax lot value	1
Relative tract value	0.5
Miles	4.07
Probability of redevelopment	4.42%

Example 6 (value 50% of average in tract & tract value 50% of average in region)	
Lot size (median)	0.116
Relative tax lot value	0.5
Relative tract value	0.5
Miles	4.07
Probability of redevelopment	5.84%

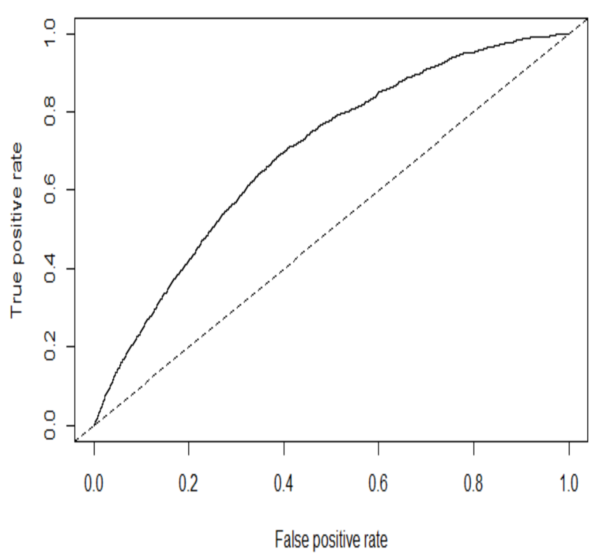
Model fit

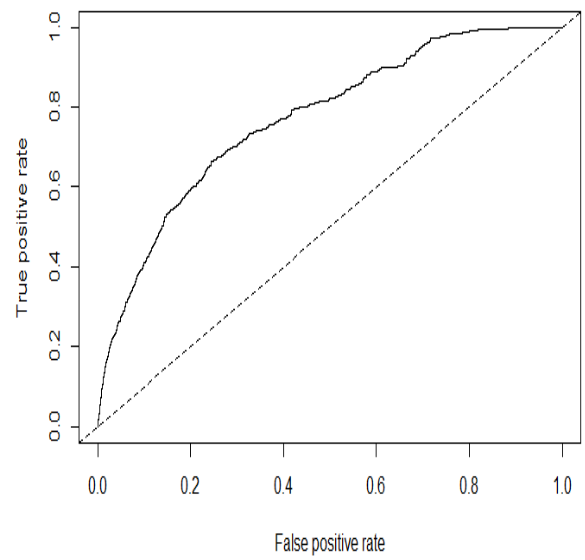
Overall, the model is very good at producing accurate probabilities of redevelopment in aggregate; in other words it is well calibrated. The model is moderately successful at identifying exactly which tax lots have a higher probability of redevelopment, i.e. it has moderate discrimination ability. One measure of the model's discrimination ability is the receiver operating characteristic (ROC) curve, which plots the probability of a false positive vs. a false negative as the probability cut-off point changes. The bottom left hand corner of the graph represents a probability cutoff of 0, which increases along the curve to a maximum of 1 at the top right hand corner. Along the diagonal line, the model would have no ability to discriminate between the lots that actually did redevelop and those that did not. The area under the curve (AUC) in this case would 0.5. The closer the line gets to the top left hand corner of the chart, the better the discrimination ability of the model. A perfect fit would have an area of 1 under the curve. The following graphs show the ROC curves for Portland (left) and the suburbs (right). The area under the Portland curve is 0.69 and the area under the curve for the suburbs is 0.77. What this value means, for example, is that given any two observations in the suburbs, one that redeveloped and one that did not, there is a 77% chance that the predicted probability of the redeveloped lot is higher than the predicted probability of the lot that did not redevelop.

