# DENSITY DYNAMICS: A HOLISTIC UNDERSTANDING OF HIGH DENSITY ENVIRONMENTS

by

JOSE P. ABRAHAM

B.Arch., Nagpur University, 2000
M.S., Kansas State University, 2010

A REPORT

submitted in partial fulfillment of the requirements for the degree

MASTER OF REGIONAL AND COMMUNITY PLANNING

Department of Landscape Architecture/Regional and Community Planning
College of Architecture, Planning and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2014

Approved by:

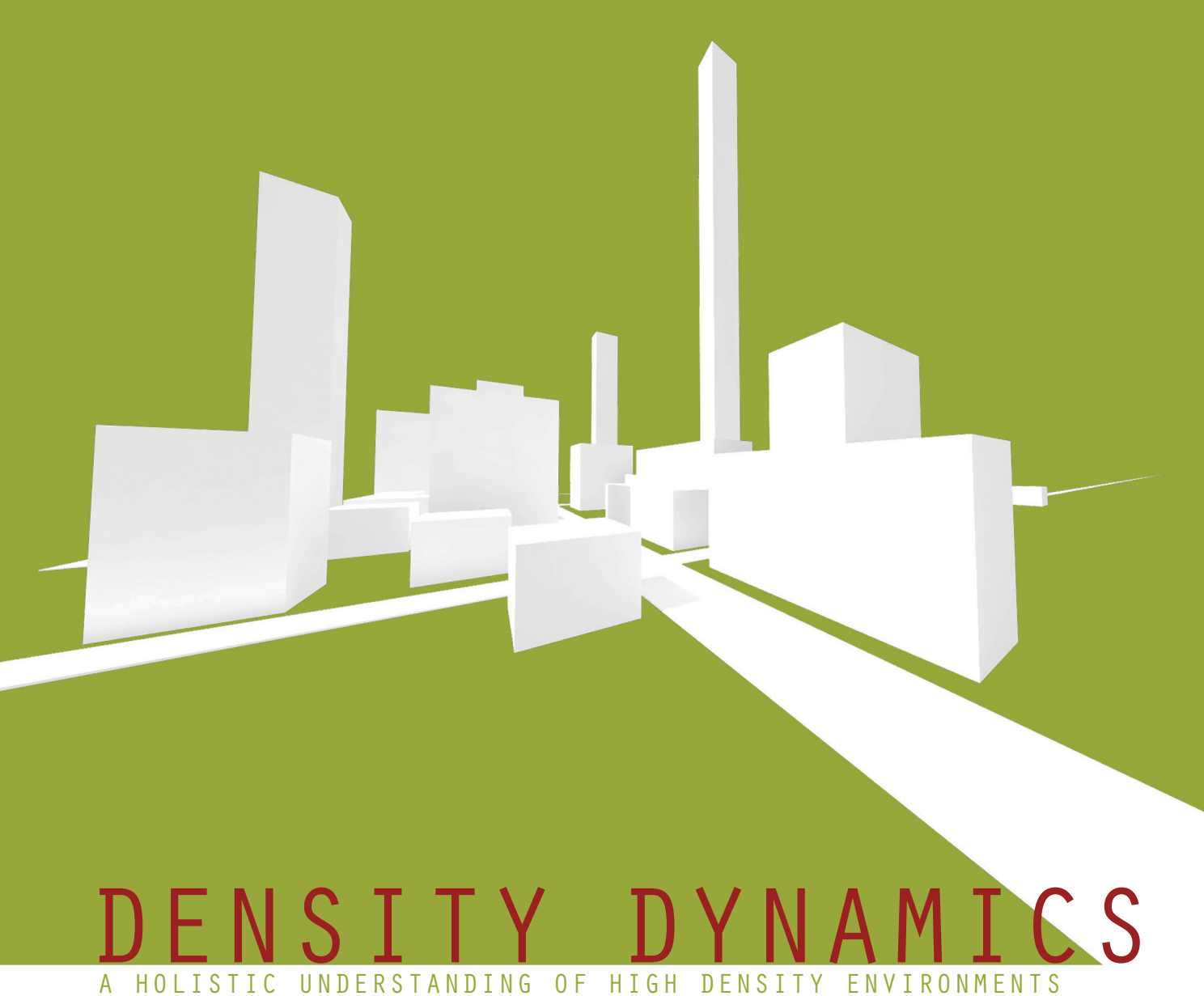
Major Professor
Dr. Jason Brody

# ABSTRACT

Today, achieving higher residential densities is an integral part of most discussions on concepts such as sustainability, placemaking, smart growth and new urbanism. It is argued that high density environments can potentially improve quality of life through a range of social benefits. In attempting to achieve these benefits, often times, developments that provide more than a certain number of dwelling units are considered desirable and successful high-density developments. However, understanding high residential density merely in terms of an increase in the number of dwelling units over an area of development might not help realize meaningful social benefits; in fact it could result in problems such as parking constraints, increased vehicular traffic, crowding, and eventually abandonment. This implies a dilemma of understanding high density environments holistically.

