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**Housing and Transit Challenge: Anticipating Neighborhood Change in
Houston's Rail Corridors**

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**Housing and Transit Challenge: Anticipating Neighborhood Change in
Houston's Rail Corridors**

by

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Dedication

To Houston. My birthplace and home.

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Finally, I wish to thank my parents for their love, support, and encouragement throughout my life and studies. Thank you Mom and Dad. Nothing would be possible without you two.

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by

Luis Gerardo Guajardo Jr., M.S.C.R.P.

The University of Texas at Austin, 2014

SUPERVISOR: Elizabeth Mueller

The expansion of Houston's rail transit network and related transit-oriented development will transform the city's growth pattern for decades to come. Environmental, public health, and accessibility improvements may accrue, however, what impact will the added infrastructure have on Houston's neighborhoods, particularly on lower income households more sensitive to displacement pressures? This professional report seeks to clarify and evaluate the housing-transit connection occurring along the city of Houston's light rail corridors by triangulating between revealed and stated preferences, at both the national and local level.

The literature review reveals *light rail* transit induces neighborhood change significantly more than other transit modes, and, that both access and design-related features catalyze land value appreciation. Consequently, meta-studies on transit impact were reviewed to provide a framework to analyze all three corridors in Houston. Current household characteristics in Houston's transit corridors reveal striking similarities to those that have incurred drastic neighborhood change in other parts of the country. These studies foreshadow in-migration of higher-income, owner-occupied, and more car-user households into light rail transit neighborhoods. Accordingly, these findings inform my call for local and state efforts to anticipate neighborhood change by leveraging the production of more affordable housing for the corridors through Houston's special purpose districts and the state's distribution of low-income housing tax credits.

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CHAPTER ONE: INTRODUCTION

Current changes in urban growth dynamics present a new set of challenges for planners, advocates, and policy makers. One of today's emerging problems in cities throughout the United States is the housing and transit challenge. Essentially, as transit systems continue to expand in many urban communities, more housing development occurs along transit routes due to improved transit access and related amenities. However, this type of housing in urban core neighborhoods is in high demand and can price residents out of transit rich neighborhoods. Most important, policy toolkits to address this challenge vary across states and are influenced by local governing regimes. Thus, it remains important for planners to understand how different regions diagnose, plan, and address their housing-transit challenge to effectively address it.

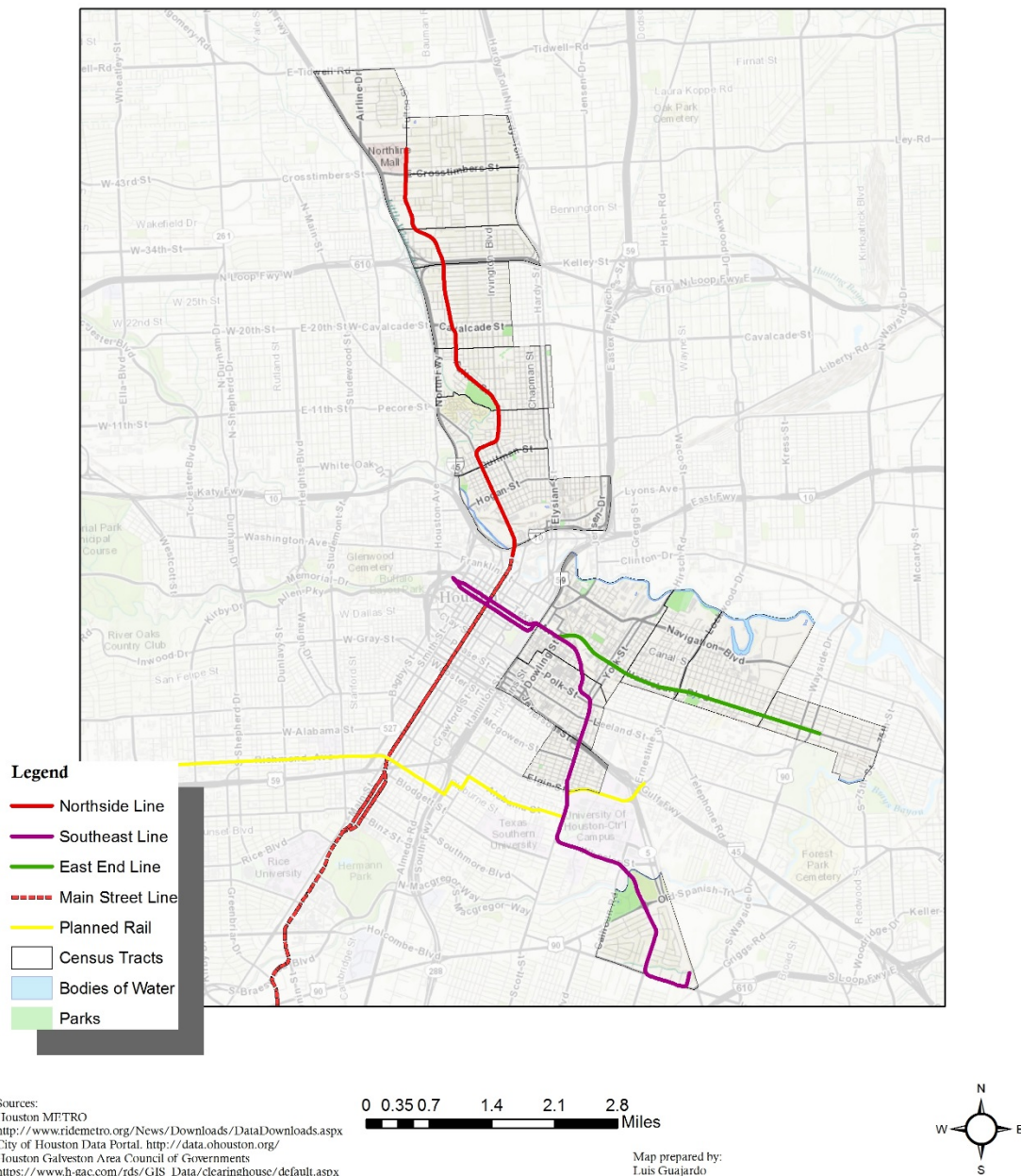
Lured by the opportunity to develop denser, climate-friendly metropolises and spur new development and tax base in urban core neighborhoods, planners have promoted transit expansion projects leaving equity and housing affordability along transit corridors as an afterthought. Many benefits may ensue from walkable-compact-communities with transit nearby such as improved air quality, more energy-efficient development, healthier residents, and added economic development opportunities for local businesses. However, they also bring negative effects like noise pollution, rising property taxes, and construction dilemmas that may hurt neighbors, particularly lower-income residents and business owners.

This professional report seeks to clarify the housing-transit challenge occurring in the city of Houston, Texas, based on a review of the literature, the city's planning context, and a housing analysis along three of city's transit corridors (**Figure 1 Transit Corridor Census Tracts**). Four questions at the core of this report include: What impact does fixed guideway transit have on neighborhoods? What is the demographic and socioeconomic profile of the three transit corridors in Houston? What are local institutions in Houston

doing to provide affordable housing along the transit corridors? And if not, what tools may facilitate the development of affordable housing along the corridors?

Figure 1 Transit Corridor Census Tracts

Houston, TX



In addition, right-of-way challenges often strain construction budgets and transit agencies may encounter stiff neighborhood opposition. According to multiple studies, light rail projects tend to run through low-income areas, perhaps ‘pursuing the path of least resistance’ where social and political capital of existing residents to oppose plans is lower. This also contributes in attracting developers to project areas with reduced land acquisition costs, to help spur Transit-Oriented-Development as transit agencies seek to justify transit investments. At the same time, housing affordability is becoming a widespread problem in the United States primarily as a byproduct of stagnant wages and rising household costs. As of 2007, 16% of all households and 24% of renters spent half or more of their income on housing expenses; a 41% increase for both owners/renters from a decade ago (Joint Center for Housing Studies 2009 through Schwartz, 2010). This study makes evident that a robust affordable housing strategy should parallel fixed guideway transit projects by demonstrating a review of previous studies that are foreshadowing neighborhood change in Houston.

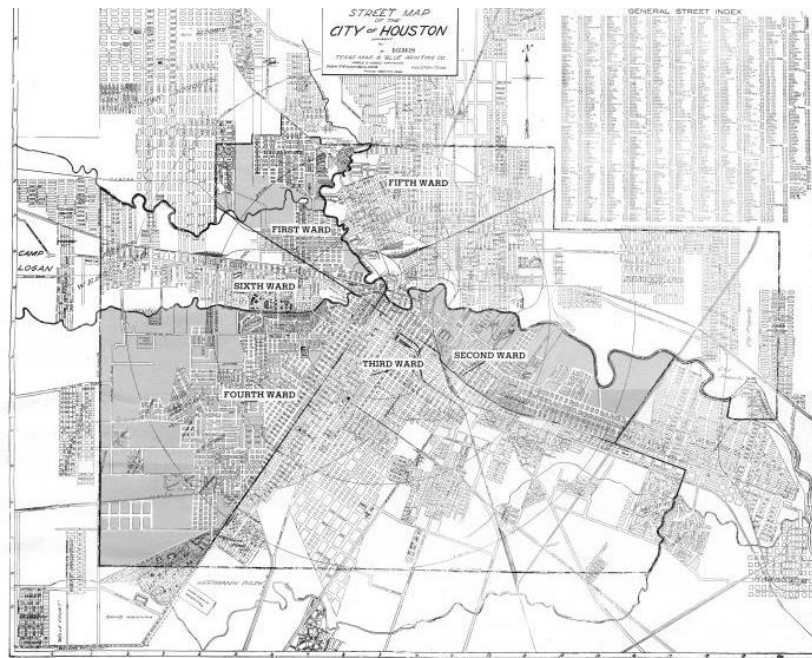
Research Purpose

Houston will add three new rail lines by 2015; Main Street Line, the city’s first, opened in 2004. Through this report I review transit impact studies and meta-studies to determine a framework for evaluating Houston’s corridors placed in three of the city’s historically minority neighborhoods; Near Northside (Northside Line), East End, and 3rd Ward (Southeast Line) (**Figure 1 Transit Corridor Census Tracts**).

Planning in Houston provides an understanding of the planning trajectory occurring locally to evaluate the level of support and resources for the provision of affordable housing. All of this is necessitated since the most common used tool for affordable housing, inclusionary zoning – requiring developers provide a portion of units, affordable to low-income families -- is not allowed in the State of Texas due to state law.

Various studies indicate troubling implications to low income, minority residents residing near light rail, potentially foreshadowing neighborhood change in Houston. The literature review uncovers three significant reasons to be expanded in consequent chapters.

Figure 2 Houston's Wards, 1920



MARCH 19-29, 1981
IN THE BEGINNING WERE THE WARDS
An Historical Exhibit about Houston's Six Wards

Image Credit: <http://houstorian.files.wordpress.com/2007/01/houstonwards1920.jpg>

First, housing preferences are shifting nationally and locally, as people's desire for more compact-infill housing near transit grows. Houston's transit corridors will boast direct service to two of the region's largest employment centers, the Texas Medical Center and Downtown. Accessibility improvements through the newly expanded rail lines will turn area residents' shifting housing *preferences* into housing *options*. This could accelerate the development of market-rate housing in the Northside, East End, and 3rd Ward.

Second, capital improvements or design-related features, which according to multiple studies, induce significant effects on property values. Houston is planning to parallel METRO's transit investments with a multi-agency infrastructure effort that includes the city, tax increment reinvestment zones, and municipal management districts. These improvements include walkable streetscapes, beautified parks, and brownfield site clean-ups to induce private sector revitalization in traditionally underinvested neighborhoods. A meta-study by Bartholomew and Ewing on the effects of transit on land values, suggests design-related features are just as complicit as access-related improvements in affecting land values and both simultaneously converge to form a "synergistic effect" (Bartholomew and Ewing, 2011).

And third, a meta-study on the impacts of transit on socioeconomic change indicate low-income-minority-renter households are most vulnerable when light rail is the mode of choice assembled. This report's analysis of demographics and housing in Chapter Three indicate similar characteristics between neighborhoods prone to socioeconomic change and Houston's transit corridors. Nationally, the influx of owner-occupied-higher-income households comes with higher driving rates and car ownership into light rail neighborhoods; presumably in contradiction to the purpose of transit to begin with. All three outcomes foreshadow a new development frontier in Houston for additional market-rate housing which could bring many benefits to the region. However, these three occurrences, particularly without a substantial affordable housing strategy, could have negative consequences for low-income and minority households living along the corridors in the East End, Northside, and 3rd Ward.

Figure 3 African-American Population Map, 2012

Houston, TX

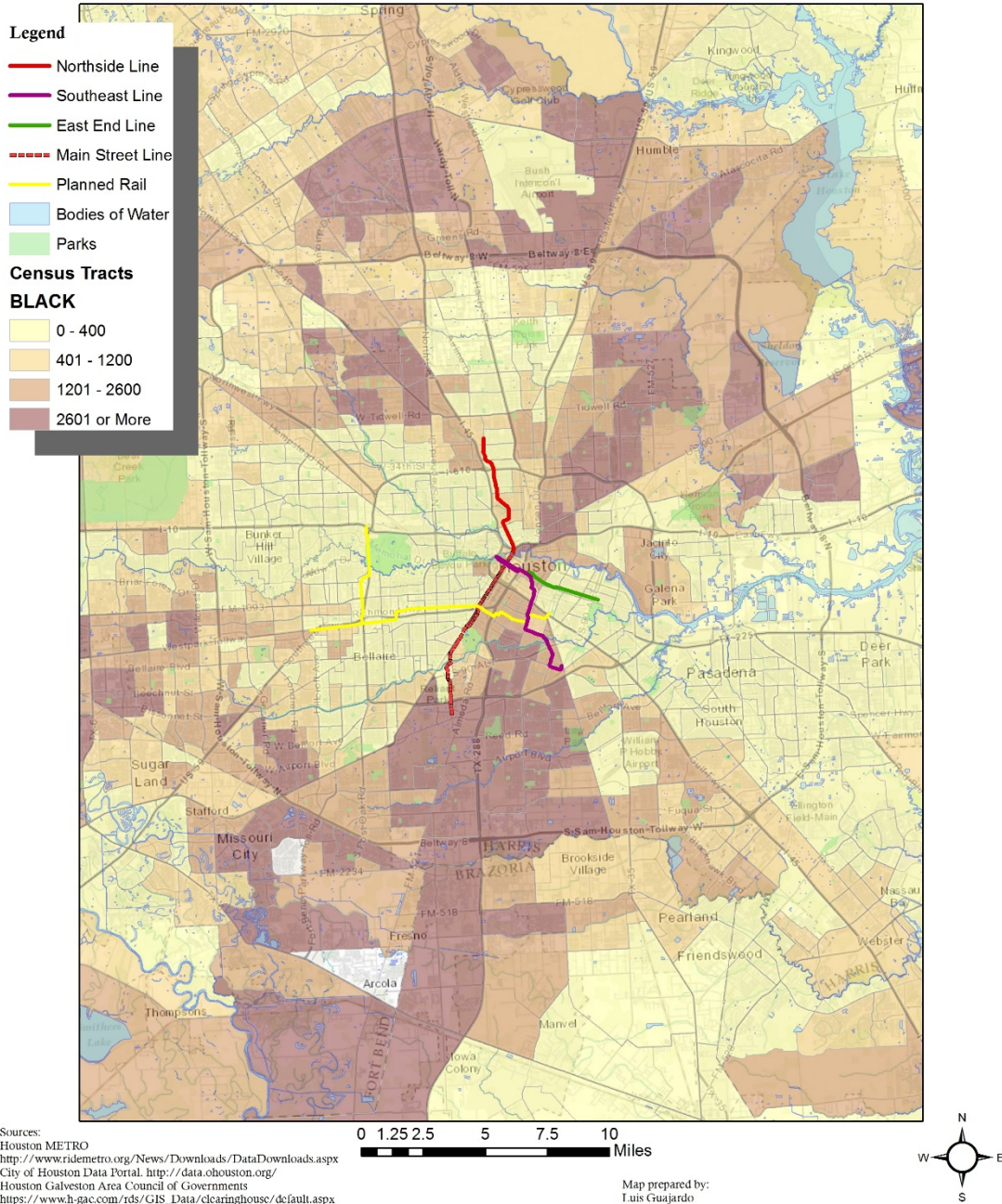


Figure 4 African-American Population Map Close-Up, 2012

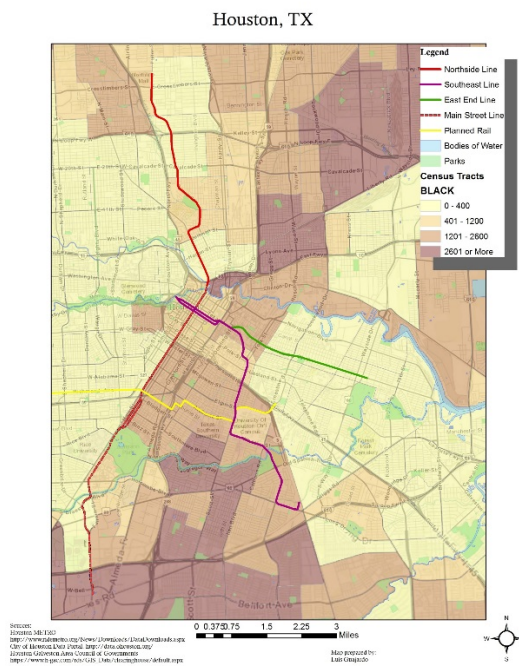


Figure 5 Latino Population Map Close-Up, 2012

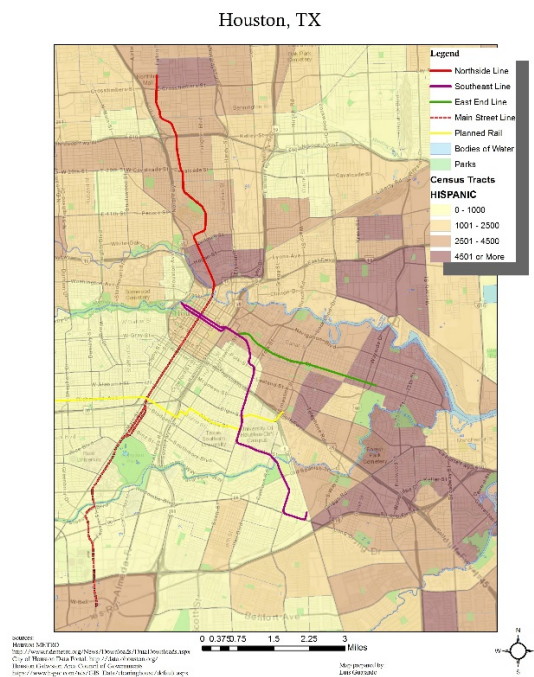
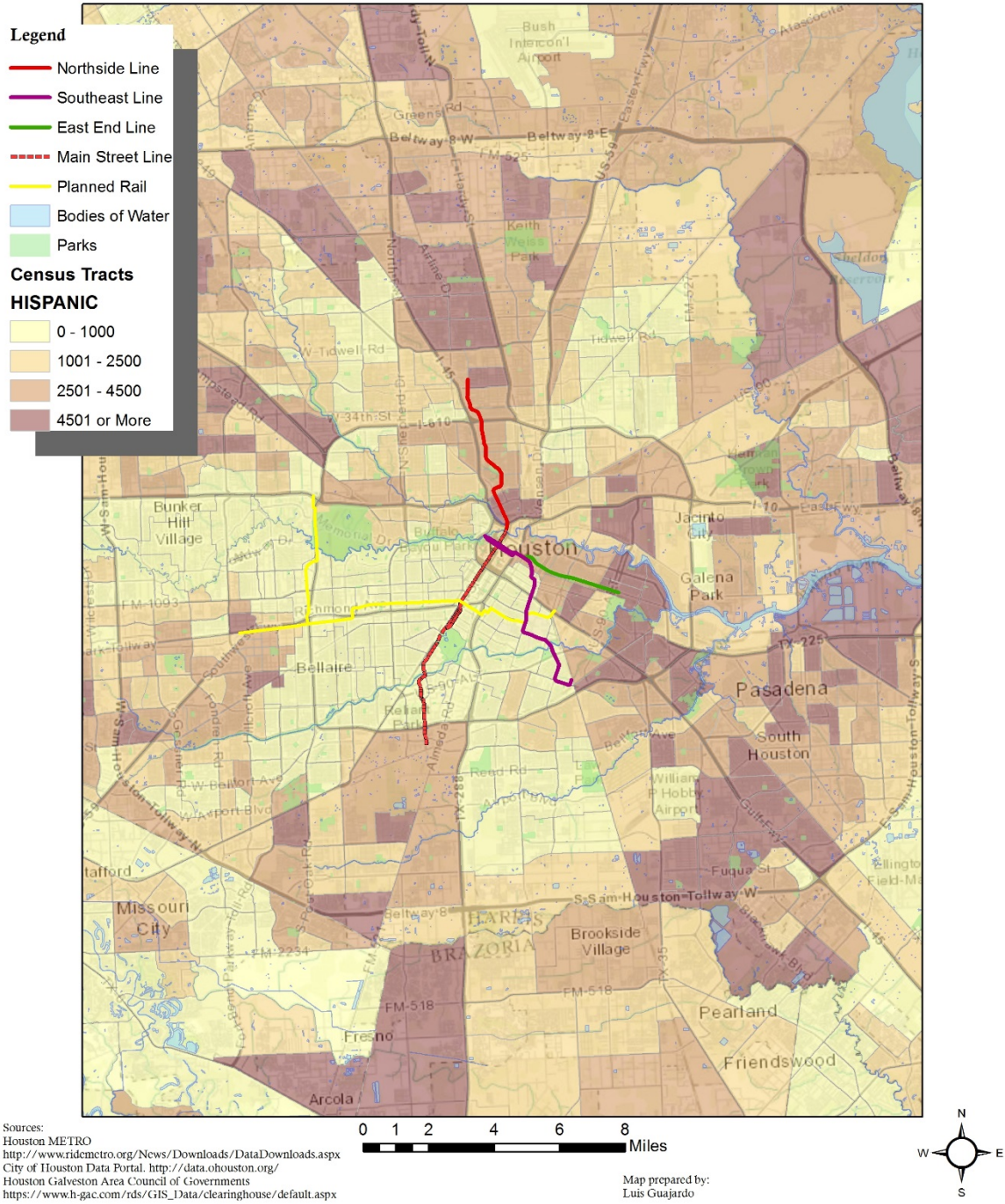


Figure 6 Latino Population Map, 2012

Houston, TX



About Houston

History

Incorporated on the banks of the Buffalo Bayou with 1,500 settlers in 1837, Houston formed as a formidable access point for steamboats and rail transportation (Gale, 2006). By 1870, Congress declared Houston a port of entry due to sizable infrastructure improvements during the previous twenty years that included a dredged ship channel into Galveston Bay and granted admittance into the national rail network (Qian, 2008). 50,000 people called Houston home by 1900 which extended 70-80 square miles along the Buffalo Bayou (Qian, 2008). Houston's Wards were established in 1841 and by 1865 Freedman's Town, located in Fourth Ward, became the heart of the African-American community well into the 20th Century (Gregory School, 2014). Freedman's Town was settled just west of Downtown and south of the flood-prone Buffalo Bayou. By 1925 it would hold one-third of Houston's population, comprised mostly of African-Americans (Gregory School, 2014).