Figure 23: Area-Under-the-Curve Goodness of Fit Plots

Portland (AUC = 0.69)

Suburbs (AUC = 0.77)





For additional testing of the fit of the model, the regression was run multiple times using an 80% sample of the data for each subarea (the "training" data set) and holding back 20% (the "testing" data set). This test evaluates the stability of the coefficients over different subsamples (checking for influential observations) and allows for predicting the redevelopment outcome on the 20% sample that is not included in the model estimation.

There are a couple of ways to measure the fit of the model for the testing data. First, we could set a cut-off probability above which we predict redevelopment to occur. For example, we could say that all lots with a probability above 10% are predicted to redevelop while no change is predicted on the remaining lots. Using this measure we can produce a confusion matrix that cross-tabulates the predicted outcomes vs. the observed outcomes. The confusion matrices for one set of the sample regressions are included below. They show relatively high rates of both false positives and false negatives (the 0/1 and 1/0 cells).

Figure 24: Regression Model Confusion Matrices

Suburbs

	predicted		
observed	0	1	Total observed
	307	11	
0	0	2	3182
1	85	23	108
Total predicted	315 5	13 5	3290

Portland

	predicted		
observed	0	1	Total observed
	541	16	
0	4	0	5574
1	230	26	256
Total predicted	564 4	18 6	5830

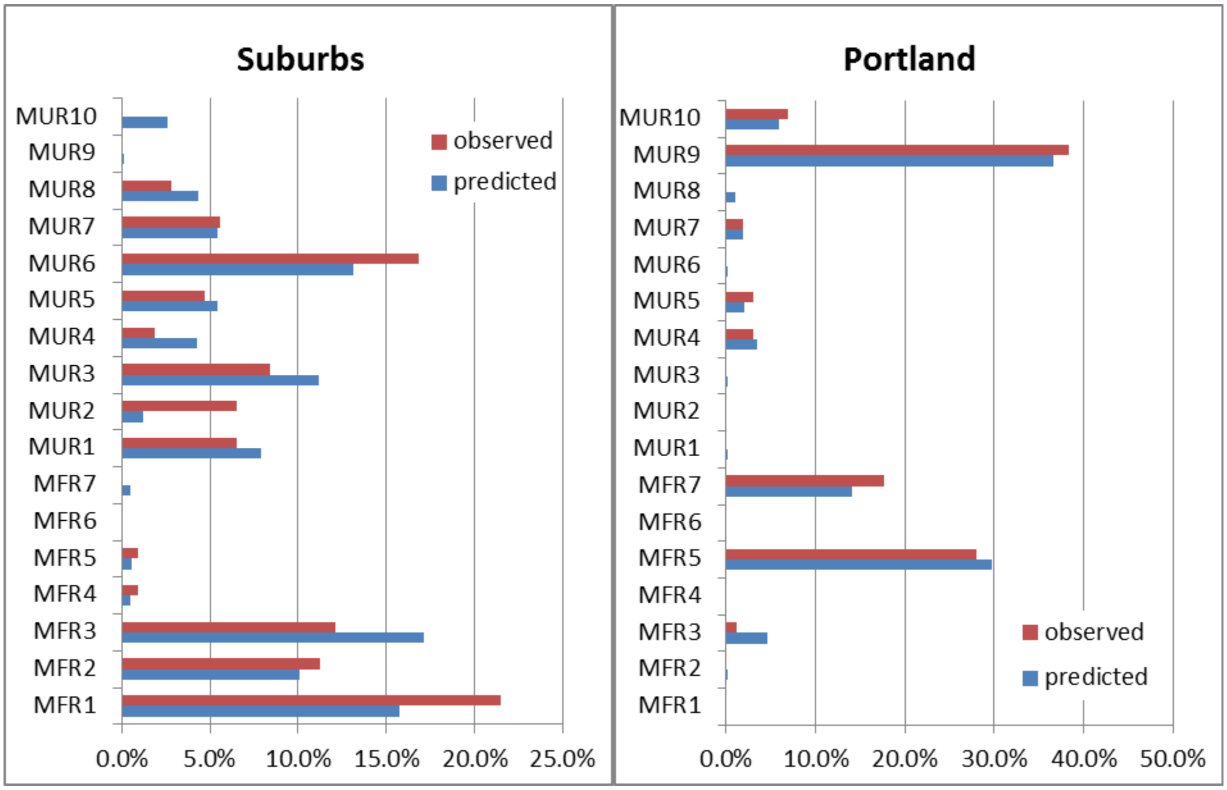
As noted though, we should not necessarily expect to accurately identify exactly which tax lots redeveloped. The model does do a good job of predicting how many tax lots redeveloped over the study period. The following tables show the number of tax lots predicted to redevelop over five different 80% sample regressions, applying the resulting models to the 20% withheld testing data. The predicted tax lots are calculated by adding up the predicted probabilities of redevelopment across all observations.

