



Prevalence of Road Repair in Lower Income Neighborhoods: Portland, Oregon.

Using US Census and City Maintenance Data to Pinpoint Statistical Correlation Between Income and Road Maintenance Time and Distance.



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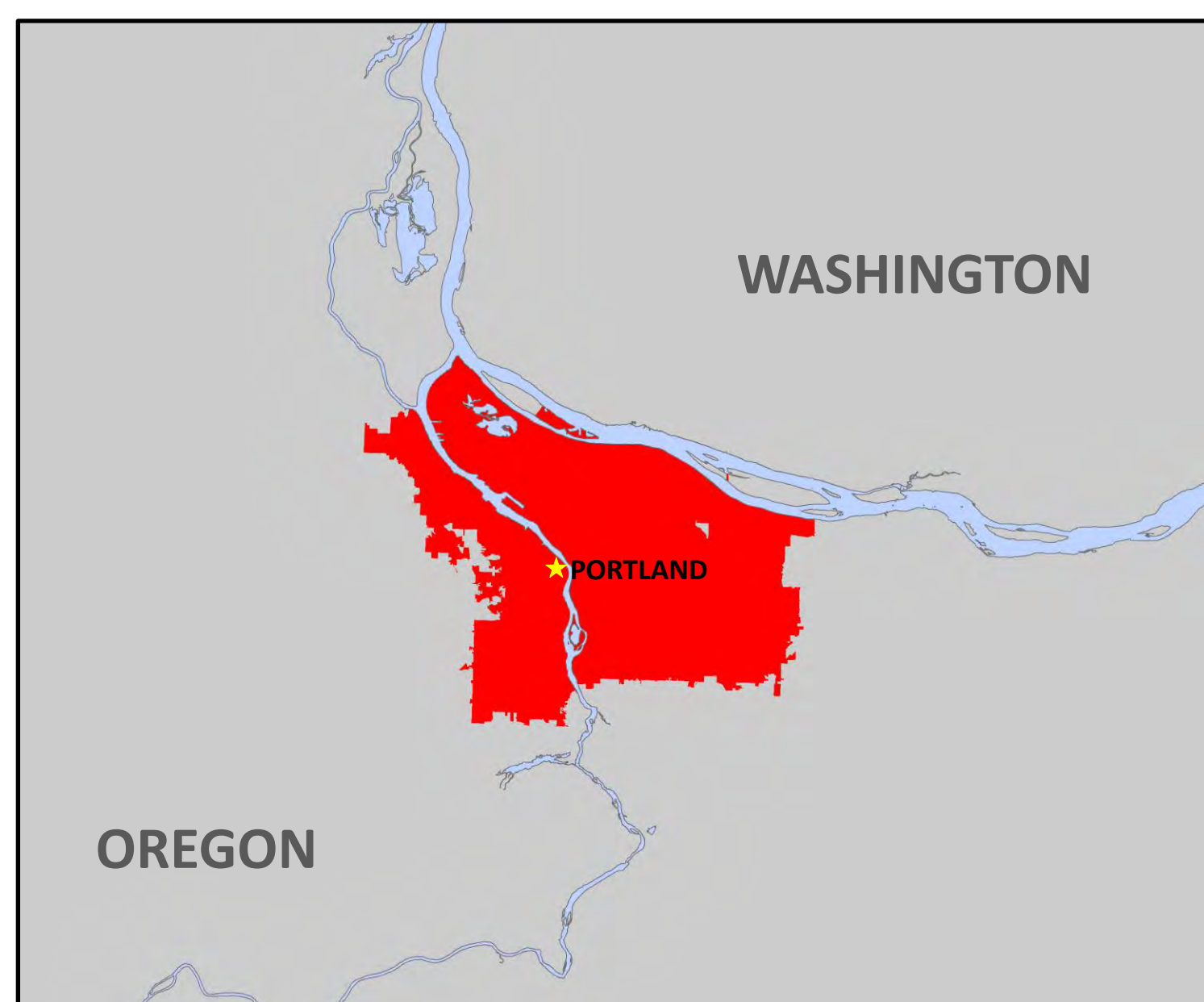
ABSTRACT

Low-income neighborhoods in urban metros are often subject to disproportionate levels of road repair and transit avenues which remain under permit for persistent issue far longer than in higher income areas. Given the tenuous economic balance residents of such neighborhood maintain costly automotive repairs due to damage and wear from road conditions become doubly problematic to financially cover. Additionally, low-income exposure to major arterials, and a higher likelihood of instance of four-way intersections: two of the biggest maintenance factors for any city. Routine use of roads in these neighborhoods by high volumes of traffic as well as higher percentage of industrial vehicles, combined with the resulting trend of longer periods of repair duress, create a set of conditions which make probability of auto impact or personal injury much higher than in better-off areas.

The purpose of this study is to provide a critical glimpse into this issue as it applies to the greater Portland metro area. Using Portland City's Bureau of Transportation Engineering and Development (BTED) Section 3: road-plan initiative to obtain a clearer picture of the City's *economic street health*, the study seeks to obtain key statistical indications of spatially disproportionate road repair levels in the bottom twenty-percent of income neighborhoods. Such data can be used by planners to effectively mitigate road issues specifically related to the neighborhoods in proximity. This is not intended as a comprehensive source of information, rather the results are intended as a planning tool alongside other data sources.

Keywords: Portland, Oregon, Income, Road Repair, Transportation, Census, Planning.

