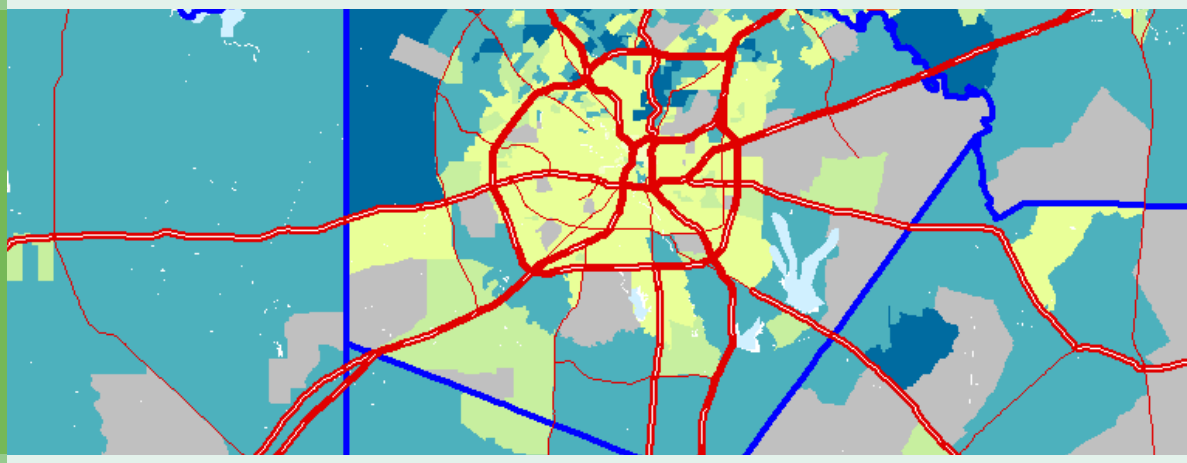
Housing + Transportation Affordability In the San Antonio Metropolitan Region

Prepared by the Center for Neighborhood Technology



December 2008

CNT

TABLE OF CONTENTS

List of Tables

List of Figures

INTRODUCTION

Summary

As San Antonio continues to grow, it has the opportunity to develop in such a way that residents can reduce the environmental impacts of travel, while also reducing household transportation costs. This report provides information on the combined housing and transportation (H+T) costs in the San Antonio metro area, demonstrating that these two household expenses are closely linked. In San Antonio, combined housing and transportation costs are higher away from the city center. While housing developments on the urban fringe take advantage of low land costs, transportation infrastructure makes car ownership a necessity. In contrast, both housing and transportation costs are lower in the compact neighborhoods closer to downtown, where residents can more easily get to jobs, shopping and amenities by transit and walking.

For years, real estate market pricing has incorporated the value of land into the price of a home—based on its location and proximity to jobs and amenities—but there is less clarity about the effect of accompanying transportation costs associated with an efficient or inefficient location on these values. In many places where single-family homes are more "affordable," or offer "more house for your money," usually in outlying areas, costs are lower in part because land is cheaper. However, the transportation costs can be much higher and can often outweigh the savings on housing costs.[1] In order to provide a better picture of affordability in the San Antonio metro area, a measure that models the full costs of transportation and combines it with the cost of housing is utilized. This tool is called the Housing + Transportation Affordability Index.[2]

The San Antonio metropolitan statistical area (MSA) average median income was $42,062 and the average household size was 2.78 members according to the 2000 US Census.[3] Given this income, housing in San Antonio is broadly affordable when measured using a widely accepted standard of affordability of 30% or less of household income.

In contrast to the relative affordability of housing, San Antonio residents are largely overburdened by transportation costs. In the San Antonio region, household transportation costs range from as little as $376 per month to as much as $1,000 or more per month.[4] As a percent of income, households in most areas of San Antonio spend more than 20% of their income on transportation. This cost actually reaches a high of nearly 33% of the area median income, making it a greater burden than housing in some areas.

Because housing and transportation costs both vary so greatly by location, and often in conflicting directions, considering the two costs jointly is key in measuring and understanding the affordability of a location. The H+T maps in this report show that H+T together can range from less than 30% in the central city to more then 80% in outlying areas for the household earning the area median income. This indicates that there are many areas, particularly those areas outside of the city limits, where the average households become quite overburdened by combined housing and transportation costs.

High housing and transportation costs have a direct effect on individual household budgets. They restrict the opportunity to save and to build assets. And, since high H+T is heavily correlated with high rates of car ownership, families often find themselves investing in automobiles that depreciate rapidly, rather than in investments that build wealth, like homeownership, savings, or education.[5]

Low combined housing and transportation costs in San Antonio correspond to specific neighborhood characteristics: they are more compact (with more households per acre) and tend to have a range of stores and amenities in close proximity. Many of these communities with low combined H+T values are walkable neighborhoods with access to scheduled mass transit provided by VIA. Low H+T scores and expanded mobility options are closely related.
As San Antonio plans for the future, maintaining low housing and transportation costs could be a strategic objective.[6] This can be accomplished planning compact mixed use development with access to transit, which encourages and supports vital neighborhoods. Expanding public transportation options and increasing ridership is also essential, by increasing scheduled service on both VIA bus routes and new fixed guideway service such as light rail, streetcar, electric trolley bus or commuter rail. New options such as car sharing,[7] van pooling and other demand-responsive services, can also increase options for residents.

San Antonio Mobility Assets

The design of San Antonio's street network and land use encourages a dependence on the auto throughout the city and metro area. According to the 2000 US Census, in the overall metro area, 93.5% of workers commute to work by auto (see Figure 1), 2.8% use public transit and 2.4% walk. San Antonio metro households own an average of 1.68 automobiles per household (see Figure 2), slightly higher than the 1.62 average calculated from major US metropolitan areas.[8] In the city of San Antonio, this mode breakdown is similar, where 92.8% commute via auto, nearly 4% of workers commute via public transit, and 2.2% walk. Within the city, households also own slightly fewer automobiles, averaging 1.58 per household. While very few workers choose modes of transportation other than by automobile, it is important to note that 16% of metro area residents and 17% of city residents who commute using an automobile, did so in a carpool. This suggests a willingness and an interest on the part of residents to look for an alternative to a single occupancy vehicle commute, whether for reasons of economics or convenience.

While these figures represent averages for the city as a whole, there is great variation within the city. Figure 3 shows the percent of workers (who do not work at home), that commute to work in an automobile, averaged by Census block groups. As previously mentioned, in the city, nearly 93% opt for this mode choice. However, Figure 3 shows that in the center city, this percentage is below 50% in some areas, and in the outer fringe of the city, this percent rises to over 95% in many areas. This variation is also directly reflected in the average number of automobiles households own (see Figure 4). In the center of downtown, households on average, own less than one automobile. In the neighborhoods on the outer edges of the city, this number again rises, in places to over two autos per household.

One factor that impacts mode choice and auto ownership is the level of transit available. In the H+T Index, a measure of transit service was developed call the Transit Connectivity Index (TCI). Transit service levels for the purposes of the TCI are based on access and intensity of transit service in a given census block group. Access is captured by a quarter mile buffer around each bus route, and intensity is based on the number of weekly bus route trips that serve the census block. For a given census block group, the index accounts for the percentage of land area within walking access to a bus route and the number of bus lines. However, it is important to note that TCI is not descriptive or a literal definition of service, but rather a calculated prediction of transit service levels. Figure 5 shows the results of the TCI application within the San Antonio area (all metro area outside of this view has a TCI of 0-1). Not surprisingly, the highest level of bus service runs through the downtown core and follows major arterials from the core, areas where auto ownership and the percent of people driving to work are both the lowest.

Maintaining current and encouraging more transportation options will be critical as gasoline prices continue to fluctuate. Figure 6 shows the gasoline expenditures in 2000 based on an average gasoline price of $1.52/gallon. Figure 7, factoring in all of the same assumptions for driving patterns, shows how these expenditures change simply based on in increase in fuel prices. This map shows annual expenditures based on a gasoline price of $3.96/gallon, a price frequently reached and even surpassed in 2008. While the drastic change between these two views is apparent, Figure 8 shows the dollar value of the actual change in average annual gasoline expenditures.

Noting the geographic trends in these changes in gasoline expenditures is significant because it indicates a level of exposure or vulnerability to fluctuations in gas prices. As stated, these two comparative maps maintain all of the same assumptions for driving patterns; only gas prices were changed. Therefore, areas exhibiting the greatest changes can be interpreted as the most vulnerable to fluctuating prices.

Because all driving pattern assumptions were held constant between the two years, it is important to note that the same numbers of average annual household vehicle miles traveled (VMT) were used in both scenarios (see Figure 9). Therefore, the areas exhibiting the highest VMT values are the areas that experience the greatest exposure to changing fuel prices and the most significant changes in gas expenditures.

One factor that impacts VMT, and therefore also influences gas expenditures, is the quantity of and access to jobs. Figure 10 shows job density, calculated using an employment gravity index model which factors the total number of jobs as well as their proximity to any given block group (for full description of the gravity model, see Appendix). All areas outside of the displayed view have a job density in the Low range, with the exception of a small area of Low - Moderate job density in New Braunfels. This figure also shows employment clusters as defined as areas having both a high job density as well as a high total number of jobs. This map shows that job density seems to have an inverse relationship with VMT, indicating that the greater the job density, the lower household VMT will likely be. These values, as with VMT, remained constant between the two comparative maps showing gasoline expenditures. Therefore, the areas with the lowest job density appear to have the greatest exposure to fluctuating gasoline prices.