Using literature review and design exploration as two key research methods, this project aims at resolving this dilemma by presenting a holistic understanding of desirable high-density environments. The research works on the idea that high densities are a matter of design and performance. Through synthesis of literature review and explorative design findings, this research focuses on the qualitative aspects of high density environments that make them meaningful and desirable.

Through synthesis of literature review and design findings, the research finds that desirable high density environments should (a) Be Physically Compact; (b) Support Urbanity; and (c) Offer Livability and Sense of Place. These three qualitative aspects of high density environments are critical in determining how well such environments perform. The research further proposes eight meaningful goals and seventeen specific guidelines to achieve aforementioned three qualities that influence the performance of high density developments. In addition to these principles and guidelines, opportunities and challenges posed by explorative design exercises also allows identifying certain supplementary guidelines necessary to strengthen the framework. Together, these findings result in a theoretical framework that may be used as an effective design and evaluation tool in considering high density environments. This framework is named "Density Dynamics" to signify various morphological and socio-economic dynamics involved in a holistic understanding of high density environments.



# DENSITY DYNAMICS

## A HOLISTIC UNDERSTANDING OF HIGH DENSITY ENVIRONMENTS

**JOSE P. ABRAHAM**
Kansas State University
Masters Project & Report
Spring 2014

# DENSITY DYNAMICS: A HOLISTIC UNDERSTANDING OF HIGH DENSITY ENVIRONMENTS

by

JOSE P.ABRAHAM
B.Arch., Nagpur University, 2000
Master of Science in Architecture, Kansas State University, 2010

A REPORT
submitted in partial fulfillment of the requirements for the degree

MASTER OF REGIONAL AND COMMUNITY PLANNING
Department of Landscape Architecture/Regional and Community Planning
College of Architecture, Planning and Design

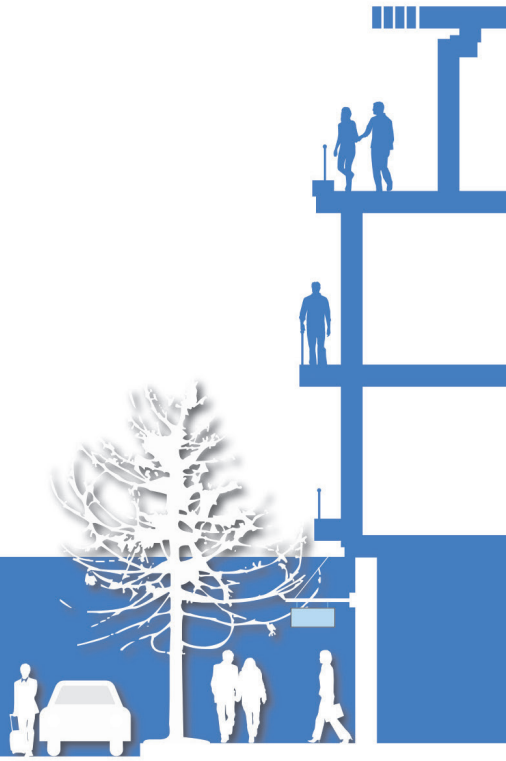
KANSAS STATE UNIVERSITY
Manhattan, Kansas

2014

Committee:
DR. JASON BRODY, MAJOR PROFESSOR
BLAKE BELANGER, COMMITTEE MEMBER
GARY STITH, COMMITTEE MEMBER

Approved by:
Major Professor

DR. JASON BRODY



CITY DENSITIES ARE A MATTER OF PERFORMANCE AND CANNOT BE MERELY BASED ON MATHEMATICAL CALCULATIONS OF THE AMOUNT LAND NEEDED FOR A CERTAIN NUMBER OF PEOPLE.....JANE JACOBS (1961)

# ABSTRACT

Today, achieving higher residential densities is an integral part of most discussions on concepts such as sustainability, placemaking, smart growth and new urbanism. It is argued that high density developments can potentially improve quality of life through a range of social benefits. In attempting to achieve these benefits, often times, developments that provide more than a certain number of dwelling units are considered desirable and successful high-density environments. However, understanding high residential density merely in terms of an increase in the number of dwelling units over a given geographic area does not guarantee meaningful social benefits; in fact it could result in problems such as parking constraints, increased vehicular traffic, crowding, and eventually abandonment. This implies a dilemma of understanding high density environments holistically.

Using literature review and design exploration as two key research methods, this project aims at resolving this dilemma by presenting a holistic understanding of high-density environments. The research works on the idea that meaningful high density environments are a matter of design and performance. Through synthesis of inputs from literature review and explorative design projects, this research focuses on the qualitative aspects of high density environments that make them meaningful and desirable.

