



Multi-Hazard Risk Report for Tillamook County



Multi-Hazard Risk Report **(DRAFT)**

For Tillamook County including the Cities of Bay City, Garibaldi, Manzanita, Nehalem, Rockaway Beach, Tillamook, Wheeler & Unincorporated Communities of Neskowin, Oceanside, Netarts, and Pacific City

Draft for local review – September 15, 2016



How was this funded?

This work was funded by FEMA’s Risk MAP program, following up on new flood hazard data that was developed for the separate flood insurance study that is ongoing for Tillamook County.

What is the purpose?

The purpose is to provide a quantitative analysis of the relative risk of various natural hazards for the communities in Tillamook County. The analysis should complement natural hazard mitigation planning efforts.

Who is doing the work?

The Oregon Department of Geology and Mineral Industries (DOGAMI).

Why is it still draft?

We want community input before we finalize the report. We’ll be engaging with the NHMP update process to accomplish this. We’ll publish it when the NHMP update is complete.



Scope of Multi-Hazard Risk Assessment



Example of building database in Tillamook.

What are we analyzing?

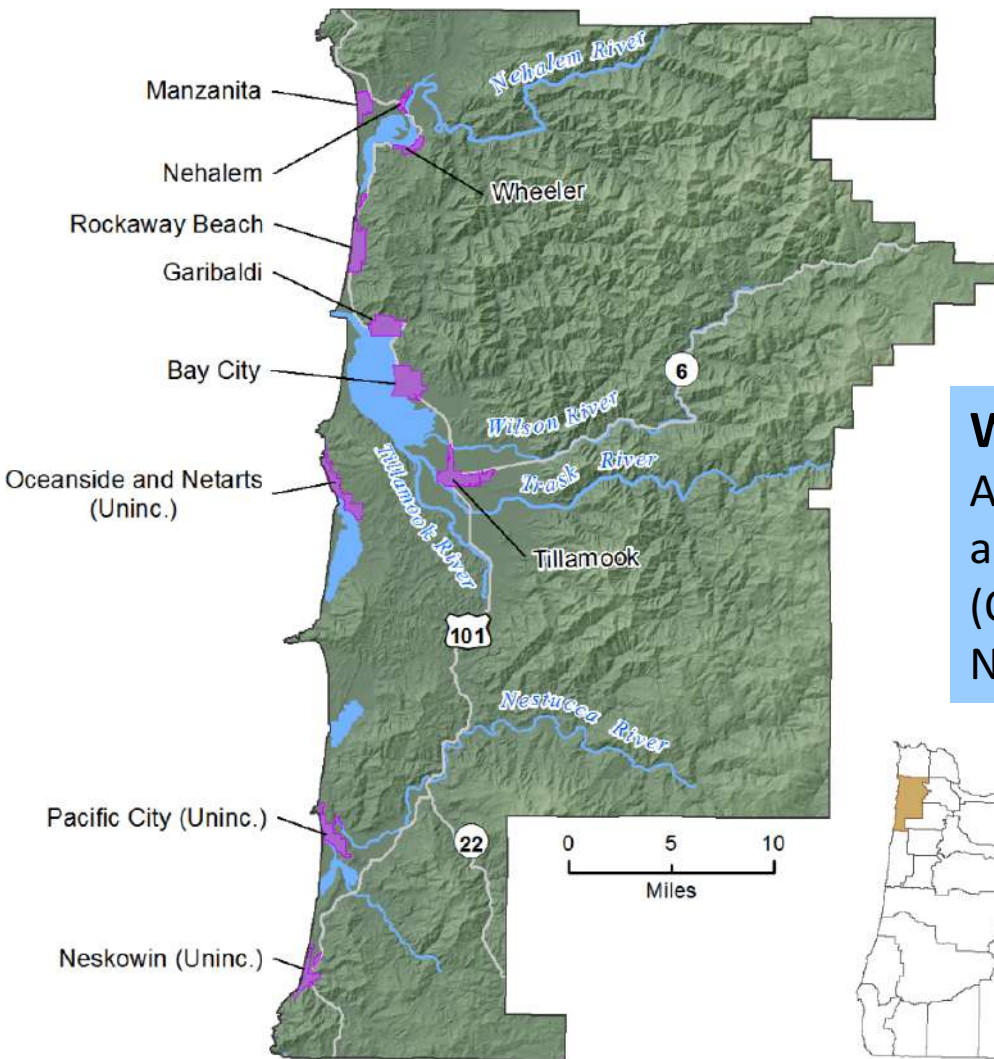
Buildings and population. For buildings we relied on assessor data to create a countywide database. For population we used the 2010 Census, and pro-rated population to residential buildings based on square footage.

What natural hazards are we considering?

1. *Cascadia Subduction Zone (CSZ) Earthquake and Related Hazards*
 - Earthquake Hazus-MH loss estimation from a CSZ Magnitude 9.0 event
 - Tsunami exposure to five potential CSZ scenarios
2. *Flooding*
 - Hazus-MH loss estimation to four recurrence intervals (10%, 2%, 1%, 0.2% annual chance)
 - Exposure to 1% annual chance recurrence interval
3. *Landslide Susceptibility*
 - Exposure based on Landslide Susceptibility Index (low to very high)
4. *Coastal Erosion*
 - Exposure based on Coastal Erosion Zones (none to very high)
5. *Wildfire*
 - Exposure based on Fire Risk Index (low to high)



Scope of Multi-Hazard Risk Assessment



Which communities did we focus on?
 All the cities, the unincorporated county, and three unincorporated communities (Oceanside/Netarts, Pacific City, and Neskowin).