Figure 25: Regression Model Validation Against Test Data

	Suburbs						Portland					
	Tax lots				Shares		Tax lots				Shares	
Sample	Total lots	Obs redev	Pred redev		Obs redev	Pred redev	Total lots	Obs redev	Pred redev		Obs redev	Pred redev
1	3262	90	105		2.8%	3.2%	5864	260	261		4.4%	4.5%
2	3348	104	102		3.1%	3.0%	6009	256	270		4.3%	4.5%
3	3309	115	103		3.5%	3.1%	5826	257	261		4.4%	4.5%
4	3218	93	103		2.9%	3.2%	5863	271	259		4.6%	4.4%
5	3315	107	103		3.2%	3.1%	5913	257	263		4.3%	4.5%
Average	3290	101.8	103.2		3.1%	3.1%	5895	260.2	262.8		4.4%	4.5%

We can also look at the distribution of observed and predicted redevelopment across various summary geographies and zoning classifications. For example, the following chart shows the distribution across zoning classes for one 80% sample regression. These numbers reflect the results of applying the model to the 20% testing sample. The results are reasonable across all of the geographies, with a better match in Portland than in the suburbs. This makes sense since there is a wider variety of zoning densities in the observed redevelopment across the suburban areas.

Figure 26: Distribution of observed vs. predicted redeveloped lots by Metro zone class



We conducted other tests of the model fit as well, including estimating the model for various subarea geographies and the region as a whole. These regressions indicated that the two final models are in fact different and should be estimated separately, particularly the intercept term and distance to the city center. We also estimated models using only the last five years of redevelopment (2011-2015) rather than the full nine years. This resulted in a lower predicted rate of redevelopment because many of the redevelopment observations in our data set occurred in 2007. Finally, we applied different coefficients to the BLI data from our 80% sample regressions to evaluate sensitivity of future capacity to model specification.

Application to the BLI

To apply the regression model to the BLI, we calculate for each eligible tax lot the probability of redevelopment using the estimated coefficients. We first need to calculate the necessary attributes for each tax lot, including the log of the relative tax lot value, log of the relative tract value, log of lot size, and distance to the city center for the Portland observations. This is a logistic regression, so the probability of redevelopment is calculated as:

$$P(redevelopment) = e^{x'\beta} 1 + ex'\beta$$

where the exponent is calculated from our regression results as (for the suburbs):

$$x'\beta = Intercept + \beta_1 LogRelValue + \beta_2 LogLotSize + \beta_3 LogTractValue$$

This probability is estimated using an observed data set that covers nine years. In order to expand this to a 20-year probability, the original value is multiplied by 2.2, with an upper limit set at 100% probability of redevelopment. This expanded probability can then be multiplied by the maximum zoned capacity on each lot (minus any existing development) to get an "expected" number of units. Typically these probabilities are small, so the expected units will be spread across a large number of tax lots. This is in contrast to the strike price methodology that would select all specified tax lots below a particular value threshold and count the full zoned capacity on those lots. The aggregate capacity estimates from applying both the regression and strike price approaches are shown below.

