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Mapping Mueller: A Post Occupancy Evaluation of Transportation Choices in A New Urbanist Community in Austin, Texas

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Mapping Mueller: A Post Occupancy Evaluation of Transportation Choices in A New Urbanist Community in Austin, Texas

by

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Report

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Master of Science in Community and Regional Planning

AND

Master of Science in Urban Design

The University of Texas at Austin

May, 2014

Dedication

To my family, for helping me find my path and providing me with the support to travel along it.

Acknowledgements

I would like to acknowledge my advisors, Dr. Barbara Brown Wilson and Dean Almy for their continual support, guidance, and advice. Thank you to Kathy Skolic, Mueller Neighborhood Association President, for her energy and excitement about this project, and for connecting me with the Mueller community. Thank you to Jim Adams, architect and planner of Mueller, for taking the time to share his perspective. I'd also like to thank the survey participants for their willingness to beta-test an online mapping program, and for their patience as technical issues arose. And finally, to my family and friends, and especially my husband, Daniel, whose strength, laughter, and encouragement kept me going through it all.

Abstract

Mapping Mueller: A Post Occupancy Evaluation of Transportation Choices in A New Urbanist Community in Austin, Texas

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The University of Texas at Austin, 2014

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The 711-acre Mueller development is located just three miles northeast of downtown on the former site of the Robert Mueller Municipal Airport. Planned as one of Austin's major transit-oriented New Urbanist developments, Mueller contains a pattern of pedestrian and bike friendly streets to encourage a range of transportation options for residents and visitors. Mueller is 30% complete and provides housing and jobs to over 3000 residents and 3000 employees. This professional report seeks to understand how current residents, employees, and visitors use the bike lanes, sidewalks, and roads in the Mueller community. To evaluate the transportation infrastructure, the author designed and coded a custom Google Maps survey that asked residents to draw common routes, points of interest, and points of concern related to their transportation choices. Field observations were conducted to verify and triangulate the information reported in the online survey. This study investigates whether the transportation principles for the development are or are not achieved by comparing the expressed principles of the development with the actual behavior reported and exhibited by frequent users.

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CHAPTER ONE: INTRODUCTION

Introduction to the Problem

Mueller is a planned community located in Austin, Texas, just three miles northeast of downtown and is the former site of the Robert Mueller Municipal Airport. In 2006, McCann Adams, the master-planning firm for the 711-acre development, presented plans for the Market District – an 18-acre mixed-use center on the southeast corner of Berkman Drive and 51st street. The proposed district included residential mixed use, office, and a structured parking facility surrounding a major grocery store anchor. When asked for community input, current Mueller and surrounding neighborhood residents insisted on pedestrian and bicycle connectivity, commercial uses facing Berkman Drive, retention of trees, significant landscaping, and a site plan that allowed for future infill. However, interested supermarket chains insisted on a rear service entrance, visibility from major streets, ample surface parking, a gas station, and a drive-through pharmacy. It was clear from the multiple community meetings that residents opposed the gas station and the auto-oriented surface parking lot.

In the summer of 2013, the Mueller Market District opened with the major Texas supermarket chain, HEB, as the anchor. While the new HEB provides many amenities to Mueller and surrounding neighborhoods, it may also be an example of how market pressures can overpower community interests and urban design objectives. The new supermarket is set back from the street, has a single entrance that faces a large auto-oriented parking lot, and is surrounded by auto-oriented uses such as a gas station, a drive-through pharmacy, and a drive-through bank. A majority of future and current Mueller residents are within a ¼-mile walking radius of the new store, but very few

design features on the site support pedestrian or bicycle transportation. The rear of the store lacks a public entrance despite the fact that the majority of Mueller residents live behind the Market District. In addition, HEB constructed a 10-foot brick wall along the back of the lot, separating the rear of the store from future residential developments directly south of the District.

Despite these barriers, HEB Mueller offers an abundance of bike parking and sells pushcarts at the checkout counter to encourage alternative transportation to the store. The street that connects Mueller residents to the new HEB is Berkman Drive, which runs north-south from 51st to Manor and serves as a vital north-south connection in East Austin. Much of Berkman Drive is undeveloped, but future plans project mixed use and higher density residential with commercial uses near 51st Street and Manor. Currently, Berkman has a protected one-way bike lane on the southbound side of the street, but lacks a complete sidewalk and bike lane on the northbound side of the street (the side of the street that the majority of Mueller residents would use to get to the HEB). The future development of these parcels could ultimately determine whether Berkman becomes the mixed-use multi-modal corridor that many residents desire, or continues to develop as an auto-oriented single-use street that caters to HEB and other auto-oriented commercial uses along the street.

On the official website, Catellus, the master developer, describes Mueller as a New Urbanist community that specifically upholds the following transportation principles:

> **A Pattern of Pedestrian-Friendly Streets:** Mueller streets are designed to serve as an extension of the open space, pedestrian and bicycle network, and contribute to the community's sense of place and identity. The buildings create friendly, active edges while the roadways and streets are designed to distribute traffic in a way that minimizes the impact on

> adjacent communities. Homes are oriented towards the street with stoops and porches that encourage neighborliness.
>
> **Transit as a Viable Alternative to the Automobile**: Mueller is planned as one of Austin's major transit-oriented developments with Capital Metro bus service and a proposed extension of the Capital Metro Rail system upon voter approval. The pattern and intensity of development is planned in conjunction with a comprehensive program of transit improvements aimed at reducing automobile dependence. (Catellus , 2014)

The designers and developers of Mueller must balance the transportation principles with the six stated goals for the project: Fiscal Responsibility, Economic Development, East Austin Revitalization, Compatibility with Surrounding Neighborhoods, Diversity & Affordability, and Sustainability (Catellus , 2014). The Market District at Mueller may be an example of the need to balance transportation principles with other goals such as Fiscal Responsibility.

However, transportation principles are essential to New Urbanist ideology and align directly with the twenty years of community plans and principles that precede the existing development. The example with HEB demonstrates that market pressures can outweigh the desires of residents and the ability for the Mueller development to achieve ambitious transportation goals.

The Post-Occupancy Evaluation (POE) performed at the neighborhood scale can be a useful tool to evaluate New Urbanist communities to determine if they work for their residents, employees, and frequent visitors, and if they effectively achieve the goals of the planner and developer. This professional report is a POE of the current transportation infrastructure at Mueller. The goal is to determine whether the transportation infrastructure works the way the developer and planners intended, and establish lessons learned for the future phases of development. To conduct the POE, the author created an

online participatory mapping survey that aims to understand how residents and visitors use the transportation infrastructure at Mueller and to test whether the designers' and developers' intentions align with the behavior of residents and frequent users. By learning what works and what doesn't, architects and planners can use this information to inform future design decisions.

GOALS OF THE RESEARCH

- To examine how residents, employees, and visitors use the roads, sidewalks, and bike lanes in the Mueller community.
- To investigate whether the transportation principles for the development are or are not achieved.
- To compare the transportation principles for the development with the actual behavior reported and exhibited by residents, employees and frequent visitors.
- To develop and test new digital mapping methods for evaluating travel behavior.
- To inform future development projects by revealing disconnects between the transportation planning, implementation, and actual effectiveness for residents, employees and frequent visitors.

Literature Review

The movement now referred to as New Urbanism can trace its roots to the 1970s and 80s when professional planners and architects re-introduced urban design standards dominant in the pre-automobile era (Ellin, 1996). New Urbanism began as a reaction to "The Crisis of Growth" (Katz, 1994) and the post-World War II suburban track development that proliferated due to investment in automobile technology, federal and state highway investments, and mortgage lending practices (Ellin, 1996). These federal funding opportunities, coupled with high demand for suburban housing, led to massive construction of highways, chain-stores, and monotonous subdivisions, which were often built so quickly that they were designed with little sensitivity for their environment (Katz, 1994). The proliferation of zoning – a planning tool that gave municipalities the power to separate uses – made it possible to completely separate jobs, housing, and services from one another, which led to overdependence on the automobile and a general lack of diversity of places.

The primary mission of New Urbanism has been the reform of suburban sprawl and America's car-dependent lifestyle, which it views as the most debilitating and the most neglected of America's crises and "the major cause of atmospheric and hydrological degradation and of social and economic problems that are even more immediate and debilitating" (Duany, 20 Years of New Urbanism, 2013). New Urbanism proposes an alternative to sprawl through a set of 27 proscribed solutions or principles organized at the regional, neighborhood, and block levels (Talen, 2005).

NEW URBANISM AND NEIGHBORHOOD PLANNING

Despite the name, New Urbanism is not a new style, but a revival of many early neighborhood and town-planning principles. Most notable perhaps is the 'Neighborhood Unit' in the 1929 First Regional Plan of New York promoted by early 20th century planners Clarence Perry and Lewis Mumford of the Regional Planning Association of America (RPAA) (Dutton, 1994). Like New Urbanism, the RPAA strived to find the ideal density and mix of uses to balance urban life with open space, fresh air, and community needs (Talen, 2005). Unlike New Urbanism, The RPAA reacted to the particular conditions of early 20th century urban industrialization and planned communities were proposed as a retreat from the chaos and ills of city life rather than a return to urban living.

In the 1929 First Regional Plan of New York, Architect Clarence Perry proposed "The Neighborhood Unit." Figure 1 (below) is a sketch produced by Perry illustrating the relationships between the residential components of a neighborhood and the uses that could be easily accessed by foot. As Perry's work predated the rise of the automobile, his street widths and building footprints were designed with pedestrians in mind. Perry utilized the 5-minute walk to define walking distances from residential to non-residential components; in particular, Perry focused on school children and their ability to safely walk to and from school.

In the first widely published book on New Urbanism, Andres Duany reiterates this concept in his essay about Neighborhood Planning: "The optimal size of a neighborhood is a quarter mile from edge to center," and "the size of a school should be determined by the number of children who can walk or bicycle to it from adjacent neighborhoods" (Duany, 1994). Embedded in the Charter of New Urbanism, is the

principle that residential environments should be organized around the "5-minute walk" to promote accessibility to public goods, services, and facilities. Architect and planner Doug Farr adapted this concept in his diagram below. While Farr identifies with the compact building principles of New Urbanism, he went on to form Sustainable Urbanism, which emphasizes green infrastructure and high performance buildings in addition to compact neighborhood design.

Figure 1: Douglas Farr's Sustainable Urbanism

Figure 2: Clarence Perry's Neighborhood Unit

In addition to similar beliefs about pedestrian oriented development, New Urbanism and the RPAA both approach neighborhood design as a controlled process. Talen explains: "The underlying logic of many planned communities, in contrast to unplanned settlement, was one of creating diversity through design. But it was a controlled diversity" (Talen, 2005). RPAA planner Raymond Unwin believed that prior

to the 20th century, development happened so gradually that each building assimilated into the whole before the next was added, but Unwin felt that during the industrial era the speed of development meant that gradual city building had been lost, and the only way to achieve a balanced community was to plan for one in its entirety (Talen, 2005).

While New Urbanism does subscribe to the notion of complete neighborhood planning, the movement also borrows from master planning critics Jane Jacobs and William Whyte, who were notably skeptical of the comprehensive approach to built form in favor of an incremental approach to city building (Talen, 2005). Like New Urbanism, Jacobs and Whyte reacted to sprawl and the effect of abandonment that sprawl had on the inner city. These writers believed that many contemporary planners of the mid 20th century were missing the key elements of urbanism and berated planners "for treating the city as a series of calculations and measurable abstractions that rendered it a problem of 'disorganized complexity" (Talen, 2005). In *The Death and Life of Great American Cities*, Jacobs explains the virtues of wide sidewalks, mixed uses, small blocks, higher densities and creative re-use that ultimately promote the diversity of complex urban spaces (Jacobs, 1961). In 1971, Sociologist William Whyte conducted the Street Life Program, in which he observed behavior in New York City streets and public spaces. His study revealed insights about human tendencies in public spaces and noted the different behaviors exhibited in vibrant public spaces compared to their less popular counterparts. Whyte's study influenced future generations of planners on the effect of certain design features on human behavior. Both Jacobs and Whyte expressed strong convictions about what made a good city, and neither was opposed to controlling development; however, both emphasized the importance of understanding the complexity of human behavior. Jacobs favored the idea of imposing a few basic rules to guide a process, rather than the

imposition of a pre-conceived plan put in place by one person or a group (Talen, 2005). New Urbanism proposes a hybrid approach to the order vs. diversity dichotomy. New Urbanism is an "integrative notion of urbanism, one that tries to negotiate order that is both incremental and visionary, that is code implemented but allows individual expression, that is sequential but also subjected to master planning. Specifically for a New Urbanist community, "order may be needed at the level of the plan and the implementing code, while small-scale incrementalism may be needed to fill in and fill out the ordered urban framework" (Talen, 2005). Essentially, New Urbanism proposes an ordered approach to planned communities, but builds in opportunities for incrementalism and diversity.

