

INTENSITY STUDIES WHITE PAPER

Summary White Paper related to Intensity Studies, including Economics, Transportation, and Climate

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Intensity Studies White Paper
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Executive Summary

This white paper provides a high-level summary of the ongoing analysis related to the Vision 2050 Intensity Studies. An improved understanding of the intensity of the impacts from the residential economy was a key recommended implementation step of the Community Growth Advisory Committee’s (CGAC) 2023 *Final Report of Recommendations*.

Unlike growth, which is most commonly measured by population increase, intensity relates to an increase in activity - something CGAC members were observing and experiencing that felt incongruous with community values. The CGAC hypothesized that large homes, defined as those over 5,750 sq ft, increasingly operate less like a typical residence and more like commercial activity nodes - generating employees, traffic and a commercial level of intensity that is inconsistent with rural areas and misaligned with the location of community infrastructure and county services.

Why is 5,750 sq ft used in this report?

This threshold was established in 2000 based on analysis relating home size to employment generation and traffic. Based on this analysis, 5,750 square feet was determined to be the house size at which impacts increased significantly.

A series of additional technical studies have been completed to dive more deeply into these topics, including employee generation,¹ transportation intensity, economic intensity, and climate intensity.² The study findings enhance our understanding of how large homes contribute to the overall intensity of activity in unincorporated Pitkin County from an economic, transportation and climate perspective. They also equip us to better align the drivers and impacts of intensity with our community values of rural preservation, balanced economy, bold climate action, and equity and affordability.

¹ As of the publication of this summary report, the employee generation study is underway and in draft form. The initial findings from the study are incorporated here, and may be updated once the study is finalized.

² The studies used to compile this report are:
Residential Economic Intensity Study, RPI Consulting, 2025
Transportation Intensity Study, Kimley Horn, 2025
Pitkin County Energy Use Utility Data Analysis, Resource Engineering Group (REG), 2025
Pitkin County Residential Employment Generation Study, Economic Planning Systems and RRC, 2025

What is “Intensity?”

In the context of Vision 2050, “intensity” relates to the economic, transportation and climate activity generated by the residential sector and, in particular, by large homes over 5,750 sq ft.

1. **Economic Intensity:** This generally refers to the economic activity and sectors in a community. For the purposes of this work, Economic Intensity is defined as *“the economic activity originating from the development, occupancy, operations and maintenance of high end, larger homes in Pitkin County. One portion of intensity originates from the residences themselves - i.e., the onsite jobs generated to build, operate and maintain a house. The other portion of economic intensity centers around the offsite real estate, development and wealth management businesses that service the residential sector and that grow as homes get bigger.”*
2. **Transportation Intensity:** This generally refers to the amount of traffic and congestion on roads and in neighborhoods. For the purposes of this work, Transportation Intensity is defined as *“the transportation activity – total trips and vehicle miles traveled (VMT) - originating and resulting from homes in Pitkin County. One portion of this intensity originates from day-to-day trips from a home that are typical for any community member, such as to work, school, or to run errands. The other portion of intensity centers around trips made to a home by workers to construct, operate and maintain a home.”*
3. **Climate Intensity:** This generally refers to the amount of gas and electric energy - and resulting greenhouse gases (GHG) - required to operate residential buildings. It can also include the greenhouse gas emissions generated by vehicle trips required to maintain and service homes in Pitkin County. GHG emissions associated with vehicle trips to maintain and service homes of various sizes was evaluated as part of a 2021 study.³ For the purposes of this study, the definition of Climate Intensity is this study limits the definition of climate intensity to *“the climate-related impacts from operating and maintaining homes in Pitkin County.”*

Key Takeaways

Drawing from the intensity study analyses, the following key findings have emerged.

1. The data studies affirm that intensity in Pitkin County is a real and quantifiable phenomenon, distinct from growth. This intensity is misaligned

³ Construction, Home Management, and Operational Emissions, Lotus Engineering, 2021
<https://storymaps.arcgis.com/collections/bab0c4c3db524fd4937405d4f2b6d0d4?item=2>

with community values of bold climate action, a balanced economy, rural preservation and equity and affordability.

2. As homes get larger, they generate more jobs and thus more economic activity when compared to smaller homes. They also use more energy and have an outsized impact on the transportation system.
3. Broader economic shifts are transitioning Pitkin County from a rural resort economy to one driven by the occupancy, construction, redevelopment and servicing of large homes in rural areas. This shift has spatial implications in that activity is no longer centered in denser urban areas with existing services and infrastructure but rather in rural areas.
4. While demand for home construction, operations and maintenance in Pitkin County has increased, construction jobs in Pitkin County have declined since 2010; however, they have increased in adjacent counties. This indicates that workers are increasingly living outside of Pitkin County and traveling further distances to job sites. This dynamic indicates an imbalance in our local economy and demonstrates a need for affordable community housing closer to jobs.
5. The analyses indicate a positive relationship between residential square footage and economic, transportation, and climate intensity. As home size increases, so do the levels of intensity. Where the relationship is exponential, land use policy and planning tools can help influence the levels of intensity to better align with community values (i.e., “bend the intensity curves”).