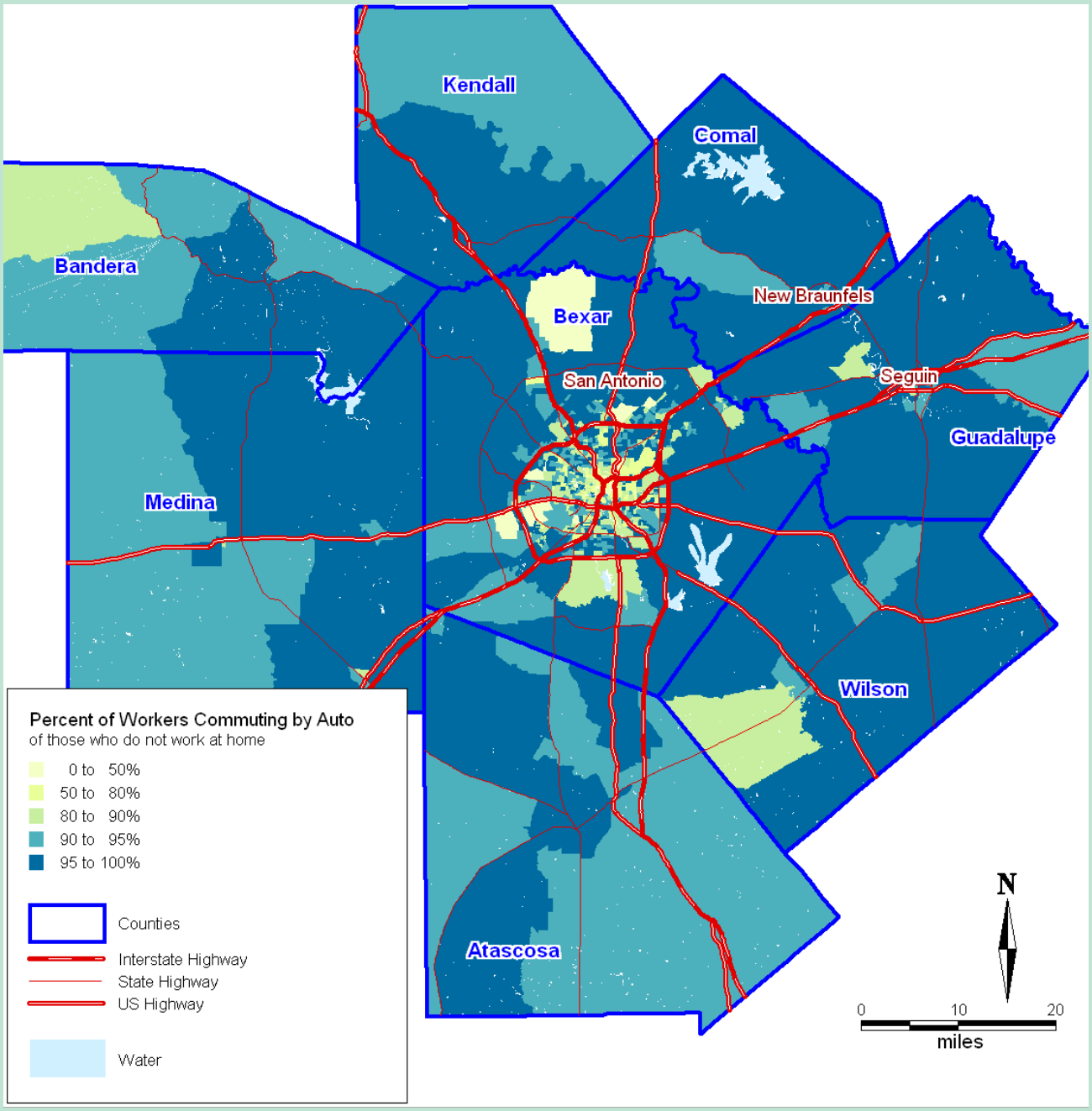


Figure 1: Percent of Workers Commuting by Automobile

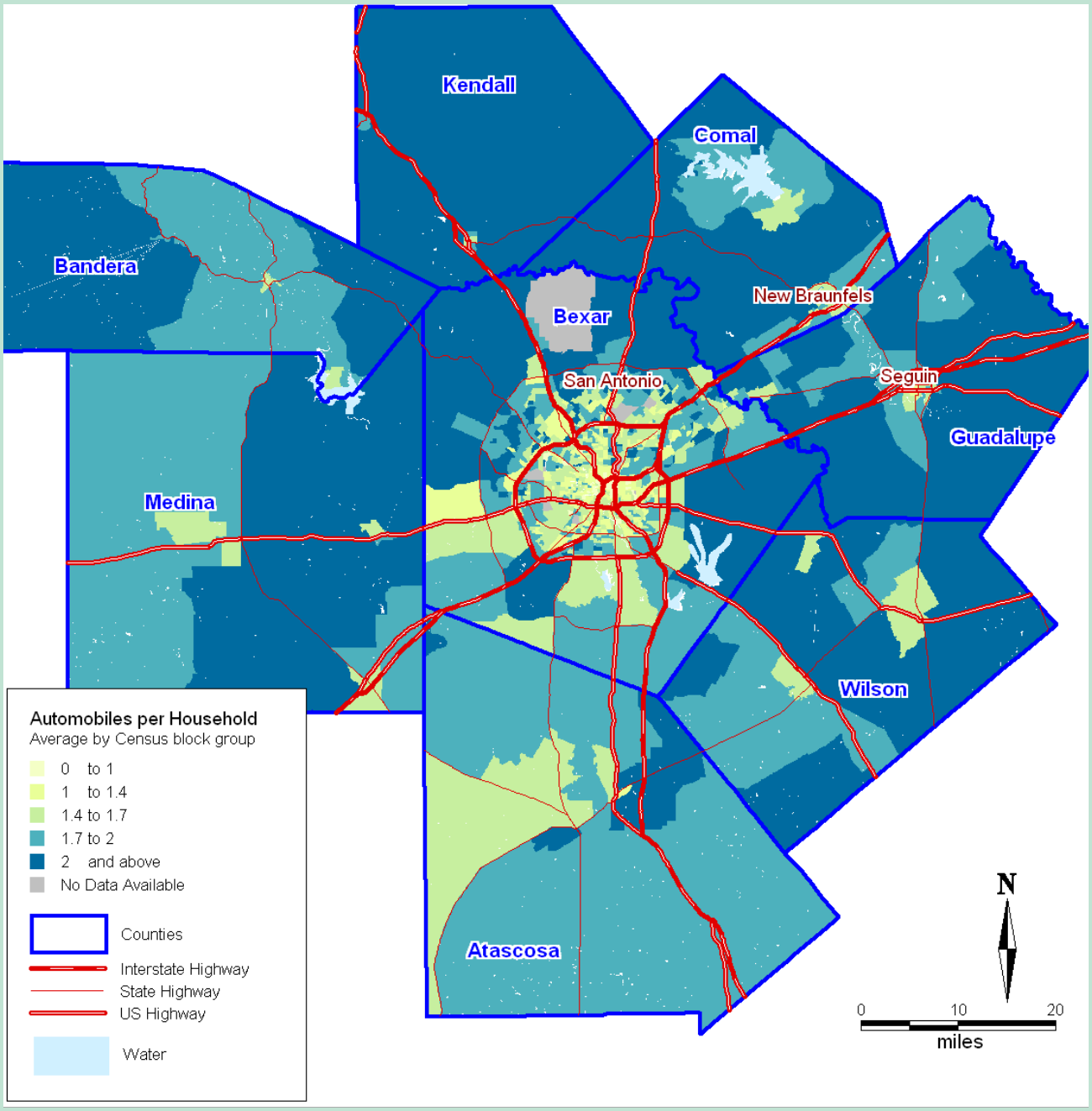


Figure 2: Average Automobiles per Household

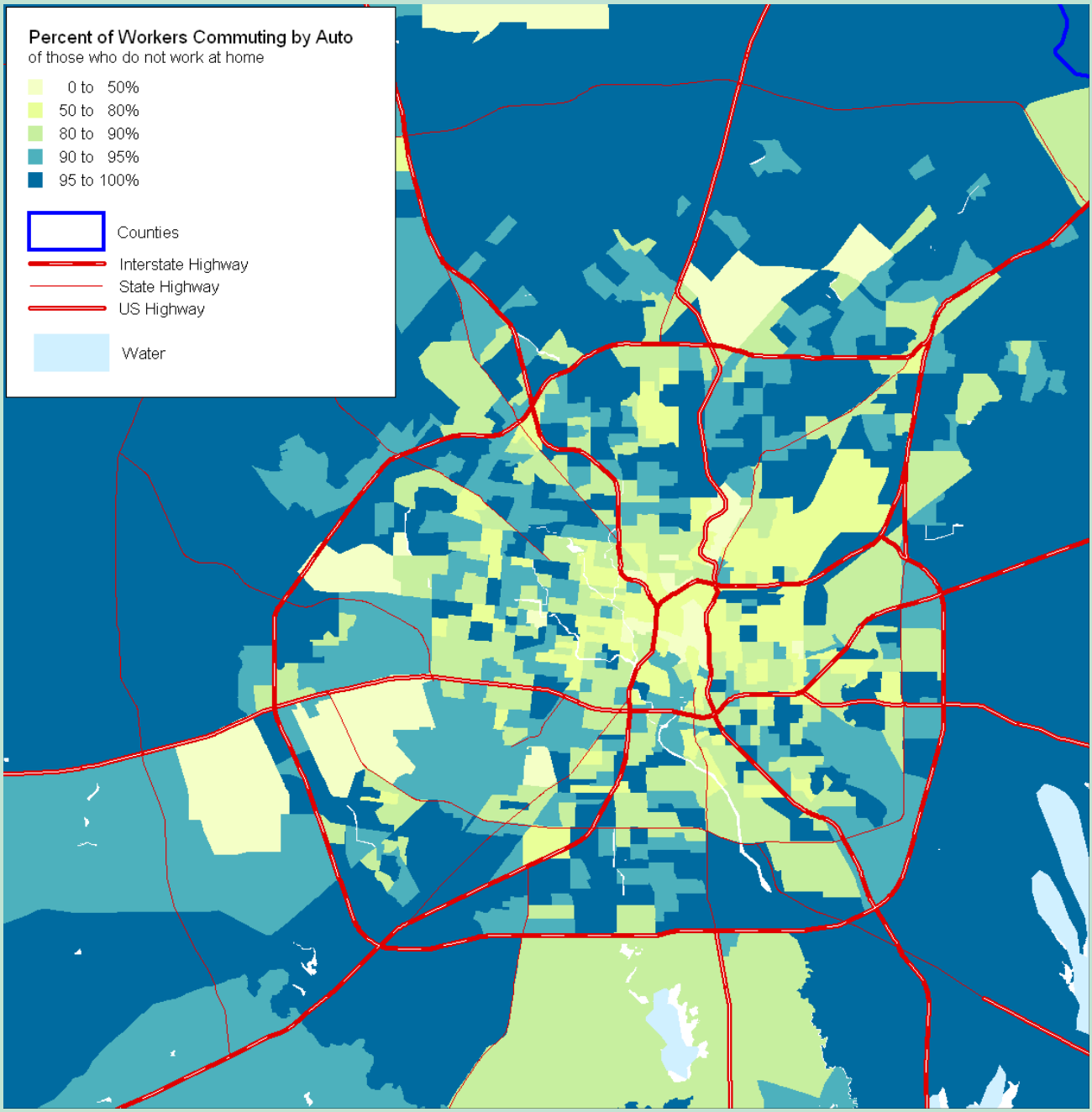


Figure 3: Percent of Workers Commuting by Automobile

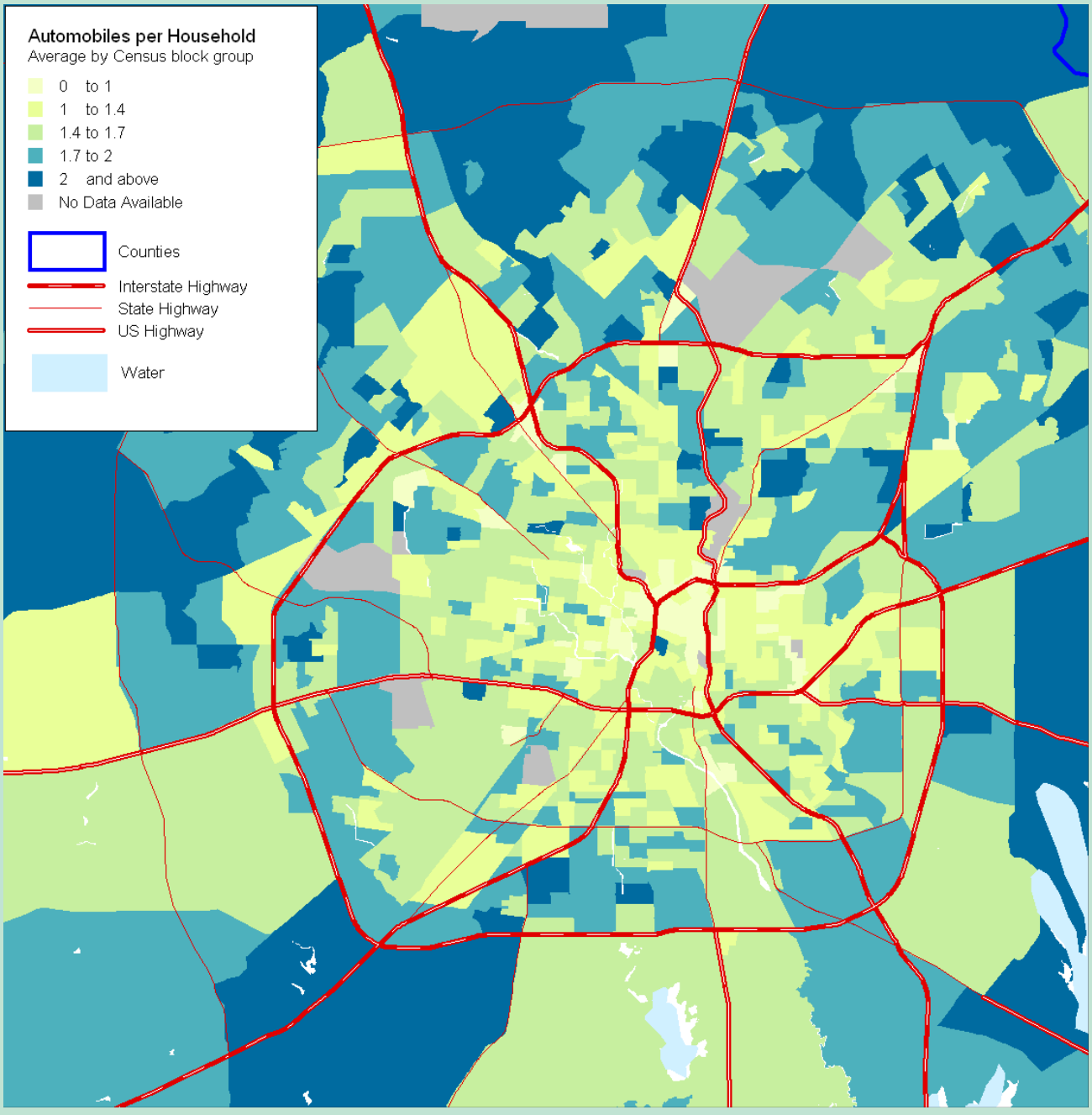


Figure 4: Average Automobiles per Household

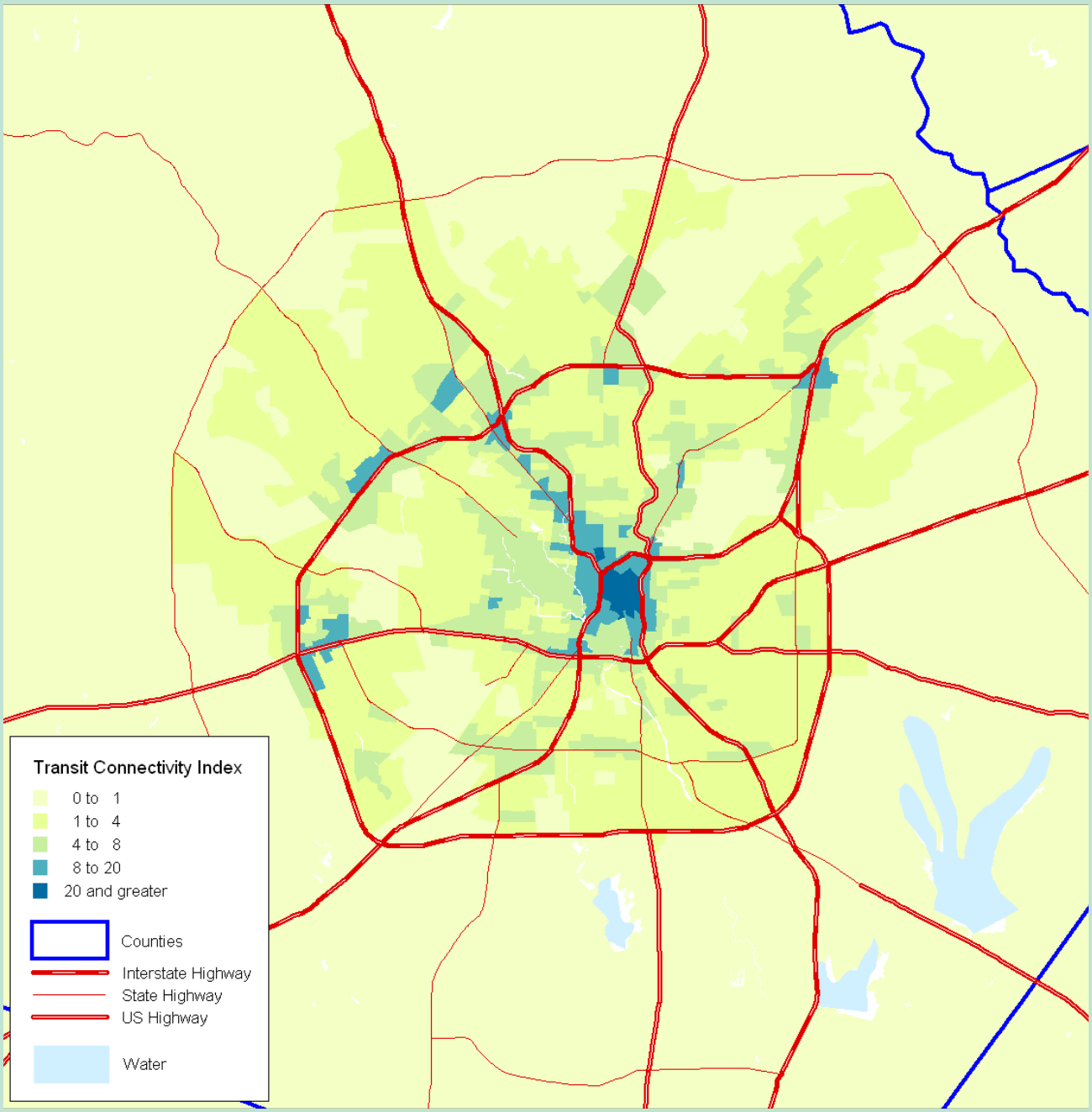


Figure 5: Transit Connectivity Index

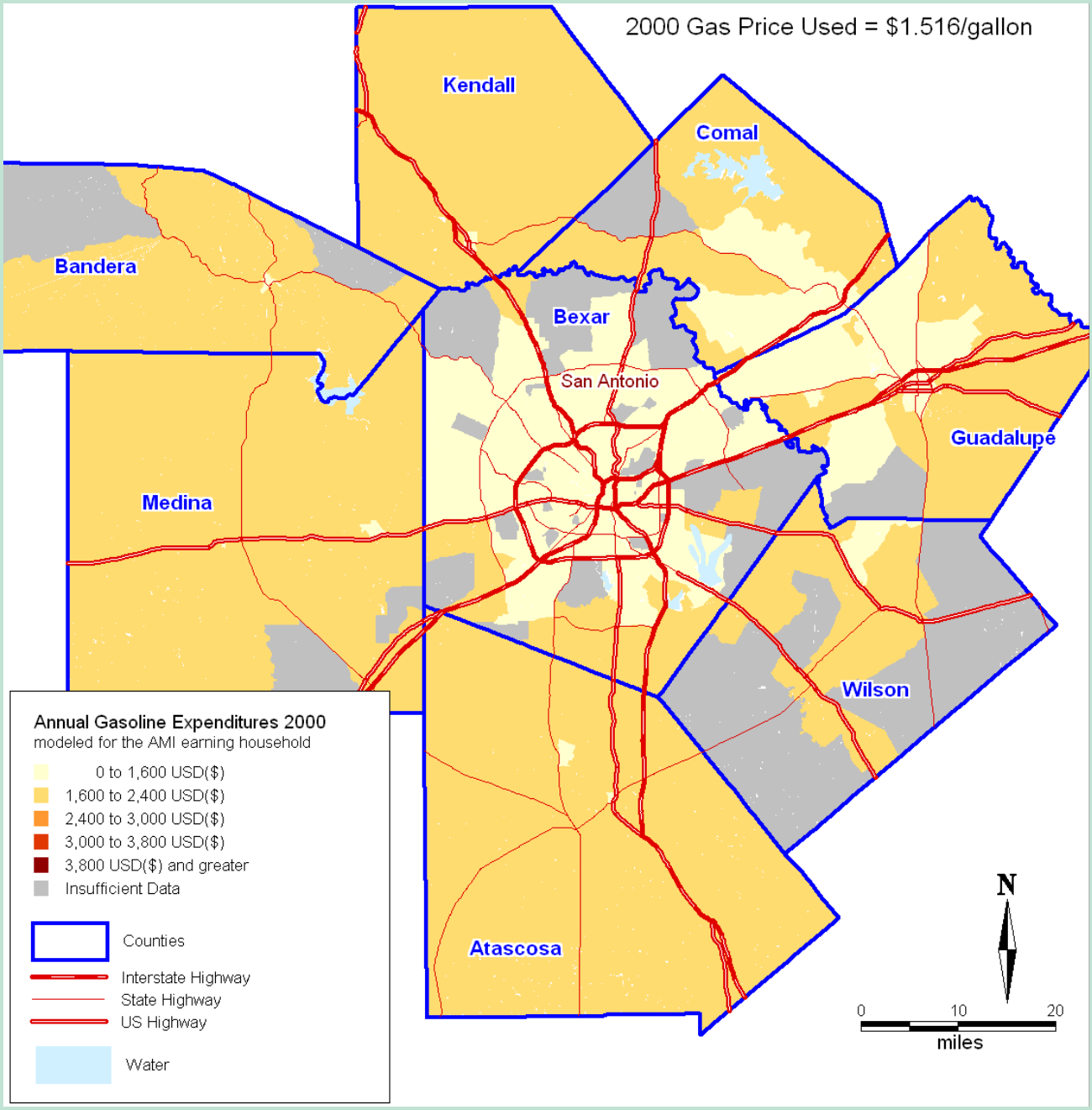


Figure 6: Annual Gasoline Expenditures Based on a 2000 Gas Price

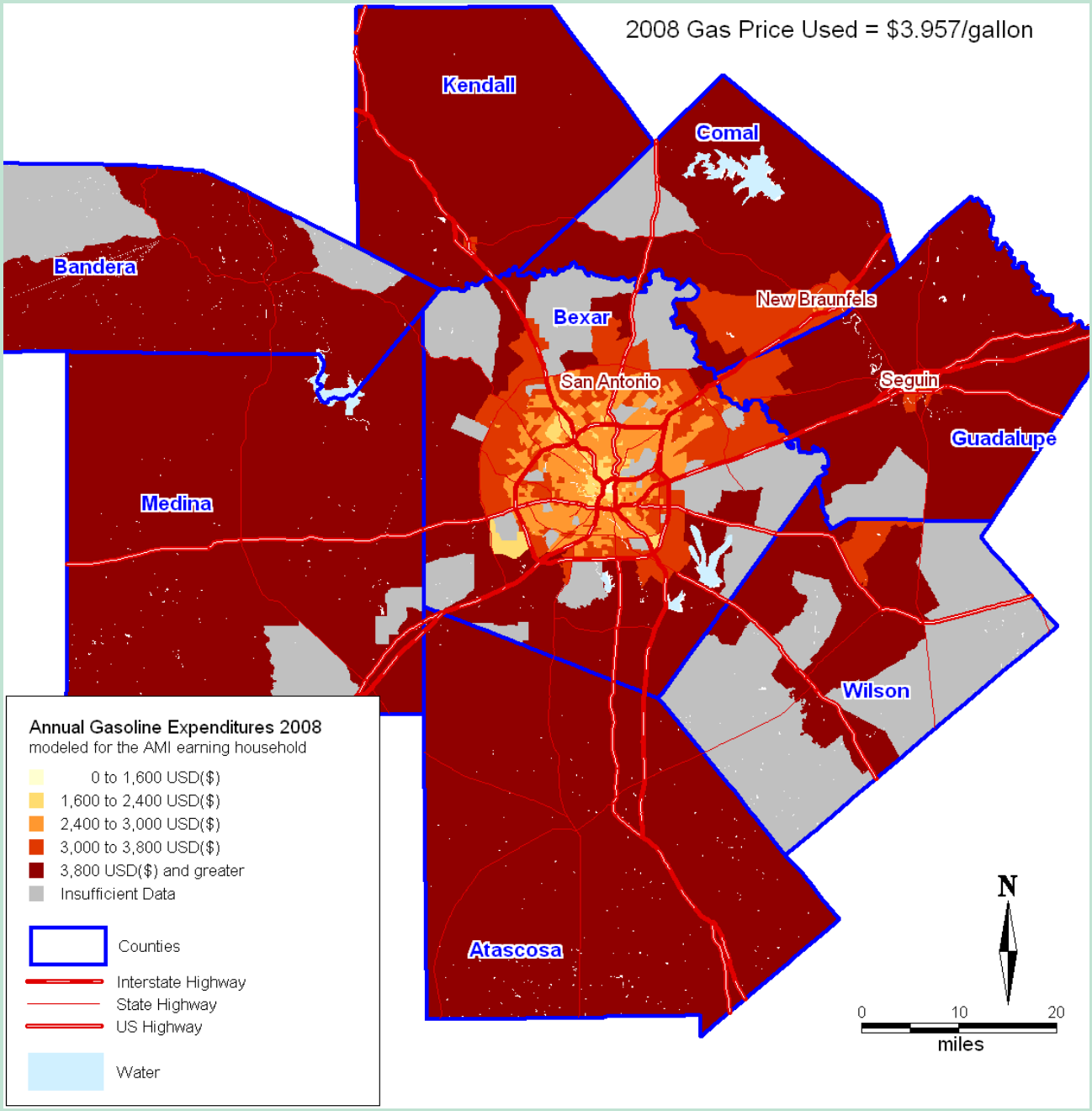


Figure 7: Annual Gasoline Expenditures Based on a 2008 Gas Price

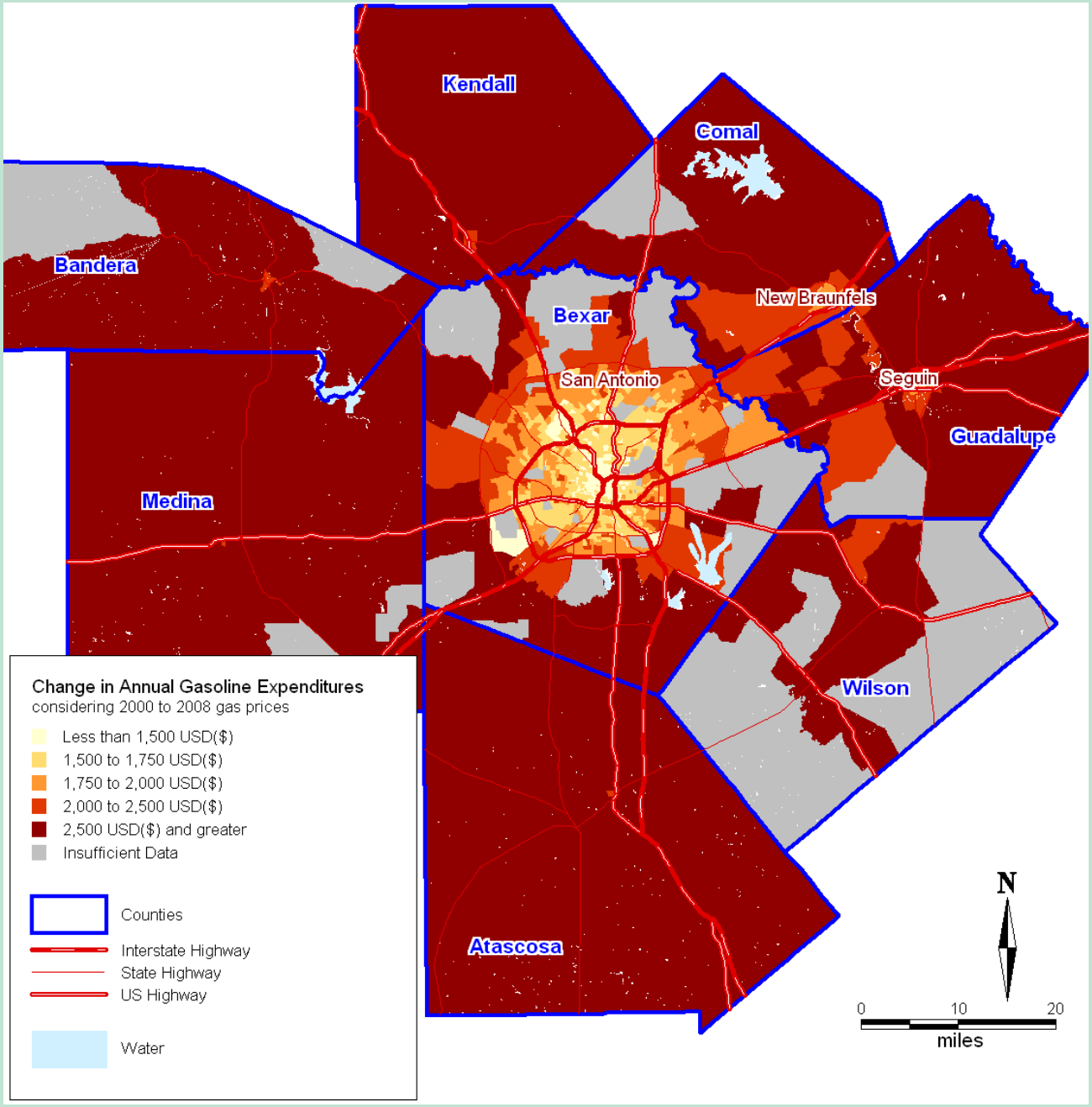


Figure 8: Change in Gasoline Expenditures Considering 2000 Price to 2008 Price

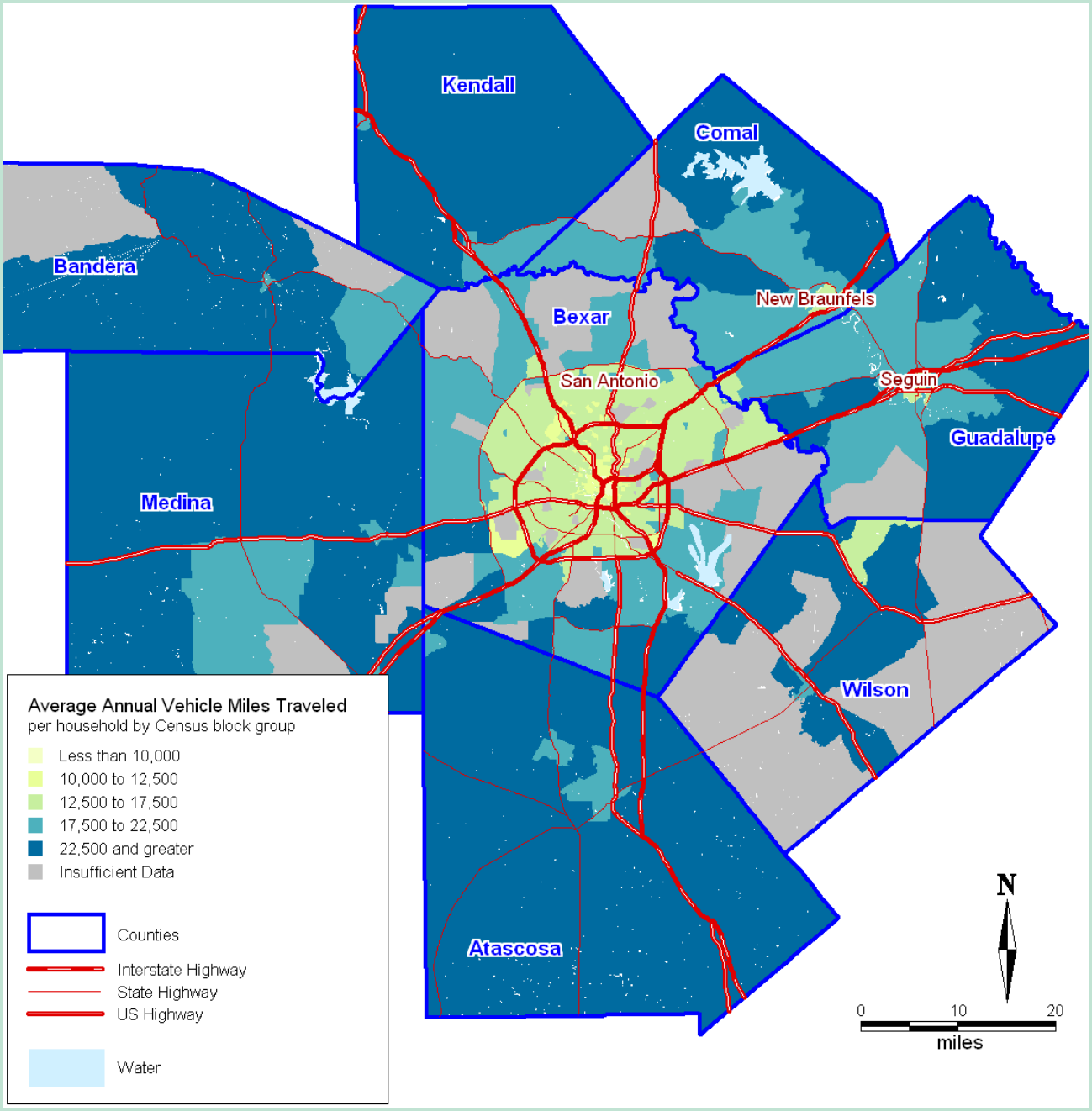


Figure 9: Annual Household Vehicle Miles Traveled

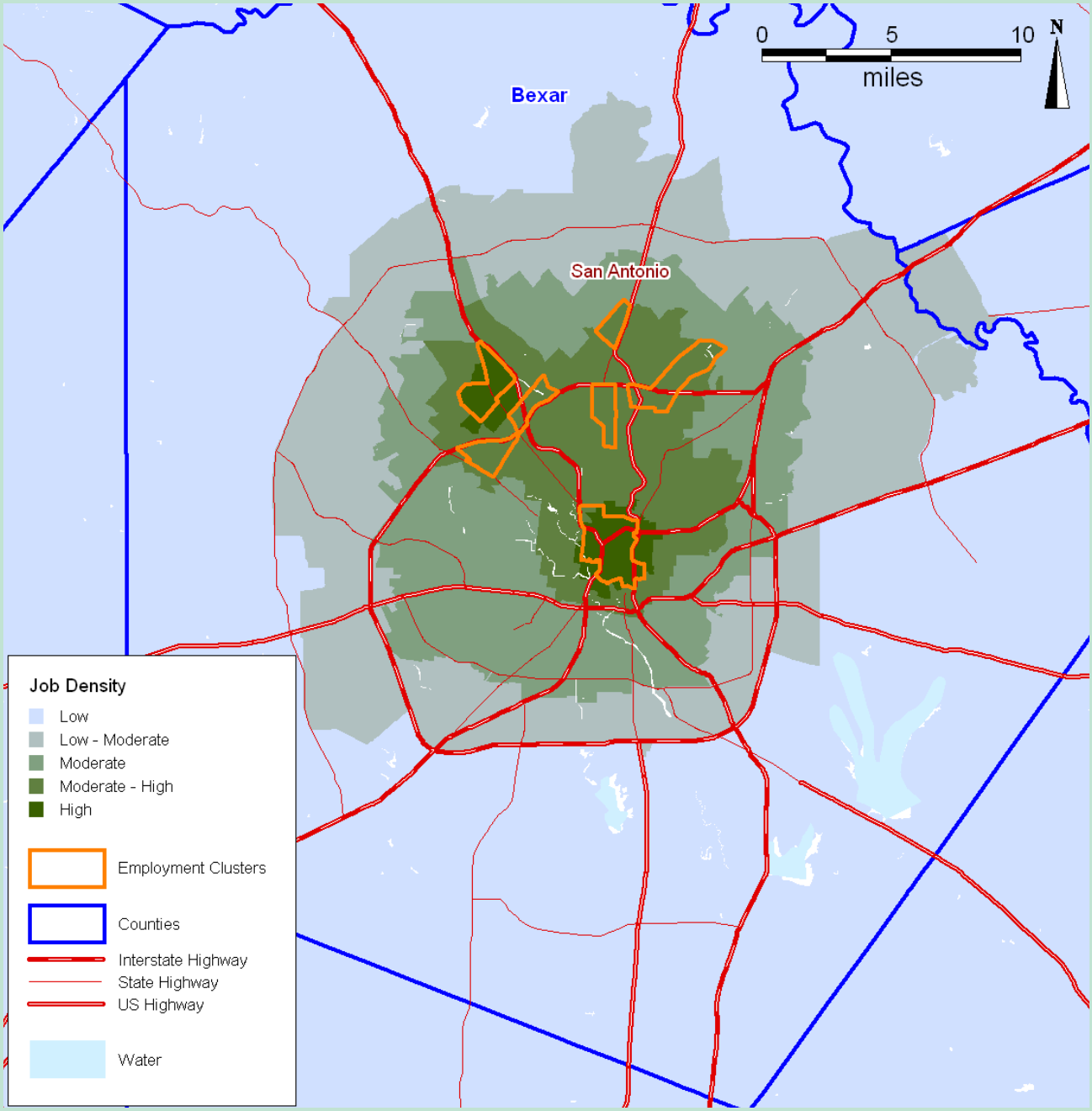


Figure 10: Job Density and Employment Clusters

Housing and Transportation Affordability: A New Understanding

For years, real estate market pricing has incorporated the value of land into the price of a home—based on its location and proximity to jobs and amenities— but there is less clarity about the effect of accompanying transportation costs associated with an efficient or inefficient location on these values. In most cases, the very same features that make the land and home more attractive, and likely more valuable per square foot, also decrease transportation costs. Being close to jobs and commuter transit options reduces the expenses associated with daily commuting; this is a cornerstone of transit-oriented development (TOD). In fact, being within walking distance of a downtown or neighborhood shopping district allows a household to replace some of the typical daily auto trips with one or more walking trips, and may even allow a family to get by with one less automobile.