Table 7: Redevelopment Statistical Analysis and Threshold Price Results in the 2018 BLI, with 2014 BLI Redevelopment Estimates for Comparison

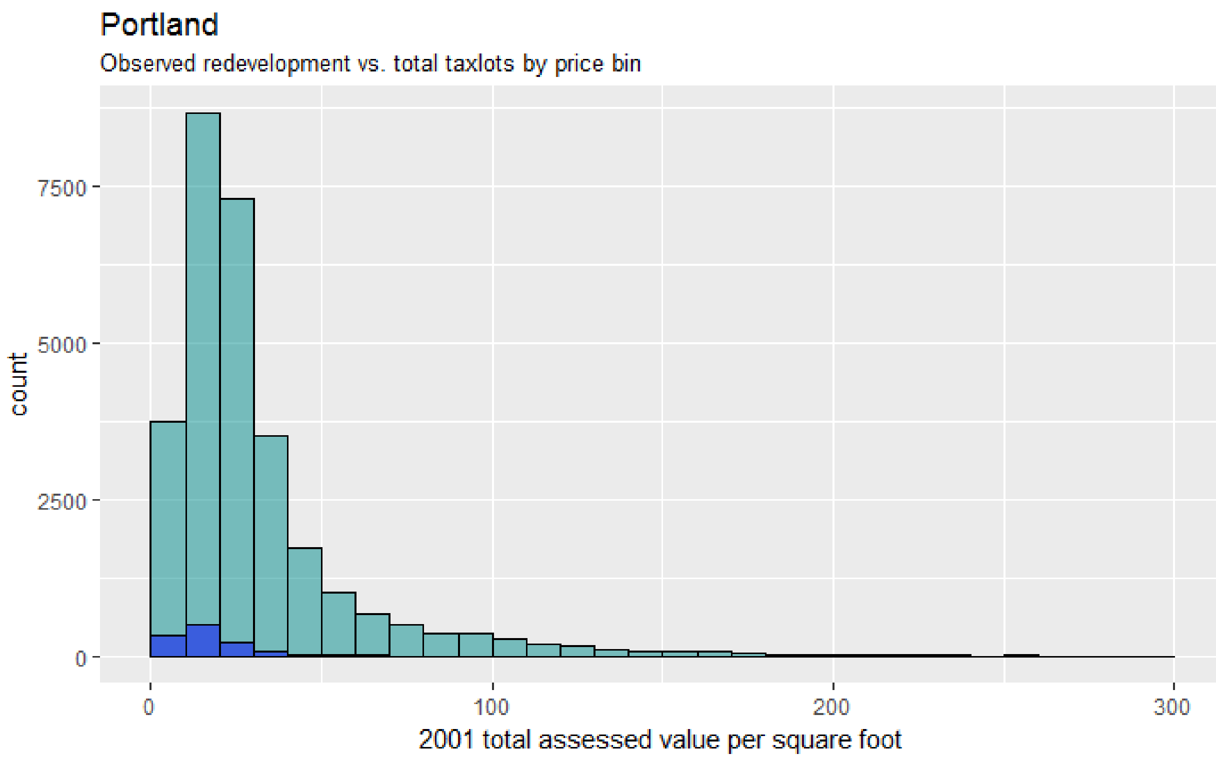
		2007-2015 Expanded	**Draft 2018 BLI**		
City	2007-2015 Actual	to 20 Year Supply	**current markets**	**high redev**	2014 BLI*
BEAVERTON	2,175	4,833	**5,264**	**3,961**	1,097
CORNELIUS	5	11	**250**	**457**	122
DURHAM	-	-	**7**	**-**	-
FAIRVIEW	4	9	**219**	**289**	336
FOREST GROVE	207	460	**1,574**	**1,515**	1,428
GLADSTONE	42	93	**206**	**370**	290
GRESHAM	914	2,031	**4,721**	**5,560**	7,482
HAPPY VALLEY	768	1,707	**5,463**	**9,111**	2,080
HILLSBORO	1,760	3,911	**4,234**	**4,177**	3,926
JOHNSON CITY	-	-	**138**	**242**	-
KING CITY	67	149	**23**	**22**	23
LAKE OSWEGO	66	147	**399**	**352**	421
MILWAUKIE	-	-	**529**	**241**	36
OREGON CITY	571	1,269	**3,518**	**4,649**	2,904
PORTLAND	18,090	40,200	**50,779**	**170,293**	194,209
SHERWOOD	30	67	**117**	**205**	306
TIGARD	220	489	**5,415**	**6,116**	1,315
TROUTDALE	3	7	**246**	**468**	536
TUALATIN	99	220	**170**	**263**	52
UNINCORP-CLACK	360	800	**3,657**	**5,189**	7,271
UNINCORP-MULT	-	-	**2,332**	**4,788**	4,447
UNINCORP-WASH	1,226	2,724	**3,794**	**5,733**	4,192
WEST LINN	-	-	**85**	**44**	73
WILSONVILLE	1,061	2,358	**322**	**494**	561
WOOD VILLAGE	64	142	**495**	**640**	517
Totals	**27,732**	**61,627**	**93,958**	**225,179**	**233,624**