Through synthesis of literature review and design findings, the research finds that meaningful high density environments should (a) Be Physically Compact; (b) Support Urbanity; and (c) Offer Livability and Sense of Place. These three essential qualities of meaningful high density environments are critical in determining how well such environments perform. The research further proposes eight meaningful goals and seventeen specific guidelines to achieve aforementioned three qualities that influence the performance of high density developments. In addition to these principles and guidelines, opportunities and challenges posed by explorative design exercises also allows identifying certain supplementary guidelines necessary to strengthen the framework. Together, these findings result in a theoretical framework that may be used as an effective design and evaluation tool in considering high density environments. This framework is named “Density Dynamics” to signify various morphological and socio-encomic dynamics involved in a holistic understanding of high density environments.

# ACKNOWLEDGEMENT

# ACKNOWLEDGEMENT

First of all I am thankful to my committee —Dr. Jason Brody; Prof. Blake Belanger; and Prof. Gary Stith—for their support, guidance, and patience throughout the project. This project would not have been possible without the support of my committee. I also thank all the team members of Urban Design and Development umbrella group and ULI competition project for their valuable inputs, involvement and zeal. Thanks Kevin Credit, Bryan Zundel, and James Rivers for all your help, support, and friendship. Special thanks to the staff at the Department of Landscape Architecture and Regional Planning, especially Jodi Fronce and Jayna Elsasser for all the help and support. I also thank the staff at Paul Weigel Library for their sincere endeavors towards empowering students. Their help, support, and guidance was vital in the completion of this project.

I thank all my professors who together have set the foundation for this project. I specially thank our department head Stephanie Rolley for being a great administrator and efficiently addressing the needs, aspirations and problems of students. Special thanks to the planning staff at the City of Manhattan for their help and guidance. I finally thank my family and friends for their constant support, encouragement, and faith in me.

