

STADIUM CITY:
A STUDY OF THE REGIONAL, ECONOMIC, AND TRANSPORTATION COMPONENTS OF A TRANSIT-ORIENTED
DEVELOPMENT AT THE TRUMAN SPORTS COMPLEX

by

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Abstract

Transit-Oriented Developments (TODs) are an unprecedented typology in the Kansas City region, which predominately exhibits automobile-oriented development characteristics. The Truman Sports Complex in Kansas City, Missouri, home of two professional sports venues, has a unique location on a proposed transit corridor, the Rock Island, planned to run between downtown Kansas City and suburban Lee's Summit. Therefore, the site is a natural choice for a TOD. Building a TOD at the Truman Sports Complex will create a focal point on the Rock Island Corridor that connects Arrowhead and Kauffman Stadiums to downtown Kansas City and Lee's Summit via a regional transit system; bring together a diverse population through the creation of a walkable, mixed-use center located adjacent to the regionally known cultural institutions; and encourage new development around the junction of Interstates 70 and 435, a major transportation node in Kansas City, Missouri.

This study employs extensive regional, market, and transportation analyses to inform specific planning and programming ideas. It draws from a large body of literature and precedents, incorporating well established elements and principles into a new development that is unique among TODs and sports-related districts. The project's findings reveal that retail, multi-family housing, and office development at the Truman Sports Complex, supported by rail transit and strong tenants, would fill a void in regional business and population density close to downtown, and have the potential to be economically viable as a regional center through 2040.. This research has also shown that in order to achieve the adequate density for pedestrian vitality on the site, high-rise development with limited single-family options is necessary. And perhaps the most important finding is that the rail line should be rerouted through the center of the site if Transit-Oriented Development at the Truman Sports Complex is pursued, in order to maximize the pedestrian-accessibility of land suitable to development and ensure that activity is concentrated around the stadiums.

Overall, the significance of this project is that it can inform the Mid-America Regional Council, the Jackson County Sports Complex Authority, and other relevant stakeholders about the potential for developing on this site, and it demonstrates that a mixed-use, pedestrian-friendly, large-scale transit-oriented development with a wide variety of program is both viable and desirable at the Truman Sports Complex.

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I. Introduction

The following study is the result of an eight-month long research process, through which Alfred Ledgin and I developed the concept for an urban design plan for a Transit-Oriented Development (TOD) at the Truman Sports Complex, which we have called “Stadium City.” We identified this project in concert with the Mid-America Regional Council’s “Corridors and Centers” strategy outlined in the *Transportation Outlook 2040* plan. In that document, the Rock Island Corridor, which stretches Pleasant Hill to the Truman Sports Complex (and potentially all the way to downtown) was identified as the possible site for future rail transit. Since the Truman Sports Complex is already an important regional activity center, we set out to create an urban design plan that would maximize the potential of the site to serve as an important transit-oriented node.

This document, which is compiled mostly from the research that I conducted, generally lays out the regional and economic context of the site, as well as a possible planned mix of uses and set of transportation impacts for the development. In that way, the first

chapter establishes the underlying regional dilemmas which led us to choose this project. The theoretical background (including literature review) on which we based much of our subsequent work is covered in the second chapter. The third chapter, analysis, deals with the specific regional and economic contexts unique to this project, while the fourth section, plan, explains our specific recommendations for the site, with a focus on solving transportation conflicts.

It is important to understand the way in which this work will actually be used – that is, while the specific numbers that we have generated may not be relevant outside the scope of this document, the internal logic of the plan itself may, in fact, be useful to future decision-makers. With that important fact in mind, the final chapter provides a guide to using this plan, and a summary of its relevant findings. Certainly, it is our belief that innovative development typologies such as TOD are integral to building a sustainable future, and it is our hope that this work will have a place in the ongoing conversation over the future of the Kansas City region.

Dilemmas, Thesis, Research Question, & Methodology

The Mid-America Regional Council's (MARC) *Creating Sustainable Places* initiative focuses on a “shared regional vision” that encompasses all phases of economic, social, and environmental sustainability. The urban design plan for a stadium TOD will fulfill the agency’s implementation strategy of “demonstrating new models” by applying a sustainable design form to a key corridor (the Rock Island) and activity center (the Truman Sports Complex), and providing a concrete demonstration project that works to “...help transform the ways neighborhoods and communities grow and develop” (Mid-America Regional Council 2011a) as outlined in the Thesis above (see MARC’s *Creating Sustainable Places*, p. 6, for an additional detailed description of the desired features of activity centers).

As Galina Tachieva states in the opening paragraph of the *Sprawl Repair Manual*, “sprawl is a pattern of growth characterized by an abundance of congested highways, strip shopping centers, big boxes, office parks, and gated cul-de-sac subdivision—all separated from each other in isolated, single-use pods” (2010). This definition describes the current character of much of the Kansas City metropolitan area. The region continues to grow ever-outward, largely ignoring substantial opportunities for redevelopment around existing communities that would better utilize current infrastructural investments than greenfield development on the exurban fringe.

In addition, this pattern of dispersion has largely separated each of the region’s most important cultural and activity centers, limiting the possibility of benefits from the economies of scale and agglomeration around these institutions, and, at the same time, ensuring that car ownership, vehicle miles traveled (VMT), and automobile dependence will all continue to increase.

The effects of this geographic fracturing—sponsored by the automobile-oriented landscapes often considered placeless—have also exacerbated the social, economic, and racial segregation that still exists between various sectors of the population. Unfortunately, these specific problems continue to exist against a backdrop of rising fossil fuel prices, carbon emissions, and other potential negative externalities from climate change—complex environmental problems that transcend the ability of one locality to address them fully.

The auto-oriented character of Kansas City and its environs and the near-universal automobile reliance that comes with it, are both entrenched in over half a century of tradition. Higher-density, well connected, mixed-use development requires favorable market conditions and a range of viable transportation options. Kansas City's dilemma then becomes a choice between the comfort in continuing familiar patterns of use-separated, car-dependent development, and the risk in pursuing new forms that would combine

commercial, entertainment, and residential uses, once deemed incompatible, in strategic centers that would foster human energy and urban vitality, and could forever alter the image of the city itself.

In addition to regional-scale **dilemmas**, several site-specific issues were discovered in the course of the project, each needing to be addressed in its own specific way.

- The location of the existing Rock Island rail line as it enters the Truman Sports Complex, in a low-visibility and poorly-accessible gulley, necessitates strategies for connecting it to the center of the site. Rerouting the line through the center of the site, while expensive, would maximize the concentration of activity near the stadiums.
- How to provide a safe, efficient circulation system for both pedestrians and vehicles on the site with its current auto-dominated road network.

- Providing the adequate parking for the stadiums and additional development - without compromising pedestrian-friendliness or connectivity – is vitally-important to optimizing the viability of the site for TOD.

Thus, the **thesis** is that the creation of an urban design plan for a diverse, connected, and economically-viable TOD at the Truman Sports Complex will maximize the potential of the site to serve as an important transit-oriented node on the Rock Island Corridor. Any development based on the general logic forwarded by this plan would serve to: a) directly connect the stadiums to both downtown and suburban Lee's Summit by means of a rail transit system, thus providing greater regional connectivity and imageability while fostering a reduction in auto mode share, b) provide a catalyst for social cohesion through the creation of a walkable, mixed-use center that integrates and expands upon the powerful cultural institutions of the Kansas City Royals and Chiefs—bringing people from diverse ages and backgrounds

into face-to-face contact with one another in a well designed public space, and c) provide a spark for redevelopment around the massive existing investments in regional infrastructure that are I-70 and I-435—both of which are located near the proposed path of the light rail line in the stadium vicinity—providing a regional-scale transportation node.

In order to delineate the philosophical foundations of this project, we have provided a list of planning principles that will provide the focus to our design strategies and research, and inform our final products. While informed by a variety of thinkers, including Kevin Lynch, Donald Shoup, Peter Calthorpe (the originator of the TOD idea itself), and others, the following list of principles is nowhere near comprehensive.

However, it does provide a starting point for investigating the means to achieve the solutions stated in the thesis:

- Focus on pedestrian connectivity (no “loops” or “lollipops” in street design) and maximization of the imageability of the site concept (Lynch 1960).
- Provide a diversity of uses, housing types, and amenities for a variety of age groups (Ditmar, Ohland and Calthorpe 2004).
- Include pedestrian-focused retail, a grocery store, possibly a school, and other public amenities that allow the residents to meet the majority of their needs within a short walk (Ditmar, Ohland and Calthorpe 2004).
- Solve the parking problem: provide garages, decrease relative parking supply, and meter public parking, providing those funds for community maintenance expenses (Shoup 2005).
- Include Complete Streets design standards.

- Provide the requisite density for financially viable transit operations (Guerra and Cervero 2011).
- Provide a detailed form-based code for future build-out of the site, including scale, form, setbacks, structure bulk, and specific design details.

Throughout this larger planning process, the primary **research question** that guided my work is: what residential density, number of dwelling units, mixture of dwelling types, amount of office space, amount of retail space, and mixture of commercial and public amenities will provide the best opportunity to make a TOD at the Truman Sports Complex economically successful?

The importance of an economic analysis of the project is primarily related to design implementation: while plans can function in many different ways, in order for a specific design to function and succeed, an understanding of its economic context is very significant.

In addition, while much of the relevant literature has discussed the important qualitative aspects of TOD design (such as use mix and streetscape design), a quantitative analysis tied to a specific site provides us clues towards the viability of different possible configurations. Figure 1.1 shows a diagram that explains the **methodology** for the regional, economic, and transportation portions of the Stadium City plan. I started with the fundamental dilemmas pertaining to the region and the Rock Island Corridor, from which the thesis and research questions explained above were generated.

From there, I conducted background research that gave me the relevant theoretical background knowledge and showed me examples of similar types of development. Ledgin conducted a site analysis and found that the most desirable area for development on the site would be on the eastern parking lots adjacent to the stadium. I used that information to develop a program for the site, which included residential, office, retail, entertainment, and public uses, as well as the requisite parking, all in a phasing plan. This information was used to develop an analysis of the

economic context of the project, which had to be re-worked several times as different amounts of programming yielded undesirable market results.

Then, in an iterative process, we took what we had found in programming and worked back-and-forth between design concepts we had discovered in the literature, spatial patterns, and the specific constraints of the site. This spatial design process produced a site plan of building masses and locations, which was then used as the framework to define the locations of parking garages and streets in detail.

While this process inevitably leaves out much of the details of Ledgin's contributions, it is important to understand the multi-faceted nature of the project, and acknowledge the fundamental collaboration between Ledgin and myself that has informed the entire Stadium City planning process. In reality, the individual components of the Stadium City plan can be separated only very carefully, being so closely interrelated in almost every way.

I. Introduction

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IV. Plan

Zoning

Massing

Streets

Parking

Rail Realignment

II. Background

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III. Analysis

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Figure 1.1. Process diagram.

II. Background

Literature Review

Based on the design process outlined above, with background research an integral part of informing the physical design process, I have divided this review across three broadly discernible categories: urban design, land use and transportation interactions, and economic influences. Of course, this is only a coarse introduction to the multitude of work that has been done on topics relevant to the regional impacts of TOD; however, it has provided a sound theoretical foundation for the development of my methodology for understanding the regional influences of Transit Oriented Development. The final portion of this review, dealing specifically with TOD, was prepared by Ledgin, and works well to provide an understanding of the core concept of the development typology as it was conceived, largely, by Peter Calthorpe.

While theories of urban design, or the influence of the built environment on human behavior, have been around probably since ancient times in various forms,

the foundation of our contemporary understanding of urban design principles was arguably formulated in the 1960s with a pair of seminal works: Kevin Lynch's *The Image of the City* and Jane Jacobs' *The Death and Life of Great American Cities* (Lynch 1960; Jacobs 1961). Although the current project seeks to implement a variety of design strategies in the creation of a TOD at the Truman Sports Complex—including empirical analysis of markets and trip generation—most of the assumptions made in contemporary site analysis/design can be linked to one of these two works, whether as an affirmation of or reaction against.

In *The Image of the City*, Lynch developed the methodology of “cognitive mapping,” in which residents of particular cities or neighborhoods draw elements of the built environment from memory. The elements drawn were then synthesized to pick out commonalities, which were then identified as “paths,” “edges,” “districts,” “nodes,” and “landmarks” (1960).

The genius of this process is that the elements identified establish a concrete plot of how the sites were perceptually organized, and thus provides reliable objective criteria for analyzing the way in which users of the built environment image specific surroundings. Of course, the five factors still provide a useful way to interpret the conceptualization and success of a site's design.

Jane Jacobs' *The Death and Life of Great American Cities*, on the other hand, was perhaps one of the first significant statements advocating the potential that mixed use planning, as well as increasing pedestrian connectivity, might have in developing a sense of community at the neighborhood-scale (1961). She observed many urban behavioral patterns where she lived (Greenwich Village, in New York City) and found that diversity of primary uses was extremely important to the vitality of a city, as well as to its safety. She also found that smaller blocks, a variety of buildings (e.g. old and new) encouraged pedestrian connectivity and economic diversity in an area. Jacobs' rational and

systematic observation of the positive effects of use mixing, while fundamentally qualitative, provides both a theoretical and methodological foundation for much of the resulting discourse on urban design and planning itself, including many of the tenets of the New Urbanist movement. Much of the literature on the interaction between land use and transportation—and many of the strategies that will be employed in our TOD design—have developed from the assumptions that she made in this work.

While much work on urban design has occurred in the intervening years, Galina Tachieva's *Sprawl Repair Manual* vividly illustrates the current stream of thought in urban design practice by taking the common elements of sprawl-type development (e.g. malls, "McMansions", conventional automobile strip shopping centers) and illustrating the ways in which these elements can be filled in to create more walkable, pedestrian- and transit-friendly environments (2010).

One of the key strategies employed in the book is the infill of existing parking lots with dense, mixed use buildings that front the street, often with interior courtyards for parking or open space.

The theory that higher density, mixed use neighborhoods have certain properties, which work to reduce automobile traffic (and are thus environmentally friendly and energy efficient) has large intuitive explanatory power: such areas generally have shorter distances between residences and places of employment, a higher volume of traffic, and a visual aesthetic and pedestrian scale that encourages non-auto mode choices. Many of the following studies are designed to test the veracity of this intuitive hypothesis.

Several studies were done on the effect of land use characteristics on travel between the end of World War II and the beginning of the 1980s, but only with the onset of New Urbanist and ‘Smart Growth’ policies did research into the field become truly voluminous. One of the most significant studies to assess the relationship between land use and travel patterns in 1980s suburban

environments was Robert Cervero’s 1989 book, *America’s Suburban Centers: The Land Use-Transportation Link*. This in-depth study analyzes 57 specific American suburban office complexes using a variety of statistical and qualitative measures, including several different kinds of regression analyses run on survey responses, as well as physical site investigation. What is important for the purposes of the current review is that Cervero’s research identifies “Suburban Employment Centers,” defined as suburban business complexes located at least five miles from the CBD, with at least 2,000 employees and 1 million square feet of office space, and investigates travel patterns to, from, and within these complexes (Cervero 1989). The study found that those SECs which contained the “greatest variety of land uses, and in particular the largest retail components,” had the highest densities, and tended to “average the highest share of vehicle pooling” (Cervero 1989).

In fact, in downtown Bellevue, WA (which Cervero identifies as a suburban sub-city), the researcher found that “density bonus” systems enacted by the city—policies that incentivized pedestrian amenities and use mixing for developers—had reduced the solo-commuting mode share to 75%, one of the lowest rates in the nation (Cervero 1989).

While Cervero’s study largely confirmed the findings of previous researchers, that the “densities of land uses have been shown to be one of the most important determinants of travel behavior,” and simply applied them to a unique development (the suburban ‘edge city’ office cluster), it was around this time that other researchers started questioning the potential spuriousness of the relationship between density and travel patterns (Cervero 1989). In a landmark study, Kitamura, Mokhtarian, and Laidet sought to answer that very question: is the correlation between land use, mixing, and travel that many studies from the 1960s through the 1980s (including America’s Suburban Centers) genuine, or is it rather “an artifact of the

association between land use and the multitude of demographic, socioeconomic, and transportation supply characteristics which also are associated with travel?” (1997). In order to test this hypothesis, they organized an extensive mail survey of five distinct neighborhoods in the San Francisco, CA Bay Area. In it, the researchers asked respondents to compose a three-day travel diary, answer sociodemographic- and neighborhood-characteristic questions, and, most innovatively, respond to questions meant to assess their personal attitudes toward certain lifestyles or methods of transportation (Kitamura, et al. 1997). Using these answers, they classified respondents into eight categories (e.g. “Pro-Environment,” “Suburbanite,” “Urban-Villager,” “Workaholic”) and matched these against both the physical characteristics of their neighborhoods, their travel patterns, and other sociodemographic information (Kitamura, et al. 1997).

Two important conclusions were formed after analyzing the data with a linear regression model. First, it was found that neighborhood land use characteristics were statistically associated with travel behaviors; importantly, higher density neighborhoods were associated with both decreased travel distance and increased non-auto mode share. However, the respondents' travel behavior was more strongly and directly associated with their attitudinal reactions than with the land use characteristics of their neighborhoods. With this result, the importance of 'self-selection' in travel pattern determination became a major feature of subsequent studies on the built environment and travel.

At this time, the burgeoning research on land use and transportation began to dovetail with related but separate research on the new built form of Transit Oriented Development. Of course, the two streams of discourse relate closely to one another, and the literature on TOD is unique and important enough to constitute its own discussion below. However, Douglas Porter's article, "Transit-Focused Development: A

Progress Report," began to bridge the gap between the theory of TOD and the quantifiable effects on travel behavior that certain design elements of TODs might have (1998). Significantly, this study found, through a qualitative analysis of existing transit systems and station areas, that "station-area planning by local jurisdictions or transit agencies should do more to create an attractive pedestrian network throughout the station" (Porter 1998). In addition, he advocates for a better understanding of how "fine-grained design relationships among building elements, public spaces, and other development features in station areas could enhance transit access and ridership" (Porter 1998).

The next substantial step in land use research came in 2003, with Krizek's "Residential relocation and changes in urban travel: does neighborhood-scale urban form matter?" Up to this point (and even afterwards), studies on the built environment and travel gathered data on a cross-sectional basis, usually selecting an individual- or household-level unit of analysis on samples from several neighborhoods within a larger metropolitan area.

Thus, this research could not infer causality conclusively, only assess correlations. Krizek, on the other hand, introduced a longitudinal design, which captured pre- and post-test survey information from a sample of relocating households in Seattle, WA (2003). Using several regression models, he assessed the relationship of many variables, including VMT, PMT (Person Miles Traveled), total number of tours, number of trips per tour, and mode share—none of the correlations had an r^2 greater than .30, with some (including mode share split) proving statistically inconclusive altogether. However, using those variables which did demonstrate significance, several interesting conclusions were formulated. First, faintly echoing Kitamura et al. (1997), Krizek found that household travel preferences are fixed (2003)—inclinations for specific patterns and mode shares (solo automobile use, for example) do not fluctuate significantly when a family moves from one type of environment (e.g., high density urban core) to another.

Secondly, when a household relocates to a more traditional (dense) neighborhood, they tend to use

local services more, decreasing tour complexity while simultaneously increasing the total number of individual trips although the total effect demonstrates a negative net VMT. Conversely, a move to the suburbs reflects increased VMT per day per household—thus demonstrating that changes in density do have an effect, albeit (relatively) weak, on travel behaviors, if not the underlying preferences, and mostly only in terms of trip generation and aggregate distance.

The interest in measuring the effect of neighborhood preference, begun by Kitamura, et al. (1997) and substantially bolstered by Krizek (2003), continued with a 2005 study conducted by Schwanen and Mokhtarian. Using a mail survey distributed throughout three San Francisco, CA Bay Area neighborhoods, the authors collected attitudinal, travel (specifically, mode share), and sociodemographic data, and then analyzed it using multinomial logit analysis. The premise of the study was to determine individuals' "consonance" or "dissonance" with regards to the type of environment in which they lived.

Thus, using a similar survey structure to that of Kitamura, et al. (1997), the researchers categorized respondents into various categories based on their attitudes towards various travel- and land use-related factors, and then matched those against where they actually lived (Schwanen and Mokhtarian 2005). In the end, four categories were created: “consonant urbanite,” “dissonant urbanite,” “dissonant suburbanite,” and “consonant suburbanite” (Schwanen and Mokhtarian, 2005). The results found that in suburban environments (generally characterized by low levels of use mixing and low density), the effect of the surroundings trumped an individuals’ preferences in determining their mode choice, while in urban neighborhoods, mode choice roughly equaled preference. The researchers’ explained this incongruence by appealing to the larger range of choices available in urban environments (one is able to walk, bicycle, use public transit, or drive if one desires) than in the suburbs, where automobile driving is basically the only practical mode available.

However, even though dissonant urbanites still largely choose to drive in the higher density, mixed use environment of the urban center, Schwanen and Mokhtarian found that they do drive less: roughly “83% personal vehicle commute mode share for the most mismatched urban dwellers, compared to 93% for the consonant suburban dwellers” (2005). In general, the results confirmed the researchers’ hypothesis that non-auto mode share would decrease on a continuum from consonant urbanite to dissonant urbanite, and then further, from dissonant suburbanite to consonant suburbanite—demonstrating the built environment’s influence in determining travel behavior. However, because preferences often determined where respondents lived, the study also reiterated the powerful role of self-selection in determining travel characteristics, including mode share.

Silva, Golob, and Goulias employed a simultaneous equations system in 2006 in order to explore the connection between land use features and the residence and travel patterns of workers in Lisbon, Portugal.

Using data collected from a telephone interview, the researchers assessed sociodemographics and commuting distance; land use features were grouped according to eight factors measured using a GIS-based system, and classified by an entropy index. Perhaps as an implicit response to Targa and Clifton's warnings, the authors categorized their findings in a nuanced way, which attempted to incorporate potential spurious correlations into a single coherent model. Essentially, while higher density, more urban areas displayed higher rates of transit and non-motorized mode use, and outskirt areas with good highway access showed higher auto mode share and greater rates of individual auto usage, the researchers depicted these apparent relationships as the last link in a longer chain of causality. Rather, distance from the CBD (which, it should be noted, is used in some studies as a proxy for density) was deemed to be the more immediate cause of the transportation-behavior findings; which, in turn, were mostly attributed to sociodemographic factors (likely due to the powerful influence of self-selection). Thus, in that way, Silva, Golob, and Goulias attempted

to convey the complexity of the subject of land use, and the interrelated nature of travel-behavior causes (2006).

Revisiting a subject broached by Krizek (2003), Maat and Timmermans sought to analyze the relationship between land use and tour-chaining, by using Poisson and negative binomial regression models to evaluate two-day travel diary responses from a sample of individuals in the Netherlands urbanized region (including Amsterdam) (2006). The researchers distinguished types of trips between "subsistence," "maintenance," and "discretionary," and matched these classifications against sociodemographic, density, neighborhood accessibility, and level-of-urbanization (and likewise, suburbanization) variables (Maat and Timmermans 2006). The authors found, first, that all of the activity and travel variables were significantly (and primarily) influenced by sociodemographic characteristics (echoing Silva et al., 2006).

As in Krizek (2003), higher densities did have some measurable impact on travel behavior: greater trip activity, greater overall tour demand, and (somewhat surprisingly) more complex tours, could all be expected as a result of more dense, mixed land use characteristics. However, although greater tour frequency correlated with reduced individual tour distance, daily distance traveled (PMT /VMT) increased in comparison to lower density environments.

The difference in the effect of density on tour complexity (a positive correlation) with regards to previous research (Krizek 2003) is interesting, and may perhaps be attributed to cultural differences between European and American locations; while in the US, as Krizek (2003) found, higher densities reduced tour complexity by facilitating a higher total number of trips (thus demonstrating balance in the total number of trips between the two environments), in the Netherlands, as Maat and Timmermans explain, tour complexity increases with density (2006). It seems that

in European urban areas, travelers are somehow encouraged to lengthen their errands, caught by things seen in passing, or possibly even the experience of being ‘out’ itself—trips at greater distances are made for more specific reasons, and thus are less complex. The hypothesis that European areas (as opposed to those in the US) of high density might contain some inherent element (designed or otherwise) that entices users to lengthen the time and complexity of their stay (and what element that might be) should be investigated with further research.

Chen, Gong, and Paaswell, in a study of the New York City metropolitan region, employed a two-equation simultaneous system to measure data collected by a single-day travel survey on automobile-use and self-selection variables, while constructing an econometric regional travel demand forecasting model to measure travel cost and time (2009).

The researchers utilized data on population density, sociodemographics, job accessibility (proxied by distance to the CBD), and distance to the nearest transit stop, while controlling for the effect of trip-chaining and self-selection, in order to assess the effect of those factors on mode choice (delineated simply as auto or non-auto). The results showed that job accessibility, or closer distance to the CBD, had the greatest impact on non-solo automobile mode share, while density, distance to transit, and travel cost, each had significant but progressively diminishing effects. Thus, again, density was shown to have some effect on mode share, although when the variable is disaggregated from the context of its associated elements (e.g. use mixing, job accessibility), it becomes unclear exactly how much. As Ewing and Cervero mention in their excellent meta-analysis “Travel and the Built Environment,” in order to avoid the complications of the ecological fallacy, studies regarding land use and travel began to use disaggregate, individual data (2010). However, it may be that this is an inappropriate way to measure the phenomenon at hand: what is the idea of

‘density’ in-and-of-itself, without context? Perhaps the weak correlations associated with the relationship between land use and travel variables is due more to the way in which we disaggregate ‘density’ or ‘use mixing’ from the urban fabric as a whole than it is to any real non-relationship.

Regardless, using a nearly comprehensive list of literature relevant to the topic of land use and travel behavior, Ewing and Cervero built on their often-cited 2001 article of the same title, calculating point elasticities of the disaggregated results of individual research projects in order to create weighted averages of result-significance across topics (2010). While previous studies regarding the body of research related to New Urbanist (or smart growth) policies—as well as those which document the history of such policies’ implementations—relied strictly on qualitative methods (refer to Table 3 for the theoretical implications of two such papers), Ewing and Cervero (2010) took a quantitative approach to literature review (Handy, 2002; Grant, 2002).

In so doing, they came to several relevant conclusions, the first being that individual travel-related variables are overwhelmingly inelastic in relation to the built environment: none had a weighted average elasticity of absolute magnitude greater than .39.

Clearly, the combined effect of such variables holds greater significance than the sum of their disaggregated parts. In addition, Ewing and Cervero found that VMT was most influenced by accessibility and street network characteristics, while walking mode share was most effected by diversity factors, as well as reduced travel distance (2010). Lastly, population and job densities seem to be only weakly related to travel behavior. While these findings in large part echo those delineated in the entirety of the literature reviewed, the quantitative methodology provides a concrete framework for assessing the potential effect of built environment variables (especially density) related to the study at hand.

One of the specific policy initiatives that came out of the study of the characteristics of street design (one of Ewing and Cervero's important "D variables") was the Complete Streets movement, which specifies a set of model elements that might be included in a policy to enhance the pedestrian friendliness of streets (2010). To that effect, the Institute of Transportation Engineers put forward a highly-detailed technical document which describes all aspects of Complete Streets design standards, including specifications on street width, pedestrian buffers, compatible land uses, etc., called *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*, which is essentially a professional codification of the various design standards and approaches that had been studied as a part of the transportation and land use literature over the preceding twenty years (2010). While it does not attempt to assess the relationship between the design features it delineates and the increase in pedestrian mode share, it is useful as a straightforward design manual that illustrates the contemporary best practices for designing walkable streets, something of primary importance to our TOD design concept.

Most recently, Guerra and Cervero have added to the literature applying specifically to the relationship between transit mode share and built environment variables (2011). In this article, the authors examine the important topic of the requisite density needed to support transit service. Its conclusions are made based on a study of the cost per mile required to construct many recently-developed transit lines. In other words, it calculates requisite amount of density around station areas that would be expected to make up the capital cost of constructing the system through fares—in that way, the density standard is given as a ratio, depending on the initial expense of constructing the transit system. The article determines that most recently built TODs are still vastly underserved from a density standpoint.

While the cost of constructing a light rail transit system along the Rock Island Corridor are still unknown, once a reasonable estimate has been made, we will be able to use the information provided by Guerra and Cervero to estimate the necessary density needed at a stadium TOD to reasonably make back the

initial cost of investment, and compare that figure with those yielded by our specific economic analysis of what the regional market might support.

While the work that we have reviewed thus far has provided a solid basis for some of the assumptions that we will make in our design, such as the importance of street network design features (e.g. connectivity and accessibility), and has provided us with a framework for understanding that density as it relates to transit mode share is probably best expressed as a function of overall cost of the transit system, much of the literature up to this point is probably best understood as a theoretical foundation for the basic design assumptions that are commonly understood to be important to TOD design.

Much of the research has attempted to quantify and rationalize the effectiveness of different design strategies; however, it has been shown that there is a relatively weak connection between most features of the built environment and TOD success, or in increasing non-auto mode share (although the connection is absolutely present).

In other words, the preceding literature is essential to have as a basis for the formulation of a basic understanding of the forces at work, but, importantly, it is less useful for giving us concrete figures or suggestions as to the specifics of what would make a thriving TOD, which is, of course, the project at hand.

In order to answer that question more fully, we now turn to the body of research very loosely titled here ‘economic influences,’ which is probably better understood as the research that concerns one of two things: 1) detailed trip generation, parking generation, demographic makeup, and management policies of built TODs, or 2) basic methods for conducting meaningful real estate market forecasts, in order to determine what mix of uses might be in demand for a TOD in the Kansas City region.