By 1901, the Spindletop oil discovery in East Texas helped make Houston the nation's leading petroleum refining center (Qian, 2008). In addition to petroleum, Houston's economy also benefited from proximity to natural resources such as cotton-fertile soil, deciduous and pine forestry for timber, and a fresh water aquifer. Early suburbs were created as early as 1892 starting with Pasadena, Houston Heights, and Deer Park and were followed by others such as Bellaire in 1911 and West University Place in 1919 (Qian, 2008).

World War II had a tremendous impact on Houston. During this time the city became the world's primary petrochemical manufacturing center (Qian, 2008). Significant wartime investments accumulated in advanced technology, defense, oil and natural gas, tourism, and property (Qian, 2008). By 1950, two-thirds of Houston's African-American population were concentrated in three of the wards – Third Ward, Fourth Ward, and Fifth Ward (Bullard, 2007). According to Bullard (2007), by 1970, over 90% of Houston's African-Americans lived in areas where they were majority. By 1980, 82% of African

Americans lived in areas where they were majority (Bullard, 2007). African-American neighborhoods were isolated, underinvested, and beleaguered with environmental racist actions from local government bodies such as the siting of toxic uses in their vicinity (Bullard, 2007).

Houston City Council aggressively annexed its older suburbs as white flight followed the area's growing post-industrial jobs in ancillary markets to the oil and gas industries (Qian, 2008). Changes to federal housing and transportation policy facilitated Houston's outward growth – namely, the expansion of mortgage insurance in the Federal Housing Act of 1949 and the Interstate Highway Act of 1956 – during an important period that bore a population surge of over 2.3 million residents from 1950 to 1980 for the metropolitan area (U.S. Census Bureau). This spatial sorting continues to define Houston as one of the nation's most expansive cities.

Consequently, the Texas Medical Center became a world-class research and treatment center, although the energy industry still led the region boasting over 85% of local employment in the early 1980's (Qian, 2008). Petroleum dependency manifested itself in the mid 1980's when the region lost a net 200,000 jobs due to the sharp dip in oil prices. Economic growth would continue, albeit, with lessons learned that led to a diversification of the economy that continues to this day. As the economy diversified in the 1990's, Houston continued to grow at a rapid pace, adding 20% in population growth from 1990-2000 (U.S. Census Bureau, 2012). Houston simultaneously continued its outward expansion by absorbing Municipal Utility Districts (MUDs) on the fringe in its ETJ or beyond. MUD's are a form of special district enabled by state legislation to develop utility infrastructure in suburban or rural settings where there is a lack of tax revenue to pay for up-front capital improvements. Texas' larger cities found themselves absorbing MUD's in hopes to expand their tax base and/or limit being landlocked by other jurisdictions.

Zoning and Land Use

Defined as a low-tax-low-service city, Houston has traditionally outsourced its public land use controls through private deed restrictions to subdivision or homeowner associations. Deed restrictions are common in Houston, especially in higher income areas. A study in 1991 by Thomas and Murray found that nearly 2/3 of residences had private deed covenants, mostly through subdivisions, MUDs, or homeowner associations (Thomas and Murray, 1991 through Qian, 2008). In *Land Use Regulations: Does Zoning Matter?* Berry argues zoning-like outcomes are produced through private market exchanges of property rights that are atypical of urban planning norms (Berry, 2001). Enabled through state governing legislation, homeowner associations in Houston have a record of foreclosing on many households for trivial reasons like non-payment of dues.

There is a lack of research on the effects of non-zoning or private deed restriction land use control for Houston. Christopher Berry declares Bernard Siegan's *Land Use Without Zoning* (1972) as the definitive source on Houston's lack of zoning. Siegan studied the effects of non-zoning in Houston and concluded the market-place provides economic incentives for segregation of uses similar to zoning. His research found industrial and commercial users siting in more expensive sites along thoroughfares rather than in lower-cost sites hidden between residential uses (Siegan, 1972 through Berry, 2001).

Additionally, Siegan compared Houston to Dallas which has zoning and found no major differences in single-family home siting and pricing. However, he did find higher rent prices for multifamily developments in Dallas where he argues exclusionary practices like zoning diminish its supply and increase its cost (Siegan, 2001). Feagin (1988) and Neuman (2003) similarly find it not coincidental that Houston is the only big city without zoning since it fits within a broader entrepreneurial political economic tradition embedded throughout its governing institutions. Buitelaar (2009) asserts that an urban regime has developed in which business elites and the local government work together to increase economic prosperity where the city serves to enable the private sector by

investing in significant infrastructure projects and refraining from restricting the private sector by means of government regulation (Buitelaar, 2009).

Berry conducted research on land use and social segregation between Houston and Dallas to account for the impact of (non)zoning and found no significant difference between income, race, tenure, housing type, or building size between both cities. He concluded the existence of an equally effective private system of land use control in Houston is evidence supporting, not undermining, the argument that patterns of segregation would not be much different without zoning. Further, he argues that land use controls for both zoned and un-zoned cities operate with informal practices and preferences to maintain residential segregation (Berry, 2001).

The Polycentric City

Houston, like other Sunbelt cities, came of age during the interstate highway expansion in the United States quickly overshadowing its well-knit 19th Century street grid. Development patterns reflect a low-intensity, auto-centric urban form with highways being the primary medium for accessing office, retail, and healthcare uses. Traditional monocentric-city models can be related to cities that developed before high-capacity highways were pervasive (Moore, Thorsnes, and Appleyard, 2007). Houston takes the form of the more contemporary, polycentric-city model with multiple employment centers in addition to a central business district (CBD).

Monocentric cities matured before the dawn of the automobile, during a time where technological cost-advantages for industrial production substituted farm labor (Moore, Thorsnes, and Appleyard, 2007). Thus, central trade nodes near ports or railroads provided a locational advantage and would become intense employment centers for emerging cities or CBDs. As automobiles and highways provided new cost advantages to firms, the need to locate next to import/export nodes decreased. However, transporting goods and services accumulated time and out-of-pocket costs so firms seek to reduce these costs by clustering.

Clusters grow until they reach their optimal size or when growth-induced costs exceed cost savings from agglomeration. Firms then begin forming new, additional clusters in hopes of cost advantages. Clusters depend primarily on roadway infrastructure to continue growing as employees working in clusters generally seek to locate reasonably close to their employment center. Growth in a cluster increases demand for travel, encouraging roadway improvements to increase capacity, resulting in improved access to the cluster and its surrounding grid. This encourages more growth in a cluster until it reaches a tipping point when adding capacity outweighs advantages of that capacity for travelers – reaching their efficient sizes with congestion.

Adaptive Transit Network

Houston's transit network has been designed to serve its vast-low-density development rather than shape it and is labeled an 'Adaptive Transit Network' in *The Transit Metropolis* (Cervero, 1998). Suburbanites make use of the nation's largest high-occupancy vehicle (HOV) network to access downtown jobs through bus, vanpool, or carpool in a system where these lanes reverse with commuting patterns – operating inbound in the morning and outbound by the evening. Highways deposit vehicles and buses through flyover ramps to park-and-ride lots along seven of the region's highways. Cervero claims Houston METRO's planners prefer to see the HOV network as a dedicated busway that accepts smaller transit vehicles – vans and loaded cars. This transportation demand management strategy maximizes the utility of existing capacity that led Houston to boast nearly 15% vanpool/carpool commuters in 1990 – one of the highest rates in the nation. Cervero suggests Houston's adaptive network is a model for this type of system, although it is not a sustainable model.

Why Houston?

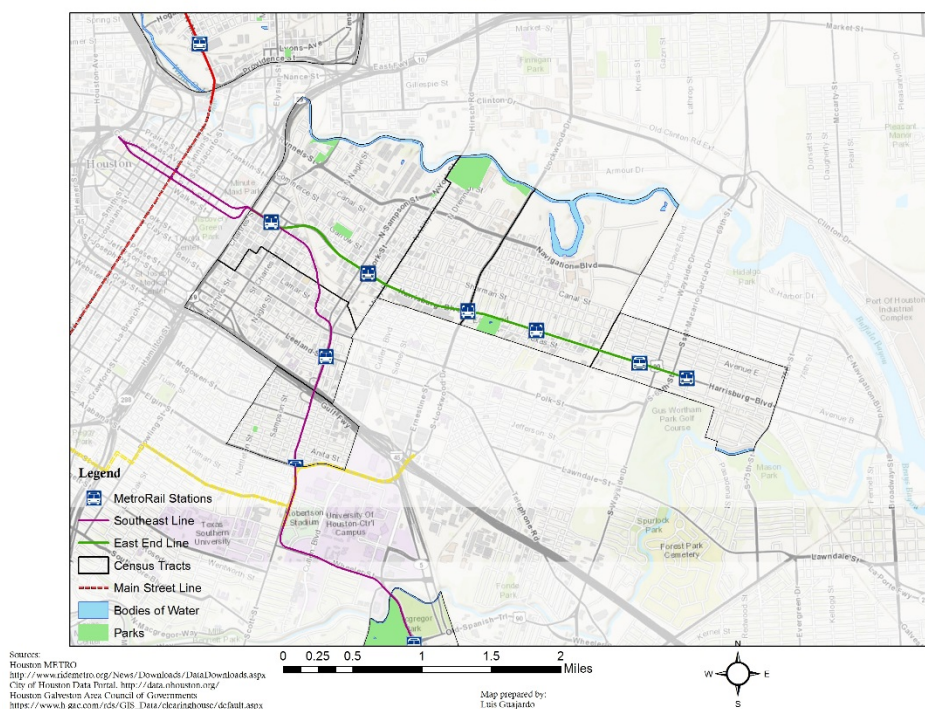
Transit will never be the same in Houston, and, Houston will never be the same due to transit. By 2020, thirty-five (35) miles of urban light rail will serve Houstonians, including seven (7) miles for a Bus Rapid Transit corridor (Uptown Line). The Main Street Line was the first light rail line in the city, opening in 2004. The Northside transit

corridor is a northward extension of the Main Street Line and opened service in December 2013 while the East End and Southeast lines are set to debut December 2014. Houston transportation plans signal to sixty-five (65) transit neighborhoods within the interconnected travel shed and are linked to the region's largest employment centers in Downtown, the Texas Medical Center, the area's largest universities, and the Uptown District (See Appendix B).

This is both an opportunity and a threat. Households in Houston pay approximately 61% of their income on housing and transportation expenses – 29% housing and 32% transportation – which is the eighth highest in the nation (Center for Housing Policy & Center for Neighborhood Technology, 2012). Moreover, housing and transportation expenses have increased by 40% in Houston from 2000 to 2012 (25% for housing alone) while household income has only risen by 24% (Center for Housing Policy & Center for Neighborhood Technology, 2012). Transit-Oriented-Development (TOD) will provide Houstonians with distinct housing choices for those seeking walkable communities near transit with potential household cost savings. Similarly, long-term public health and environmental benefits will ensue, even if marginal, by curbing the region's auto-centric development form.

Figure 7 East End Corridor

Houston, Texas



Nonetheless, low-income minority households living near new rail lines, those that stand to benefit most from improved access and reduced transportation costs, could be priced out of their neighborhoods. National studies suggest providing affordable housing near transit is an emerging challenge for major metropolitan areas. Houston's historically lax land use controls and meager affordable housing strategies make it ever more difficult for the region to seize this transformative opportunity to induce the development of affordable housing near transit. Therefore, tracking demographic and socioeconomic changes along transit corridors in Houston is important to understanding what changes are attributable to light rail investments.

A history of environmental racism in Houston has created stark differences between where whites and minorities live, work, and play (Bullard, 2007). A lack of zoning regulations, while enabling white-middle class and upper-class neighborhoods, has adversely affected minority neighborhoods. Houston's all-white, all-male city

government of the mid-20th Century steered landfills, incinerators, garbage dumps, and garbage transfer sites to African-American neighborhoods (Bullard, 2007). Apart from disinvestment, Bullard also reminds us that siting solid-waste facilities in black neighborhoods led to further stigmatization of these neighborhoods as dumping grounds for other unwanted uses that would further devalue their property (Bullard, 2007).

Additionally, Houston's zoning responsibilities were put in the hands of homeowner associations and citizens through private deed restrictions giving them the authority to regulate uses in their community. This affected lower-income and minority neighborhoods that struggled to enforce and renew deed restrictions in neighborhoods with higher turnover and less homeowners (Bullard, 2007). Although deed restrictions were available for low-income, minority communities, they placed an additional burden of self-government to communities with minimal resources and more pressing issues (Bullard, 2007).

Houston approaches a critical juncture in the coming years. It is important to cautiously assess how the siting of this major urban rail infrastructure, wanted or unwanted, needed or not, will affect neighborhoods with higher sensitivities to displacement. Particularly in a city with a tragic record of environmentally racist actions and an enigmatic affordable housing strategy, to date.

Recent planning efforts signal an embrace of urban planning norms in a city that has traditionally resisted them. Although a coherent affordable housing strategy is lacking in regional and city plans, compared to other sustainability initiatives. The city will undergo a comprehensive plan update in 2015, known as the Houston General Plan, to interconnect numerous planning initiatives underway. It will be interesting to see what type of affordable housing strategy emerges from this planning process.

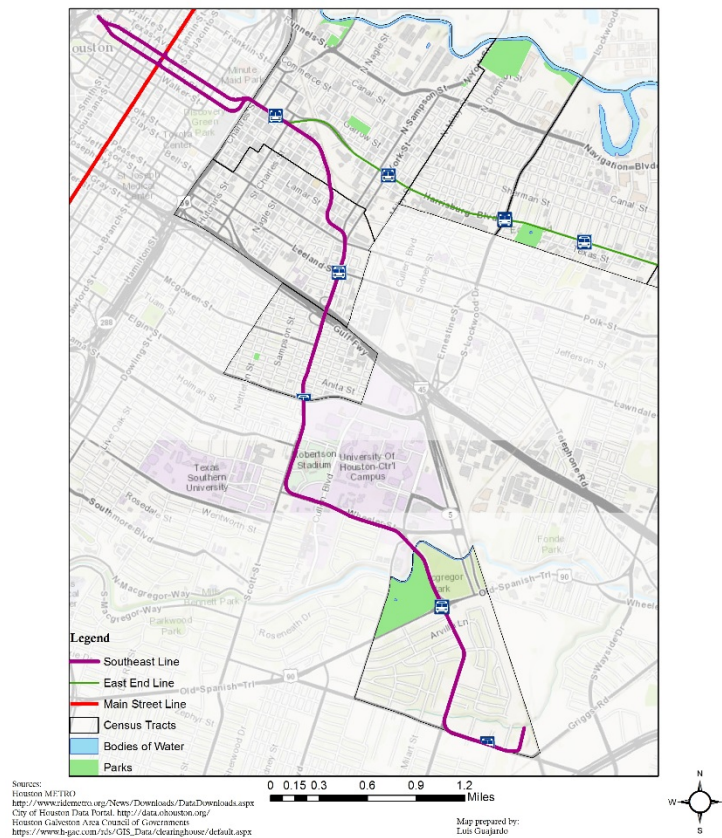
Current regional plans focus on developing livable centers (placemaking) around Houston's employment clusters to expand live-work-play neighborhoods throughout the region. Other notable strategies in Houston include adoption of a Complete Streets policy

(2013), urban design guidelines for transit corridors (2009), a new bikeshare program (2013), the Bayou Greenway Initiative (2020), MetroRail (2004), Transit Re-Imagined (2014), among others.

Figure 8 Southeast Corridor

Southeast Line

Houston, Texas



Research Method

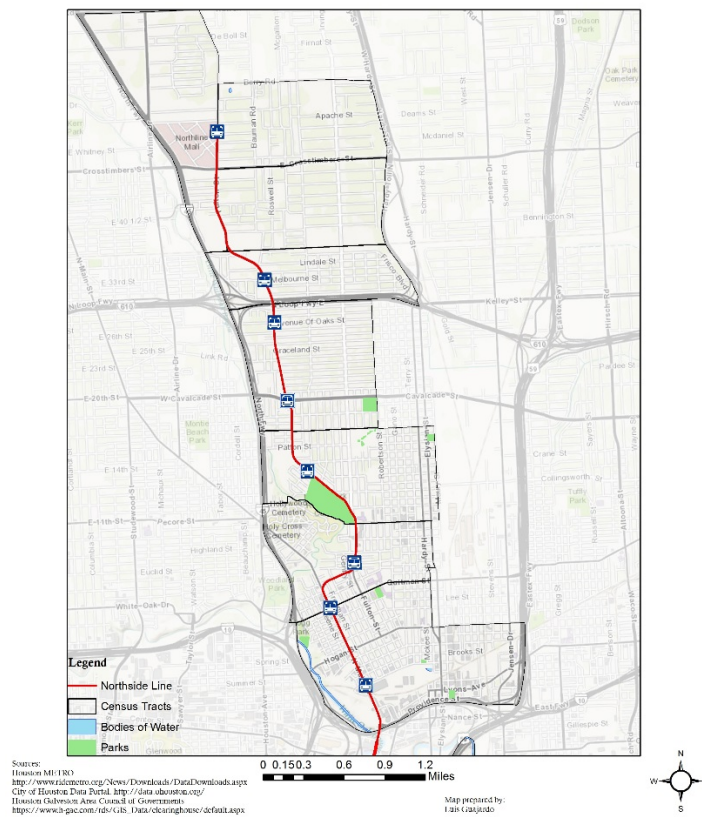
Revealed and stated-preferences are applied to triangulate research and better understand the complexity between housing and transit. Revealed preferences are covered by transit impact studies on land value, socioeconomic, and demographic characteristics. Stated preferences included are housing and/or living preference surveys by households. This approach yields both national and local information. Local studies included are 2012 housing preference surveys by the Kinder Institute for Urban research at Rice University

and a 2013 transit impact study for Houston’s first light rail line operating since 2004 by Qisheng Pan, Chair of the Urban Planning and Environmental Policy program at Texas Southern University. National and local information gives way to a local analysis along the transit corridors focused at the census tract level that includes tracts¹ with more than 50% of their surface area within a half-mile of the rail lines (See Figures 4, 5, & 6). Both the research and analysis provide an understanding for what will occur and frame local and state public policy changes that can mitigate neighborhood change in an equitable way.