By contrast, in many places where single-family homes are more "affordable," or offer "more house for your money," usually in outlying areas, costs are lower in part because land is cheaper. However, the transportation costs can be much higher and can often outweigh the savings on housing costs. In many of these areas where households "drive to qualify" for affordable housing, transportation costs can exceed 32%, creating a greater burden than housing. Conversely, for some communities where households benefit from less automobile dependency, transportation can represent as little as 10% of median household income.[9]

In order to provide a better picture of affordability in the San Antonio metro area, a measure that models the full costs of transportation and combines it with the cost of housing is utilized. This tool is called the Housing + Transportation Affordability Index (the "H+T Index" or the "Index") (see Appendix for Methodology). The Index is reported here as the percentage of household median income consumed by Housing Costs (H) plus Transportation Costs (T), as shown in the formula below (see Figure 11). For example, for a particular census block group, the Index may be 45% for a median household income, where 30% of income is spent for housing and 15% of income for transportation.

Housing and transportation costs considered together, as in this index, are a useful measure of the relative affordability of different locations in the San Antonio region. Based on comparisons of 53 metro areas studied, ranging from large cities with extensive transit (such as the New York metro area) to small metros with extremely limited transit options (such as Fort Wayne, IN), 18% of area median income being consumed by transportation has been selected as an attainable standard for transportation costs. All metro areas considered, to varying extents, exhibit areas where the level of 18% has currently been reached. Therefore, taking this level of 18% and combining it with the standard of 30% or less of income consumed by housing, creates a benchmark of affordability defined as spending no more than 48% of the median income on housing and transportation combined.

Figure 11: Affordability Index Formula

$$\text{Affordability Index} = \frac{\text{Housing Costs} + \text{Transportation Costs}^*}{\text{Income}}$$

*Transportation Costs include the modeled cost of Auto Ownership, Auto Use, and Transit Use

Applying the H+T Affordability Index to San Antonio

Using the factors described above, the Affordability Index was calculated for the San Antonio metro area by Census block group. As described above, the formula for the Index is simple: housing plus transportation divided by income equals the true cost of where one chooses to live.

Transportation

Figure 12 shows the monthly transportation costs, modeled for a household making the area median income (AMI) of $42,062, by census block group in the San Antonio metro area. There are clear differences in the transportation costs between downtown San Antonio and the suburban-style development around the city border and the more dispersed areas in the counties surrounding Bexar County. Not surprisingly, absolute transportation costs are lowest in the transit service area. They are lowest in the San Antonio central city, generally under $800 per month. They are particularly low in the Downtown neighborhood where households can spend as little as $376 per month on transportation. These lower transportation costs are due to higher densities, where access to amenities and employment centers is plentiful. Transportation costs climb to more than $1000 per month on the outskirts of Bexar County and in much of the surrounding counties. This is partly a function of lower density and the absence of other key elements that contribute to lower transportation costs within San Antonio's downtown core, resulting in higher auto ownership rates and a need to travel greater distances for everyday needs.

Figure 13 shows the same modeled monthly transportation costs, this time as a percent of the area median income by census block group. Household transportation burdens in metro San Antonio are striking. There are very few places where households spend 18% or less of the AMI on transportation, and these areas are primarily downtown. In any other part of the metro area, the average household can expect to spend at least 20% of their income on transportation, and upwards of 32% in the farthest reaching areas of the metro.

Figure 14 shows an even more striking view – transportation costs as a percent of 80% of the area median income ($33,650). This view is significant because this is the transportation burden closest representing what working households can expect in the San Antonio area. Here, the areas where households can anticipate spending more than 18% of their income on transportation cover the entire metro area with the exception of three block groups right downtown. This indicates that a large majority of households making less than the area median income (and even many making AMI) will be significantly overburdened by the cost of transportation in the San Antonio metro area.

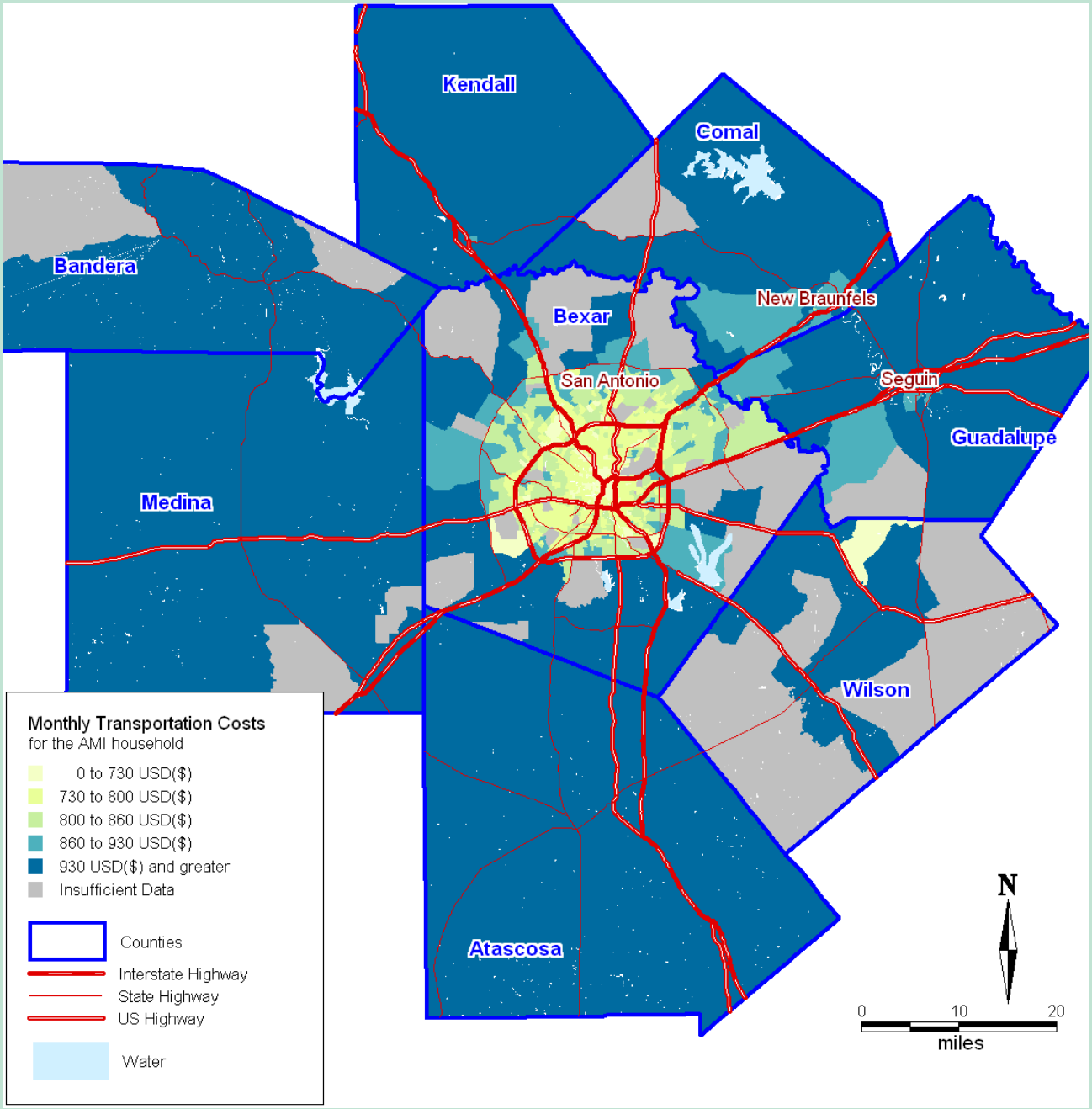


Figure 12: Monthly Transportation Costs

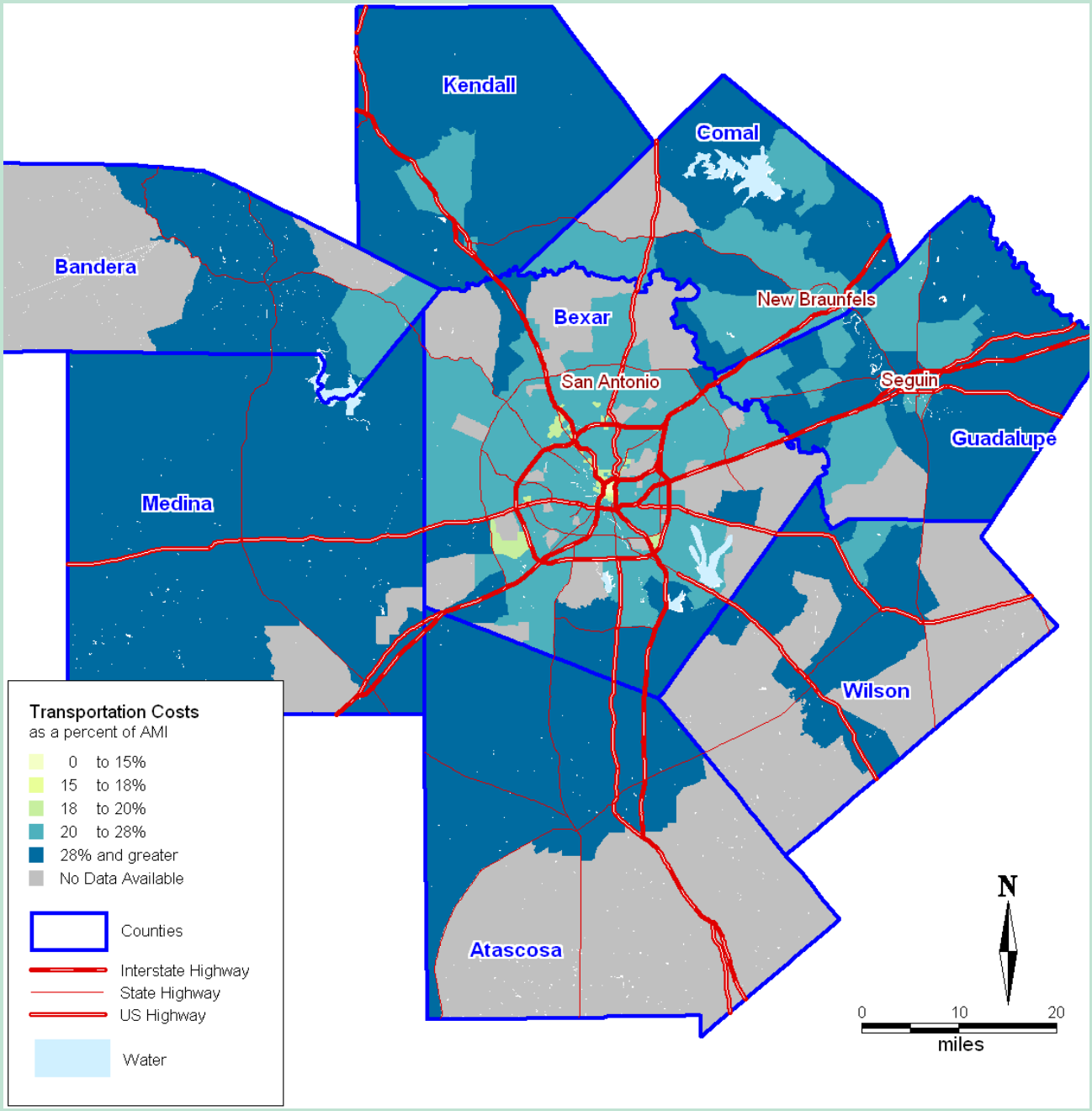


Figure 13: Monthly Transportation Costs as a Percent of AMI

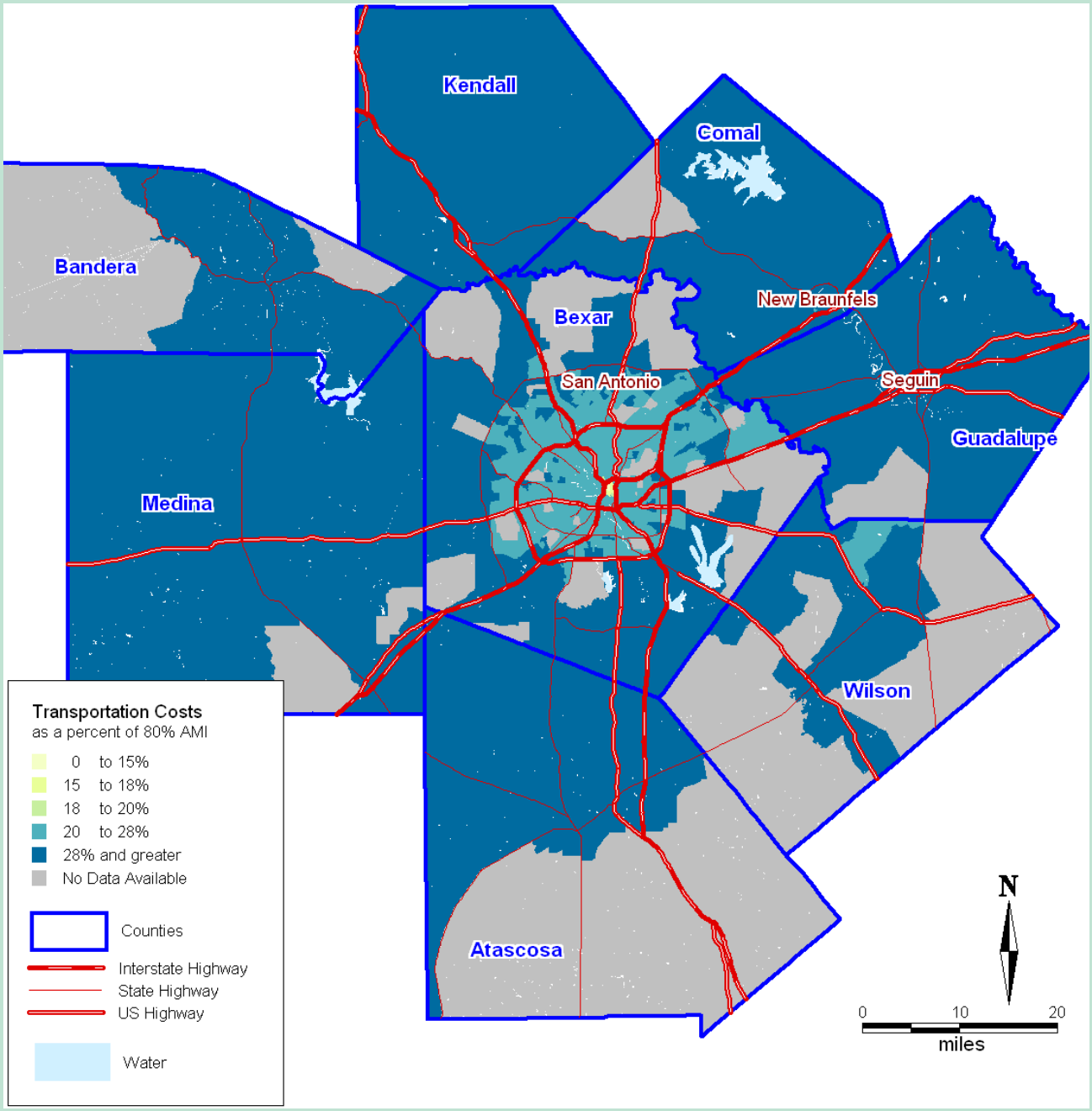


Figure 14: Monthly Transportation Costs as a Percent of 80% AMI

Housing

Housing is significantly more affordable than transportation in metro San Antonio. Figure 15 shows that housing costs are significantly less in the downtown and central neighborhoods than around the city border and outlying neighborhoods. Exurban areas in Atascosa and Medina counties also have low housing costs. Figure 16 shows that the AMI earning household pays less than the national standard of 30% of their income on housing in a large portion of the metro area. To the north of downtown San Antonio, especially moving up into Comal and Kendall Counties, housing costs do become slightly out of reach for the average earning household, but overall, the metro area is still largely affordable in terms of housing alone for families earning the AMI. Households earning 80% of the AMI face greater housing burdens. The map in Figure 17 indicates that these households can choose from a much smaller area where they can limit housing costs to 30% or less of their income.