Taken together, these findings indicate a critical need to reframe our approach beyond managing growth to also addressing - and mitigating - intensity impacts through tools available to Pitkin County.

Introduction

This white paper compiles the findings from the economic, transportation, and climate intensity-related studies for the Vision 2050 process. Each has yielded important insights, including updated working definitions of different types of “intensity.” These definitions, outlined above, articulate what the county has been experiencing and help establish a data-informed baseline to measure and manage aspects of intensity through future County programs, policies, and codes.

CGAC Background and Recommendations

The [CGAC Final Report of Recommendations \(2023\)](#) included specific hypotheses related to the impacts of large homes. The CGAC hypothesized that large homes have an outsized impact on the intensity of economic, transportation, climate, and character in Pitkin County, identifying the following aspects that informed their recommendations report:

1. Growth is no longer defined simply as density, but also as intensity and activity - a shift that reflects changing economic realities in Pitkin County.
2. Land use patterns and infrastructure have been historically based upon a rural/urban landscape. We’ve built an infrastructure that assumes a workforce in the urban area (i.e., housing in urban areas, bus transit) with less activity in our rural areas. However, with the rise in activity/service generated by large homes in our rural areas, there is increasing misalignment between Pitkin County infrastructure and nodes of activity.
3. These trends have direct impacts on our climate and environmental values (e.g., residential and transportation-related emissions, waste, air quality, etc.) and also spur downstream impacts that directly affect equity, community carrying capacity, and economic resiliency (e.g., shifts in economic and community composition, lack of affordability, etc.).
4. The Land Use Code is the most influential tool the County has to influence our community values and directly shape the land use pattern and activity we want to see in unincorporated Pitkin County.

Problem Statement

The CGAC identified intensity as a qualitative phenomenon impacting our community values and quality of life. To test these assumptions, it was important to define and quantify intensity to better understand its drivers, impacts, and dynamics.

Simply put, what do we mean by intensity? How do we measure it? How much economic activity do large homes drive relative to overall economic activity in Unincorporated Pitkin County? What's the relationship, if any, between large homes and traffic congestion? How does home size relate to the county's greenhouse gas emissions? What else is driving intensity or is intensity impacting that we haven't understood?

The data-informed answers to these questions can equip the County to more effectively manage and mitigate intensity in ways that support our community's values.

Approach

For each study, the county engaged consultants with subject matter expertise to lead the data review and analysis. This white paper clarifies the definition, metrics and baseline analysis for each aspect of intensity. Because this is uncharted territory, the goal of data analysis is not to achieve perfection but rather to establish a baseline. Where necessary, proxies for measuring intensity have been identified to simplify ongoing measurement and ensure the county can track trends over time. Insights from these studies will inform land use policies in the Comprehensive Plan as well as updates to the county code.

Existing Conditions and Trends

Since 2000, Pitkin County's population has grown 6.9% from 15,763 to 16,968 residents in 2025 compared to 34.6% growth at the state level, from 4.3 million to 5.8 million residents in 2025. The County is expected to grow 3.6% to 17,584 over the next 25 years. By comparison, Colorado is expected to grow by 25% to 7.25 million residents by 2050.⁴

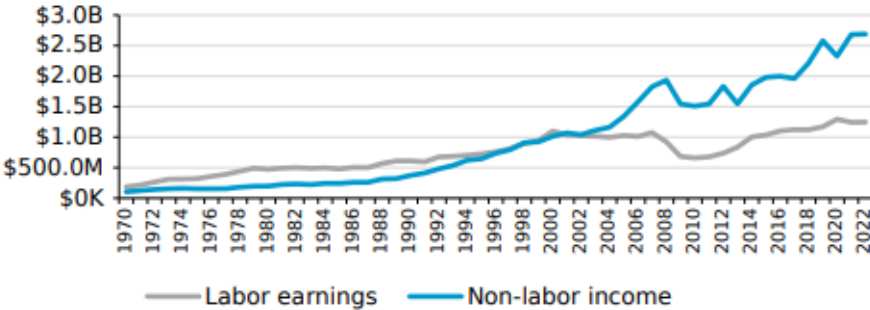
While the full-time population growth in Pitkin County is not significant, development and related activity has substantially increased in rural areas of the County, swelling day-time population up to three-fold.⁵ The lived experience resulting from this activity is apparent in the traffic congestion clogging Highway 82 and our rural roads; an emerging economy devoted almost entirely to the construction and maintenance of large residential properties; and special events and short-term rental activities taking place in rural corners of our community that changes the traditional use of residential properties to one that is more commercial in nature. To reduce and manage intensified activity in rural areas, the first step is to define the problem and better understand the dynamics of intensity.