Figure 9 Northside Corridor

Northside Line

Houston, Texas



¹ 15 census tracts are included with 50% or more of total area within a half-mile of the three transit corridors. Census tracts included: 2104, 2105, 2106, 2123, 2202, 2203, 2204, 2205, 3101, 3102, 3104, 3105, 3109, 3122, and 3133. Excluded: Census tract# 3121 from Southeast Line as it covers only the University of Houston and skews the statistical analysis.

CHAPTER TWO: LITERATURE REVIEW

This section includes research on evolving stated housing preferences since the 1990's to better understand potential implications of transit developments for local housing markets. I then shift to revealed preference studies on transit and neighborhood change addressing how and why fixed guideway transit is altering housing markets. Included in this review are transit-impact studies, baseline information to track change, and projecting displacement. Consequently, I review local housing preference surveys from the Kinder Institute and the only light rail impact study conducted along Houston's Main Street transit corridor, in existence since 2004.

Ewing and Bartholomew describe the hedonic price analysis as a revealed preferences method with certain limitations in studying the transit-related-effects on real estate due to its reliance on transactional data (empirical). Future research could overcome these limitations by mixing revealed preference and stated preference methods. Stated preference data (i.e. surveys for housing preferences) could help to test the depth of the market for TOD and to explore more nuanced factors influencing buyers and sellers in a given housing market, while bounding the survey data with empirical observations of actual transactions.

Revealed preference methods such as hedonic price or travel cost analyses use empirical data from economic transactions to determine consumer's willingness to pay for goods while stated preference methods rely on assertions of preference, such as housing preference surveys (Bartholomew and Ewing, 2011). Both approaches are limited but when combined they illustrate a more complete whole for the effects TOD has on land values.

The authors suggest revealed preference approaches are limited in testing demand for goods that do not yet exist. They are inherently focused on the past, making the approach ineffectual for assessing policy or investment options not already represented in the market (Bartholomew and Ewing, 2011). Their strength lies in an intuitive demonstration

of consumer preference by selecting when they are required to prioritize competing demands for time and money.

Stated preference methods, on the other hand, are described by Bartholomew and Ewing as much more flexible since they dwell on hypothetical situations, allowing analysts to construct survey instruments designed to elicit motivations and influences behind respondent's choices. Drawbacks from SP methods center on their strengths as well. For example, respondents do not have to make choices with its attendant consequences, introducing more bias into the response. This bias may stem from several reasons other than preexisting political bias or intentions to affect the outcome of the survey. From respondents having incomplete information about the alternatives to a sense of triviality since decisions lack real consequences, bias is prevalent in SP methods.

Housing Demand in the 21st Century

Housing preferences are changing throughout the United States. Our current built environment represents a mixture of building preferences. Post-WWII preferences dominate both urban form and housing typology of the American city with ubiquitous auto-centric design and large-lot single family housing. Nevertheless, numerous surveys indicate a substantial shift in these preferences, most notably growing demand for attached housing near urban amenities cannot be satisfied by supply. Arthur C. Nelson labels this, "The Great Mismatch" in his 2012 *Mass Market for Suburban Development is Over*.

Nelson discusses similar patterns emerging throughout distinct housing surveys from 1990 to early 2000's (Nelson, 2006). He warns for bias from particular planning interests, yet, most stated preference surveys are from the development industry, to inform, the development industry. His literature review includes 1999's survey from the National Association of Home Builders (NAHB), 2011's National Association of Realtors (NAR) survey, and 2007's Robert Charles Lesser & Company (RCLC) survey.

In 2001, two planners from the University of Southern California, Myers and Guerin, analyzed NAHB's 1999 survey. They concluded, "housing demand is growing in specific niches where supply is short" (Myers and Guerin, 2001). Their findings suggest preferences for townhomes and condominiums amounted to 17% while only being 10% of the available housing stock with 30% of respondents supportive of townhome construction in their neighborhoods (Myers and Guerin, 2001). Simultaneously, the authors found significant differences between age group respondents. Late-middle-aged adults prioritized urban amenities such as nearby transit and shopping at twice the level of young parent households. Additionally, their demographic estimates predicted a significant increase in households with adults 55 and over and a decrease of households with children. The authors combined housing preferences with their demographic projections to predict, "Preferences would add greatly to the growing market impact of home seekers preferring compact-city alternatives" (Myers and Guerin, 2001).

Nelson synthesized numerous surveys from the 1990s through early 2000s through an undisclosed methodology finding 38% of Americans preferred attached housing products (townhomes, condos, apartments, and cooperatives), 37% wanted small-lot single family homes, and 25% preferred large lot homes (Nelson, 2012). Nelson also includes data from the RCLC and NAR's surveys completed in 2007 and 2011, respectively. The former indicated a 34% preference for attached housing, 35% for small lots, and 31% for large lots (Nelson, 2012). The latter survey indicated a 39% preference for attached housing, 37% for small lots, and 24% preferred large lots (Nelson, 2012).

"The Great Mismatch" is explained by Nelson as the growing surplus of our large lot housing inventory as compared to current-day housing preferences. By combining housing surveys, including 2009's American Housing Survey, Nelson infers attached housing products constitute 30% of the nation's housing inventory while large lot housing accounts for 40% of the supply. Given the demographic changes, this implies a 20 million surplus of large lot housing than demand calls for (Nelson, 2012). Most

importantly, Nelson's mismatch theory suggests prices may soar for small-lot and attached housing in markets with limited supply and growing preferences.

It remains unclear for the type of price premiums directly attributed to supply mismatches in American housing markets. However, calculating mismatch between regional housing inventory and housing preferences could help provide context for analyzing regional housing affordability. In Houston's case, it is useful to examine the Kinder Institute's Houston General Survey on living preferences against American Community Survey results for household characteristics at the metropolitan level. In addition, townhomes in Houston are not considered attached row houses, and thus, are classified as 1-unit detached structures by the American Community Survey unlike housing preference surveys, where they are considered small-lot, infill housing.

So, we now know housing market preferences are shifting, but, how does transit infrastructure affect housing prices and characteristics? If this type of housing is becoming a commodity in cities, then what are the ramifications of transit proximity to these features and what particular characteristics are causing price increases? The next section explores transit impact on land values and socioeconomic and demographic characteristics.

Rail Transit and Gentrification

Studies reviewed in this section cover the impact of light rail transit on land values, socioeconomic factors, and other indicators to predict displacement. Qisheng Pan's literature review covers findings from multiple transit impact studies on land values, including light rail, heavy rail, and commuter rail. Light rail transit studies from Pan's review are included while heavy rail and commuter rail are briefly referenced for a comparative purpose. Beginning with Pollack et al. studies are reviewed with a format that includes an overview, methods, and results section. Pan is not reviewed in this manner because his methods and results are covered later in the report under the Chapter Three as a local baseline.

Pollack et al. delve into socioeconomic and demographic consequences from transit to amplify ‘narrowly-focused’ research favoring non-gentrification indicators (Pollack et al., 2010). Also included is a 2014 study by Boston’s regional planning commission (MAPC) focused on diagnosing displacement risk along a new light rail corridor in Somerville, MA. I seek further evidence on the influence of fixed guideway land values; Bartholomew and Ewing’s review on Hedonic Price Effects of TOD (2011) propose two causal factors commonly uniting in fixed guideway transit projects; access and design features. And, for purposes of determining and conducting a transit-housing analysis in Houston, literature from these studies is reviewed on the following three topics: catchment areas, baseline socioeconomic traits, and projecting displacement (See Appendix G, for all studies).

Light rail’s impact on land values, demographics, and housing: Key Findings in the Literature

Pan’s examination of transit impact studies on land value points to an inconsistent pattern across North America (Pan, 2012). These studies stay within the limitations of impact on land values as opposed to Pollack et al. who delves into socioeconomic and demographic change caused by transit. Pan’s findings associate positive effects on residential property values, yet, vary depending on a study area’s income levels, distance to employment areas, and proximity to rail stations.

Pan analyzes three light rail studies in his review. First, Al-Mosaind et al. studied light rail effects in 1993 finding positive capitalization of values for properties within 500 meters or approximately 1/3 of a mile from light rail stations. Property values within this boundary were 10.6% higher than outside properties, decreasing by \$2,175 USD for every 100 meters further away (Pan, 2012). Second, Chen et al. studied Portland in 1998 through a hedonic approach to evaluate light rail’s impact on single-family homes. Their results were also a net positive effect beginning at a 100 meter or 328 foot distance from the station where values begin to decrease further away (Pan, 2012). Pan also included a more recent study by Hess and Almeida in 2007 for Buffalo and New York City. Their

hedonic method results showed positive capitalization in high-income station areas and negative in low-income station areas with property values increasing \$2.41 for every foot closer to a light rail station (Pan, 2012). More details from Pan's study is provided later in this chapter.

Overview

Pollack et al. went beyond land capitalization, studying socioeconomic characteristics with the siting of new stations in transit-rich-neighborhoods (TRNs). TRNs were determined by half-mile catchment areas without data limitations and complications from 1990 to 2000 Census. Their research indicates a substantial shift in demographic and economic traits, particularly in *light rail* station areas. Housing became more expensive, neighborhood residents wealthier, and vehicle ownership more pronounced; a pattern of rising housing costs and incomes. Among the more startling findings are rapidly rising housing costs for vulnerable renters and the influx of automobile-owning households into transit-rich, predominantly low-income neighborhoods (Pollack et al., 2010).

Methods

The authors selected a heterogeneous set of forty-two TRNs from twelve metropolitan areas. with heavy rail, light rail, or commuter rail stations opening between 1990 through 2000 and divided into four transit system classifications: large-sized-evolving, medium-sized-evolving, small-fast growing, and emerging. Emerging stations were eliminated since they were built post-1997, giving no time for demographic changes to surface by the 2000 U.S. Census (Pollack et al., 2010).

Three types of analyses were conducted in this study. First, determining how and what particular demographic changes differed from changes in its respective metropolitan area. Second, Pollack et al. focused on differences of 20 percentage points or more between the TRN and its surrounding metro area to point out significant differences and counter the study's small sample size. And third, they analyzed results by transit-type analysis to test each mode's prevalence in affecting neighborhood change.

Results

Renters were more susceptible to gentrification as 62% of the TRNs experienced faster growth of owner-occupied units than their metro area. TRNs with more renters also demonstrated significantly higher rates of in-migration of owner-occupied household units, substituting with renter-occupied units (Pollack et al., 2010). Even more troubling, *light rail* stations were consistently found to be placed in predominantly lower-income, renter household neighborhoods than were heavy rail or commuter rail stations. Owner occupancy not only increased throughout higher-renter TRNs but increased at alarming rates in *light rail* TRNs, exceeding the metro area by 146% where heavy rail and commuter rail's impact stayed on pace with the MSA (Pollack et al., 2010).

Median incomes rose by 77% in *light rail* TRNs when compared to the metro area as opposed to an 18% increase in heavy rail and 2% for commuter rail TRNs (Pollack et al., 2010). Median home values increased in *light rail* TRNs by 500% more than their metro area for owner occupied housing while increasing at 217% in heavy rail and 24% in commuter rail TRNs (Pollack et al., 2010). Although rental housing was shed from *light rail* TRNs, median rent rose by 50% more than their metro compared to only 30% more for heavy rail and 10% more for commuter rail.

Most astonishing, the rate of people commuting through public transit decreased in 12 of 16 *light rail* TRNs, albeit, this statistic is masked by growth in total number of riders due to increases in total housing units (Pollack et al., 2010). Meanwhile, heavy rail and commuter rail TRNs proved more effective in drawing commuters to transit with heavy rail increasing at 20% and commuter rail at 60% compared to the overall growth in the metro area, while *light rail* decreased approximately 5% (Pollack et al., 2010). Moreover, households owning two or more cars outpaced metro area growth by 52% in *light rail* TRNs, while heavy rail TRNs increased at 16% and commuter rail TRNs shed households with two or more vehicles (Pollack et al., 2010).

Overview

Boston's Metropolitan Area Planning Council (MAPC) – their regional planning commission – concluded a study in 2014 funded through the Partnership for Sustainable Communities to diagnose displacement risk along a new urban rail corridor in Somerville, MA. Somerville is located just 2 miles north of Boston and is one of New England's most densely populated cities, comprising 75,000 residents within 4 square miles. Currently, a trip to Boston requires multiple transfers or modes. With the advent of the Green Line (GLX) there will be a one-seat ride into Boston, attracting new growth to the GLX corridor with improved access in a historically diverse community.

Methods

MAPC established a two-fold strategy to understand displacement risk. First, a baseline analysis with current demographic information, and secondly, measuring the magnitude for displacement grounded on four locally-common displacement drivers [*rent increases, condo conversions, expiring affordability, and property tax increases*]. The way displacement risk is assessed varies by indicator. For example, rent increases includes assessing the number of lower income renter households not currently cost-burdened but who will become so as a result of rent increases near stations.

Results

Projections indicate significantly higher rental costs and a shift from rental properties to condominiums will ensue over the next fifteen years. Transit-induced rents near stations are predicted to increase between 25% - 67%. Moreover, 8.4% of Boston's designated affordable housing stock is located in Somerville and facing expiring affordability by 2020. For owners, the prospect of converting expiring units to market rate will be even more enticing if predicted real estate conditions take effect soon.

Pan's review of the literature reveals mixed results for land value appreciation but that is also a function of the methodologies applied in those studies. The bulk of his cited studies use inconsistent measures that do not allow us to make assertions on transit impact on land value, particularly varying in distances or sources such as rail stations and bus stops.

Many of these studies are unclear and seemed to include bus stops into their studies on fixed guideway stations, which will skew the data. Access-related improvements are not singular to transit impact as was the focus of the studies in Pan's review and as we will see in the consequent section, design-related features from non-transit sources expand the discussion on the hedonic price effects from transit.

Pollack's study warns us light rail changes neighborhoods with low-income, renter-occupied households for higher-income, owner-occupied households that drive more because they can afford it. Assessing Houston's current corridors is important to understand similarities at the socioeconomic and demographic level. Since land value's impact may be derived from multiple sources, it is important to distinguish which factors are transit-induced. The next section reviews literature seeking to understand why land value appreciates from transit sources.

Why does land value appreciate?

Infrastructure projects are likely to bring about demographic or socioeconomic changes to neighborhoods with amenities and dis-amenities that can affect the calculus for housing renters, buyers and sellers. Bartholomew and Ewing suggest a mutually-dependent effect occurs between access and design-related features and their impact on land value, which they call a 'synergistic effect' (Bartholomew and Ewing, 2011).

Bartholomew and Ewing conducted a meta-study on the hedonic price effects of TOD on land values. They designated studies into two distinct categories since both are branches of TOD hedonic price literature; access and design-related. Their review indicates real estate prices are capitalizing from the emerging housing market preferences. Most importantly, amenity-based features of TOD reflect an important role in urban land markets, independent from improved access to transit. Essentially, older transit infrastructure in desirable places where amenities are developing, are susceptible to the same price capitalization or gentrification pressures as new developments where both are occurring simultaneously.

The authors define the hedonic price analysis as a two-sided method; structures built on the land, and, the land itself. Features affecting structures on the land include square footage, number of bedrooms, age of the house, or the presence of a pool among others. Land, however, is divided into two portions; access and design related characteristics. Accessibility includes distance to amenities or dis-amenities like parks, transit, schools, landfills, or crime-ridden areas while design related attributes consider the design of a transit station, open and public spaces, or street design. Most importantly, the authors point to the “synergistic effect” occurring between these two categories by referencing a series of studies in San Diego and Phoenix that demonstrate “transit station proximity provides no statistically significant price premium in the absence of a good pedestrian environment and vice-versa” (Bartholomew and Ewing, 2011). They warn about design-related improvements inducing price capitalization where transit access already exists; asking planners to be aware of this unconventional price effect on land.

Bartholomew and Ewing’s meta-study of hedonic price effects on property values signal a warning message for MetroRail’s impact in Houston. According to their findings, simultaneous improvements of access and design related features yield significant capitalization on land values. Their review also indicates real estate prices for denser transit oriented development are increasing from emerging housing market preferences measured through stated preference methods. Most important, amenity-based features of TOD reflect an important role in urban land markets, independent from improved access of transit. Essentially, older transit infrastructure in desirable places or places becoming more desirable with added amenities, are susceptible to similar price capitalization pressures as developments where both occur simultaneously. For Houston this equates to additional price pressures with added streetscape improvements in Houston’s rail corridors, which, are essential for neighborhoods to access rail infrastructure. The following section details indicators to determine a corridor analysis for Houston’s rail lines.

Indicators

Catchment Areas

Robert Cervero suggests dropping the term TOD in favor of TOC or Transit Oriented Corridors in *The Transportation/Land Use Connection* (2007). He describes corridors as natural sub-regional travel sheds where activities, such as shopping, recreation, and perhaps even working, occur within these loosely defined sheds ranging from six to eight miles. According to Cervero, developing linear TOCs in cities can reduce cross-haul trip making for scattered trip origins and destinations that leads travelers to opt for automobiles over transit. Thus, TOCs allow trains and buses to get filled in both directions not only during peak hours, but also in the midday and throughout the week. In its current form, the study area takes the form of a TOC, sharing employment destinations and residential communities that perhaps might bring more recreational, shopping, and employment uses.

Guerra, Cervero, and Tischler conducted a meta-study in 2011 to test the commonly accepted half-mile catchment area for transit station areas by reviewing 1,449 transit stations in 21 cities across the United States. The authors found a minimal influence between different catchment areas and predicting station-level transit ridership. For land use purposes, their research supports a quarter-mile catchment area for retail and office uses and a half-mile for residential types. Guerra et al. caution these recommendations as starting points in considering local TOD policy.

Canepa challenges the traditional half-mile standard by studying reasons transit users may walk greater distances than a half-mile (Canepa, 2007). He concludes housing density, employment density, and urban design greatly influence walking patterns as pedestrians are not interested in the distance but rather their perceived travel time in reaching a destination. Factors such as density and design may influence pedestrians to travel more than 0.5 mi but suggests a prescriptive solution remains rather elusive or context-based.

According to MAPC, walksheds are not simply half-mile circles around a station but depends on pedestrian routes feeding into them. MAPC defines a walkshed as, “the area within a half-mile walking distance of a transit station, taking into account the network of sidewalks and other pedestrian through-ways” (MAPC, 2014). The Houston corridor in this report is primarily in an area with low-density-minimal-design features. Thus, it should be studied at the corridor level, with half-mile radii in evaluating residential and employment uses.

Socioeconomic

Pollack et al. describes transit-related gentrification research to be “lacking a broader set of factors.” Pollack claims that although 95% of American households own a car, people of color, low-income households, and renters disproportionately live in households without a vehicle and are more likely to use transit. This group is also referred to as core transit riders. Additionally, they make the case for understanding neighborhood change as vital to ensuring core transit riders continue to benefit from using transit. Moreover, the authors emphasize the number of fixed guideway transit systems now in 41 Metropolitan Statistical Areas (MSAs) of the United States which will continue to attract a wide range of riders through transit oriented development. Thus, their research sought socioeconomic and demographic data at both the neighborhood and metropolitan scale for a comparative analysis of changes. Variables included:

- Population growth
- Housing units
- Housing tenure
- Racial & ethnic composition
- Median household income
- Households with incomes above \$100,000
- Gross rents
- Home values
- In-migration
- Public transit use for commuting
- Motor vehicle ownership

Boston’s MAPC area-stakeholders decided to study displacement risk with a two-fold analysis. First, they determined benchmark demographic indicators to monitor over time, and secondly, a four-step method to project displacement potential along the corridor based on development

patterns in comparable neighborhoods. Their baseline analysis identified three categories of indicators (**Table 1 MAPC's Indicator Categories**) to assess changes along the rail line's walkshed. Each indicator put forth is measured against its respective regional share to identify if trends are widespread or contained.