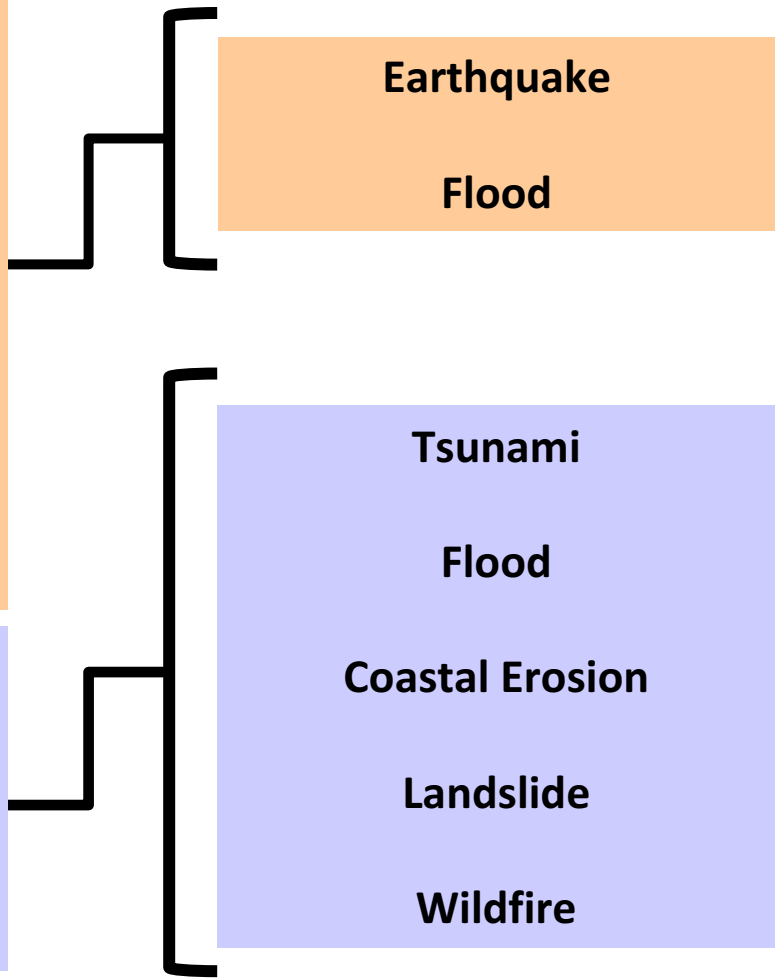
Terminology

Defined Terms for Hazus Loss Estimation

- Loss estimation: Damage that occurs to a building in an earthquake or flood scenario, as modeled with Hazus-MH.
- Loss ratio: Percentage of estimated loss relative to the total replacement cost of a building.
- Damage function or curve: A formula that represents the relationship between a given hazard parameter(s) (e.g. depth of flooding) and the estimated loss to a building.
- Replacement cost: Monetary amount to restore a building to its pre-loss value. This term is used in the context of Hazus loss estimation.