The first of these studies is a special report commissioned by the State of California, entitled “Statewide Transit-Oriented Development Study,” that concerns California TOD parking policy (Boroski, Faulkner and Arrington 2002). By surveying a variety

of TOD parking practices put in place to reduce parking by land use from standard requirements, including shared parking, in-lieu fees, transportation demand management (e.g. transit pass programs), hours restrictions, unbundling housing and parking, car sharing, and “robotic” parking systems, the authors compiled a best practices guide for planning for reduced parking at TODs (Boroski, Faulkner and Arrington 2002). The most important result of this study is found in Appendix A, which outlines a basic methodology for determining shared parking for future TODs, which is a smart and effective strategy to put in place to reduce the amount of parking required for our proposed TOD, especially in an environment such as the Truman Sports Complex, where vast parking lots already threaten the pedestrian viability of future development at the site—and where parking demand for sporting events occurs for a relatively few hours each year (roughly 8% of the year).

In his landmark *Planner's Estimating Guide*, Arthur Nelson provides a detailed methodology for calculating the future demand for all kinds of land use facilities and infrastructure systems, using relatively easy-to-obtain data from the US Census Bureau and the US Bureau of Labor Statistics (Nelson 2004). By providing specific tables, forecasting methods, and standards for sizes of various land uses, the book provides a ready-made guide for calculating future housing and retail demand. In this way, the Estimating Guide will provide the basis for performing the region-specific real estate forecast to be conducted for this project. By determining the future population, employment, and land use demand for the KC metro area and the local area surrounding the Truman Sports Complex, we can make market-supported decisions about the specific mix of uses and scale of the TOD development.

Once the more general analysis has been conducted, those results will be allocated according to the case studies supplied by *The New Transit Town*, a best practices guide for TOD that incorporates several specific case studies of successful TODs, including data on their overall size, intensity, and mix of uses (Ditmar,

Ohland and Calthorpe 2004). While the work also presents general information on TOD theory and implementation, it is primarily useful in this context for providing baseline data on the general makeup of other TODs, in order to compare it to the projected demand for TOD-compatible housing and commercial real estate found through the market forecast.

Another study from the State of California, "Travel Characteristics of TOD in California" provides detailed insight into the demographic features of TOD residents, including travel behavior, by surveying the patrons of forty TODs (Lund, Cervero and Wilson 2004). While the study provides a wealth of data pertinent to TOD implementation (including detailed analyses of several California TOD station areas), the most important questions that it answered were that living in a TOD increased the probability of transit use compared to the surrounding city by about five times, and also that office workers whose place of employment is in a TOD are 3.5 times more likely to use transit compared to the surrounding city (Lund, Cervero and Wilson 2004).

The further findings of the study are also very important in determining the basic demographic profile of an ‘average’ TOD resident, and the report was able to determine many fundamental demographic characteristics, including average age, household size, income distribution, vehicle ownership rate, and a wealth of other factors.

In general, the average TOD resident has a small household (no children), a medium-high income, and is young. In addition, the study found that transit accounts for “about one-fifth of trips to retail sites in TODs,” while pedestrian modes account for “one in ten trips” (Lund, Cervero and Wilson 2004). Though some urban design features—especially street network connectivity at the trip destination—more strongly influence transit ridership (with a correlation factor of .37), most built environment design features show relatively low correlations with transit mode share, including: sidewalks along walk route (.16), street trees (.079), street lights (.178), and street furniture (.137) (Lund, Cervero and Wilson 2004).

However, the authors of the study give strong credence to the idea that TOD is a marketable and viable real estate typology, that they accomplish the planning goal of increasing transit ridership, and fill the need for affordable housing, all very important findings that our project hopes to use as a foundation for creating a successful project (Lund, Cervero and Wilson 2004). Also, the detailed demographic material will be invaluable to the current project as a way of calibrating demographic trends/demand to the average TOD consumer.

The next important work is Donald Shoup’s *The High Cost of Free Parking*, which builds on a body of research (much of it his own) looking at the basic inadequacy of traditional methods of determining parking and trip generation rates. Basically, Shoup’s thesis is that most cities require too much parking for all land uses, especially those located in more urban contexts, and that this vast oversupply has become a de facto subsidy for automobile use, thus increasing traffic congestion and degrading the quality of our existing high-density urban fabric (2005).

In this book, he suggests the implementation of new parking strategies, including unbundling housing and parking costs in new development, and increasing the amount of pay parking. Its connection to the current project is that it provides a well-documented theoretical framework for our desire to reduce surface parking at the Truman Sports Complex, and lends insight into the economic benefits of such a strategy.

Wilson, in his study “Parking Policy for Transit-Oriented Development,” applies Shoup’s arguments to twenty six residential TODs in California (2005). The report looks at parking pricing and policies at TODs, as well as mode share split between driving and transit, and finds that “current parking supply and pricing policies do not support the transit objectives of TOD” (Wilson 2005). Echoing Shoup and the earlier studies of California TODs, Wilson suggests that shared parking supply, parking provision based on average (rather than peak) demand, and unbundling parking cost from the unit price are effective ways to enhance the urban design and transit ridership of residential TODs.

In a study conducted for the Florida Department of Transportation, Chu and Polzin attempted to construct an “alternative measure of transit mode share” by looking at more nuanced definition of trips, distances, and person miles traveled than the basic census journey-to-work data that is most commonly relied upon (2007). While the researchers conducted an in-depth survey and data analysis of Florida transit riders according to several more detailed methods of mode share analysis, the primary takeaway for the current project is that transit mode share can be measured in various ways, some of which provide more information about the actual travel patterns and behaviors of transit users—an important insight when attempting to conduct true evidence-based TOD design. While the kind of original data collection necessary to complete advanced mode share analysis will be beyond the scope of our project, the authors offer their support for the viability of the mode share data from the American Community Survey, which we will use as our primary source of mode share information for the Kansas City region in our market forecasting.

One of the most useful pieces of research on TOD trip and parking generation was completed in 2008 by Cervero and Arrington, called “Effects of TOD on Housing, Parking, and Travel,” and consists of a detailed study of travel demand of 17 TODs in four metropolitan areas. In general, the researchers found that the automobile-reducing effects of TOD hoped for by planners and policy makers “are muted since most US TODs are parked oblivious to the fact that a rail stop is nearby” (Cervero and Arrington 2008). The first portion of the study consists of a massive literature review covering demographic and ridership analyses of TOD resident populations, including population forecasts, which found restricted parking supply, fast, frequent, and comfortable service, and proximity to station to be the most important factors for influencing transit mode share.

The second portion compiles “original empirical data on vehicle trip generation rates for a representative sample of multi-family housing projects near rail transit stations” (Cervero and Arrington 2008). As

such, this study helps to inform Shoup’s criticisms of the ITE’s Parking and Trip Generation manuals by providing reliable, detailed data on the transportation demand characteristics of TOD. The end product is essentially a calibration method for adjusting peak parking demand by land use as a factor of the ITE’s trip generation rate. Shown in Figure 2.1 are the proportions of residential TOD PM trip generation rate as percentages of the ITE rate as function of surrounding density and distance to the CBD—as can be seen, the more dense and closer a TOD is located to the CBD, the smaller its proportion of vehicle trip generation as compared to that stated in the ITE manual (Cervero and Arrington 2008).

In essence, this analysis will allow us to calibrate the ITE trip generation manual for residential land uses to the Truman Sports Complex location, based on the more reliable, TOD-derived data developed in this study.

In that way, we can provide an accurate estimate of vehicle demand generated by the proposed TOD, thus saving infrastructure provision cost and enhancing the urban design quality of our project.

In order to bolster our market analysis methodology, a private study on the commercial real estate market for the 3rd Street Corridor Specific Plan (an area which includes a proposed TOD) in Los Angeles was consulted (MR+E 2009). The methodology largely followed that found in Nelson, but provided some additional data on rental rates and other real estate factors endemic to the commercial market (2004). In studying this analysis, the question of the size catchment area for the proposed Truman Sports Complex TOD—and thus the scale at which market data should be collected—was raised, underscoring the importance of finding as accurate economic data as possible for the subject site.

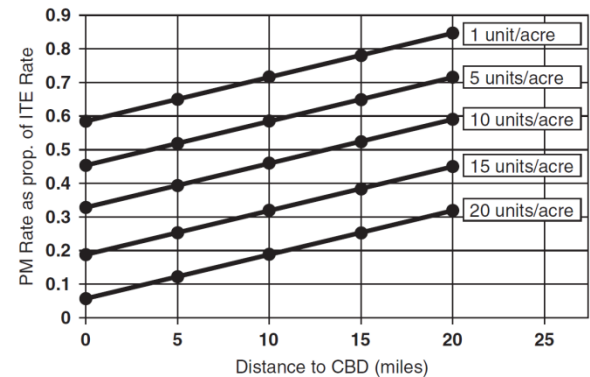


Figure 2.1. *Proportions of residential TOD PM trip generation rate as a percentage of the ITE rate, based on surrounding density and distance to the CBD (Cervero and Arrington 2008).*

Finally, Ho conducted a parking and trip generation study for the Oxford Plaza TOD in Berkeley, California a part of a student ITE research project (2010). While the study is only moderately applicable to the project at hand, it provides a concise and well-researched model for conducting similar trip/parking generation studies should the needs arise (perhaps of other comparable mixed use shopping centers in the Kansas City metro), and all underscores the findings from the body of research that suggests that low levels of parking provision in TODs—.4 spaces per dwelling unit in Oxford Plaza—contribute to higher rates of non-auto mode share.

In summation, the literature on economic influences helps to provide a basic methodological framework for the data analysis portion of this project, as well as lend insights into the travel and parking demand characteristics of built TODs. While much of the data was collected in regions and contexts somewhat dissimilar to that of Kansas City, the methods that were used in these studies help to provide an analytical system that can be applied to the study region.

Glossary

Density is a measure of spatial concentration, and in studies, refers most frequently to the number of either jobs or individuals per unit of land area. **Diversity** measurements, on the other hand, are used as quantifiable proxies for the amount of use mixing in an area: the most frequently encountered are “entropy” factors, “wherein low values indicate single-use environments and higher values more varied land uses,” generally on a scale from 0.0-1.0 (Ewing and Cervero 2010). **Design** encompasses a whole range of factors, from street network design (gridiron patterns vs. suburban curvilinear roads), to average block size, number of intersections, building setback, sidewalk accessibility, street width, and other factors, all in an attempt to “differentiate pedestrian-oriented environments from auto-oriented ones” (Ewing and Cervero 2010).

Destination accessibility and **distance to transit** both generally refer to the distance traveled to some point of interest, whether it is economically-related

(the Central Business District, workplace, or even local commercial areas) or simply a transit stop (Ewing and Cervero 2010). And, of course, demographic **factors** are central to nearly every study regarding the effect of the built environment on travel variables, as they are used to control for certain potential biases (and may explain different commuting patterns and mode choices).

Other important concepts include the common measure of automobile trip distance, **Vehicle Miles Traveled** (VMT), and ‘tours’, which are complete trips begun and ended at home. A “tour chain” is a string of trips—and thus complex, as it involves more than one destination (Maat and Timmermans, 2006). Finally, **self-selection** refers to the (very likely) propensity of those who live in dense neighborhoods to have chosen them specifically for their transportation characteristics (easier access to transit, shorter distances to the CBD, and easier non-auto mode accessibility).

Precedent Studies

In order to better understand the regional dynamics at work in the Kansas City area, especially with regard to the introduction of some form of rail transit and our proposed Transit Oriented Development, I found it instructive to investigate a single regional precedent study at three different scales, each of which relates to the project at hand in different ways. As Calthorpe and Fulton explain in *The Regional City*, TOD is functionally a regional concept, due to the fact that suburban residents can only realistically embrace a less auto-dependent lifestyle if a strong regional transit network is in place (2001). The authors cite Portland, Oregon, as an exemplar of regional planning (among others), and certainly Portland presents a powerful precedent study due to its long and famous history of successfully implementing regional planning programs, beginning with the advocacy of Governor Tom McCall in the 1970s, the implementation of State Bill 100 (and mandatory urban growth boundaries), and the grassroots civic planning organization of 1000 Friends

of Oregon. However, for the study at hand, it is additionally important that Portland presents a fairly close comparison in many basic ways to Kansas City, allowing us, through this precedent study, to be able to begin to gauge the relative effectiveness of various regional transit policies and design strategies.

In many ways, Portland is similar to Kansas City. The two regions populations are similar in size - 2,035,334 for the Kansas City MO-KS MSA in 2010, to 2,226,009 for Portland-Vancouver-Hillsboro MSA - and are geographically similar, both being located at the confluence of two major rivers and spanning two states (US Census 2010). Even the larger settlement patterns, with a narrow band of population concentrated both along I-70 in Kansas and I-5 in Oregon, consisting of medium-sized capital cities (Topeka and Salem) and two land grant university towns (Lawrence and Manhattan; Corvallis and Eugene) in the midst of an otherwise rural state, constitute some additional similarity between the two regions.

Of course, in many ways, it is more instructive to investigate the differences between the places. According to the American Community Survey, in 2010, 82.7 percent of Kansas City's workers commuted to work by driving alone - in Portland, the rate was 71.3%, a significant 13.8% difference (US Census 2010). And in qualitative terms, the sustained density and vibrancy of Portland's central city contrasts vividly with downtown Kansas City, which is crisscrossed by Interstate highways and remains mostly empty beyond the business day, save for a few disconnected nodes of activity.

In order to narrow in on the relevant dynamics at work in Portland, I have selected three scales at which to focus: the city of Hillsboro and its relationship to the rest of the region, Orenco Station, a master-planned TOD located in Hillsboro, and Pioneer Courthouse Square in downtown Portland, an example of the kind of vibrant urban plaza that we plan to integrate into our design for a TOD at the Truman Sports Complex.

Hillsboro, Oregon

Hillsboro, shown in Figure 2.2 bounded by black, is one of the western-most suburbs of the Portland metropolitan region. While the city itself contains a fine-grained downtown and the Orenco Station TOD, its development pattern and function is largely that of a traditionally affluent suburb, with some of the expected characteristics of sprawl: large arterial roads, low density single-family development, and single-use commercial centers. However, as can be seen in Figure 2.2, with the number of employed workers over 45,000, it also acts as a regional employment node (US Census 2010). Hillsboro's development into an employment center is not surprising, of course, when considering the large number of high-tech companies, including Intel and Yahoo!, that have facilities or headquarters there - thus making the city a major component of the so-called "Silicon Forest."

Interestingly, as shown in Figure 2.3, the relative share of employment in the information sector in Hillsboro is fairly low - just 2% (US Census 2010). The manufacturing, education and healthcare, and professional/administrative (which most likely contains the bulk of those who work at the high-tech companies) sectors make up the largest share of employment in the city, together constituting over half of the total number of employed (US Census 2010). Still, the city's economy is fairly diverse, with a wide distribution of jobs across various sectors of the economy.

Understanding Hillsboro as a regional employment center is important to our project primarily in terms of the interaction between economic activity and transportation behavior. Shown in Figure 2.4 is the commute mode share for the city, which shows a slightly higher rate of driving alone to work than that of the region as a whole - about 75% (US Census 2010). And while transit trips constitute a 7% portion of all work trips, this number in and of itself is not enough to demonstrate a massive shift in travel behavior due to the construction of the MAX Light Rail Blue Line or the Orenco Station TOD.

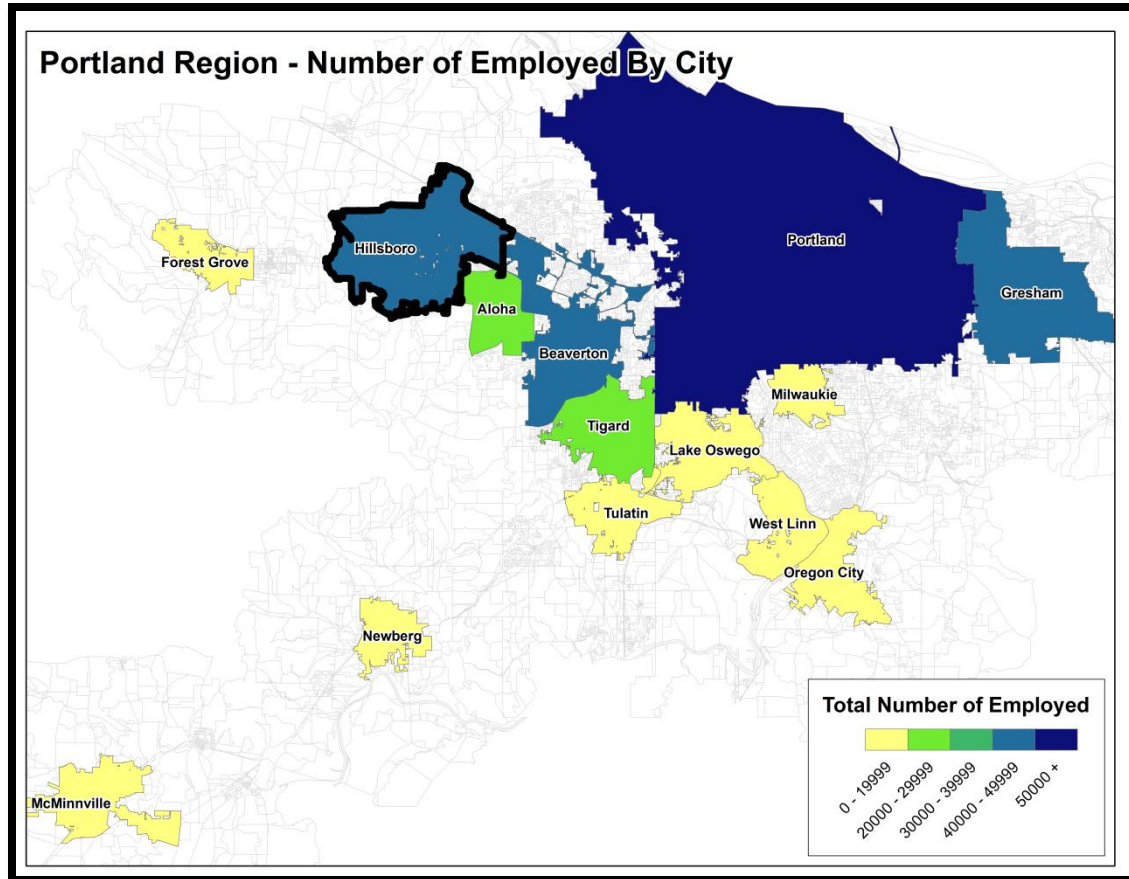


Figure 2.2. Hillsboro (in black) and employed persons per place in the Portland MSA.

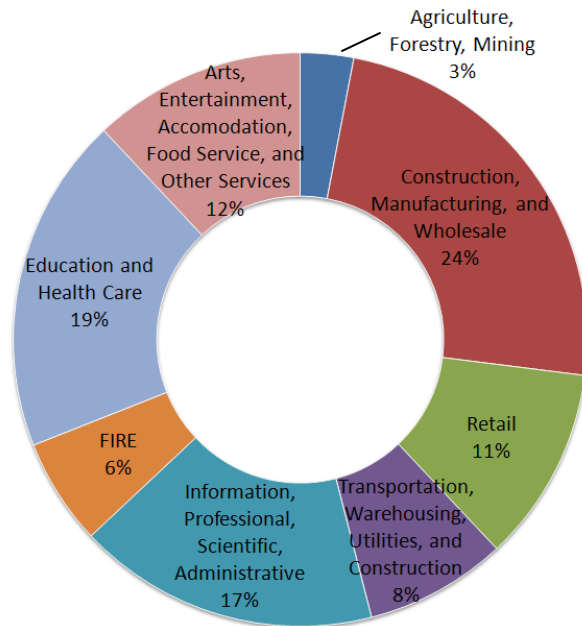


Figure 2.3. *Employment by industry for Hillsboro, Oregon.*

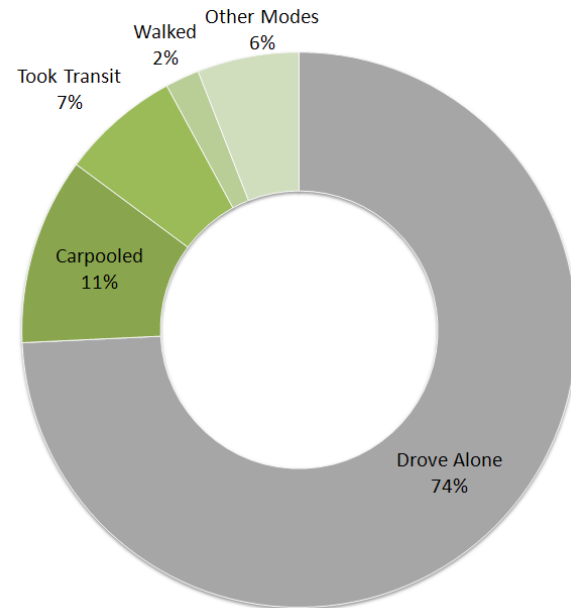


Figure 2.4. *Commuting mode share for Hillsboro, Oregon.*

In other words, Hillsboro's suburban context and location at the periphery of the metropolitan area seem, at least initially, to trump the investment in transit infrastructure that has been made thus far.

A look at Figure 2.5, which shows total commuting inflow to the city, reinforces this view to some extent. The highest percentage of commute trips from the cities shown on the map to Hillsboro that are made by transit are from Forest Grove, a suburban community even further out from the center - and even this figure, 8%, is not particularly high (Census Transportation Planning Products 2010). Taken in whole, this map displays the tenets of the traditional "gravity model" of transportation planning fairly accurately - that is, that transportation demand is positively correlated with relative weight (amount of employment, in this case) and inversely related to travel time. Still, it is interesting to see modest in-commuting to Hillsboro from Portland and even Gresham (which is an employment node in its own right) via transit.

However, the idea that Hillsboro's regional transportation activity functions primarily in the

traditional terms of a suburban sub-center (or edge city) to central city relationship is nuanced by the map shown in Figure 2.6, which shows total commuting outflow from the city to the other communities in the metropolitan area. Here we can see that 24% - almost a full quarter - of all commute trips from Hillsboro to Portland are made by transit (Census Transportation Planning Products 2010). This finding displays the potential effectiveness that rail transit may have to capture a large segment of the traditional suburb to central city commute trips - the kinds of trips which the Rock Island Corridor is certainly in a position to impact.

While Hillsboro is not directly comparable to the Truman Sports Complex area (which is a kind of an inter-municipal suburb of Kansas City), at least two things are clear from this study: 1) it functions successfully as a regional employment sub-center, and 2) a significant portion of people are using the transit system for some of their work trips, despite the overwhelmingly suburban character of the city in a regional context.

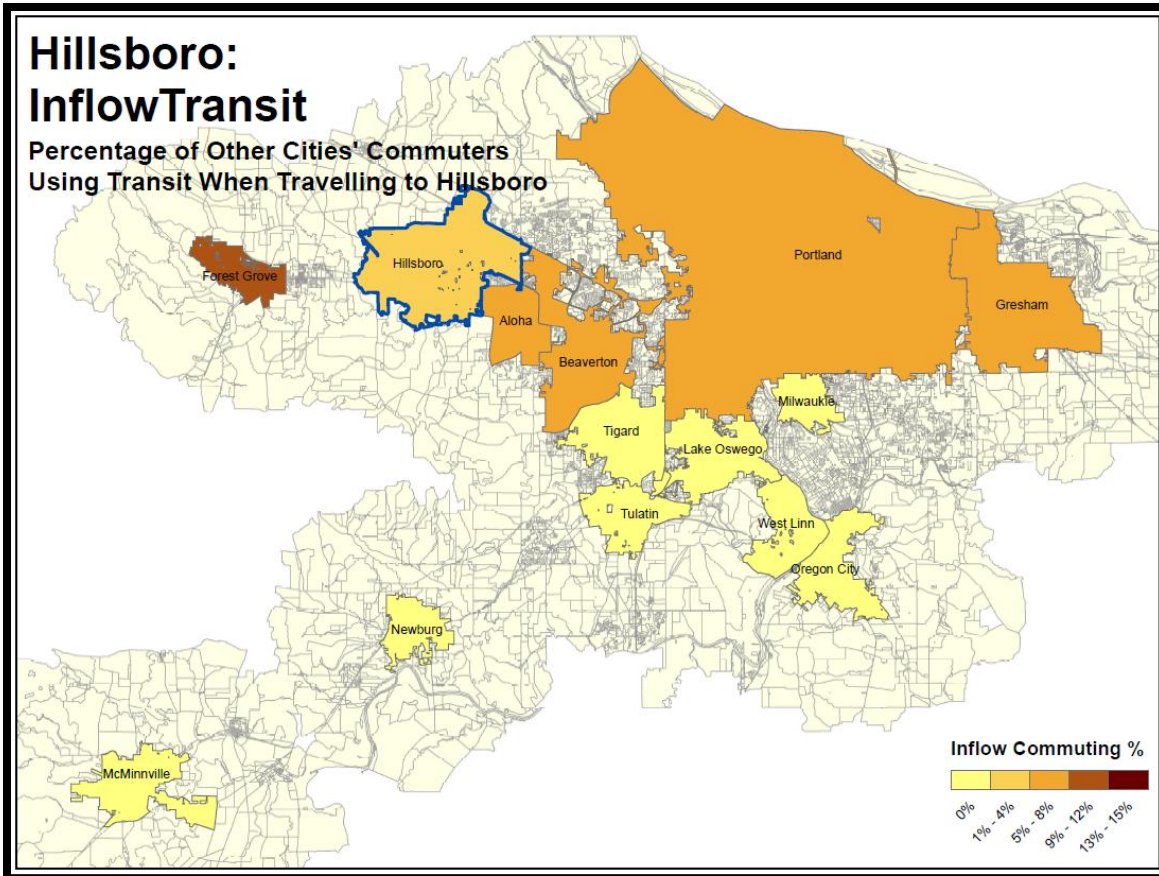


Figure 2.5 *Inflow of transit commuting to Hillsboro.*

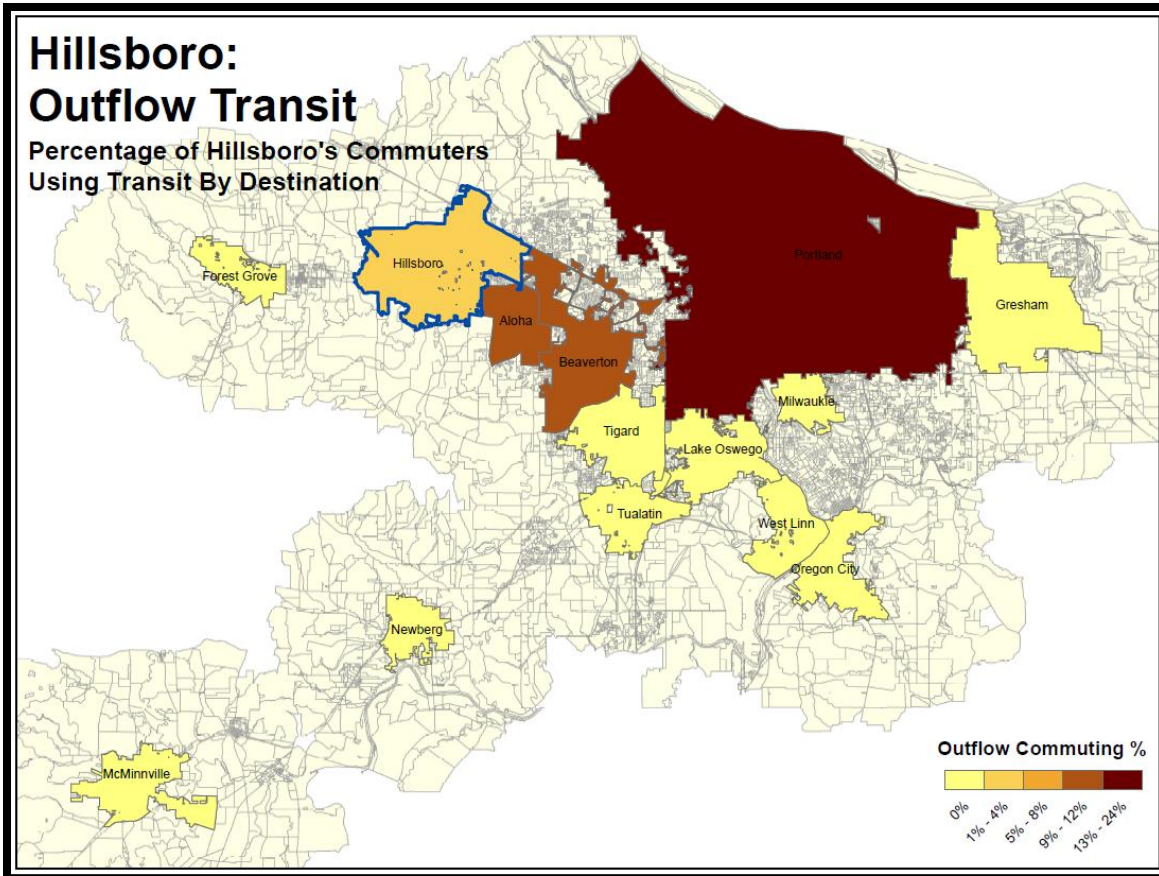


Figure 2.6. Outflow of transit commuting from Hillsboro.

Orenco Station

Orenco Station, whose business district is shown in Figure 2.7, located near the geographic center of Hillsboro, was originally planned to house commercial development to serve the growing high-tech industries moving into the area in the 1980s and 90s. Once the MAX Light Rail Westside Blue Line was approved, however, the site was slated for mixed use development (National Resources Defence Council 2011). Through an innovative public-private partnership, which involved the developers - PacTrust and Costa Pacific Homes - on the one hand, and the City of Hillsboro, Tri-Met transit authority, and Portland regional government, Metro, on the other, the plans for a 190-acre Transit Oriented Development eventually came to fruition.

Designed by Alpha Engineering, Fletcher Farr Ayotte Architects, Iverson Associates, and Walker Macy Landscape Architects, Orenco Station is the largest TOD that has been built on a suburban

greenfield - thus providing an excellent case study for the characteristics of a TOD “built from scratch” and planned to encompass all of the elements of a functioning community (National Resources Defence Council 2011; Ditmar and Ohland 2004).