NEW URBANIST NEIGHBORHOOD MODELS

New Urbanism produced two approaches to neighborhood design, the "traditional neighborhood development" (TND) and the "transit oriented development" (TOD). Both neighborhood design models emphasize compact, mixed-use, transit and pedestrian oriented development. The TOD conceived by Peter Calthorpe is rooted strongly in convictions about regional planning and the importance of transit (Katz, 1994). TOD's place priority on immediate access to transit – typically as part of a regional plan that links multiple transit stations and associated transit-oriented developments. TNDs, conceived by town planning firm, Duany Plater-Zyberk (DPZ), operate at a smaller scale, include more fine-grained regulations and vary more in response to local conditions. TNDs put less emphasis on transit as the solution to reduced automobile use and focus instead on creating complete neighborhoods sized for walking and biking distances with a balance of uses such as jobs, housing, shopping, and entertainment. Though TND's do

not strictly prioritize mass transit, they do intend to reduce automobile demand by creating safe, attractive mixed use environments that make it easier for people to walk or bike short distances such as to the park, school, or convenience store. In addition, emphasis is placed on creating a pleasurable pedestrian environment where streetscapes are shaded and include pedestrian amenities; parking lots are tucked away from the street and replaced by plazas, shop fronts, porches, and patios instead.

The other hallmark of TND's is neighborhood design guidelines that promote architectural features that encourage social behavior among residents and visitors. In traditional neighborhood developments, almost every home has a porch and garages are behind the homes with an entrance through a smaller alley-like street instead of through paved driveways. The garages and service entrances to commercial buildings are typically tucked behind the building in order to create a grid of straight streets and generate clear and enclosed public spaces (Ellin, 1996). While both types of development are aimed at reducing the use of automobiles, TODs provide mass transit as a direct alternative to the automobile for traveling long distances throughout the city or region.

THEORETICAL PERSPECTIVES

One of the earliest criticisms levied against New Urbanism was a challenge as to whether it actually reduces automobile dependence. In 1996, Crane raised the point that "the impacts of new (urbanist) plans are generally indeterminate, and it is unclear whether designers understand the reasons well enough to avoid unintended results (Crane, 1996). Crane points outs that New Urbanist communities are not purely based on scientific logic – they are partially based on assumptions about how humans behave. Traffic demand models that evaluate whether locating trip origins and destinations closer

together on a grid of streets can show that people drive less, but "the pivotal question is whether there will be a behavioral response". Crane points out that this response is not just based on preference, but also as on external factors like the cost or time expensed using one travel mode versus the other.

In, *On Form versus Function: Will the New Urbanism Reduce Traffic, or Increase it?* Crane tests whether car trip demand increases or decreases based on assumptions about how much time each trip takes. He found that design features such as mixed uses, gridded streets, and traffic calming have inconclusive results as they relate to reducing demand – traffic calming clearly reduced demand, but gridded streets increased demand and mixed use was inconclusive. Crane concludes that New Urbanism lacks a critical step in linking the design features they promote with economic concepts of price, cost, and quality.

Another criticism of New Urbanism is that the adherence to the forms of the past may actually prevent the discovery of new solutions to problems presented in a rapidly changing contemporary context (Ellin, 1996). A principal value in New Urbanism is to promote the historical, physical, cultural and social context of a place. The search for context is similarly the search for diversity that Talen discusses and is a direct reaction to the lack of context found in prior architectural movements such as modernism. Ellin explains that contextualism is difficult to achieve because of a multitude of factors including economic and political constraints, invention of histories, and the personal shortcomings of urban designers and the tendency to overlook the larger contexts in which they build (Ellin, 1996). Ellin's criticism is that a deep and authentic contextualism is hard to achieve, particularly by a singular designer. She calls on designers to shift their

focus away from a "search for a usable past" and towards "a more sophisticated understanding of their place in history, of cultural differences, and of the larger political economy in which they currently work" (Ellin, 1996). Ellin argues that only through a true and deep understanding of current socio-political context will a designer be able to utilize their creativity to suit the specific design task at hand.

Susan Moore elaborates on the importance of context in her recent article: *What's wrong with best practice? Questioning the typification of new urbanism*. She argues that New Urbanism has the potential to become socially or politically indifferent by adopting a universal checklist of "best practices". Moore is critical of the proliferation of formalistic, even ritualistic sets of norms, practices, and policies that promote a particular approach for achieving a planning or urban development vision (Moore, 2013). For example, if certain housing provisions or community development solutions are abstracted down to their core principles to be reproduced in relatively disconnected geographic locations, unsuitable design solutions could be implemented at the expense of democratic debate on local urban futures (Moore, 2013). Like Ellin, Moore is skeptical of New Urbanism's emphasis on appropriating the best of the usable past, as a 'common sense' solution – for fear that critical skepticism and deliberation might be over-ruled by design solutions that worked in other places or time periods.

Like Ellin, Moore draws similar conclusions about the risk of New Urbanism promoting the adoption of watered-down and decontextualized principles at the exchange of truly context appropriate solutions. Ellin (1996) points out that it isn't the intention of designers that is inherently flawed, but it is the reality of how difficult it is to implement a truly context appropriate solution. In addition, certain regulatory and economic challenges make it difficult to implement mixed-use projects. Talen (2005) asserts that

the movement has “struggled to find the right implementing mechanisms and regulatory codes to make urbanist ideals successful”. While Ellin and Moore levy criticism on the implementation of New Urbanism, Crane challenges whether there will be a behavioral response once a New Urbanist solution is implemented. He advocates for more rigorous methods to evaluate the effectiveness of New Urbanist solutions such as transportation demand models that incorporate economic theory of costs, time, and quality.

The TOD and TND neighborhood models are not just strategies and recommendations, they are neighborhood templates that come with design guidelines that ascribe the dimensions of the development, the number of residents and jobs, street typologies, sidewalk and bike lane widths, as well as the character and height of the architecture. Embedded in these models is the assumption that the design of the community – from the transportation patterns to the architectural details -- will trigger a behavioral response from residents and frequent users. Critics like Crane, Ellin, and Moore challenge the authenticity of new urbanist neighborhood models and question whether the expressed behavior of residents actually matches up with the projected behavior the designer envisions. Crane advocates for more rigorous scientific models that incorporate behavior variables like attitude and choice, while Ellin and Moore suggest more dialogue between the designers and the end users and a deeper understanding of the socio-economic and political realities of a place to ensure that the solution will be suited to the needs of the future residents and users who live there.

PRIOR RESEARCH

There have been many studies conducted that evaluate the effect of urban design features on transportation patterns, but rarely do the studies evaluate personal attitude and choice as a determinant of transportation behavior. Kitamura et al. (1997) conclude that the quality of neighborhood streetscape environments affect the frequency that people walk – for example, pedestrian travel is higher in neighborhoods with complete sidewalk networks and other pedestrian amenities and safe crosswalks. Ewing, Haliyur, & Page (1994), and Cervero & Radisch (1996) claim New Urbanist neighborhoods are less dependent on automobiles than their suburban counterparts due to their internalized facilities and services. Newman asserts that permeable street systems, which encourage direct movement through an area, are likely to have less car use. Newman also found that shorter distances are likely to mean that some walking trips become more viable, but also found that other factors are likely to be more significant in reducing car use and facilitating other modes (Newman, 2008).

Lund conducted a study comparing walking behavior in New Urbanist neighborhoods to their suburban counterparts but considered attitudinal data as an important variable in the regression model. Lund found that pedestrian-friendly streetscapes, everyday amenities, parks and retail shops within a neighborhood can increase pedestrian travel behavior but that attitudinal factors such as individuals seeking a more community-oriented neighborhood play a more significant role in determining behavior (Lund, 2003).

In addition to quantitative research, there have been several qualitative studies that attempt to evaluate New Urbanist transportation infrastructure through surveys, observations, and interviews. In 1996, researchers Plas & Lewis conducted an extensive

qualitative research effort to determine what factors contributed to a sense of community in a New Urbanist development. Though transportation principles were not specifically analyzed, they observed "for the most part, adults and children felt they could travel the streets of the town freely, walking for neighborly reasons as well as to get family supplies" (Plas & Lewis, 1996). Langdon (1997) conducted interviews with residents in two New Urbanist communities: Kentlands and Harbor Town. He found that due to the compact neighborhood, complete sidewalk network, and multiple route options, the residents he interviewed did walk more and were more willing to let their children walk places by themselves.

In the most direct precedent for this study, Tomlinson conducted a Post-Occupancy Evaluation of the New Urbanist community River Ranch in Laffayette, Louisiana. Using multiple research methods, Tomlinson interviewed and observed residents to determine whether the goals of the architect were achieved. One of the goals measured was whether the design of the New Urbanist neighborhood successfully promoted walking and reduced driving. Tomlinson found that this goal was difficult to assess "since most jobs and all schools are located outside of the development, necessitating a large number of cars travelling on a regular basis in the village." While some residents did express that they walked more and drove less, it was unclear whether this behavior was due to the design of the neighborhood, or the personality and lifestyle of the interviewee (Tomlinson, 2007).

New Urbanist developments have had some success at reducing automobile dependence. However it is difficult to pin down the specific factors that contribute to multi-modal transportation. Crane (1996) and Lund (2003) both suggest that attitude,

choice, and behavior are important factors to consider when evaluating New Urbanists developments, and Moore (2013) and Ellin (2005) draw similar conclusions about the risk of adopting of watered-down and decontextualized principles at the exchange of deliberation and context appropriate solutions.

MAPPING MUELLER'S CONTRIBUTION

The intentions of this study are articulated by the prolific Philadelphia planner, Edmund Bacon, in his 1969 article *Urban Process: Planning with and for the Community*. He writes:

> Until there is general understanding of the process of hypothesis formation, its injection into the tumult of democratic dispute, the generation of feedback, and the restructuring of the hypothesis in the light of that feedback, in an ever recurring cyclical interaction, little progress will be made in achieving a viable relationship between the intellectual and actual decision making, and indeed, in the very formation of viable concepts (Bacon, 1969).

Bacon describes the critical importance of the feedback loop in the planning and design process in order to gauge whether the design successfully accomplishes the goals of the architect, planner, or developer. If New Urbanist communities strive to be authentic and context sensitive, it is essential for designers and planners of those communities to listen and adapt to the feedback of the residents and users that live there. As Moudon suggests:

> New Urbanism should study its own work, evaluate it critically and establish a baseline from which progress can be measured. People living in New Urbanist communities, as well as those building and managing them can shed light on all sides of the debate: how good are the small lots, the town centers, the alley dwellings? Are residents shedding their cars, children walking to school? How strong are social ties in the community? Both positive and negative answers to these questions need explanation, in order to guide the designers into the next generation of projects (Moudon, 2000).

To understand the success of a New Urbanist community, we must ask the people who live there, because only their actions and behavior can verify whether the design strategy works in the particular context – and perhaps, how it can be improved. This project aims to evaluate the efficacy of one case study, based on the local knowledge of residents and frequent users of the neighborhood. The research goal is to understand how residents and visitors use the transportation infrastructure at Mueller and to test whether the designers' and developers' intention matches up with the behaviors of residents. It is not meant to be a critique of New Urbanist ideology, but rather a proposal for New Urbanism to incorporate a comprehensive feedback loop into the process in order to stay effective and relevant. By learning what works and what doesn't, architects and planners can use this information in a feed-forward role.

Methodology

A Post-Occupancy Evaluation (POE) is a process that evaluates the performance of an environment after it has been occupied. It evaluates whether the performance of the environment satisfies the original goals and suggests solutions for improving the performance, thereby improving the relationship between the people and the environment (Preiser, 1994).

To conduct a POE at the neighborhood level, Churchman & Ginosar (1999) recommend an evaluative approach suited to the particular characteristics of residential neighborhoods to collect systematic information of the interactions between residents and the physical environment. Diverse research methods are encouraged in order to reach different types of information and triangulate between the findings of the different methods. Overlapping diverse research methods helps to paint a "multidimensional picture of the condition of the neighborhood, and assists in identifying problems which require planning intervention" (Churchman & Ginosar, 1999).

The main method used in this study was an online participatory mapping survey that asked residents and frequent visitors to contribute local knowledge such as commonly traveled routes, points of concern, and points of interest. Rantanen & Kahila (2009) point out that data collection of local knowledge is often left out of the planning process because it is considered to be opinion or belief, as opposed to hard, technical knowledge and professional expertise. In addition, the methods of collecting and processing local knowledge are inadequate and inconsistent, which prohibits the planning process from incorporating the knowledge appropriately. They argue that internet-based

mapping tools have an increasingly important role in communicative planning processes because they allow for successful distribution of information and two-way interaction, which enable residents to create, manage, and distribute their own spatial information (Rantanena & Kahilab, 2009).

In addition, a mapping survey is a quick way of gathering data about how users perceive certain routes and travel experiences. "Understanding the way cyclists perceive their environment as well as mapping and analyzing these perceptions could be the key to designing positive cycling experiences which may well encourage more people to travel by bicycle, thereby contributing to sustainable urban environments" (Snizek, Sick Nielsen, & Skov-Petersen, 2013).

PROCESS AND TIMELINE

This POE contained three consecutive research methods: preliminary analysis and interviews (September – November 2013), online interactive mapping survey (November 2013– January 2014), and field observations (February 2014).