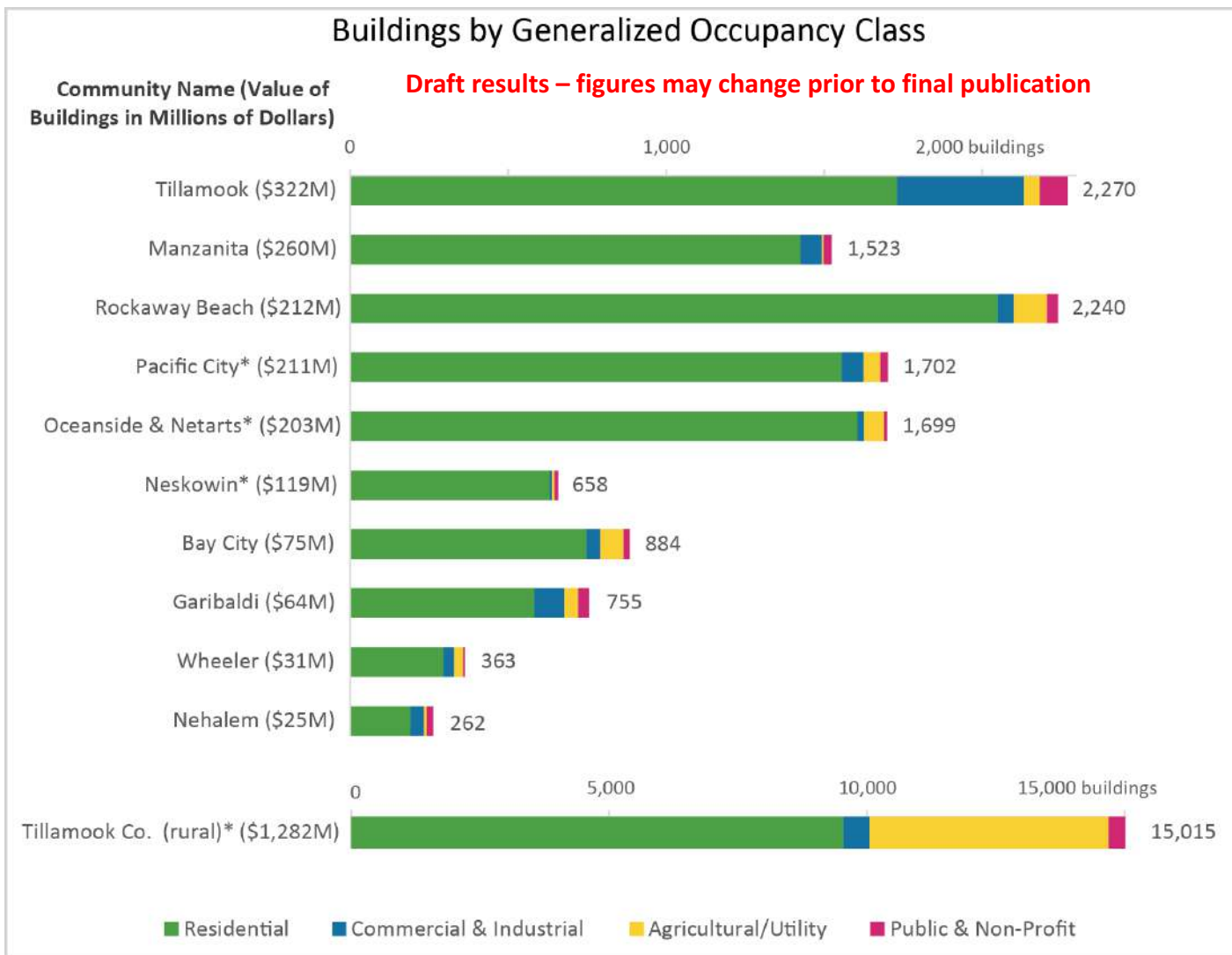
Defined Terms for Exposure Analysis

- Exposure: Determination of whether a building is within or outside of a hazard zone. No loss estimation is modeled.
- Building value: Total monetary value of a building. This term is used in the context of exposure.