Table 1 MAPC's Indicator Categories

Demographics and Migration	Housing and Households	Transportation
Economic Diversity	Housing Cost Burden	Vehicle Ownership and Mileage
Racial and Ethnic Diversity	Families with Children	Commuter Mode Share
Migration by Race	Equitable Homeownership	Transit Commute Times
Migration by Income	Designated Affordable Housing	
<small>Source: The Dimensions of Displacement: Baseline Data for Managing Neighborhood Change in Somerville's Green Line Corridor. MPAC, Feb. 2014.</small>		

Baseline Indicators

MAPC assessed economic diversity by tracking the share of low-income households in Somerville to gauge displacement or replacement through time with HUD's Comprehensive Housing Affordability Strategy dataset. According to the MAPC study, stable or increasing shares of low-income households indicate the presence of affordable housing. Racial and ethnic diversity is closely tied to economic characteristics as higher-income households are disproportionately white. A declining number of residents of color indicates displacement processes may be underway. Monitoring racial and ethnic composition through the American Community Survey is utterly important to ensuring residents of color have access to the new services. Areas with rapid population turnover, such as Somerville where nearly one in six residents moved in within the last year, register demographic changes more sensibly. For example, the city's demographics will be drastically changed if modest changes occur in the economic or ethnic characteristics of in-migrants.

Households paying more than 30% of their income on housing are considered 'housing cost burdened.' Stagnating wages or rising housing costs in a local market affect borderline families. According to MAPC, households face increasing difficulty in securing affordable housing if the share of cost-burdened low-income households rises locally. They also suggest evaluating the share of non-cost burdened low-income households for the city to determine if cost-burdened households can stay in the city without being strained by high housing costs. A changing housing stock might not cater to everyone, especially as the demographic characteristics continue to

indicate a decline in housing for families. Families with children may be declining in certain areas not necessarily due to national trends, but simply because new housing options are not catering to them. MAPC recommends comparing these households to the region to see if there is a regional trend and how it relates to state or national trends.

Moreover, considering homeownership rates by race and ethnicity in the watershed relative to the city, region, state, or other surrounding jurisdictions will demonstrate the corridor's disparities or strengths. Evaluating designated affordable housing helps understand the corridor's likely impact on low income households. For example, MAPC states if the absolute number of deed-restricted affordable units is rising and its share of total units is stable then it is keeping pace with, if not reducing, the affordability challenge relative to its population growth. If the absolute number of subsidized units is growing but its share of total units is declining, then the city should consider strategies to increase its ability to produce affordable housing.

Vehicle ownership and mileage increases indicate poor transit services not capable of meeting residents' needs and/or that high-income, less transit-dependent households make up a larger share of the population. Both outcomes undermine mobility policy objectives of an urban rail project to reduce dependence on automobiles. Similarly, commute mode share numbers allow for conclusions about travel behavior, albeit, strictly related to work commutes. MAPC recommends studying this indicator with awareness of broad economic conditions such as recessions or gasoline price fluctuations that result in modal shifts. Transit commute times, in theory, should be reduced with high capacity rail transit as bus commutes experience longer wait times and more frequent stops. Most importantly, improved commute times increase accessibility and are a factor in the capitalization of transit benefits with land values, identified by Ewing and Barthalemuw.

Projecting Displacement

MAPC focused on changes around comparable neighborhoods to determine variables for projecting displacement risks. Rent increase projections, condominium conversions, expiration of affordability deed restrictions, and property tax increases were identified as the most significant drivers for displacing low-income renters and homeowners in the Boston area.

In the study, rent increases were projected based on rent premiums at stations along the walkshed and those of existing nearby rail stations. Cost-burdened, low-income renters are the most vulnerable to rising rent increases and could be a significant amount of the study area's population which would be revealed through the baseline analysis. Rent increases are projected by comparing current rent premiums at walkshed stations to rent premiums at existing, more mature stations nearby. Essentially, the rent premium is the ratio of station walkshed mean rent to mean rent more than ½ mile from the station.

MAPC planners projected rent increases with two models. First, a weighted average method to account for small sample sizes around stations, secondly, a linear regression model to control for other neighborhood characteristics that may also impact rental prices. Walkshed area rent increases are then induced from the ratio of the average premium among the existing station walksheds to current premiums at each proposed station. Results project a number of current residents that would become rent-burdened, as a result.

Condominium conversions or the conversion of rental properties to homeowner properties occurs when higher-income residents attracted to a given community's revitalization are inclined to seek for-sale properties than rental. Simultaneously, owners of existing rental units may find it profitable to convert their properties to a condominium for a more rapid and lucrative return on investment. The MAPC study indicates the importance of distinguishing between condominiums added through new construction and conversions because new construction can meet market demand without displacing existing residents. In their study, MAPC planners retrieved data from Somerville's Planning and Community Development Department and the tax assessor to identify building types of condominium conversions. This helps understand rental building types that may be at risk of conversion. For example, if two or three family buildings are the majority of conversions, then, apartment buildings with four or more units are at lower risk of condo conversion displacement than two or three bedroom building types.

Comparing condo conversions along the corridors to comparable neighborhoods in the metro area and regional shares also provides valuable information to assess the direction of condo conversions, if it is even occurring. Condo conversion projections were calculated by the prevalence of condo conversions along the Red Line transit corridor in Boston, then estimating how many conversions the Green Line corridor would stimulate. In order to ascertain rental unit

loss due to condo conversions, MAPC planners matched property addresses to owner addresses through their tax assessor's data and concluded 30% of units of units in common-ownership of two and three family structures were occupied by the owner of the building. In this way, they estimated a low to high window if structures were owner occupied prior to conversion or high if all are investor owned.

Acquiring data on expiring affordable housing provides additional information on the potential loss of affordability within a transit corridor. An important distinction must be made between project-based and deed-restricted affordability. The former may come as a supply-side subsidy from the state or federal government to a private entity to offer affordability for a predetermined period of time. The latter usually occurs through government-backed financing with affordability and fair housing terms that run with the land in perpetuity. Identifying expiring affordability contracts before they expire may enable extended affordability.

MAPC states the challenge in appreciating markets such as transit corridors is more acute since owners may have less incentive to renew their contracts and chose to convert units to market rate. This could displace many lower-income households. MAPC planners evaluated soon to expire affordability permits for both project-based and rent-restricted units, in Somerville and along the corridor.

Rising property values also cause tax payments to increase dramatically, particularly in property-tax dependent states such as Texas where this study is taking place. Homeowners most affected by rising property taxes are not simply low-income households. Those with fixed incomes like seniors or people with disabilities must be vigilant for rising tax bills. MAPC planner's model estimated the range of potential increases, not to forecast the value of specific properties or the relative increase in station areas. They estimated a "proximity premium" of Somerville properties within a half-mile of existing stations (along the older transit corridors) which are worth 27% more than comparable properties further away from those stations. The proximity premium is then added to determine hypothetical increase in assessed value for homes along the transit corridor and the percentage of income the increase would represent at various income levels.

Planning in Houston

This section reviews the planning context to ground the reader in Houston's development pattern. Houston's planning and land use segment serves to demonstrate the impact local public policy tools or lack thereof have on Houston's development. Houston's extensive use of special purpose districts for planning, second only to New York City, is described to distinguish their planning priorities along the rail transit corridors. Most are investing in design-related improvements and public perception of their neighborhoods to induce a larger tax base while only one has decided to invest significantly in affordable housing. And finally, the transportation network is explained first in addition to current-day regional and city plans for housing at the end of this section to underscore the inconsistent commitment to affordable housing along this multi-modal transportation network. .

METRO Rail & Bus Transit Re-Imagined

Houston's transit system is undergoing transformative changes that will shape urban growth for decades to come. Prior to 2004, Houston METRO operated a bus-only system. By 2017, the network will include four light rail lines and one Bus Rapid Transit (BRT) corridor (Uptown Line) – totaling 21 service miles. The 5th rail line, University Line, is a 10 mile corridor planned to run from the populous neighborhoods to the west to the major employment, medical, and university destinations in central Houston but faces staunch opposition by U.S. Representative, John Culberson. This line would also connect the four light rail lines to the BRT corridor in the Galleria Neighborhood (See Figure 3). City council approved a Transit Corridor Ordinance in 2009 to supplement light rail corridors with urban design guidelines. Consultants and the Urban Land Institute provided recommendations to the Planning Commission's committee on Mixed-Use/TOD to help draft an ordinance (City of Houston Planning and Development Department, 2009). Performance measures, construction and maintenance standards, and Transit corridor streets and intersecting streets require ADA accessible sidewalks. Additionally, future city sanctioned permits will require a pedestrian access plan.

Figure 10 METRORAIL System Plan



Source: Houston Metro

Houston Reimagined is a breakthrough plan to restructure METRO’s bus network to better serve the residential growth west of Downtown. The plan calls for a “Frequent Network” which are bus corridors with 10-15 minute frequencies covering over a million residents and a million jobs. This high-frequency grid will improve convenience from the current alignment centered on the outdated monocentric city model.

Jarrett Walker, transit consultant leading the initiative, claims Houston’s transit network does not account for its current polycentric growth pattern, rather, its network focuses on feeding the CBD which now has only 25% of the region’s employment (Walker, 2014). Moreover, service would be expanded to seven days a week and would run until 1 AM for no additional costs by simply removing inefficiencies in the current network. Transit Re-Imagined is set for public comment in Spring 2015 in anticipation of launching new service by Summer 2015. See Appendix C Existing Bus Network and Appendix B Re-Imagined Bus Network for a comparative view of both networks.

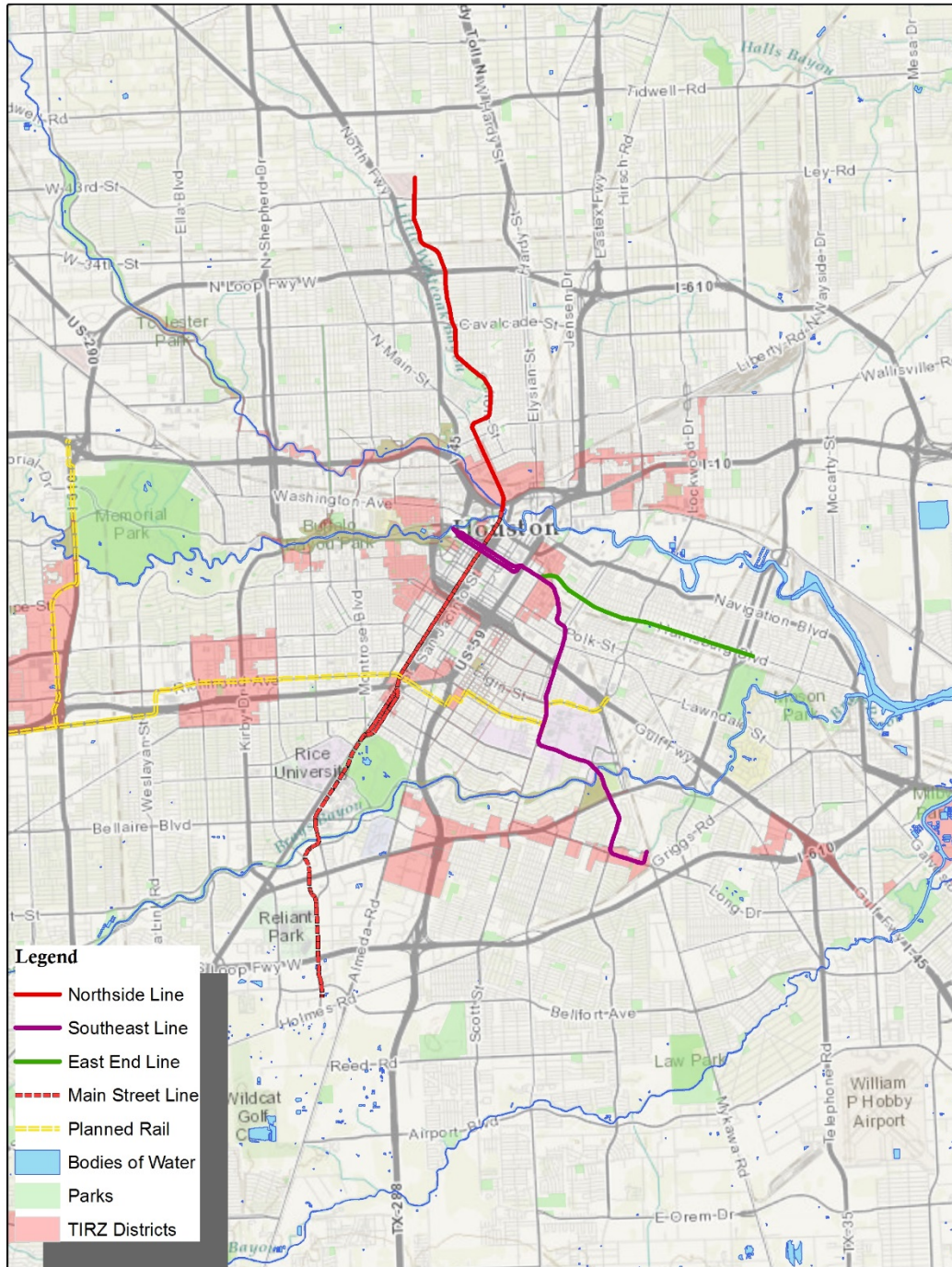
TIRZ & MMDs

Since 1980, Houston has compensated for its lack of planning and infrastructure by establishing city enabled Tax Increment Reinvestment Zones (TIRZs) and state-enabled, Municipal Management Districts (MMDs). Layered throughout the city, TIRZ's and MMD's may be assembled together or in proximity to provide sufficient planning and infrastructure revenue in areas where residents desire more public services and amenities. Both are special purpose districts, although, TIRZ's are created particularly to attract new investment in an area by financing redevelopment costs up front (City of Houston, 2014). Houston is second to New York City in its use of special purpose districts, adding a valuable layer for planning and governance to its limited toolbox, although these districts come with particular shortcomings.

TIRZ districts are determined by the city for redevelopment purposes in areas determined as an economic or social liability to public health, safety, morals, or welfare (City of Houston, 2014). TIRZ districts are financed in a tax-increment manner by setting aside taxes attributable to improvements in a fund to pay for continued capital improvements. (Blueprint Houston, 2013).

Figure 11 Houston TIRZ Map

Houston, TX



Sources:
 Houston METRO
<http://www.ridemetro.org/News/Downloads/DataDownloads.aspx>
 City of Houston Data Portal. <http://data.ohouston.org/>
 Houston Galveston Area Council of Governments
https://www.h-gac.com/rds/GIS_Data/clearinghouse/default.aspx

0 0.5 1 2 3 4 Miles

Map prepared by:
 Luis Guajardo

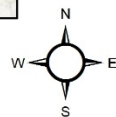
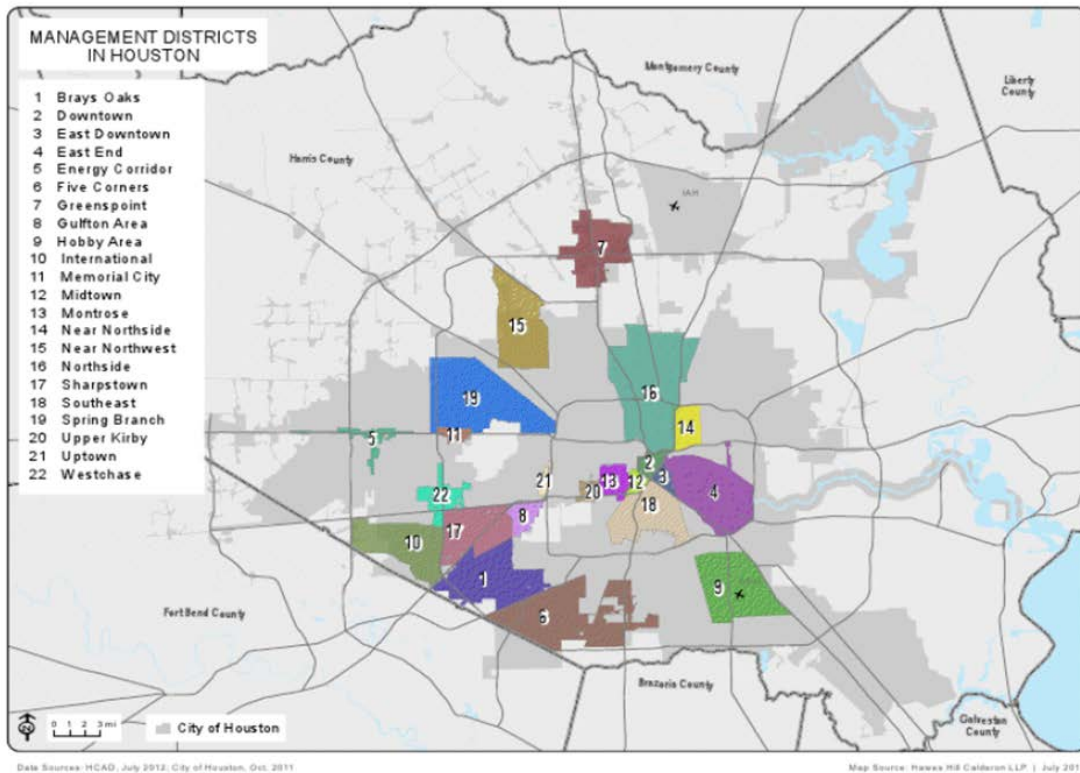


Figure 12 Houston MMD's Map



Source: City of Houston

MMD's are petitioned by local communities through their state elected officials that must then pursue state legislation under Chapter 375 of the State's Local Government Code. MMD's are encouraged to supplement city services for all uses except single-family homeowners. They are categorized into three types – major activity center, neighborhood commercial corridor, and redevelopment zones (Blueprint Houston, 2013). Blueprint Houston (2013) defines them in the following way:

- **Major Activity Center** – dominated by high-rise buildings and other commercial property with a predominance of office and retail uses that could include medium-density residential uses. The impetus for their creation is focused on economic development. Downtown, Uptown, Westchase, Greenspoint, Memorial City, and the Energy Corridor are in this category.
- **Neighborhood Commercial Corridor** – include a mix of residential, commercial, and industrial uses. The goal is to stabilize declining or under-performing commercial corridors to assist neighborhood preservation. Districts in this category include – Greater

East End, Greater Northside, Greater Southeast, Montrose, Spring Branch, Sharpstown, International, Brays Oaks, Five Corners, and Near Northwest.

- **Redevelopment Zone** – in evolving areas of the city where the primary goal is significant transformation from existing conditions. East Downtown, Upper Kirby, and Midtown Districts are in this category.

According to *Blueprint Houston* (2013), 34% of the city's land area is served by an MMD where the ratio is higher in the inner-loop at 40% -- a peculiar accomplishment considering the amount of deed restricted subdivisions in Houston. MMD's show several areas for improvement. For example, poor oversight and transparency were among the findings of a 2010 Special Report by the Texas Senate Intergovernmental Relations Committee on special districts (Texas Senate, 2010). In addition, *Blueprint Houston* suggest MMD's can enhance their effectiveness by improving several areas other than oversight and transparency. They claim an inconsistent coordination record with the city's large-scale capital improvement program (CIP), also known as *Rebuild Houston* coordination could bring rapid, non-redundant, infrastructure improvements. Capacity building between MMD's is noted as a cost-effective strategy to help the least-established MMD's avoid timely learning curves. Other strategies put forth include collaborative training between MMD's, advanced planning coordination, and electronic data bases illustrating their planning and investment efforts to better communicate with the public and planning partners (*Blueprint Houston*, 2013).

Livable Centers

The regional planning commission in Houston, named the Houston-Galveston Area Council of Governments (HGAC) has conducted activity-center planning for a regional growth strategy through a grant from the Partnership for Sustainable Development focused on integrating environmental, transportation and housing strategies through broad livability principles. HGAC named the concept "livable centers." Houston's livable centers take the form of current day high-density employment centers, planned for added TOD features, with compact and mixed uses designed to be walkable (HGAC, 2014). There are seventeen (17) livable center studies identified for the Houston region. Livable centers with planning studies along the transit

corridors include both the Northside and East End; central findings proceed this section. The Southeast transit corridor does not have a livable center study.