STUDY AREA

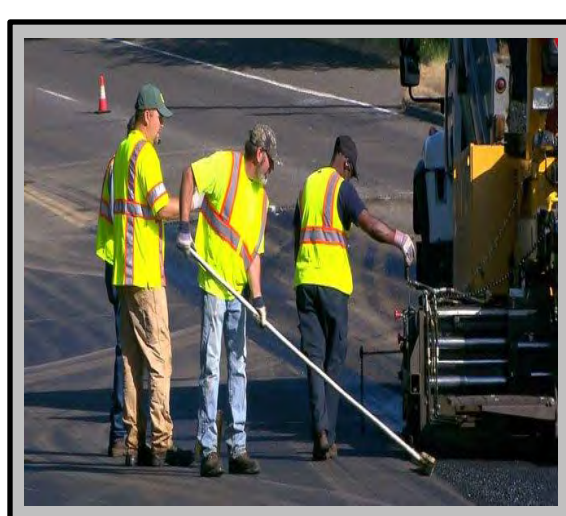


The study area of this data survey is by-census, the greater Portland City area, as falling within the Multnomah County boundary, including the south-most bank of the Columbia River and the intersecting stretches of the Willamette River. Portland is city of 583,776 individuals residing in the metro area, an average density of 4,375.2 people per square mile. The median income for a household in the city is \$40,146 placing 13.1% of the population below the poverty line. (2010 US Census)

BACKGROUND

The City of Portland Maintains its proprietary road maintenance records in shapefile format via the City of Portland, Office of Management & Finance's Bureau of Technology Services data portal. Permitted and logged batch jobs are categorized by duration of permit, whether active or completed. These files are archived on a month-to-month basis, to be later compiled and released as complete yearly reports. For the purpose of this study, the 2013 package was used, with relevant repair permit types falling into 4 main types:

Persistent LID Permits



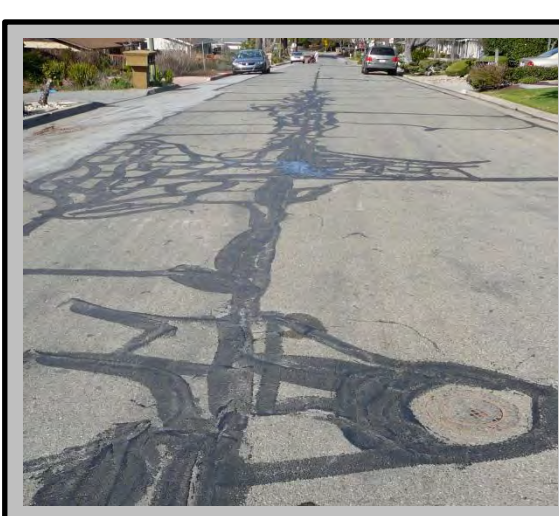
Mid to Long-term, local improvement district (LID) permits for road repair and improvement. Includes the area of improvement within the project limits of local improvement districts (LIDs) that have been formed by City Council since 2001, both ongoing and completed.

Single-Contract Permits



Short-term, limited-permit improvements representing repairs to older roads, repairs due to specific issue, or general repaving on a yearly basis. The moratorium requires a higher level of pavement restoration during reconstruction which is specified by the City Engineer through the permitting process.

Pavement Moratorium



Short-term, limited-permit improvements representing repairs to older roads, repairs due to specific issue, or general repaving on a yearly basis. The moratorium requires a higher level of pavement restoration during reconstruction which is specified by the City Engineer through the permitting process.