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF FIGURES

## 1.0 INTRODUCTION



## 2.0 METHODOLOGY AND PROCESS



## 3.0 LITERATURE REVIEW



## 4.0 EXPLORATIVE DESIGN

# LIST OF FIGURES

## 4.0 EXPLORATIVE DESIGN



## 5.0 SYNTHESIS

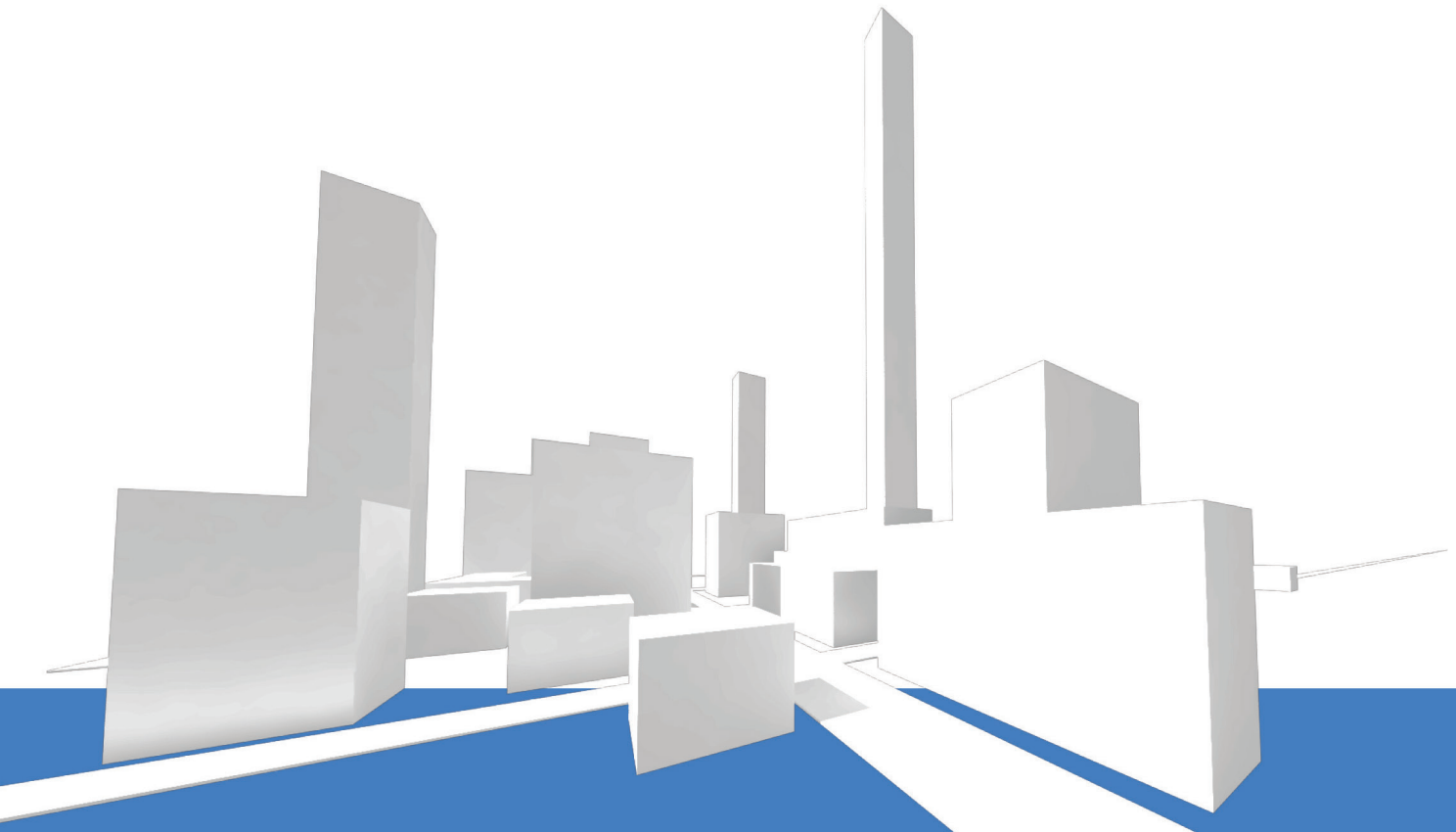
# LIST OF FIGURES

## 5.0 SYNTHESIS

# CHAPTER 1
# INTRODUCTION

# 1





EVEN THOUGH DENSITY IS A SCALE TO MEASURE CONCENTRATION OF PEOPLE, ANY STUDY OF HIGH DENSITY DEVELOPMENT WOULD BE DEVOID OF INTELLECTUAL OR SOCIAL SIGNIFICANCE IF LIMITED TO THE TECHNICAL DEFINITION OF THE CONCEPT (CUTHBERT,1985,P.81)

# INTRODUCTION

Density is one of the most familiar terms in the realm of planning and urban design. It is a scale to measure the concentration of people over a specific geographical area (Cheng, 2010, p. 03). Even though density is a mere scale to measure concentration of people, it is much complex in its outworking in planning and urban design practices. Density of built environments has for long been a matter of importance to both professionals and general public. In the past, planners and designers have wrongly associated high density with all sorts of environmental and social problems, and therefore, have promoted relatively lower density suburban environments (Jacobs, 1961, p. 202). Density is also a cultural issue amongst general public because when it comes to residential preferences, people have a psychological affinity for low density environments (large lot, single-family developments). As a result of various inter-related socio-economic factors; sprawling, low density, suburban environments emerged as a predominant development pattern. However, recent debates about a sustainable and desirable way of creating built environments and managing growth has led several scholars and practitioners to reconsider high density environments. This master's report focuses on high density environments. The report aims at suggesting relevant design principles and guidelines to create meaningful high density environments based on a holistic understanding of various dynamics associated with the concept of density.

## 1.1 DILEMMA AND QUESTIONS

Recent identification of low density sprawling suburban growth as an undesirable pattern has renewed the focus on a need for high density and compact developments. It is argued that high density environments offer better quality of life while reducing resource consumption, thereby, making it a more sustainable approach (Carmona,

SOURCE: ALEX MACLEAN, HTTP://WWW.ALEXMACLEAN.COM/ (USED WITH PERMISSION)