In selecting Orenco Station as a relevant precedent, I have focused on two elements: 1) it is the largest master-planned TOD in existence, and, seeing at the Stadium City project eventually proposes to encompass a similar area, it provides a relevant precedent in terms of scale, and 2) Orenco most certainly intends to be a diverse and vibrant community (whether or not it is successful) in its own right, and thus many of the planning principles that it employs may be useful to Stadium City, whose primary challenge will be to develop beyond a single-use, entertainment-driven bar-and-tailgating district catering solely to young singles. With a wide range of housing types (including single-family homes), commercial uses, and a school, Orenco was certainly conceived as a comprehensive development and marketed to a diverse demographic.

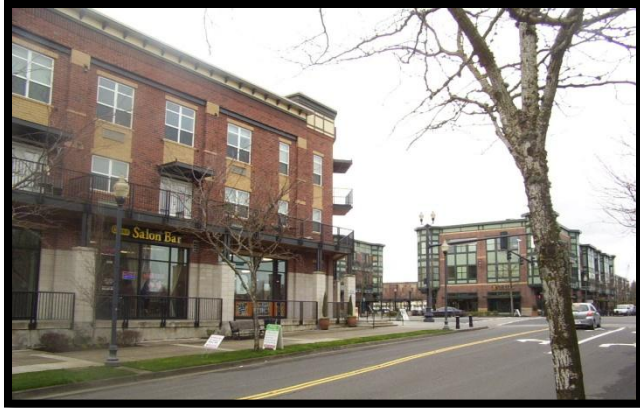


Figure 2.7. *Orenco Station.*

Table 2.1 displays the basic land use and parking statistics for the development, which includes a roughly equal proportion of single-family detached, single-family attached, and multi-family dwelling units (Ditmar and Ohland 2004). Orenco Station also mixes retail and office space in roughly equal proportions and - importantly for our work at the Truman Sports Complex - displays off-street parking ratios below those generally required for either commercial or multi-family uses.

The question of requisite density - which, as shown above, has been a central focus on the literature and research on transit ridership and Transit Oriented Development - is also of central importance to our investigation. At 10.5 units per acre, does Orenco Station provide enough density to fully support its function as a TOD (Ditmar and Ohland 2004)? In order to measure this, I turned to the criteria set forward by Cervero and Guerra in the article “Cost of a Ride,” which measures requisite station-area density in terms of the total cost per mile to build the system (2011). According to the Portland transit authority, Tri-Met, the Westside MAX Blue Line from Hillsboro to the City Center, which opened in September of 1998 and spans 18 miles and 32 stations, cost \$963 million to build (2011). According to Cervero and Guerra’s calculations, then, $\$963,000,000 / 18 \text{ miles} = \$53,500,000$ per mile. Thus, a minimum of approximately 32 persons/gross acre is necessary to make the line economically viable.

The map in Figure 2.8 depicts the MAX Westside Blue Line stations that are located in Hillsboro, including Orenco Station (bounded by orange), as well as the maximum 2,000 foot pedestrian walking radius suggested by Calthorpe around each station (in purple) and population density by block in persons per acre, with those blocks meeting the density threshold of 32 persons/ acre bounded in black (1993). Given these parameters, one can observe that little of the land located within the pedestrian-shed of the transit stations in fact meets the requisite density as defined by Cervero and Guerra.

Within Orenco Station itself, as shown in Figure 2.9, only 3 designated Census blocks have achieved the requisite density, and even these are not located particularly near to one another. While this feature in-and-of-itself does not constitute the success or failure of the project, it does suggest that, at least in terms of pure economics, Orenco could have benefited from increased density, particularly around the station area (around which two of the blocks meeting the requisite

density are located). The lack of density in Orenco Station, which is almost certainly related to its near-equal distribution of housing types between multi- and single-family housing, may explain some of the lack of transit ridership seen in Hillsboro outside of the suburb to central city commute, as well as the general lack of street activity and vibrancy outside of business hours.

Beyond density, I conducted two additional analyses on the site design of Orenco Station. In the first, I modeled the building mass and general type of use for the entire built portion of the Orenco area using an aerial photograph. The result is shown in Figure 2.10, with five general types of structure/use delineated: purely commercial or mixed use building, which received the darkest shade, as they constitute the most impervious mass, while multi-family residential areas are depicted in gray to indicate that the shaded area in these cases represents not only building mass but also generally some small surrounding landscaped areas.

High density single-family homes are hashed in gray to indicate their less-pervious mass, and traditional low density single-family structures (mostly homes remaining in the area and built before Orenco Station was conceived as a master-planned development) are shown in the lightest green gradient. The school, an important and unique land use, is indicated by its own reddish color.

The purpose of this visualization is to indicate both the general spatial pattern of the distribution of different types of housing and other uses, as well as to give a general impression of the amount of pervious/dense building mass and open space (including open-air parking areas) contained in the development. In general, I would indicate that the most structurally-dense areas are concentrated in the middle of the development, somewhat near to the transit station, and along an axis stretching from the northeast to the southwest. The higher density uses are generally placed closer to the transportation infrastructure, and serve to buffer the single-family homes to some extent,

which are dispersed further to the edges of the development. The road network is largely curvilinear in nature, although it maintains a relatively high level of connectivity and a lack of cul-de-sacs. The school is separated from almost all of the commercial and higher density residential development, and is located on the far western edge of the area. These patterns in many ways reflect the traditional “Neighborhood Unit” concept endemic to suburban land development for most of the 20th century, but differ in a few significant ways from conventional suburban development, including the increased connectivity, generally dense commercial located at the center of the development, and the presence of a transit stop in the development. However, the thing that stands out most from this analysis is the sheer amount of open space - whether for parks or parking lots - that is contained within the TOD. Certainly this lack of concentrated density is an important feature to note.

Development Size/Type	Residential	Commercial	Density	Height	Parking Provision	Distance to Transit
190 acres; greenfield	300 single-family attached and detached units; 350 condos; 600 apartments	Retail: 27,000 ft. ² , Class A Office: 30,000 ft. ²	10.5 units/acre	2-story single- family detached to 4- story mixed use commercial	.75-.9 spaces per unit	1/4 mile

Table 2.1. *Aggregate parking, housing, and land use statistics for Orenco Station.*

Portland MAX Westside Blueline: Population Density by Census Block in Hillsboro

Census blocks with a density greater than 32 persons per gross acre are bounded by black.

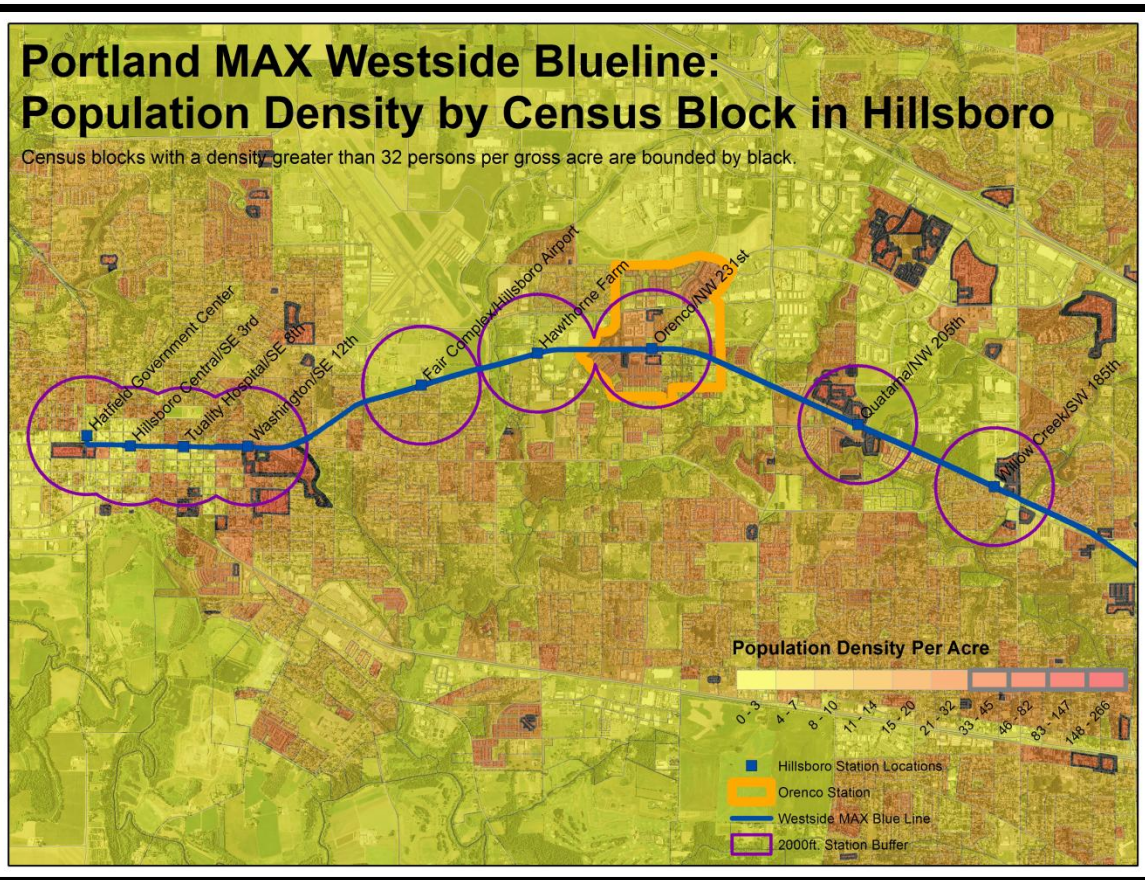


Figure 2.8. Density of Portland MAX Westside Blue Line stations.

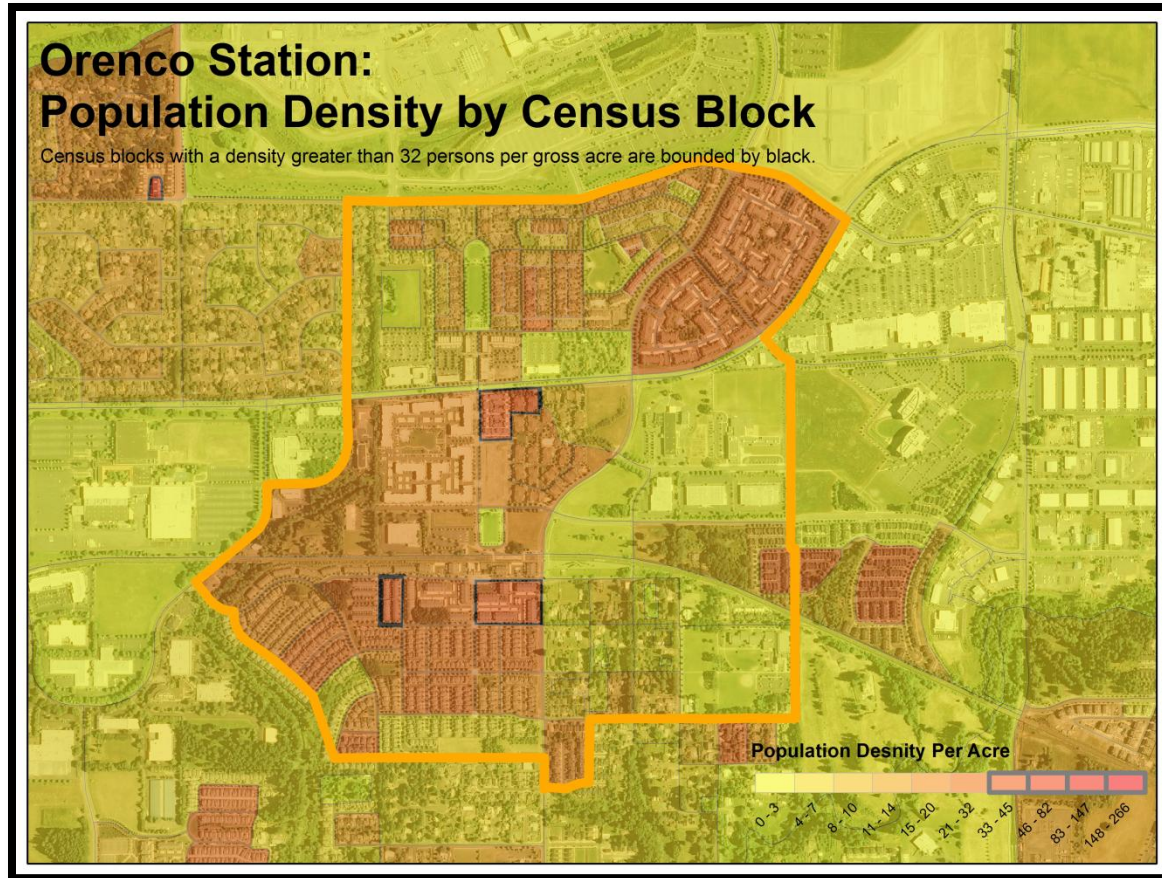


Figure 2.9. Population density for Orenco Station area.

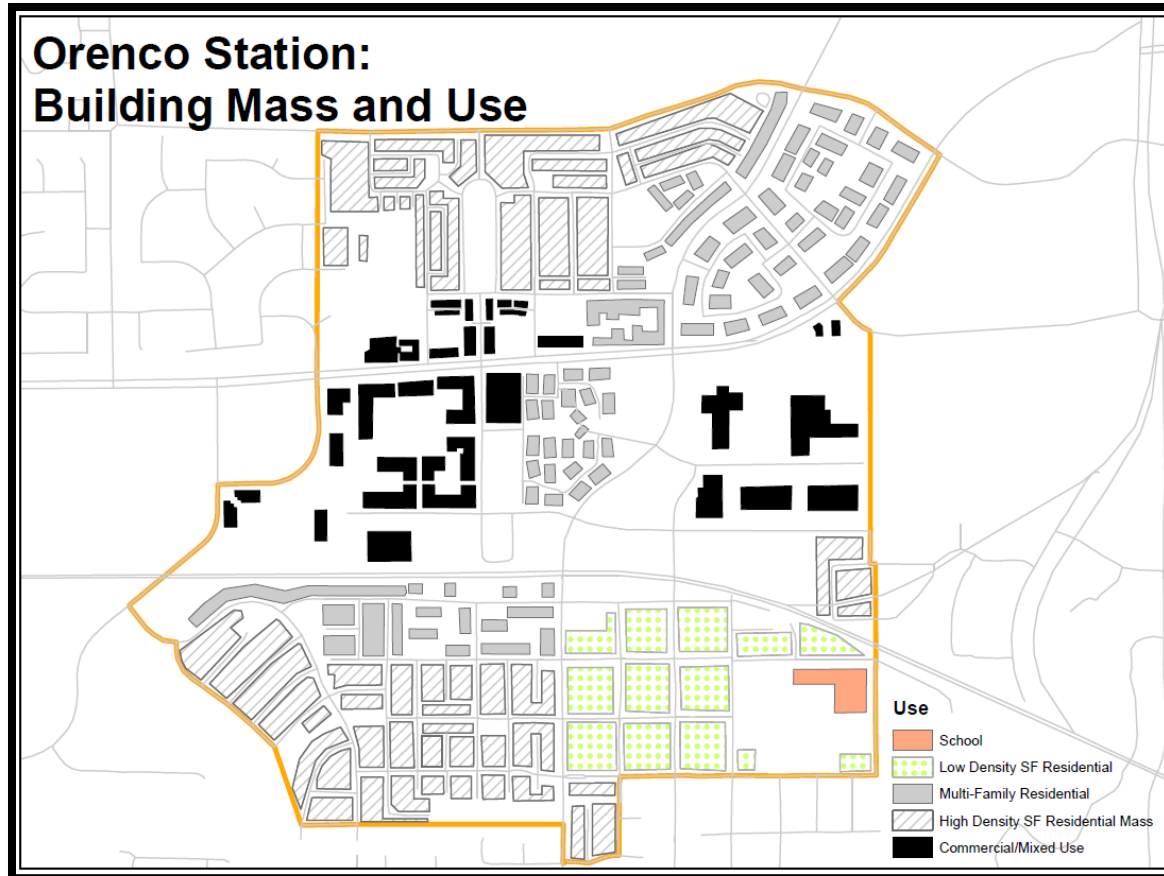


Figure 2.10. Orengo Station building mass and type of use.

The final analysis conducted here of Orenco Station is an application of Kevin Lynch's urban design criteria to the site, which includes the identification and mapping of landmarks, edges, pathways, nodes, and districts, shown in Figure 2.11 (1960). It is important to note that I have considered all of Orenco Station to constitute a single district, and I have not identified any landmarks, although the vista created by the park at the north edge of the development may constitute one. While vehicle pathways are almost always barriers for pedestrians, I have added local or pedestrian pathways to the analysis, in order to indicate how the development functions for different users. As can be seen from the map, two of the identified nodes - the transit station and commercial center - are located within the defined pedestrian-shed, while the third, the school, is located just outside of this boundary. Unfortunately, one of the main challenges to true walkability in this TOD is indicated by the arterial streets, marked by blue, that crisscross the central area of the site, including two arterial roads that separate the transit station from the main commercial node and

grocery store to the north. While a permeable, well-connected street network for pedestrians is visible in several areas of the site, especially to the north of the commercial node around the park, it is unfortunately fairly disconnected from the remainder of the development, and especially the school.

From this study, I have concluded that while Orenco Station maintains a healthy diversity of housing types and sufficient space for both commercial and office activity, it suffers from three main shortcomings: 1) a lack of gross density sufficient to support sustained transit ridership, 2) a preponderance of dispersed and uncoordinated open space, and 3) several significant pedestrian barriers that reduce connectivity between the commercial area, transit station, and school. These features will be especially important to emphasize when devising our design for the layout of Stadium City, as there is relatively little surrounding development of any kind to support pedestrian vibrancy and sustained activity in the vicinity of the Truman Sports Complex.

Pioneer Courthouse Square

The final precedent reviewed for this project is Pioneer Courthouse Square, located in the center of downtown Portland. In order to provide a public focal point for the Stadium City TOD, we believe that a vibrant urban plaza that integrates the stadiums and the surrounding planned commercial and mixed use development will provide an important activity center in our design.

Interestingly, Pioneer Courthouse Square, although located in a truly urban context, was opened in 1984 as a part of the City of Portland's first comprehensive downtown planning process. Thus, it was not part of the organic development of the city but rather designed by Will Martin as a part of an international competition (Pioneer Courthouse Square 2011). The history of the site itself is also quite interesting; it originally housed a school building, constructed in 1858, and later was home to the grand Portland Hotel, which opened in 1890. In 1951, Meier & Frank bought the block, tore down the hotel, and constructed a parking garage in its place - when an even taller

parking structure was proposed in the late 1960s, the City purchased the block with an intention to turn it in to public open space, which opened in 1984 (Pioneer Courthouse Square 2011).

As can be seen from Figure 2.12, the surrounding context of the square (which is marked by orange) is traditionally urban, as it sits in the midst of a dense, permeable, and well-connected street grid. The blocks are about 250 feet square in this area of downtown Portland, tiny by the standards of most development, but providing a multitude of potential pathways and connections. While the street grid shown here was platted with the original settlement, the creation of small blocks anywhere typically allows for the easier redevelopment of individual parcels, as such an investment does not always automatically require the resources of a powerful corporation or individual, and thus can in some cases be done more locally, in a unique style or character, or even by the city itself (where in many cases the outright purchase of land by any city, especially in downtown, is usually cost-prohibitive).



Figure 2.12. Downtown context of Pioneer Courthouse Square.

Figure 2.13 gives one the sense of enclosure and density that surrounds the square - rather than being a delineated plaza in the midst of a low density environment, the square is a visual break, and as such, it provides a location for pass-through transportation activity (cutting across) as well as a highly legible meeting place. In addition to its function in the street grid as a focal point of pedestrian traffic, it is also a well-used stop for the light rail transit system, with stops for the Blue, Yellow, and Green Lines all present in the square. The square itself is also bounded by an array of different uses, including the Pioneer Courthouse itself, which provides the impetus for large civic gatherings (or protests), as well as retail uses such as Nordstrom's, general office space, and a TV station, among others.

In addition, the layout of the square itself, with the coffee shop located in the center, enhances potential pedestrian activity, and the fountain and steps curving around the southern edge create separate nooks for sitting or relaxing within the square. Importantly, each

of these features are relatively clustered and close to one another, so as to draw the user through the space with a variety of potential experiences. In addition, the photo demonstrates the other powerful feature of the square's layout: it's open central area provides a space for temporary uses and activities, such as the musical concert that is shown in the picture.

While it is undisputable that Pioneer Courthouse Square benefits from being located in a dense, vibrant downtown, some of its design elements certainly enhance its success as a designed urban space (for example, contrast its patterns of use with City Hall Square in Boston). Its key design elements are its location in a permeable street grid with small block size, a strong surrounding visual frame and structural density, its location at the intersection of transit, vehicle, and pedestrian pathways, its location near a wide range of uses, and its compact clustering of internal elements, including a coffee shop, which further draws potential passers-by into the space.

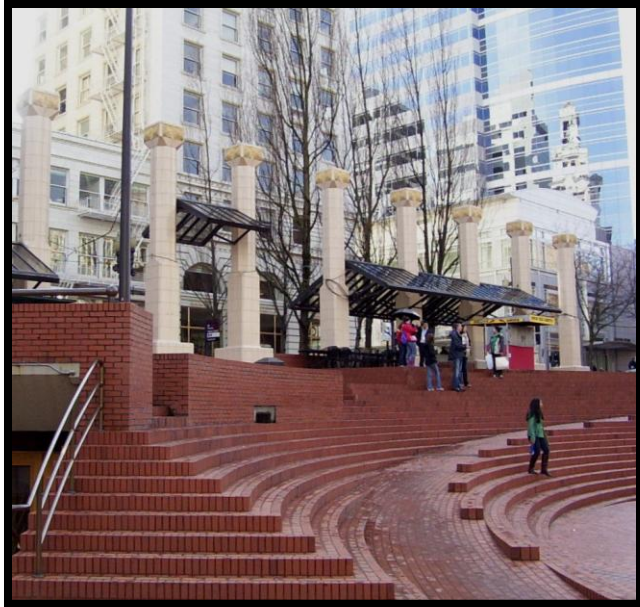


Figure 2.13. *Pioneer Courthouse Square.*

As has been shown in urban settings many times, the injection of a plaza into a design does not instantly make it more walkable or even more aesthetically pleasing. In the case of Stadium City, however, we believe that a well-design public open space that serves as the point of connection between the various activity

centers at the Truman Sports Complex and designed on the principles of Pioneer Courthouse Square could become as integral asset to the development and serve multiple functions: as a legible landmark, transportation node, gathering place, or simply a space from which to observe the cyclical ramblings of the city.

III. Analysis

Regional Analysis

In order to analyze the Stadium City site at a regional scale, I compiled an inventory of comparable regional activity nodes, informed by a previous MARC analysis. These eleven centers constitute the expected competition for the proposed Transit-Oriented Development, and includes a range of development typologies (shown in Figure 3.1), from incrementally-developed centers such as Westport and City Market, to single-developer projects that include the early auto-oriented shopping center at the Country Club Plaza, enclosed malls such as Independence Center, and the more recent lifestyle centers, the most successful of which is the Legends at Village West. The design for Stadium City intends to expand on these existing typologies, creating a new development format for the region that has been thus far unseen.

The rationale behind developing a typology of existing retail centers is to a) give us a more in-depth understanding of the different choices that a potential Stadium City consumer currently has, and b) inform

our design programming by analyzing the combination of existing types that Stadium City will involve.

Through literature review and precedent studies, we have considered the importance of organic development patterns, and contrasted them with those areas that are master-planned by a single developer. While the Stadium City project falls into the latter category, it is important for us to note both the effectiveness and the shortcomings of regional examples of such projects, as well as the patterns of urbanism inherent in incremental development. A single-developer regional activity center that is provided with a plan that encourages some level of opportunity for organic development and use-modularity, as we propose, has the potential to develop significant resiliency.

In terms of the employment catchments of the existing activity centers, as shown in Figure 3.2, the newer regional-scale shopping centers, such as the Legends and Zona Rosa, are located in areas that are relatively less business-dense.

Many of the older developments, such as the Country Club Plaza and the downtown Power and Light District, and even Oak Park Mall, are located within the more-established area of regional employment concentration that runs roughly in a hook from the north to southwest, and also demonstrate higher levels of local business density within 1 mile of the identified center. As can be clearly seen, the Truman Sports Complex is currently located in a relative void of employment density, despite its location close to the central activity nodes clustered around downtown. Likewise, as shown in Figure 3.3, these trends hold steady for population density as well, with the highest area of residential density concentrated in the core of the region. Outlying areas, such as the Truman Sports Complex, exhibit relatively low population density.

Regional transportation flows between these activity centers for 2010, shown in Figure 3.4, exhibit a somewhat different pattern. While the majority of successful shopping centers in the region are located

near major traffic systems, the Truman Sports Complex's location at the intersection of I-70 and I-435 demonstrates significant regional access and belies its relatively underdeveloped surroundings. Also, with a lack of long-range transit, this map demonstrates the general current regional commuting patterns, and seems to show that a transit route connecting the eastern suburbs to downtown would be successful.

The existing void in regional transit provision is also displayed in Figure 3.7, which shows current mode share by percentage for Kansas City, Missouri. As can be seen, 80% of workers in Kansas City drove alone to work in 2010, underscoring the regional dependence on the automobile and lack of viable transit or pedestrian options. This feature can also be seen in both Figure 3.5 and Figure 3.6, which show regional commuting transit flows to-and-from Kansas City, Missouri; both maps exhibit the fact that no more than 8% of trips to work made to, from, or within Kansas City are made via public transportation.

From this regional inventory and analysis, a few key features of this metropolitan area can be ascertained: 1) the fastest-growing and most successful regional activity nodes are currently located (for the most part) outside the area of the highest regional concentrations of both jobs and people; however, 2) these centers are well-connected to the region by high-capacity, well-used automobile infrastructure, a condition that also currently exists at the Truman Sports Complex site; 3) the older, generally incrementally-developed centers located in the region's core, while close to the highest concentrations of business activity, still lack high residential densities in their immediate areas, and 4) almost none of the current regional shopping centers exhibit strong patterns of mixed use - all eleven listed here are, for the most part, single-use concentrations of retail activity and are 5) widely and evenly dispersed throughout the region, except for those located near downtown; finally, 6) the region currently has a dearth of transit availability and, thus use.

Unfortunately, the patterns exhibited in this analysis point towards an ever-expanding urban service area that, without strong mixed use activity centers (TODs) linked by transit, will continue to graze ever outward into the rural periphery, cannibalizing economic activity from the center, where infrastructure is more efficient to provide and vibrant, connected places are arguably easier to create. Stadium City, with its location within the first ring of urbanization, provides a powerful prototype to test the regional effectiveness of Transit-Oriented Development in helping to curb the Kansas City metro's sprawling growth pattern.