Economic Trends

The socioeconomic trends over the last decades shed light on the changing dynamics in Pitkin County. While tourism-related jobs have increased slightly since 2010, jobs related to real estate, development and wealth management account for nearly 66% of the job growth in Pitkin County from 2010 to 2022. Despite an overall increase in construction activity taking place at job sites within Pitkin County since 2010, construction-related jobs generated within Pitkin County have declined.⁶ These dynamics suggest that the economic makeup of Pitkin County is shifting.

Another key economic trend is the increasing level of wealth present in our community and the widening affordability gap. Today, 68% of personal income of Pitkin County residents is derived from non-labor sources, such as investments, interest, dividends, or retirement

Figure 1: Labor Earnings vs. Non-Labor Income in Pitkin County



Source: Headwaters Economics' Economic Profile System, Pitkin County (2024)

⁴ State Demographer Office, Population Estimates Vintage 2024

⁵ Peak Population, Development Trends, and Buildout Report, RPI Consulting (2020)

⁶ State Demography Data Job Sectors by County 2001-2023.

accounts.⁷ This is the reverse at the national level, where two-thirds of income is derived from wage earnings and only one-third from non-labor income. And the wealthy are getting wealthier. Since 2000, the percentage of total personal income from non-labor income has increased by 165%, far outpacing the increases in wage-earnings which have only increased by 13%.⁸

This rise in wealth and economic activity in Pitkin County is also captured in retail sales tax collections, which increased by 60% from 2019 to 2024.⁹ However, not all residents are contributing in equal measure to this activity. Whereas the average median household income is \$111,291 in Pitkin County, a household with two working adults must bring in \$148,512 annually to earn a living wage.¹⁰ The resulting wage gap and increasing economic activity from non-labor sources highlights the overall shift in economic intensity from traditional wage-earning economic sectors to wealth-generating sectors that are out of reach for most average county residents.

Building Permit Trends

Historically, development in the unincorporated portion of the County has been characterized by traditional rural residential and agricultural use. Over the last few decades, many of the rural properties have been redeveloped into high-value, high-amenity residential estates complete with large luxury residential homes, accompanying structures and exterior amenities such as pools, spas, fire pits, ponds, and water features. In 2000, Pitkin County issued 278 new residential building permits with an average construction valuation of \$632,118 or \$1.2 million in today's dollars.¹¹ In 2023, 110 new residential buildings were issued with an average valuation of \$3,181,315. While 60% fewer residences were built, the valuation increased by 400%.¹² Additionally, the average size of homes built has increased by 18.8% - from 4,498 sq ft in 2000, compared to 5,345 sq ft in 2024.

This stunning increase in valuation far outpaces inflation and is driven by substantial demand for luxury construction at the highest end that involves custom finishes, premium imported materials, and cutting-edge integrated technology, resulting in commercial-grade systems and high-performance homes. The complexity of construction demands a sophisticated and substantial labor force and demonstrates the disproportional level of development intensity associated with high-end high-amenity residential construction.

⁷ Headwaters Economics' Economic Profile System, Pitkin County (2024)

⁸ Headwaters Economics' Economic Profile System, Pitkin County (2024)

⁹ <https://stories.opengov.com/pitkincountyco/published/fvlhaPP1M>

¹⁰ U.S. Census Bureau, Estimate of Median Household income for Pitkin County, CO, Retrieved from FRED, Federal Reserve Bank of St. Louis; MIT Living Wage Analysis

¹¹ BLS inflation calculator

¹² Pitkin County Construction Valuation by Year (2024)

Employee Generation Trends

Pitkin County has required mitigation for employment generation for nearly 50 years. Over this time, various studies have been completed to understand the employment generation for residential development. The last such study was completed in 2004 and is being updated in 2025 as part of the Vision 2050 work. This study focuses on employment associated with the construction of new residential units (e.g. contractors and specialty trades workers), employment associated with the ongoing operations and maintenance of homes and employment associated with the construction of residential remodels.

Construction employment generation today is estimated to be approximately 6.7 times higher in the current estimates than the 2004 estimates. This is a result of growth in the sector, as well as an update in the study's methodology to better account for all types of construction-related employment.¹³ The result is an estimate of 0.096 full-time construction workers per 1,000 residential sq ft of new home construction, compared to 0.014 from the 2004 study.¹⁴ This updated study demonstrates that more full-time workers are required today to construct homes to the level of complexity demanded by the high-end, high-amenity residential development sector.