SOURCE: HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/B/B9/PRUITT-IGOEUSGS02.JPG, (ACCESSED ON SEPTEMBER 21, 2013)

## ...A DILEMMA OF DIFFERENTIATING BETWEEN HIGH DENSITY ENVIRONMENTS AND DESIRABLE OR MEANINGFUL HIGH DENSITY ENVIRONMENTS....


SOURCE: HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/3/3E/TOWN_BROOKHAVEN_1.JPG, ACCESSED ON SEPTEMBER 21, 2013)

Heath, Oc, & Tiesdell, 2003, p. 183). However, high density may be understood in many different ways due to the relative nature of the concept. As a result, often times high density developments become restricted to a concentration of residential units. Such development projects even though are high density environments may not be any different from low density suburban environments in its performance. So it seems that there is a dilemma of differentiating between high density environments and meaningful/ beneficial high density environments. Also, even though density is a quantitative measurement, it has immense qualitative implications. So any valuable study on density should not be limited to technical definition of the concept but extend to its qualitative implications (Cuthbert, 1985, p. 81).

Driven by the dilemma of being able to understand what meaningful high density environments are and understanding the qualitative implications of the concept of density, this report attempts to answer the following two research questions:

1) What constitutes a holistic understanding of high density environments?
2) How can we create meaningful high density environments?

## 1.2 RELEVANCE

The concept of density is foundational to planning and urban design practices. A thorough understanding of the concept is necessary for every planning and urban design professional. A pressing need for high-density environments have been emphasized by several scholars and professionals. There has been a growing trend of market and housing preferences for high density environments (Nelson, 2013, p. 108). Considering the need for high density environments and the benefits associated with it, a holistic study of the concept of density and specifically high density environments becomes highly relevant to the planning profession. Therefore, as a regional and community planner, acquiring a holistic understanding of various dynamics of urban density would prove helpful in building better places. This report can serve as a guide for planners to better understand the qualitative implications of high density environments. Additionally, specific design guidelines for meaningful high density environments prescribed in this report can help in planning decisions for new and redevelopment projects.