East End 2009 & Northside 2010

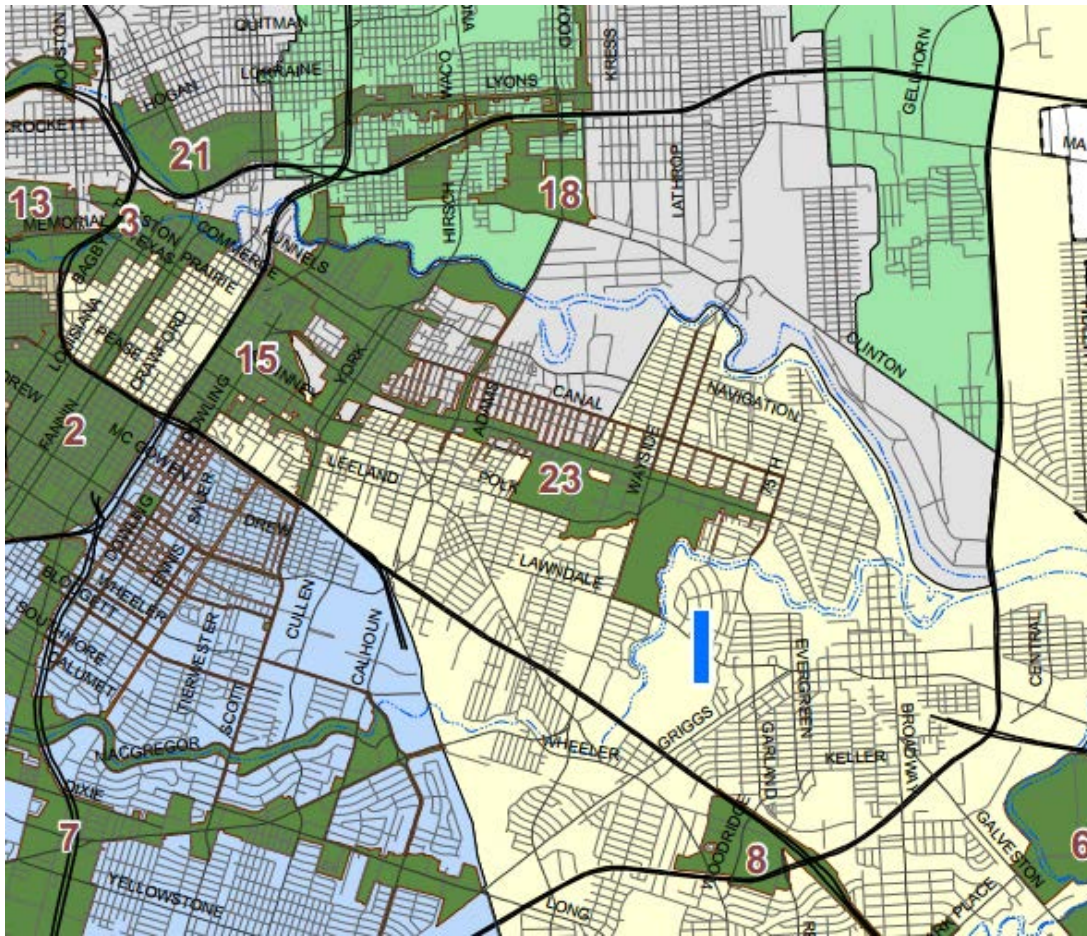
Both studies focus on developing design-related improvements to parallel the ensuing light rail investments. Property value appreciation is being sought to ultimately make both into more desirable neighborhoods to live in for Houstonians, according to the studies. The East End's study distinguishes itself for a more significant park and trail network linked to improving a decrepit part of Buffalo Bayou that passes right down the middle of it into downtown. This natural barrier requires a more significant investment, however, it could sustain higher land value appreciation over the long-run. Pedestrian improvements gravitate towards both the bayou to the north and the light rail line to the south. The Northside's livable centers study similarly plans to improve the pedestrian streetscape around a battered sidewalk network. Other immediate strategies focus on establishing urban design standards, encouraging medium density infill development, and identify underutilized properties throughout (HGAC, 2010).

Housing

Affordable housing planning varies in Houston because of the lack of zoning. Tax Increment Reinvestment Zones (TIRZ) or Municipal Management Districts (MMDs) often are formed to plan and provide land use planning, urban design guidelines, infrastructure, and affordable housing. There are inconsistencies for the provision of affordable housing along the rail corridors. For example, Houston's TIRZ #23² in the East End conducted a revitalization plan in 2011 in anticipation of the Harrisburg urban rail corridor (**Figure 13 East End TIRZ Districts**). The 30-year financing plan dedicates \$150,000 or 0.001% to leveraging affordable housing. To put this in context, this same plan has accounted for \$20,000,000 in cultural and public facility costs and \$15,000,000 for parks.

² not pictured on Figure 8 and Figure 14; GIS layer not available

Figure 13 East End TIRZ Districts



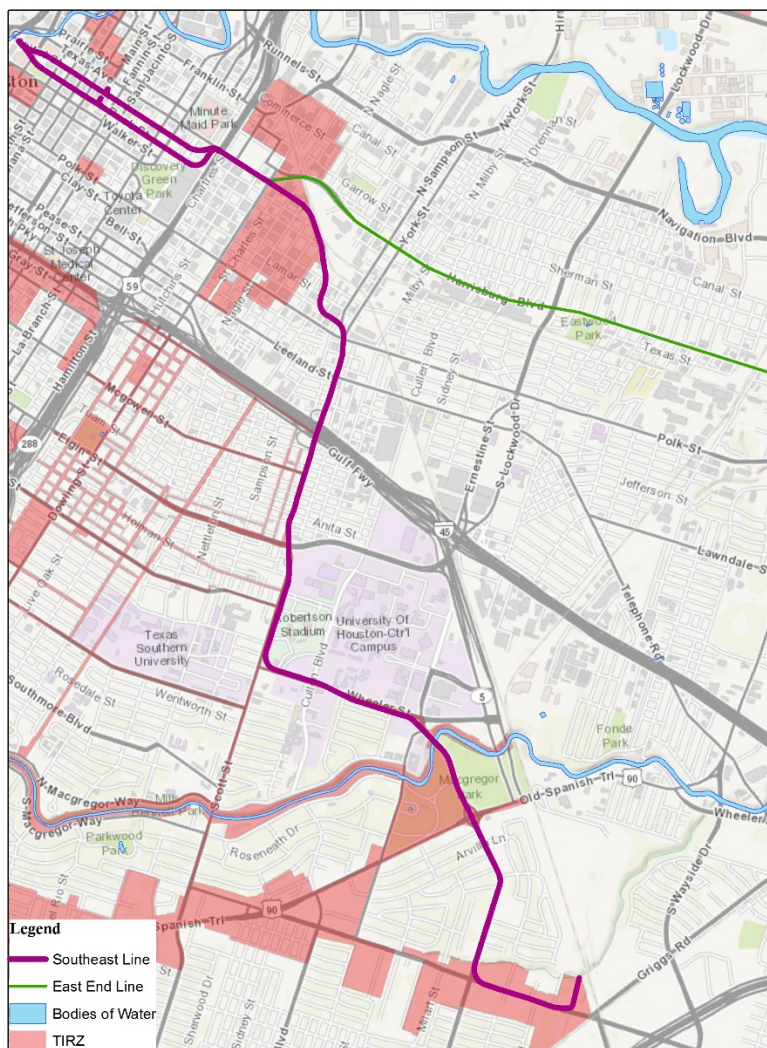
Source: City of Houston

The Southeast rail line has two reinvestment districts -- TIRZ #7 at the southernmost portion of the corridor and TIRZ #15 at the northernmost portion next to Downtown (Figure 14 Southeast TIRZ Districts). The Greater Southeast Management District also falls within the boundaries of the Southeast Line. TIRZ #15 in East Downtown has not allocated any funds for affordable housing while TIRZ #7 does not display their finance plan on the web nor does the City of Houston. The Greater Southeast MMD has also not allocated funds for affordable housing.

Figure 14 Southeast TIRZ Districts

Southeast Transit Corridor

Houston, Texas



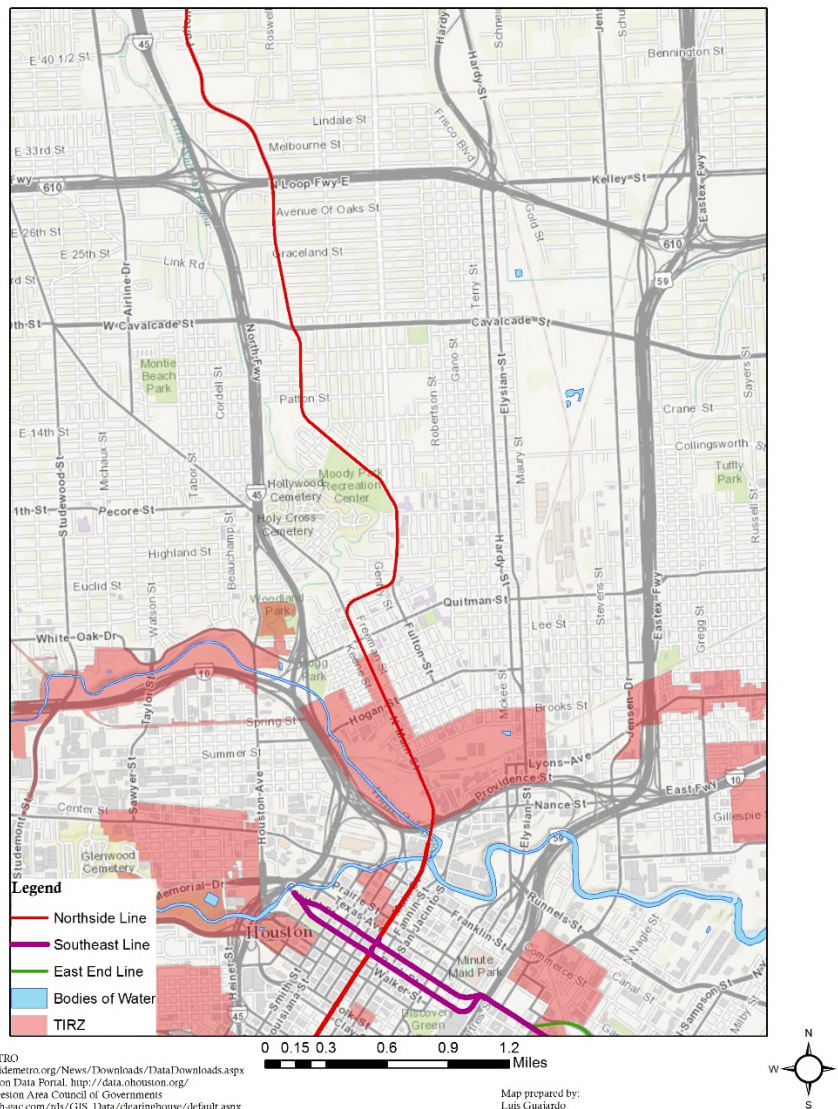
Sources:
 Houston METRO
<http://www.ridemetro.org/News/Downloads/DataDownloads.aspx>
 City of Houston Data Portal. <http://data.houston.org/>
 Houston Galveston Area Council of Governments
https://www.hgac.com/gis/GIS_Data/clearinghouse/default.aspx

Map prepared by:
 Luis Guajardo

On the other hand, Northside TIRZ #21 (Figure 15 Northside TIRZ Districts) has a city-sanctioned ordinance to guarantee the provision of affordable housing. Their 30-year financing plan identifies \$5,000,000 or one-third of the revenue, net of city and administrative costs, to preserve or leverage affordable housing. Moreover, this TIRZ defines their primary development objective to, “take advantage of the opportunity to participate in the growing Houston area market for new housing, predicted to be at 589,000 new units by 2033” (City of Houston, 2008). A more profound housing market analysis has not been conducted to account for affordable housing needs in either TIRZ.

Figure 15 Northside TIRZ Districts

Northside Transit Corridor Houston, Texas



Houston's Consolidated Plan 2010 - 2014

“Consolidated Plans allow states and local jurisdictions to assess their affordable housing and community development needs to make data-driven, project-based investment decisions.” (U.S. HUD, 2014) These are four year plans carried out through Annual Action Plans accounting for federal formula block grant funding such as the Community Development Block Grant (CDBG), HOME Investment Partnerships Program, Emergency Solutions Grant Program (ESG), and the Housing Opportunities for Persons with AIDS Program (HOPWA). The City of Houston’s Housing and Community Development Department (HCDD) is responsible for the Consolidated Plan which serves as the grant application for all four major entitlement grants during this time span.

The latest plan covers the period from 2010 to 2014 and identifies low income and extremely low income families as struggling to attain affordable housing with waiting lists for Section 8 totaling 19,000 families and public housing equaling 14,087 families. The plan also cites the National Association of Homebuilders and Wells Fargo “Housing Opportunity Index” that tallies the percentage of affordable homes based on a metropolitan area’s median household income. According to the index, Houston’s affordability has declined from 64% in 2001 to 47% in 2007, showing the alarming trend low-income housing advocates have warned about. Additionally, 46% of Houston-area renters are unable to afford a 2-bedroom apartment at fair market rent. The Market Study in Houston’s consolidated plan identifies a dip in demand for single-family homes in Houston as indicative by a decrease in the volume of sales.

Analysis of Impediments for Fair Housing (2010)

HUD rejected Houston’s 2010 Analysis of Impediments (AI) to Furthering Fair Housing in late 2011 citing a failure to assert how it would further fair housing, particularly for protected classes. HUD requires jurisdictions receiving federal housing funds from HUD to affirmatively further fair housing by assessing impediments to fair housing choice in the jurisdiction, take appropriate actions to overcome the effects of impediments identified, and maintain records reflecting that analysis and actions (Henneberger, 2012). An October 2011 letter from HUD explicitly lists the plan’s deficiencies. According to the letter, the plan fails to,

“Identify and address patterns of segregation based on race and national origin, identify appropriate actions to address identified housing discrimination, address access to

housing and services for persons with disabilities and persons with limited English proficiency. Furthermore, it fails to contain actions to address the impediments it does identify and it lacks references to maintaining documents and records to document its actions in addressing the identified impediments” (Henneberger, 2012).

HUD concludes by stating they would provide their technical assistance to ensure the city corrects the deficiencies and meet compliance. However, the City of Houston’s Community Development Department continues to display the rejected AI on its website since March, 2011. No other information was found on Houston’s AI, whether approved by HUD in time for this report.

Disaster Recovery Market Analysis (2013)

The State of Texas granted \$152 million to the City of Houston in round two for disaster recovery housing relief due to 2008’s Hurricane Ike (SWA Group, 2013). A stakeholder team comprised of local, state, and federal agencies drafted the housing market analysis through a team of planning consultants with the ultimate goal of making an effective community revitalization impact.

Stakeholders:

- U.S. Department of Housing and Urban Development (HUD)
- State of Texas, General Land Office (GLO)
- City of Houston, Mayor’s Office
- City of Houston, Housing & Community Development Department
- Houston Housing Authority (HHA)
- Texas Low Income Housing Information Service (TLIHIS)
- Texas Organizing Project
- Texas Appleseed

Nine (9) priority neighborhoods were selected on need-based criteria for four (4) funding selections that could make a significant impact. The Near Northside, north line transit corridor, was chosen based on an evaluation process relying on pre-established criteria by the stakeholders. The report’s corridor analysis describes the Near Northside, adjacent to downtown, with “potential for fairly rapid change in the character” of this subsector. They list a wide-range of reasons for dramatic neighborhood change in the Near Northside including – locational advantages, a sufficient population of older-aesthetically-pleasing homes, empty lots, large undeveloped tracts that would attract high density housing development, and the advent of the

new Metro light rail line (SWA Group, 2013). Additionally, the analysis suggests evidence of rapid neighborhood change lies in the recent widespread quantity of ‘for sale’ commercial tracts adjacent to the transit corridor on Main Street (SWA Group, 2013).

Proposed Policy Recommendations (SWA Group, 2013):

1. Improve the mobility issues through a series of streetscape improvements and new street additions
2. Preserve affordable housing in the area for low-income and workforce residents
3. Leverage high-quality market-rate and mixed-income housing to help revitalize and stabilize the neighborhood
4. Leverage the significant investment in the light rail by encouraging high-density, vertically mixed-use development near the stations
5. Encourage more retail and grocery stores in the area to provide residents shopping choices
6. Convert underutilized land and vacant properties into attractive mixed income/mixed use development sites
7. Provide more sports fields and recreational opportunities in low area near White Oak Bayou
8. Coordinate with METRO to find the best site to relocate the bus barns to facilitate the bayou bypass project to proceed
9. Work with the Union Pacific railroad to look at options of relocating some of the freight rail lines
10. Work with HISD to improve the quality of the education at the public schools

Evolving Housing Preferences & Light Rail’s 1st Decade in Houston

Houston General Survey

The Houston General Survey has been conducted annually for the past thirty-three years by the Kinder Institute for Urban Research at the University of Rice. The survey measures Houston’s economic and demographic changes and how residents respond to them (Kinder Institute, 2014). The institute’s methodology relies on selecting respondents annually through a two-stage random-digit-dialing method. Samples have expanded to almost double at 1,300 due to declining cooperation rates to approximately 45% from an 80% threshold within the last two decades.

Housing preference questions are integral to the survey although inconsistent questions throughout the years prohibit a long-term comparison. There exists consistency between 2008, 2010, and 2012 living preference questions. This set of housing preference questions closely resemble the major nationwide stated preference surveys from NAHB, NAR, RCLC, and Nelson referenced in the literature review (**Table 2 Houston Area Survey**). The Houston Area Survey differs in that only two answer choices are given for this question, nonetheless, it still indicates a

growing interest in a smaller-lot with urban amenities within walking distance. 2012 appears to be the first year this response surpasses large-lot, auto-dependent, single family home.

Table 2 Houston Area Survey

Houston Area Survey				
Housing Preferences	2008	2010	2012	+/-
Single-family with big lot where need to drive almost everywhere	59.1%	57.9%	47.4%	-11.7%
A smaller home in more urbanized area, within walking distance of shops and workplaces	36.1%	39.2%	51.0%	14.9%
Respondents	702	750	1266	
<small>Source: City vs. Suburb : Kinder Institute for Urban Research (City vs. Suburb : Kinder Institute for Urban Research) http://kinder.rice.edu/content.aspx?id=2147484483 </small>				

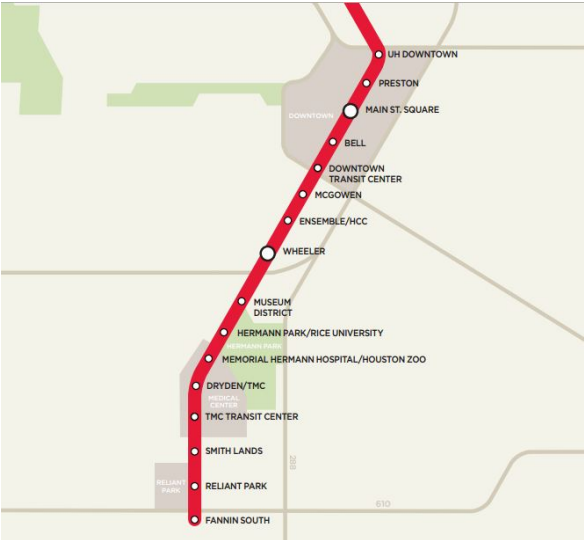
Transit Impact from Houston’s 1st Rail Line

Houston’s first rail line, known as the Red Line, opened in 2004 and covers a 7.5 mile corridor (**Figure 16 Red Line**) connecting the region’s two largest employment centers – Downtown and the Texas Medical Center (Pan, 2012). This transit line differs from the newest corridors for holding much less residential uses and more commercial and office uses. It also accounts for sixteen (16) stations on the Main Street Corridor and expanded north of downtown in 2013 as the Northside Line (**Figure 17 Northside, East End, & Southeast Transit Corridors**). The central portion of the corridor traverses Midtown which transformed into one of Houston’s most vibrant neighborhoods during the last decade. In a study conducted by the Midtown Management District in 2013, assessed values demonstrated a 196% rise from 2000 to 2013 or \$420,319,760 to \$1,244,931,678 (Alvarado and Powell, 2013). Light rail’s impact to this rise remains uncertain since multiple jurisdictions invested heavily in transit supportive infrastructure, including, the neighborhood’s management district, tax increment reinvestment zone, and the city. The management district describes the history of Midtown as “after 1990 was comprised of vacant land, boarded up buildings, a few single family residences, and a few prosperous businesses in the area. Generally the area had been marred by blight, lack of direction, and very little cohesiveness, all of which led to the revitalization efforts that exist today” (Midtown Management District, 2014).

Pan provides the first transit impact study on residential property values for the Main Street transit corridor through linear and multi-level regression modeling. Pan’s analysis does not cover changes in socioeconomic or demographic characteristics. In addition, his study evaluates the impact of transit on property values but does not include design-related features other than the transit infrastructure, as Bartholomew and Ewing (2011) warn about.

His research demonstrates a net positive effect for residential property values at least a quarter mile away from rail stops, although, not for properties within a quarter mile. Pan employed seven (7) models – baseline, home physical characteristics, transit access, distance to both employment centers, population and job density, job accessibility, and the last model includes all variables – each with multiple sets of explanatory variables for multi-level regression and ordinary least square testing (Pan, 2012).