Transportation Trends

Pitkin County has sought to understand transportation impacts on the community for many years. Transportation impacts include the number of miles traveled and the associated effects on roads and bridges, as well as the greenhouse gas (GHG) emissions generated by the trips. Individual trips also have an impact on the overall quality of life for the community, so understanding the reasons for different trips aids in understanding the potential solutions to address these impacts.

Pitkin County draws 62% of its workforce from outside the county and 24% travel over 50 miles. This leads to increased traffic congestion on Hwy 82 and challenges to quality of life for our commuting workforce.¹⁵ Since 2001, annual average daily traffic (AADT) on Hwy 82 has increased by 39.7%.¹⁶ For the traffic counter at Highway 82 and

¹³ The 2004 study excluded employment by specialty trade contractors and employment by firms based down valley but doing construction work in Pitkin County. These are included in the 2025 analysis by RRC and EPS.

¹⁴ The generation rate of 0.096 full-time construction workers is derived from a combination of three different methodologies, including 1)IMPLAN and RIMS II multiplier method; 2) Aggregate Valuation / Jobs method; and 3) Pitkin County COVID Job Site data. Methods 1 and 2 are industry standard, and method 3 provides some ground truthing to the figures. The COVID methodology is more conservative than the other methods, which influences the blended generation number.

¹⁵ US Census Bureau On The Map

¹⁶ Annual Average Daily Traffic, or AADT, is estimated as the total traffic volume passing a road segment in both directions for a year divided by the number of days in the year, FHWA

Old Snowmass, there were 242,721 AADT in 2019, compared to 267,898 AADT in 2024, representing an increase of 10.37%.¹⁷

In 2023, transportation accounted for 32% of Unincorporated Pitkin County's total GHG emissions. This was largely driven by on-road gas and diesel-powered transportation, the emissions from which increased by 1% since 2019.¹⁸ On a per capita basis county-wide, regional transportation emissions represent 12.9 mtCO₂e per person, which is similar to surrounding counties but is more than double the state average of 5 mtCO₂e.

The level of traffic congestion and associated emissions has reached a level of intensity that many local and regional players are trying to manage and solve. Measuring the transportation impacts of Pitkin County's residential economy is an important step to contributing to these solutions

Climate Trends

Unincorporated Pitkin County has set bold goals for reducing its climate impact. The County's 2025 Climate Action Plan aims for a 65.3% reduction in annual greenhouse gas emissions by 2030 and a 90% reduction by 2050 from 2019 levels. Furthermore, the plan proposes that Pitkin County and the community work to accelerate these goals by achieving 100% GHG emissions reductions by 2050 - or sooner.¹⁹

To measure and manage the county's progress toward its goal, the County published a comprehensive inventory of 2023 greenhouse gas (GHG) emissions in 2024.²⁰ This inventory updated the previous emissions baseline established in 2019. The results show that Unincorporated Pitkin County's greenhouse gas Scope 1, 2 and 3 emissions in 2023 totaled 280,230 metric tons of carbon dioxide equivalents (mt CO₂e), a 1% decline from 2019 (using the same methodology.) However, residents generated nearly 45 tons of emissions per capita in 2023 – more than double the state average of approximately 20 tons per person.

Residential building emissions accounted for 30% of all GHG emissions within Unincorporated Pitkin County. While natural gas and propane emissions increased by 3% since 2019 - presumably driven by increased square footage of the community's building stock, emissions from electricity declined by 8%. This decline can be attributed to the increasing deployment of renewable energy by Holy Cross Energy, which expanded its share of renewables from 44% in 2019 to 50% in 2023. While Pitkin County is making progress on its GHG reduction goals, focusing on reducing emissions associated with residential buildings remains a top priority.

¹⁷ CDOT and RFTA, [Regional Commuting](#)

¹⁸ Pitkin County 2024 GHG Inventory

¹⁹ 2025 Pitkin County Climate Action Plan

²⁰ Pitkin County 2024 GHG Inventory

Overall Findings

This section is divided into key findings for each intensity: Economy, Transportation, and Climate.

Economic Intensity

The residential economy is defined as the onsite jobs generated and related offsite services needed to develop, construct, remodel, operate and maintain a home in Unincorporated Pitkin County. *One portion of residential economic intensity originates from the residences themselves - i.e., the onsite jobs generated to build, operate and maintain a home. The other portion of economic intensity centers around the offsite real estate, development and wealth management entities that service the residential sector and that grow with the increase in larger homes.*

While the overall Vision 2050 work and existing conditions acknowledge the tremendous economic impact that increasingly wealthy homeowners bring to the County in the form of personal and non-labor income, the focus of this economic study is on the direct on-site and off-site activity generated by homes in Pitkin County.