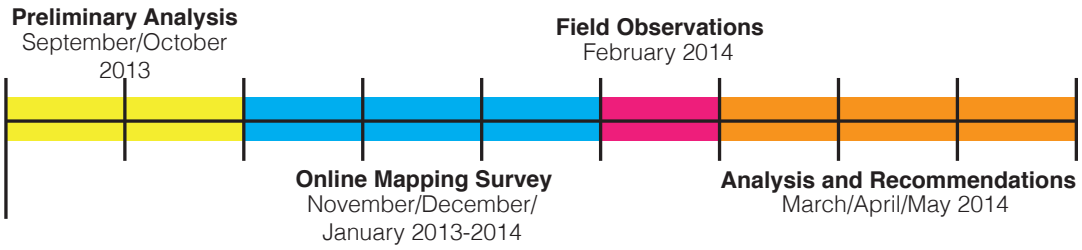

Figure 3: A Timeline of the Research Process

PRELIMINARY ANALYSIS AND INTERVIEWS

The first method entailed gathering existing data, informal interviews, and discussions with neighborhood activists, the master planner, and the Mueller neighborhood association president to contribute to the author's understanding of the neighborhood's origin, history, and original goals behind the development. In addition to interviews, source material such as early planning documents, current master plans, zoning maps, design guidelines, neighborhood and city-council transcripts, news articles, and blog posts were also reviewed and evaluated.

ONLINE INTERACTIVE SURVEY

Figure 4: A screenshot of the interactive survey

An interactive online survey with a mapping component was created by the author and distributed to residents, nearby residents, and employees of Mueller. The intention of the survey was to gather local knowledge about route choices, points of concern, and points of interest.

The online survey contained three parts. The first part of the survey allowed respondents to manually enter in their commonly traveled routes and answer follow-up questions to indicate the mode of transportation, reason, frequency, companions, and route description. The second part of the survey asked users to identify places of concern or interest that impact their route choices. Respondents located points on the map, indicated whether they were a concern or interest, type of place, frequency, and description. The third step in the survey asked users to complete a list of demographic

questions and open-ended comments related to user satisfaction and future recommendations.

SURVEY RECRUITMENT METHODS

The survey link was posted to the Mueller neighborhood association message board and was sent out over the Mueller neighborhood association list-serve. The survey link was also emailed to the surrounding neighborhood association presidents and communications officers of Cherrywood, Windsor Park, and Delwood II. In addition, the survey was emailed to the HR directors and Community Liaisons of major employers such as HEB, the Thinkery, and Dell Children's Hospital. Respondents were able to email if they encountered any problems with the survey, as well as post comments on the neighborhood association message board. In addition, the survey was advertised and shared on social media sites such as Twitter, Facebook, and Reddit.com, and personal contacts that frequent or live in the Mueller neighborhood. An instructional video was also made and posted to the website.

SURVEY DESIGN METHODS

The survey was designed and coded using the Google Javascript API v3, a customized internet based programming language created by Google that allows web programmers to embed Google Maps into a webpage and access additional coding libraries to make more dynamic or complex online maps. In this case, the "Drawing Tools" library was used to embed drawing tools on the map so that website visitors could draw and save the data to a secure online database.

A website domain (www.mappingmueller.com) was purchased, designed and

coded by the author using HTML and JavaScript languages. Then, Google Maps was embedded into the webpage and the Google API software was activated so that users could draw and save routes and points on the map at their exact coordinate locations. The final step of the survey was a series of demographic questions that the author coded using an HTML form. Lastly, the author set up a password protected MYSQL database so that users submitted their information to an encrypted online database.

The survey stayed active from December 12, 2013, to February 14, 2014. During the two months, 85 people completed the survey. The survey respondents submitted 242 routes, 125 points of interest, and 84 points of concern.

DATA ANALYSIS METHODS

All of the data was stored in the database as latitude and longitude points with X and Y values and corresponding attribute information such as route type, frequency and description. The point data was stored as single (X, Y) values and the route data was stored as strings of (X, Y) values. ESRI ArcGIS 10.1 was used to map and analyze the data. To map the point data, the author made an "XY Event Layer" using the ArcGIS data management tool. This tool creates a new point feature from X and Y coordinates defined in a database table. Each point was added to the map with its corresponding attribute data. For the route data, the author plotted all the points in the coordinate string individually, and then applied the Data Management "Points To Line" tool to create a line from the series of points. Each point and route contained a special ID number that linked each route and/or point to the respondent who filled out the survey. Finally, the user ID number of each route and each point was joined to the same ID number in the

demographic dataset collected in step three of the survey.

Once the data was successfully mapped in GIS, the spatial analysis tool Kernel Density calculated the point and line magnitude per unit area. The Kernel Density operation created a series of maps that show the density of routes and points controlling for a certain attributes such as mode type, user demographic, or route reason.

FIELD OBSERVATION METHODS

After mapping the data using GIS, the author conducted field observations to compare the reported behavior of users against observed behavior. Six 30-minute observations were conducted at key locations indicated by the results of the online mapping survey. The sites were chosen based on the density of route traffic, points of concern and points of interest at each site. The sites identified ranged from traffic intersections to streets, pedestrian corridors, and public recreation spaces. Observations provided context for the data collected in the survey such as specific physical details and triangulated the data to provide a more comprehensive understanding of the transportation infrastructure.

Drawing from Creswell's observation method outlined in *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, concrete observations were first observed and recorded, then personal thoughts, behaviors, and reactions to the site were acknowledged and written down in order to account for personal bias and to retain important key thoughts or analysis.

FEASIBILITY AND LIMITATIONS

There were a number of technical limitations with the online mapping survey. Many respondents reported glitches encountered on the Mueller neighborhood association online message board. When a glitch was reported, the author promptly attempted to fix the problem and repost the link to notify the respondent that the problem had been fixed. Around 90% of the glitches were fixed; however, some respondents reported browsers did not display the map and drawing tools properly, making it impossible for them to complete the survey with accurate information.

Upon further reflection, the route data gathered did not account for chain-trips – or if it did, it was difficult to identify, as only one mode choice was available for each entry. The route data gathered did not account for multiple reasons for a particular trip. So if a person took a certain route to go to work and shopping, both reasons were not recorded. Another limitation with the survey is that it required access to the internet and a desktop or laptop computer. The survey was not designed to function on mobile or touch-screen devices, and there was no paper version. Populations in the Mueller community and surrounding area without access to internet on a laptop or desktop computer were not able take the survey.

The survey and observations were conducted from November 2013 to February 2014, so the data may be limited to route and travel behavior during the months the survey and observations took place. In addition, the winter weather conditions may have reduced the likelihood of outdoor alternative transportation use such as walking and biking.

CHAPTER TWO: MUELLER FROM AIRPORT TO VILLAGE

Context and Site

The 711-acre Mueller development is located just three miles northeast of downtown Austin on the former site of the Robert Mueller Municipal Airport. Austin is currently the 11th largest city in the United States, with a population of 859,814 and a five-county Metropolitan Statistical Area (MSA) of 1,915,039. Austin and the surrounding five county MSA have grown exponentially since the 1990s, and the population is expected to double to nearly four million by 2040. For the last four years in a row, Forbes Magazine ranked Austin America's #1 Fastest Growing City in America. To mitigate the effects of this sprawl and to capture the future tax base for the region, Austin continues to focus efforts on urban growth and economic development strategies that support residential growth in central Austin. As a large city-owned property less than five miles from downtown, Mueller offers an opportunity to provide a variety of housing, employment, recreation, and shopping opportunities that appeal to young families and others who might otherwise move to the surrounding suburbs.

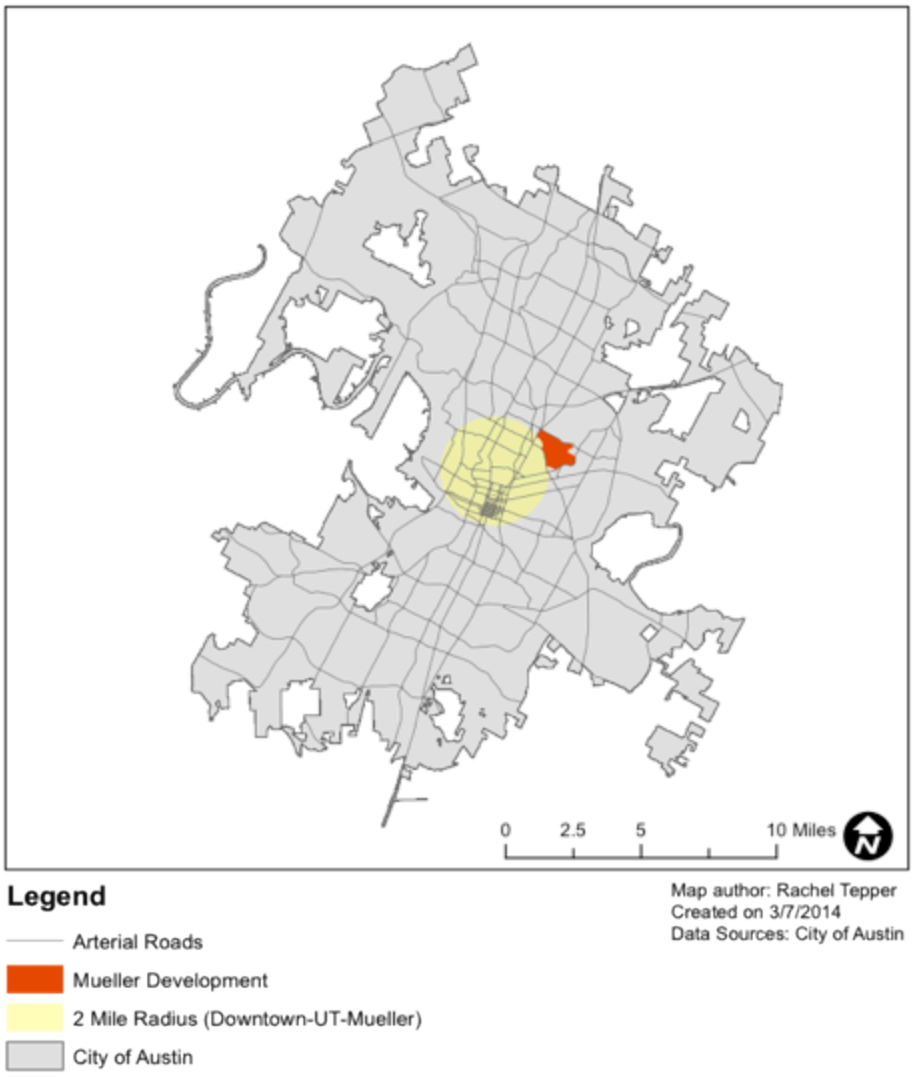

Figure 5: Mueller in the Context of Austin

Mueller is located just east of I-35, bordered by 51st street to the north, Airport Boulevard to the southwest, and Manor Road to the south/southeast. Just beyond the arterial roads are surrounding residential neighborhoods: Cherrywood to the southwest (across Airport), Windsor Park to the northeast (across 51st), and Delwood II to the west.

Due to its previous use as a municipal airport, much of the land directly adjacent to the site is owned by the city of Austin and is maintained as parkland. This land includes the Morris Williams Golf Course just to the southeast on Manor Road, the 57-acre Bartholomew Park just north of Mueller on 51st, and the 9-acre Patterson Park just to the west across Airport Boulevard.

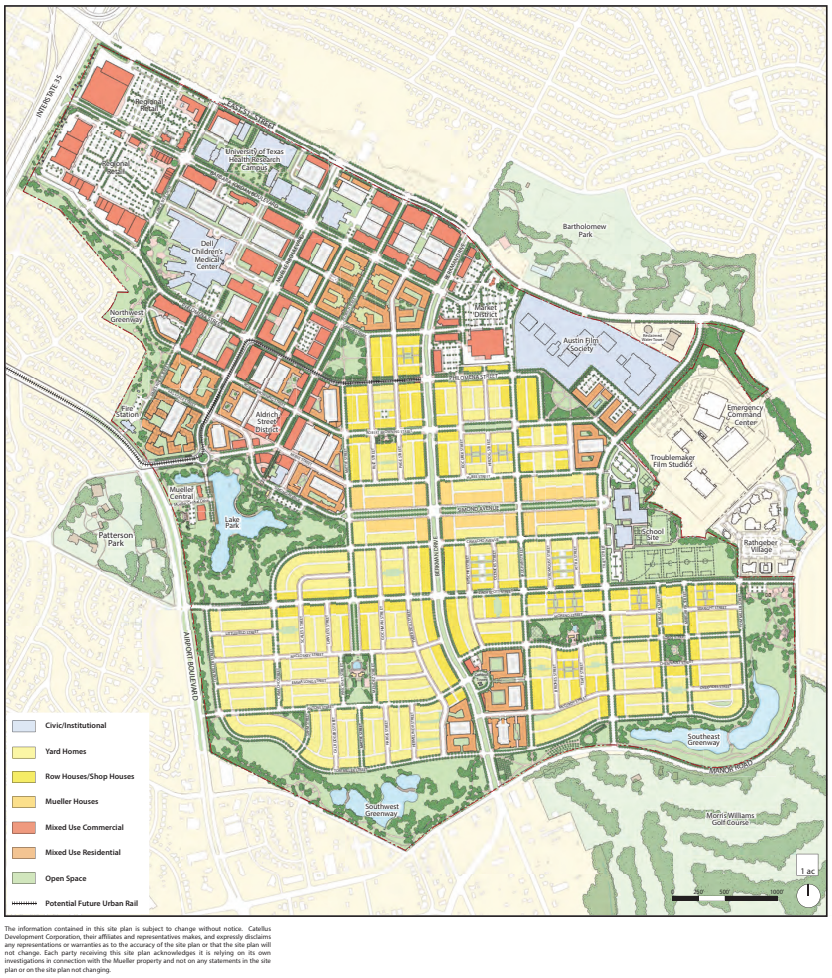

Figure 6: Mueller 2013 Illustrative Concept Plan

Mueller is divided into four residential neighborhoods, two employment centers, and a town center. The Regional Retail and Hospital Center is located at the far eastern edge of the site, directly accessible from I-35 where greater numbers of regional customers may access them from the interstate and frontage roads. The Market District is

located on the northeastern edge of the site along 51st street directly across from the Windsor Park neighborhood. The town center will be located within the interior of the redevelopment along Aldrich Street and is designed as a retail cluster of smaller shops, locally owned establishments that will connect the employment centers with the single-family neighborhoods.