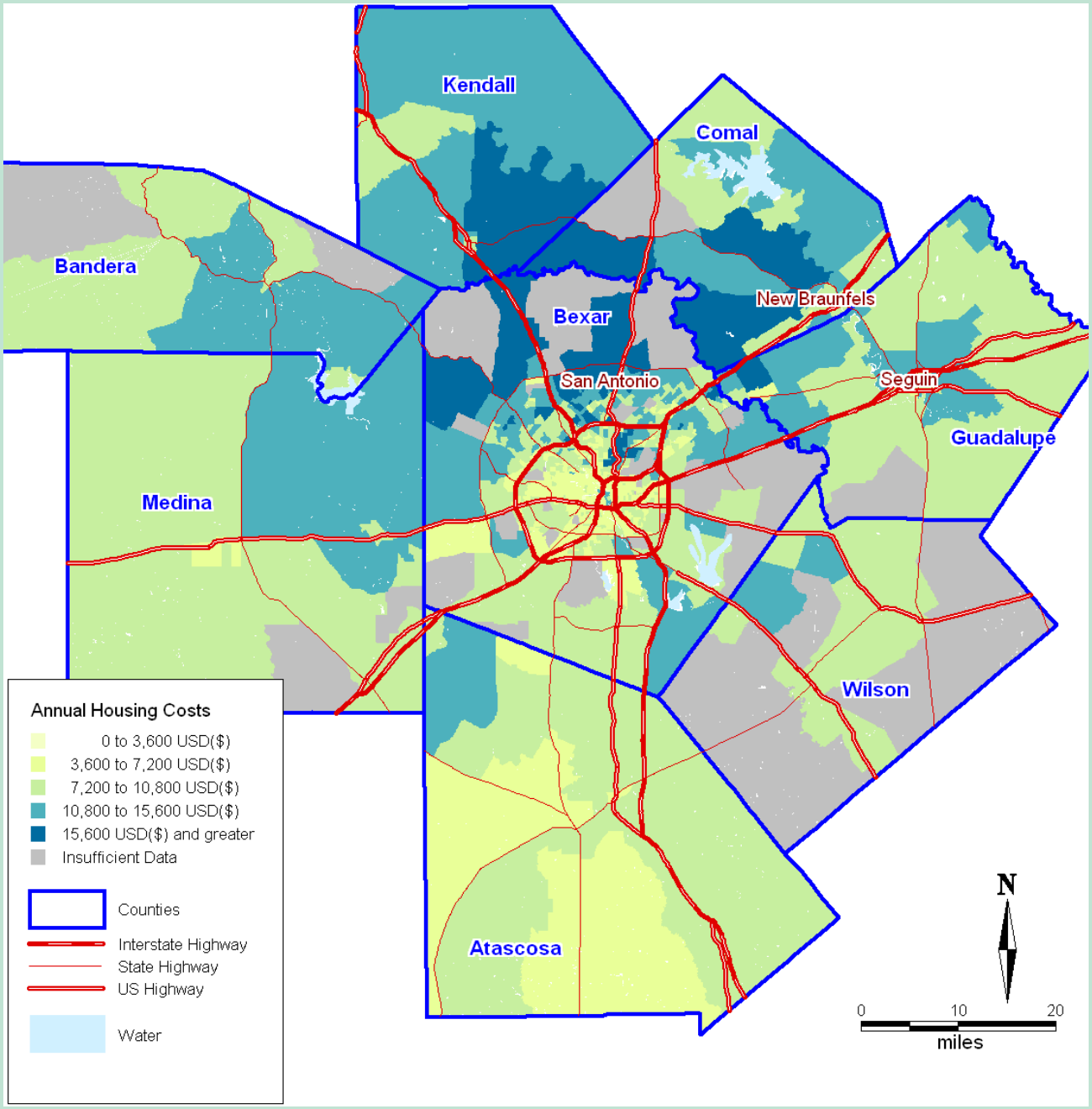


Figure 15: Annual Housing Costs

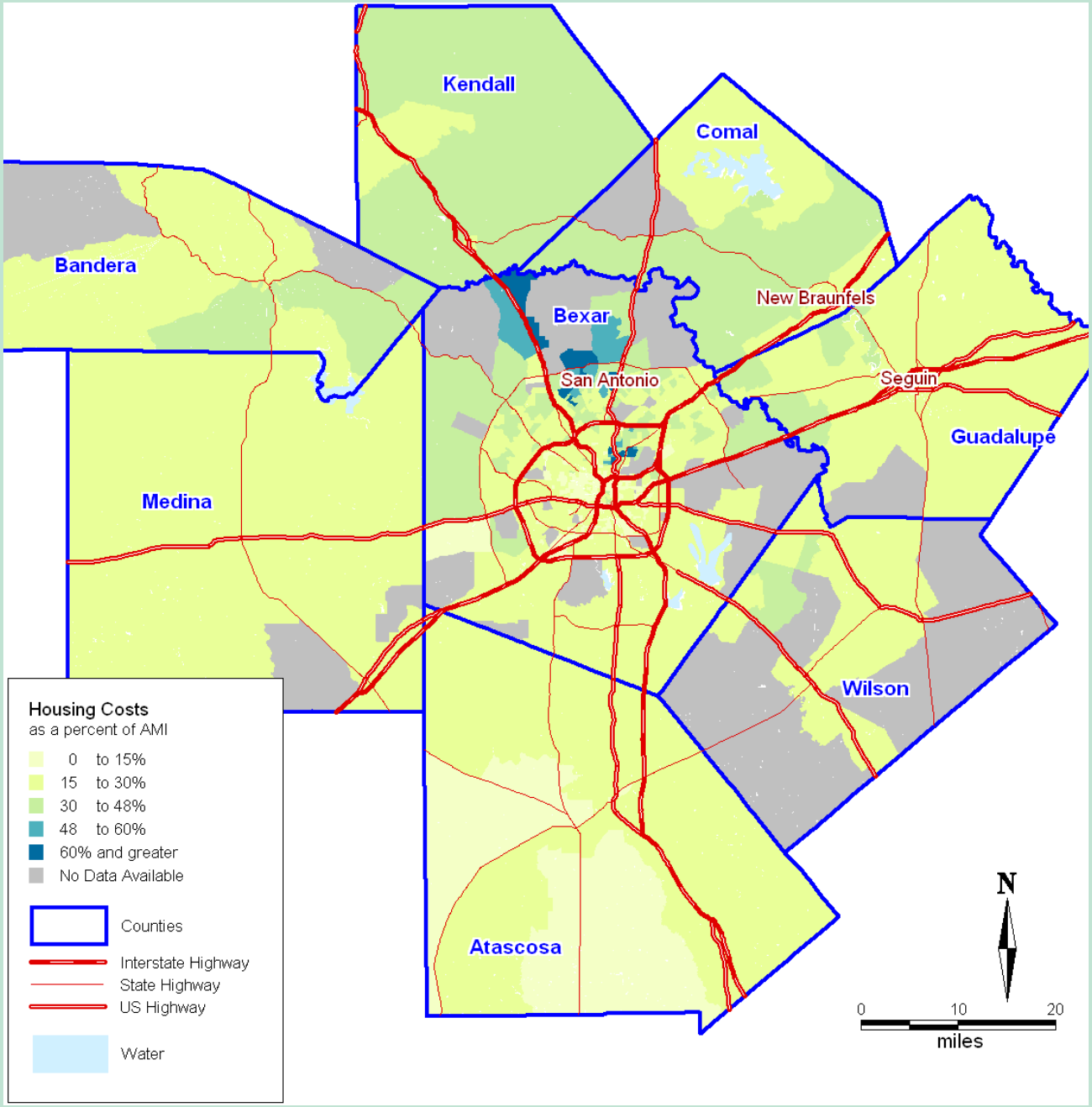


Figure 16: Annual Housing Costs as a Percent of AMI

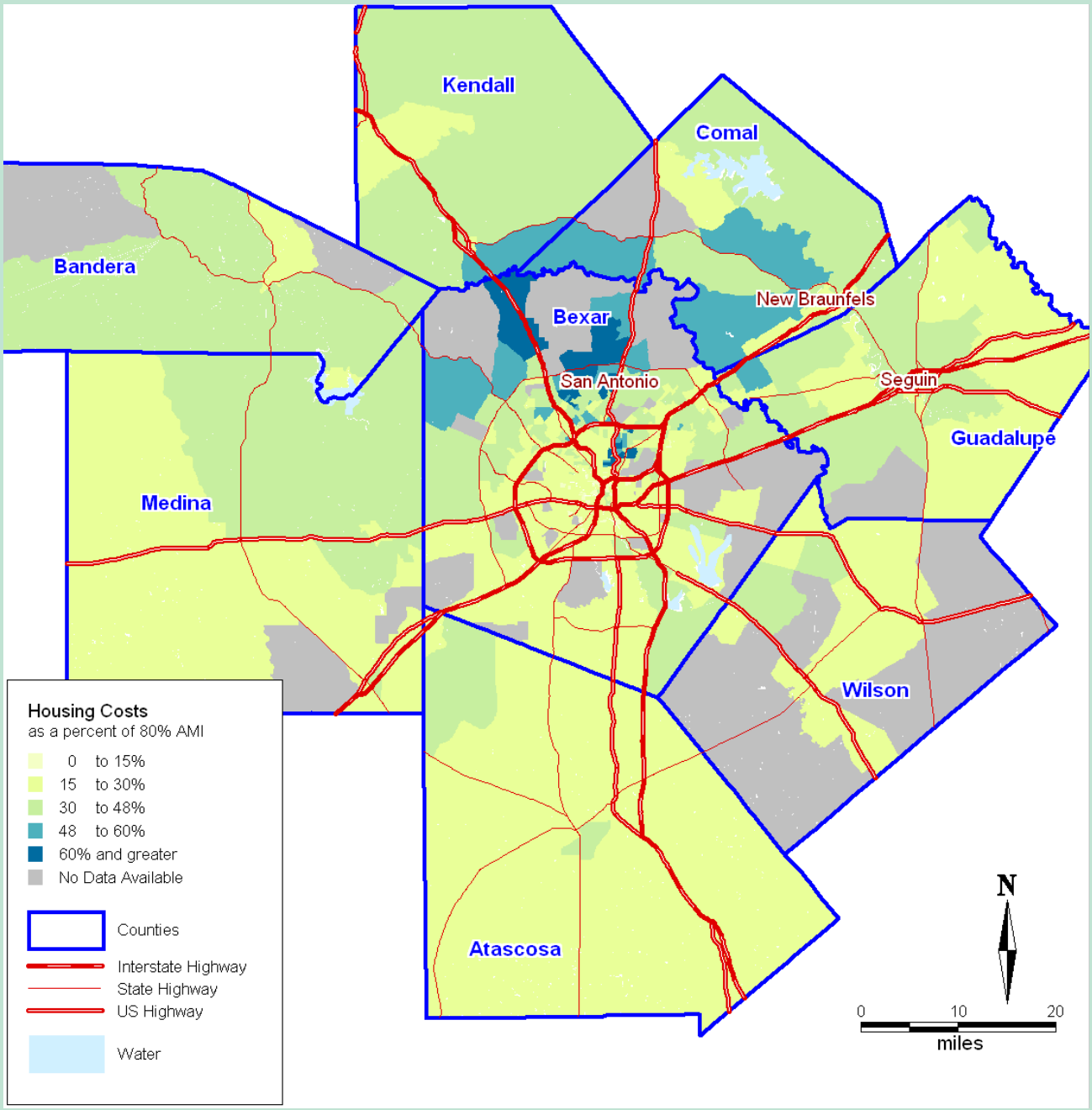


Figure 17: Annual Housing Costs as a Percent of 80% AMI

Housing + Transportation

As seen in previous maps, housing and transportation affordability can both vary greatly by location, making it extremely difficult for households to make informed decisions about the true affordability of housing location choices. The combined H+T Affordability Index maps (Figures 18 and 19) show the burdens that AMI earning and working households pay for combined housing and transportation in any given area throughout metro San Antonio. If it is assumed that spending no more than 48% of a household's income for both housing and transportation combined is affordable, Figure 18 indicates that a household earning the AMI has a relatively small area of metro San Antonio to choose from, primarily limited to the city of San Antonio. Figure 19, representing the H+T affordability for working households, shows an even more restricted area of affordability limited to the central area of the city of San Antonio. These figures clearly indicate that simply considering housing costs alone do not give a complete view of affordability.

High Housing + Transportation costs affect not only individual household savings and their potential for wealth creation, but also the overall economic well being of the metro area. City government, however, has the ability to influence high transportation costs. City government can encourage and implement multimodal transportation options for residents and create streetscapes that encourage walking and bicycling. The City can also adopt an aggressive policy to market the benefits of riding VIA and promote mixed-use development with jobs and shopping downtown to provide San Antonio residents an alternative to driving to outlying shopping centers to meet these needs. Finally, the City can support a regional planning policy that directs future growth in a manner that promotes pedestrian-oriented, compact, mixed use development in areas with access to transit.