Metrics or Proxies

The proxies used to measure the residential economy include: 1) onsite jobs generated to construct, remodel, operate and maintain homes in Unincorporated Pitkin County (per incremental 1000 sq ft), 2) the portion of the economy related to onsite home construction, operations and maintenance, and offsite residential services, and 3) the change in employment and personal income in sectors related to residential development.

Baseline of Economic Intensity

Homes in Pitkin County require their own workforce - first to construct them and then to maintain them and operate the systems. The 3,974 total jobs at residences in Pitkin County span ten sectors and make up 14% of the total jobs in the county.²¹ The larger the home, the more jobs that are supported by it.

For onsite jobs, employment generation for new construction is estimated at 0.096 construction, operations and maintenance employees per 1,000 sq ft of heated square footage. For remodels, the estimated generation rate is 0.053 permanent construction workers per \$1 million in residential remodel valuation.²²

²¹ Economic Intensity Study, 2025, RPI

²² US BEA Input-Output Accounts – Use Table, 2017; EPS and RRC

Looking more deeply at the mix of job industries in Pitkin County as of 2022, construction-only jobs accounted for approximately 4% of the county’s economy, declining in Pitkin County by 16% from 2010 to 2022. In comparison, real estate, development services and wealth management jobs were 31% of 2022 Pitkin County jobs. Since 2010, this industry group added 2,738 new jobs, a growth rate of 49% accounting for 66% of all new job growth in Pitkin County. Within this industry group, labor earnings grew by 149%, or \$320 million from 2010 to 2022.

Figure 2 – Job Trends by Industry Group

Industry Group	2010	2022	Change 2010-2022	% Change 2010 - 2022	% Total Job Growth 2010 - 2022
Tourism	7,994	9,055	1,061	13%	25%
Construction	1,194	1,001	-193	-16%	-5%
Real Estate, Development Services and Wealth Management	5,595	8,333	2,738	49%	66%
All Else	7,526	8,112	586	8%	14%
Total	22,309	26,501	4,192	N/A	100%

Source: Economic Profile System by Headwaters Economics; RPI Consulting

Key Findings

Larger, more expensive homes are a driver of intensity, increasingly acting more like commercial nodes of activity than residences. Construction, operations, and maintenance jobs increase proportionately to home size, both of which grow linearly with every 1,000 square feet increase in home size.²³ As home size and value in Pitkin County have increased, onsite construction and maintenance jobs have also grown. Large homes over 5,750 sq ft account for 71% of the total residential square footage built in unincorporated Pitkin County between 2019-2024.²⁴ As employment numbers increase proportionately to square footage, it follows that 71% of new residential jobs in the past five years have been generated by large homes.

Despite the increased demand for onsite construction, operations, and maintenance jobs, these jobs have declined in Pitkin County by 16% since 2010. At the same time, these jobs have increased in adjacent communities, growing by 27% and 25% respectively in Garfield and Eagle Counties. This tells us that construction workers are increasingly living in other places and traveling from further distances to job sites in Pitkin County. This dynamic, along with the growth in non-income-based wealth in Pitkin County, indicates a broader economic shift and raises questions about a balanced economy and opportunities to address transportation, equity and affordability.

²³ EPS and RRC Employee Generation Study, 2025

²⁴ Pitkin County Building Permit Data, 2024

Transportation Intensity

Transportation intensity is defined as transportation activity, including trips and vehicle miles traveled (VMT) in Unincorporated Pitkin County related to residential uses. Specifically, Residential Transportation Intensity means *the transportation activity originating from and generated by homes in Pitkin County. One portion of this intensity originates from day-to-day trips from a home that are typical for any community member, such as to work, school, or to run errands. The other portion of intensity centers around trips made to a home by workers to construct, operate and maintain a home.*

Metrics or Proxy

Transportation intensity is the combined total of all daily trips related to residences, which are measured in three ways for trips in Unincorporated Pitkin County:

1. Home-Based Work (HBW) trips, which are work-related trips made by residents who are commuting to work outside their homes;
2. Home-Based Other (HBO) trips, which are made by residents unrelated to work such as for recreating, grocery shopping or other errands; and,
3. Non-Home-Based (NHB) trips, which are made by employees of a residence to provide services related to that home's operations and maintenance.

These three trip purposes can be aggregated to the Unincorporated County level. Daily trips and VMT for each category can be estimated based on home size to quantify transportation intensity generated by residential land uses in the Unincorporated County.²⁵ Figure 3 illustrates the breakdown of these three trip types.

Figure 3: Total Trips and VMT by Trip Purpose

Category	Total Trips	Total Residential VMT	Percent of Total Residential Trips	Percent of Total VMT
Unincorporated County	24,988	141,076	N/A	N/A
Home Based Other (Errands)	20,619	110,974	82.52%	78.66%
Home Based Work (Commute)	2,448	11,793	9.80%	8.36%
Non-Home Based (Operations and Maintenance)	1,921	18,309	7.69%	12.98%

Source: Kimley Horn

²⁵ Transportation Intensity Study, Kimley Horn, 2025

Baseline of Transportation Intensity

Of the nearly 44,000 daily vehicle trips made in Unincorporated Pitkin County using data sources from 2020 through 2024, 57.01% (24,988 trips) are related to residential land uses. This excludes trips that pass-through Pitkin County but do not begin or end in the County.