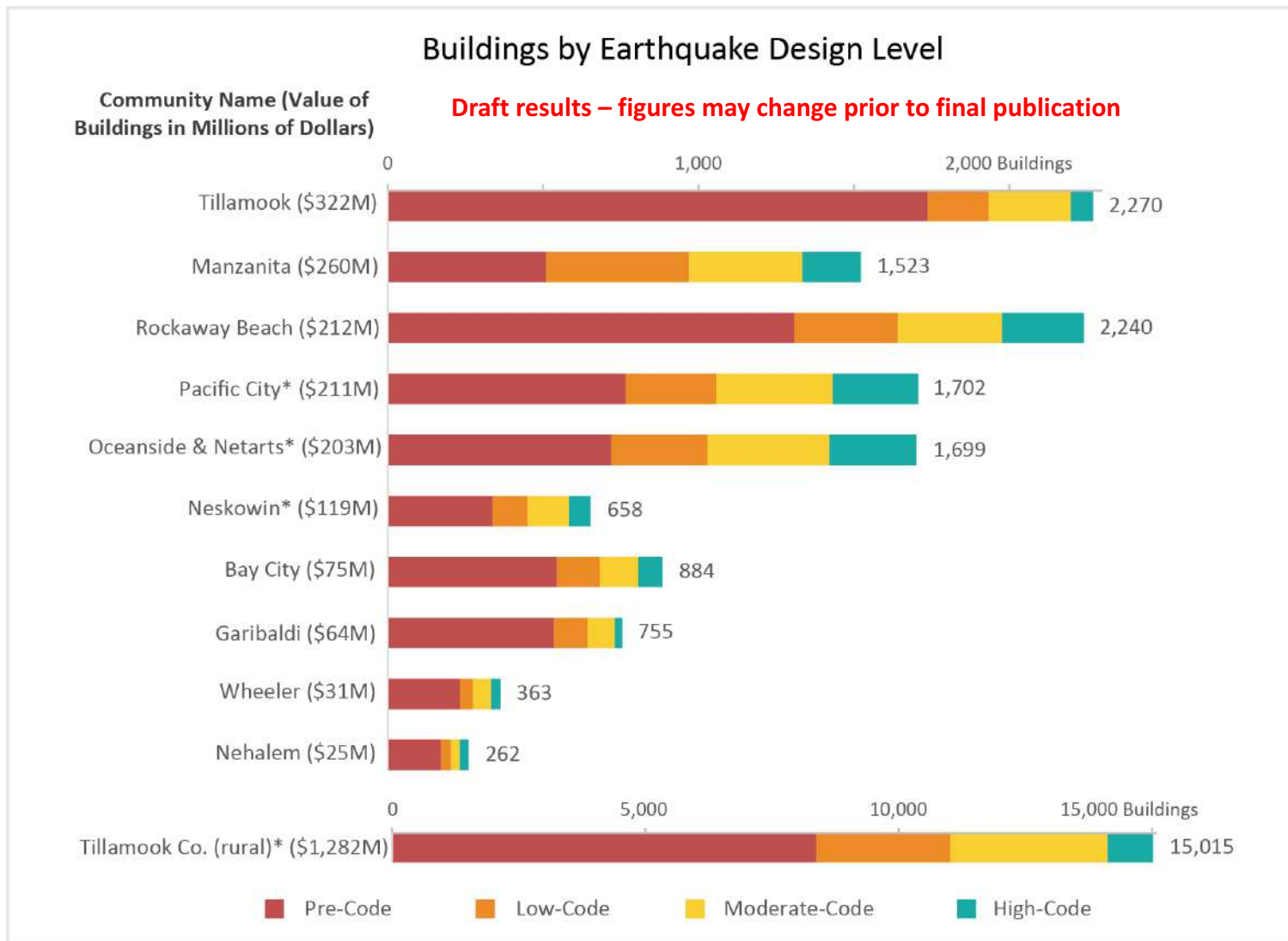


Community Characteristics





Community Characteristics



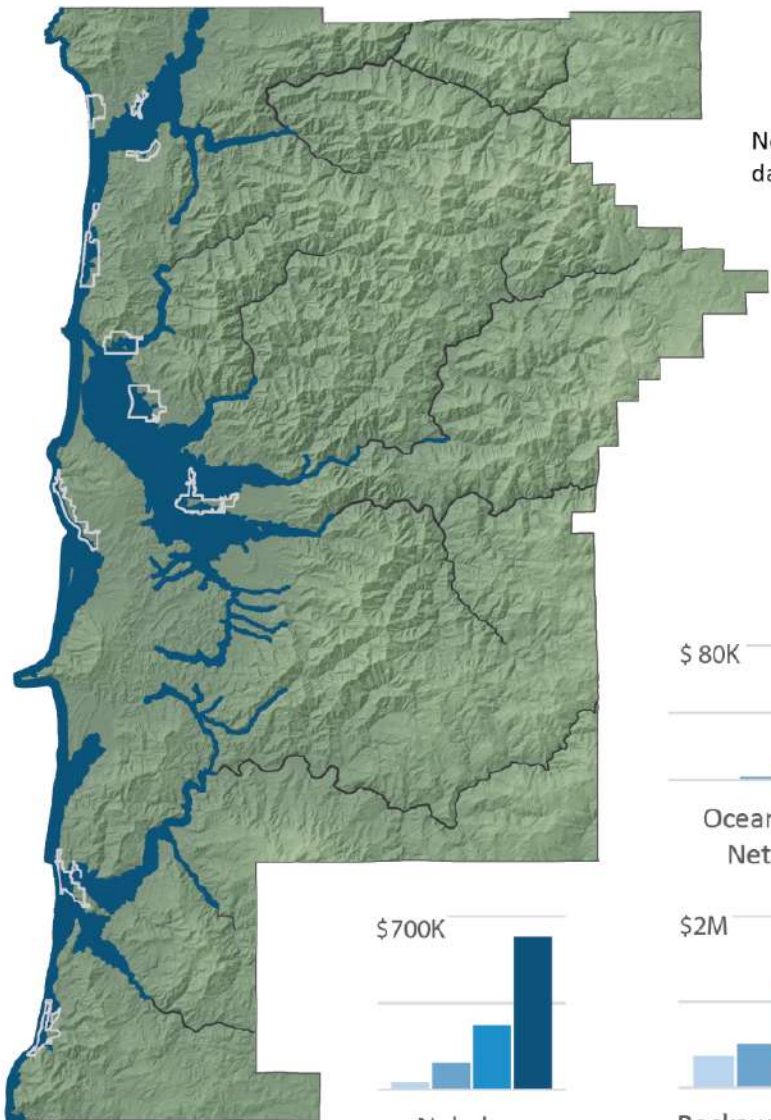


Draft results – figures may change prior to final publication

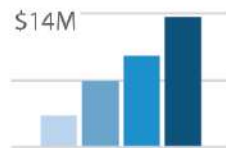
Flooding Damage

No flood damage reported for Manzanita or Bay City. Building damage listed in millions of dollars (M) or thousands of dollars (K).

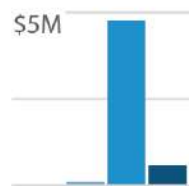
- 10-Year Flood
- 50-Year Flood
- 100-Year Flood
- 500-Year Flood



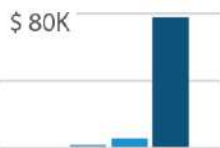
Map shows 100-year flood zone



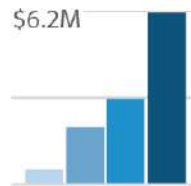
Tillamook Co. (rural)*



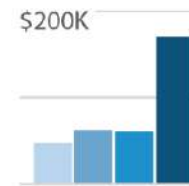
Neskowin*



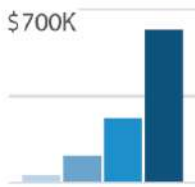
Oceanside & Netarts*



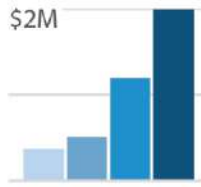
Pacific City*



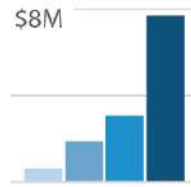
Garibaldi



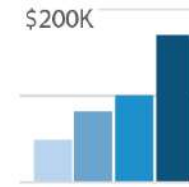
Nehalem



Rockaway Beach



Tillamook



Wheeler

Graphs not normalized. They show absolute damage.