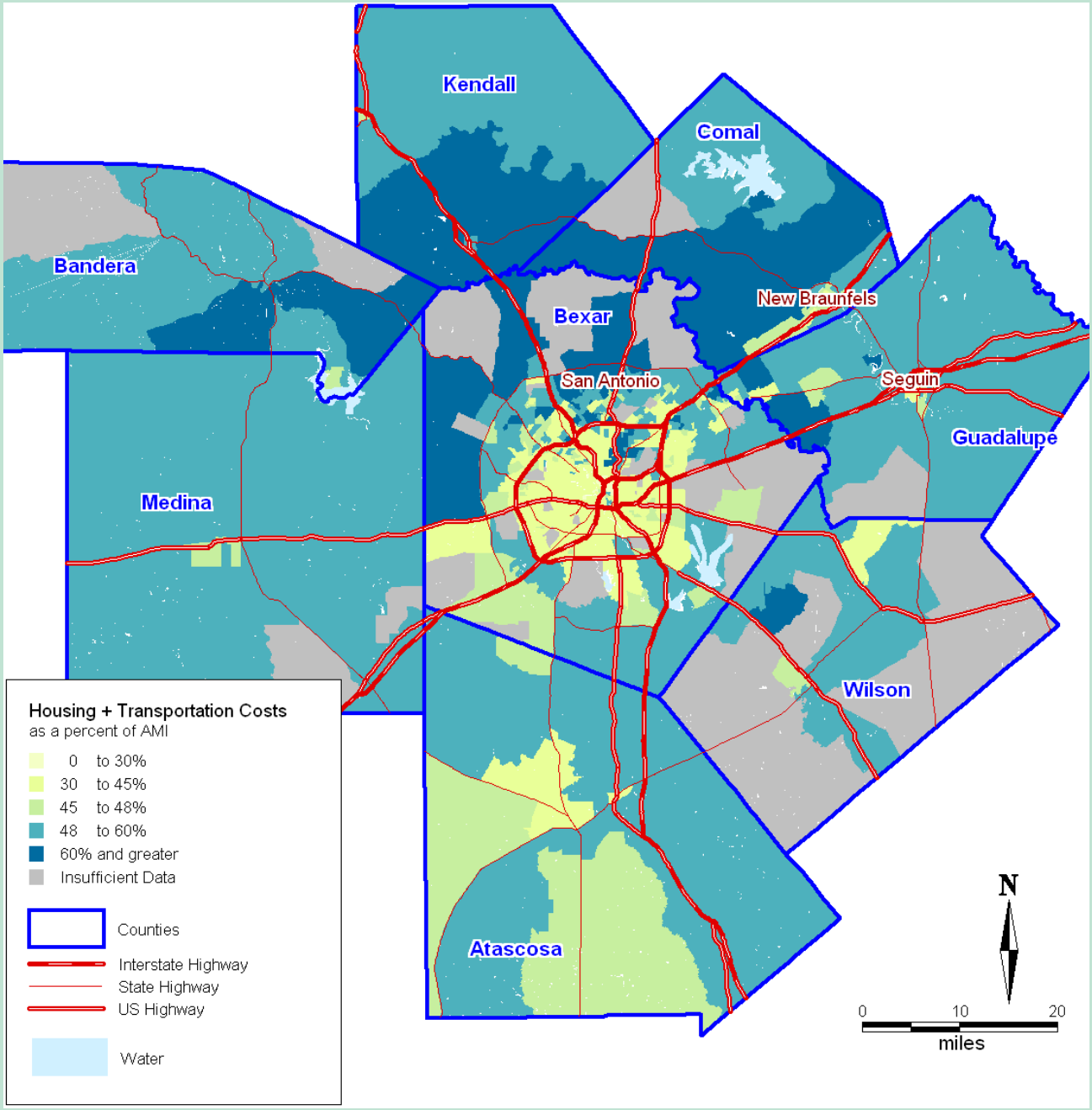


Figure 18: Housing + Transportation Costs as a Percent of AMI

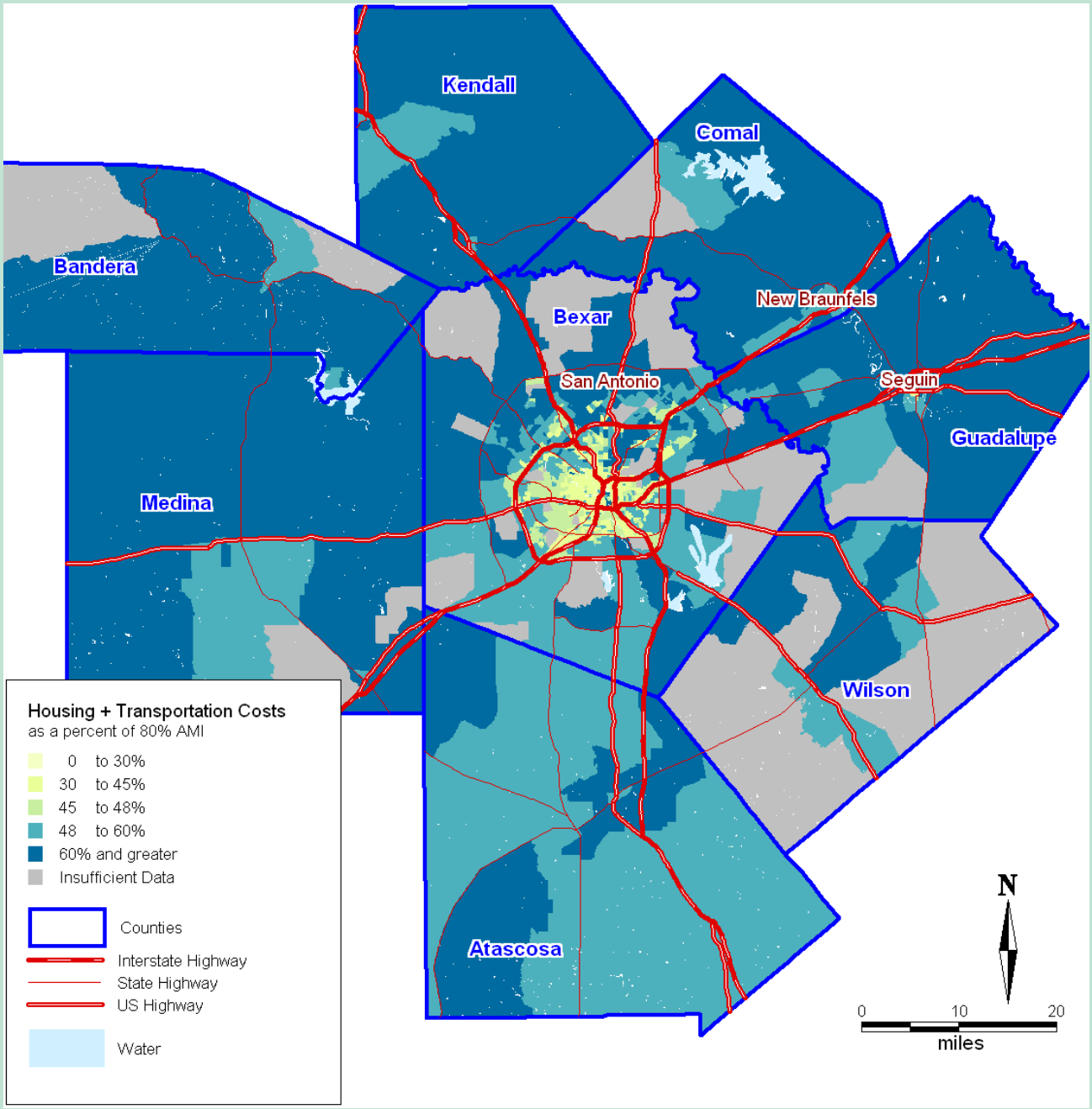


Figure 19: Housing + Transportation Costs as a Percent of 80% AMI

Profiles of Transportation Costs for Sample Communities

Table 1 below shows the average transportation costs for San Antonio and neighboring communities and indicates how two Index variables, households per residential acre and average vehicles per household, influence the average household transportation costs. In the City of San Antonio, the average transportation cost is $733 per month and, in Bexar County, $753 per month. While the city makes up a large majority of the county population, the dispersed land use patterns outside of the city limits results in the county having a lower density, higher average vehicles per household, and therefore, slightly higher average transportation costs than the city. The same pattern holds true for Sequin in Guadalupe County and New Braunfels in Comal County.

There are also significant differences in transportation costs within San Antonio. Transportation costs are the highest in the city around the outer edges where density is quite low (see Figure 21). In neighborhoods such as Forest Crest and North San Antonio Hills, transportation costs average over $1,000 per month. Transportation costs reach a low of $376 per month in the Downtown area where the density is over 35 households per acre, a relatively high density for the metro area. King William and Downtown are examples of more compact areas with services and amenities within walking distance where households have fewer vehicles and benefit from more transit options. Research indicates that households living in these more compact neighborhoods will own fewer vehicles and drive fewer miles – resulting in lower monthly transportation expenditures.

Place	Households	Households per Residential Acre	Average Vehicles per Household	Average Transportation Const/Month
Main Cities				
San Antonio	404,255	3.44	1.58	$733
Seguin	7,465	2.70	1.54	$787
New Braunfels	12,293	2.14	1.71	$870
Counties				
Bexar County	488,959	3.24	1.63	$753
Guadalupe County	30,883	2.18	1.90	$934
Comal County	29,061	1.93	1.91	$925
San Antonio Neighborhoods				
Downtown	*	35.76	0.48	$376
King William	*	4.27	1.31	$551
Royal Ridge	*	4.36	1.57	$757
Oak Park - Northwood	*	2.60	1.75	$807
Kingsborough Ridge	*	1.58	1.70	$817
Lackland Terrace	*	3.51	1.74	$826
Southwest	*	2.27	1.98	$913
Stone Oak	*	2.16	1.81	$1,045
North San Antonio Hills	*	2.38	2.06	$1,070
Forest Crest	*	2.33	1.94	$1,081
Source: US Census Bureau, 2000. Transportation costs are modeled based on Affordability Index.				
* Specific household counts are not provided because specific neighborhood boundaries were not available.				
See Figure 20 for Sample Neighborhood locations				

Table 1: Transportation Costs for Neighboring Places and Sample Communities in San Antonio

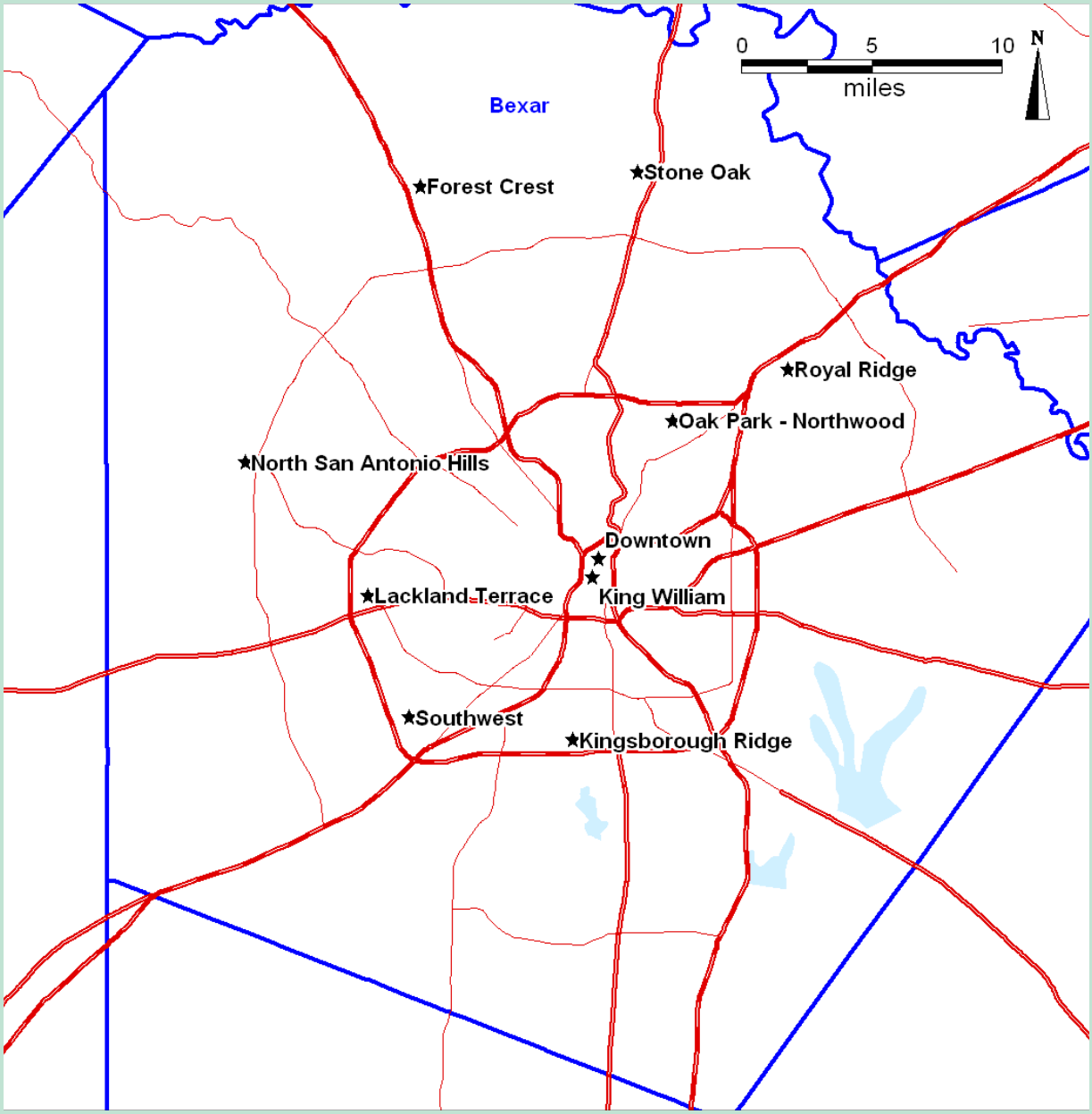


Figure 20: Sample Neighborhood Locations

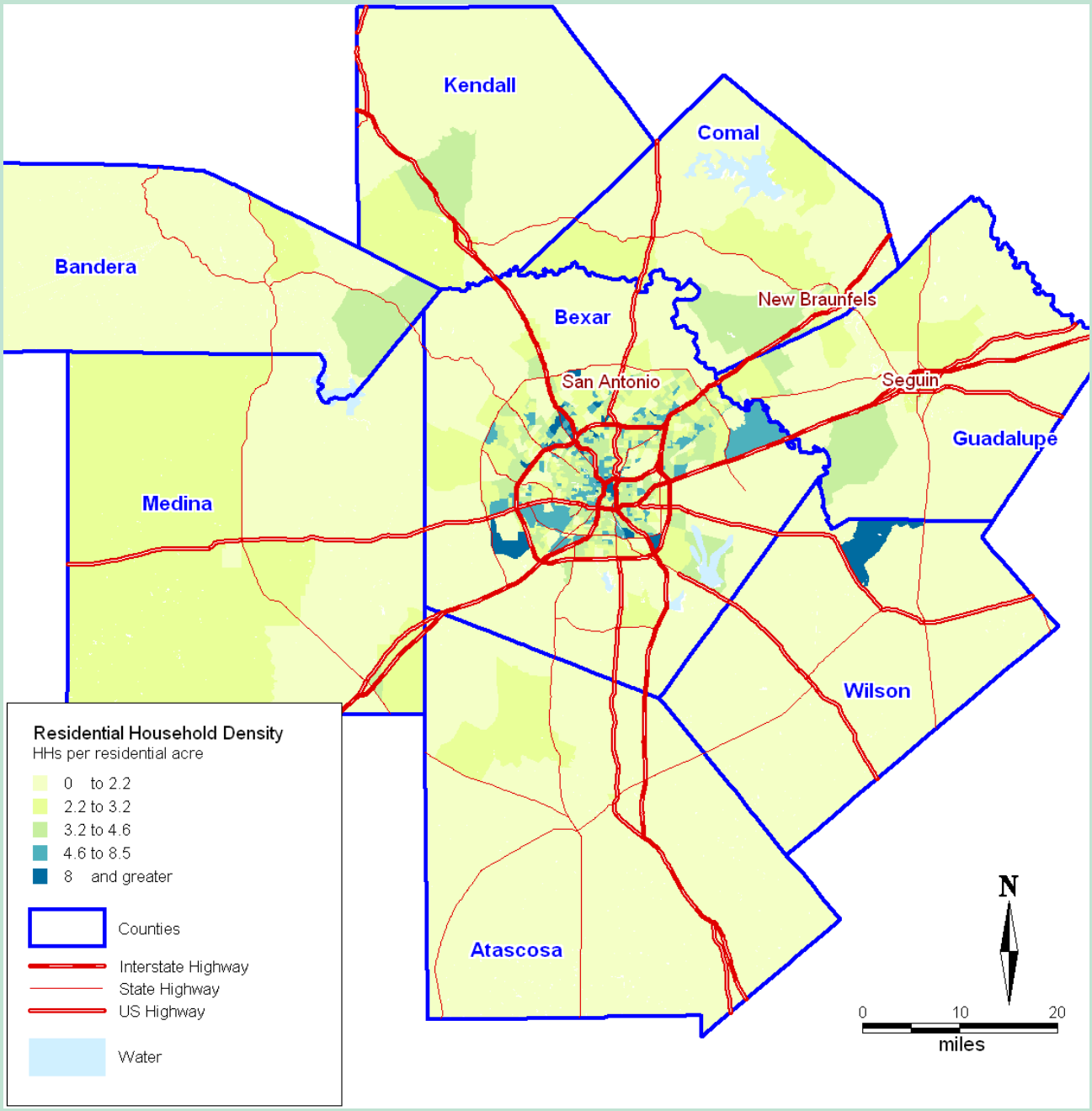


Figure 21: Density

Changing Affordability with Changing Fuel Prices

While it is quite intuitive that increasing fuel prices impacts households' transportation cost burdens, what may be less clear is the extent to which people will be impacted, and how exposure to such variability can impact households differently. Households living in largely auto dependent areas are left in a position of great vulnerability to fluctuations in fuel prices because they have few options other than to drive. However, households in compact, mixed-use areas with access to transit, jobs and services have much more transportation mode choice, less dependency on automobiles, and therefore, less exposure to changing costs.