Figure 16 Red Line



Source: Houston METRO

Both models indicate home size and age play the dominant role in influencing property values; home size yields positive effects while home age has negative effects (Pan, 2012). Properties within a quarter-mile express a significant negative effect from access to light rail stations on property values and the effects becoming insignificant between a quarter-mile and one-mile from light rail stops. In addition, there exists inconsistency from the MLR and OLS model on access to properties within one to three miles from light rail stops. Population and job density, in addition to access to employment centers, demonstrate significant impacts on property values; population density the only with negative effects. Both employment centers indicate significant positive effects on property values while job density and job accessibility show diverse effects by job sector (Pan, 2012).

CHAPTER THREE: CORRIDOR ANALYSIS

The purpose of this analysis is to capture neighborhood characteristics and compare to Pollack's findings on neighborhoods that experienced change. All three corridors were combined into one variable (recognized as 'corridor(s)' or 'transit corridor(s)') when comparing against metropolitan averages and unless explicitly stated.

I reviewed demographic, socioeconomic, housing, and transportation indicators at the half-mile corridor level through census tracts with more than 50% surface area in a half-mile buffer for the Northside, East End, and Southeast transit lines in Houston, Texas. The half-mile watershed and corridor level are not definitive boundaries for neighborhood change but can provide a glimpse of the immediate characteristics near transit and their relationship to the infrastructure. Information collected from the American Community Survey (ACS) and HUD for the corridors and metropolitan area serve as comparative indicators of neighborhood changes over time.

Selected indicators range from studies in the literature review, mainly the MAPC study provides baseline indicators for demographics, housing, and transportation. I supplemented baseline information with indicators from my limited experience participating in housing market studies through planning practice. These indicators include educational attainment, population growth, home values, residential building permits, housing affordability, and household projections among a few others.

Figure 17 Northside, East End, & Southeast Transit Corridors



Source: Houston Metro

The Northside transit corridor opened light rail service in December 2013 while the East End and Southeast corridors are set to debut December 2014. This analysis is focused at the corridor level that includes census tracts³ within a half-mile of the rail lines. Houston transportation plans signal to sixty-five (65) transit neighborhoods within these travel sheds and are linked to the region’s largest employment centers in Downtown, the Texas Medical Center, Universities, and the Uptown District (See Appendix B).

³ 15 census tracts are included with 50% or more of total area within a half-mile of the three transit corridors. Census tracts included: 2104, 2105, 2106, 2123, 2202, 2203, 2204, 2205, 3101, 3102, 3104, 3105, 3109, 3122, and 3133.

Figure 18 Northside Transit Corridor



Source: Houston Metro

Baseline Indicators

Demographics & In-Migration

Methods

2012 American Community Survey (ACS) data provides the basic data for population age pyramid, ethnic breakdown, and population growth from 2000 to 2012. Very-low and extremely low income percentages are provided in comparison to the metropolitan area, in addition to educational attainment in this section.

HUD defines very-low-income households as those earning between 30% and 50% Median Household Income (MHI) and extremely-low-income for those under 30% (U.S. HUD). Approximately \$28,000 equals 50% MHI for the Houston Metropolitan Statistical Area (MSA)

while \$16,800 approaches the 30% threshold. I include HUD's Comprehensive Housing Affordability Strategy (CHAS) data sets for the City of Houston in 4-year estimates, 2007-2011.

CHAS data is divided into income distributions for owner and renter households at the metropolitan scale only. CHAS income distribution divides households into five categories: under 30% MFI, 30-50% MFI, 50-80% MFI, 80-100% MFI, and over 100% MFI. Since CHAS data does not reduce to the tract level I include ACS data to account for the corridor census tracts. ACS household income distributions are divided into various income brackets that do not match HUD CHAS data sets. Therefore, I set CHAS thresholds within the ACS income brackets, collected the number of households within each ACS income bracket, and determined a number of households above or below CHAS thresholds based on their deviation from both ends of an ACS income bracket for a comparative analysis to CHAS thresholds (i.e. 30-50% MFI).

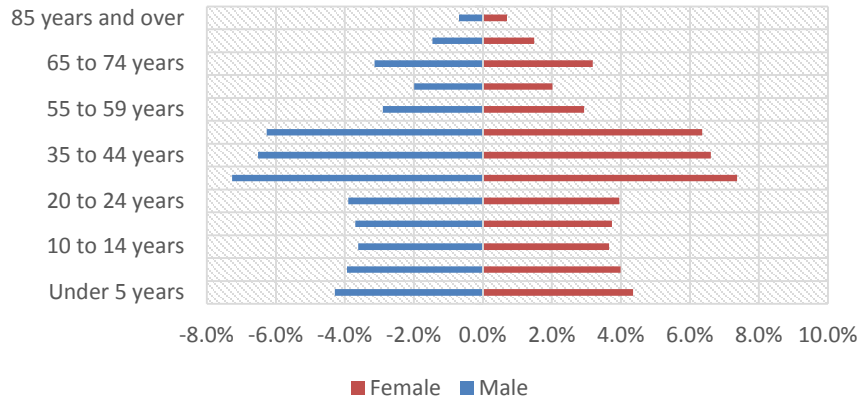
For example, \$15,428 or 30% AMFI lies between the \$15,000-\$24,999 ACS income bracket. A total of 3,937 households earn between \$15,000 and \$24,999 in the transit corridors and we want to identify how many of the 3,937 households belong under \$15,428 but over \$15,000. Thus, I subtract the difference of \$15,428 and \$15,000 (\$428) and divide by the size of the income bracket (\$9,999) to distribute a percentage (0.04%) of its 3,937 households into the 30% MFI and under households (169 households allocated from this income bracket).

In-migration data informs economic, demographic, and ethnic characteristics of people moving into the transit corridor over time. There are two time interval options for measuring in-migration – one and five year spans. Annual intervals pick up on frequent moves and short-term movers. Five year intervals nullify this particular effect, although miss multiple moves throughout the five-year timespan (Smith, Tayman, and Swanson., 2001). Out-migration data cannot be acquired at the census tract level, and thus, has been disregarded for this study.

Figure 19 Age of Population by Gender

Age of Population in Transit Corridors

Source: U.S. Census Bureau, ACS 2012 5-Year Estimates



Results

Low Income Households in the Region 2000: **30.9%**

Low Income Households in the Region 2012: **45.9%**

Low-Income Households in Transit Corridor 2000: **69.7%**

Low-Income Households in Transit Corridor 2012: **70.9%**

Number of Low-Income Households in Transit Corridor 2000: **20,994**

Number of Low-Income Households in Transit Corridor 2012: **21,655**

Transit Corridor Share of Region’s Low Income Households 2000: **2.9%**

Transit Corridor Share of Region’s Low Income Households 2012: **1.6%**

Table 3 Population Growth

Population Growth, 2000 - 2012

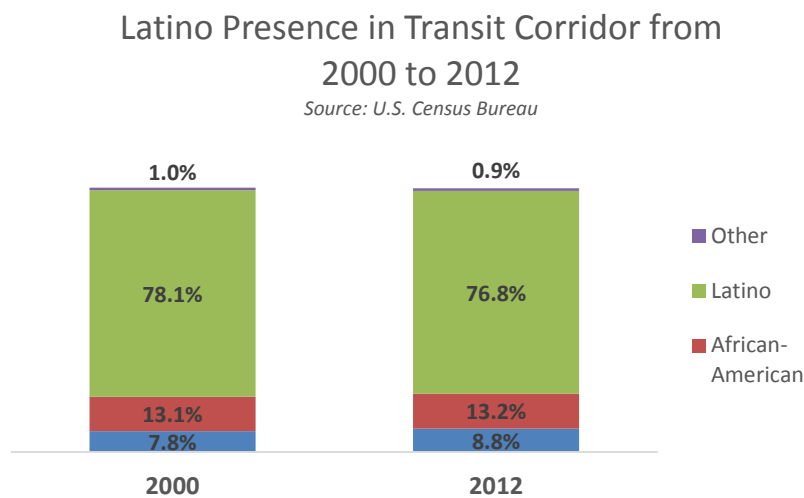
Geography	2000	2012	Percent Change
Transit Corridor Population (TCP)	70,498	64,791	-8.1%
Houston MSA	4,669,571	6,204,161	32.9%
TCP Share of Houston MSA	1.51%	1.04%	-30.8%

Source: U.S. Census Bureau, PUMS 2000 - 2012 & ACS 2012 1-Year Estimates

Houston’s growing share of low-income households, those earning less than 80% of area MFI are now at 46%, up from 31% a decade ago (See Results). Stagnant wages may be the most significant factor contributing to this rise in low-income households, although, growing disparity between *mean* and *median* incomes from 2000 to 2012 point to growing income inequality in the Houston MSA. In 2012, *Median* Family Income covered 72% of *Mean* Family Income when it used to cover 75% in 2000. Similarly, *Median* Household Income currently covers 69% of *Mean* Family Income, much less than its 2000 share of 73% (U.S. Census Bureau, PUMS Data Sets and ACS 1-year estimates). Households within these tracts indicate lower wage levels than the regional median – their MHI equaled to \$30,000 (53% of Regional MHI) in the Northside and \$36,000 (64% Regional MHI) in the East End/Southeast combined, far below Houston’s \$56,000 MHI.

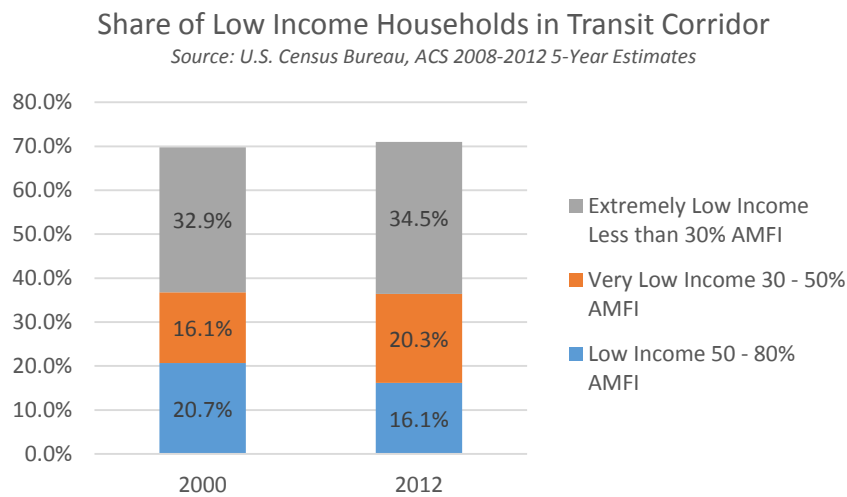
Population in the transit corridor amounts to 1.04% of the Houston MSA in 2012 with a decline of 5,707 residents from 2000 to 2012 or 8.1% (Table 3 Population Growth). This is at odds with the regional high-growth pattern occurring in Houston placing population growth at 32.9% from 2000 to 2012. Additionally, the corridor’s population density is about 91% of the city’s population density and approximately 65% of some the city’s densest neighborhoods, indicating potential for denser uses along the corridor.

Figure 20 Ethnicity in Transit Corridor



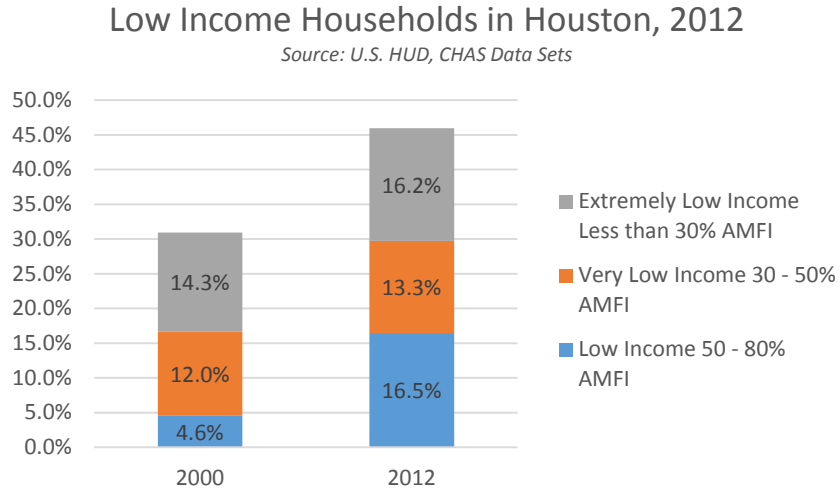
Household characteristics demonstrate a high amount of Latino households at approximately 63% and a significantly higher share of low-income renters relative to regional and state median shares. Although the majority of the population is Latino in the transit corridors it only accounts for 2.4% of the region’s Latino population (U.S. Census Bureau, 2012 ACS 5-Year Estimates). Latinos make up 76.8% of the corridor’s total population down from 78.1 from 2010 (See Figure 7). From 2000 to 2012, Latinos decreased by 5,296 and African-Americans by 677 while Non-Latino Whites increased by 237. Population changes could significantly alter the Latino share, primarily due to the low amount of people residing along the corridor. However, assessing changes in the near future for population, ethnicity, and income provides a better snapshot for the type of neighborhood change occurring in the transit corridors.

Figure 21 Low Income Household Distribution in Transit Corridors



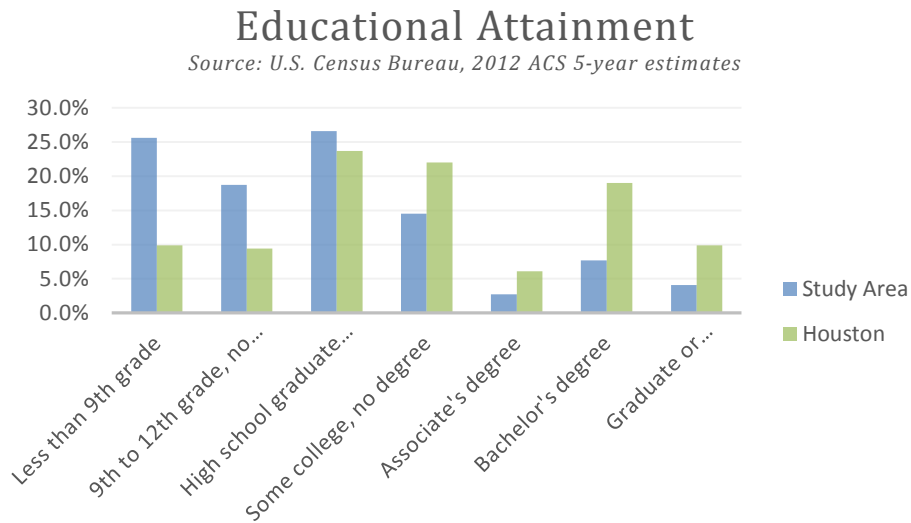
Interestingly, the share of extremely-low and very-low income households (under 50% MFI) is growing along the corridor. And although we cannot properly identify out-migration at the census tract level in the transit corridors, we can infer from the population changes and Latino decline between 2000 and 2012 that Latino households earning more than 50% MFI have left the transit corridor.

Figure 22 Low Income Households in Houston



Educational attainment is significantly less along the transit corridors than the region as 45% of the corridor population has less than a high-school diploma or equivalent (**Figure 23 Educational Attainment**). Monitoring the influx of residents with a bachelor’s degree or higher over time will be a significant indicator of the type of gentrification within the neighborhood. For now, only 11.1% of residents have a bachelor’s degree or higher in the transit corridors while 28.9% is the regional share.

Figure 23 Educational Attainment



Housing

Methods

The Center for Transit Oriented Development's Guidebooks on Location Efficiency credit a joint 2009 study by Reconnecting America and the National Housing Trust examining expiring affordability in 'transit zones' for major metropolitan areas. Their analysis excludes Low Income Housing Tax Credit (LIHTC) units but covers project-based Section 8, Section 202/811 Supportive Housing for the Elderly and Persons with Disabilities, rent supplements, and rental assistance payment units. Furthermore, the study defines transit zones as half-mile radii from both bus transit with frequencies under fifteen minutes and fixed guideway systems (Harrell, R., A. Brooks, & T. Nedwick, 2009).

Affordable housing inventory is determined by several sources. Low Income Housing Tax Credit (LIHTC) properties were accessed through U.S. Department of Housing and Urban Development (CPD Maps) for corridor assessment and from Texas Department of Housing and Community Affairs (TDHCA) for metropolitan scale. HUD's portal provides both LIHTC units and HUD multifamily properties providing project-based units in the transit corridor. These numbers provide an idea for subsidized affordable housing within the transit corridor.

Houston's regional planning commission, H-GAC, released its 2040 housing demand model for the Houston area at the traffic analysis zone (TAZ) level and is included in this section. This model is interrelated with four other models: demographic evolution model, employment model, real estate development model, and employment location model. H-GAC planners calculate the housing demand model by allocating its regional share of new housing units to the regional total of new housing units (See Table 4, 5, & 6). The net change for regional total is then allocated to TAZs in their respective proportion of allocated households and controlled to the average household size (H-GAC, 2013). Essentially, the model takes a static snapshot of housing growth rates in present-time and does not factor changes in the growth rate throughout the model's years. The model serves as a conservative baseline for future household demand which is extremely useful when comparing to residential building permits over time. Projections indicate high present-day growth rates occurring in TAZs nearest to Downtown (highlighted in grey).

Table 4 2040 Household Estimates, Northside

Northside									
TAZ ID	Households 2010	Households 2040	% change	Jobs 2010	Jobs 2040	% change			
1561	575	888	54%	1811	1804	0%			
1567	983	1243	26%	810	818	1%			
1508	577	592	3%	569	566	-1%			
1512	1489	1512	2%	594	605	2%			
1511	548	548	0%	569	570	0%			
1504	381	425	12%	401	400	0%			
1507	167	167	0%	157	364	132%			
1506	354	357	1%	318	323	2%			
1480	716	719	0%	323	324	0%			
1479	218	228	5%	236	296	25%			
1483	219	219	0%	375	377	1%			
1482	237	304	28%	207	203	-2%			
1484	525	530	1%	179	236	32%			
1475	47	971	1966%	131	1121	756%	Adjacent to downtown		
1476	3	689	22867%	890	1230	38%			
	7,039	9,392	33%	7,570	9,237	22%			

Source: 2040 Regional Growth Forecast. HGAC. <http://www.h-gac.com/community/socioeconomic/2040-regional-growth-forecast/default.aspx>

Table 5 2040 Household Estimates, East End

East End									
TAZ ID	Households 2010	Households 2040	% change	Jobs 2010	Jobs 2040	% change			
649	446	497	11%	692	936	35%			
651	278	386	39%	745	909	22%			
650	136	409	201%	1050	1178	12%	Adjacent Downtown		
674	748	970	30%	770	257	-67%	maximums coffee plant?		
677	1213	1224	1%	703	734	4%			
718	582	584	0%	1344	1484	10%			
719	1201	1214	1%	1009	1004	0%			
	4,604	5,284	15%	6,313	6,502	3%			

Source: 2040 Regional Growth Forecast. HGAC. <http://www.h-gac.com/community/socioeconomic/2040-regional-growth-forecast/default.aspx>

Table 6 2040 Household Estimates, Southeast

Southeast									
TAZ ID	Households 2010	Households 2040	% change	Jobs 2010	Jobs 2040	% change			
649	446	497	11%	692	936	35%	Adjacent Downtown		
650	136	409	201%	1050	1178	12%			
684	128	134	5%	1075	1428	33%			
685	574	979	71%	1257	1470	17%			
688	460	492	7%	148	149	1%			
689	352	358	2%	185	182	-2%			
691	438	464	6%	77	76	-1%			
706	0	0		6457	7026	9%	University of Houston Main Campus		
708	0	0		92	89	-3%			
705	1268	1268	0%	237	236	0%			
733	0	0		16	12	-25%			
734	445	453	2%	408	641	57%			
732	576	578	0%	175	176	1%			
764	545	623	14%	543	543	0%			
765	589	998	69%	932	902	-3%			
	5,957	7,253	22%	13,344	15,044	13%			

Source: 2040 Regional Growth Forecast. HGAC. <http://www.h-gac.com/community/socioeconomic/2040-regional-growth-forecast/default.aspx>

Results

Deed-Restricted Affordable Housing Units in Transit Corridor: **375**

Deed-Restricted Affordable Housing Units in Houston: **9,652**

Deed-Restricted Units in Transit Corridor as Share of Total DR Units: **3.9%**

LIHTC Units in Transit Corridor: **1,005**

LIHTC Units in Houston: **27,486**

LIHTC Units in Corridor as Share of Total LIHTC Units: **3.6%**

Housing Cost Burdened Households in Transit Corridor: **8,996**

Share of Cost Burdened Households in Transit Corridor: **41.5%**

Share of Cost Burdened Households in Houston: **32.7%**

Approximately 2/3 of the housing stock was built before 1970 in the corridors, whereas, 73% was built post-1970 for the Greater Houston Area (U.S. Census Bureau), showing a relatively old housing stock susceptible to deterioration, demolition, or renovations.