Private-Issue Permits



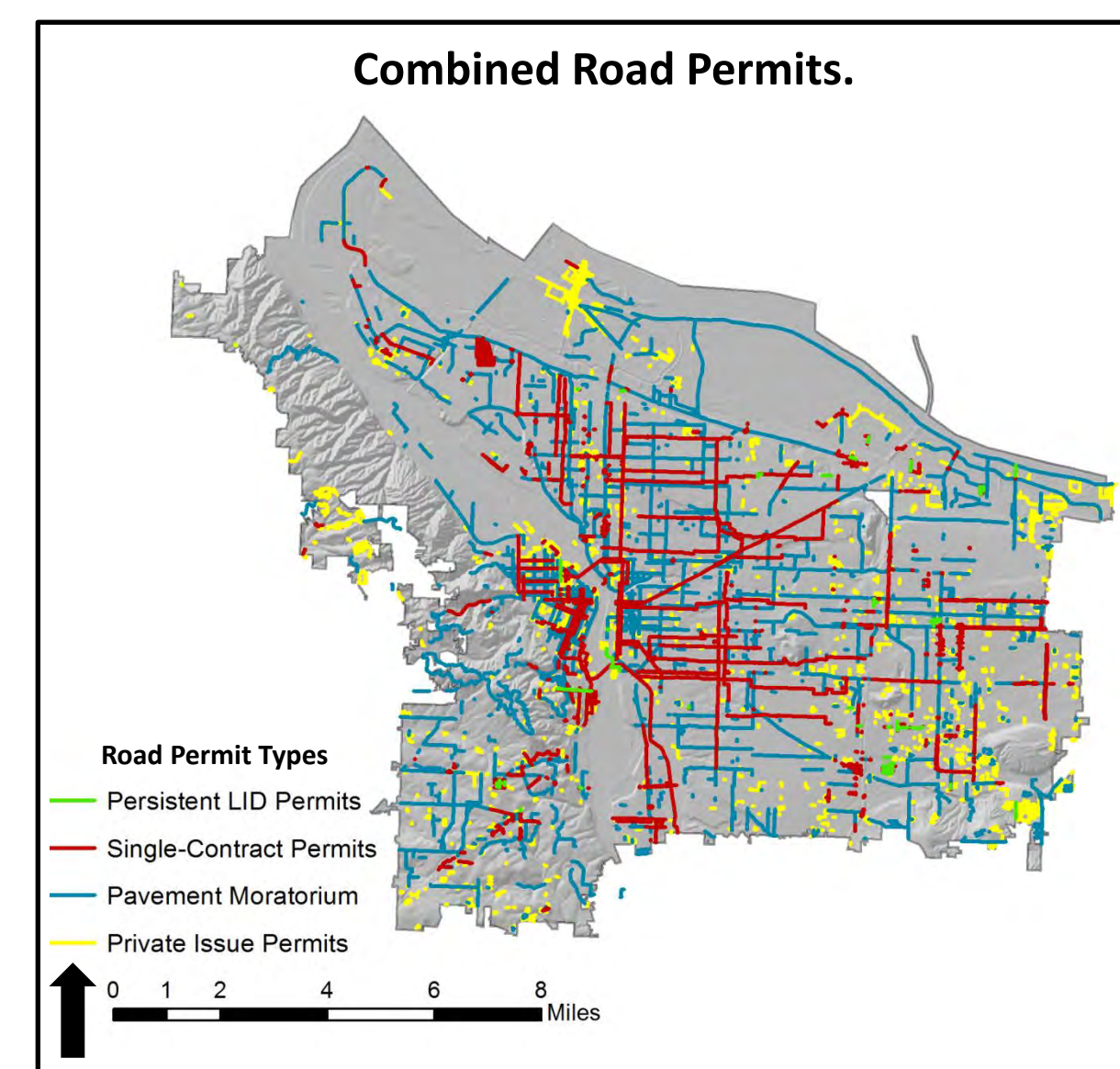
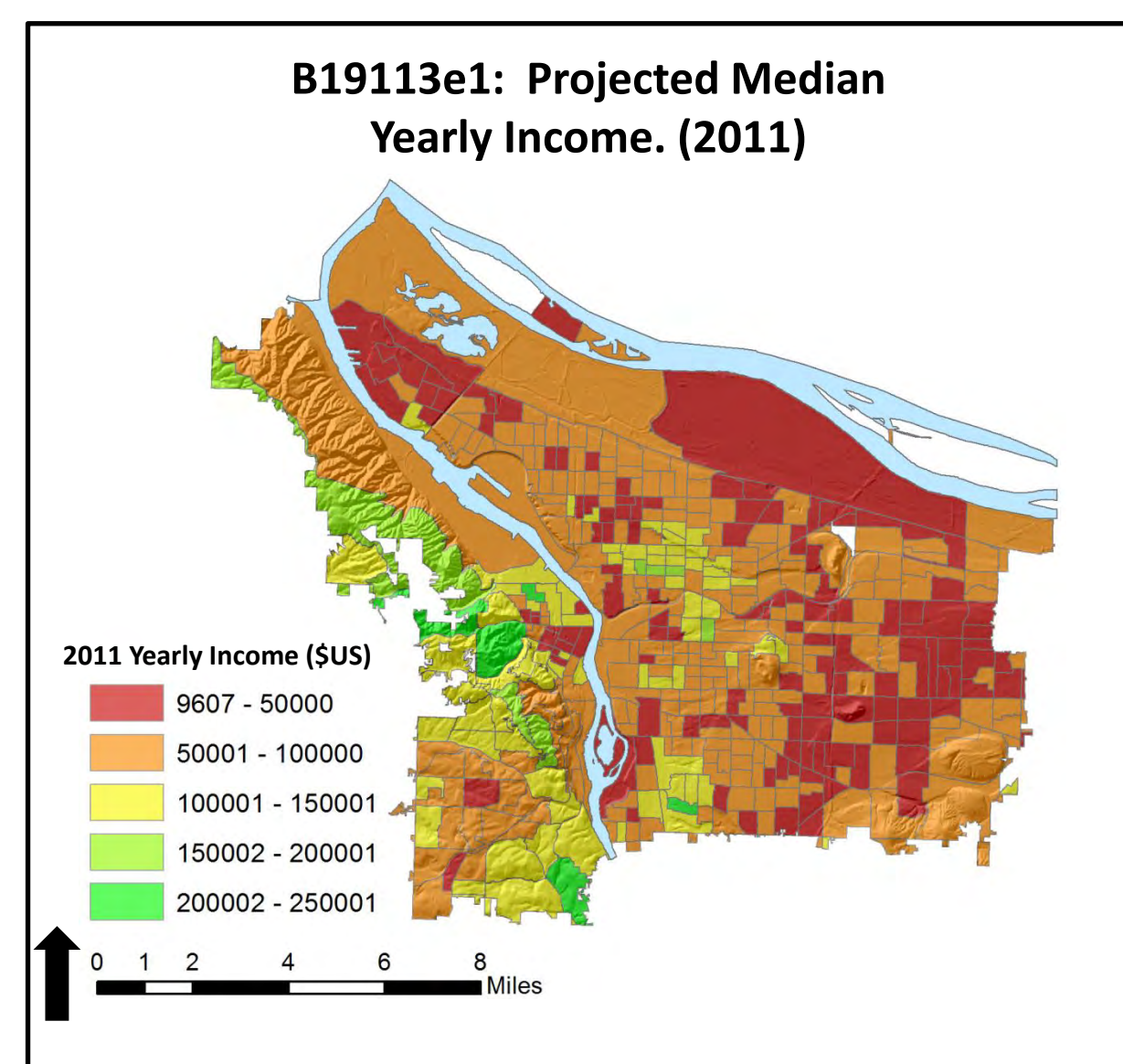
Short-term, specific private-issue permits for road. These feature classes indicate where developer-generated construction jobs are in design or permitted as reviewed by the City. Includes mandated road improvements issued as part of business construction permits.

METHODOLOGY

1. Road Data Obtained from the 2013 City of Portland, Office of Management & Finance's Bureau's 2013 road health data package. The four components were individually isolated and monthly and yearly 'days under permit' for road repairs were field-calculated.

2. Median Income data drawn from 2010 US Census and American Community Survey 2011 5 year projected estimate for income via the ACS Factfinder Engine. The Portland Metro Area was clipped from Oregon State data, and field "B19113e1: MEDIAN INCOME IN THE PAST 12 MONTHS (IN 2011 INFLATION-ADJUSTED DOLLARS) (Estimate)" was isolated.

3. The four road permit layers were merged and clipped with total yearly 'days under permit' retained as the primary analysis factor.