## 1.3 PROJECT SET-UP

The master's project was set up as a collaborative meshwork between four students who while working on individual focus areas operated as an umbrella group with a general focus on urban design and development. This umbrella group was led by Dr. Jason Brody and the group comprised of Kylie Harper, Derek Hoetmer, Bryan Zundel, and I. The collaborative meshwork allowed a meaningful integration of individual research projects with two group projects.

(a) Revitalization proposal for Village Plaza in Manhattan, KS; (MHK Project);
(b) 2013 Annual Gerald D. Hines Student Urban Design Competition (ULI Competition Project)

The Urban Design and Development (UDD) group functioned as a meshwork through Fall 2012 and Spring 2013, assembling and applying knowledge from group, team, and individual research levels. While the research project provided a knowledge base for the two group projects, the group projects gave the opportunity for design exploration of theoretical and conceptual ideas involved in individual research projects. The individual research topics of the UDD group complemented one another, thereby allowing knowledge sharing, skill sharing, and accountability. The meshwork had two teams so

as to develop two entries in the 2013 ULI - Gerald D. Hines Student Urban Design Competition. The teams included a diverse collection of graduate students, who developed plans for a large-scale site with complex demands and challenges. While the purpose of entering this competition was to win, it was also to explore individual research areas (UDD, 2012). The MHK Project was utilized as a preparation for the ULI competition and as another medium to further explore individual research topics.

During the course of the meshwork, there were several stakeholders involved. The team was led and guided by Dr Jason Brody who served as my Major Professor. Other faculty members who served as committee to the team members and offered valuable inputs were Blake Belanger and Gary Stith. The team had regular guidance and inputs for the MHK Project from the planning staff at City of Manhattan. For the ULI competition, the team was joined by three other members Andrew Heermann and Laurel Johnston, fourth year architecture students from Kansas State University and Jonathan Arndt from University of Missouri (Figure 1.1).

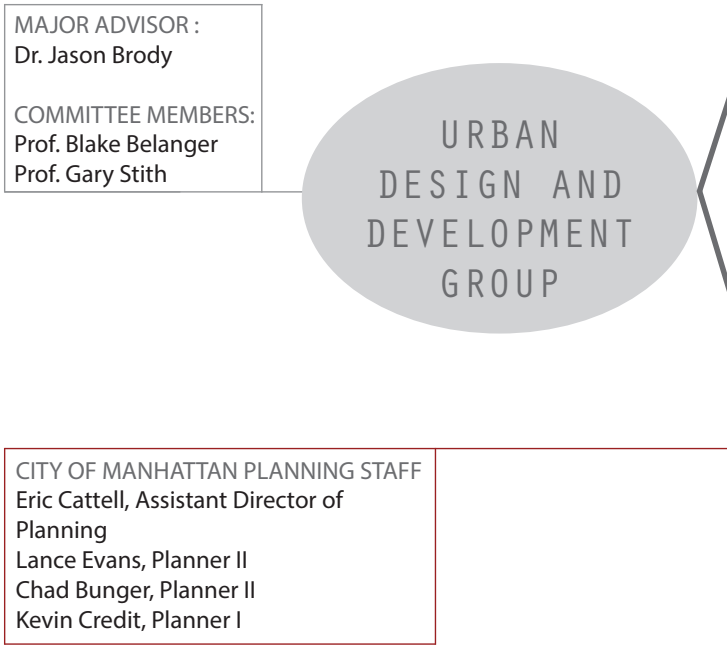
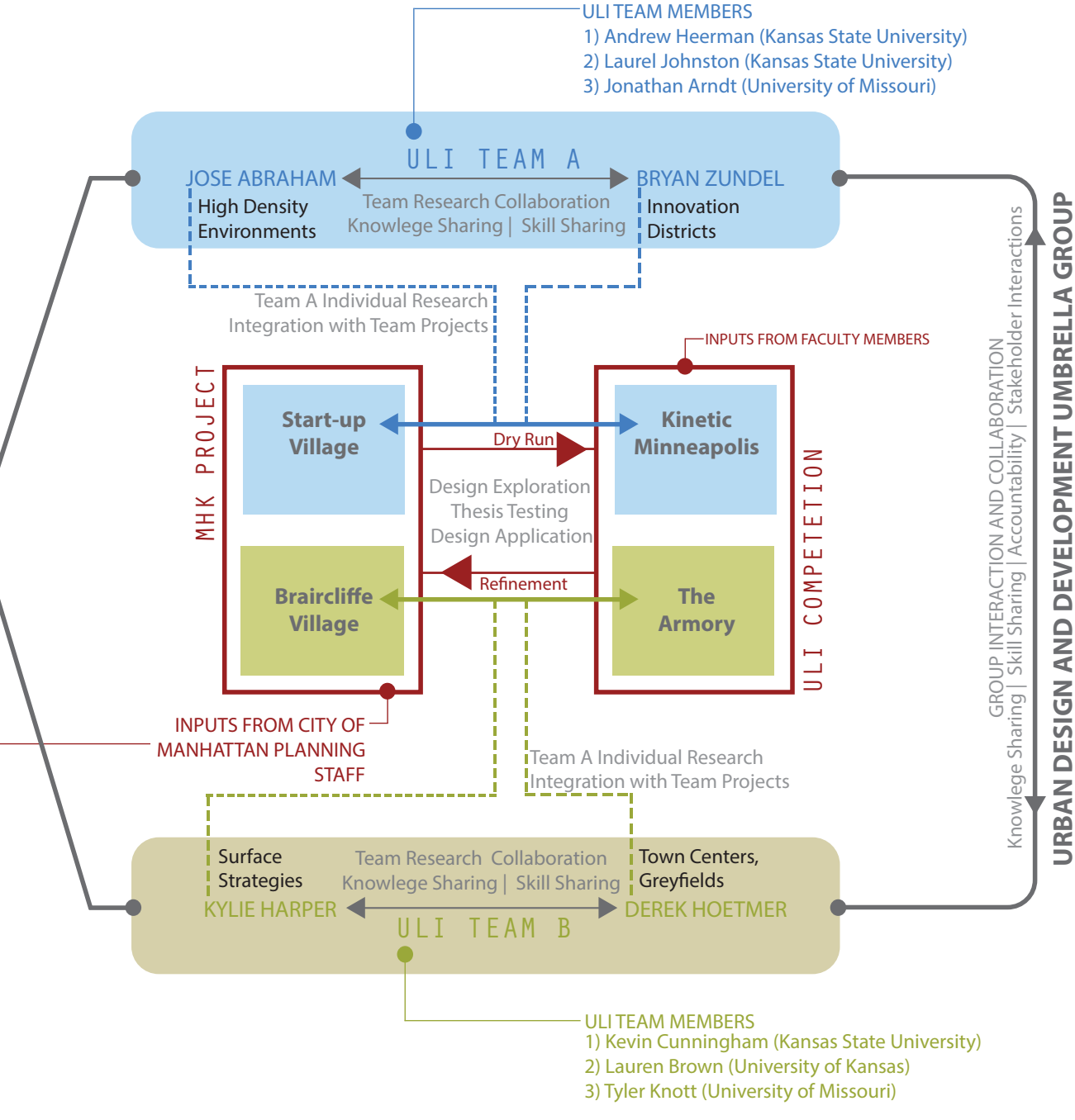