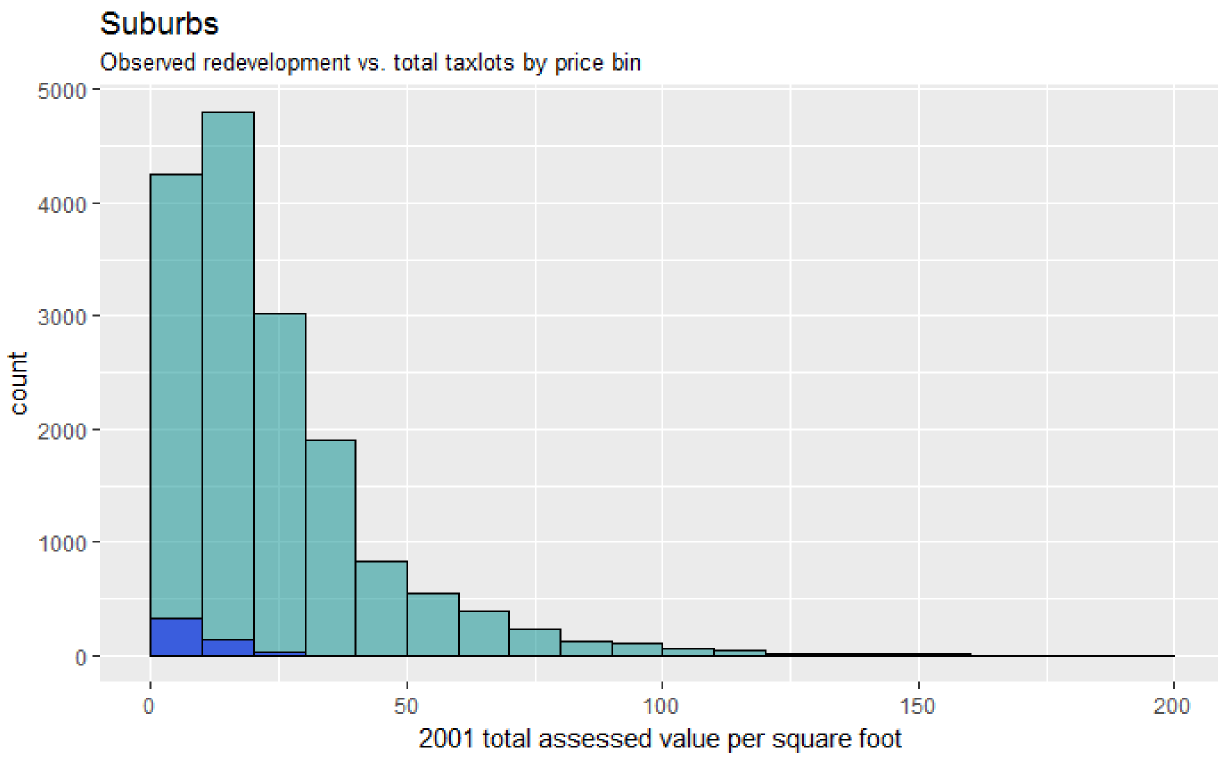
** Note that the 2014 BLI covers different future time period than the 2018 BLI and includes additional capacity for Damascus.*