The transit corridors contain a high volume of renter-occupied housing units relative to the metropolitan area, with low ownership rates, under 40% (**Figure 24 Housing Tenure in Transit Corridors**). A total of \$175.7 million dollars in Low-Income Housing Tax Credits (LIHTC) have been ascribed to developers in the Houston area for the provision of affordable housing since 1990 (TDHCA, 2013). This is not surprising as LIHTC is regarded as the largest contributor to the development of affordable housing across the nation. These credits facilitated the development of 39,080 units where 37,170 were classified as affordable in Houston; 1,424 exclusively for people with disabilities. Affordability restrictions expire typically after fifteen years and data confirming the amount of expired units is not made available by TDHCA. Thus, for the purpose of this study, I will assume all units on TDHCA’s inventory end at year fifteen in order to estimate the number of active LIHTC units in the Houston area. Accounting for lapsing affordability, this yields 27,486 units as 9,684 units would have expired before or on 2014 – 26% of all LIHTC units. According to HUD CPD Maps, there are a total of 1,007 LIHTC active units within the 20 mile transit corridor (U.S. HUD, 2014).

Figure 24 Housing Tenure in Transit Corridors

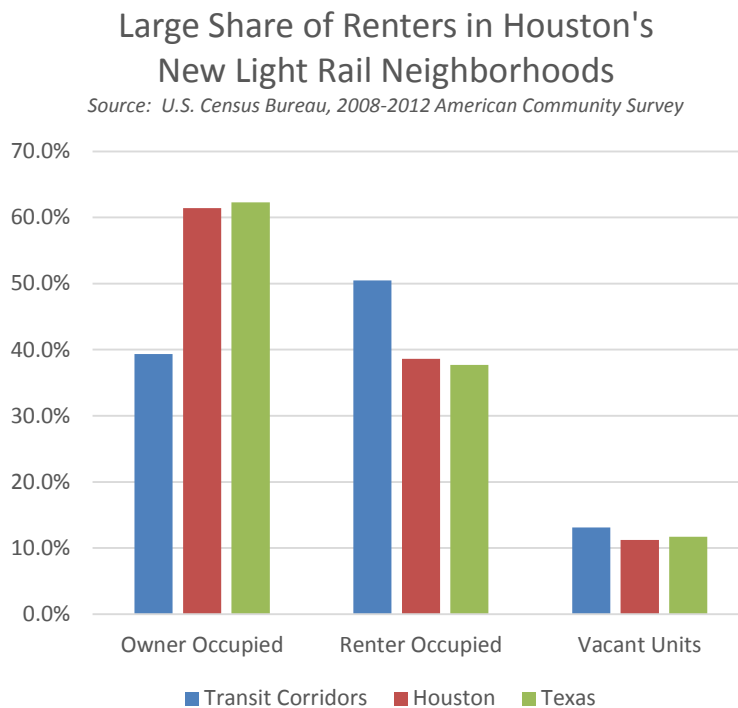
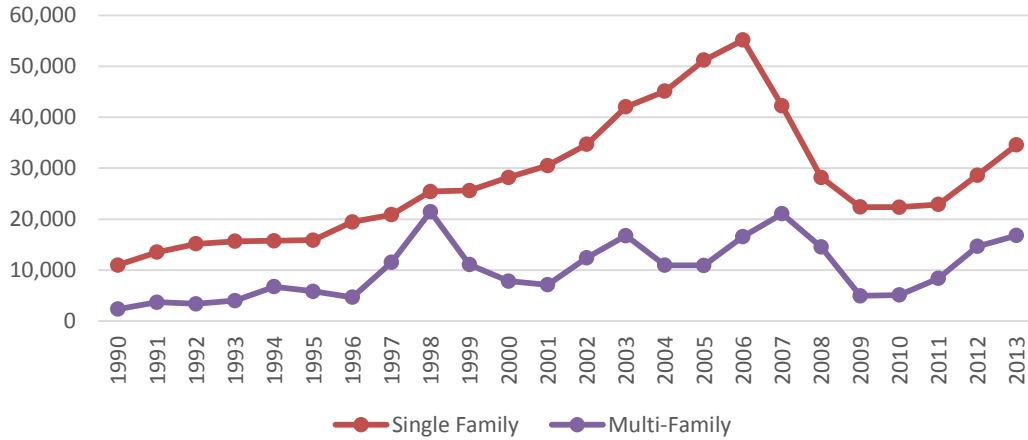


Figure 25 Building Permits 1990 - 2013

Residential Building Permits in the Houston Region, 1990 - 2013

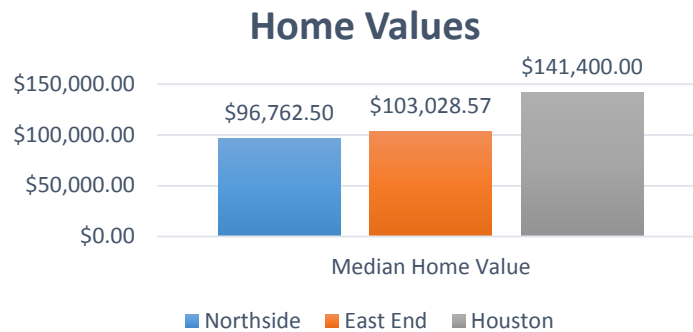
Source: U.S. Census Bureau and Real Estate Center at Texas A&M University



A joint study by Reconnecting America and the National Housing Trust concurred there were 9,652 affordable units (non-LIHTC) in Houston, of which 2,689 or 28% were near transit, with 2,217 set to expire by 2014. From the top 20 metropolitan areas, Houston demonstrated the 2nd lowest share of location-efficient units (in transit zones) at 28% while others like San Francisco and New York were at 95% and 75%, respectively (AARP, 2009).

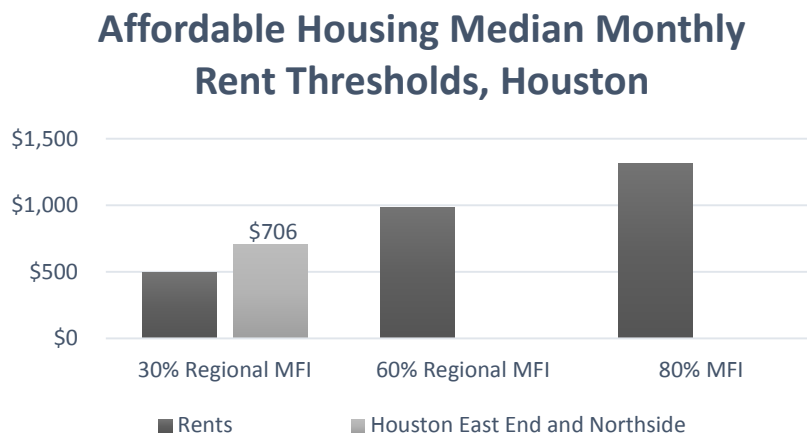
Median home values in the transit corridors reside just under 70% of the region's (Figure 26 Home Values). Lower home values help keep tax bills low where slight increases could trigger large-scale displacement for households on fixed incomes. At current home values and at a tax rate of \$0.0256, the median tax bill usurps a larger share of household incomes along the corridor; demonstrating the fiscally regressive nature of property taxes. For example, property taxes along the corridor approximate 8.33% of MHI or \$2,475 of \$29,717 in the Northside and 7.35% of MHI or \$2,636 of \$35,877 in the East End, while equating 6.47% of the regional MHI or \$3,617 of \$55,910.

Figure 26 Home Values



Rent along the transit corridors currently provides affordable housing to very-low income households with median rent at \$700 or 40% of the regional MFI (Figure 27 Median Affordability). Tracking the rate of increase in future years for median monthly rent in the transit corridors compared to the region’s increase in monthly median rent will indicate the level of affordability in the neighborhood. Because subsidized affordability remains a low-share of total housing units in the corridors, this number is utterly important and could increase abruptly if private market-rate development ticks up without an increase in subsidized housing units.

Figure 27 Median Affordability



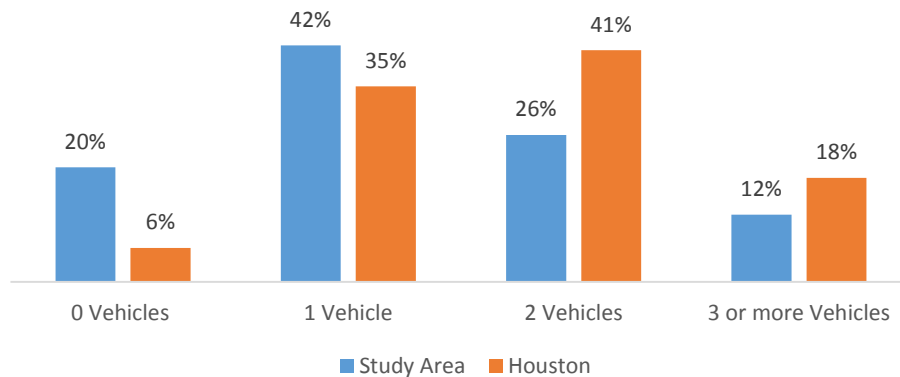
Transportation

Vehicle ownership, commute to work mode share, and commute time was acquired through ACS 1-year and 5-year estimates for both the transit corridors and the metropolitan area. These numbers are capable of demonstrating transportation needs and preferences in a community.

Figure 28 Automobile Ownership

Extremely Low Automobile Ownership in Transit Corridors

Source: U.S. Census Bureau, ACS 2012 5-year estimates



Results

Residents in the transit corridors show significant transit dependent characteristics when measured against regional averages. For example, 62% of households have less than 1 vehicle whereas only 40% of regional households do (**Figure 28 Automobile Ownership**). Corridor households also contain larger household sizes, at approximately 3.40 persons per household whereas regional averages equal 2.92, placing a significant burden on household mobility. Current residents also display less drive alone characteristics than regional averages; 68% to 79%. Furthermore, 25% of neighborhood residents take either transit, carpool, or walk to work while only 15% of Houstonians do (**Figure 29 Commute to Work Houston & Figure 30 Commute to Work Transit Corridors**). Mean travel time is slightly less at 25.97 minutes in the corridors while Houston averages 28.10 (U.S. Census Bureau, 2012 ACS 5-year estimates).

Pollack’s study warns light rail TRNs outpaced metro area growth of households with two or more cars by 52%. Similarly, light rail TRNs decreased the rate of people commuting through transit in twelve of sixteen TRNs although the number of riders could increase depending on the neighborhood’s population growth. The current neighborhood residents demonstrate transit-supportive traits, particularly in transportation indicators and would justify local transportation agencies advocating for deep-affordable-housing to maintain optimal ridership.

Figure 29 Commute to Work Houston

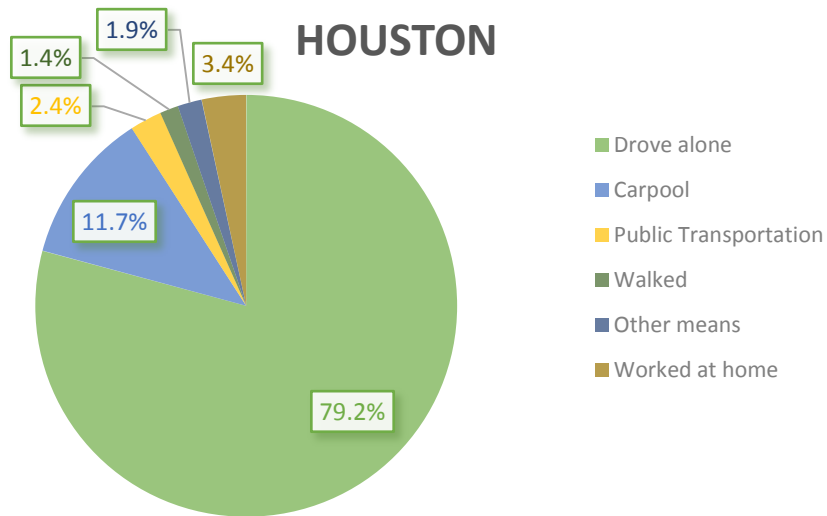
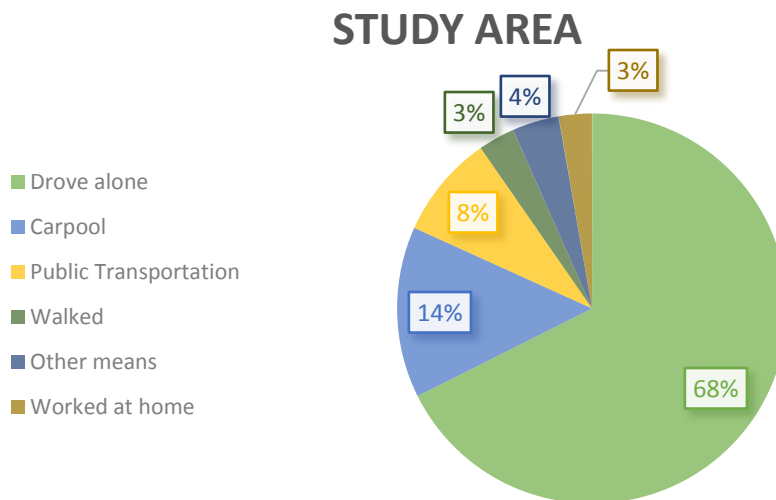


Figure 30 Commute to Work Transit Corridors



CHAPTER FOUR: PUBLIC POLICY AND CONCLUDING THOUGHTS

Findings

Neighborhood change seems inevitable for Houston's transit corridors. When and how change occurs is yet to be experienced but there remain several reasons for local agencies to pursue a comprehensive affordable housing strategy for neighborhoods proximate these light rail lines.

Pollack's studies and present-day conditions in the corridors seem to foreshadow socioeconomic and demographic change. Pollack et al. found overwhelming evidence that low-income, renter households with low-automobile ownership were the ones most vulnerable to household substitution in transit rich neighborhoods. Those are precisely the present-day characteristics to describe all three transit corridors in Houston; overwhelming amount of low-income, minority renters with below average automobile ownership and usage rates. Monitoring in-migration rates over the coming years will prove beneficial to understanding housing substitution and its effect on displacement.

It might be reasonable to expect increases in wealthier-homeowners with increased car presence and usage but only time will tell. MetroRail's plans seem to underestimate or plainly disregard potential increases in car ownership and commuting in TRNs. Houston's affordable housing strategy, through its General Plan in 2015, will better describe the housing vision for these transit corridors. The question of 'who do we want living near the transit corridors?' is a question this plan must contend with prior to laying out an implementation path. It must consider the implications fixed guideway transit corridors bring to TRNs such as more homeowners with increased car ownership and that increasingly commute by car.

Housing and transit planning for these corridors should be one comprehensive effort as federal New Starts funding (5309) from the Federal Transit Administration (FTA) now mandates since 2013. Houston's FTA funding, however, predates this policy change.

Access, Design, and Housing Preferences Converge

Houston's multiple planning initiatives, while well-intentioned, could converge to displace residents along transit corridors. Planning and capital improvements adjoining urban rail such as the Livable Centers and ReBuild Houston are the type of improvements Bartholomew and Ewing suggest hold mutual-dependency in affecting property values. They may also induce unintended

price capitalization by creating a ‘synergistic effect’ between access and design features where design improvements near preexisting transit access.

More Stated Preferences Needed

Downtown and the Texas Medical Center directly employ more than 210,000 people, accounting for nearly 10% of the region’s workforce (Perdue, 2014). Understanding Metrorail’s impact on housing preferences from this significant employment pool is one way to increase the body of information on housing market pressures. Similar surveys can be directed toward universities and museums in the transit corridors.

Policy Solutions

Although Houston’s planning methods are unconventional, Houston’s special purpose districts (MMDs & TIRZs) present local governing bodies with the ability to rapidly fund the provision of affordable housing through general or revenue bonds. The City of Houston should pursue an in-depth housing market study for each special purpose district to apportion a set of the tax-increment finance for affordable housing based on the market study’s determination. If Houston is to create sustainability-driven livability centers, MMD’s and TIRZ present a valuable opportunity to preserve and leverage project-based affordable housing. A report from Enterprise, the National Housing Trust, and Reconnecting America synthesized public policy interventions for the preservation of affordable housing and transit-oriented development in four case studies. Their report identifies various strategies consequently described.

Low Income Housing Tax Credits (LIHTC)

Additionally, the city should seek changes to the state’s housing Qualified Allocation Plan (QAP) in order to leverage more location-efficient affordable housing near its transit corridor. Low Income Housing Tax Credits are supply-side subsidies for developers to apportion affordable units and are designated by the Internal Revenue Service through each state’s designated agency (Schwartz, 2010). The Texas Department of Housing and Community Affairs (TDHCA) is the lead agency in Texas, distributing tax credits to developers through an annual application and ranking process. Criteria are set forth in the QAP program and it evolves over time, almost annually, as local jurisdictions and developers submit public comments. Texas QAP criteria awards points for proximity to transit, however, more points should be allocated for fixed

guideway transit due to its distinct impact on land values and socioeconomic factors. Depending on a range of changes to the criteria, it could dramatically shift the spatial arrangement of LIHTC. Additionally, with other large Texas cities planning for mass transit networks, this could be an advantageous policy for the state to consider and can build it gradually by testing its effectiveness. Moreover, the QAP establishes criteria for fair housing and access to opportunity where added transit points may combine well for low-income families, with these other factors.

Acquisition Funds

The purpose of acquisition funds is intuitive from its name, to provide financing for the purchase of land and buildings for preservation, redevelopment, or affordable housing construction (Enterprise, 2010). Examples include the City of Denver's \$15 million TOD Fund, established in partnership with Enterprise and the Urban Land Conservancy as a revolving fund to acquire land or building sites in anticipated transit station areas (Enterprise, 2010). Denver is expected to create or preserve 1,000 affordable units and leverage \$100 million in economic development by creating construction and permanent jobs for their residents (Enterprise, 2010). Enterprise also cites Washington, D.C. for creating their Site Acquisition Funding Initiative (SAFI) and the Local Initiatives Support Corporation (LISC) among a few other revolving housing funds for the production of affordable housing in their community (Enterprise, 2010).

Housing Trust Funds

HTF's purpose is to collect and allocate revenue streams for affordable housing (Enterprise, 2010). Examples provided demonstrate versatility, ranging from voter referendum revenues to set asides from deed recordation and transfer taxes (Enterprise, 2010).

Tax Increment Financing

TIFs or in Houston's case, TIRZs, can dedicate a share of increment revenues to up-front affordable housing set asides (Enterprise, 2010). Atlanta's Beltline Affordable Housing Trust Fund is an example that receives 15% revenues from the various Beltline Tax Allocation Districts through TIF financing. In turn, the Beltline AHTF provides grant funds to private and non-profit developers for the preservation and production of affordable housing units. Houston's multi-layered TIRZ and MMD districts provide a great opportunity to invest in affordable

housing funds such as Atlanta Beltline's. Only Houston's Northside TIRZ is investing money for affordable housing, although, it remains unclear how they will invest their funds at this point.

Neighborhood Stabilization Program (NSP)

HUD provides funding to support abandoned and foreclosed land for redevelopment purposes (Enterprise, 2010). Recently, Denver received \$19 million in NSP grant funds for multifamily housing preservation in transit corridors. Housing vulnerability and deteriorated housing stock in Houston's corridors make it an ideal applicant for this funding stream from HUD to preserve affordability along its new transit corridors.

Tenant Right of First Refusal

The purpose of this state-level policy change is to allow tenants with notice of sale and an opportunity to arrange a preservation purchase for their unit (Enterprise, 2010). Washington D.C. established the Tenant Opportunity to Purchase Act requiring owners provide tenants an opportunity to purchase the property at the same price as a third-party buyer (Enterprise, 2010). This policy would require changes to state tenant laws which should be considered but not prioritized.

Land Banking Authority

Through a land bank authority there is local capacity to acquire and hold property for potential development similar to housing trust funds. Houston's Land Assemblage Redevelopment Authority (LARA) currently exercises this function and has a portfolio of affordable housing strategies in Houston including HOPE. HOPE serves the purpose of a neighborhood stabilization program by acquiring abandoned and foreclosed land Houston's inner city distressed neighborhoods and works with non-profit and private developers to rehabilitate and sell them to low-income families in revitalization areas deemed by the Mayor (City of Houston). HOPE's current borders (since 2009) include the Northside along the Northside Transit Corridor and 3rd Ward along the Southeast Corridor – the East End Corridor is not within the service boundary of the HOPE program. HOPE's affordability period runs for ten years. Families earning up to 80% of area median family income may qualify for the program.