FIGURE 1.1: REPRESENTATION OF COLLABORATIVE MESHWORK AND GROUP ORGANIZA

## 1.4 PROJECT OVERVIEW

The following chapters discuss the various aspects of the project in detail. However, Figure 1.2 provides a general overview of the project graphically.

The first step to the research process is literature review, which is done in two parts. A preliminary literature review establishes the dilemma for the project and also explores the concept of density and its various implications. Preliminary literature review studies density measurements, complexities associated with the concept of density, and the need for high density environments. Based on insights from




Start-up Village: Design Proposal for MHK Project by Team A
Braircliffe Village: Design Proposal for MHK Project By Team B
Kinetic Minneapolis: ULI Competetion Entry by Team A
The Armory: ULI Competetion Entry by Team B

TION (BY AUTHOR, 2013).

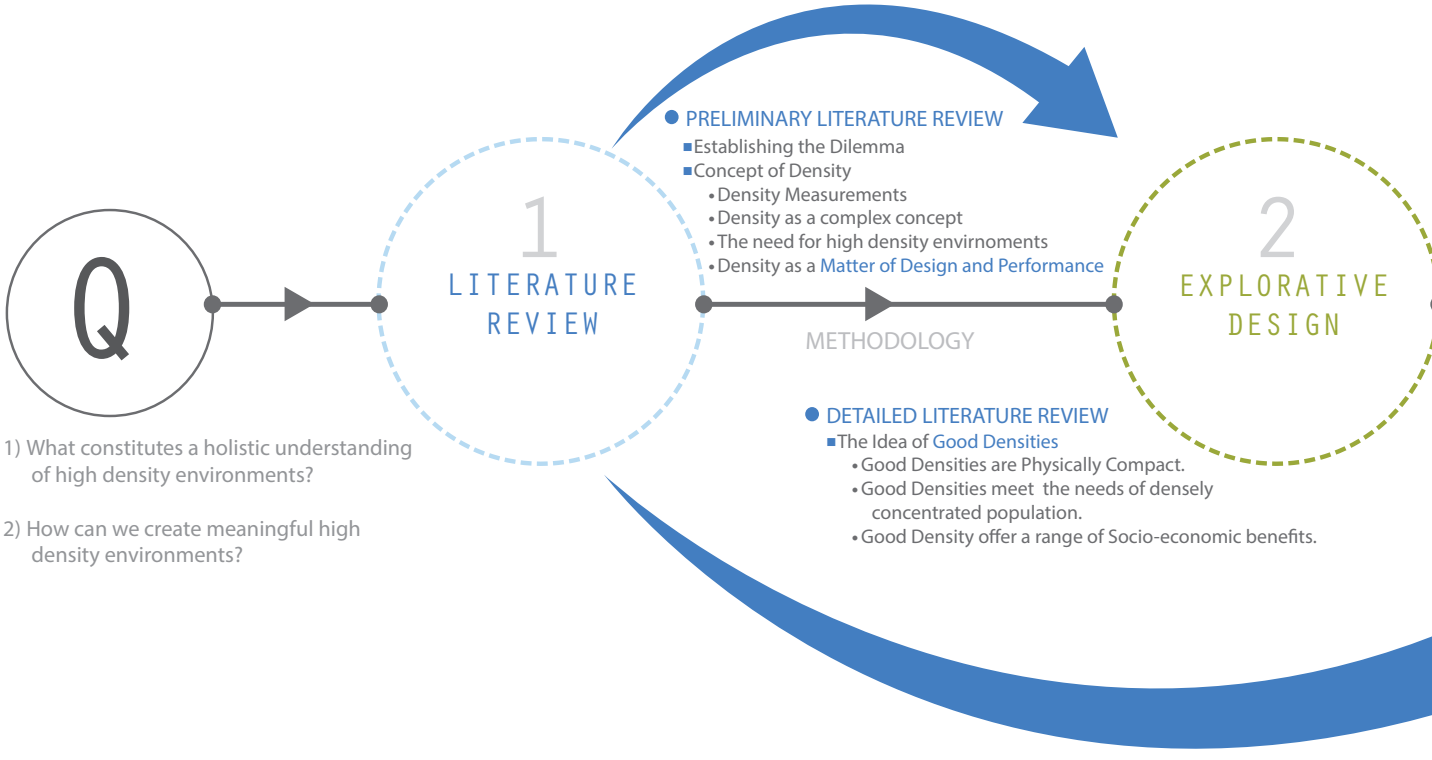
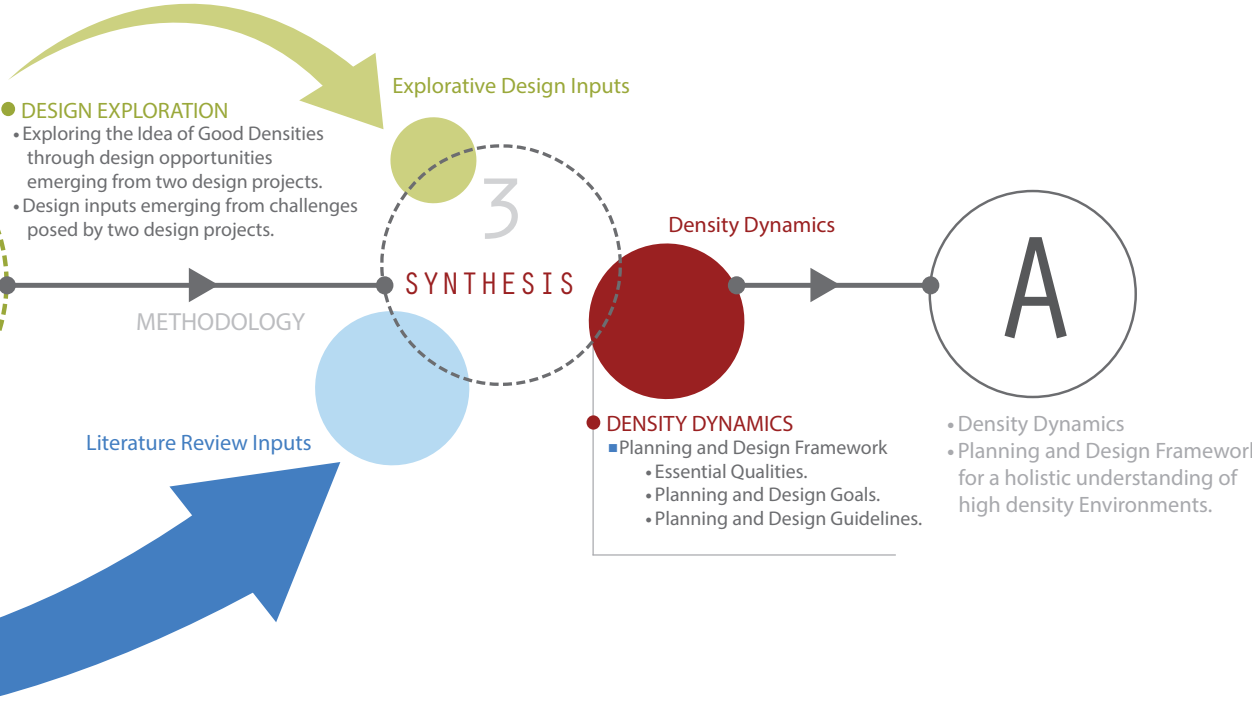