4. Spatial Query used to isolate Individual income ranges by 20%, 40%, 60%, 80%, and 100% cut points extracted.

5. Queries used with inverse Erase layers to isolate specific road coverages.

6. Distance of combined segments / Whole calculated for each income bracket

7. Feature-to-Raster used to create sampling probability raster, assigning "1" to the roads coinciding with the income blocks they underlie, and "NULL" for all non-road features..

8. Create Spatially Balanced Points Tool (Geostatistical Analysis) used to create 50 random samples of 50 points each.

9. Samples used to determine mean probability of a given road repair point of being in the bottom 20% of Portland Metro income blocks.

10. Standard Linear Regression Test used to infer statistical significance of results /determine a line of probable determination.

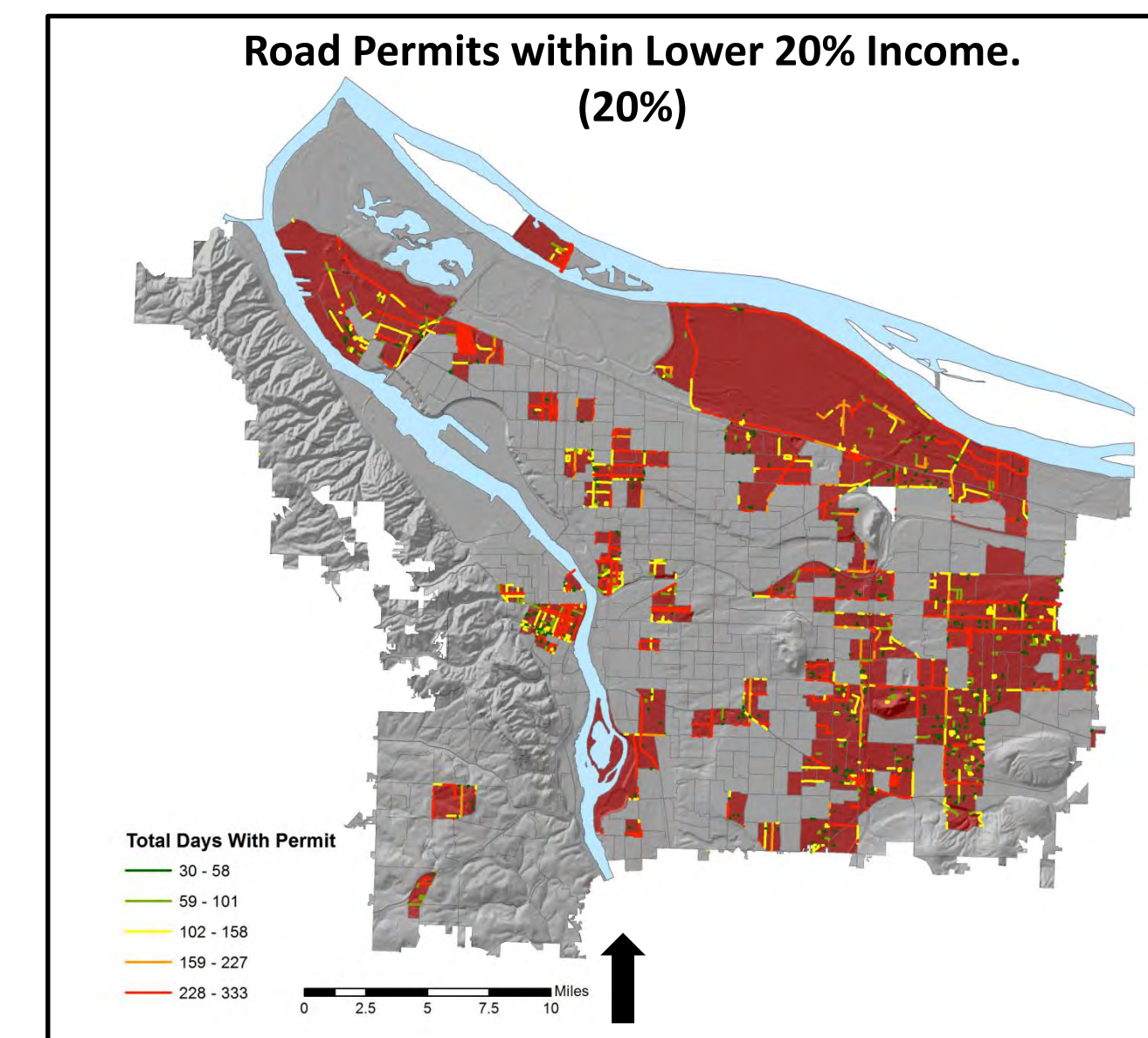
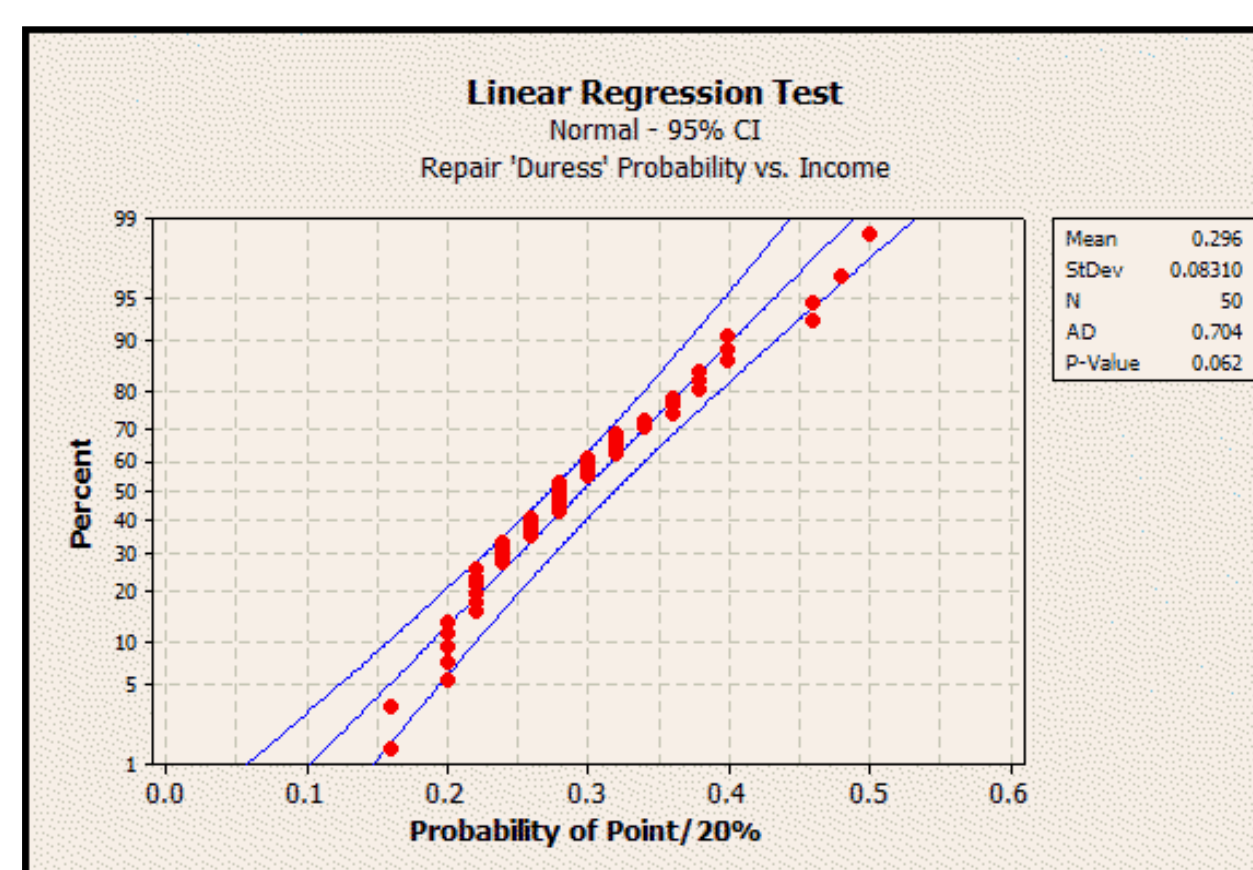
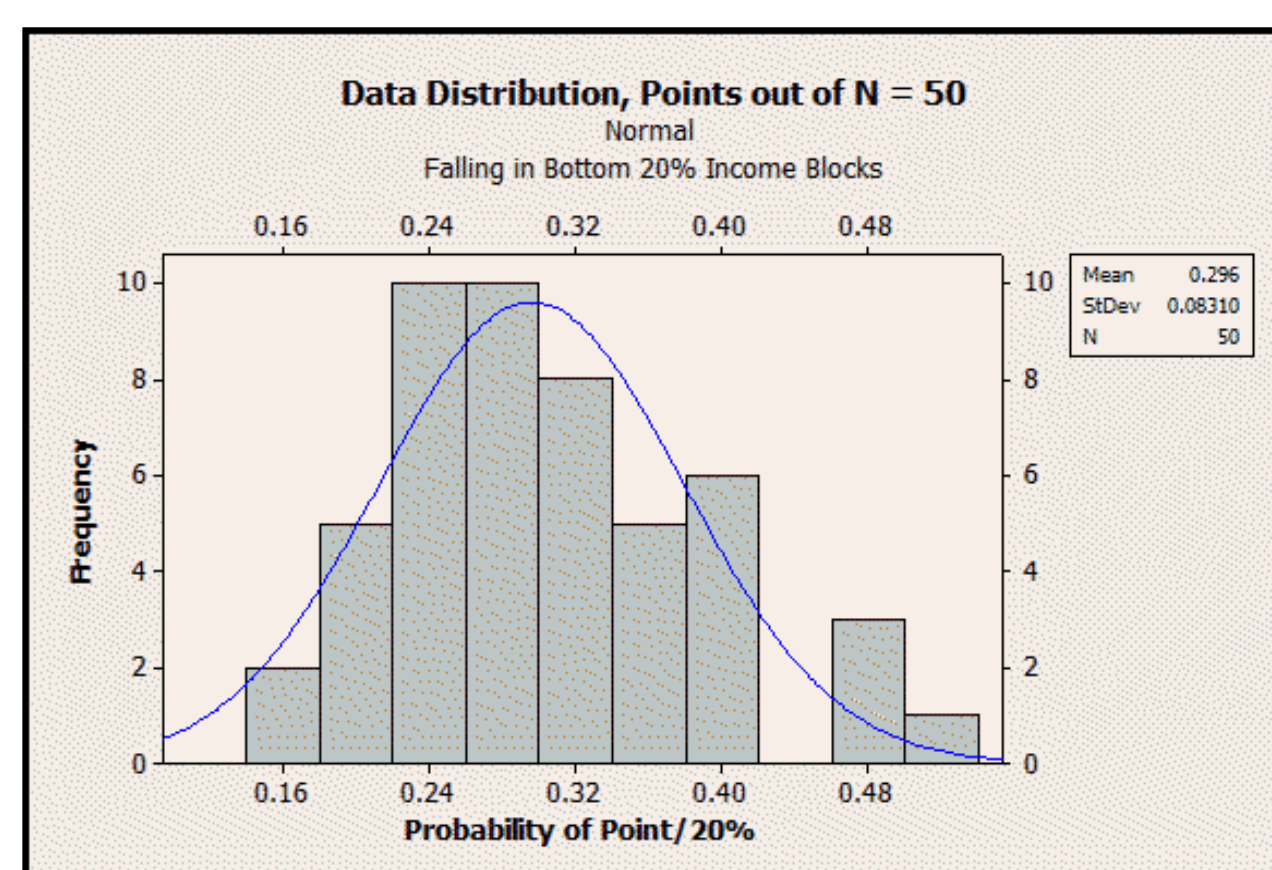
RESULTS

By Random Sampling: Of 50 Random Trials of 50 Tests each, an average of 29.6% (.296) of all points per Trial fell within the bottom 20% Income Block. (< \$9000 to \$50000 MAX.)