The average daily trips by residents are relatively consistent across home size. However, employee trips—those made by landscapers, property managers, cleaners, and contractors—rise significantly with increases in home size.

For the average home size of 3,278 sq ft in Unincorporated Pitkin County, home-based and commute trips are 8.07 per day per home, while employee trips (non-home-based) are 0.55 trips per day per home. For homes that are 5,750 sq ft to 8,500 sq ft, home-based errands and commute trips are 8.63 per day per home, while Employee based trips are 3.04 trips per day per home, nearly six times the employee-based trips generated by smaller homes.

These employee-related trips also tend to be longer and persist year-round, regardless of whether the home is seasonally occupied. While employee-related trips account for 7.69% of all daily residential trips in Unincorporated Pitkin County, they represent nearly 13% of total daily vehicle miles traveled.

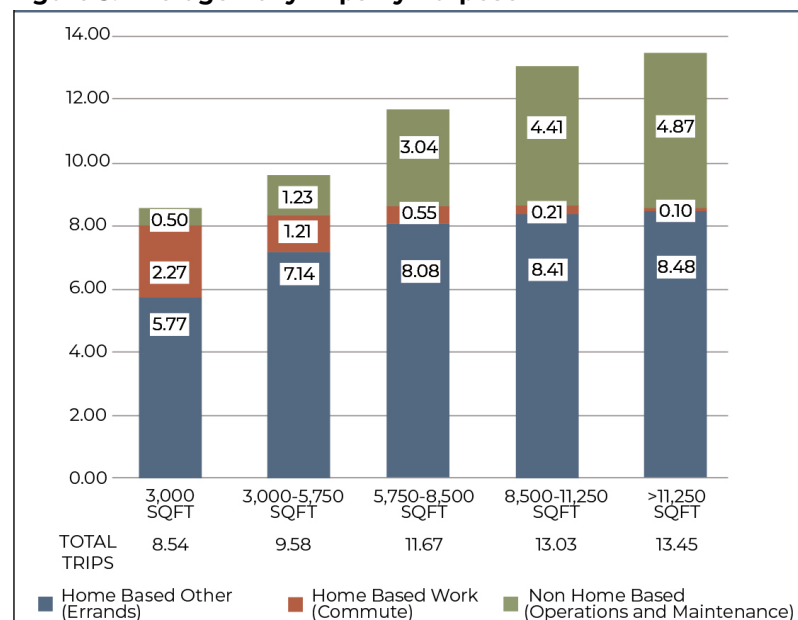
The 2024 GHG Inventory indicates that ground transportation accounts for 16% of Unincorporated Pitkin County's total emissions and includes transportation used to service large homes. This affirms the assumptions from the CGAC and community sentiment that transportation impacts from servicing large homes are misaligned with the County's climate goals and present an opportunity for future policy to mitigate the intensity impacts.

Figure 4: Daily Residential Trips

Daily Residential Trips	Total Daily Trips	Percent of Total Daily Trips
24,988	43,834	57.01%

Source: Kimley Horn

Figure 5: Average Daily Trips By Purpose



Source: Kimley Horn

Key Findings

The analysis shows that large homes have a disproportionate impact on the trips and traffic seen on county roads. While resident trips do not vary dramatically between different size homes, employee trips do. The largest homes generate nearly ten times more employee trips (4.87) compared to smaller homes (0.5). These employee-related trips also tend to be longer on a year-round basis, accounting for an outsized number of VMT relative to their portion of the whole. This pattern supports a broader finding: as homes get larger, they demand more labor, services, and travel - even when unoccupied - and labor travels longer distances than other trip types.

While homes over 5,750 sq ft represent only 14.36% of Unincorporated Pitkin County's housing stock, they account for 19.51% of all daily residential trips and 24.26% of all residential vehicle miles traveled (VMT).²⁶ This supports the notion that large homes in Unincorporated Pitkin County generate an outsized portion of vehicle activity relative to their market share and thus fuel transportation intensity throughout the county.

²⁶ Transportation Intensity Study, Kimley Horn, 2025.

Climate Intensity

Climate intensity is defined as the amount of gas and electric energy used – and greenhouse gases (GHG) - required to operate a home in Unincorporated Pitkin County. It also considers the greenhouse gas emissions generated by vehicle trips required to maintain and service homes of various sizes, which was evaluated in a 2021 study and is not further explored here.²⁷

Metrics/Proxy

Energy Usage Intensity (EUI) measures the carbon dioxide equivalent (eCO₂) of the total energy - electric power and natural gas - annually used to operate a home relative to its size, or square footage (eCO₂/ft²/year).