Unincorporated Multnomah County redevelopment included in Portland number in Draft 2018 BLI

The following two charts show the number of lots that redeveloped over the observed time period (blue), overlaid on the total number of tax lots (green) by total assessed value per square foot. What is clear from these charts is that a very small percentage of the developed lots in any value bin actually redeveloped over the nine year period. And while a larger share of the lower valued lots redeveloped, we observe redevelopment across a wide range of values.

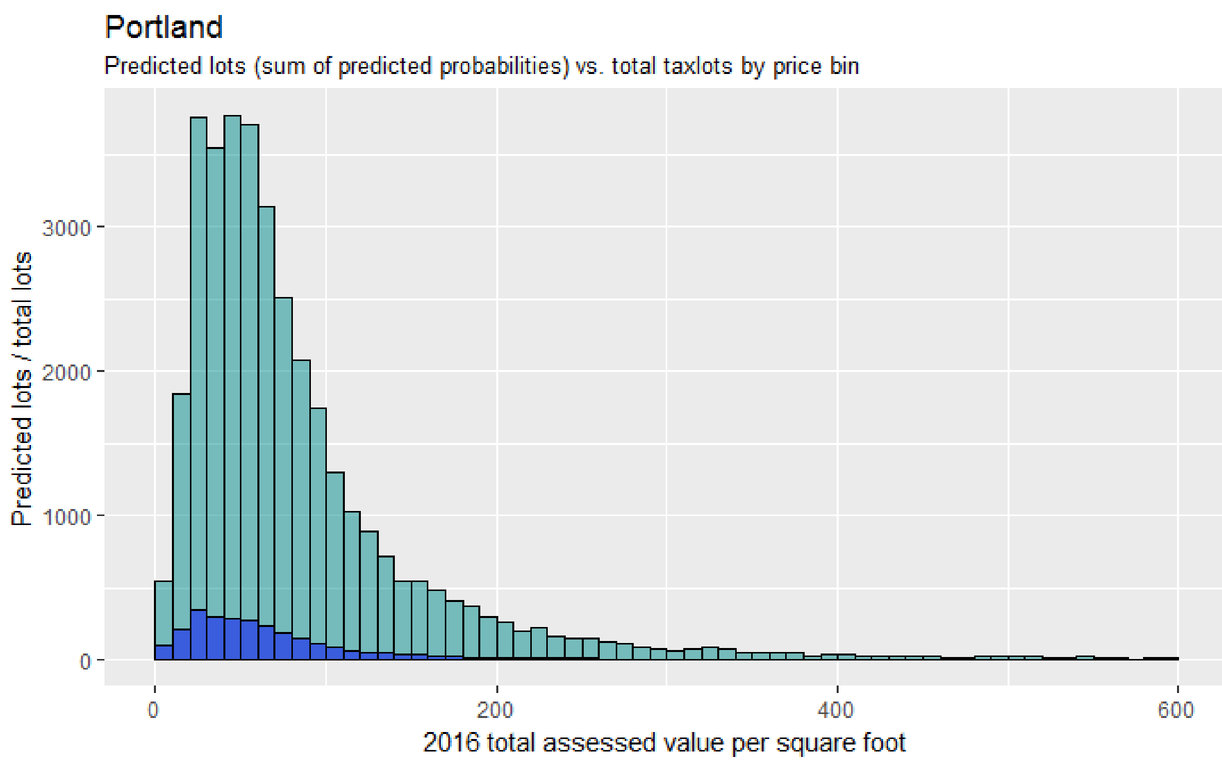
Figure 27: 2007-2015 Observed Redevelopment vs. All Developed Tax lots by Price. All Portland (top chart), areas outside Portland (middle chart)