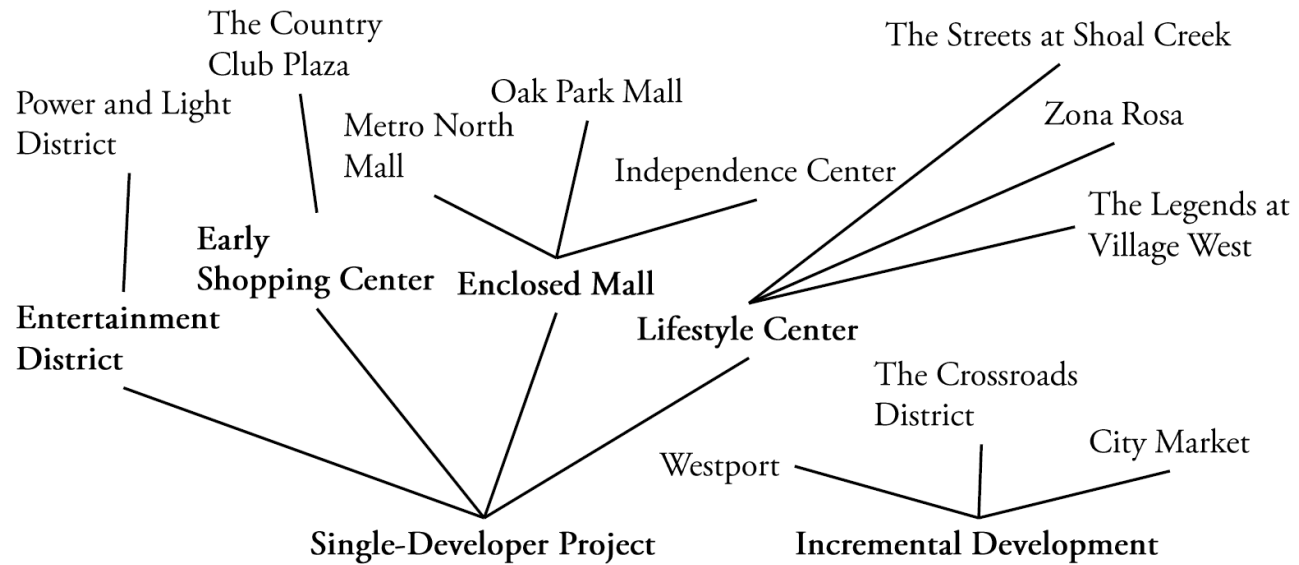


Figure 3.1. *Regional shopping center typology.*

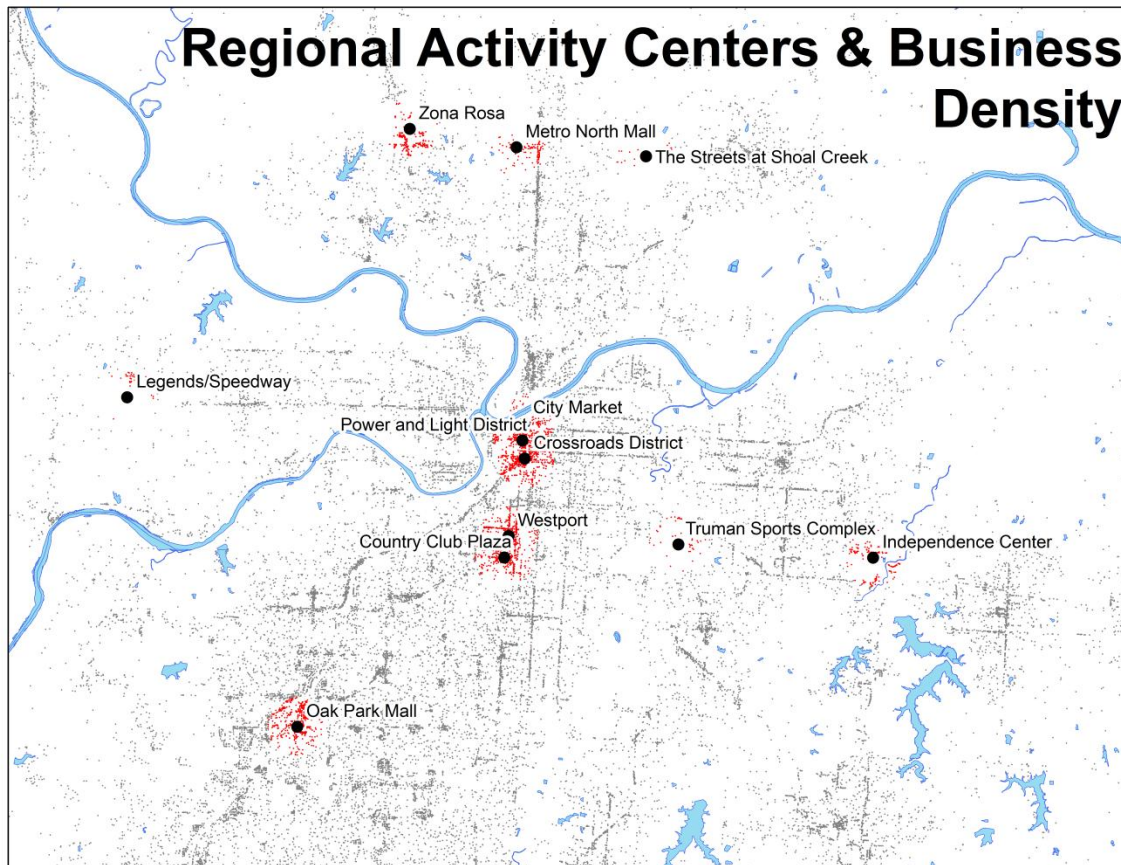


Figure 3.2. *Business density and regional centers.*

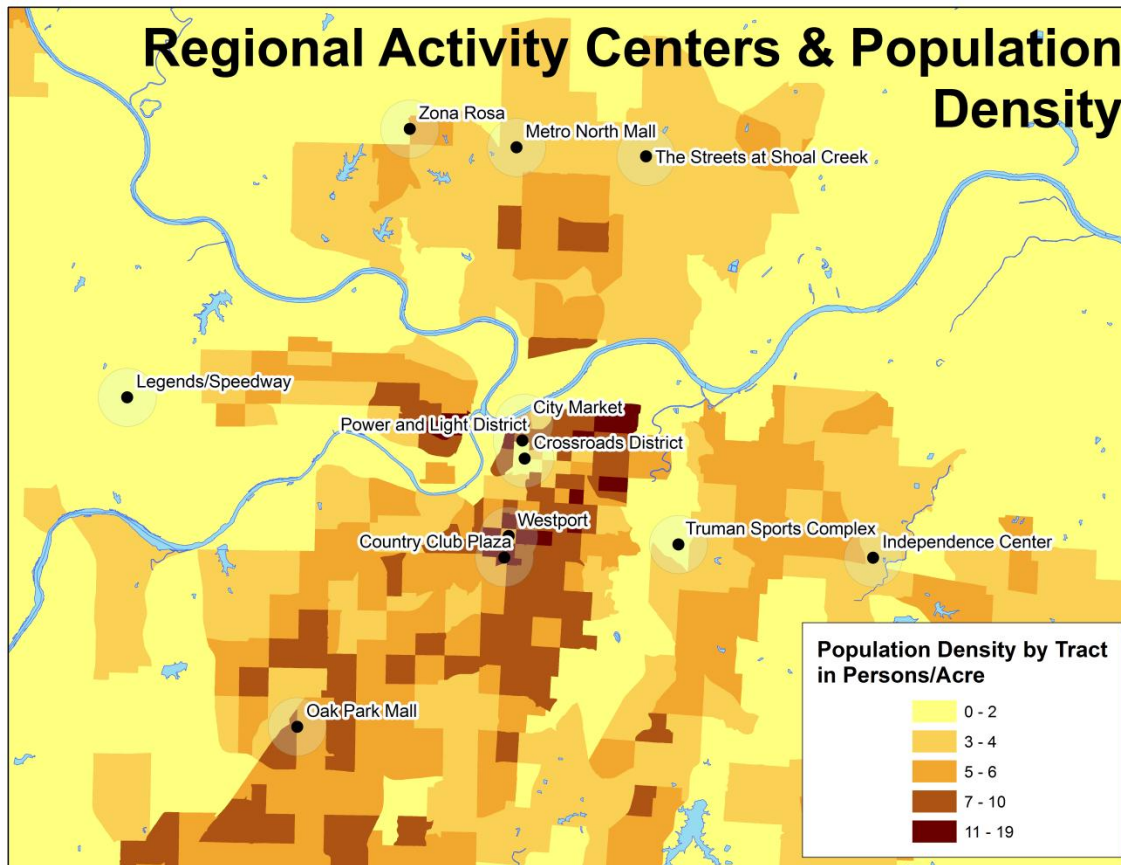


Figure 3.3. *Population density and regional centers.*

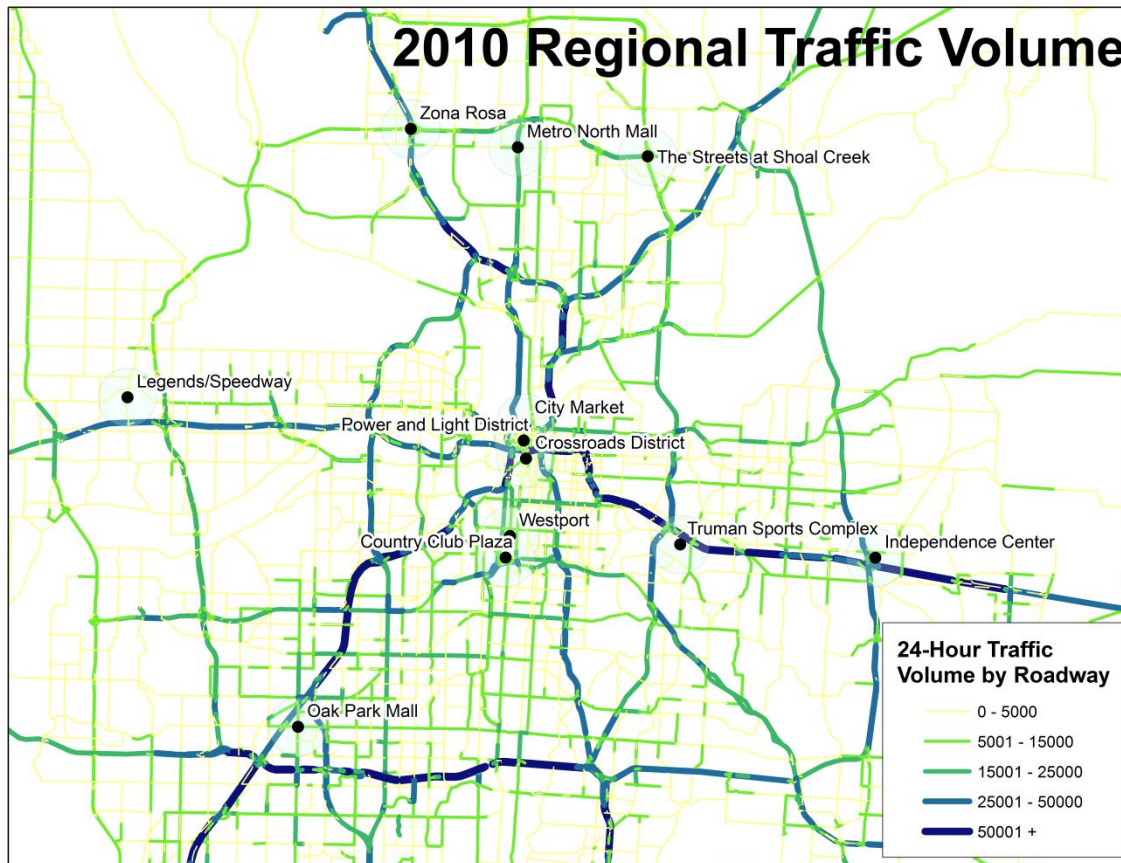


Figure 3.4. 24-hour traffic volume and regional centers.

Kansas City, MO: **Inflow Transit** Percentage of Other Cities' Commuters Using Transit When Travelling to Kansas City

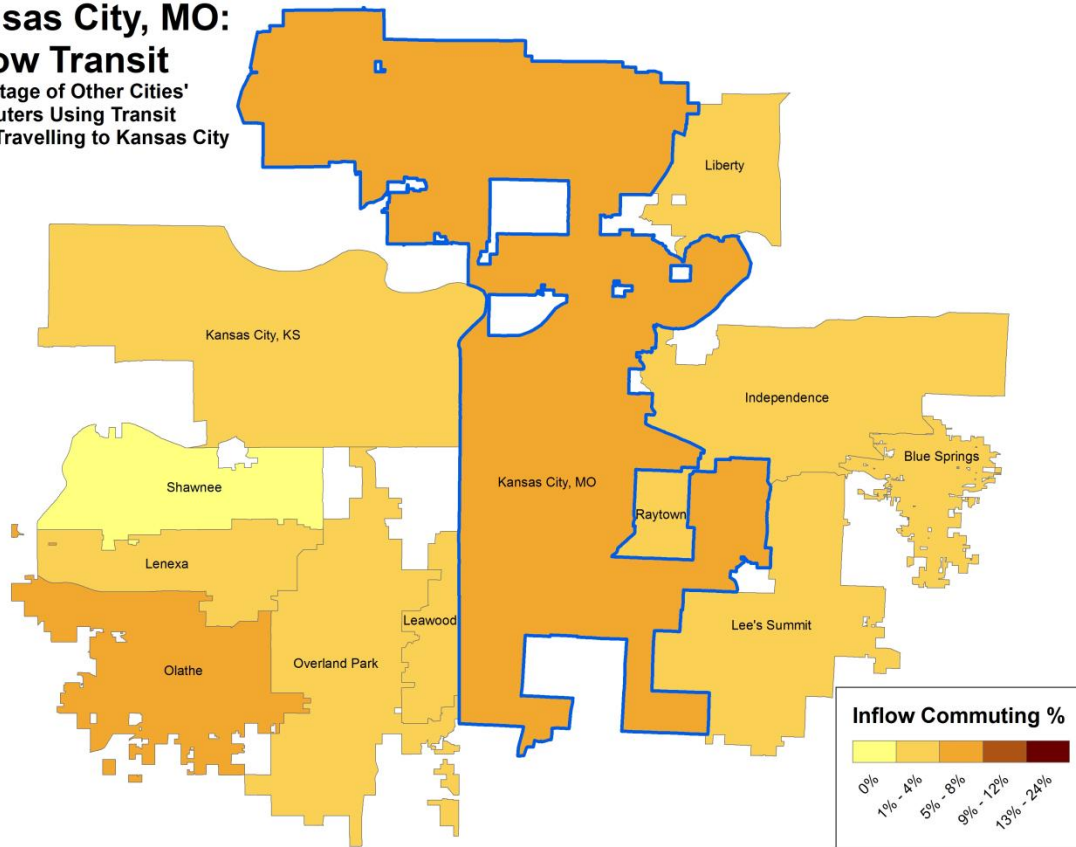


Figure 3.5. *Inflow transit commuting to Kansas City, MO.*

Kansas City, MO: **OutflowTransit** Percentage of Kansas City's Commuters Using Transit By Destination

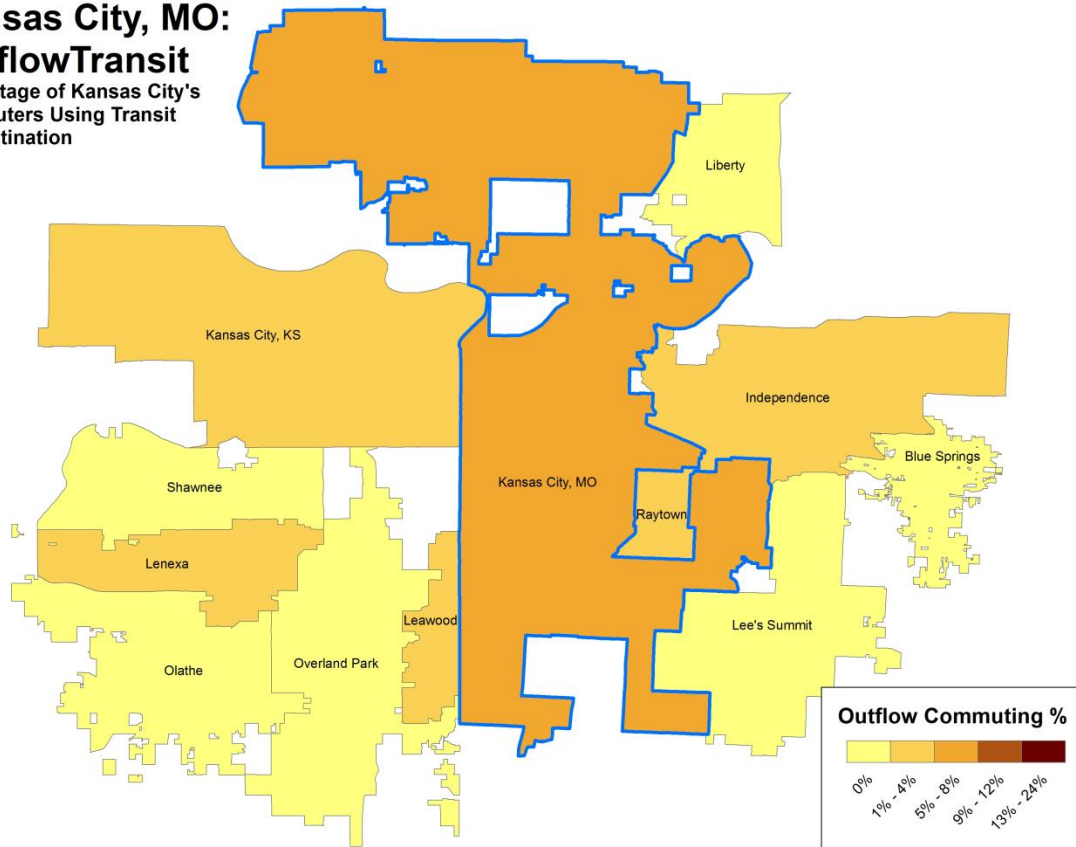


Figure 3.6. *Outflow transit commuting from Kansas City, MO.*

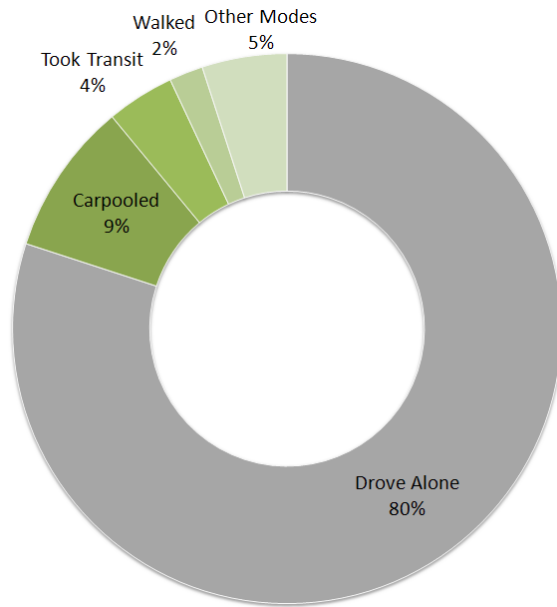


Figure 3.7. *Commuting mode share for Kansas City, MO.*

Site Analysis

Ledgin conducted a comprehensive site analysis that looked at topography, soils, water tables, existing parking conditions, land cover, surrounding land use, relevant regulations, among other things. The primary conclusions of this body of research, which is summarized in Table 3.1, are the following: 1) While Raytown Road offers a largely unrealized potential for increased automobile connectivity to the site, and is theoretically suited to some sort of development, its natural and topographic conditions preclude it from serious consideration for development. The existing woods, stream, and topography offer good opportunities for recreational trails or other natural uses. 2) Development should occur on the existing parking lots to the west and south of Arrowhead Stadium, due to a relatively flat grade and close access to the stadiums themselves. In addition, better connection to Raytown Road can be more easily developed through changes to the site's circulation system.

Characteristic Category	Main Findings
Total Acreage	594 acres
Existing Parking Spaces	19,200 paved and 6,800 unpaved
Conflicting Infrastructure	High-voltage power line in southwestern portion of site
Trails	Existing unpaved trail network and potential area for new trail
Elevation	Entire site: 220 to 330 meters Parking area: 250 to 270 meters 30-meter elevation change in undeveloped area between Raytown Road and parking lot
Slope	Greater than 10 percent in natural area, often approaching 50 percent
Soils	Eroded silt loam in undeveloped area along Rock Island Corridor
Land Cover	Deciduous forest, deciduous woodland and immature forest, mixed evergreen deciduous, and lowland hardwood forest and woodland in undeveloped area along Raytown Road

Table 3.1. *Summary of site analysis (cont. on next page).*

Characteristic Category	Main Findings
Hydrology	Round Grove Creek Floodplain along portion of Raytown Road High water table in southern and western portions of site
Automobile Transportation	Freeways: I-70, I-435; Arterial Roads: Blue Ridge Cutoff, U.S. 40, Raytown Road; Collector Streets: Stadium Drive, 43 rd Street, Ozark Road; Local Streets: other public streets, sports complex circulation system
Interchange	Proposed ramp from Stadium Drive to Northbound I-435
Traffic Volumes	Generally higher on Blue Ridge Cutoff than on Raytown Road or Stadium Drive
Rail Transit	Rock Island Corridor
Bus Transit	KCATA Blue Ridge Express route, two stops on site
Surrounding Land Use	60% single-family residential
Surrounding Housing	85% built between 1940 and 1969
Surrounding Density	0.32 DU/acre average
Schools	Part of site in Kansas City district, part in Raytown district
Regulations	Site owned by JCSCA, zoning unrelated

Table 3.1. *Summary of site analysis (cont. from previous page).*

Market Analysis

A market analysis allows us to better understand the economic context of future development at the Truman Sports Complex. In that way, the purpose of this section is to lay out, in as concrete detail as possible, the proposed mix of uses, quantity, size and type of development at the Truman Sports Complex that will provide the greatest opportunity for economic success, in addition to accomplishing the larger goals of this project; namely, to better connect the cultural centers of the Kansas City region and to provide a diverse, walkable activity center on the Rock Island Corridor that keys off of and enhances the vitality of the existing stadiums.

In general, in order to conduct market analysis for the three key components of the development – multi-family residential, office, and entertainment/retail - I employed three different methods, as shown schematically in Figure 3.8. For the multi-family housing and office portions, I projected total employment to find the number of new renter

households and amount of office space required, and then divided the proposed number of units by the total demand to find the capture rate the development would need to attain in order to get 100% occupancy. That value is then assessed based on the characteristics and amenities of the proposed development and general market principles in order to determine whether or not it is realistic. For retail analysis, I projected population and used data on consumer expenditure pattern to find total projected expenditures on retail, and then applied a range of possible capture rates for our development. The product of this analysis provides a projected sales volume per square foot for the retail component of Stadium City, which can then be used to compare to other existing, successful retail centers.

The primary theoretical underpinning for the development program came from Peter Calthorpe's seminal book *The Next American Metropolis*, in which he develops many of the central concepts of TOD as well as specific benchmarks for densities and use mixing (1993).

	Neighborhood TOD	Urban TOD
Public	10%-15%	5%-15%
Core/Employment	10%-40%	30%-70%
Housing	50%-80%	20%-60%

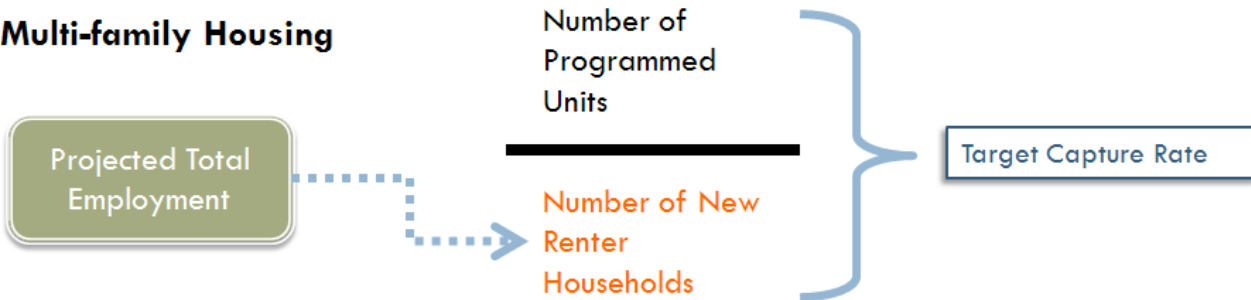
Table 3.2. *Recommended mix of uses for two types of transit-oriented development.*

The basic recommended mix of uses for Neighborhood and Urban TODs is laid out in Table 3.2. In general, the distinction between the two TOD types comes in terms of context and intent – Neighborhood TODs are primarily residential, while Urban TODs are oriented towards employment (Calthorpe 1993). Certainly, with its emphasis on entertainment-based uses and focusing the existing activity generated by the stadiums (as well as a large office component), the Stadium City district falls into the Urban TOD category, and the general prescriptions in terms of use mix shown in Figure 3.9 largely guided the initial programming process. In terms of gross percentage, the final program for Stadium City delineates 10% floor area for public use (mostly in the

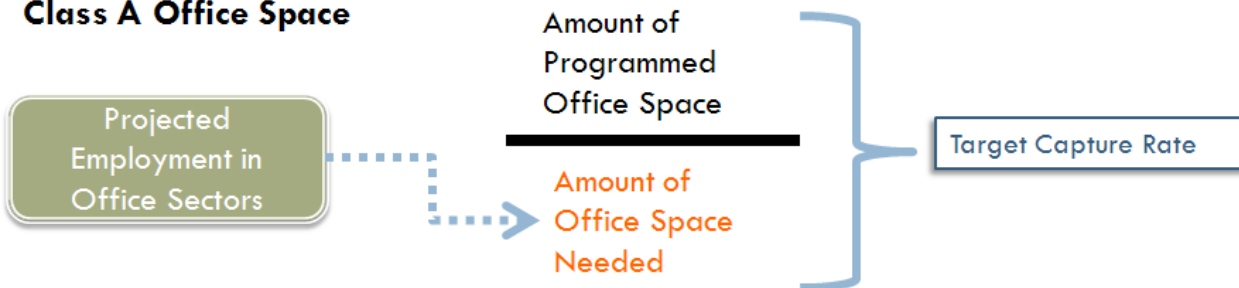
form of parkland), and 45% each for both employment and housing uses. A detailed description of the specific components of the program will be presented later on in this chapter.

The second essential theoretical consideration provided by Calthorpe concerns Dwelling Unit (DU) density – in *The Next American Metropolis*, he identifies a minimum of 15 DUs/net acre for Urban TODs in order to maintain the desired level of pedestrian activity (1993). While there is a wealth of literature that concerns minimum requisite densities needed for successful transit service (including many sophisticated recommendations for residential density, including basing it on the construction cost of the transit system itself), as Guerra and Cervero indicate, most newly-built TODs (including even exemplars such as Orenco Station in Hillsboro, Oregon) do not reach Calthorpe’s initial suggestion of 15 DU/net acre (2011).

Multi-family Housing



Class A Office Space



Entertainment/Retail

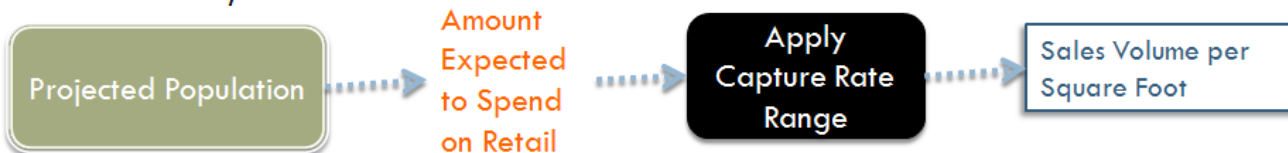


Figure 3.8. Market analysis methods.

In addition, density is only one of several important factors that contribute to mode share and travel behavior (albeit an important one), and it is the opinion of the author that density has perhaps garnered a disproportionate amount of attention in the literature compared to other aspects of TOD development, such as design and diverse use mixing. Thus, while not based strictly on detailed quantitative analysis, 15 DU per acre – being more dense than most existing TODs – is probably at least as dense as necessary in order to garner the level of pedestrian vitality and support for the proposed local retail, and was selected as the foundation for determining the total number of units to provide on the site.

The final element of TOD theory used in the creation of the program was the idea that the majority of a TOD's contributing uses should be within a quarter mile radius – the typical distance for a relaxed five minute walk - of the transit station, in order to encourage walkability and the concentration of pedestrian activity, called a “pedestrian shed” in the

SmartCode developed by Duany Plater-Zyberk (DPZ) (2010) . The location of the transit station being proposed in this report – east of the two stadiums, roughly equidistant from each –allows for a large proportion of the stadium site to be available for development. Activity within the ¼ mile buffer (shown below in Figure 3.11, along with the proposed station location) would also be concentrated in and around the stadiums, thus capitalizing on that important and favorable synergy.

Underneath the quarter mile radius is an area of approximately 125.6 acres – the primary development site. From that area, a net density of 15 DU/acre yields a minimum requirement of 1,884 dwelling units, which was used as the basis for constructing the remainder of the program.

Program

The general characteristics of the development program are laid out in Figure 3.9, which shows the breakdown of the Stadium City district's overall use mix (between entertainment/retail, office, public, and housing), as well as the proportion of total floor area allotted to the four residential product types (studio, 1-, 2-, and 3-bedroom apartments). In terms of the employment portion of the program, after various iterations of market analysis, the author determined that office uses – while difficult to predict demand for – would provide a solid commercial anchor for the development as time goes on, being relatively more flexible to changing business patterns and market fluctuations, and more adaptable to conversion to unpredictable future uses (unused office space above retail shops can always be converted into additional residential uses) than retail space.

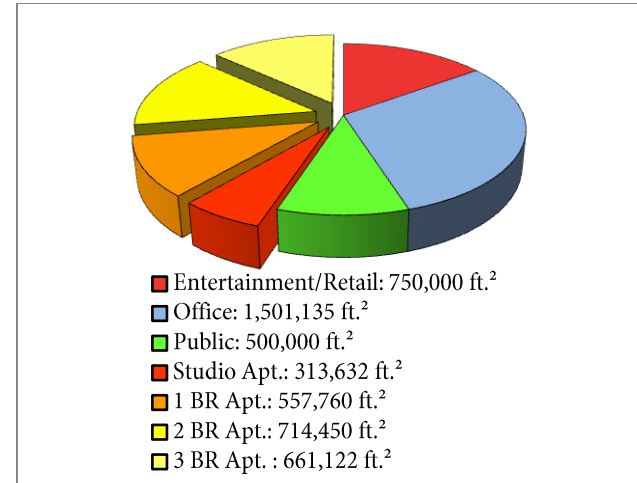


Figure 3.9. *General distribution of uses by floor area for Stadium City.*

In addition, as will be shown below, the market for retail development is largely based on population (household) and medium income growth, while office uses are tied closely to specific-sector employment growth.

In short, according to the present analysis, the Kansas City region (the seven-county version for which detailed projections could be obtained by the Mid-America Regional Council) is not projected to grow at a fast enough rate to justify more than an additional 750,000 ft.² of retail space in this location, unless the new center was able to dominantly out-compete most existing retail centers (at market capture rates of 5% or greater), which is not likely. Thus, 750,000 ft.² was selected as an appropriate (and more marketable) amount of retail development. In addition, the presence of the stadiums and the desire to capitalize on existing activity patterns, lends itself to a shift away from “big-box” or product-driven retail to more specialized “entertainment” retail uses (such as specialty computer product or clothing stores) and consumption-related service uses.

The residential portion of the program, on the other hand, was driven primarily by the desire to obtain a net density of at least 15 DU / acre, as well to maintain industry-standard unit sizes (and competitive rents).

As shown in Table 3.3, 396 studio apartments, 560 1-bedroom apartments, 550 2-bedroom apartments, and 378 3-bedroom apartments yield the desired density when distributed across the gross land area designated in the third column.

Due to the regional demand for affordable housing, and the need for that housing to be of a high-quality design and located within walking distance of necessary amenities and transit service, 10% of each housing type was reserved for affordable housing. This development employs the Low Income Housing Tax Credit program (LIHTC), which allows the developer to recoup a portion of its taxes if it provides rental units below market rate for residents earning no more than 60% of the area median income. This allocation will provide for a more diverse population in the Stadium City district, offering a benefit to residents both locally and regionally.