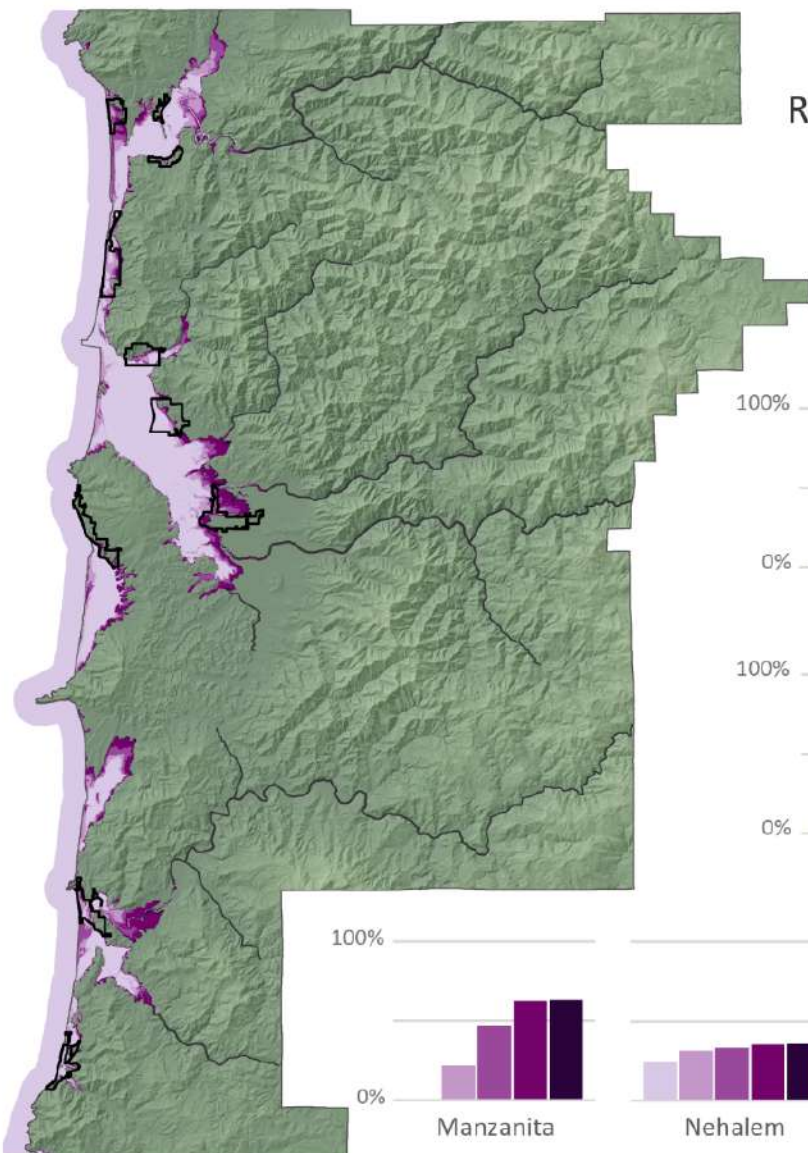
Note that Neskowin does not have 500-year flood mapped.



Draft results – figures may change prior to final publication

Tsunami Exposure

Ratio of Exposed Value to Total Building Value



Tsunami Sizes

- Small
- Medium
- Large
- X-Large
- XX-Large



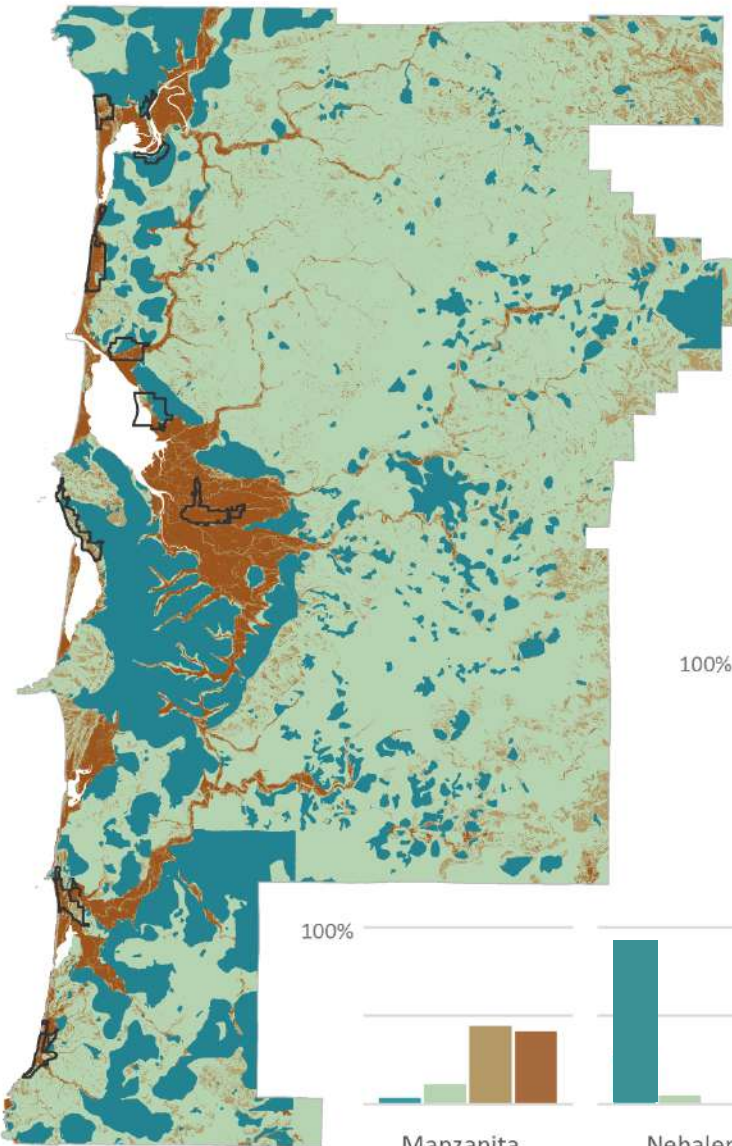
Graphs normalized. They show exposure ratio, comparable across communities.