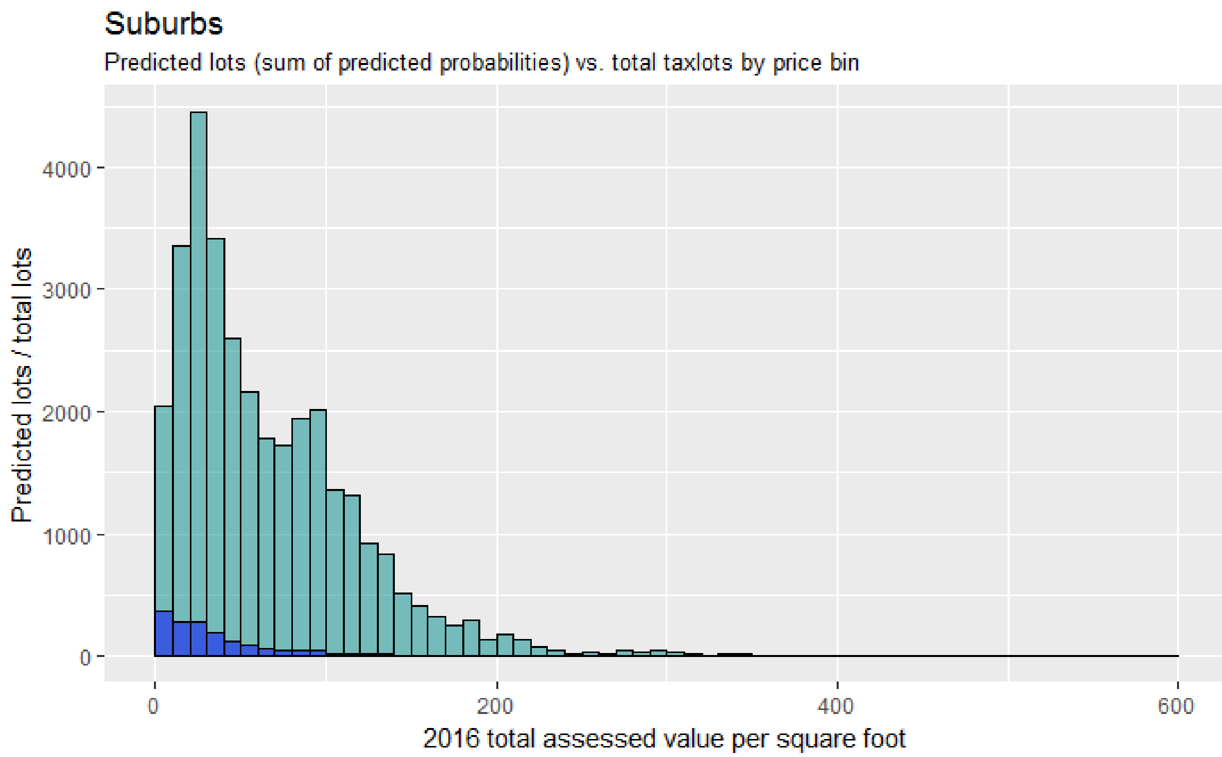



Suburbs
Observed redevelopment vs. total taxlots by price bin
count
5000
4000
3000
2000
1000
0
0
50
100
150
200
2001 total assessed value per square foot

The regression approach produces patterns of predicted redevelopment across tax lot values similar to what was observed in the LDMS data. More lots are predicted to redevelop in lower value bins, but a small amount of redevelopment is predicted to occur on higher value tax lots as well. The first three charts below depict tax lots, while the last two depict residential units.