Currently, there are just over 700 homes built, a regional retail center, two parks, and anchor offices and businesses. Catellus estimates that the development is roughly 35% complete, containing 3,500 residents and 3,500 employees. The Mueller master plan calls for 5,700 residential units, 140 acres of park space, a mixed-use town center with abundant commercial space, on-site jobs, and convenient access to transit options (Catellus 2004). The current master plan projects an eventual capacity of 13,000 residents and 13,000 employees.

To reach the intended density numbers, Mueller will need high capacity transit. Mueller modeled its housing density on the City of Austin's transit-oriented development ordinance, which means that the master plan projects a density that is only achievable if Mueller receives urban rail or some form of high capacity transit. The new community is designed with ample sidewalks, parks, walking trails, and innovative bike infrastructure; however, the majority of existing commercial development is auto-oriented. The roads surrounding Mueller are larger arterial streets and highways, which limits connectivity to adjacent neighborhoods. In addition, the phasing of the development creates a challenge for current residents who are impacted by construction disturbances and undeveloped infrastructure.

History of Mueller

In 1982, the Austin American Statesman ran an article about expanding the Robert Mueller Municipal Airport. Rick Krivoniak, a resident of the Windsor Park neighborhood directly north of Mueller, remembers reading the Statesman article shortly after purchasing his new home. “One plan would have leveled my neighborhood, another flattened east Austin.” Krivoniak and other homeowners from nearby neighborhoods banded together to form the Citizens for Airport Relocation (CARE) led by architect and surrounding Cherrywood neighborhood resident, Girard Kinney. The group originally came together to advocate for moving the airport instead of enlarging it, but in the process they realized they needed to start thinking about the future use of the site (Krivoniak, Windsor Park Neighborhood Resident, 2013).

In 1984, the group proposed an alternative vision for the land’s future called the CARE plan. This document recommended increased residential density and mixed-use development designed in such a way that was compatible with the adjacent neighborhoods and tied into the fabric of east Austin. "We all agreed that if we could get the airport relocated, we needed to be thinking from the beginning about what was going to happen at Mueller," architect and planner Kinney says" (Ross, 2013). In 1996, a 16-member Task Force representing a spectrum of Austin interests challenged the city to create a district that would be a model for responsible urban development and that could influence the form and pattern of growth in Austin.

In May 1999, the last flights left Robert Mueller Municipal Airport and the return flights landed at Austin Bergstrom International Airport. Citizens and lawmakers in

Austin began an extensive planning effort to redevelop the Mueller site. In 2000, the city hired the urban design firm McCann Adams (formerly ROMA Design Group) to develop a detailed master plan and design guidelines. In 2004, the city of Austin established a Tax Increment Financing District to finance the public infrastructure and entered into a legally binding Master Developer Agreement with Catellus, a land development company that specializes in developing mixed use communities. In the agreement, the city also approved the zoning and the design guidelines necessary to implement the master plan.

TRANSPORTATION DESIGN PRINCIPLES

Mueller's transportation principles originated in the 1984 CARE Plan. The key transportation principles established by the CARE Plan were (1) to keep traffic out of surrounding neighborhoods and (2) to create a high density center "village" with hike-and-bike trails, greenbelts, roads, and bus routes that all lead to the center. The CARE Plan authors envisioned Mueller as a pedestrian-oriented urban environment with a small central park plaza near the high-density center of the development. The perimeter of the site was envisioned to consist of less intensive, automobile-oriented uses, utilizing lower structures and twice as much landscaping as the minimum currently required by city ordinance. However, the plan also called for the development to integrate into the surrounding neighborhoods by linking Patterson and Bartholomew Parks with the newly created park near the center of the village. The plan specifically outlined that neighborhood linkage would be made by means of hike-and-bike trials and not streets.

Mueller transportation principles were further outlined in the Mueller Process and Goals Task Force Report in 1997, and then incorporated into the framework and

foundation of the Mueller Master Plan. The Task Force proposed six principles: Fiscal Responsibility, Economic Development, East Austin Revitalization, Compatibility with Surrounding Neighborhoods, Diversity, and Sustainability. The transportation vision was embedded in Principle 4: Compatibility with Surrounding Neighborhoods, which stipulated that "development must maintain and enhance the quality of life in adjacent neighborhoods, providing complementary linkages, land uses and transportation patterns," and Principle 6: Sustainability, which specified that development be planned in a way that promotes energy efficiency, reduced auto dependency, watershed protection and green space preservation" (Catellus , 2014).

The final principles were established in the 2004 produced by McCann Adams Studio (formerly Roma Design Group) for the Development Agreement between Catellus and the City of Austin. The transportation principles were a combination of Traditional Neighborhood Development, New Urbanism, and current green building and sustainable design practices. Developers envisioned Mueller as a walkable, transit-oriented, "Green Community" that provided a clear alternative to the automobile-dominant patterns of development that prevailed for much of the 20th century (Roma Design Group, 2004). The streets were designed to distribute traffic in a way that minimizes impacts on adjacent communities and serves as an extension of the open space pedestrian and bicycle network. A series of street sections were proposed to accompany the plan.

The Mueller Master Plan projected transit use into the design of the Mueller community, stating that Mueller offers one of the few opportunities to develop a dense transit-oriented community. Mueller designers located and reserved right-of-way for

potential Capital Metro rapid transit projects such as light rail and rapid bus, estimating that these future projects could divert up to 30% of single occupancy vehicle trips generated by the development.

Despite the rhetoric about pedestrian and transit-oriented development, the plan does little to encourage existing bus service in Mueller. There are no efforts to locate new bus stops or bus services for existing Capitol Metro routes. In addition, a considerable amount of design and planning went into creating direct access from the development onto the I-35 main interstate that runs through the city of Austin.

MUELLER TRANSPORTATION DESIGN CRITICISMS

Over the years, the Mueller Master Plan received criticism for the development of its transportation infrastructure. According to master planner Jim Adams, advocates of New Urbanism criticized that the development did not engage the public realm along major corridors like Airport and Manor, electing instead to locate auto-oriented uses and greenway buffers around the edges of the development along major streets.

In addition, Windsor Park neighborhood residents expressed frustration about the removal of a previous frontage road, turning a 1500-foot trip into a 4500-foot trip; additionally, some of the proposed design methods, such as a roundabout at the entrance of the development, have left users frustrated. According to early Mueller advocate and Windsor Park neighborhood resident Rick Krivoniak, "citizens are being asked to fix these with transportation bonds just a few years after they were designed and constructed" (Krivoniak, The Mueller Progenitors, 2012).

Despite these issues, some neighbors and residents praise Mueller for trying out

new and unconventional forms of transportation infrastructure. In an online interview for the Mueller neighborhood association website, neighbor and long-time Mueller advocate Girard Kinney commented, "While I worry about several transportation issues, I applaud Mueller's willingness to learn. CycleTracks (reserved bike paths along streets with protection on both sides) are going to be used, and we'll learn from them. I'm glad we have a roundabout. For its flaws, Mueller's learning from it, taking it to the next level and I appreciate that." Kinney points out that Mueller developers are not afraid to take risks and implement new transportation methods like the roundabout and the cycle tracts and learn from them based on feedback from residents, visitors and employees (Kinney, 2012). Catellus and McCann Adams also regularly attend neighborhood meetings to update residents on the current construction projects and ask for feedback about the existing conditions of the development.

In a personal interview, master planner Jim Adams expressed some concerns about the transportation infrastructure. First, Adams stated that Mueller needs a better temporary infrastructure plan to inform users of future development and temporarily provide connections to important destinations. For example, some residents insist on walking to the new HEB grocery store, but the sidewalk infrastructure has not been built yet. Another concern Adams expressed was that despite Mueller's best efforts to reduce auto-dependency, currently it is very difficult to live in Austin without a car and the market is not willing to reduce parking ratios. He explained that Mueller is engineering density in a market that is not yet ready for it, and even though the residents living in Mueller do want more density, it won't happen until the market is ready (Adams, 2013).

CHAPTER THREE: ANALYSIS

This chapter presents an overview of the data received in the online mapping survey and observed in the field. The first section details the demographic data to describe the overall characteristics of survey respondents. The second section elaborates on the points of concern and interest identified by survey respondents based on data and comments received from respondents, as well as personal observations. The final section presents the route data received by mode type, route reason, and demographic characteristics to show the variety of route behavior and how certain factors influence route choices.

Demographic Overview of Survey Participants

A total of 85 people completed the Mapping Mueller online survey. Demographic data was collected to understand the unique characteristics of the population that participated in the survey. For each demographic question, respondents had the option of choosing not to disclose the information. Of the 85 people that participated, 42 were Mueller residents, 29 lived within one mile, 4 worked in Mueller, 3 lived and worked in Mueller, and 3 lived in the greater Austin area. Fifty-two percent of the survey respondents were male, forty-two percent were female, and six percent chose not to disclose their gender. Sixty-five percent of survey respondents reported owning their own home, sixteen percent reported that they rent, and nineteen percent chose not to disclose. Of those who lived in Mueller, eight Mueller residents reported living in a condo/apartment, four lived in garden homes, one lived in a Mueller house, eight lived in row housing, and twenty-three lived in yard homes (Mueller's detached single family housing option).

Further demographic information on the subjects can be seen in the following charts:

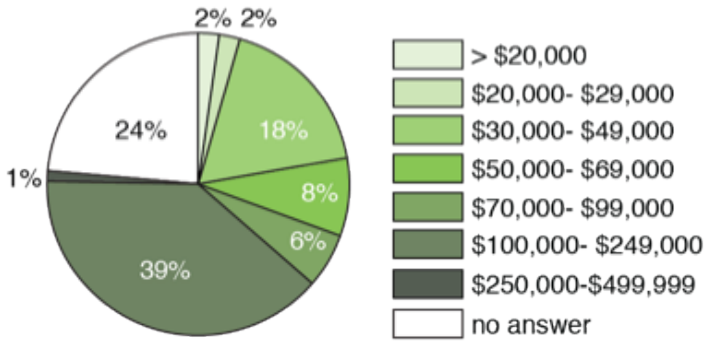

Figure 7: Respondent's reported annual family income in US dollars

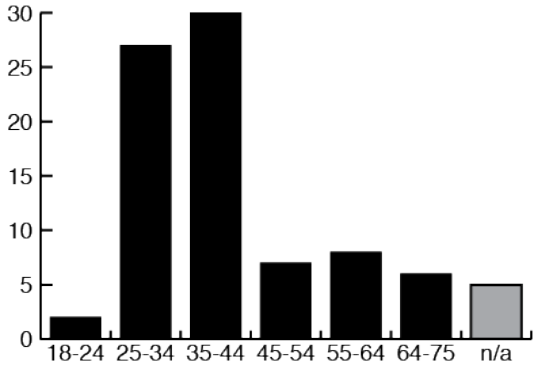

Figure 8: Age range of respondents

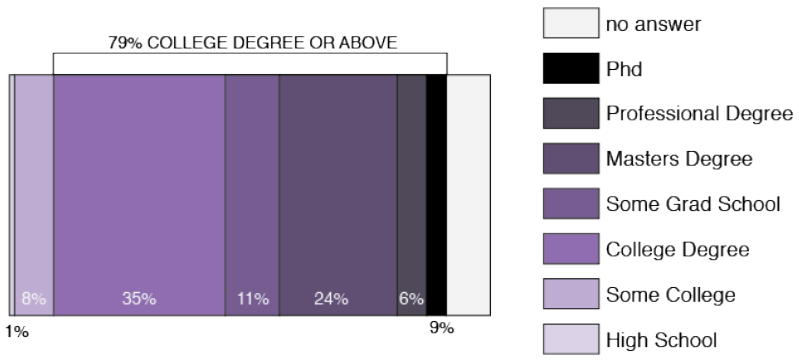

Figure 9: Respondents reported highest level of education completed

In addition to demographic characteristics, respondents were also asked their most frequent mode of transportation and the frequency that they use the shops, parks, and trails around Mueller. Instead of choosing from a list of options, respondents were asked to write in their most frequent mode of transportation. Most respondents (57%) reported the car as their most frequent mode of transportation. However, there were a variety of responses to this question – including combinations of car and bike use, bike and pedestrian use, carpooling and bus use. Taken together, responses that indicated some form of alternative transportation constituted 33% of responses. Respondents reported a normal distribution of store frequency, with 47% of users shopping at Mueller 2-3 days a week and few shopping every day or almost never. The parks have a wider distribution of user frequency. While 32% of respondents reported visiting the parks 2-3 days a week, 16% of respondents indicated that they almost never use the parks and trails at Mueller, and 14% of respondents indicated that they only use the parks and trails once a month. The following charts visualize the data collected for these questions (Figures 10, 11, and 12).