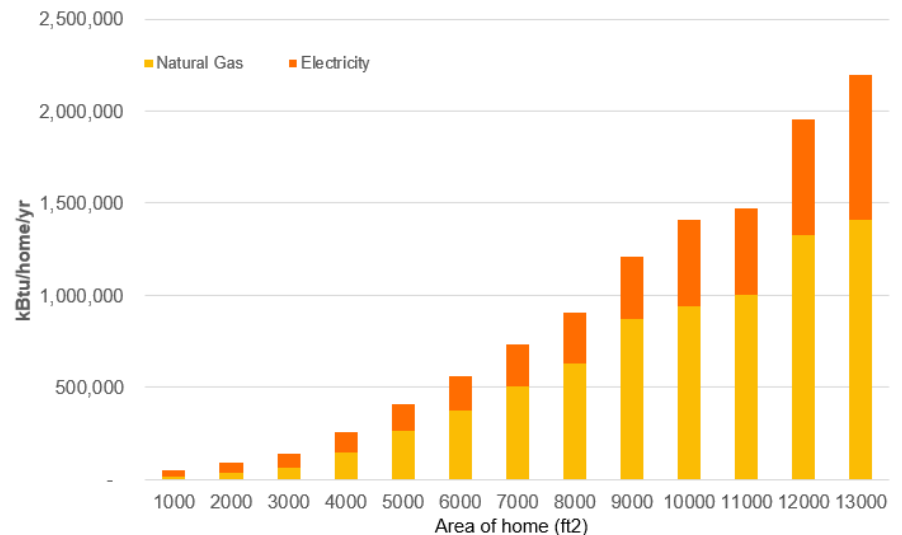
Baseline of Climate Intensity

The County worked closely with Holy Cross Energy and Black Hills Energy to evaluate electric and gas usage data from over 15,000 data points, including 2,274 electric meters over 5 years and 945 gas meters over 4 years. The analysis establishes a positive correlation between annual energy use intensity and home size; as homes in Pitkin County get bigger, their GHG emissions from electric power and natural gas consumption increase.

Key Findings

The analysis shows that larger homes in Pitkin County use more energy, not just because they are larger, but also on a per square foot basis. This indicates that the types of systems and amenities in these larger homes create a near exponential impact on the amount of energy consumed. On average, the total gas and electric energy usage for a 13,000 sq ft home is 41 times more than a 1,000 sq ft home, and a 10,000 sq ft home is 26 times the energy usage.²⁸

Figure 6: Natural Gas and Electric Energy Consumed per home per year



Source: Pitkin County Energy Use Utility Data Analysis, Resource Engineering Group (REG), 2025

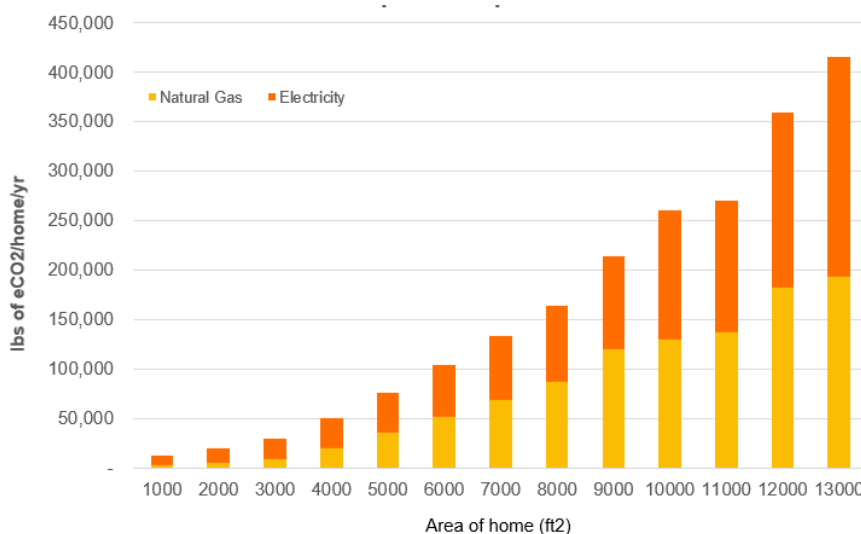
²⁷ Construction, Home Management, and Operational Emissions, Lotus Engineering, 2021
<https://storymaps.arcgis.com/collections/bab0c4c3db524fd4937405d4f2b6d0d4?item=2>

²⁸ A 1,000 sq ft home is estimated to use a total of 53,044 kBtu/home/year and a 13,000 sq ft home is estimated to use 2.199 Million kBtu/home/year

The higher EUI of large homes is likely driven by “amenity loads” - i.e., energy using amenities not seen in the average American household. Examples include humidification, intensive AV and IT systems, wine storage, extensive air filtration and lighting systems, indoor and outdoor spas and pools, snowmelt systems and outdoor fireplaces and heaters. This is further supported by Pitkin County’s Renewable Energy Mitigation Program (REMP) data showing a dramatic increase in use of snowmelt, spas, outdoor pools and heat tape in larger homes. Thus, limiting home size without accounting for amenity load may not fully address the energy intensity of large homes.