Figure 28: Predicted Redevelopment in the 2018 BLI Statistical Version. For Portland (top), Areas Outside Portland (middle), and Region Altogether (bottom)




Suburbs
Predicted lots (sum of predicted probabilities) vs. total taxlots by price bin
Predicted lots / total lots
0
1000
2000
3000
4000
0
200
400
600
2016 total assessed value per square foot

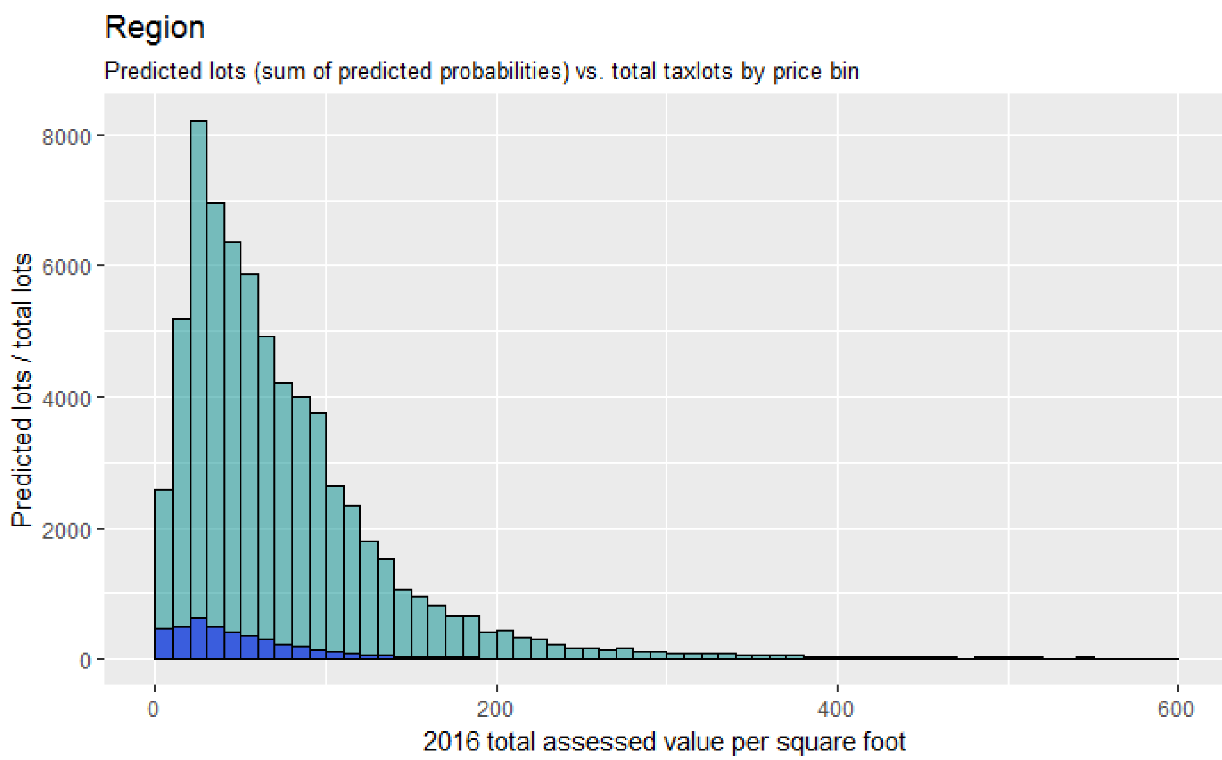

Region
Predicted lots (sum of predicted probabilities) vs. total taxlots by price bin
Predicted lots / total lots
0
2000
4000
6000
8000
0
200
400
600
2016 total assessed value per square foot

Figure 29: Regression-Forecast Redeveloped Units vs. Max Zoned Capacity (top) and Strike Price Method (bottom)