Draft results – figures may change prior to final publication

Landslide Exposure

Ratio of Exposed Value to Total Building Value



Very Highly Susceptible Highly Susceptible
 Moderately Susceptible Low Susceptible



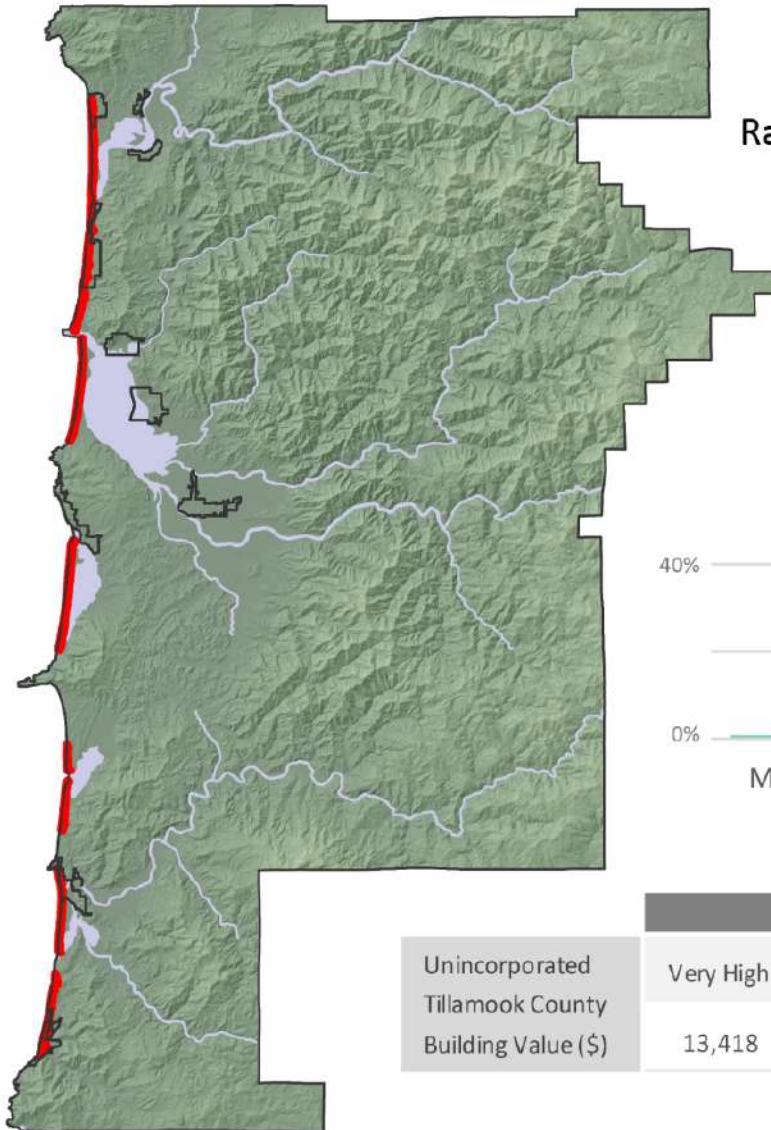
Graphs normalized. They show exposure ratio, comparable across communities.



Draft results – figures may change prior to final publication

Coastal Erosion Exposure

Ratio of Exposed Value to Total Building Value

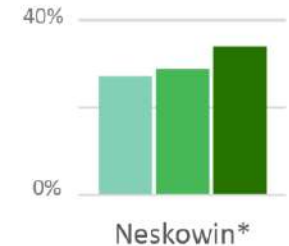


Erosion Probability Category

- Very High Susceptibility
- Highly Susceptibility
- Moderately Susceptibility
- Coastal Erosion Study Area



Unincorporated Tillamook County Building Value (\$)	Susceptibility		
	Very High	High	Moderate
	13,418	18,928	33,885



Graphs normalized. They show exposure ratio, comparable across communities.