A gross adjustment factor of 25% was used to estimate the amount of floor area dedicated to walls, building infrastructure, and common areas, yielding the “useable” square footages for each of the unit types, which may also include garden or outdoor space depending on the specific design considerations of the individual units. (Nelson 2004). Thus, the final column to the right displays the leasable size per unit for each of the four housing types, as follows: 594 ft.² for studio apartments, 747 ft.² for 1-bedroom apartments, 974 ft.² for 2-bedroom apartments, and 1,312 ft.² for 3-bedroom apartments. Figure 3.10 presents a visual depiction of the range of Stadium City’s housing types. Although it does not show specific building shapes, many of the programmed dwelling units are planned to take shape as conventional courtyard garden apartments, conventional mid-rise mixed-use structures, and high-rise apartment and hotel towers. As shown in the figure, each building type will contain all four sizes of apartments, although the proportions of apartment types will vary by building type.

The rationale behind the mix of units and product types was generally to provide a larger number of smaller, loft-style dwelling units that would be affordable for the target market of young professionals, aged 21-49, especially in the early phases of the development. However, as the site expands and becomes more established, some larger apartment types were seen as necessary for attracting a more diverse consumer base, including family households. Table 3.4 shows the employment development program, with the desired amount of office and entertainment/retail uses delineated by size. This mix was developed with a focus on specialty shops and entertainment activities, as shown in the furthest left-hand column.

Dwelling Units by Housing Type		Affordable Units	% Units	Sq. Ft.	By Acre	Gross Ft. ² / Unit	Usable Ft. ² / Unit (-25%)
Studio Apt.	396	40	21%	313,632	7.20	792	594
1 BR Apt.	560	56	30%	557,760	12.80	996	747
2 BR Apt.	550	55	29%	714,450	16.40	1,299	974
3 BR Apt.	378	38	20%	661,122	15.18	1,749	1,312
Total	1,884	188	100%	2,246,964	51.58		

Table 3.3. *Distribution of housing product types and sizes.*

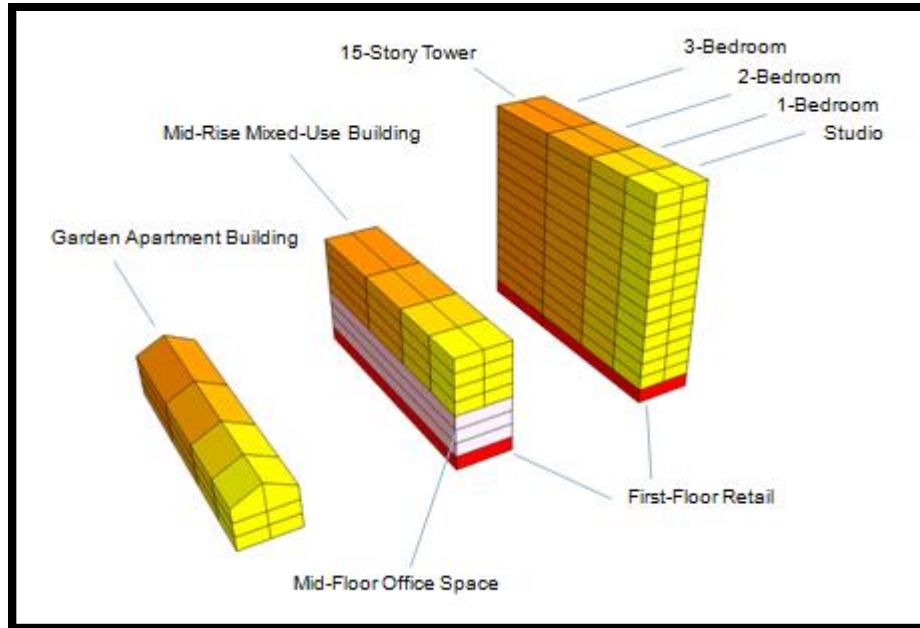


Figure 3.10. Residential building types.

Industry-standard specifications for the typical size of grocery stores, hotels, and theaters, helped to inform the size requirements for these services; the remainder of the employment program in both office and retail was then allocated generally across a range of potential uses (Schmitz and Brett 2001). The totals are 64,669 ft.² for a grocery store, 160,000 ft.² of hotel space, 78,025 ft.² of theater space, 447,306 ft.² of shops and restaurants, and 1,501,135 ft.² of adaptable Class-A office space.

The program also delineates 500,000 ft.² of public space, which was planned to be concentrated in three major uses, as shown in Table 3.5: 1) a plaza located in-between the two stadiums and surrounded by specialty retail and consumption related uses, serving simultaneously as an open travel way, a central gathering point, and also a place to enjoy eating and drinking outside, 2) the transit stations themselves, consisting of the train platforms, staircases, ticket booths, seating areas, and café, split between a northbound and southbound entrance located

underground on opposite sides of the street, and 3) a public park and recreation area, containing tennis and basketball courts as well as open green space.

Commercial Development Type	% of Total Development	Gross Ft. ²
Retail/Entertainment Total	15%	750,000
Grocery	1%	64,669
Hotel	3%	160,000
Theater	2%	78,025
Specialty Stores/Services/ Restaurants/Bars/Coffee Shops	9%	447,306
Class A Office Space Total	30%	1,501,135

Table 3.4. *Distribution of employment uses.*

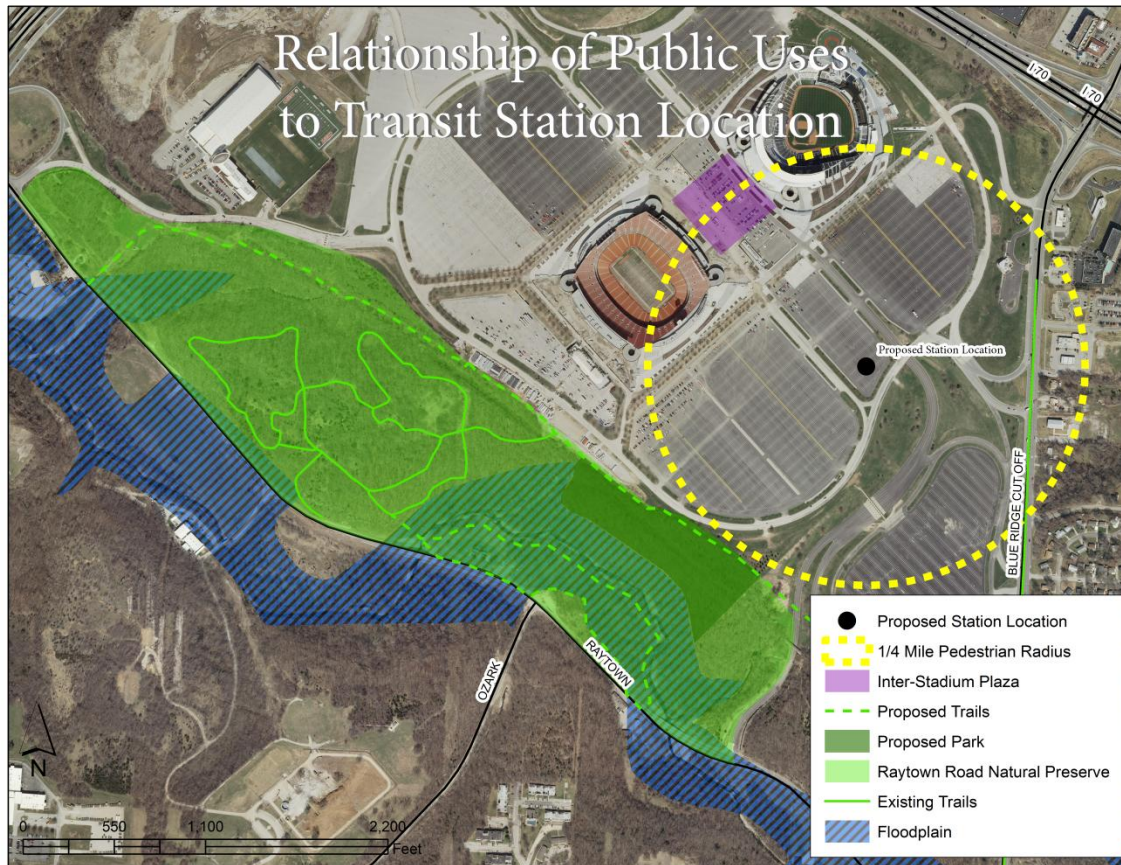


Figure 3.11. *General location of selected public uses and pedestrian shed.*

Public Uses	Ft. ²
Included in Program	500,000
Transit Station (underground)	9,000
Inter-Stadium Plaza	62,500
Public Parks/Recreation Areas	428,500
Extraneous to Program	7,175,442
Raytown Road Natural Buffer Area	5,366,014
Rights-of-Way	1,809,428

Table 3.5. *Distribution of public uses, including gross area attributed to rights-of-way.*

Beyond those primary uses allotted in the program, an existing natural buffer area between Raytown Road and the project site is slated to be maintained and enhanced with additional trail connections, markings, and signage. A map showing the general layout of the proposed station location, plaza, public park, existing and proposed trail network, the natural buffer, and

these items' relationship to the quarter-mile pedestrian shed is shown in Figure 3.11.

In addition to the public space allotted to parks mentioned above, dedicated rights-of-way are planned to account for at least an additional 1,809,000 ft.² of developed area. Certainly, the proper allocation and design of the rights-of-way will be critical to the overall success of this project, and specific design considerations for these areas are addressed more thoroughly in the final plan. Calculations for parking provision are discussed below in this chapter.

Economic Context

According to Schmitz and Brett, market analysis for large-scale mixed use developments must treat each unique use individually, as various development typologies function differently in the market (2001). In that way, the following section will describe the economic context for future multi-family residential, entertainment/retail, and office development according to an 8-18 year planning horizon. However, before describing the more-detailed and idiosyncratic findings for each of the three primary uses, some general trends for the Kansas City region will be presented whose relevance encompasses all three phases of the planned development.

According to data provided by MARC, the future population projected in 2040 for the core seven-county Kansas City region (consisting of Johnson, Leavenworth, Wyandotte, Cass, Clay, Jackson, and Platte counties), which is shown by a map in Figure 3.12, is 2,607,871, a growth of almost 700,000 people

from 2012-2040. In addition, the number of households is projected to grow by over 319,000 to 1,073,925 in 2040, and, likewise, employment is expected to grow to 1,380,145 (2011c). While MARC provides these gross projection numbers for each decade (2020, 2030, etc.) for the 7-county region, the author used the average annual change rate between decades to fill in the specific year-by-year values. And, by dividing the employment figure by the number of households for each given year, the rate of employment per household was determined, which would prove to be an important metric in measuring the future demand for multi-family housing.

Several other regional projections were also made in order to obtain the basic data needed to estimate the future demand for multi-family housing and employment development. Median income was obtained for the years 2000-2008 from MARC, yielding an average rate of 2.55% (2009). Also, the inflation rate for 2000-2008 was gathered and averaged, producing an annual average inflation rate of 2.32% (Mid-America Regional Council 2012).

The inflation rate was then subtracted from the median income growth rate in order to obtain the rate of real income growth. This rate, .23%, was then applied linearly to regional median income values starting in 2009, and continued through 2040. While this means of median income projection admittedly has many inadequacies, the analyst determined that, due to data limitations, unpredictable fluctuations in the business cycle, and the ease of working with future values in inflation -adjusted terms (as 2008 dollars), this projection method would be able to function as a competent baseline in order to gain a general understanding of the future purchasing capability of the region's population..

From this information we can begin to form a general conception of the economic trends at work in the region – employment, households, and real median income are all expected to grow, although the number of employed is expected to climb at a much faster rate than real median income. Thus, generally, we can make the assumption that while the regional economy is projected to grow substantially over the course of the

next 20-30 years, the level of wealth creation (i.e., economic development) may not be accelerating as quickly. This general trend also appears to indicate that the demand for multi-family housing may be stronger in the next 8-18 years than that for retail – an idea which ultimately influenced the program's development, and is explained in further detail below. In addition to gross socio-demographic indicators, constructions trends were also analyzed and projected.

A chart showing a summary of the square footage of relevant land uses constructed by year from 1980-2011 is shown in Figure 3.13. As can be seen from the general pattern of the chart, year-to-year construction rates seem to depend more on extraneous variables (such as the state of the economy or employment growth in specific sectors) than on a predictable pattern over time. Thus, mathematically projecting the existing trends over the next 8-18 years, which was done for each of the six land use categories shown, is of little predictive value.

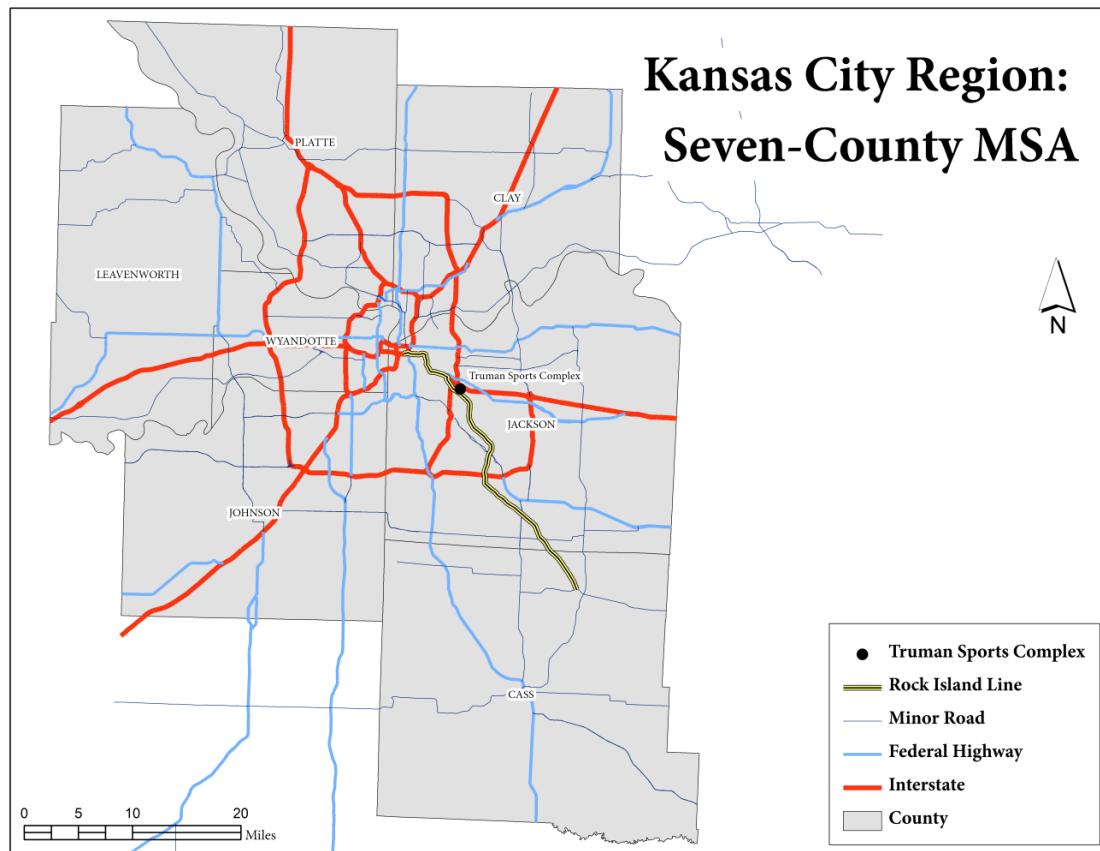


Figure 3.12. *Seven-county Kansas City region.*

However, the general patterns are still useful to inform qualitative analysis, and here they also show the relative regional mix of construction by area (heavily weighted towards single-family residential), the fluctuations in construction due to the overall state of the economy, as well as average annual total construction figures. Unfortunately, concrete projections of supply were not able to be made from this data for office, multi-family, or retail uses; thus, it is recommended that prior to any serious development consideration at the Truman Sports Complex, a more in-depth and relevant supply-side analysis (focusing on truly competitive projects rather than gross projections) be conducted.

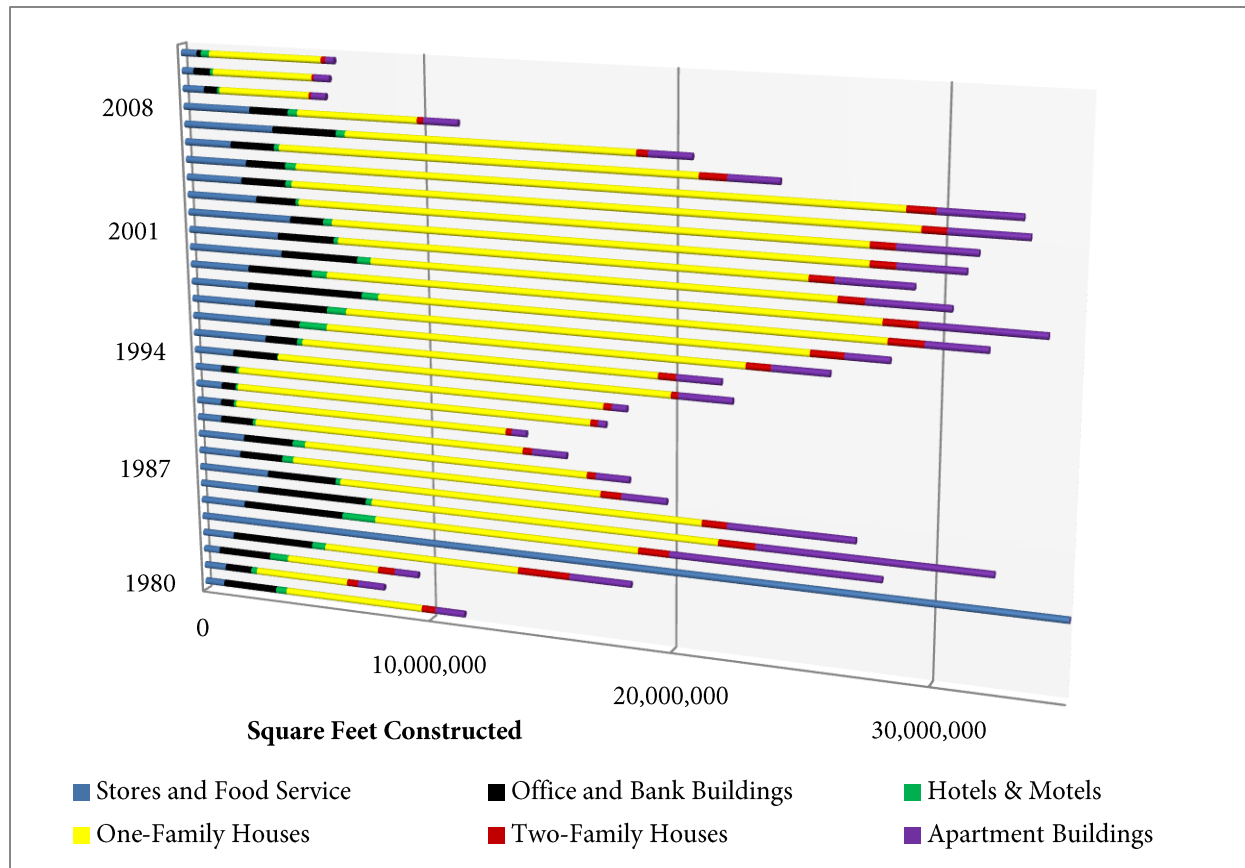


Figure 3.13. *Regional construction trends in relevant land uses.*

Multi-Family Residential

In order to project the future demand for multi-family residential housing in the Kansas City region, the project was first divided into six phases, with construction planned to begin in 2017. Each phase consists of generally 2 or 3 years of planned development, as shown in Table 3.6. The delineation of phases, shown in Figure 3.14, was based on the general strategy of spacing development costs (and likewise demand and financing considerations) across a long time frame, as well as taking into consideration an appropriate spatial patterning. This is especially important in terms of regional absorption rates, which tend to start lower than comparable cities' rates in the first quarter after construction is complete, but show strong average absorption in quarters 2-4 and beyond (Mid-America Regional Council 2006b). Thus, phasing across 4 or more quarters provides an effective strategy for ensuring that products are filled before construction starts on additional phases, which has important implications for balancing the financing and

debt service requirements for the development, a topic beyond the scope of the current report.

In terms of specific numbers, Table 3.6 shows that phase 1 is planned to consist of 211 studio apartments, 171 1-bedroom apartments, and 135 2-bedroom apartments. Phase 2 contains 84 1-bedroom apartments, 41 2-bedroom apartments, and 43 3-bedroom apartments. As can be seen from this distribution of unit types, phases 1-2 are constituted mostly of the smaller product types marketed towards small-household, young professionals and sports enthusiasts. This is a conscious marketing decision, as the early phases of Stadium City will mostly draw on the existing activity of the stadiums and entertainment-related uses (such as bars and restaurants) in order to maintain their viability. Sports tourism and related recreational events might also be an effective marketing strategy for these early phases.

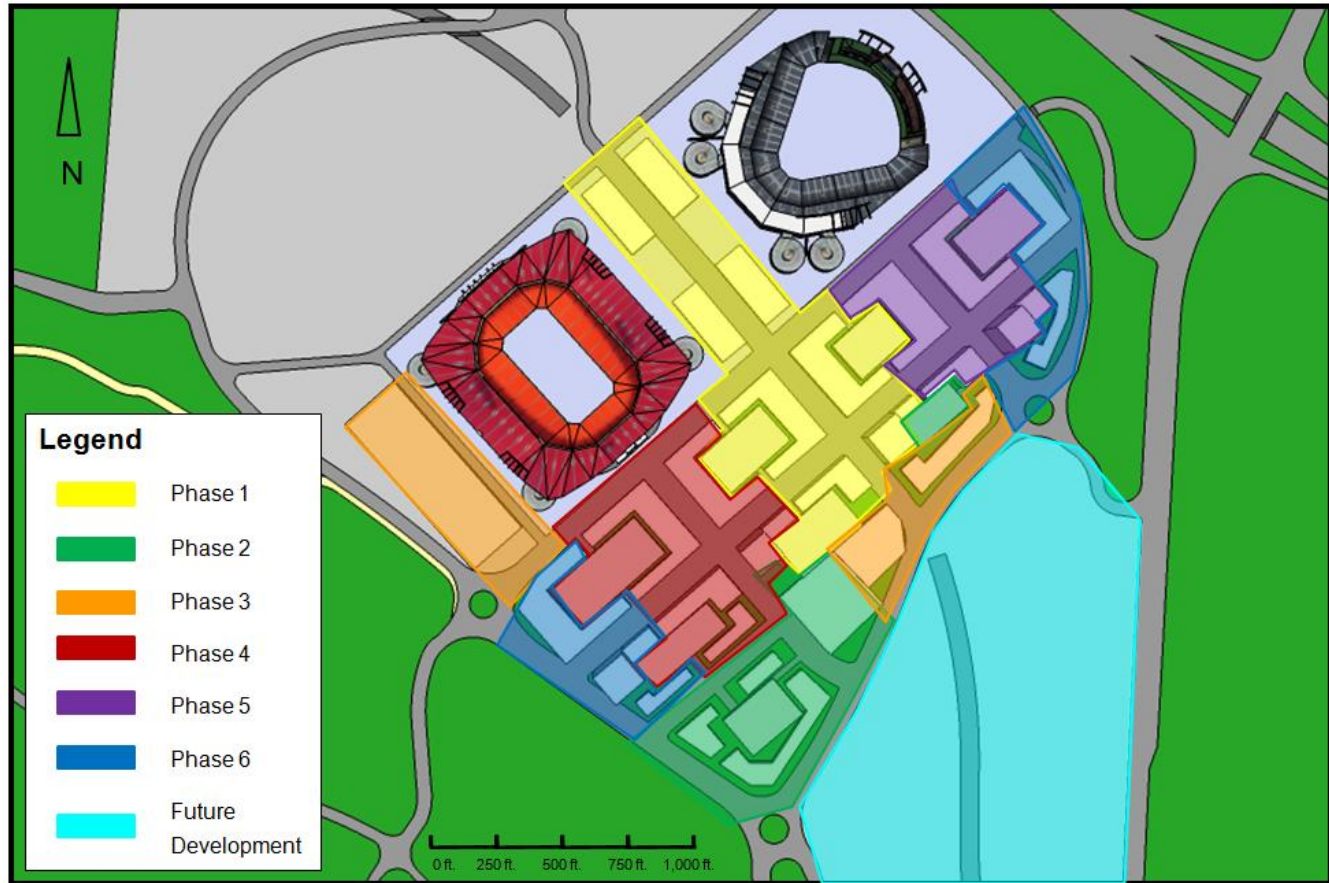


Figure 3.14. Spatial phasing plan and Stadium City site plan.

Phase	Units	Phase % Of Total Dev.	Studio Apt.		1 BR Apt.		2 BR Apt.		3 BR Apt.	
1	517	27.4%	211	53%	171	31%	135	25%	-	0%
2	168	8.9%	-	0%	84	15%	41	7%	43	11%
3	74	3.9%	-	0%	26	5%	19	3%	29	8%
4	398	21.1%	75	19%	139	25%	98	18%	86	23%
5	324	17.2%	32	8%	100	18%	135	25%	57	15%
6	403	21.4%	78	20%	40	7%	122	22%	163	43%
Total	1,884	100.0%	396	100%	560	100%	550	100%	378	100%

Table 3.6. *Number and type of housing units by phase.*

Phase 3, whose construction is set to finish in 2023, 4 years after the initial opening of Stadium City consists of 26 1-bedroom apartments, 19 2-bedroom apartments, and 29 3-bedroom apartments. Next, phase 4 is planned to contain 75 studio apartments, 139 1-bedroom apartments, 98 2-bedroom apartments, and 86 3-bedroom apartments. Phase 5 plans for 32 studio apartments, 100 1-bedroom apartments, 135 2-bedroom apartments, and 57 3-bedroom apartments, while phase 6 contains 78 studio apartments, 40 1-bedroom apartments, 122 2-bedroom apartments, and 163 3-bedroom apartments.

As can be seen in phases 4-6, construction of the smaller product types begin to taper off as the development gains its own identity as an established mixed-use district. At this point, more family-oriented amenities and housing choices are planned to supplement the existing retail and entertainment uses (phasing for the planned commercial development is covered in the next section). The marketing for this time frame should then focus on luxury urban living,

with parks and specialty restaurants and stores highlighted. While it is understood that the public's conceptualization of Stadium City may never truly shift away from its function as a primarily entertainment- and sports-focused district (such as the Power and Light district), it may be possible to tweak the image in later phases to attract a more diverse consumer base, focusing on Stadium City's urban features and easy access to employment (as in the Country Club Plaza).

From there, projected employment growth, according to the method outlined above, was determined for each phase, as shown in Table 3.7. Then, the projected employment value was divided by the calculated employment per household rate for the end year of the phase to determine the average number of households associated with the projected employment growth. This value was then multiplied by the average regional rental rate provided by the "Consumer Expenditure Survey" from 1987-2003 (Mid-America Regional Council 2006a).

This value, representing the projected number of new rental households per phase, is shown in Table 3.7 in the fourth column from the right. This is a reasonable estimate of the projected number of new rental housing units that will be demanded per phase, and thus how many rental housing units will need to be built in the region during the given years. The two columns on the far right of the table show the total number of units programmed for Stadium City per phase, and the corresponding percentage of total demand that these units are expected to absorb (found by dividing the number of units planned by the projected number of new rental households). In a way, these percentages might be related to the concept of commercial “capture rate” presented later in this chapter - but in terms of total households rather than percentage of household income expenditure.

Such expenditures are accounted for in Table 3.7, as projected inflation-adjusted median income for the phase end year is applied to the number of projected new rental households, and then multiplied by 30% in

order to determine the maximum expected expenditure on housing per phase (30% being the commonly accepted maximum rate for affordable housing) (Schmitz and Brett 2001). This total new rental housing expenditure was then multiplied by the phase’s percent share of total demand, and then again by 12, to yield the maximum affordable rent for each phase, based on regional population characteristics.

Thus, we can gather from these calculations general indicators of rental housing demand, both in terms of new households and their expenditure ability. Total demand capture rates provide the analyst with a sense of the overall scale of the development compared to the rate of employment growth per phase, and thus what realistic absorption rates might be, based purely on demand.

Phase	Year	Proj. New Emp.	Assoc. HH (/Emp. Per HH)	New Renter HH (31.9% Rental Rate)	Available Income (*Med. Inc. in 2008 Dollars)	Income to Spend on Housing	Income Available for Dev. Supply	Housing Income (Per New HH)	Max. Aff. Rent (/12)	Prog. Units	% Share of Total Demand
1	2017- 2019	51,539	41,260	13,162	\$773,960,029	\$232,188,009	\$ 5,461,617	\$17,641	\$1,470	517	3.93%
2	2020- 2021	23,611	18,837	6,009	\$354,939,097	\$106,481,729	\$ 5,489,906	\$17,721	\$1,477	168	2.80%
3	2022- 2023	24,142	19,203	6,126	\$363,484,322	\$109,045,297	\$ 5,691,899	\$17,801	\$1,483	74	1.21%
4	2024- 2025	24,685	19,577	6,245	\$372,235,275	\$111,670,583	\$ 5,672,983	\$17,882	\$1,490	398	6.37%
5	2026- 2027	25,240	19,958	6,366	\$381,196,910	\$114,359,073	\$ 5,370,865	\$17,963	\$1,497	324	5.09%
6	2028- 2030	51,905	40,858	13,034	\$785,721,752	\$235,716,526	\$ 5,949,955	\$18,085	\$1,507	403	3.09%

Table 3.7. *Regional projected demand for new rental housing units by phase.*

The second piece of useful information yielded from this demand analysis is the max affordable rent per phase, based on projected median income. While a more useful measure (unavailable due to data constraints) would perhaps be projected income by quartile (or broken down further in some fashion), the values shown in Table 3.7 still provide a meaningful way to compare the affordability (and thus viability) of prospective rents, which will be determined below based on average construction costs.

In general, the demand analysis shows that employment is projected to increase rapidly over the course of the development horizon, yielding a relatively large demand for new rental housing units and thus a strong market for the proposed development. However, real income is not projected to increase quite as rapidly, meaning that proposed rents will need to remain relatively low (thus limiting unit sizes) in order to remain widely viable in the region.