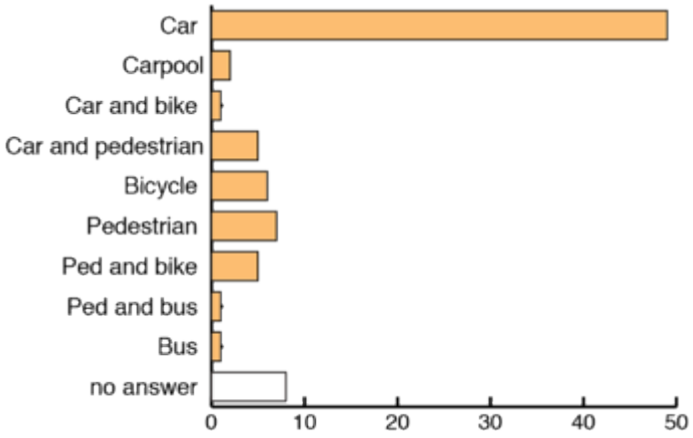

Figure 10: Respondent most frequent mode of transportation

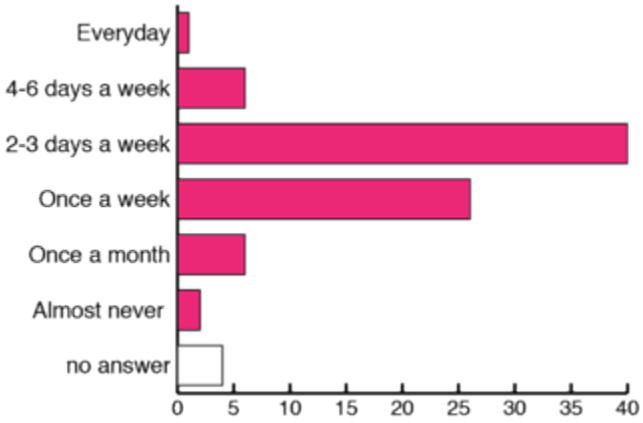

Figure 11: Respondent frequency of Mueller retail

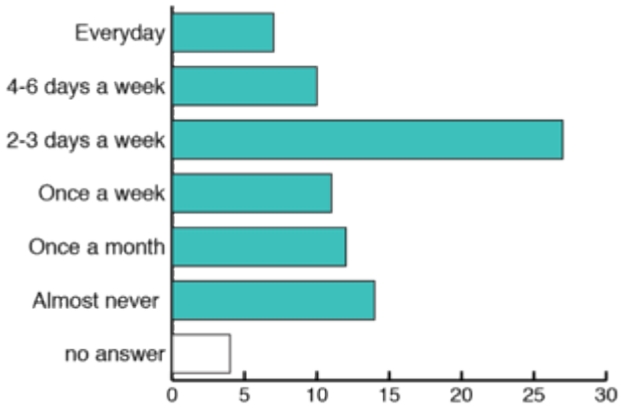

Figure 12: Respondent frequency of Mueller parks and trails

The demographic data by itself does not reveal anything specific about the transportation infrastructure at Mueller, except perhaps that the majority of respondents commute by car. However, the value of collecting this data is that it can be linked to each respondents route and point-of-interest information to determine route pattern trends for different user groups – whether it be users who visit the park every day, female users, bicycle riders, etc.

Survey Results: Points of Concern and Points of Interest

Respondents entered a total of 84 points of concerns and 125 points of interest. The points were categorized by location type, frequency of visit, and descriptive details. Figure 14 provides a breakdown of points received by location type.

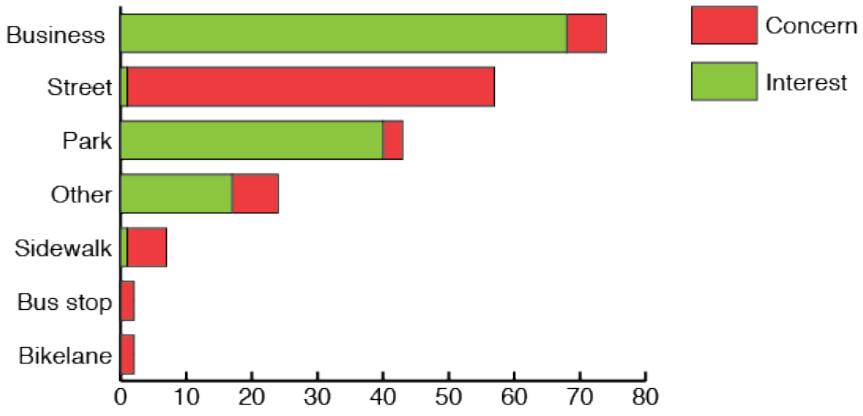

Figure 13: Points of concern and interest by location type

Respondents located the majority of interest points at parks and businesses, while the majority of concerns received were located along streets in and adjacent to the

Mueller development. To analyze the descriptive comments, I used the online program Wordle, which generates a graphic that sizes words based on their frequency in a dataset. As the figure below indicates, food locations, especially the new HEB grocery store have a dramatic impact on people's route choices.

Figure 14: Word frequency for Points of Interest

It is important to identify high-interest locations because transportation infrastructure needs to connect people to their desired destinations, and understanding where these locations are and whom they attract can guide route design and placement. The data indicates that there are many high-interest locations; however, the number of concerns along streets indicates that respondents may encounter difficulty in reaching them. The Wordle below displays the common language found in the comments for points of concern. Words like traffic, intersection, street, cars, and names of streets like Berkman and Airport occur frequently in the description of concerns.

Figure 15: Word frequency for Points of Concern

Mapping the Point Data

Each point contributed by a survey respondent contained a coordinate location in the Mueller development. Figure 16 shows the location and density of points in the Mueller development. A density analysis was performed to determine the areas with the highest concentration of concern and interest points. Field observations were then conducted at the areas with the highest density of points to provide additional details about the user experience.

Locations of Interest

Illustration 1: Points of Interest

SITE A: HEB MARKET DISTRICT

Figure 16: HEB entrance from parking lot

Figure 17: HEB entrance from Berkman Drive

HEB received 17 points (the most of any location), but surprisingly very little commentary. Participants frequently wrote "HEB" with no additional description. One survey participant wrote, "I have heard about green features in this new HEB and want to visit soon," while another wrote: "HEB: good grocery store in neighborhood." Observations confirmed the popularity of the store: on a weekday afternoon visit, nearly every parking space was taken and people were lined up at every checkout counter. Despite the store's popularity, many of the bike racks were empty and few pedestrians were seen arriving by foot. Most pedestrians walked from the parking lot to the store and no pedestrian was observed walking to other retail locations in the market district.

The store itself bustled with activity. Upbeat music played from the loudspeaker and store patrons gathered around sample stations in addition to scouting aisles for grocery items. Five people waited in line at the Mueller Market Café and ten people sat and dined in the indoor café seating area. At the time of observation, no patrons were sitting at the outdoor portion of the café. The observation and commentary revealed that HEB provides an enjoyable shopping experience inside the store, but the majority of

shoppers arrive by car, walk from the parking lot to the store, and primarily dine in the indoor portion of the café.

SITE B: PAGGI SQUARE

Figure 18: Paggi Square Petanque Court

Figure 19: Sidewalk and Mailboxes

Paggi Square is a small pocket park surrounded by newly constructed row houses and garden homes located just east of Berkman at Robert Browning and Ruiz. It is .3 acres in size, contains neighborhood mailboxes, a well-shaded sand area, bench seating, and a small gazebo. Survey respondents commented that this is a nice quiet pocket park and a popular spot for court games like Petanque and Bocce Ball. According to the Mueller neighborhood website, this park was designed with Petanque court and some residents lead regular lessons to teach others how to play the game.

Another unique feature of this park is the large trees that were transplanted from the old airport parking lot. Paggi Square sits atop the former concrete airport runway and all vegetation had to be planted or moved from another area on the site. The mature trees provide the surrounding residents with a shady spot to watch children play, relax from the heat, or play games.

Only one person used the park during the 30-minute weekday afternoon observation. The visitor drove to the mailboxes, parked her car, checked the mail, and drove away. Many of the homes around the park are still under construction, which meant there was a considerable amount of noise, debris, parked cars, and construction during the

middle of the weekday. This, and the fact that the park is surrounded by residential homes that are mostly vacant during the day, may explain why there was little activity at the park on a weekday afternoon.

SITE C: LAKE PARK

Figure 20: Visitors feeding the ducks at Lake Park

Figure 22: Gated Playground at Lake Park

Figure 21: Lake Park Soccer Field

Figure 23: Mueller Farmers Market

Lake Park is located just east of Airport and south of Aldrich. It sits between the medical and multi-family district to the north and the residential neighborhood to the south. Many survey respondents identified Lake Park as one of their favorite spots in the neighborhood. One resident wrote that the "lake adds a great value to park as primary

focal point." Another wrote Lake Park is a "fun place to take the kids." Many respondents mentioned they like to visit the Saturday Farmers Market and Food Trailer Park located at the restored airport hangar on the west side of the park near Airport Boulevard. Participants listed the picnic tables, playground, water fountains, trails, feeding the ducks, fishing, and the Thinkery Children's Museum (located just across the street to the north of the park) as just some of the many amenities that the park provides. Observations confirmed that Lake Park is a highly programmed yet flexible space that allows for multiple events to occur over time and space. Nan Ellin (2005) might refer to this park as a space that achieves hybridity and connectivity**.** The park brings activities and people together by increasing the density of activity and includes cross programming such as fishing, which may appeal to an older age group, while at the same time offering a playgrounds for young children. The true success of the park is that these activities can be conducted nearby and at the same time without interrupting or interfering with one another. The benefit of this kind of hybridity is that it may reduces the amount of trips one has to travel to reach a variety of amenities, and Ellin would argue that the quality of each experience is enriched because of the juxtaposition of the two activities.

SITE D: ELLA WOOTEN PARK

Figure 24: Playground at Ella Wooten Park

Figure 25: Empty Basketball Court at Ella Wooten Park

Ella Wooten Park is located in the heart of the established single-family residential neighborhood in the southwestern portion of the Mueller development. It contains a neighborhood pool, a basketball court, a large lawn, a playground, picnic tables, and a barbeque pit. Survey respondents mentioned the park was a great place to take a dog for a walk, take children to play, or go for a swim (though some complained about the pool's limited hours for non-residents). During a weekday afternoon observation, children climbed on the playground and a family played with their dog on the open lawn. No one used the basketball court. A handful of residents swam in the gated pool during residents-only pool hours.

Even in the late afternoon on a mild 80-degree day in April, the sun was bearing down directly over the park and there were few places to find shade. The observations and commentary revealed that Ella Wooten primarily provides amenities for adjacent residents and is more of an extension of the single-family homes around it than an amenity for the entire Mueller community or nearby neighborhood residents.

SITE E: SOUTHWEST GREENWAY

Figure 26: Public Art Sculpture in the Southwest Greenway

Figure 27: Jogger on the Southwest Greenway Trail

The Southwest Greenway is located at the southwestern edge of Mueller along Airport Boulevard and Manor Road. Respondents mentioned that the walking/running trails, public art, and natural prairie landscape are the features that make this park a popular point of interest. Unlike Lake Park, this greenway places priority on natural habitat and running trails instead of sports and activity. The observations confirmed the value of this park is the beauty it adds to the landscape, the running trails, the quiet spaces it provides for its users, and the ecological benefits it brings to the area by restoring the Texas Blackland Prairie ecosystem. The area is buzzing with butterflies, bees, and other critters.

The term "greenway" is an appropriate way of describing this park, because, as the survey responses and observations indicate, people primarily use this area for passing through while walking and jogging. It also should be noted that the greenway currently acts as a buffer that wraps around Mueller and separates it from the adjacent development along Manor and Airport. Observations showed poor connectivity such as limited crosswalks and pedestrian amenities that might serve to connect adjacent properties to the Southwest Greenway.