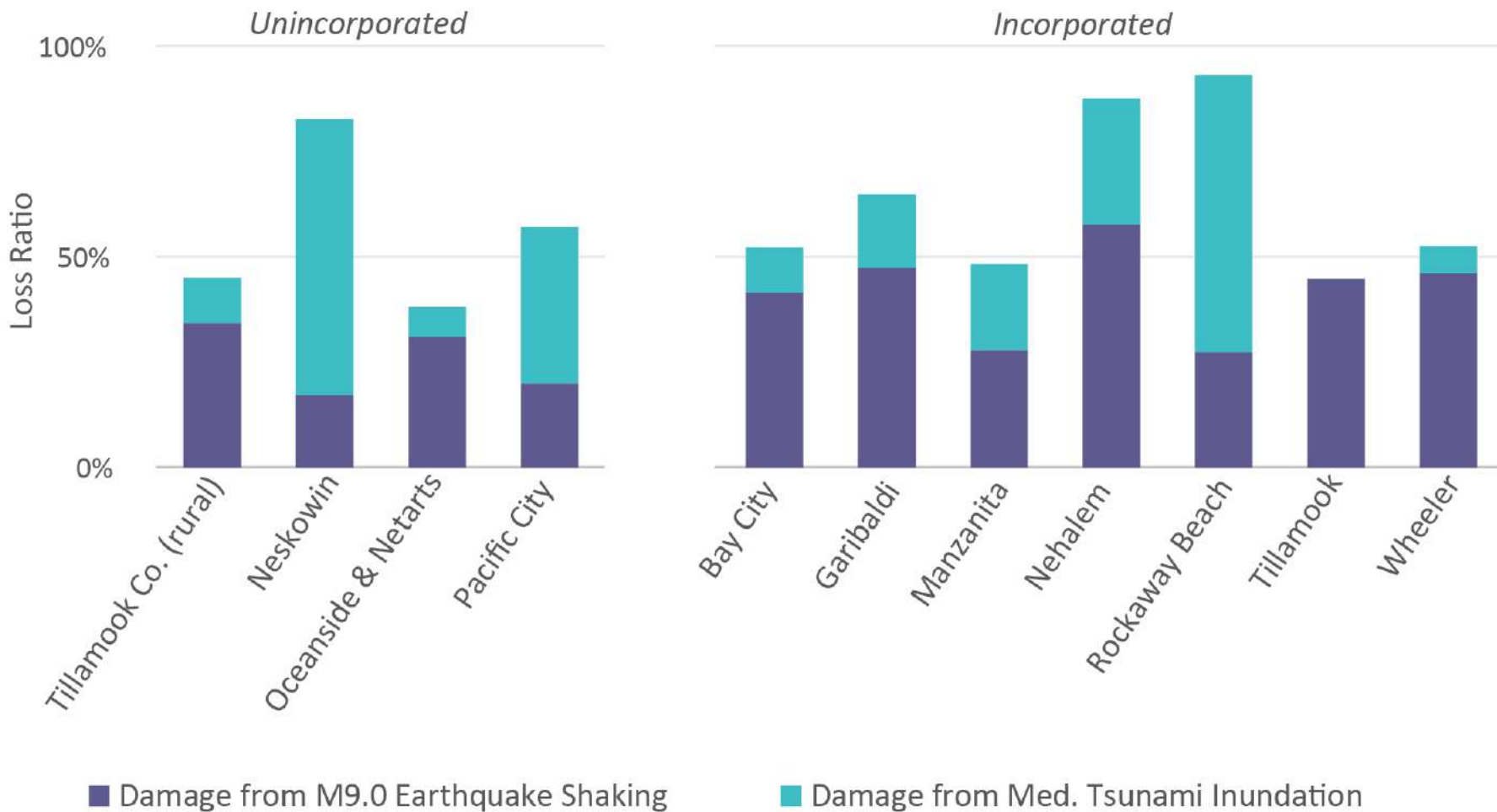


Wildfire exposure results are out of date. We just received a new dataset from Oregon Department of Forestry. We will revise results next week.



Tsunami and Earthquake Building Damage

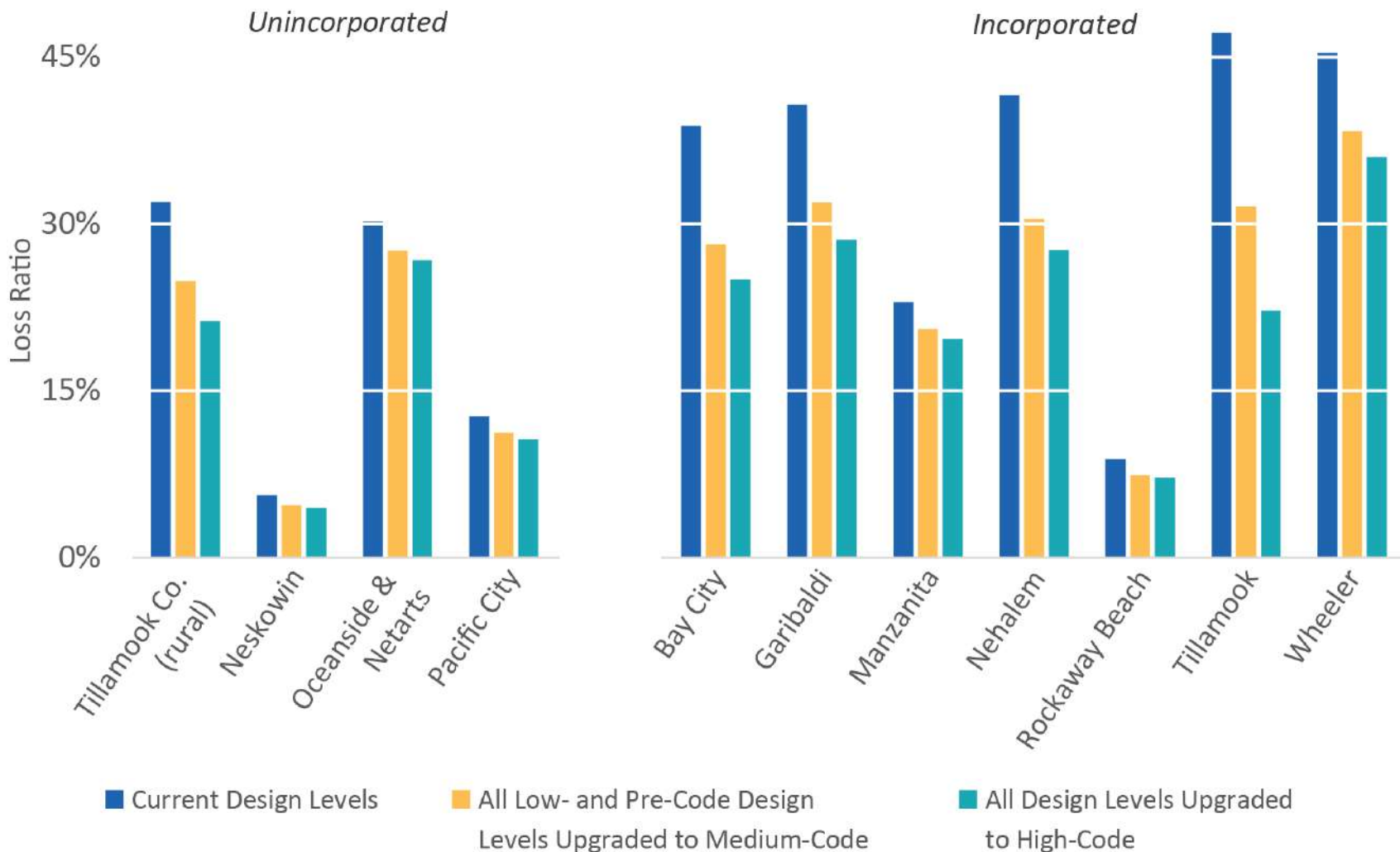
Draft results – figures may change prior to final publication