Figure 22 shows the same monthly transportation costs mapped in Figure 12, using a gas price of $3.96, a price frequently reached, and even surpassed, in 2008. The tremendous impact of this increased fuel price is immediately apparent. Figure 23 further illustrates this point, showing the actual percent change in values between Figure 12 and Figure 22. In other words, Figure 23 shows the change in transportation costs of an increase in gas prices from $1.52 to $3.96. In this scenario, all other variables, such as income or vehicle miles traveled, are held at the same value, making the change in transportation costs a sole function of the change in gasoline prices. The areas with the greatest change in transportation costs can be interpreted as the areas most vulnerable to changing gas prices. For example, downtown San Antonio shows a much smaller change in transportation costs than outer counties, indicating that downtown San Antonio is less impacted by increasing gas prices or less vulnerable to such changes.

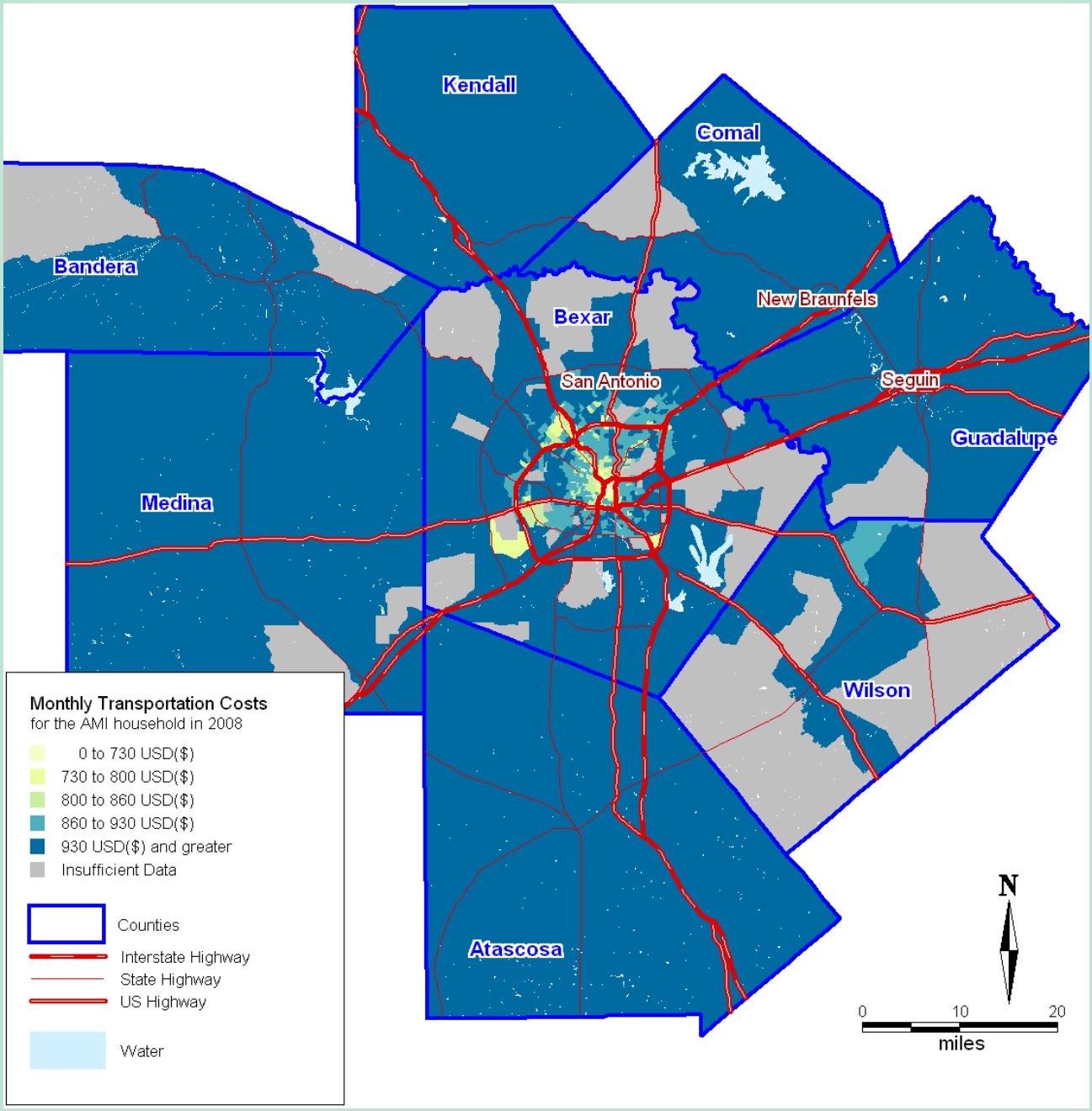


Figure 22: Monthly Transportation Costs Based on a 2008 Gas Price

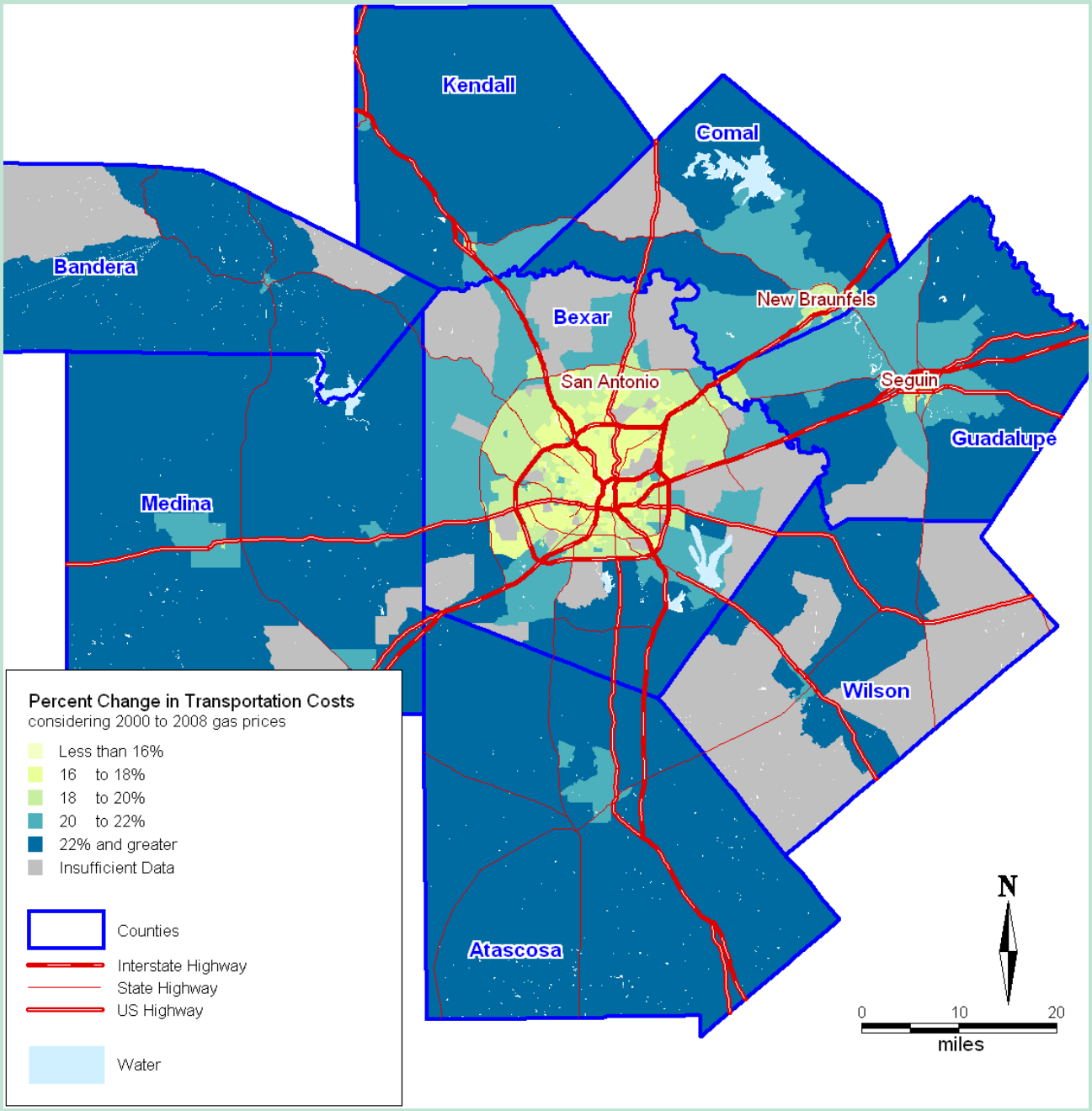


Figure 23: Percent Change in Transportation Costs Considering Select 2000 to 2008 Gas Prices

CONCLUSIONS

Summary of Affordability Index Results

In the San Antonio metro area housing costs are in an affordable range in many areas for an average earning household; in most places, a household earning the AMI could expect to spend 30% or less on housing. But, the majority of these households could also expect to pay more than 20% of their income on transportation in nearly the entire metro area, with the exception of downtown San Antonio.

Figures 24 and 25 present a unique, new view of affordability. Figure 24 presents a traditional view of affordability – housing costs consuming no more than 30% of a household income. Here, areas shaded yellow represent the areas where an average earning household could expect to find affordable housing. Compared to this, Figure 25 presents a new view of affordability – housing + transportation costs consuming no more than 48% of household income. Here, the yellow area condenses significantly indicating the reduction of affordable areas to households earning the AMI. This change in land area actually represented 128,208 housing units, or approximately 22% of the total households in the year 2000.

While a standard of affordability of 48% or less of income devoted to housing and transportation costs has been utilized in this H+T analysis, it is important to realize that this should not be seen as an ultimate goal. With increasing fuel prices, economic instability, and problems associated with automobile use, clearly individuals and communities should be striving for a more affordable goal. Figure 26 illustrates housing and transportation costs when 45% of income is selected as the index level of interest, and Table 2 below shows the count of households in the block groups that fall into these different standards of affordability. This figure and table indicate that this level is attainable in San Antonio, and is currently accomplished within the city core and in a few pockets in the surrounding counties. Considerations of the characteristics in these areas, such as transit access, high density, as well as access to services and jobs in walkable neighborhoods, should serve as a model for expanding areas in which this level of affordability is attainable.

This new view is significant and unique in that it allows examination of the combined costs of housing and transportation by location, a result of differing characteristics of the local environment, such as density and proximity to employment centers. The Housing + Transportation Affordability Index also allows comparison for different income levels and household characteristics, significant for analyzing how different families may be impacted by affordability differently.

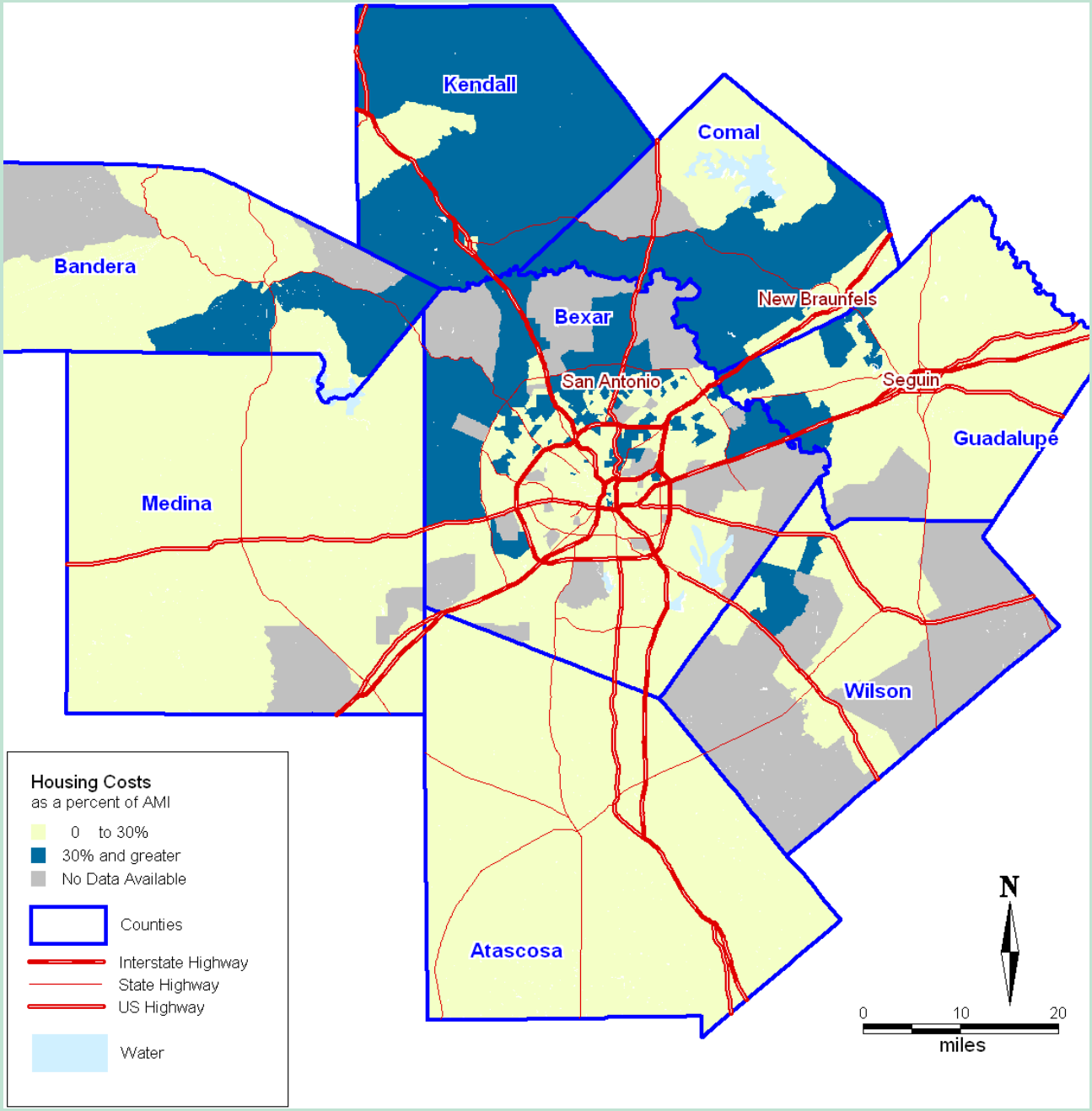


Figure 24: Traditional View of Affordability: Housing Costs Above and Below 30% of AMI