Construction cost calculations are necessary to conduct in order to determine the expected return-on-

investment rate, as well as for financing considerations. In Table 3.8, the proposed cost of units by phase is shown. In order to calculate these figures, the 2008 median square foot construction cost for all types of multi-family structures was obtained, according to the International Code Council's (ICC) "Building Valuation Data" (2008). 2008 data was used in order to compensate for inflation – although it does mean that the costs presented in this report assume no real (non-inflation) change in building costs for multi-family housing structures, which is of course unlikely, but a necessary assumption to make in order to be able to compare across time periods.

The median costs of construction per square foot was \$115.49 in 2008; this value, multiplied by the gross square footage proposed by structure type for each phase yields the values shown below in Table 3.8. The first phase is the second-most expensive, with a price tag of \$59,222,458 needed in order to accommodate a comprehensive core of growth.

However, in future phases, the prices are generally back-loaded, increasing as larger units are constructed, with phase 2 at \$24,498,899, phase 3 at \$11,698,908, phase 4 at \$54,922,427, phase 5 at \$46,196,232, and phase 6 at \$62,962,947. This reflects the financially-driven phasing strategy, with revenues and equity from the initial phases able to finance the later, more expensive stages of development.

Table 3.9 shows the cost per unit type in order to get at pricing strategies that can maximize the return on investment without compromising general affordability and rapid absorption. 10-year rent pricing rates were found by dividing the cost per unit by 120 months, yielding the following rates: \$762.23 per month for studio apartments, \$958.57 per month for the 1-bedroom apartments, \$1,250.18 per month for the 2-bedroom apartments, and \$1,683.27 per month for the 3-bedroom apartments.

While this analysis does not take into account desired profits, financing constraints (such as debt service), maintenance costs, or functional obsolescence

considerations, it does provide a baseline for considering return on investment calculations and rent affordability. Comparing these figures to the projected maximum affordable rent rates for the region as a whole, shown in Table 3.7, it seems that the proposed rents are within sound pricing guidelines, with only the largest product type falling outside the median housing affordability for the region for most of the development horizon.

In summary, the mix of multi-family housing product types and the phasing strategy developed in this section appear to fit within reasonable considerations for adequate space, return on investment, absorption, and affordability. While a complete supply-side analysis of the multi-family market is not possible to conduct this far out from buildout (8-18 years), it is suggested that such an analysis be conducted closer to the project start date in order to ascertain specifics about price-point niches, amenity values, and general marketability of the project, as should a detailed financing plan.

Dwelling Unit Type	Phase					
	1	2	3	4	5	6
Studio Apt.	\$19,299,750	\$ -	\$ -	\$6,860,101	\$2,926,976	\$7,134,505
1 BR Apt.	\$19,669,810	\$9,662,363	\$2,990,731	\$15,988,910	\$11,502,813	\$4,601,125
2 BR Apt.	\$20,252,899	\$6,150,880	\$2,850,408	\$14,702,104	\$20,252,899	\$18,302,620
3 BR Apt.	\$ -	\$8,685,656	\$5,857,768	\$17,371,313	\$11,513,545	\$32,924,698
Total	\$59,222,458	\$24,498,899	\$11,698,908	\$ 54,922,427	\$46,196,232	\$62,962,947

Table 3.8. *Proposed cost of units by phase.*

	Cost Per Unit	10-Year Rent
Studio Apt.	\$ 91,468.01	\$ 762.23
1 BR Apt.	\$ 115,028.13	\$ 958.57
2 BR Apt.	\$ 150,021.47	\$ 1,250.18
3 BR Apt.	\$ 201,992.01	\$ 1,683.27

Table 3.9. *Proposed rents and 10-year payoff rate by unit type.*

Commercial Development

The market analysis for entertainment/retail uses takes a slightly different form than that for multi-family residential structures. Rather than determining household demand and the requisite rental rates, retail market analysis seeks to determine the total regional retail sales potential for the development, and thus the projected sales per square foot. This value is then used to compare to existing retail centers, and thus establish the extent of the projected trade area for the new development (in this case, according to an adaptation of the traditional retail gravity model). While construction cost/repayment factors are possible to calculate, they are not as important to the potential developer/investor of retail land use, and thus are not included in this report.

As for office uses, demand is primarily driven by employment growth in specific sectors – in this case, MARC aggregated different sectors based on common characteristics in order to compensate for the shift in sector definitions that came in moving from the

Standard Industrial Classification (SIC) codes to the North American Industrial Classification (NAICS) system (Mid-America Regional Council 2011b). For the present analysis, the government, education and health services, professional and business services, financial activities, and information sectors were selected as the primary office-demanding employment industries. The projected employment growth was then applied to standard assumptions on office space required per worker, and total demand for office space was then ascertained.

First, however, a detailed phasing plan was developed for all of the proposed employment uses, shown in Table 3.10. Using the same phase time frames as the housing development program, employment uses were planned according to two basic strategies: 1) ensure that phase 1 contains basic stadium-related amenities (e.g. hotel), and a complete mix of uses, including restaurants and specialty retail stores, and some initial office space, and 2) generally concentrate retail development in the early phases and escalate concentrations of office uses as the plan horizon develops.

This phasing plan informed retail sales volume projections and office space demand calculations, explained below. In order to project the sales potential of the planned Stadium City entertainment/retail center, the individual components (e.g. restaurants, hotels, etc.) were analyzed as a whole in the planned end year of construction (2027).

First, the “Consumer Expenditure Survey” data for the region was analyzed by finding the median total percentage of consumer expenditures in relevant categories (e.g. “food away from home,” “alcoholic beverages,” “household furnishings and equipment,” “apparel and services,” “entertainment,” “personal care products and services,” “reading,” and “tobacco products and smoking supplies”); in this case, the median percentage spent on entertainment/retail goods and services in the Kansas City MSA was 22.15% (Mid-America Regional Council 2006b).

This value was then multiplied by the total number of households expected to reside in the extended trade area - in this case, the 7-county region – in 2027, and again by the projected median income (in 2008

dollars). As shown in Table 3.11, the product of this calculation is \$12,261,857,032, and represents the total retail sales expenditure expected to occur in the region in 2027.

Now, this very large value represents sales transactions occurring at every retailer in the region – clearly, each individual shopping center (or store) can only expect to capture a small percentage of this expenditure. Three potential capture rates, reflecting a range of sales projections – low, mid-range, and high - for Stadium City are shown in the center of the table in Table 3.11. The wide range of potential capture rates (from 1.85% to 4.3%) presented here reflect the many uncertainties surrounding the development, from the unknown effect of the transit line on retail patterns, the uniqueness of the TOD typology, and, primarily, the inability to accurately project the supply-side dynamics, future competitive centers, and market fluctuations of retail trade 15 years into the future.

Phase	Years	Office Space	Shops and Restaurants	Grocery Store	Hotel	Theater
1	2017-2019	306,250	229,686	-	160,000	-
2	2020-2021	-	8,000	64,669	-	-
3	2022-2023	-	4,500	-	-	78,025
4	2024-2025	440,625	115,625	-	-	-
5	2026-2027	494,880	73,870	-	-	-
6	2028-2030	259,380	15,625	-	-	-
Total		1,501,135	447,306	64,669	160,000	78,025

Table 3.10. *Number and size of proposed employment uses by phase.*

Sales Analysis Overview: 2027 (2008 \$)							
	Retail Sales Potential	Capture Rates %			Projected Sales Range		
Market Area		Low	Mid	High	Low	Mid	High
Extended Trade Area	\$12,261,857,032	1.85%	2.50%	4.30%	\$226,844,355	\$306,546,426	\$527,259,852
Proposed GLA (sq. ft.)					750,000	750,000	750,000
Sales per sq. ft.					\$ 302.46	\$ 408.73	\$ 703.01

Table 3.11. *Projected entertainment/retail sales volume.*

Another vital consideration for market capture potential is the mix of potential tenants. As explained in *Real Estate Market Analysis*, “ultimately, the tenants, not the mall itself, provide customers the benefit of shopping. Because tenants play the key role in the success of a shopping center, if [the proposed development] cannot secure quality tenants because of prior commitments to [other shopping centers], then [the proposed development] will have difficulty positioning itself as the destination of value and selection” (Schmitz and Brett 2001). This is certainly the case with Stadium City, and to that effect, a list of potential tenants by proposed use is provided in Table 3.12 in order to provide examples of high-quality tenants that would boost sales volumes and enhance the economic potential of the development (desired office tenants are also included in the chart). The importance of tenant mix is also underscored in a recent *Wall Street Journal* article that analyzes the current consumer trends in retailing; according to “The Malaise Affecting America’s Malls,” luxury shopping centers continue to enjoy high sales volumes and strong performance, while mid-range or underperforming malls do not, and are subsequently

being pushed out the market (Hudson 2012). “Strong malls” are those with average sales per square foot of \$400 or more, and the industry average is around \$350 per square foot.

Shopping centers with sales volumes under \$300 per square foot are classified as vulnerable to reconfiguration or collapse, and the highest-earners, such as Cherry Creek mall in Colorado, possess sales volumes of \$760 per square foot (Hudson 2012).

Thus, the three sales volume projections shown in Table 3.11 reflect three possibilities: at the low end, a projected annual sales per square foot rate of \$302.46 reflecting a regional capture rate of just 1.85%, barely above the “vulnerable” mark and probably not strong enough to sustain long-term market viability; the mid-range projection, which was used in the development of the gravity model below, assumes a capture rate of 2.5% and yields a reasonable sales per square foot volume of \$408.73, enough to push Stadium City into the “strong” category; and, finally, the high projection demonstrates the capture rate that would be required to attain sales volumes per square foot above \$700, a strong (but not impossible) 4.3% (Hudson 2012).

Commercial Development Type	Examples of Desired Tenants
Grocery	Trader Joe's, Whole Foods, Hen House, Constantino's Market
Hotel	Four Seasons, Marriott, Towneplace Suites, Sheraton, Holiday Inn
Theater	AMC Fork & Screen, New Theatre Restaurant, Lyric Opera of Kansas City
Specialty Stores/Services	Chanel, Apple Store, Louis Vitton, Burberry, Prada, Sephora, Restoration Hardware
Restaurants/Bars/Coffee Shops	Morton's Steakhouse, BJ's Brewery, Dave and Buster's, Paciugo Gelato, Starbucks
Class A Office Space	Sprint, Cerner, State of Missouri, City of Kansas City, MO, Ford Motor Company, Hallmark Cards, Honeywell, Kansas City Royals & Chiefs

Table 3.12. *Examples of desired luxury tenants for entertainment/retail and office uses.*

Thus, while many variables influence the realized capture rate that any development is able to obtain, the reasonable mid-range projection for Stadium City of

\$408.73 per square foot demonstrates genuine market viability for a mixed-use entertainment/retail center at the Truman Sports Complex.

In order to integrate existing competition (the supply side of the market) into a spatial analysis of the primary trade area for the proposed development, a retail gravity model, adapted from William J. Reilly, was used, shown in Figure 3.15 (1931). Colleague Nathan Jurey assisted in creating a derivation of Reilly's equation that sets the equation equal to "Distance to Midpoint" rather than "Attraction", and thus reads as follows: Distance to Midpoint = Total Distance / [Attraction + $\sqrt{(\text{Sales Volume 2} / \text{Sales Volume 1})}$], where Attraction = 1 (due to the fact that the midpoint between two shopping centers is where attraction is equal), Sales Volume 2 = the projected sales volume of the subject site, Sales Volume 1 = the sales volume of all other competitors, Distance to Midpoint = the distance from each competitor's location to the midpoint, and Total Distance = distance from Sales Volume 1 to Sales Volume 2 (measured in miles) (Reilly 1931).

This equation was applied to seven existing competing regional entertainment/retail centers (Zona Rosa, the Legends, Oak Park Mall, the Power and Light District, Westport, the Country Club Plaza, and Independence Center) and the mid-range projected sales volume for Stadium City shown above in order to produce a spatial map of the extent of Stadium City's expected market penetration (i.e., its primary trade area).

The boundary for the trade area is drawn using the tangent lines from each of the competing shopping centers' midpoint radii, as well as a non-derived southern boundary of I-470 (due to reasonable travel time inferences). With a size of 57,276 acres, constituting some 2.7% of the total 2,085,080 acres in the 7-county region, the calculated primary trade area shows considerable opportunity for market capture.

Figure 3.16 shows the Stadium City primary trade area in relation to projected 2015 demographic characteristics – notably, the density of those aged 21-49 (the primary market segment for this development)

(Mid-America Regional Council 2009). While the highest regional concentrations of those in the target demographic still reside in the center – to - southwestern areas of Kansas City MSA, Stadium City will have a significant capture rate within its primary trade area, which still contains a significant concentration of those aged 21-49.

Office demand, on the other hand, was ascertained by projecting employment in specific sectors through 2030. MARC, in order to allow comparison between the SIC and NAICS codes, aggregated certain types of employment categories into similar clusters. The analyst then selected those clusters that would be the primary drivers for regional office demand, including the broad categories of government, education and health services, professional and business services, financial activities, and information (Mid-America Regional Council 2011b).

Figure 3.17 shows the historical and projected growth for these sectors. MARC provided historical employment data from 1990-2010; in order to project

future growth, a linear regression was applied to each of the five data sets. While this is certainly a rudimentary projection method, all but one yielded r^2 values of .81 or greater, which indicates that most of the change over time in employment for each sector can be explained linearly. The dashed line in Figure 3.17 indicates the point at which projections are employed.

In general, the projections show that these sectors' share of total regional employment will be expected to remain somewhat constant over the course of the next 18 years, with the information industry continuing to lose jobs from its peak employment of 56,000 in 2000. The remaining sectors are expected to grow in terms of total employment, but generally maintain their current share of regional employment, which means that significant amounts of new office space will need to be constructed.

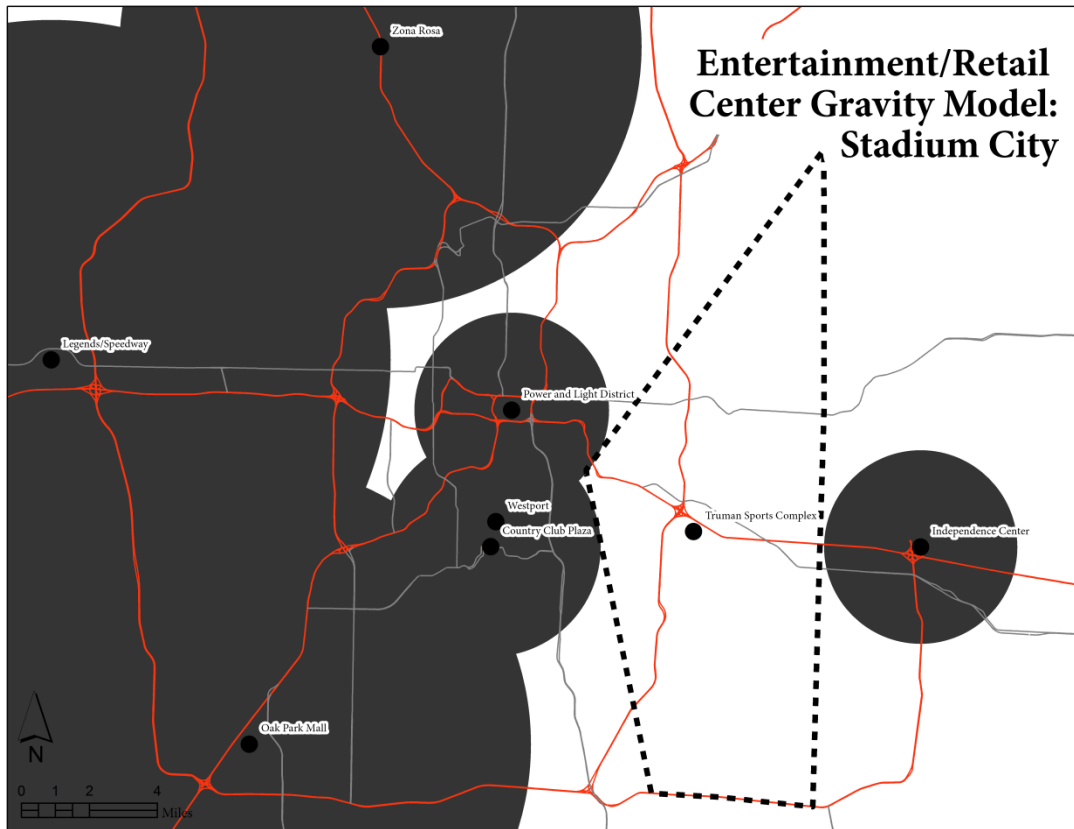


Figure 3.15. *Primary trade area for Stadium City based on projected sales volume.*

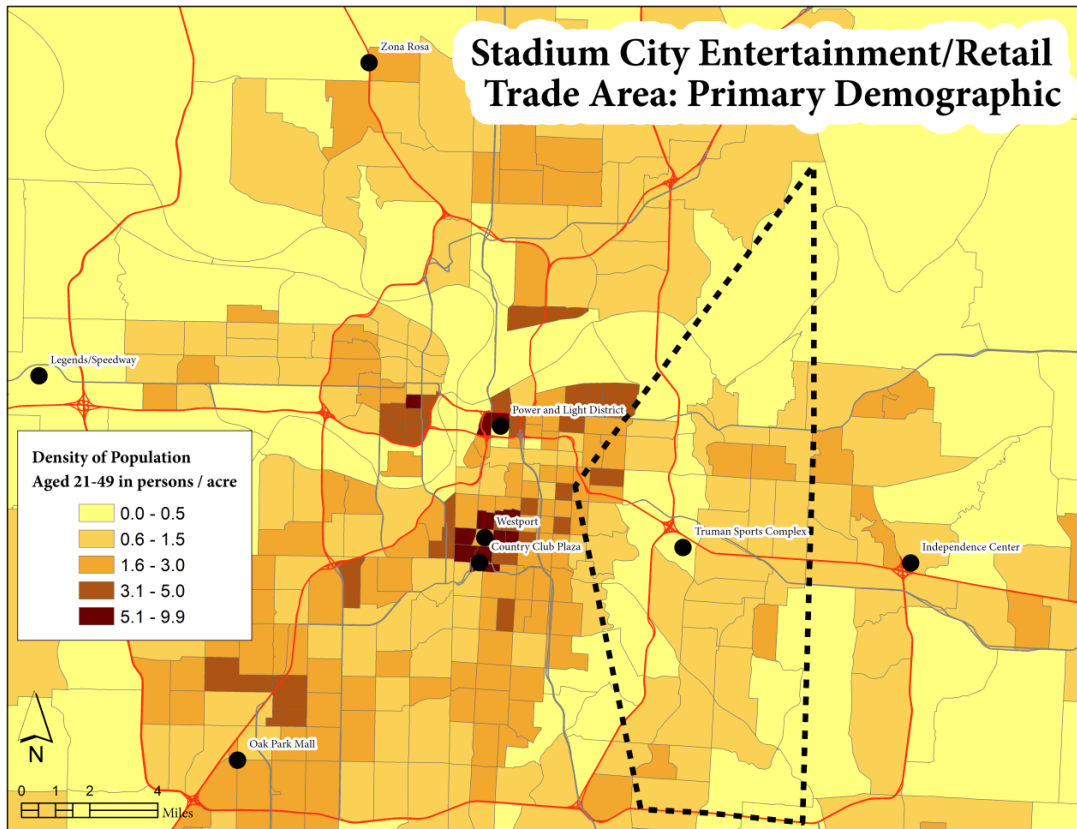


Figure 3.16. Demographic characteristics of primary trade area.

These employment projections were then applied to each planned phase of development, shown in Table 3.13. A base value of 200 gross square feet per office employee was used to calculate the demand for office space in the given years of each phase, although this is certainly only a coarse estimate (Schmitz and Brett 2001). The amount of office space proposed in each phase was then divided by this value in order to determine a percentage of total demand, shown in the far right column of the table. As can be seen, expected capture rates for the total demand seem high: 12.00% for phase 1, 34.52% for phase 4, 38.77% for phase 5, and 10.16% for phase 6.

However, as Schmitz and Brett caution, “a straight-line projection of either office employment or net absorption is a notoriously unreliable method of estimating office demand,” due to fact that such projections cannot take into account the fluctuations in the business cycle that are particularly influential to office demands (2001). Instead of pure mathematical models, the authors explain that “the demand analysis must go beyond general projections of future demand

to identify and assess the sources of demand for the proposed office building. This analysis should include the identification of both potential tenants and market niches that need space (Schmitz and Brett 2001). Thus, the share of total projected demand is perhaps less meaningful than the evaluation of potential future tenants, as shown above in Table 3.12.

So, while the large amount of office space currently programmed into the Stadium City development presents a range of options (including possible conversion to other uses) and offers the ability to capture some expected market demand, the recruitment of key tenants and future analyses will be integral to establishing the economic success of the office component. Overall, demand for office space is certainly projected to grow in the region, and Stadium City will likely be able to capture a significant portion of that demand – however, a future study is recommended in order to see if reductions or changes to the program (perhaps up to as much as 750,000 ft.²) might be necessary or desirable given the prevailing market conditions in 2017.

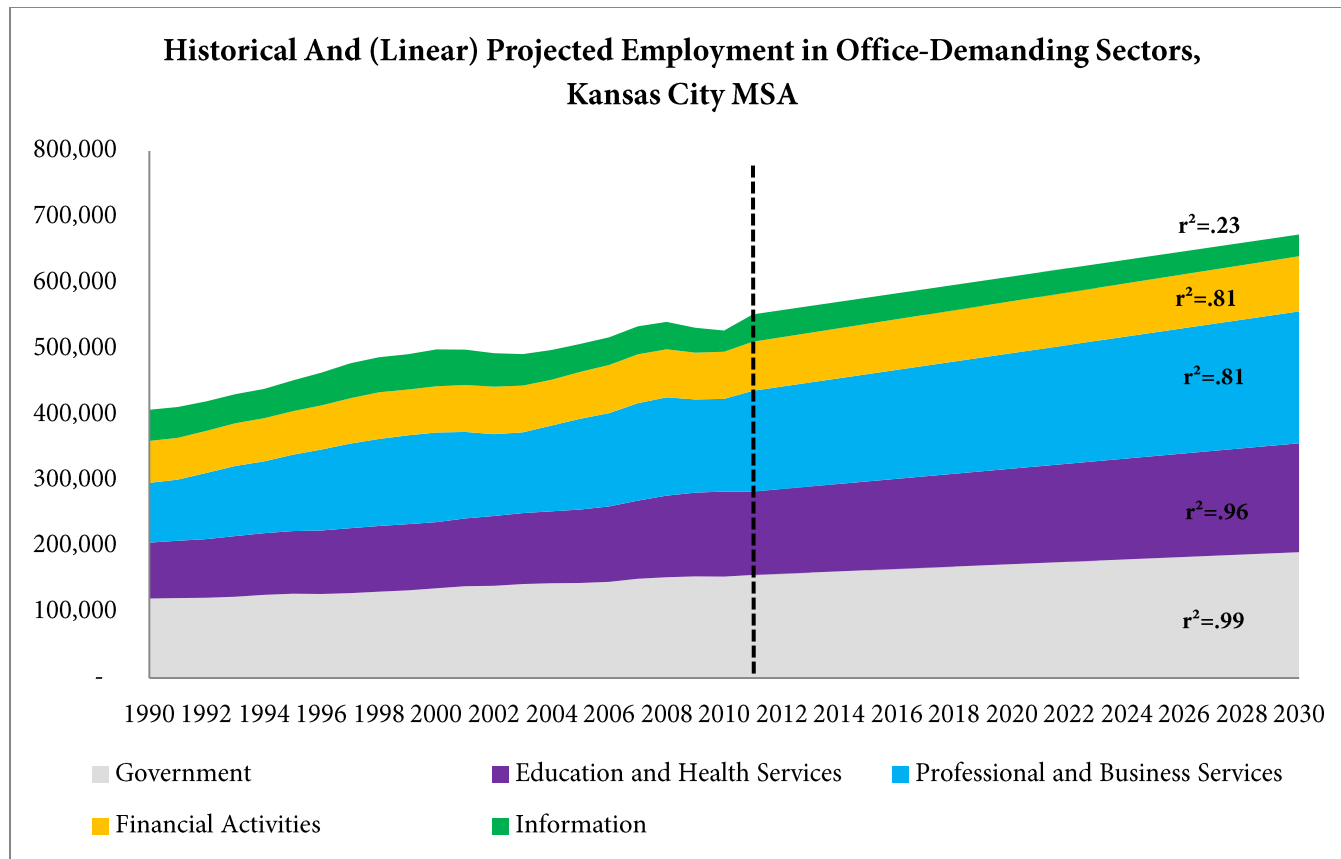


Figure 3.17. *Employment growth in office-demanding sectors.*

Phase	Years	Projected Office Employment Growth	Projected Office Space Demanded (200 ft. ² / employee)	Gross Ft. ²	% Share of Total Demand
1	2017-2019	12,765	2,553,088	306,250	12.00%
2	2020-2021	6,383	1,276,544	-	-
3	2022-2023	6,383	1,276,544	-	-
4	2024-2025	6,383	1,276,544	440,625	34.52%
5	2026-2027	6,383	1,276,544	494,880	38.77%
6	2028-2030	12,765	2,553,088	259,380	10.16%
Total		51,062	10,212,352	1,501,135	

Table 3.13. *Regional projected demand for office space by phase.*

Transportation Analysis

The determination of expected trip and parking generation rates for the proposed development program, as well as the expected transit mode share once the Rock Island Line is introduced, is the primary purpose of this section, and will strongly guide the spatial layout and design of Stadium City.

However, the economic impact of rail transportation on the property values of the proposed transit-oriented development is the first object of this section. While such considerations could be explicitly included in a market analysis, the current report focuses not on profits or economic impacts, but rather on the economic context of the region and the long-term viability of the proposed development. Given that, it is still important to understand the potential market effects of rail transit on development and how they might affect Stadium City's viability or affordability. A concise article prepared by Booz, Allen, and Hamilton, Inc. summarizes the findings of the relevant literature on the subject (Diaz 1999).

In general, the most relevant findings of the study are as follows: 1) a study of the Bay Area Rapid Transit (BART) system in Pleasant Hill, California, specifically measured the impact of proximity (within a quarter mile) to the transit station on rents, and found that, while controlling for all other factors, an increase in rent of \$34 per month could be expected; 2) the impact on residential property values seems to be highly correlated with whether or not residents value the transit service (whether they use it), and perhaps with small-scale image and design issues such as ease of accessibility and perceptions of safety; 3) the primary way that property values increase is by providing a marketable increase in access (in other words, people trade savings in commuting time for more expensive housing); 4) pedestrian accessibility (within the quarter mile radius) is very important to increasing property values due to rail transit (i.e., providing parking but no good pedestrian access will not increase property values); and 5) market penetration – that is, the most established lines with the highest ridership and most number of possible destinations – is the primary determinant in creating increases in property values (Diaz 1999).

In addition, an article by Jeffery Smith and Thomas Gihring called “Financing Transit Systems Through Value Capture” suggests that “many planners and economists, including Nobel laureate William Vickrey, [believe] that cities could benefit by funding transit system development costs and a major portion of operating costs from land value capture, that is, by taxing a portion of the additional value of adjacent properties that result from transit accessibility”(2006). Certainly in the case of Stadium City, where the existing land slated for development is already owned (at least partially) by Jackson County, capturing the increase in value as a result of the introduction of the transit line, perhaps as a sort of Tax-Increment Financing (TIF), may be a viable way to finance either the construction of the Stadium City TOD or the transit line itself.

In terms of direct transportation impacts based on the program developed in this chapter, the expected number of a) trips generated, b) parking spaces required to be built for the proposed development, and

c) parking spaces expected to be replaced due to the planned development on existing parking were all calculated in order to better guide the site design process.

Using the 8th Edition of the Institute of Transportation Engineer’s (ITE) *Trip Generation Manual*, the author determined the expected number of PM Peak trips per phase, as shown in Table 3.14 (2008). In general, the author matched each aspect of the program to the closest category found in the ITE *Manual*, listed on the left-hand side of the table, and calculated the number of units (e.g. DU, 1,000 ft.², etc.) proposed for each phase, according to the program. Then, the given number of trips per unit was multiplied by the proposed number of units, thus yielding the expected number of vehicle trips expected to be generated by the proposed Stadium City new construction. The general category “Shopping Center” was used in place of each individual shop/restaurant type, since the specific uses for each programmed store has yet to be determined.

In their wide-ranging study on California TODs, *Effects of TOD on Housing, Parking, and Trip Generation*, Cervero and Arrington offer several pertinent conclusions about the travel characteristics of TOD (2008). The most important to the current study is that density and proximity to the Central Business District (CBD) have a direct, quantifiable effect on TOD trip generation; in fact, a TOD positioned roughly seven miles from the CBD (as the Truman Sports Complex is) and built at a density of 15 DU/acre can actually expect a trip generation rate just 30% of the PM average given in the *Trip Generation Manual* (Cervero and Arrington 2008). Thus, on the right side of Table 3.14, the 30%-adjusted vehicle trips expected to be generated by phase are shown. While conclusions about the specific impacts of these added trips to the surrounding transportation network are beyond the scope of the current report, the collection of this basic data is important in beginning the conversation about surrounding traffic impacts.

Expected parking generation rates from the 4th Edition of the ITE's *Parking Generation Manual* (and thus the number of additional parking spaces that will need to be provided) for the development are similarly shown in Table 3.15 (2010). A similar method was used to determine the number of expected parking spaces required by each proposed land use; one land use, "Light Rail Transit Station" was added, due to MARC plans that mandate at least fifty parking spaces to be provided for the station at the Truman Sports Complex itself. And while Cervero and Arrington do not explicitly develop a standard reduction for parking spaces at TOD, they do suggest 1.1 spaces per multi-family residential DU as a model number of required spaces (slightly lower than the 1.2 spaces per apartment suggested by the ITE) (2008). Thus, 1.1 was used to determine the adjusted number of required parking spaces for the proposed residential development, and the determined value from the ITE *Manual* was used to gather parking needs for the remaining land uses by phase.