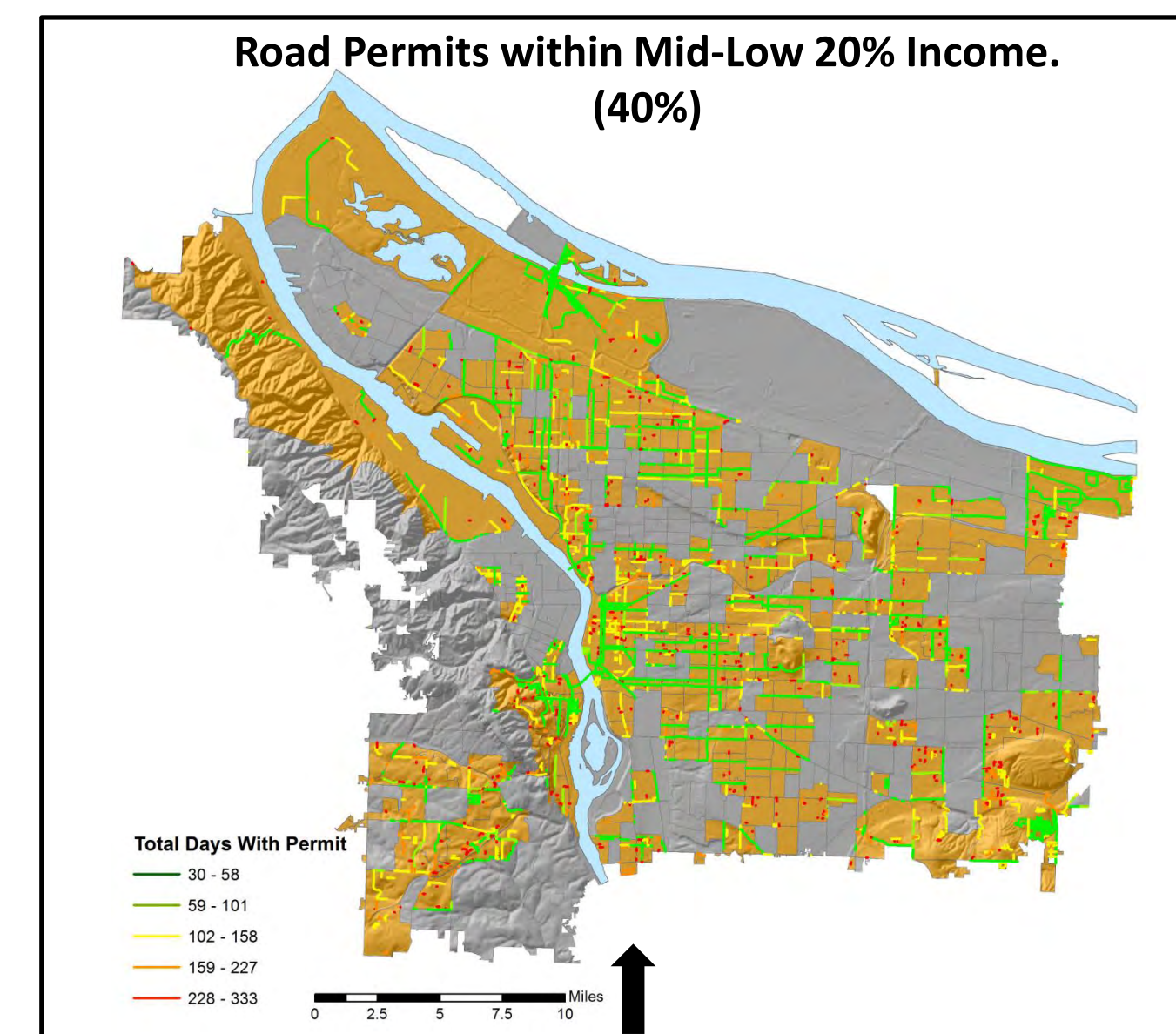
Linear Regression Testing indicates a P-value of 0.062, making evidence of correlation of Income Block and Yearly Days Under Permit of Roads only possible at the 90% Confidence Interval, assuming $\sigma = 0.0831$.

By Distance: Of the entirety of permit jobs falling in each Income Block Category, 1089355.466 ft of road out of a total 2013 permit distance of 3599915.503083 ft, falls within bottom 20% Income Block.