Locations of Concern

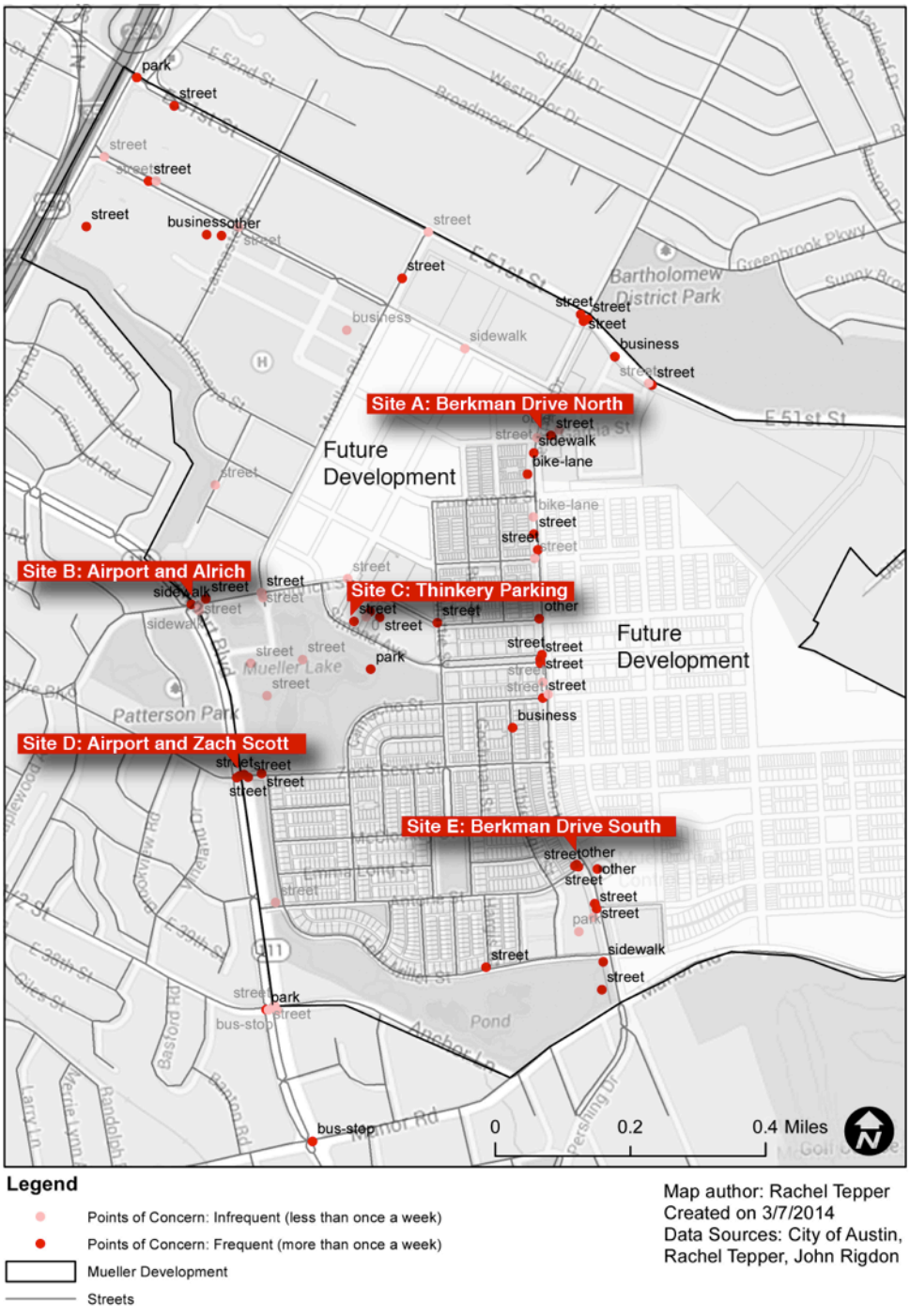

Illustration 2: Points of Concern

SITE A: BERKMAN NORTH

Figure 28: Southbound Cycle Track on Berkman Drive

Figure 29: Cyclist Not Riding in Northbound Cycle Track on Berkman Drive

Berkman North refers to the area along Berkman just south of 51st street. Respondents shared concerns about parking capacity, unsafe pedestrian crossings, construction blocking the street and bike-lane, incomplete bike and sidewalk infrastructure, and the speed of traffic. One resident commented that the intersection at 51st and Berkman "needs better pedestrian crossing," while another wrote that the "lanes are really wide to be one lane." Residents expressed frustration that the separated bike path on the west side of the street frequently has construction vehicles parked in it, rendering it unusable. Residents also brought up that joggers and walkers tend to use the separated bike path, making it difficult to navigate. Observations revealed this to be the case, as many bikers were observed biking in the road rather than in the separated bike lane (one biker pictured above).

The other primary concern shared by residents is the lack of sidewalk

infrastructure on the east side of the street that connects the neighborhood to the HEB parking lot. A temporary path starts at Robert Browning, just a few blocks south of HEB, but doesn't connect to any pedestrian crosswalk, making it difficult to use.

SITE B: AIRPORT AND ALDRICH

Figure 30: Panorama of the Intersection at Airport and Aldrich

Figure 31: Crosswalk looking east towards the Mueller Development.

Figure 32: Car traffic on Airport at Aldrich.

Many residents noted their frustrations about the crosswalk length and timing at the intersection of Airport Boulevard and Aldrich Street. One resident wrote, "Timing on the crosswalk across airport is way to short for the average person to be able to cross the street." Another wrote, "This intersection is terrible for cyclists and pedestrians both." The crosswalk along Airport is over 130 feet from curb to curb, and the crosswalk on

Aldrich – which is located in the Mueller development – is over 95 feet from curb to curb. The crosswalk time across Airport is 40 seconds, so pedestrians must walk at a rate of 3.25 feet per second in order to cross the street safely. The average walking speed assumptions for traffic engineering are typically between 3 to 4 feet per second (fps). In 2002 however, the Public Rights-of-Way Access Advisory Committee recommended a universal maximum pedestrian walking speed of 3.0 feet per second for pedestrian clearance times at signalized intersections (United States Access Board, 2002). In addition to the speed at which one is required to walk across this street, the intersection connects two large parks, a trail system, and two adjacent residential neighborhoods, so it has a high volume of pedestrian use.

SITE C: THINKERY PARKING

Figure 33: Parent and child biking on the sidewalk and parked cars on Simond Ave

Figure 34: Parallel parking on Simond Ave.

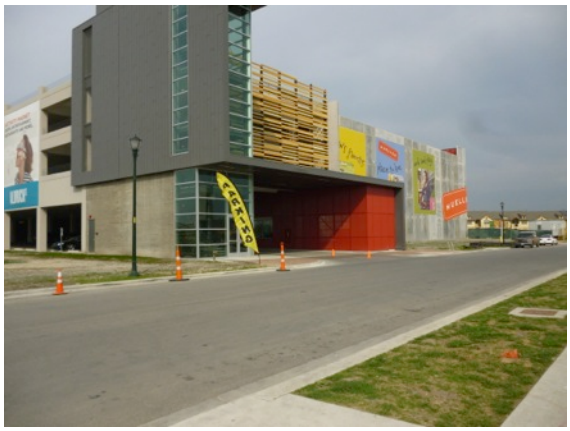

Figure 35: Entrance to shared parking garage on McBee Street, just north of the Thinkery.

Figure 36: Construction on McBee looking east

Residents, employees, and neighbors expressed concerns about the traffic and parking around the Thinkery children's museum. One respondent explained that visitors "going to the museum park all over the streets and in the park parking lot when they should be using the garage. If someone wants to park their car next to the park there is no space. There should be no museum parking allowed in the park parking lot." Vehicle speed on Simond was also a concern raised by respondents: "Cars fly through Simond Ave, but there is a high volume of family pedestrian traffic, particularly with small children during the week." In addition to speed, the slight curve in Simond Avenue leaves drivers with low visibility until they are up on the crosswalk. One resident suggested adding a "pedestrian crossing" or "children crossing" sign. A Thinkery employee explained that young children waiting in line to go into the museum see the park at the end of the crosswalk and take off running without regarding the street. Observations confirmed many of the concerns reported by residents. Even on a weekday afternoon

parked cars lined the street of Simond Avenue, but few cars sat in the large parking garage behind the museum. For residents arriving from the Airport/Aldrich entrance, the street parking is visible before the parking garage. The museum entrance sits directly across from the park playground, which makes it easy for visitors to go to the museum and the playground in one trip.

The co-location of similar uses such as a children's museum and a park has many urban design and sustainability benefits. From a sustainability perspective, visitors are able to accomplish two trips in one, which reduces car trips. From an urban design perspective, the adjacent uses begin to create a synergy that starts to define the character of the area and spreads out into the streets and adjacent parcels eventually creating a node of activity.

In this case, the transportation infrastructure hinders the synergy of these two uses in three ways: parking location, visibility and route options. The parking garage is located on a partially undeveloped block behind the Children's museum in the opposite direction of the park and playground. In between the park and playground there are roughly 40 spots of on street parking and 50 spots in the adjacent playground parking lot. Many visitors prefer to wait for street or playground parking instead of driving to the parking garage. The constant traffic of cars pulling in and out of parking spaces around the museum creates conflicts with pedestrians trying to cross the street. In addition, the angle of Simond Avenue reduces the visibility of crossing pedestrians to drivers traveling west. Finally, the lack of east-west connections through Mueller from Berkman to Airport increases the likelihood that drivers will use Simond Avenue as a cut through street.

SITE D: AIRPORT AND ZACH SCOTT

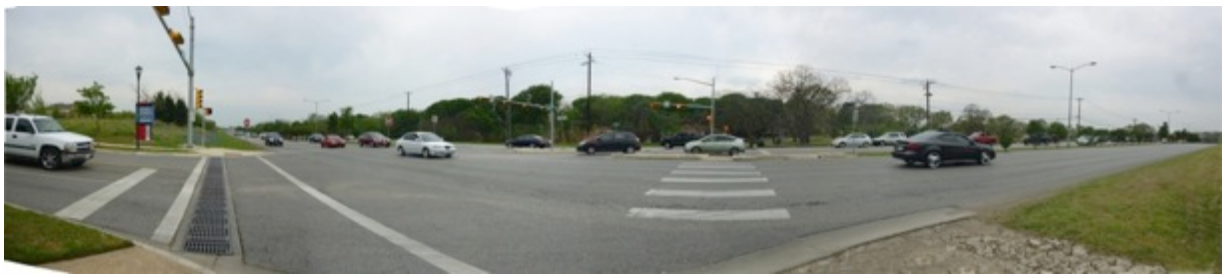

Figure 37: Panorama of the intersection at Zach Scott and Airport

Figure 38: Car turning left onto Airport from Zach Scott

Figure 39: Car turning left to go south on Airport from Zach Scot

Respondents unanimously reported that turning left at the intersection of Airport and Zach Scott is dangerous, stressful, and often impossible due to limited visibility and (until recently) no stoplight. Zach Scott currently does not connect to the neighborhood road across the intersection and a special median is in place to block westbound drivers from entering onto the neighborhood street. All westbound Zach Scott traffic must turn left or right onto Airport. During the duration of this research project, a stoplight was installed and observations revealed that it did reduce left-turn wait time. Some residents suggested that Zach Scott should connect to Schieffer Avenue across the street. However, connecting the streets would likely increase traffic in the Cherrywood neighborhood,

which would disregard one of Mueller's transportation principles which aims to avoid increased traffic in adjacent neighborhoods, Another respondent noted that cars turning from Airport onto Zach Scott are not always mindful of the pedestrian crossing on Zach Scott which is located about 50 feet back from the intersection and connects the greenway trail network.

Zach Scott is an example of a neighborhood connector street that received an unintended amount of auto-traffic – particularly for residents turning in and out of the development. Mueller residents advocated for a stoplight at this intersection and one was recently installed, but intersections like this one should be studied in context to determine what routes and which users are relying on the intersection to determine if there is a safer and more effective solution than simply installing a traffic signal.

SITE E: BERKMAN SOUTH

Figure 40: Construction and lack of infrastructure on Berkman Drive

Figure 41: 90 degree turn to continue driving northbound on Berkman

Survey participants located a majority of concerns along Berkman Drive. The southern section of Berkman Drive had a different set of concerns than the northern cluster (Site A) mentioned above. On the southern portion of Berkman, participants wrote that it is "difficult to see oncoming traffic due to geometry and parked cars," and that "this street is not wide enough for bikes to ride comfortably." Because Berkman is still under construction, its street width varies dramatically: its width reaches a maximum of 90 feet in the northern section of the development, but narrows to 40 feet as the street continues south. Despite this shift in street width, there are no temporary measures to calm traffic. One residents noted that "Berkman (is) wide and straight and has no intersections inducing cars to go in excess of 40 mph or even more." The street is actually slightly curved, but not curved enough to alter sightlines, making it feel straight. The curve and the lack of signaled intersections does affect one's ability to turn left onto the street. One respondent wrote, "Parked cars block the view of on-coming traffic. Prior to turning either right or left, one must place vehicle well into the southbound lane in order

to view clearance.”.” The final concern mentioned was that “traffic is getting heavy on Berkman,” and there are “many (pedestrians) who cross this street.” Unlike many of the neighborhood streets that don’t need signals, on Berkman, drivers are moving “fast and few look to slow down when they see walkers. Observations confirmed the difficulty of turning left from neighborhood side streets onto the northbound lane on Berkman Drive. Pedestrians were seen walking on vacant land with no sidewalks or on construction sites, and drivers were observed hesitating as lane widths varied throughout the street – particularly at Berkman and Manor where drivers must make a sharp 90 degree turn to continue southbound along the street. Many drivers were observed traveling at high speeds while performing this turn. Despite the fact that Berkman is still under construction, a temporary use plan such as gravel sidewalk paths, consistent lane widths and clear, visible signage, could help users understand the upcoming changes to the roadway and foster the intended behavior for the future development of the roadway. If not, the roadway will continue to develop haphazardly, and Mueller developers will be tempted to respond to the market demand for an auto-oriented north-south connector roadway in this part of east Austin.