ITE Trip Generation Manual, 8th ed., PM Peak Hour				Adjusted Trips Generated by Phase						
Code	Use	Unit	Trips / Unit	1	2	3	4	5	6	Total
220	Apartment	DU	0.62	96	31	14	74	60	75	350
310	Hotel	Rooms	0.59	42	-	-	-	-	-	42
445	Multiplex Movie Theater	1,000 ft. ²	4.91	-	-	115	-	-	-	115
710	General Office Building	1,000 ft. ²	1.49	137	-	-	197	221	116	671
850	Supermarket	1,000 ft. ²	10.5	-	204	-	-	-	-	204
820	Shopping Center	1,000 ft. ²	3.73	257	9	5	129	83	17	501
	Total			533	244	134	400	364	208	1,883

Table 3.14. *Expected trip generation rate for proposed land uses by phase.*

ITE Parking Generation Manual, 4th ed., Weekday Average				Adjusted Parking Spaces Required by Phase						
Code	Use	Unit	Spaces / Unit	1	2	3	4	5	6	Total
93	Light Rail Transit Station w/ Parking, Urban	1,000 Daily Boardings	58	58	-	-	-	-	-	58
221	Low/Mid-Rise Apartment, Urban	DU	1.2	569	185	81	438	356	443	2,072
310	Hotel, Urban	Rooms	0.64	154	-	-	-	-	-	154
445	Multiplex Movie Theater	Screens	36.2	-	-	724	-	-	-	724
701	Office Building, Urban	1,000 ft. ²	2.47	756	-	-	1,088	1,222	641	3,708
850	Supermarket, Urban	1,000 ft. ²	2.27	-	147	-	-	-	-	147
820	Shopping Center	1,000 ft. ²	2.55	586	20	11	295	188	40	1,141
	Total			2,122	352	817	1,821	1,767	1,124	8,003

Table 3.15. *Expected parking generation rate for proposed land uses by phase.*

Of course, the development program presented in this chapter assumes that the vast majority of Stadium City will be constructed on the existing parking lot of the Truman Sports Complex; in that way, the number of parking spaces that will need to be built will in fact be quite larger than the number provided in Table 3.15.

In order to estimate the potential total amount of parking that will need to be constructed, the analyst developed an estimate for the total amount of existing parking that will be redeveloped, and thus the number of parking spaces that will need to be replaced (most likely in garages), shown in Table 3.16.

The total footprint for the proposed development was measured according to the spatial layout determined in the final plan (according to phase) and then divided by the estimated total area of the existing parking lot, 5,760,000 ft.² (this value was determined by taking the existing number of parking spaces at the Truman Sports Complex, 19,200, and multiplying by the standard estimate of 300 ft.² per parking space). The resulting number approximates the percentage of

existing parking area that is proposed to be redeveloped per phase; in order to find the number of parking spaces affected, this percentage was multiplied by the total existing number of spaces on the site, 19,200. Finally, an adjustment was made, based on an assumption that 30% of gameday travelers would arrive by transit, once the line is constructed and operational, thus reducing the number of required spaces that must be rebuilt to serve the stadiums themselves.

This adjusted number of rebuilt spaces was then added to the previously-calculated number of new parking spaces required and shown in the bottom of Table 3.16. The total number of spaces was then multiplied by 300 ft.² (the standard assumption for one parking space's share of total land area, including parking aisles, etc.). The amount of programmed parking by phase, delineated in detail in the final plan, is shown in the bottom row for comparison purposes. As can be seen, in phase 1, 4,169 parking spaces must be constructed, amounting to approximately 1,250,585 ft.².

Phase 2 requires 1,270 spaces (about 381,088 ft.²), demand for parking in phase 3 is some 1,305 spaces (391,351 ft.²), phase 4 requires 3,225 spaces (another 967,390 ft.²), phase 5 generates 2,720 spaces (815,879 ft.²), and, finally, the off-street parking generated by phase 6 is some 2,664 spaces, about 799,253 ft.²

All in all, the 15,352 total spaces that are proposed to be built over the course of the Stadium City development constitutes about 80% of the existing parking currently on the site. While opportunities for on-street parking within the development are certainly expected, design considerations for the pedestrian-friendly accommodation of the massive amount of required parking will be one of the primary design challenges for the project. Even with the maximum verifiable amount of adjustments and expectations of transit usage, adequate parking provision is one of the primary concerns for the development of Stadium City.

	Phase						
	1	2	3	4	5	6	Total
New Development Requirements							
New Spaces Required	2,122	352	817	1,821	1,767	1,124	8,003
Elimination of Existing Parking							
Total footprint area (including rights-of-way)	876,953	393,555	208,984	601,563	408,203	660,156	3,149,414
Percentage of existing parking area	15.22%	6.83%	3.63%	10.44%	7.09%	11.46%	54.68%
No. of spaces	2,923	1,312	697	2,005	1,361	2,201	10,498
Adjusted spaces (30% gameday transit mode share)	2,046	918	488	1,404	952	1,540	7,349
New Development + Replacement Parking							
New Spaces Required	4,169	1,270	1,305	3,225	2,720	2,664	15,352
Aggregate parking floor area @ 300 ft. ² per space (incl. aisles)	1,250,585	381,088	391,351	967,390	815,879	799,253	4,605,546
Programmed Parking	1,404,000	331,200	1,382,400	972,000	540,000	-	4,629,600

Table 3.16. *Expected parking replacement by phase.*

Conclusions

The preceding chapter has covered a variety of topics related to the precise layout of the development program, from number, type, and mix of units to market analysis and the determination of the development's transportation considerations. Following is a quick summary of the key findings from this analysis:

- The target market of Stadium City are those aged 21-49, specifically young professionals, small family households, and those who value urban, transit-related, and recreational amenities.
- The construction of the project will be divided across 6 phases from 2017-2030.
- Roughly 2,245,000 ft.² of the development will be made up of multi-family housing, consisting of 1,884 units, including apartments of all sizes.
- Another 750,000 ft.² of the development will be devoted to entertainment/retail, including a grocery store, high-rise hotel, a theater, and over 447,000 ft.² of specialty shops, restaurants, bars, and coffee shops.
- More than 1,500,000 ft.² of the development will consist of Class A office space.
- The development will include a transit station, public plaza, public recreational space, and a large nature preserve (including trails) fronting Raytown Road.
- Preliminary market analysis has determined the viability of the housing and employment components of the development, as long as, regional population and income growth continues at current rates, and high-quality retail tenants (with high sales volumes per ft.²) are obtained.
- The planned introduction of transit service is vital to the success of the development, and should cause surrounding property values to rise.

- The viability of the market for the programmed amount of office space is less clear; future, more-detailed market analyses (including evaluation of competitive projects) should be conducted closer to the development horizon in order to determine specific pricing/marketing characteristics and strategies.
- Some 15,352 parking spaces will need to be built or restructured into parking garages in order to accommodate the planned development, constituting a primary design dilemma for the site.

IV. Plan

Massing, Spatial Layout, and Zoning

To this point, the report has focused primarily on background analysis of various kinds – detailed, mostly quantitative investigations of a wide range of pertinent issues. This section builds on this work by proposing a specific vision for what a TOD at the Truman Sports Complex could look like – in that way, we provide visual representations of different spatial characteristics of the site. Of course, in doing this, we have continued to work from our primary assumptions, founded in the literature and developed in the program and market analysis, including the necessary density, street widths, traffic improvements, etc. It is our hope, however, that through this plan, the reader can begin to imagine what is possible on the site while understanding and learning from the analysis and rationale behind specific design decisions that we made.

In its simplest form, the massing and spatial layout of the site at full buildout is shown in Figure 4.1. While a variety of building heights and types are represented,

several basic concepts are readily apparent: high-rise towers climb out of the former parking lot, framing and buffering the stadiums without isolating them. A cluster of massing can be found in the inter-stadium area, centered on a public plaza and intended to capitalize on the activity generated by the stadiums. At the same time, the entire western parking lot is crossed with a small-block gridded street pattern and roughly heterogeneous levels of massing, in order to maximize cross-connectivity and afford opportunities at the edges for lower, more residentially-oriented intensity levels.

As one moves east from the stadiums through the heart of the development, the experience is roughly akin to passing through a series of cross-sectional layers, which run northeast-southwest. First, the experience is focused on the immediate stadium area, with activity concentrated in the center of the site; the next layer consists of mid-rise (4-story) mixed-use buildings, human-scaled and focused on active pedestrian uses.

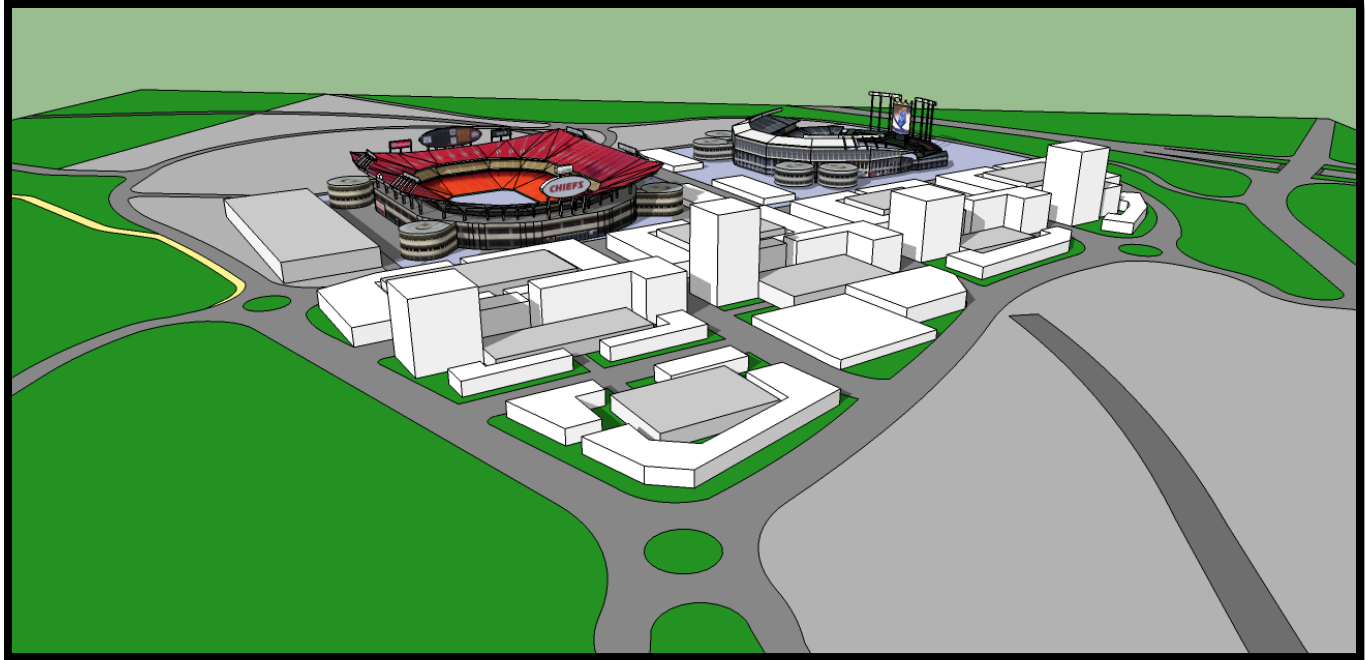


Figure 4.1. *Overhead view of Stadium City.*

The next layer evokes a feeling of immersion – the densest uses are here, an urban wall that works to enclose the entire middle of the site, between the stadiums and the towers. The final layer, then, provides a release from this massive density, with shorter, residentially-focused uses afforded some buffer from the noise and bustle of the stadium-adjacent area. As shown in Figure 4.2, each of these layers is roughly categorized into the basic form-based zoning categories for the site.

This strategy of spatial patterning provides homogeneity and a sense of enclosure within each layer, but allows the primary east-west pathways (including the central street, Stadium Street, which is discussed in more detail below) to slice directly across each layer, providing the exciting experience of passing through a variety of unique environments, building forms, and uses. The specific characteristics of each zoning district are laid out in Table 4.1. Generally, the categories reflect the massing described above, with target lot coverages and building heights directed at maintaining a

pedestrian-friendly urban environment that activates space across the full width of the site; however, they are also tied to the specific land uses (and amounts) outlined in the development program. The site plan divides the Stadium City development into 31 building lots and nine parking garages, each of which has been tagged by one of the seven specially-tailored zoning districts.

Generally, most of the development is concentrated in mixed-use zones denoting different building heights and lot coverage– the M-1 district provides for two-story mixed-use between the stadiums, while the M-2 district targets four-story mixed-use buildings in the center of the site. The M-3 and M-4 districts encompass the taller portions of the site, allowing eight- to ten-story and fifteen- to twenty-story development, respectively. No specific level of use mixing is required in the mixed-use zones; however, the vast majority of these buildings are envisioned in the traditional mixed-use mode, with ground-floor retail uses, mid-level office, and residential apartments on the upper floors.

The remaining zoning categories are single-use categories designed for specific uses; the C-1 district allows for the provision of a grocery store, while the C-2, Entertainment, district is intended to house the theater for the development. R, Garden Apartments, provides for three-story, low lot-coverage residential uses at the edges of the site in order to foster a quieter, more natural, and somewhat-buffered environment for residential uses; accordingly, the R district is the only zone in which the buildings are not required to front the sidewalk directly.

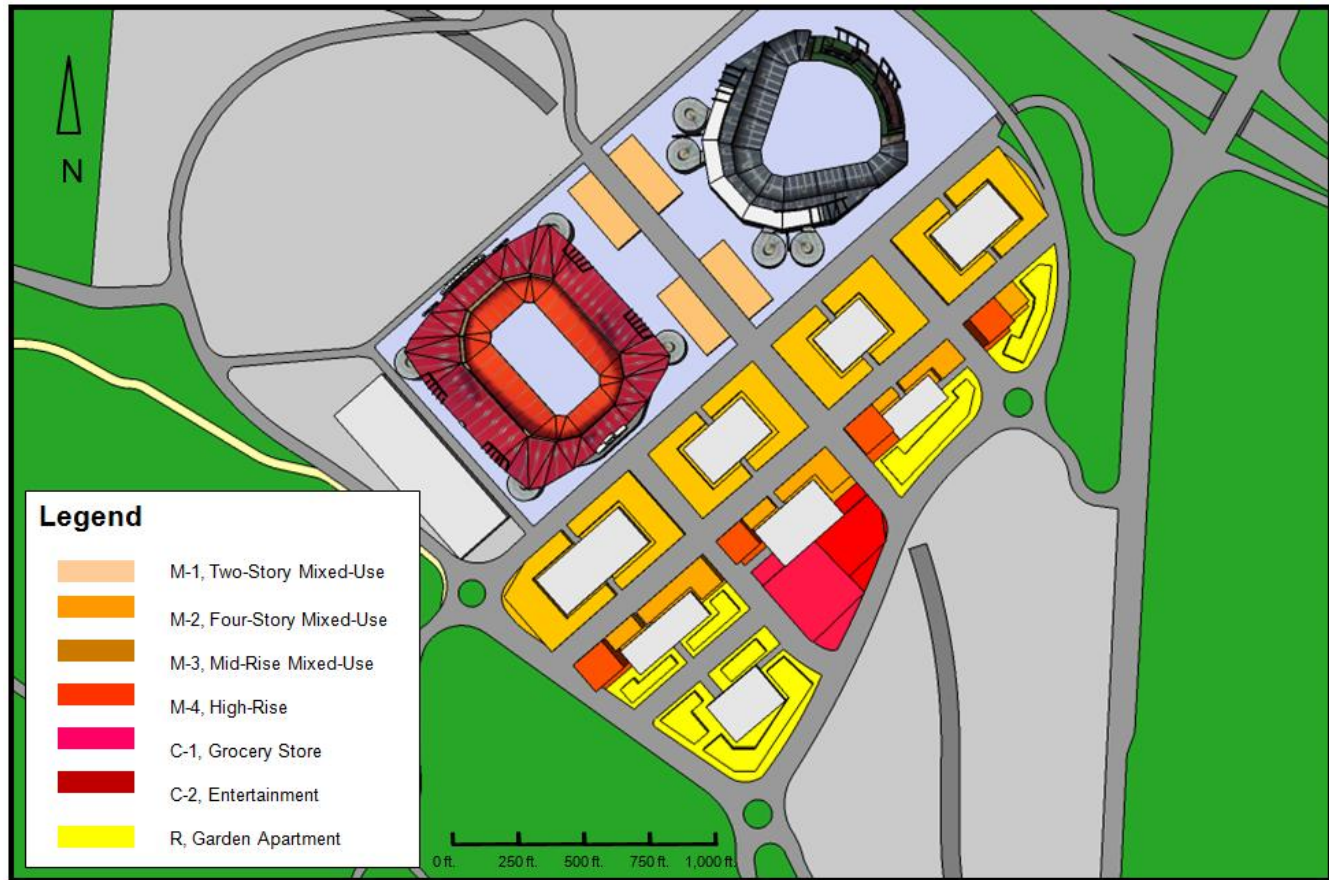


Figure 4.2. *Zoning map.*

Symbol	Description/Use	Color	Target Lot Coverage	Target Height	Setback From Sidewalk
C-1	Grocery Store		70%	One-Story	N
C-2	Entertainment		72%	Two-Story	N
M-1	Two-Story Mixed-Use		100%	Two-Story	N
M-2	Four-Story Mixed-Use		80%	Four-Story	N
M-3	Mid-Rise Mixed-Use		80%	Eight- to Ten-Story	N
M-4	High-Rise		80%	Fifteen- to Twenty-Story	N
R	Garden Apartments		50%	Three-Story	Y
P	Parking		100%		N

Table 4.1. *Characteristics of zoning classifications and symbols.*

Local Transportation Improvements

Beyond spatial programming, the focus of my work on the site plan pertains mostly to transportation matters. In that way, I worked to address the original dilemmas of the site that were identified at the outset of the project, described in Chapter 1. The three transportation-related design concerns were a) the disconnection between the existing Rock Island line and the stadiums themselves, b) the inadequacy of the interior circulation system for pedestrians, and c) how to deal with the vast amounts of parking required.

Figure 4.3 shows the overall land use and transportation design concept for the site, including local-scale improvements to the exterior and interior circulation systems in order to address the three primary transportation goals. Most important to note on the map are the following elements:

- A proposed realignment of the rail line infrastructure from the existing right-of-way

to the south of the stadiums (shown in solid purple) to a new path directly through the center of the site (shown in dashed purple) in order to maximize on-site activity and pedestrian accessibility.

- Rerouting the rail line entails a new location for the transit station (shown as a blue circle) at the edge of the developed area in order to create strong pedestrian traffic volumes between the stadiums and the station.
- In order to deal with exterior vehicular traffic and the need for increased accessibility from Raytown Road, an extension of the existing Ozark Road is Proposed (in dashed yellow), as well as three new roundabouts (orange circles) to more efficiently disperse traffic along the ring road. Several of the existing interior streets are also planned to be reconfigured (shown in dashed orange).

- Finally, a marked crosswalk is proposed to be constructed along Blue Ridge Cutoff (orange star) in order to increase the site's pedestrian connectivity to surrounding land uses.

The specific nature of the proposed site-scale transportation improvements is developed in the following sections.

Land Use and Street Reconfiguration

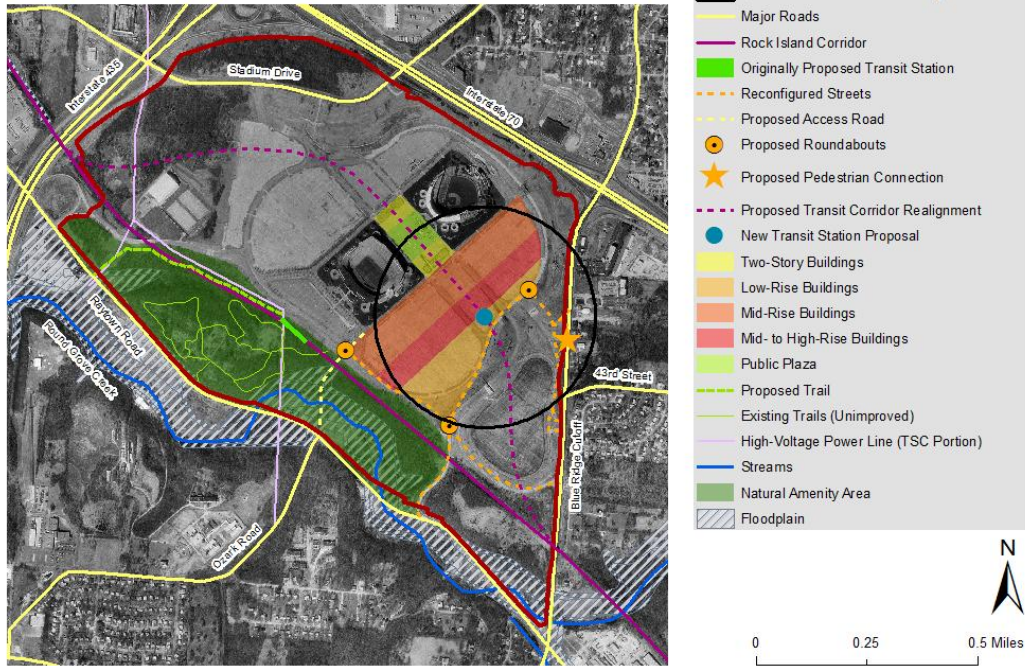


Figure 4.3. Design concept.

Rail Line Realignment

One of the most expensive and fundamental changes that we have proposed to the existing site is certainly the realignment of the existing rail corridor through the center of Stadium City, shown over the aerial site plan in Figure 4.4. However, due to the potential that the realignment has for activating the entire space, and the topographic constraints inherent in developing in the steep area in which the existing rail bed sits, we felt that it was an essential component to a successful TOD. Without a centrally-located station, close to both the stadiums and easily-buildable land, the ability to maximize the walkability of the area within a quarter-mile pedestrian shed becomes very difficult.

One of the primary logistical challenges in proposing to reroute the rail line is the uncertainty over the transit mode that may ultimately be developed – if light rail is chosen for the Rock Island Corridor, then it may be accommodated fairly easily at-grade on the streets of Stadium City. This mode would also provide ample

opportunities for riders to see the development as they ride through it, generating curiosity about the site as well as excitement – realignment would also be relatively cost-effective. If heavy rail is chosen, however, a tunnel is necessary to maintain pedestrian connectivity at street level, which is much more expensive and infrastructurally-intensive.

Figure 4.5 shows the existing vertical profile of the site and the two alignment options developed for light rail and heavy rail operations. The scale of the drawing is greatly exaggerated– each mark on the x axis shows 100 meters, while each mark on the y axis shows 10 meters. This was done in order to perceptibly show the differences in verticality while covering the horizontal extent of the site. For the heavy rail alignment (shown in thick black), the line would enter a cut-and-cover tunnel beginning generally at the western edge of the existing satellite parking lot.

The majority of the trench needed to construct the tunnel would be at least 12 meters in depth, before being forced to climb back towards the surface due to the higher elevation of the west side parking lot. The maximum allowable slope for a rail track is 5%, which is what is depicted in the figure. Shown in gray is the existing topography that would most likely need to be graded in order to accommodate a safe track profile.

The proposed light rail alignment (dashed), on the other hand, is planned to be built at-grade in the street right-of-way; thus, the light rail line can follow the contours of the site's existing topography within the 5% maximum slope limit. Similar grading on the west side of the site would need to be done to accommodate light rail.

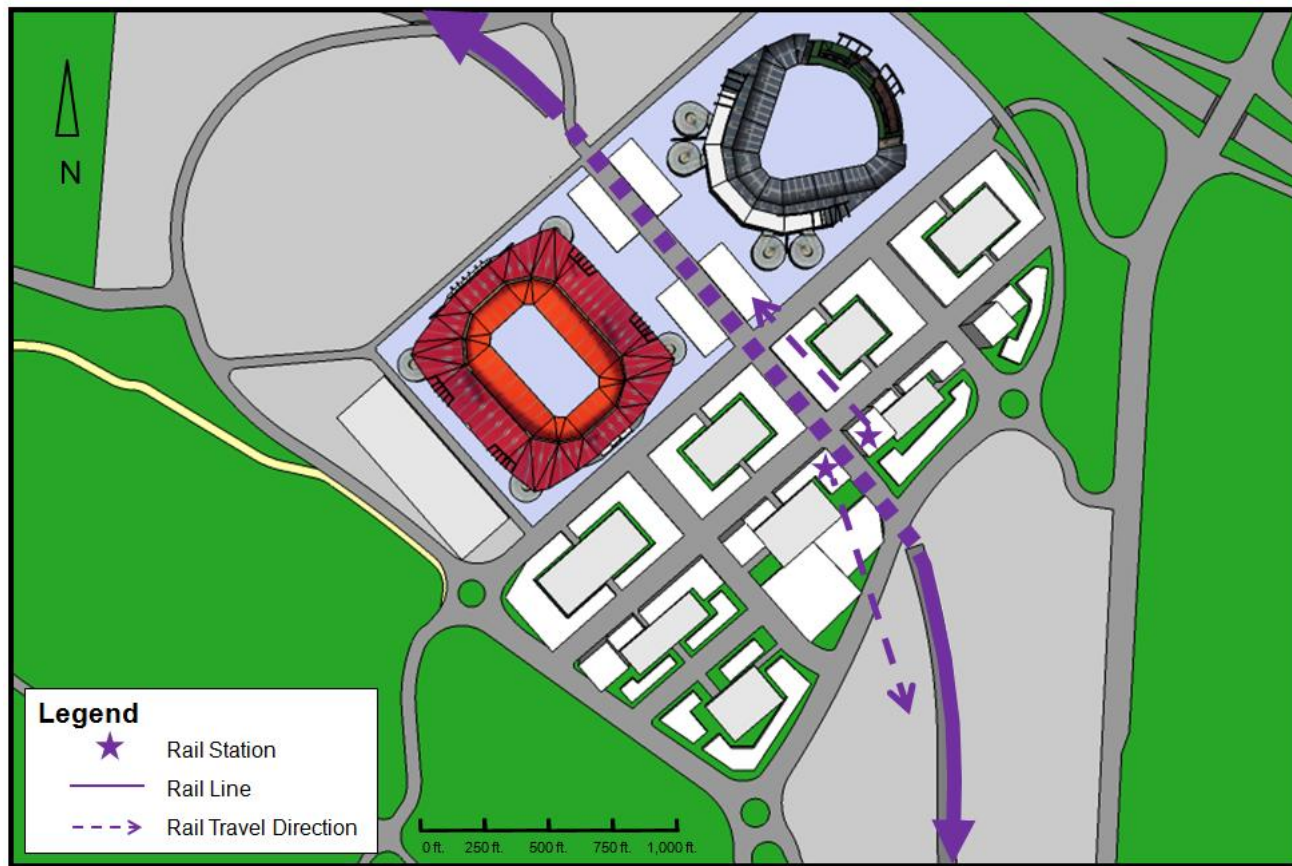


Figure 4.4. Proposed rail line realignment.

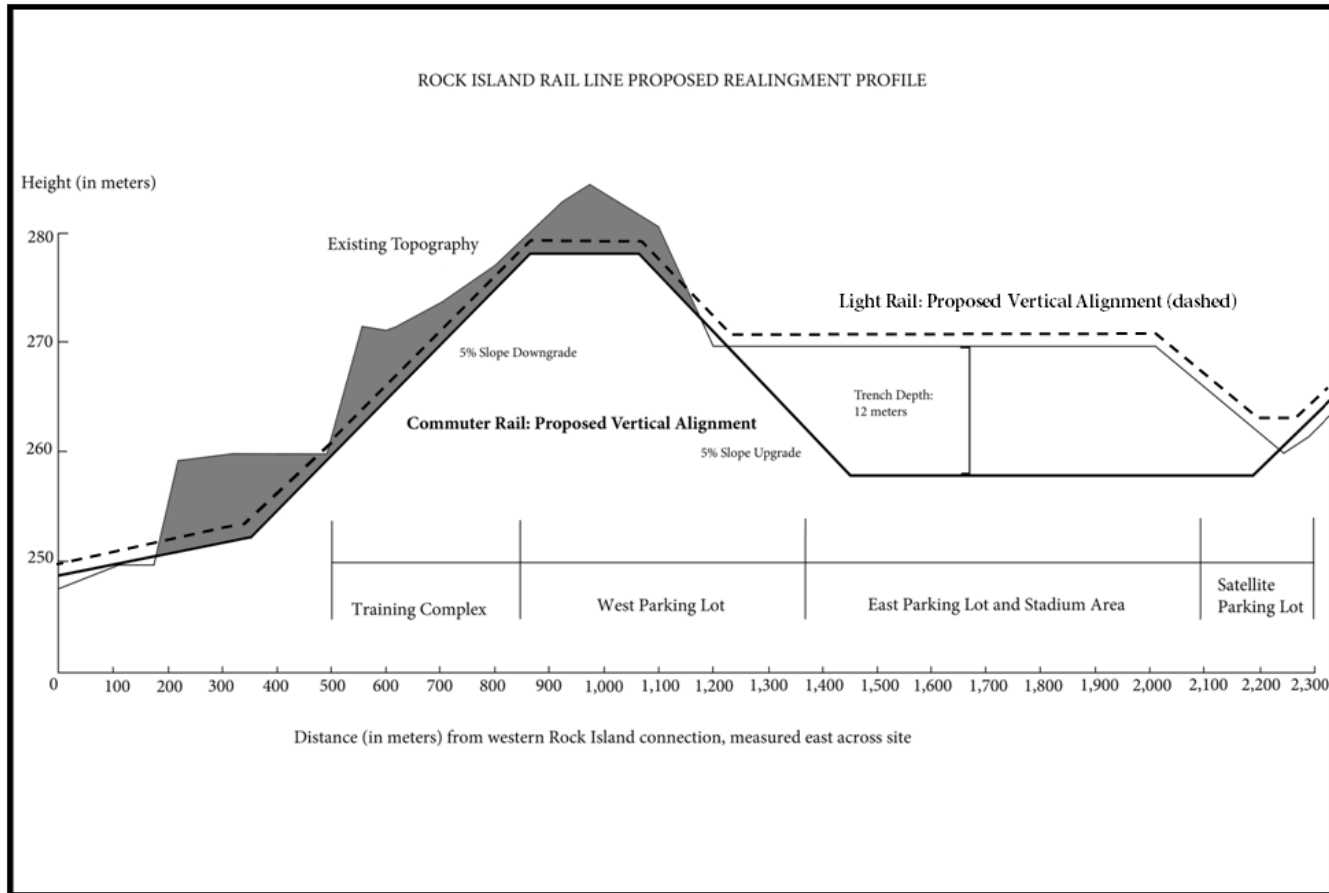


Figure 4.5. Vertical rail line realignment profile.