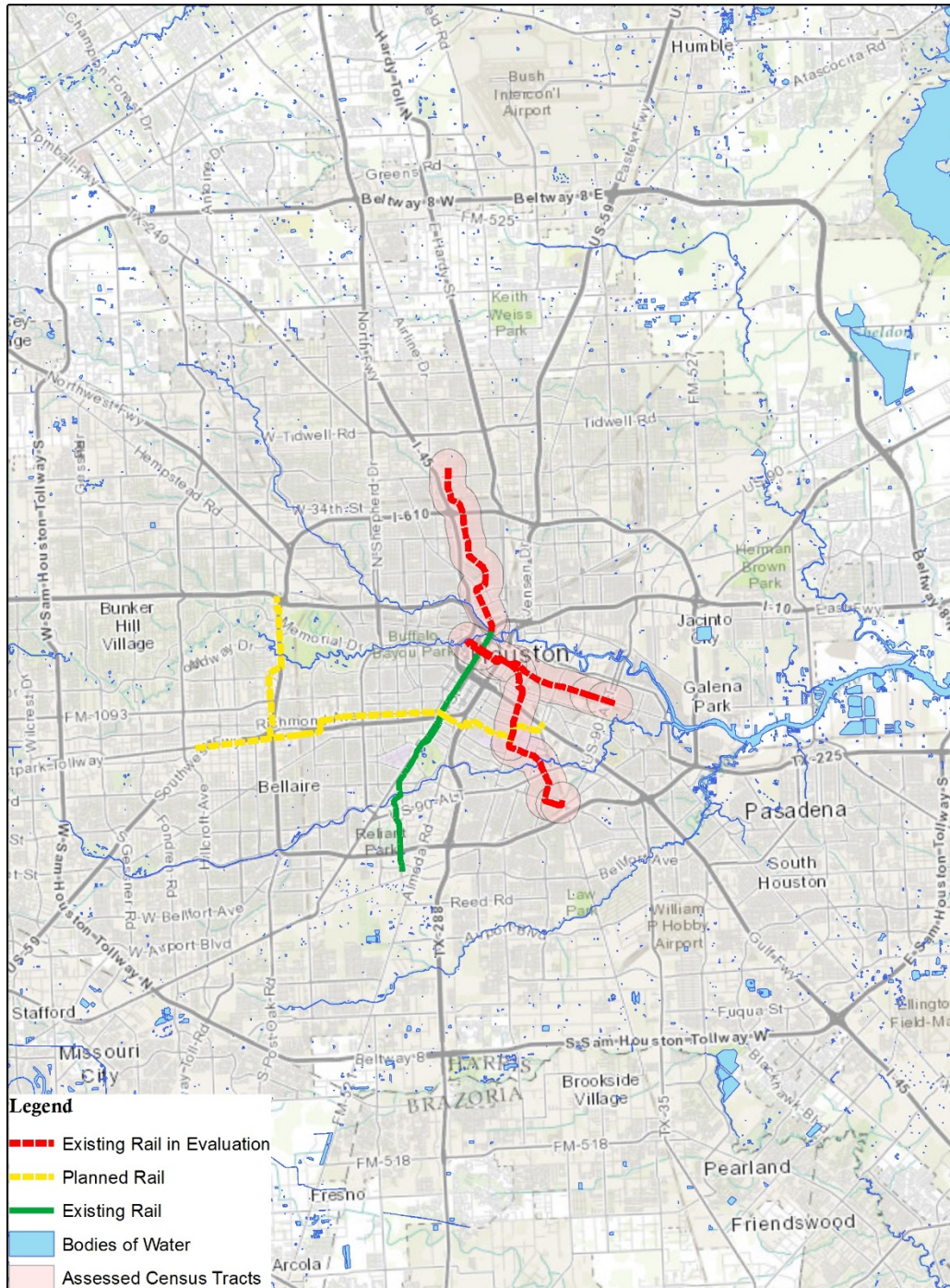
Inclusionary Zoning, Density Bonuses, & Parking Relief

The purpose for density bonuses is to exchange more square footage for the production or preservation of affordable units by allowing developers more density, and essentially, more units to increase their profit margin (Enterprise, 2010). Density bonuses also enable transfer of development rights where off-site affordability is provided by real estate developers purchasing unused density from affordable housing owners in exchange for the right to build over allowable density thresholds (Enterprise, 2010). Inclusionary zoning is the most commonly used tool for providing affordable housing but is not allowed by Texas state law. Inclusionary zoning requires developers provide a certain threshold for affordable units, typically between 10% - 25%.

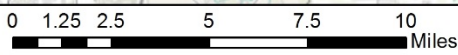
Appendices

Appendix A: Study Area

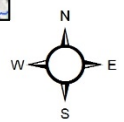
Houston's Urban Light Rail Neighborhoods



Sources:
 Houston METRO
<http://www.ridemetro.org/News/Downloads/DataDownloads.aspx>
 Houston Galveston Area Council of Governments
https://www.h-gac.com/rds/GIS_Data/clearinghouse/default.aspx



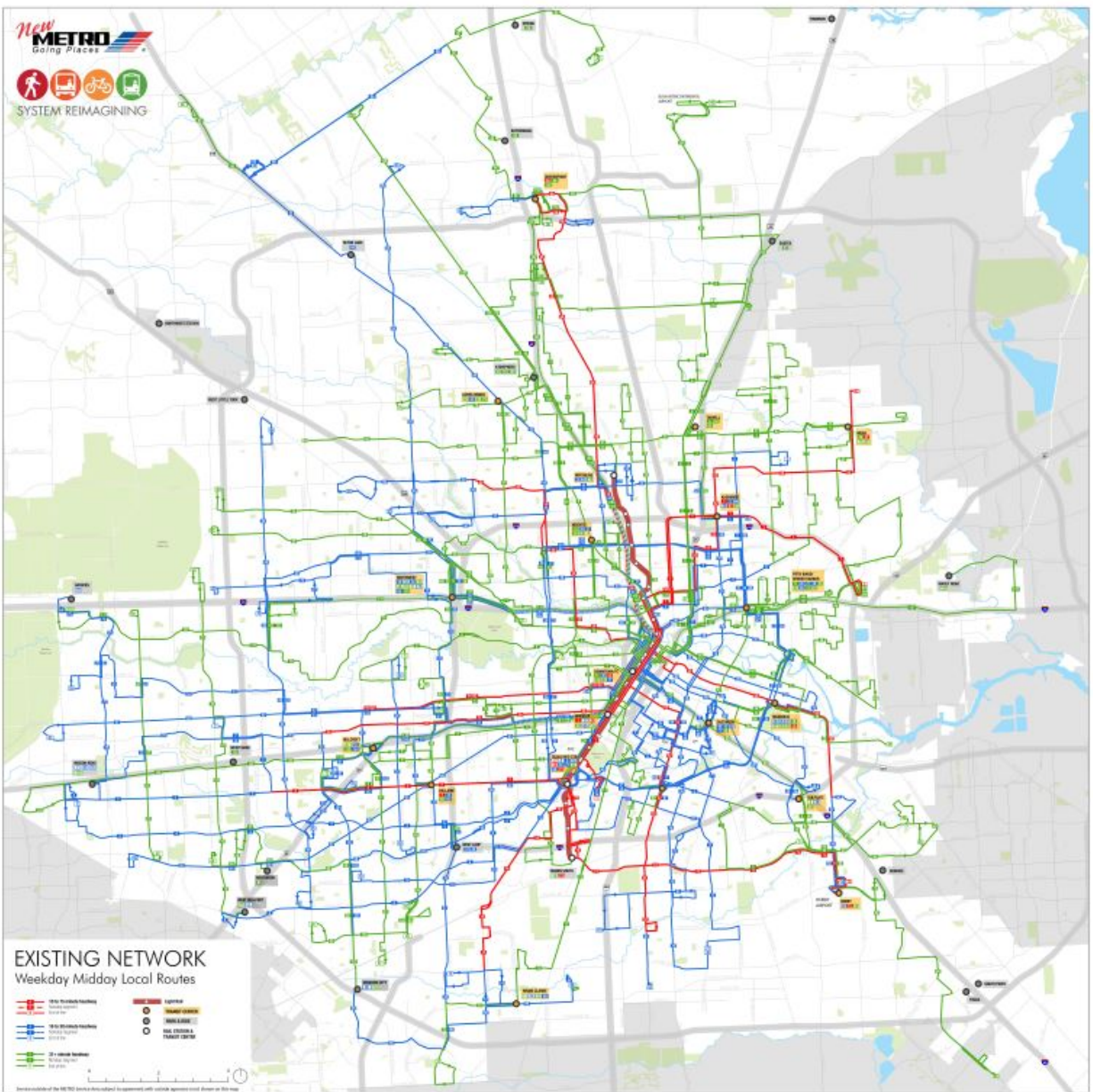
Map prepared by:
 Luis Guajardo



Appendix B: METRORAIL System

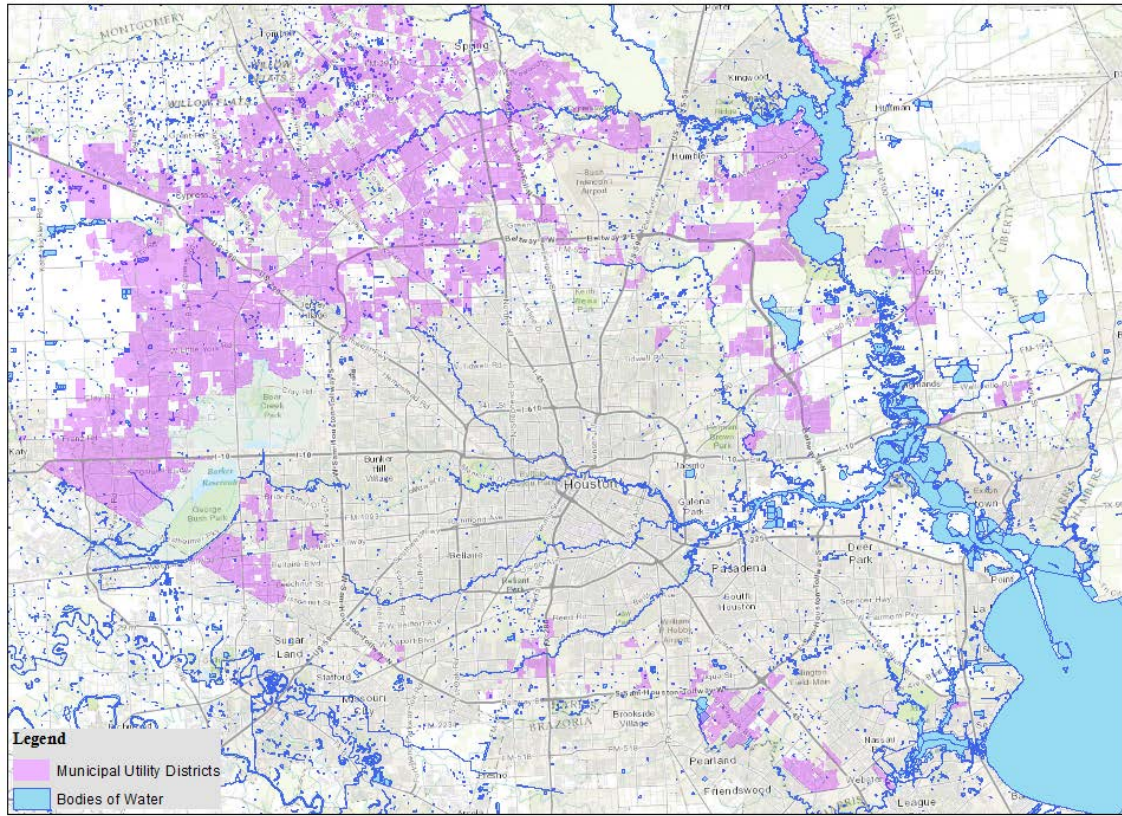


Appendix C: Existing Bus Transit Network



Appendix E: Municipal Utility Districts in Houston

Location of MUD's in Greater Houston



Sources:
Harris County, Public Data, GIS Files, <http://pda.hcad.org/GIS/>
Houston Galveston Area Council of Government
http://www.h-gac.com/gis/GIS_Data/clearmghouse/default.aspx

0 1.5 3 6 9 12 Miles

Map prepared by:
Luis Guajardo



Appendix F: TOD Typologies

Typology of Transit Oriented Development				
TOD Type	Land Use Mix	Minimum Housing Density	Regional Connectivity	Frequencies
Urban Downtown	Office Center	> 60 units/acre	High	< 10 mins.
	Urban Entertainment		Hub of radial system	
	Multifamily Housing			
	Retail			
Urban Neighborhood	Residential	> 20 units/acre	Medium access to downtown	10 mins peak; 20 mins off-peak
	Retail		Subregional circulation	
	Class B Commercial			
Suburban Center	Primary Office Center	> 50 units/acre	High access to downtown	10 mins peak; 10-15 mins off-peak
	Urban Entertainment		Subregional hub	
	Multifamily Housing			
	Retail			
Suburban Neighborhood	Residential	> 12 units/acre	Medium access to suburban center and to downtown	20 mins peak; 30 mins off-peak
	Neighborhood Retail			
	Local Office			
Commuter Town Center	Retail Center	> 12 units/acre	Low access to downtown	Peak service; Demand Response
	Residential			
<i>Source: CTOD. "Hidden in Plain Sight: Capturing the Demand for Housing Near Transit." 2004.</i>				

Appendix G: List of Transit & Gentrification Studies

Studies on the impacts of transit rail lines on land values							
	Study	Year	Area	Transit Type	Impact	Results	
qsheng article	Bowes and Ihlandfeldt	2001	Atlanta	heavy rail		Property values within one-quarter mile of stations are 19% less than those beyond three miles. Property between 1 and three miles from a station has significantly higher value than those beyond three miles. Large positive effects in high-income neighborhoods between one-quarter and three miles of a station, negative direct effects beyond one-quarter mile to low-income neighborhoods, and negative crime effects in downtown.	
	Nelson and McCleskey	1990	Atlanta	heavy rail		Property values increase over US\$1000 for each 100 feet closer to a rail station in low-income neighborhood but slightly negative effects in high-income communities.	
	Al-Mosaind	1993	Portland	light rail		Positive capitalization of 10.6% higher values for properties within 500 meters of the LRT stations. Average property values are US\$4.32 higher within 500 meters to station than outsiders and decrease US\$2.175 for every 100 meters away from station.	
	Chen et al	1998	Portland	light rail		Net positive effect. Starting at a distance of 100 meters from the station, property values decline US\$32.2 for each meter away from station.	
	Lewis-Workman and Brod	1997	New York City	heavy rail		Significant positive effects in one mile radius to rail station in New York City. Property values decline by US\$2300 for every 100 feet further from station.	
	Lewis-Workman and Brod	1997	San Francisco	heavy rail		Significant positive effects in one mile radius to BART station. Property values decline by US\$1578 for every 100 feet further from station.	
	Cervero	1996	San Francisco	heavy rail		US\$34 higher rent within a quarter mile of the stations	
	Landis et al	1994	Sacramento, San Diego, and San Jose	light rail		Light rail stations has positive effects on home price to San Diego Trolley (US\$2.72/meter), negative effects in San Jose (1.97/meter), and indeterminate effects in Sacramento.	
	Landis et al	1994	San Francisco	heavy and commuter rail		Property values increase significantly closer to a rail station. US\$2.29/meter in Alameda and US\$1.96/meter in Contra Costa	
	Baum-Snow and Kahn	2000	Atlanta, Boston, Chicago, Portland, Washington	heavy and light rail		Houses 1 km from transit rent for \$19 more a month and sell for \$4972 more than those 3 km from transit.	
Reid (access-related price effects)	Cervero and Duncan	2002	San Jose	commuter rail		Parcels within ¼ mile of commuter rail sell for \$25/sq. ft. more; parcels within ¼ mile of LRT sell for \$4/sq. ft. more.	
	Debrezion, Pels, and Rietveld	2007	Various	commuter, heavy, light rail		House prices increase 2.4 percent and commercial prices 0.1 percent for every 250 m closer to a station.	
	Duncan	2008	San Diego	light rail		Condos ¼ mile from station sell for \$22,000 more and houses \$12,000 more than those 1 mile away.	
	FTA	2000	Washington	heavy rail		A 1,000 ft. reduction in distance to station increases value by \$2.30/sq. ft.	
	Goetz et al	2010	Minneapolis	light rail		Homes within 1/2 mile of a station sold at 16.4 percent less than the surrounding area before light rail, but 4.2 percent more after.	
	Hess and Almeida	2007	Buffalo	light rail		Homes within ¼ mile sell for \$1,300-3,000 more than those further away.	
	Kahn	2007	14 cities	commuter, heavy, light rail		Across all 14 cities, no change for homes in census tracts within 1 mile of a transit station and lower than area median income, but wide variation between cities of between 633 percent and 14 percent.	
	Landis, Gahathakurta, and Zhang n.d.		Bay Area	commuter, heavy, light rail		Homes in Alameda County sell for \$2.29 more for every meter closer to a BART station; homes within 300 m of the CalTrain sell for \$51,011 less; proximity to light rail was mixed with San Jose showing a negative effect, San Diego a positive effect, and Sacramento no effect.	
	Reid (design-related auto-oriented)	Bowes and Ihlandfeldt	2001	Atlanta	heavy rail		Properties within ¼ mile of transit sell for 19 percent less than those more than 3 miles away, but those 1-3 miles away sell for 3.5 percent more.
		Goetz et al	2010	Minneapolis	light rail		Condos and homes with good access to station platforms have price premiums of \$350 and \$45/m of proximity, respectively; condos and homes separated from stations by an arterial and industrial uses show no benefit.
Reid (design-related mixed uses)	Grether and Mieszkowski	1980	New Haven	N/A		Proximity to nonresidential uses significantly affects residential prices in 3 of 16 tested neighborhoods.	
	Li and Brown	1980	Boston	N/A		Home prices increase by \$1,486 for every meter closer to retail uses.	
	Matthews and Tumball	2007	Seattle	N/A		Home prices in auto-oriented neighborhoods are not significantly affected by the presence of retail. In pedestrian neighborhoods, retail proximity results in both positive and negative effects, with the former overwhelming the latter at about 235 ft. from the retail use.	
	Song and Knaap	2004	Portland	N/A		Proximity to neighborhood retail uses increases residential sales prices.	
Reid (design-related greenspace)	Anderson and West	2006	Minneapolis	N/A		Home prices increase by 0.0035 percent for every percentage decrease in distance to neighborhood parks; the effect increases with proximity to the CBD and higher densities.	
	Irwin	2002	Baltimore - Washington	N/A		Preserving farmland through easements or purchase significantly increases the price premiums of surrounding properties compared to unpreserved farmland.	
	Donovan and Butry	2010	Portland	N/A		Street trees fronting and within 100 ft. of a residential property can add up to \$8,870 in sales price.	
Reid (design-related street design)	Matthews and Tumball	2007	Seattle	N/A		A gridded street pattern increases sales prices in neighborhoods with other pedestrian features but decreases prices in more auto-oriented neighborhoods.	
	Song and Knaap	2003	Portland	N/A		Home prices increase with increases in street connectivity and reductions in block size.	
	Krizek	2006	Minneapolis	N/A		City residents will pay more for proximity to off-road bike path but less for a roadside path; suburban residents will pay up to \$1,058 less for locating 400 m closer to any bike path.	
Reid (synergistic price effects)	Atkinson-Palombo	2010	Phoenix	light rail		For houses and condos within walking distance to transit, those in mixed-use neighborhoods receive premiums of 6 percent and 28 percent, respectively; those in residential-only neighborhoods receive a 12 percent 13 percent discount.	
	Duncan		San Diego	light rail		Condos 0.3 km from the station in neighborhoods with good pedestrian quality receive a 15.3 percent (\$19,404) premium; those 0.3 km from the station in areas with poor pedestrian quality receive a 7.6 percent (\$9,962) discount.	
	Ryan and Weber	2007	Chicago	N/A		In economically distressed neighborhoods, houses located in traditional neighborhood developments (TND) received a 21 percent 27 percent price discount compared to other infill projects.	
	Song and Knaap	2003	Portland	N/A		Houses in New Urbanist neighborhoods receive a \$24,255 premium compared to houses in conventional suburban neighborhoods.	
	Tu and Eppli	1999	Kentlands, MD	N/A		Houses in the Kentlands receive a 12 percent price premium over houses in conventional suburban neighborhood.	

Source: Ewing and Bartholomew, 2012 and additions from the author

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