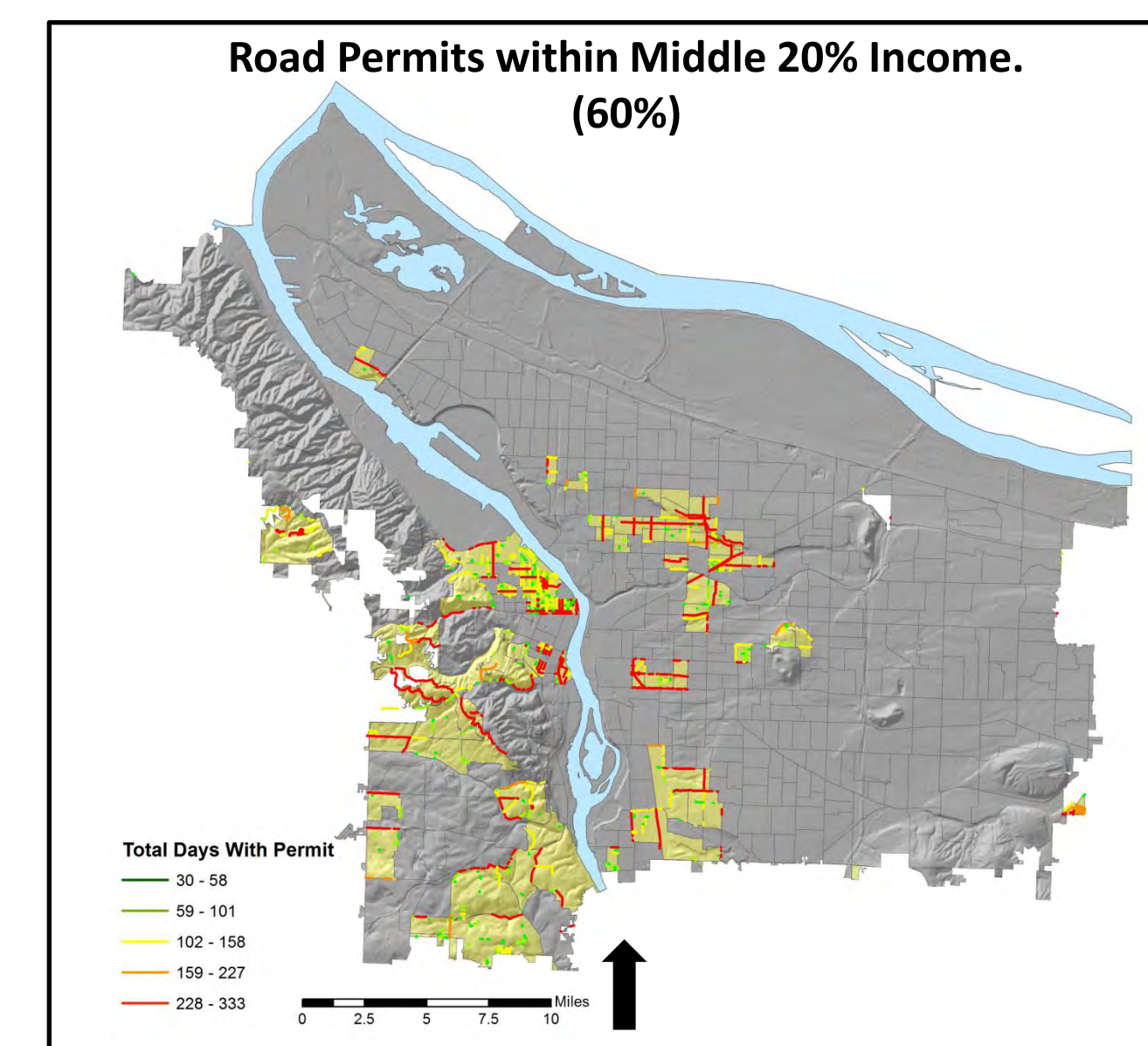
(< \$9000 to \$50000 MAX.) This equates as an estimated 30.2% (.302) of all 2013 permit job/ft fell within a bottom 20% Income Block.



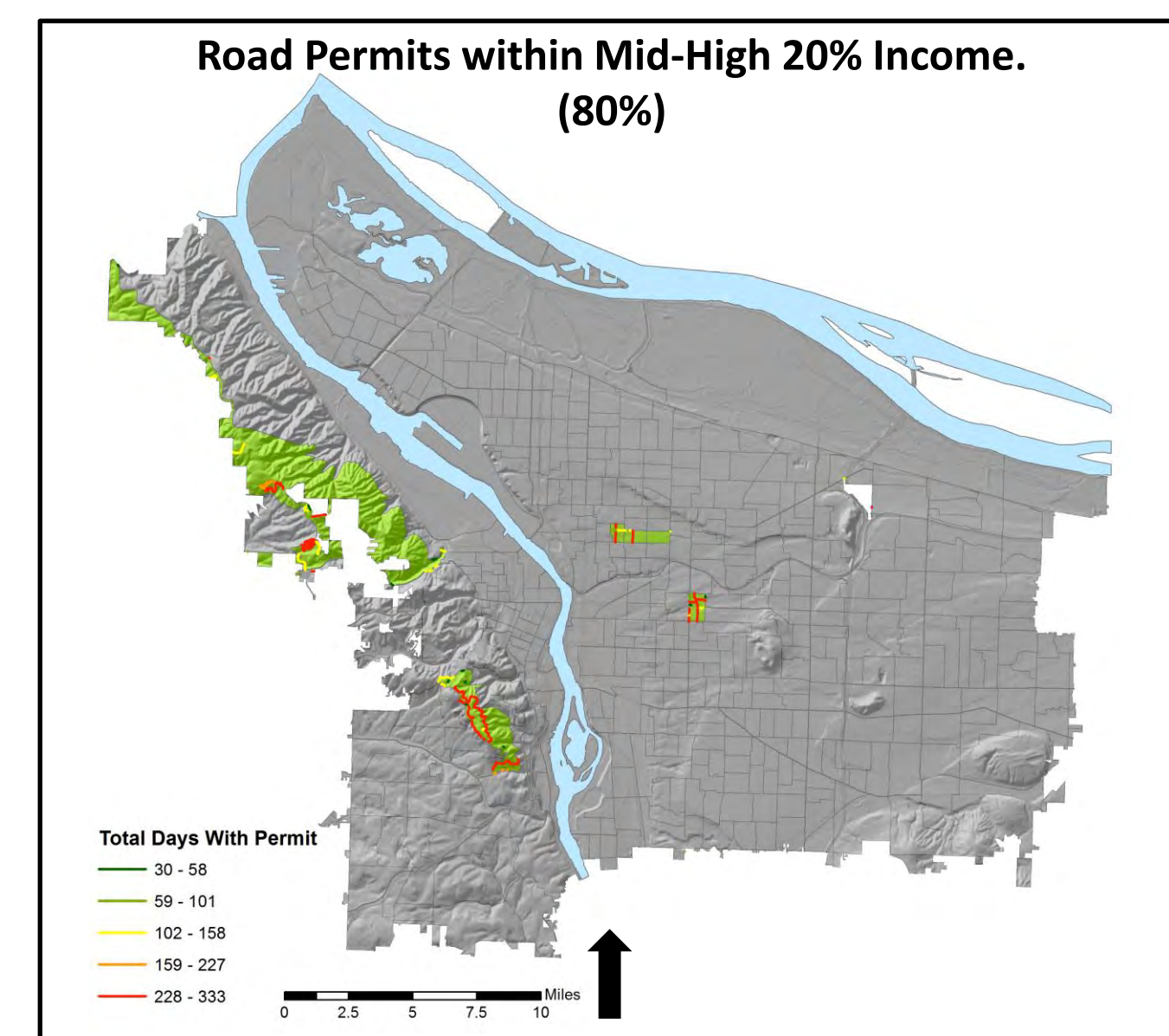
Permit ft Income Category / Total ft
1089355.46637 ft / 3599915.503083 ft
(30.2%)