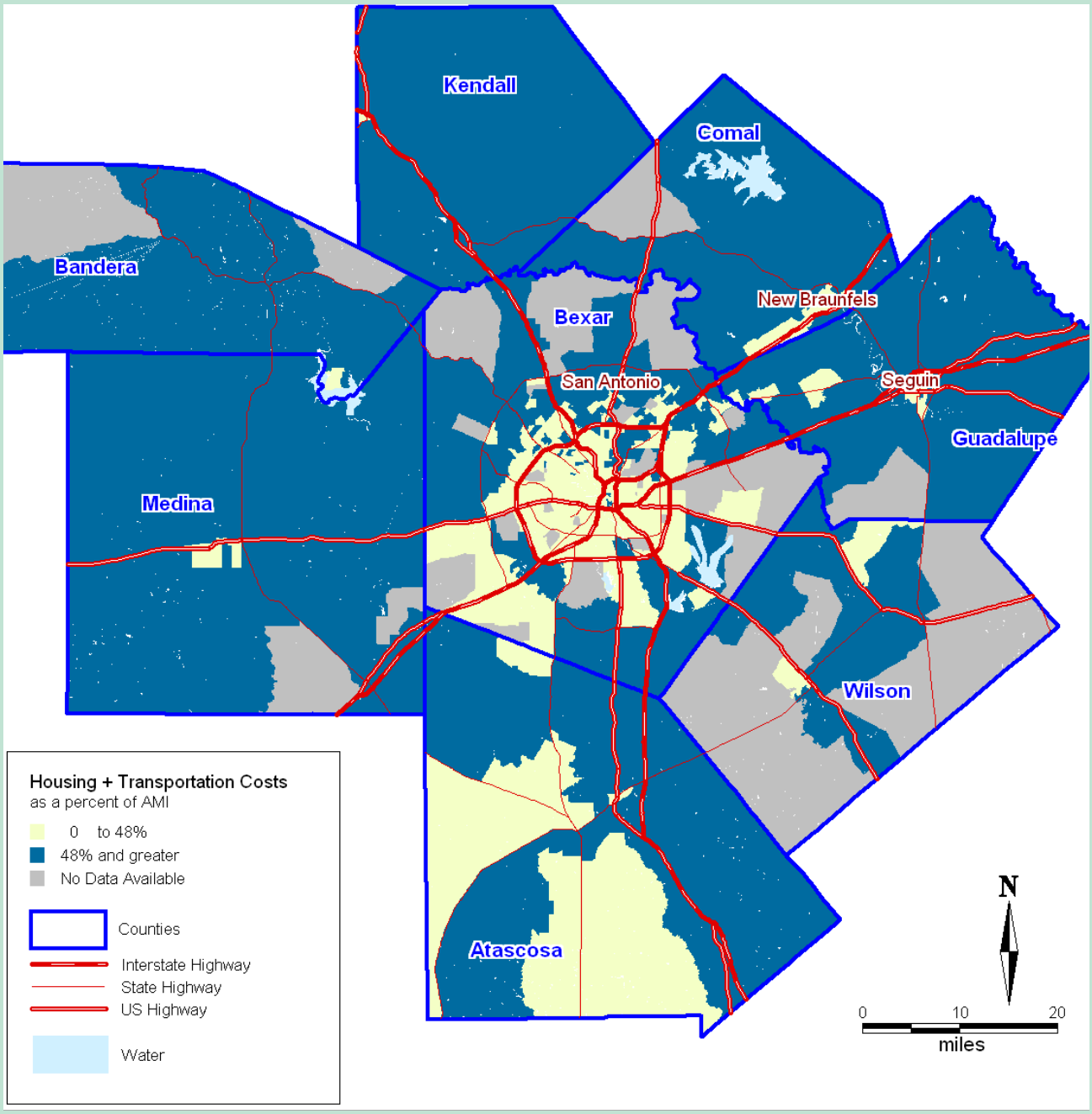


Figure 25: New View of Affordability: Housing + Transportation Costs Above and Below 48% of AMI

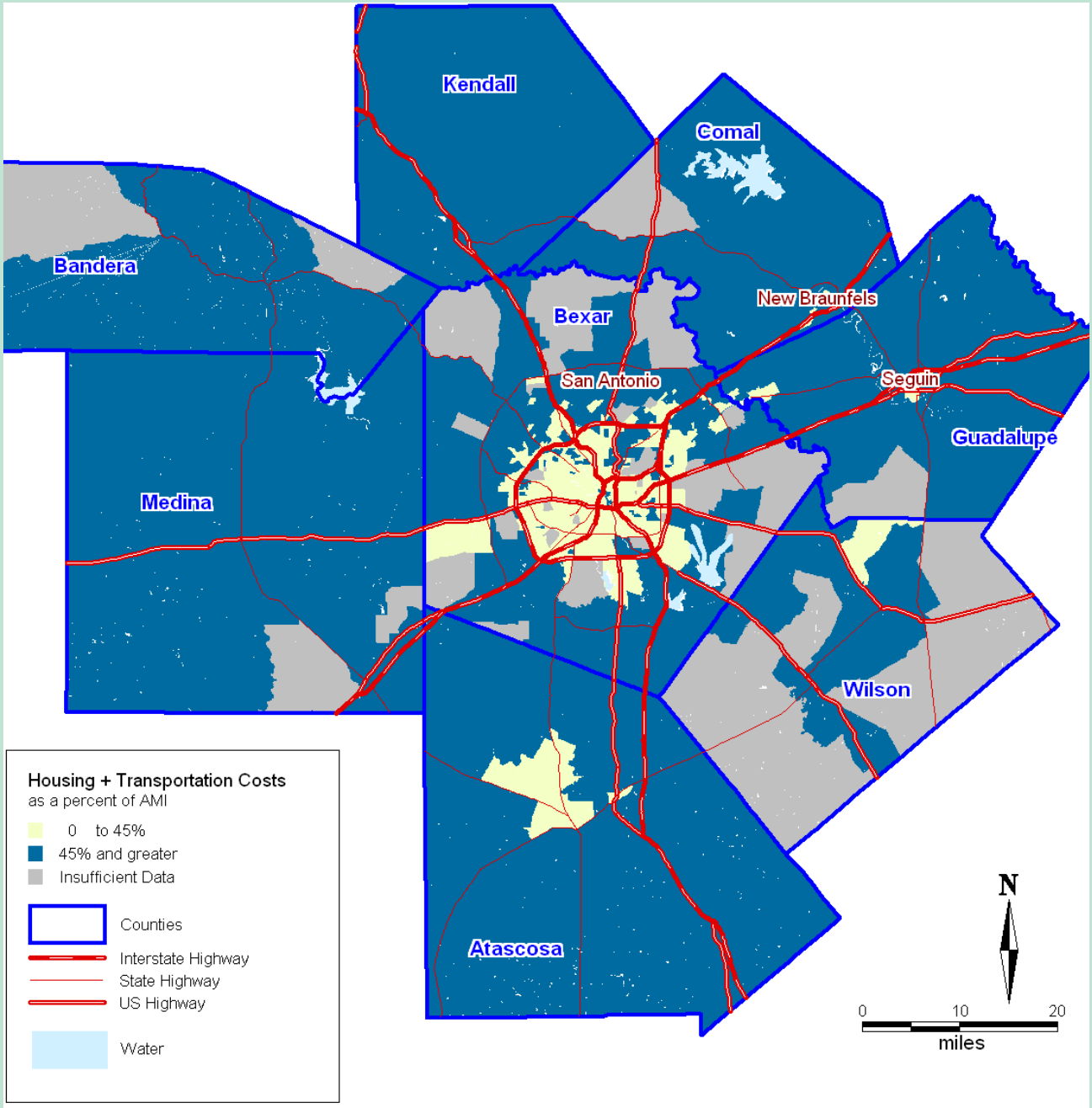


Figure 26: Goal for Affordability: Housing + Transportation Costs Above and Below 45% of AMI

	Total Households*	Households in block groups where average housing costs are 30% or less of AMI*	Households in block groups where average H+T costs are 48% or less of AMI*	Households in block groups where average H+T costs are 45% or less of AMI*
Whole MSA	587,786	461,321	333,113	271,729
City of San Antonio	402,423	332,907	281,446	247,626
Atascosa County	12,813	12,813	4,531	3,004
Bandera County	6,463	4,724	464	0
Bexar County	481,017	379,169	309,960	260,310
Comal County	27,722	19,555	6,329	1,659
Guadalupe County	30,256	23,026	9,138	6,397
Kendall County	8,614	2,556	495	0
Medina County	12,242	12,242	732	0
Wilson County	8,649	7,228	1,464	359

* Count of households in block group for which H+T Index was calculated

Table 2: Count of Households under Different Affordability Standards

APPENDIX

Brief Overview of H+T Affordability Index Methodology

The H+T Affordability Index was created for the San Antonio region at the census block group level. Information specific to San Antonio on residential density, commercial services, infrastructure, transit service, and job access were used to predict auto ownership, auto use (vehicle miles traveled per year per vehicle), and transit use. Because the Index is specific to both household size and income, analysis was done for a number of household sizes and income levels.

The results from the Index highlight areas where development patterns, job access, and land use patterns are especially conducive to transit use, walking, biking, and lower auto use. The results also indicate areas where new development patterns likely necessitate higher auto ownership, multiple daily trips by auto, long distances to work, and are difficult to serve by transit.

The Index can be used to provide two types of valuable information: 1) a single number to score each neighborhood's affordability, represented by an estimated monthly household transportation cost; and 2) as an unbundled set of indicators (e.g. transit connectivity, block size, distance to employment, housing density) used to determine which of these factors are contributing to the cost of the area, e.g. large block sizes, low job access, low density, few nearby services.

Transportation Costs

The methods for the transportation cost model draw from the peer-reviewed Location Efficiency research findings on the factors that drive household transportation costs. The model has been reviewed by practitioners at the Metropolitan Council in Minneapolis-St. Paul, fellows with the Brookings Institution, and other academics specializing in transportation modeling, household travel behavior, and community indicators from the University of Minnesota, Virginia Polytechnic, and Temple University, among others.

Specifically, the transportation cost model incorporates four neighborhood variables (residential density, average block size, transit connectivity index, and job density) and four household variables (household income, household size, workers per household, and average journey to work time) as independent variables. These variables are used to predict, at a neighborhood level (census block group), three dependent variables – auto ownership, auto use, and public transit usage – that determine the total transportation costs (see Figure 27).

To do so, the household transportation cost model is based on a multidimensional regression analysis, where a formula describes the relationship between the dependent variables (auto ownership, auto use, and transit use) and the independent household and local environment variables. To construct the regression equations, each predictor variable is tested separately; first to determine the distribution of the sample and second to test the strength of the relationship to the criterion variables. The models are summed to derive the total household costs for auto ownership, auto use, and transit. The predicted result from each model is multiplied by the appropriate price for each unit – autos, miles, and transit trips – to obtain the cost of that aspect of transportation.

These regressions were conducted to fit six metropolitan areas. All other regions were

run based on a prototype city chosen to best match the areas character, age, and transit development and infrastructure.

Job Density as defined using an Employment Gravity Index

As mentioned, job density is used as an input variable in the transportation cost model. Job density is calculated using a method called the Employment Gravity Index that considers all jobs within the region. The density is calculated using the total number of jobs scaled by the inverse square of the distance ($1/r^2$) to any given block group.

Housing Costs

Housing Costs were determined using the Census variables Selected Monthly Owner Costs for Owners with a Mortgage and Gross Rent for Renters Paying Cash at the block group level.

The US Census defines Selected Monthly Owner Costs as:

Selected monthly owner costs are the sum of payments for mortgages, deeds of trust, contracts to purchase, or similar debts on the property (including payments for the first mortgage, second mortgage, home equity loans, and other junior mortgages); real estate taxes; fire, hazard, and flood insurance on the property; utilities (electricity, gas, and water and sewer); and fuels (oil, coal, kerosene, wood, etc.). It also includes, where appropriate, the monthly condominium fees or mobile home costs (installment loan payments, personal property taxes, site rent, registration fees, and license fees). Selected monthly owner costs were tabulated separately for all owner-occupied units, specified owner-occupied units, and owner-occupied mobile homes.

Gross Rent is defined as:

Gross rent is the contract rent plus the estimated average monthly cost of utilities (electricity, gas, water and sewer) and fuels (oil, coal, kerosene, wood, etc.) if these are paid by the renter (or paid for the renter by someone else). Gross rent is intended to eliminate differentials that result from varying practices with respect to the inclusion of utilities and fuels as part of the rental payment. The estimated costs of utilities and fuels are reported on an annual basis but are converted to monthly figures for the tabulations.

The Census reports aggregate values for both of these variables as well as the count of owners and renters used to compile the different aggregates. Therefore, to find an average value for SMOC and GR, the aggregate is divided by the count of households making up the aggregate value.

For the purposes of this study, housing costs are estimated using only renters paying cash and owners paying mortgages. Renters paying with vouchers (e.g. subsidized housing) and owners who no longer have mortgage payments are therefore excluded.

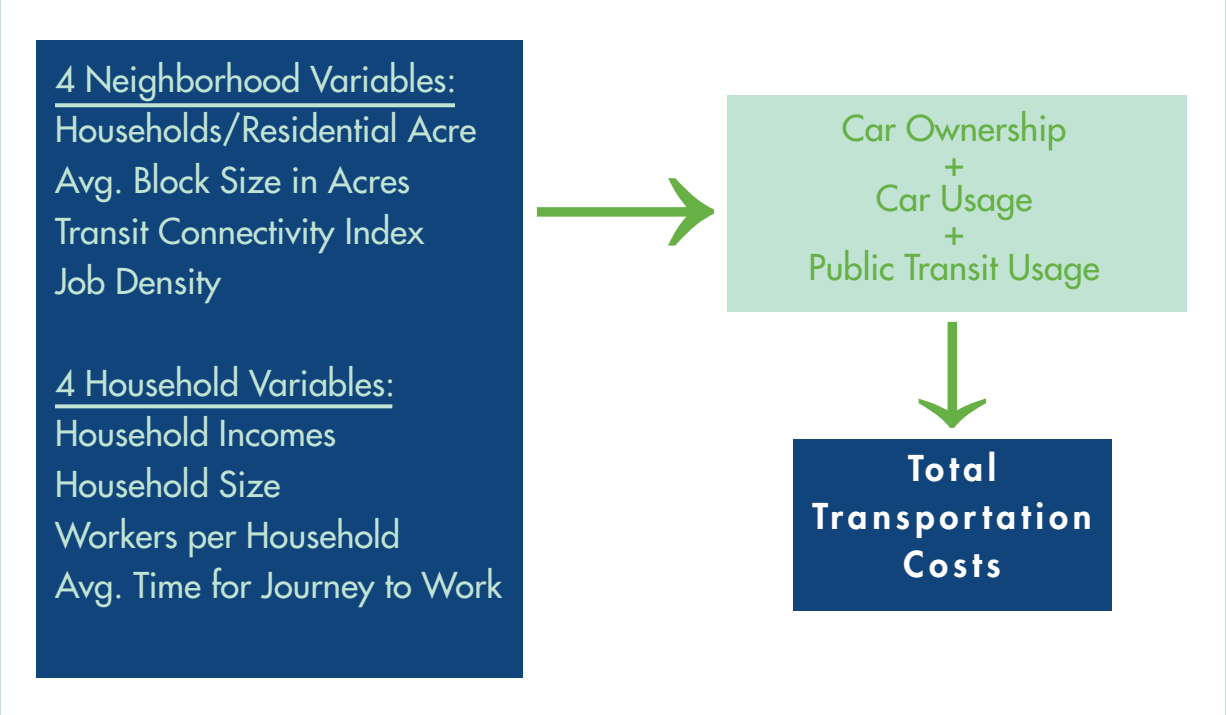


Figure 27: H+T Affordability Model

END NOTES

1 Lipman, Barbara J. A Heavy Load: The Combined Housing & Transportation Burdens of Working Families. Center for Housing Policy, Washington D.C., 2006.

2 Center for Transit-Oriented Development and Center for Neighborhood Technology. The Affordability Index: A New Tool for Measuring the True Affordability of a Housing Choice. Brookings Institution's Urban Markets Initiative, Washington D.C., 2006.

3 All data, statistics, and maps presented in this report reference 2000 data unless otherwise noted.

4 High and low transportation expenditures calculated from the H+T Affordability Index.

5 Bullock, Ryan Mooney and Bernstein, Scott. Driven to Debt. CNT, 2002.

6 The Metropolitan Transportation Commission, which is the Metropolitan Planning Organization for the San Francisco Bay Area, this year formally adopted a goal of reducing the combined cost of housing and transportation as a percentage of median income by 10 percent by 2035. Various cities have started considering such a goal for municipal policy, or are considering adopting a policy defining housing affordability as including the cost of transportation.

7 In San Francisco, independent non-profit car sharing organizations have documented considerable cost of living reduction benefits. See: Cervero, R., Golub, A., and Nee, B. San Francisco City CarShare: Longer-Term Travel-Demand and Car Ownership Impacts. Institute of Urban and Regional Development, University of California at Berkeley. Department of Transportation and Parking, City of San Francisco.

8 Average calculated based on the 53 metropolitan areas presented on the H+T Affordability Index website (http://htaindex.cnt.org).

9 High and low transportation expenditure percents calculated from the 53 metropolitan areas presented on the H+T Affordability Index website (http://htaindex.cnt.org).