Greenhouse Gas emissions (GHG) can also be understood on a per-home and per- square footage basis. Again, larger homes have an outsized impact. On a per year basis, a 13,000 sq ft home has 33 times higher GHG impact per year than a 1,000 sq ft home.²⁹ Similarly, on a per square foot basis, the 13,000 sq ft home has 4.7 times higher GHG impact than a 1,000 sq ft home. Additionally, on a per sq ft basis, larger homes use a higher percentage of natural gas.

Figure 7: GHG Generated per home per year



Source: Pitkin County Energy Use Utility Data Analysis, Resource Engineering Group (REG), 2025

These results occur despite increasing home energy efficiencies, residential solar deployment and a cleaner grid serving Pitkin County and suggest the need to address amenity loads as homes increase in size.

According to the 2024 Pitkin County GHG Inventory, average emissions per home in 2023 were greater for Unincorporated Pitkin County than average emissions per home for the county as a whole (including incorporated cities and towns and unincorporated areas). Whereas the average home in Unincorporated Pitkin County

²⁹ For the analysis the eCO₂ for *electricity* is 0.2804 lbs of eCO₂/kBtu for the current utility grid mix, and 0.1371 lbs of eCO₂/kBtu for natural gas. The Holy Cross Energy data seeks to incorporate “up stream” effects of energy production, but Black Hills Energy does not, indicating that the actual GHG impacts from the natural gas is likely much higher than their reporting. Refer to the full REG Climate Intensity Report for more details. Climate Intensity White Paper, REG, 2025

generated an average of 24.1 mtCO₂e per home per year, the average home in Pitkin County generated 14.3 mtCO₂e per home per year. For comparison, the average US home generates about 7.1 mtCO₂e per year ([EPA](#)). This suggests that homes in Unincorporated Pitkin County are more carbon intensive, accounting for a disproportionate amount of emissions relative to its housing stock. Unincorporated Pitkin County contains about 26.4% of all housing units in the county while generating 44.6% of residential building emissions.

Key Takeaways

By defining and quantifying various aspects of intensity in Unincorporated Pitkin County, this work has provided the technical backing to affirm qualitative assumptions in the CGAC report. The findings demonstrate that intensity is a real and measurable phenomenon. They also bring to light the regional nature of intensity and the opportunity to collaborate with regional partners on a shared and scalable approach.

- As homes get larger they generate a level of economic, transportation and climate intensity that is disproportionate relative to their number in Unincorporated Pitkin County. This phenomenon is unique from growth, suggesting that both growth and intensity be considered when developing future programmatic, policy and code updates.
- Intensities grow at different rates relative to home size. For example, whereas construction jobs generated by new construction grow linearly, employee-based transportation intensity increases exponentially with home size. These different relationships help identify areas where County tools may be most effective in addressing the different impacts.
- As intensity generated by large homes has shifted to the County's rural areas, this activity misaligns with county infrastructure (roads, resources, etc.) intended to serve areas of greater density and fuels a discussion around where intensity is desired.
- As workers constructing and servicing large homes are increasingly traveling further distances to job sites in Unincorporated Pitkin County, this raises questions about a balanced economy and the need for more affordable and equitable housing in areas closer to jobs.

Conclusion

Recognizing that intensity is real and measurable, the next step is to determine how best to manage and reduce it through thoughtful policies, codes, and programs that align with our community's values and success measures. This means asking important questions: Where is greater intensity appropriate, and where should it be limited to protect rural areas? How can we balance the economic, environmental, and social impacts of intensity, especially given that the majority of our workforce lives outside the County and some commute long distances? Could expanding affordable housing options within the County help reduce transportation, climate and economic intensity and support a more balanced local economy? What strategies, beyond mitigation fees, can address the clear link between home size and impacts on climate, economy, and transportation?

The answers to these and other questions will continue to shape the Vision 2050 effort, guiding the Comprehensive Plan update and future changes to land use codes. While Pitkin County has already taken meaningful steps, such as setting limits on house size and adopting more rigorous building and energy codes, these actions are only the beginning. Their full impacts are yet to be seen, and continued policy work will be essential to manage intensity in ways that support long-term community resilience, sustainability, and quality of life.