Survey Results: Routes

Survey respondents entered 135 vehicle routes, 70 pedestrian routes, 34 bicycle routes, 2 bus routes, and 1 skate route for a total of 242 routes. For the purpose of this study the bus routes grouped with the vehicular travel and the skate route was grouped with pedestrian travel. The following graph illustrates the mode breakdown.

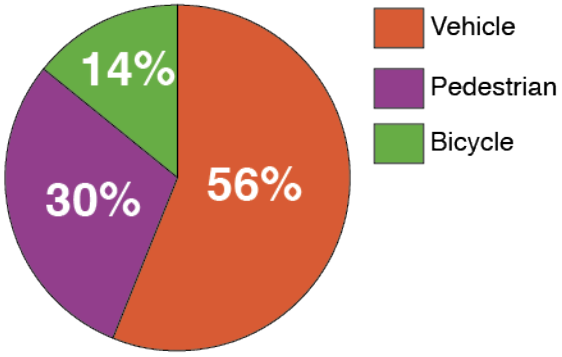

Figure 42: Mode Breakdown of Survey Transportation Routes

VEHICLE ROUTE DENSITY

Illustration 3 (below) shows the density of vehicle routes for all survey respondents. The roads with the most vehicular density are Airport, Manor, I-35, Berkman, 51st Street, Zach Scott, Aldrich, Barbara Jordan and Mueller Blvd. Philomena, just north of Mueller Blvd, is also frequently used by survey participants. Participants entered route reasons, companions, frequency, and descriptions, in addition to the vehicle route. The graphs below illustrate the route reason for travel and companion type.

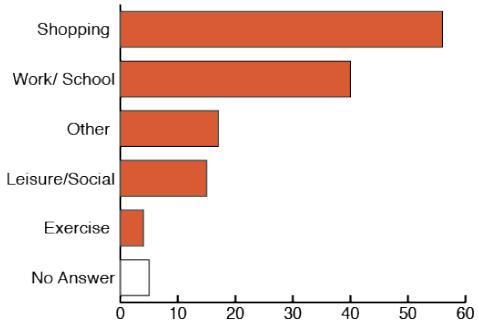

Figure 43: Vehicle Route Reason

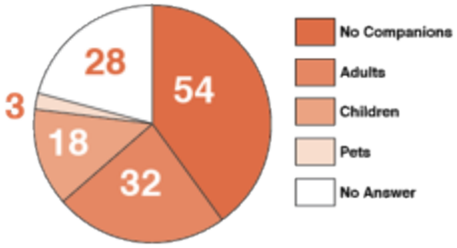

Figure 44: Vehicle Route Companion Type

Illustration 3: Vehicle Route Density

PEDESTRIAN ROUTE DENSITY

Illustration 4 (below) shows the density of pedestrian routes for all survey respondents. The trails in Lake Park and along the buffered edges along Airport and Manor have the highest density of pedestrian travel. Aldrich, Simond, Zach Scott, and Tom Miller also have a high number of pedestrian trips. Berkman is another street that receives a high number of pedestrian trips but currently lacks continuous sidewalks, particularly on the east side of the street. The graphs below illustrate route reason and companion type.

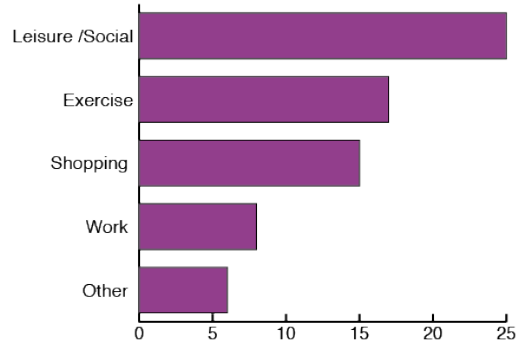

Figure 45: Pedestrian Route Reason

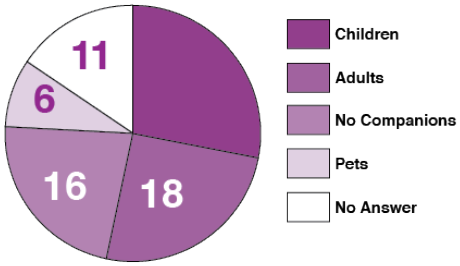

Figure 46: Pedestrian Route Companion Type

Illustration 4: Pedestrian Route Density

BICYCLE ROUTE DENSITY

Illustration 5 (below) shows the density of bicycle routes for all survey respondents. Tom Miller, Camacho, Mattie, Threadgill, Berkman, and Simond show the highest density of bicycle use. The graphs below illustrate route reason and companion type.

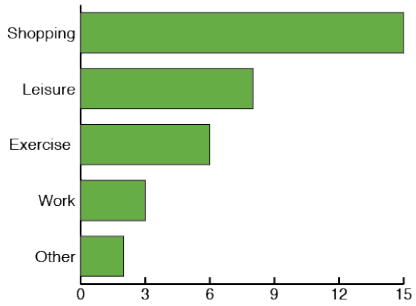

Figure 47: Bicycle Route Reason

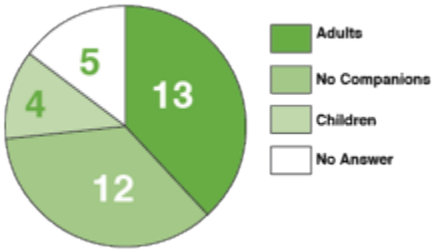

Figure 48: Bicycle Route Companions

Illustration 5: Bicycle Route Density

ROUTE REASON: EXERCISE

The illustrations below display the exercise route density for pedestrian, bicycle, and vehicular transit. Pedestrian density is the most concentrated, with primary use along Berkman Drive (east) connecting to the trail system along the Southwest Greenway, and wrapping west around the development along Airport Boulevard. The map below indicates a high density of pedestrian use at the intersection of Airport Blvd and Aldrich. This is a key intersection because it connects the development to the adjacent Cherrywood neighborhood and Patterson Park (noted as concern "Site B" above). The pedestrian density continues through the middle of the development along the trail and park system and loops back around along neighborhood streets like Simond Avenue. Bicycle exercise use is also situated around the perimeter roads like Berkman Drive (east), Tom Miller (south), and Airport (west). Unlike pedestrian use, respondents tend to bike around the park along the southern edge using Zach Scott and Camacho Street and come up north through the development on Mattie and Berkman Drive. Vehicular exercise density is the least visible, but a few respondents indicated that they drove outside the development for gym visits, Pilates class and exercise trails.

Illustration 6: Route Density: Exercise

ROUTE REASON: SHOPPING

Respondents primarily do their shopping by car, with the highest density of use along auto-oriented roads such as 51st Street, Airport Boulevard, and Berkman Drive. The primary destination for pedestrian shopping is the HEB Market District on the northeastern portion of the site. Respondents indicate using Berkman Drive, which currently lacks sidewalk infrastructure on one side (as mentioned in "Concern Site A" above). Bicycle route density is more dispersed; however, the same route density can be seen on the northern portion of Berkman Drive that connects the neighborhood to HEB. Barbara Jordan, the east-west road that connects the Regional Retail district to the Market District is dense with vehicular shopping routes and could become a very trafficked and auto-oriented road. It is likely that many people drive to the development to visit HEB in the Market district, and also drive to the Regional Retail to go to the Home Depot, Starbucks, Best Buy, and other big-box locations. The pull between these two locations on this street is likely to continue as other retail uses are added to the development.

Illustration 7: Route Density Shopping

ROUTE REASON: LEISURE/SOCIAL

The pedestrian density for Leisure and Social routes is extremely dispersed, indicating that respondents have many route choices for leisurely walking. Respondents reported over 25 pedestrian routes for the Leisure/Social category, the largest number of routes for any reason category, and specified only one dense area along Simond Avenue where pedestrian leisure activities overlap. The route descriptions indicated that many participants walked from their house to destinations around Lake Park and Simond Avenue such as the Farmer's Market, Children's Museum, and playground. Other respondents indicated routes for dog walks and leisurely loops around the neighborhood. The data indicates a well-connected pedestrian network that offers residents and visitors a variety of pedestrian route choices for leisurely strolls.

However, a well-connected network for leisurely walking does not necessarily indicate a well-connected pedestrian network for utilitarian travel. Baron et al. (2008)

compared leisurely and utilitarian walking frequency in new urbanist and conventional neighborhoods. They concluded that "streets that are locally less accessible are related to more leisure walking," and that "one possible explanation is that residents may choose to walk more for leisure in areas that have less vehicular traffic. This is consistent with hypotheses suggesting that environments that support leisure walking may not support utilitarian walking, and vice versa." While the pedestrian network at Mueller does successfully achieve its goal of creating a network of pedestrian friendly streets, Baran et al. make the point that enabling leisurely travel does not necessarily encourage utilitarian travel in order to decrease automobile dependency. Bicycle route density seems concentrated along one route, possibly indicating a frequent route by one respondent. Vehicular density indicates primary use along the edges of the development and around the intersection of Airport, Aldrich and Simond, the location of the Children's museum and the beginning of the Mueller Town Center.

Illustration 8: Route Density: Leisure/Social

ROUTE REASON: WORK

Survey respondents indicated that vehicular travel is the primary mode for work routes, relying on Airport Boulevard, I-35, 51st Street, and Berkman Drive as the primary arteries for work travel. The density map also indicates density along east and west neighborhood streets that connect to Airport and Berkman such as, Zach Scott, Camacho and Simond/Aldrich. Unlike other route reasons, work routes are generally tied to early morning and late afternoon travel, indicating that many of the routes on the map happen around the same times of day and potentially create traffic along those roads.

Illustration 9: Route Density: Work

DEMOGRAPHIC CHARACTERISTICS

In the final step of the survey users entered demographic information that the author joined to each route so that data could be sorted and displayed based on a variety of demographic characteristics. This allowed a deeper analysis of route density to determine whether personal characteristics affected the route travel. Sorting the data by gender, age, and income did not reveal obvious conclusions about route choices (see

illustrations below). But upon reflection, specific characteristic data questions could have been asked about behavior and lifestyle choices that may have revealed more obvious conclusions. For example, it might have been beneficial to collect respondents' moods or emotions for each route. It would have also been beneficial to know the lifestyle choices of route users. For example, a respondent who identifies as highly active might have a different transportation behavior and a different set of points and routes than a respondent who is less active.

With the data collected in this survey, the author did not feel specific conclusions could be drawn about route choices and demographic characteristics. However, one goal of this research was to test whether an online mapping survey is capable of doing analysis at this level of specificity. With targeted questions, enough data, and proper sampling, the mapping survey could be a useful tool to determine route preference by demographic characteristic.

Illustration 10: Route Density Males

DEMOGRAPHIC CHARACTERISTIC: FEMALES

Illustration 11: Route Density Females

LOCATIONAL CHARACTERISTICS

In addition to demographic characteristics, the final step of the survey asked respondents to identify where they lived in relation to the Mueller development. The majority of respondents were residents of Mueller or adjacent neighborhoods. The data

below illustrates the different route patterns for the two user groups. The apparent pattern is that Mueller residents rely more heavily on internal roads and networks, while the visitors rely primarily on arterial and perimeter roads that either go through the site or connect directly to major destinations.

MUELLER RESIDENTS

Illustration 12: Route Density Mueller Residents

NON MUELLER RESIDENTS

Illustration 13: Route Density Non Mueller Residents

CHAPTER 4. CONCLUSION

At the outset of this study, master planner Jim Adams expressed that despite Mueller's best efforts to reduce auto-dependency, living in Austin without a car is still very difficult. Mueller is engineering a density that the market is not yet ready for—and even though Mueller residents want greater density, market pressures prevent a dramatic transformation.

The original plans for Mueller envisioned a large pedestrian-oriented grocery store located in the center of the development anchoring the Town Center with walking, biking, and transit routes through the neighborhood and surrounding communities. Grocery retailers in the Texas market were unwilling to locate in the Town Center because it did not offer the same accessibility and visibility from major roadways.

Residents, prospective residents, and nearby neighbors desired a grocery store, and when the market was unwilling to locate in the Town Center, Mueller developers decided to alter the plan and locate the grocery store on the far northeast portion of the site off of 51st Street—a major arterial road. The grocery retailer HEB met many of Mueller's requests, including achieving LEED certification with sustainable building design strategies and incorporating community amenities like a café, ample bike parking, and a variety of organic food options. However, HEB was unwilling to change the urban design of the store, reduce the parking ratios, or even locate pedestrian amenities like a complete sidewalk or a rear entrance leading up to the store from the neighborhood. The set-back structure, surface parking lot, service station, and accessory retail are all auto-oriented with front doors that primarily face the large parking lot in the middle of the

block. Despite the auto-oriented nature of the store, HEB is a success according to the Mapping Mueller survey, where it received the most points out of any interest location in Mueller. The success of HEB raises three questions that were evaluated in this study:

1. Are Mueller residents, neighbors, and frequent visitors actually ready for development that reduces auto dependency?
2. Are the original transportation principles of the Mueller development actually being implemented in the design and construction of the development?
3. Can studying the behavior of Mueller residents, employees, and visitors reveal opportunities to improve the pedestrian, bicycle, and transit options?