Interior Circulation and Streets

Another primary dilemma that the design for Stadium City seeks to address is to integrate pedestrian and vehicular traffic in a safe and efficient manner. The overall circulation strategy for the site is shown in Figure 4.6.

The first planned elements are the three proposed roundabouts at the edges of the developed portion of the site, whose purpose is to efficiently filter car traffic through four-way intersections and into the interior road network. The roundabouts allow increased access for vehicles while providing a speed-reduction transition between the auto-oriented environment at the exterior of the site and the permeable, pedestrian-friendly interior

In addition, we have divided the street system into 4 major classes of streets, which are designed to function in different ways. Table 4.2 shows the exact specifications for each of the street types, as well as a qualitative analysis of pedestrian-friendliness, development intensity, and noise for each street type.

The first street class is called interior collector, and consists of the ring road, which is the primary vehicular access-way to the site. Figure 4.7 shows a detailed section of the street, which has a 94 foot. right-of-way, four twelve foot vehicle lanes separated by a planted sixteen foot median into which left turn lanes can be cut. The sidewalks are each ten feet wide, with a small shrubbery buffer between the vehicle travel-way and the sidewalk.

The second-class street is called Stadium Street, and is the site's central pathway, connecting the transit station to the stadiums. Stadium Street is the most important, active, and visible street in the development, and thus demands its own unique type. It is planned to have the highest intensity land uses fronting it, and designed to carry pedestrian and vehicular traffic in equal volumes. While building massing does not strictly respond to the activity intended for Stadium Street, due to our desire to provide a the maximum variety of building types and activities in a cross-sectional experience for pedestrians the uses – especially pedestrian-oriented retail, restaurants, and services- are planned to correlate directly with Stadium Street, with active uses given priority.

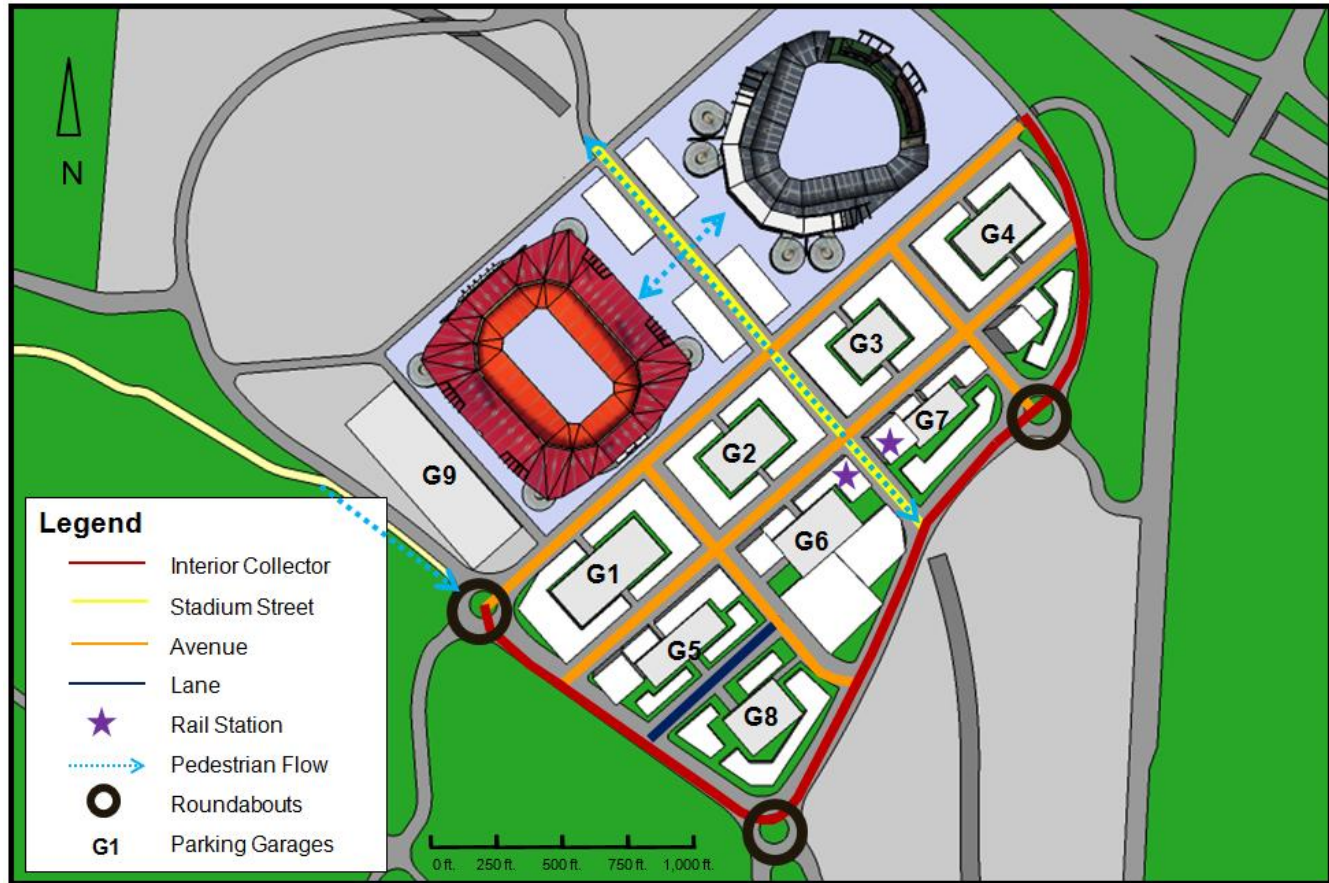


Figure 4.6. Interior circulation and proposed parking garage locations.

Figure 4.8 shows the heavy-rail configuration for Stadium Street, with two relatively-skinny 10.5 foot vehicle lanes and parallel parking on both sides of the street, which functions as effective buffers between the sidewalk and traffic. The curb contains a six foot bicycle track, which provides safety from the opening doors of parked cars. The bicycle track is separated from pedestrians by a planted six foot buffer, and the sidewalk itself is fourteen feet, providing ample space for pedestrian traffic. Figure 4.9 shows the light rail configuration for Stadium Street, which carries the two-track rail alignment in the center of the right-of-way rather than automobiles (each four-way intersection would need to be signalized in this circumstance in order to offer pedestrians, cyclists, and vehicles safe opportunities to cross the tracks). In this configuration, extra buffer space between the bicycle track and the rail lines is needed, which comes in the form of plantings and open space – a small shrub buffer is also provided between the pedestrian sidewalk and the bicycle pathway.

Next are the third-class streets, called avenues, which are likewise pedestrian-oriented, but somewhat different functionally from Stadium Street – the land

use activities associated with these streets are not intended to be as intense, with more of a residential side-street character. Figure 4.10 shows the layout of the avenues, with 78 feet of right-of-way, two thin travel lanes, parallel parking on both sides of the street, and wide fourteen foot sidewalks.

Finally, fourth-class streets are called lanes, with one planned currently on the site. These roads have a primarily residential character, and are slightly smaller and less friendly to automobiles than the others; Figure 4.11 shows the lane section, with slightly smaller sidewalks than previous streets in order to respond to the increased setbacks in this area of the site, which is primarily residential in character.

Figure 4.6 also shows the most important pedestrian flows – Stadium Street is intended to handle the strong flows expected to be generated between the rail stations and the stadiums, with the inter-stadium intended to act as a formal entrance point to the stadiums. A pedestrian connection from the proposed trail system to the interior of the development itself is also expected.

Class	R-O-W Width	Type	Speed Limit	Ped. Friendliness Rating	Dev. Intensity Rating	Noise Rating
1	94 ft.	Interior Collector	30			
2	90 ft.	Stadium Street: Commuter Rail Option	20			
2	92 ft.	Stadium Street: Light Rail Option	N/A			
3	78 ft.	Avenue	20			
4	74 ft.	Lane	15			

Table 4.2. *Characteristics of planned street types.*



Figure 4.7. *Street section showing Class 1 Interior Collector.*

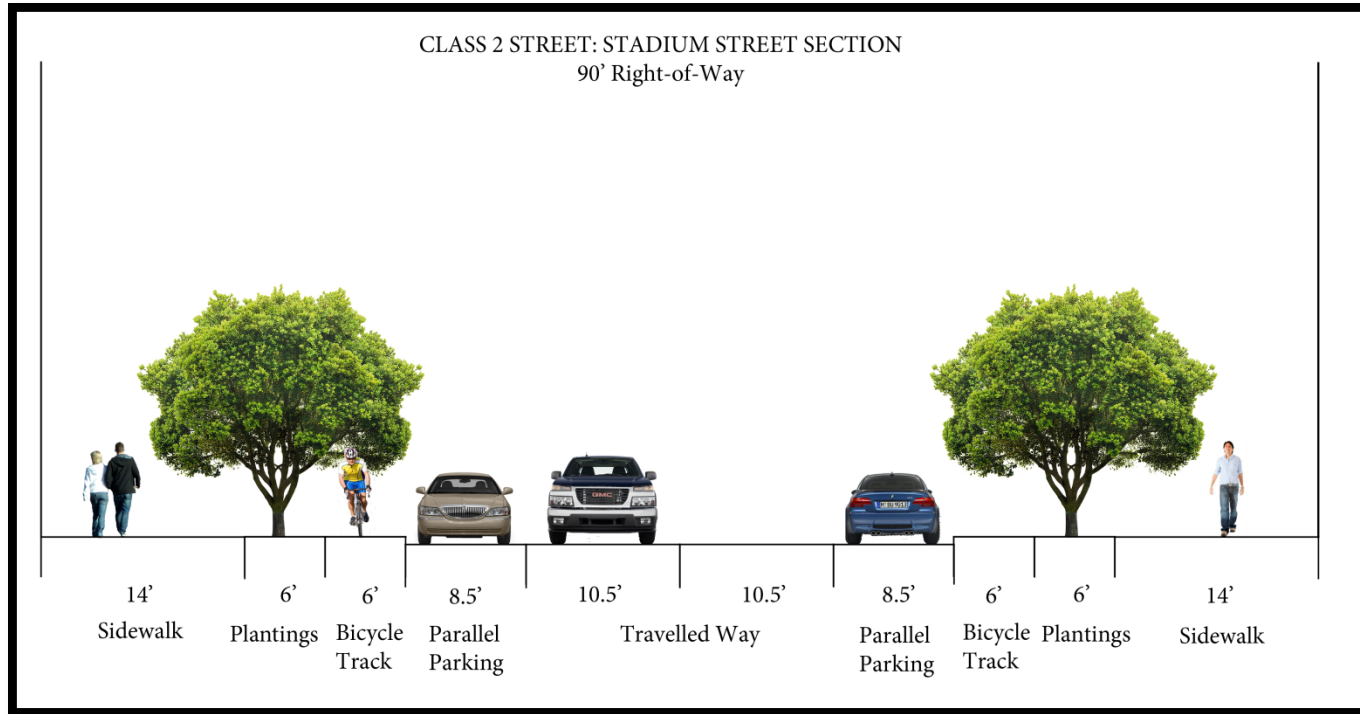


Figure 4.8. *Street section showing Class 2 Stadium Street.*

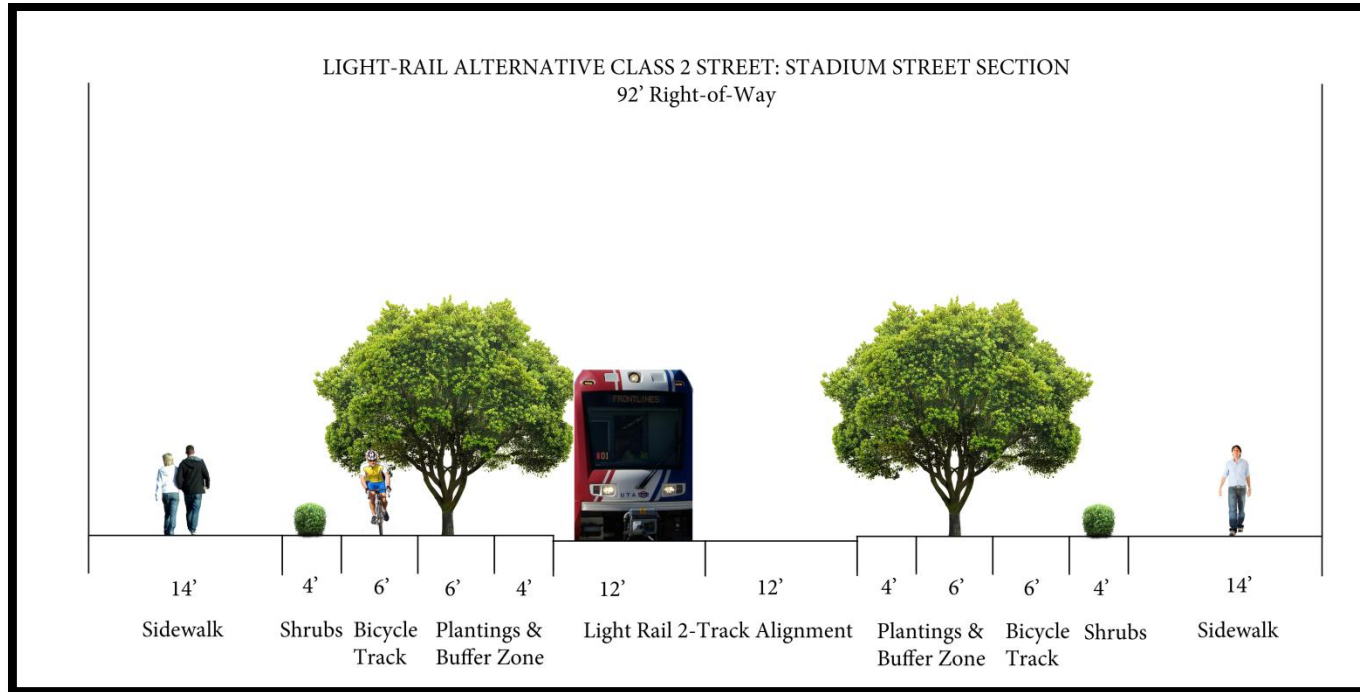


Figure 4.9. Street section showing light rail alternative for Class 2 Stadium Street.

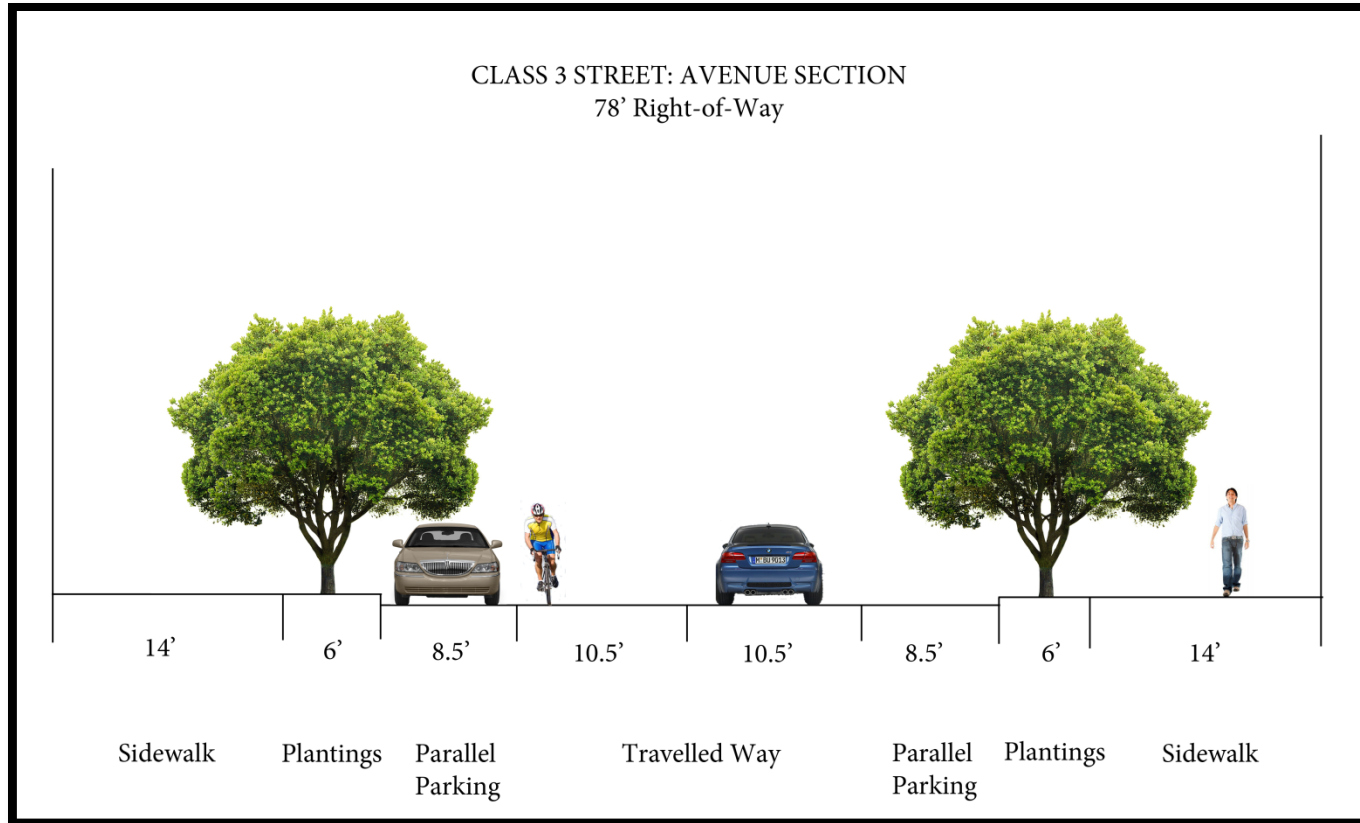


Figure 4.10. *Street section showing Class 3 Avenue.*

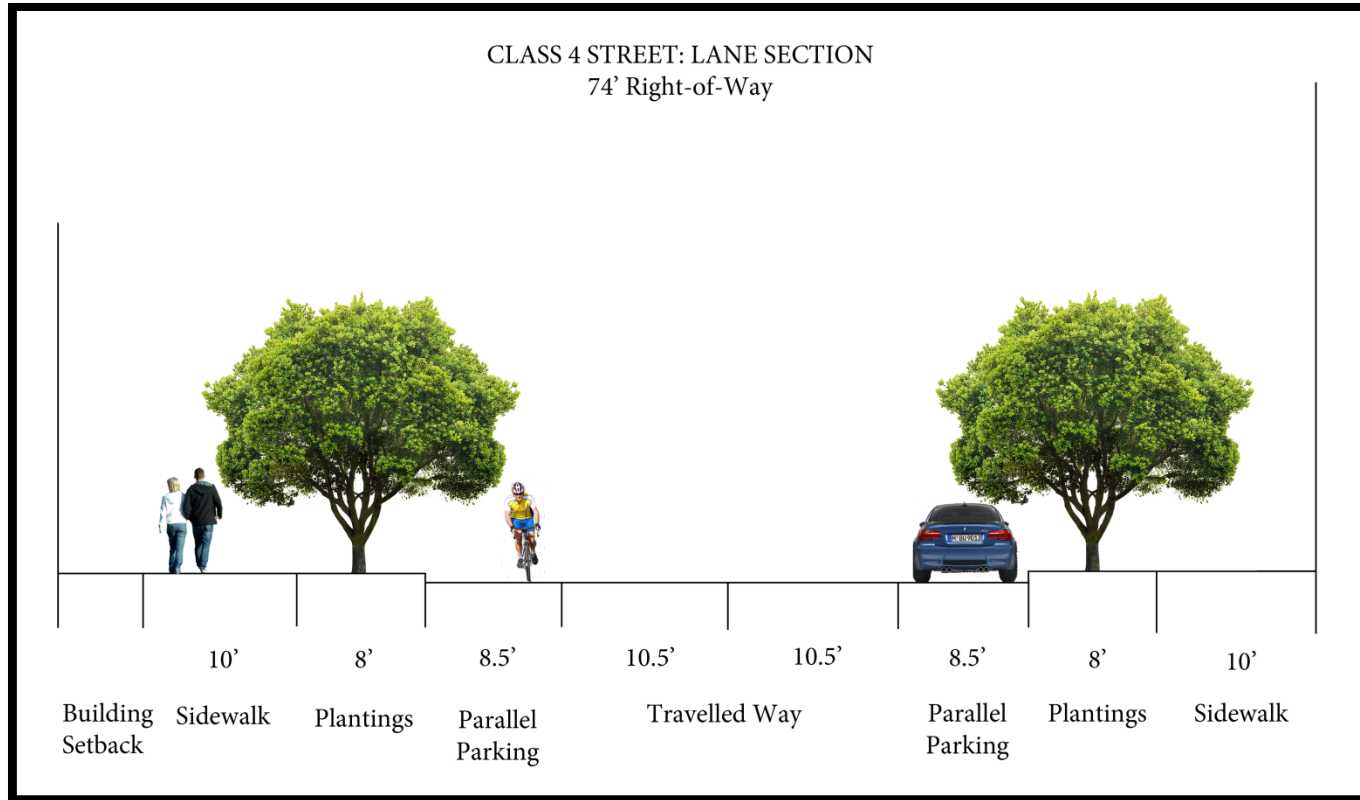


Figure 4.11. *Street section showing Class 4 Lane.*

Parking

The final transportation dilemma addressed through the Stadium City site plan is how to accommodate the massive amount of parking required. Due to the fact that the development will be built almost exclusively on existing parking lots, some 15,000 parking spaces are expected to be necessary to construct in order to provide even the bare minimum for the site, which is, even after the introduction of transit, a highly automobile-intensive site.

As shown in Figure 4.6, the concept guiding our parking provision strategy is to mitigate the negative effects of the necessary parking by a) aggregating the required spaces into nine parking structures and b) positioning them within the site's interior blocks. This concept, couple with alleyway access drives that do not cut across the prevailing direction of pedestrian travel (east to west), effectively buffer the structures from view of pedestrians and surround them with the active uses of the street front to ensure safety and accessibility. In addition, dispersing the parking garages on a block-by-block basis allows individual businesses and

residents convenient access to their own localized parking supply. Table 4.3 provides a description of the height and capacity of each parking structure –note that each garage features levels both above- and below-ground in order to eliminate the possibility of garages that are taller than the buildings which surround them. The garages range in height from two- to five-stories above ground, and in total size from 115,200 ft.² (roughly 384 spaces, based on a general assumption of 300 gross ft.² required per parking space) to 1,382,400 ft.² (some 4,608 spaces).

The final consideration necessary for parking is what to do on gamedays now that access to the site is no longer physically controlled by gates. Our suggestion is to institute pay-for parking in each garage, whose rates increase during gamedays. The option for merchants to validate parking on gamedays with purchases above a certain value should mitigate the disincentive to shoppers. The money gathered from parking could then be used for general maintenance of the rights-of-way, parking structures, and streetscapes in the entire development.

Garage #	Width	Length	Sq. Ft.	Stories	Lot Coverage	Total Sq. Ft.
G1	180'	420'	75,600	10 (5 above ground, 5 below ground)	100%	756,000
G2	180'	300'	54,000	10 (5 above ground, 5 below ground)	100%	540,000
G3	180'	240'	43,200	10 (5 above ground, 5 below ground)	100%	432,000
G4	180'	300'	54,000	10 (5 above ground, 5 below ground)	100%	540,000
G5	120'	360'	43,200	5 (3 above ground, 2 below ground)	100%	216,000
G6	180'	300'	54,000	8 (4 above ground, 4 below ground)	100%	432,000
G7	120'	240'	28,800	4 (2 above ground, 2 below ground)	100%	115,200
G8	180'	240'	43,200	5 (3 above ground, 2 below ground)	100%	216,000
G9	240'	720'	172,800	8 (5 above ground, 3 below ground)	100%	1,382,400
Total						4,629,600

Table 4.3. *Size and height of planned parking structures.*

Conclusions

While this chapter focuses primarily on the transportation aspects of the Stadium City plan, it explains our solutions to several specific issues:

1. The massing and zoning of the site concentrates development forms into layers of varying form and density, through which the primary east-west pathways that connect the transit station to the stadiums cut through. This creates an exciting visual experience while allowing the concentrated amount of development provided for in the program.
2. Realignment of the rail line through the center of site is vital to the success of a TOD at the Truman Sports Complex. Such realignment catalyzes pedestrian activity and provides more room for development within the critical quarter-mile pedestrian shed around the transit station.
3. In order to deal with potential vehicle and pedestrian conflicts, we have developed a detailed street typology. Stadium Street, which connects the station and the stadiums, is the primary focus of the development, with the highest pedestrian activity and development intensity.
4. To mitigate the negative effects of providing over 15,000 parking spaces on site, parking is provided in mid-block garages, buffered from the street by active uses.

V. How to Use This Plan

As the culmination of nearly eight months of work, this document contains a mass of specific analyses, background information, concepts, and ideas related to the successful implementation of a TOD at the Truman Sports Complex. And while these elements function coherently within the bounds of this document, I think it is important to provide an explanation of how this plan should actually be used, seeing as it is very unlikely that the coherent whole is ever realized in the way that is described here.

Lewis Hopkins, in his book *Urban Development*, explains how, why, and when plans are likely to be made – according to his analysis, situations in which plans are useful are in cases where decisions are “(1) interdependent, (2) indivisible, (3) irreversible, and (4) face imperfect foresight” (2001). The possible construction of a rail transit (or trail) system in the Rock Island Corridor according to MARC’s plans certainly fits these criteria – thus, it seems, the plan for Stadium City (which relates heavily to the rail transit decision) has the opportunity to be useful by offering

strategies to deal with the possibilities that surround investment in the Rock Island Corridor.

Of course, different plans are used and intended to be used in different ways – Hopkins denotes five, of which two seem especially relevant to the Stadium City plan – “vision” and “design” (2001). Plans function as visions when they “raise aspirations or motivate effort” or paint a picture of what is possible (Hopkins 2001). This focus for plans is also reflected in MARC’s *Creating Sustainable Places* document when it calls for “demonstrating new models” which, whether physical test cases or well-displayed representations, can work to change beliefs and excite people (2011). Certainly the Stadium City plan, by applying innovative design concepts to a familiar regional landmark, can function as a catalyzing vision that enables stakeholders and residents to imagine what is possible.

Plans that function as design, on the other hand, work “by figuring out a result for many interdependent actions before acting. It thus avoids the problems of interdependence, indivisibility, and irreversibility through a presumption of perfect foresight,” however, it is inevitable that even for built projects “the design concept breaks down over time...but still results in somewhat coherent forms” (Hopkins 2001). Certainly, the plan for Stadium City was created primarily in the mode of design (supported by analysis) by assuming perfect foresight, and seeing as it is not a part of a concrete development plan, it is almost certain that its overall concept will never fully be implemented. I think that it can still be imminently useful, however, as long as its internal logic is transparent and able to be used and applied in whatever concrete decisions are eventually made in the area. In that way, pieces of the plan’s individual parts may be able to help inform future relevant strategies.

To that end, Hopkins admonishes that “plans are more likely to be used, even by planners, if pointers are provided from decision situations to plans rather than

only from plans to decisions” (2001). He also notes that the importance of explaining the internal logic of the plan (the information that was used to make the specific recommendations found in the plan itself) is potentially more important than the specific concepts of the plan itself (Hopkins 2001).

With these recommendations in mind, Figure 5.1 provides a diagrammatic explanation of the internal logic of the Stadium City project document, framed by possible decision situations in which the content of the plan might be used. While there are of course many additional decision points in which information from this study might be useful, those pertaining to the possible location or viability or transit or TOD investment seem the most likely. Hopefully this diagram can function as an index to those interested in the future of the Rock Island Corridor, who, when facing the relevant decisions points listed on the left, may refer back to the content of this plan that will prove to be the most useful and informative based on the context of the situation.

Decision Situations

Whether or not to pursue transit on the Rock Island Corridor; where to locate transit stations on Rock Island Corridor.

Where to locate transit station at Truman Sports Complex site.

Whether or not a TOD at the Truman Sports Complex is economically viable or worth government investment.

How to regulate development around proposed transit stations.

Plan Section

Regional Analysis

Site Analysis

Market Analysis

Site Plan

Plan Findings/Recommendation

- Regional activity centers widely dispersed.
- Development at Truman Sports Complex would fill void in business and population density near to downtown
- Close to existing cultural and transportation infrastructure.

- East parking lot ideal for development.
- Rail line should be rerouted through center of site to maximize activity.
- Increased access to Raytown Road, across Blue Ridge Cutoff important.

- Medium-scale retail development is viable with strong tenants.
- Adequate density necessitates high-rise development with limited single-family options.

- Concentrate development intensity between station and stadiums.
- Concentrate parking mid-block and in garages..
- Design streets with parallel parking, skinny traffic lanes, and wide sidewalks.

Figure 5.1. *Internal logic of Stadium City plan and potential decision situations in which information might be used.*

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