Reduction in M9.0 Earthquake Shaking Damage From Building Code Improvements

Draft results – figures may change prior to final publication





Community Overview

Community Name	Population	Number of Buildings	Essential Facilities ¹	Total Building Value (\$)
Pacific City	947	1,707	1	212,062,000

Hazus Analysis Summary

Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Damaged Buildings	Damaged Essential Facilities	Replacement Cost (\$)	Loss Ratio
Flood ²	1% Annual Chance	170	18%	320	1	3,063,000	1.4%
Earthquake*	CSZ Mag 9.0 Deterministic	99	10%	260	0	28,084,000	13%
Earthquake (within Tsunami Zone)		139	15%	300	0	24,080,000	11%

Exposure Analysis Summary

Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Exposed Buildings	Exposed Essential Facilities	Building Value (\$)	Exposure Ratio
Flood	1% Annual Chance	276	29%	484	1	37,118,000	18%
Tsunami	CSZ Mag 9.0 – Medium	386	41%	806	1	83,301,000	39%
Tsunami	Senate Bill 379 Regulatory Line	583	62%	1,239	1	135,375,000	64%
Landslide	High and Very High Susceptibility	125	13%	183	0	24,930,000	12%
Wildfire	High Threat	0	0%	0	0	0	0%
Coastal Erosion	High Susceptibility	4	0.4%	25	0	50,675,000	4.2%

Draft results – figures may change prior to final publication



Appendices Tables

Tsunami

(all dollar amounts in thousands)

Community	Total Number of Buildings	Total Estimated Building Value (\$)	Small (low-severity)			Medium (moderate severity)			Large (high-severity)			XX Large (very high-severity)		
			Number of Buildings	Building Value (\$)	Ratio of Exposure Value	Number of Buildings	Building Value (\$)	Ratio of Exposure Value	Number of Buildings	Building Value (\$)	Ratio of Exposure Value	Number of Buildings	Building Value (\$)	Ratio of Exposure Value
Unincorp. County (rural)	15,015	1,282,436	520	46,924	3.7%	1,692	147,262	11%	2,548	223,814	18%	3,706	370,556	29%
Neskowin	653	118,463	268	56,198	47%	461	81,824	69%	485	86,960	73%	508	91,182	77%
Oceanside-Netarts	1,701	203,363	62	11,292	5.6%	88	15,432	7.6%	141	21,433	11%	326	36,738	18%
Pacific City	1,707	212,062	175	15,825	7.5%	806	83,301	39%	1,252	148,741	70%	1,355	156,498	74%
Total Unincorp. County	19,076	1,816,324	1,025	130,239	7.2%	3,047	327,819	18%	4,426	480,948	26%	5,895	654,974	36%
Bay City	884	74,770	4	370	0.5%	62	8,455	11%	136	20,515	27%	234	26,459	35%
Garibaldi	755	64,331	9	549	0.9%	91	11,870	18%	197	26,106	41%	336	33,894	53%
Manzanita	1,523	259,780	0	0	0.0%	354	56,238	22%	703	121,483	47%	966	163,906	63%
Nehalem	260	24,886	45	6,091	25%	61	7,856	32%	67	8,261	33%	77	8,872	36%
Rockaway Beach	2,240	211,809	591	49,215	23%	1,525	146,945	69%	1,888	170,195	80%	2,095	186,898	88%
Tillamook	2,270	322,398	0	0	0.0%	3	71	0.2%	84	24,651	7.6%	482	84,661	26%
Wheeler	363	30,556	14	1,047	3.4%	24	2,072	6.8%	33	3,798	12%	56	5,703	19%
Total Tillamook County	27,371	2,804,854	1,688	187,511	6.7%	5,167	561,327	20%	7,534	855,957	31%	10,141	1,165,367	42%

Draft results – figures may change prior to final publication



Jed Roberts

Flood Mapping Coordinator

Oregon Department of Geology & Mineral
Industries (DOGAMI)

Portland Office

jed.roberts@dogami.state.or.us

(971) 673-1546