This conclusion attempts to provide insight to these questions based on the analysis of the data collected in the Mapping Mueller study.

1. Are Mueller residents, neighbors, and frequent visitors actually ready for development that reduces auto dependency?

While this study represents a small slice of residents and visitors in the Mueller community, it does reveal that many residents walk or bike to points-of-interest locations within Mueller, especially to local parks. The survey also revealed that most respondents work outside of the development and use their vehicle to commute to work. While some residents walk or bike to the HEB Market District, many expressed frustration that the sidewalk infrastructure does not exist.

Residents also pointed out opportunities to improve the safety and human comfort for pedestrians and bicyclists such as creating a safer intersection on Airport and Aldrich Street or adding a temporary sidewalk on Berkman. Respondents also suggested creative alternatives to vehicle use in Mueller such as neighborhood shuttle services. One resident suggested, "Offering shuttle service between the major areas of Mueller complex should be considered. It is difficult to find parking and having the option to leave your car and get to multiple points of interest would be a great option." Another issue respondents raised is the quality and location of the existing bus service. Mueller currently has bus service on Aldrich and Mueller Blvd, and just outside the development on Manor and Airport, but only two respondents in the entire data set indicated using the bus system as a form of regular travel. For the majority of residents in single-family homes, the bus service is too far away for regular travel. A bus line on Berkman should be considered because residents who live in the north and south portions of the development use this road regularly.

Based on the analysis of the Mapping Mueller data, many residents are ready for a development that reduces auto dependency. Mueller developers should consider short-term solutions for transit use such as improving the existing bus service and creating temporary paths around construction sites to take advantage of immediate opportunities to improve the existing infrastructure.

2. ***Are the original transportation principles of the Mueller development actually being implemented in the design and construction of the development?***

As Ellin (2005) and Moore (2013) point out, one criticism of New Urbanism is that designers and developers often implement commonly accepted best practices based on their success in other places or time periods without an in-depth understanding of whether the solution is the right approach for the particular context and circumstances. Moudon (2000), Tomilson (2011) and others suggest that to improve New Urbanism we must establish feedback loops to evaluate the performance of New Urbanist communities to determine whether or not they works for their residents and frequent users. Tomilson (2011) and Churchman & Ginosaur (1999) recommend the Post-Occupancy Evaluation (POE) to evaluate neighborhood performance and study user behavior through a variety of qualitative research methods that are contextually relevant to the study area and the skills of the researcher.

Based on the analysis of the Mapping Mueller survey data, Mueller is achieving its goals of encouraging pedestrian and bicycle transit—especially for leisure and exercise. The majority of respondents still use vehicles for shopping and work routes, and the majority of shopping and work destinations within Mueller are auto-oriented.

At this time, Mueller is not achieving its goal of being transit-oriented – only two out of 285 routes included bus travel. Mueller does have the right-of-way for future urban rail expansion, but at this time the majority of survey respondents use vehicles for long distance travel.

3. Can studying the behavior of Mueller residents, employees, and visitors reveal opportunities to improve the pedestrian, bicycle, and transit options?

The analysis of route data, points of concern, and points of interest revealed strengths and weaknesses in Mueller's transportation infrastructure, as well as opportunities for future development. The data collected in the survey and observations were analyzed and presented in the preceding chapter, the following pages compile the lessons learned in this study into a set of recommendations for the future phases of the Mueller development.

A. Create more intersections at major arterials along the edges of the development.

Survey participants located the majority of concern points on intersections along major arterials like Airport, Berkman, and 51st Street. Traffic builds up at these intersections because there are few opportunities to enter and exit the development. A greenbelt buffer wraps around the edge of Mueller, shielding residents from the busy traffic along the arterials to the north, south, and east of the development. Residents, employees, and visitors are funneled to only a few key intersections when they leave or enter the development. More signalized intersections located along Berkman, Airport, Manor and 51st Street would disperse traffic and decrease volume at each intersection. Decreased vehicle traffic would make pedestrian crossings safer and free up space to add pedestrian and bicycle amenities like bulb-outs and protected bike turn lanes.

As Mueller continues to grow, developers and city officials must prioritize the

major intersections and routes that connect Mueller residents to the surrounding neighborhoods and employment centers. Because these areas will see increased vehicle traffic, planners and developers will need to identify and respond to the areas of greatest demand.

B. Restrict/reduce thru-traffic on Simond Avenue and create safer pedestrian intersections on McBee Street.

Simond Avenue is situated between Lake Park and the new Thinkery Children's Museum – two of the most popular points of interest identified by survey participants. The Lake Park playground is visible from the main entrance of the Thinkery. The survey data and observations revealed a high concentration of pedestrian and automobile traffic along this stretch of Simond Avenue. Respondents expressed concern about the safety of pedestrians—particularly children who frequently cross this street to visit the park and playground before or after a trip to the children's museum.

An analysis of route traffic patterns reveals that drivers use Simond Avenue to access the Airport and Aldrich intersection—a major gateway in and out of the development—and one of the most direct ways to access I-35. Efforts should be made to divert thru-traffic off of Simond Avenue and onto McBee, which is just one block north of Simond and also connects to Aldrich Street. McBee should have a signalized crosswalk, a children crossing sign, and other infrastructure in place to prevent children from running out onto the street.

The Thinkery should also encourage visitors to park in the shared parking garage rather than waiting for a parallel parking spot on Simond or the playground parking lot. Adding a back-entrance to the Thinkery along McBee Street, or installing an interactive

public art feature along the Aldrich Street Paseo connecting the the McBee parking garage to the front door, might encourage visitors to park in the garage.

C. Link the future Town Center to the HEB Market District.

One of the biggest impacts on survey respondent route choices is the HEB Market District development. The HEB is a high-interest destination and residents will continue to demand infrastructure that supports connections to HEB. In addition, HEB should be better woven into the fabric of the neighborhood. The grocery store has the potential to be an asset to the community, but it currently does not even have a sidewalk connecting it to the neighborhood. Current plans for the future town center do not acknowledge the Market District's potential impact on people's route choices. Many residents visiting the town center will shop at HEB. The vehicle, bicycle, pedestrian, and future transit systems in the town center should all acknowledge HEB as a part of the system.

Next Steps for Future Research

Mueller planners and developers should continue to examine how residents, employees, and visitors use the neighborhood's sidewalks, bike lanes, and road networks. Online participatory mapping platforms can be useful tools to gather feedback from Mueller community members. While automated GPS tracking systems like Map-My-Run and Garmin are becoming increasingly popular for gathering data about route preference, there are some benefits to having users map their own routes. Users filter the route data so that the information received is embedded with additional information such as route preference, route reason, and demographic characteristics. By asking users to think critically about where they prefer to run, walk, bike, or drive, researchers can engage

users and allow them to become active participants in the planning process.

As New Urbanist design principles continue to guide neighborhood development, planners should seek out resident feedback early on in the design process. Mapping Mueller is one example of how neighborhood post-occupancy evaluations conducted in the early phases of development can reveal areas of concern and opportunities for improvement, ensuring the places people live respond to residents' needs.

Appendix

The Mapping Mueller Survey can be accessed at www.mappingmueller.com.

Below is a transcription of the survey.

Consent form:

Welcome to the Mapping Mueller Study

This survey is part of an ongoing effort to collect information about common routes, points of interests, and points of concern in and around the Mueller Community in Austin, Texas. Information collected will be used for an academic research project conducted by Rachel Tepper, a master's student in Community and Regional Planning at the University of Texas. Your involvement in this survey is entirely voluntary and there is no more risk than the risks associated with everyday life. There are no direct benefits to participating, however, it is hoped that your participation will help researchers learn more about how resident and user behavior can influence the development of Mueller and other masterplanned communities. If you choose to participate, you will be asked to sketch the routes you commonly travel in a map-based interface, and make notes of points of interests and points of concerns that impact your transportation choices. individual information will be kept confidential and stored on the University of Texas webspace where it will be password protected and encrypted. This study has been processed by the Office of Research Support and the study number is 2013-09-0114. Please review the terms of use before you proceed.

The survey consists of 3 steps:
Add routes that you have followed in Mueller in the past month.
Add points of interests and points of concern in Mueller that impact your route choices.
Answer motivation assessment and demographic questions.
When you are finished completing the survey, you can submit your response online. You may decline to answer any question and you have the right to withdraw from participation at any time. Withdrawal will not affect your relationship with The University of Texas in anyway. If you do not want to participate either simply stop participating or close the browser window. If you have questions about your rights or are dissatisfied at any time with any part of this study, you can contact, anonymously if you wish, the Office of Research Support by phone at (512) 471-8871 or email at orsc@uts.cc.utexas.edu.

Terms of Use:

My name is Rachel Tepper and I am a third year Master's student in the Department of Community and Regional Planning at the University of Texas at Austin conducting research under the supervision of Professor Barbara Brown Wilson and Dean Almy on travel behavior in and around the Mueller community in Austin, Texas. Mueller is planned as one of Austin's major transit-oriented developments with a pattern of pedestrian and bike friendly streets to encourage a range of transportation options for residents and visitors. This study aims to understand how resident and user behavior can influence the development of masterplanned communities overtime. As a resident or frequent visitor to Mueller, your opinions are important to this study. Your involvement in this survey is entirely voluntary and there are no known or anticipated risks to participation. If you agree to participate, the survey should not take more than about 15 minutes. You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and will be grouped with responses from other participants. Further, you will not be identified in any thesis, report or publication resulting from this study. If you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact me at rtepper@utexas.edu. In addition to these terms, you agree to abide by the Google Maps "Terms of Use".

Step #1: Draw Routes
Instructions

1. Click on the "draw route" symbol  located on the top-right of the map. Place your curser at the start of your route and begin to draw.

2. Use the map zoom controls on the left side of the map to accurately draw on the specific path, sidewalk, lane, etc.

3. Once you have completed your route, click on the route to open an information balloon where you may enter descriptive attributes. Click save once you are done.

Right click on a route to delete it.

**Please note, to save your route information, you must click save on the individual pop-up window. Once you leave this page, your information will be cleared.

Info window questions
Your Route: Coordinates
Travel Mode: Vehicle/Bicycle/Rail/Pedestrian/Motorcycle/Other
Usage (in the past month): Everyday/4-6 days/2-3 days/Once a week/Once a month/ Almost never
Main Reason for Travel: Work/School/Shopping/Social/Leisure/Exercise/Other
If other, please explain:
Travel Companions: Adults/Children/Pets/None
Description:

Step #2: Add Points
Instructions

1. Click on the "add points" symbol  located on the top-right of the map. Click at any location on the map to add points of interest or points of concern to the map.

2. Use the map zoom controls on the left side of the map to accurately locate the specific point.

3. Once you have placed your point, an information balloon will appear where you may enter descriptive attributes. Click save once you are done.

Right click on a point to delete it.

**Please note, to save your point information, you must click save on the individual pop-up window. Once you leave this page, your information will be cleared.

Info window questions

Point of Concern or Point of Interest?: Point of Concern/Point of Interest
Type of Place: Business/Public Park/Private Yard/Shared Yard/Alley/Street/Sidewalk/Bus Stop/Bike Lane/Place of Residents/Other/
Frequency of Visit (in the past month): Everyday/4-6 days/2-3 days/Once a week/Once a month/ Almost never
Description:

Step #3: Motivation and Demographic Questions
1. Please select the statement that most accurately describes you:
I am a resident of Mueller
I work in Mueller

I live nearby (~mile of) Mueller
I live in the greater Austin area
I am not a resident of Austin

2. How frequently do you shop at the stores at Mueller?
Every day
4-6 days a week
2-3 days a week
Once a week
Once a month
Almost never

3. How frequently do you use the parks and trails at Mueller?
Every day
4-6 days a week
2-3 days a week
Once a week
Once a month
Almost never

4. What is your most frequent mode of transportation?

5. Household Size
1
2
3
4
5
6+

6. Sex
Male
Female

7. Age Range
18-24
25-34
35-44
45-54
55-64
65-74
75+

8. Race/Ethnicity (optional):

9. Mueller Housing Type (residents only)
Yard House
Garden Home
Row House
Courtyard Row House
Mueller House
Condominium

10. Owner or Renter
Owner
Renter

11. Occupation:

12. Approximate Household Income
Below $20,000
$20,000-$29,999
$30,000-$49,999
$50,000-$69,999
$70,000-$99,999
$100,000-$249,999
$250,000-$449,999
Greater than $500,000

13. Highest Level of Education Completed:
Some high school
High school graduate
Vocational training
Some college
College graduate
Some graduate school
Masters
Ph.D.
Professional degree

Additional Comments

Thank you for completing the Mapping Mueller survey. If you have any questions about the survey, or would like more information, please contact rtepper@utexas.edu

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Vita

Rachel Cathryn Tepper grew up under the sunny skies of Albuquerque, New Mexico. She earned her high school diploma from Bosque School and went on to earn a Bachelors of Fine Arts in Design from the University of Texas at Austin. She is expecting to complete dual masters' degrees in Community and Regional Planning and Urban Design at the University of Texas in the spring of 2014. Upon graduation, she will work as a planner at Design Workshop's Austin office.

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This report was typed by Rachel Tepper.