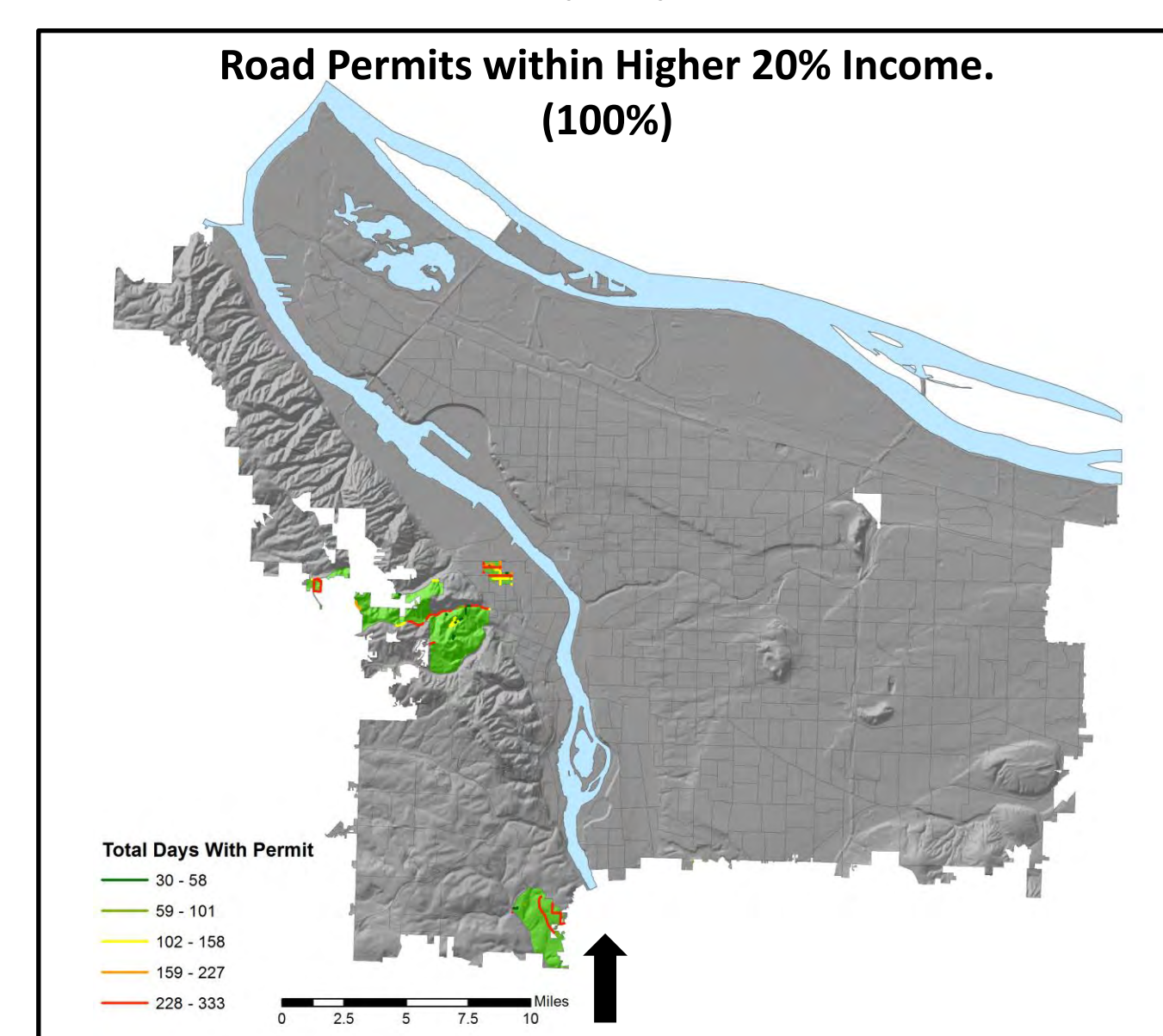
Permit ft Income Category / Total ft
1875753.673279 ft / 3599915.503083 ft
(52.1%)



Permit ft Income Category / Total ft
532190.538018 ft / 3599915.503083 ft
(14.8%)



Permit ft Income Category / Total ft
58152.162246 ft / 3599915.503083 ft
(1.6%)



Permit ft Income Category / Total ft
38489.302306 ft / 3599915.503083 ft
(1.0%)

CONCLUSION

While only Slight Statistical Evidence was found for a correlation between Days under Permit for the Portland Metro's Roads and the Median Income of its neighborhoods, it is still telling that 30.2% of all permits issued fell in neighborhoods reporting the lowest 20% of incomes. Given sufficient time, additional current data, and a robust sampling model it is probable that a greater degree of relation would be found.

While only the Regression Test only assumes accuracy at the 90% confidence level, ($\alpha = .10$) the data is still meaningful by virtue of probability of instance that a permit repair contract, limited job, or moratorium would occur in the lowest 20% of income neighborhoods.

ACKNOWLEDGMENTS

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