FIGURE 1.2: PROJECT OVERVIEW (BY AUTHOR, 2014).

the aforementioned topics and certain specific literature sources, preliminary literature review establishes that high density environments are a matter of design and performance. This forms the basis for detailed literature review, which is that a holistic understanding of high density environments should be based on qualitative aspects of density. Through a wide range of literature sources, detailed literature review studies high density environment based on the idea of good densities. Good densities, according to various scholars and theorists, should (a) be physically compact; (b) meet the needs of a densely concentrated people; and (c) offer a range of socio-economic benefits. Literature review provides a range of concepts, principles, and design inputs related to the aforementioned aspects of good densities. Even though the literature review findings are comprehensive, they require further exploration and organization for a holistic understanding of meaningful high density environments.

The second step to the research is explorative design. Through two design exercises of varying contexts, literature review findings are further explored in terms of application. The purpose of explorative design exercises is two fold.



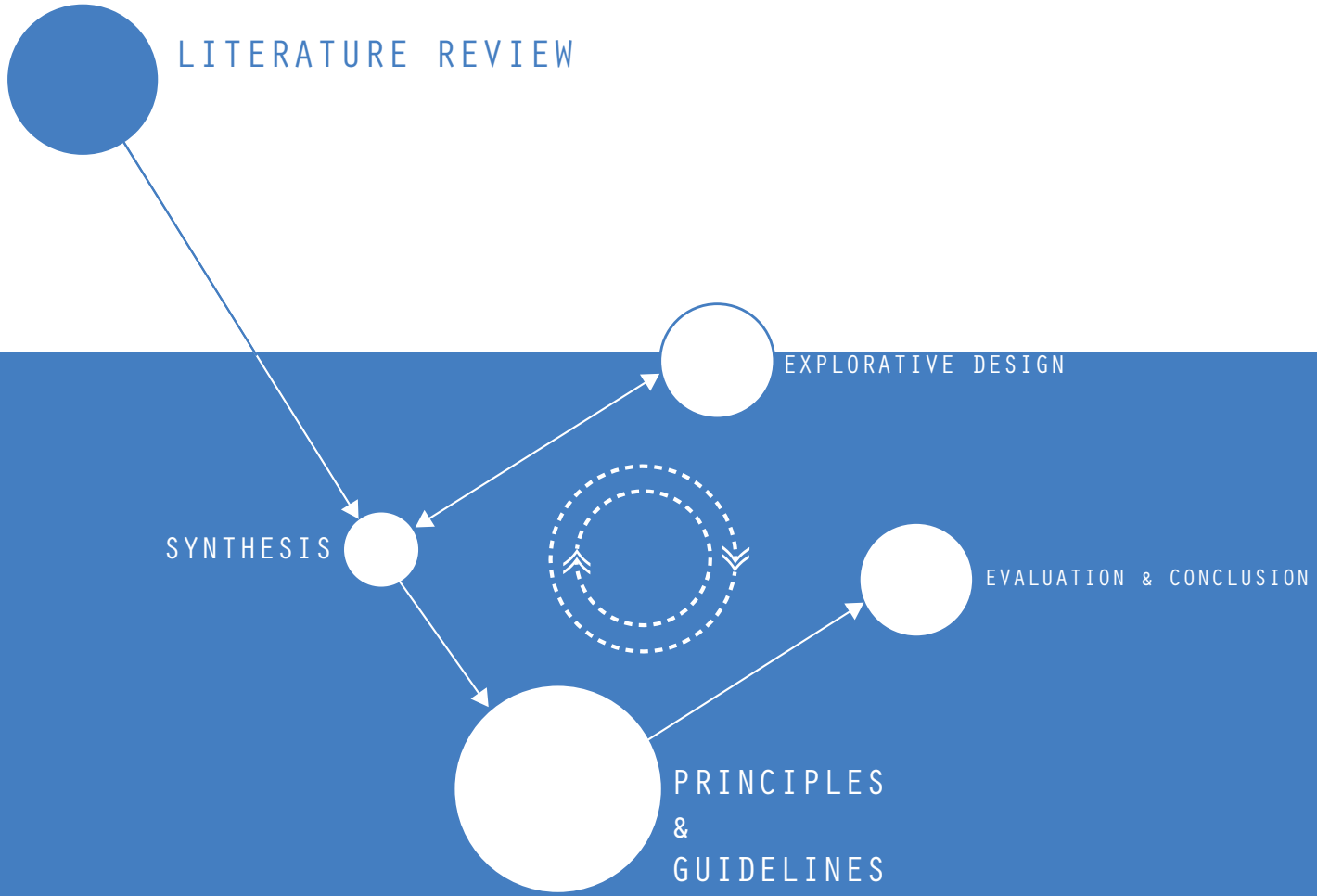

Firstly, design opportunities emerging from the projects allow exploring literature review findings in terms of its application. Secondly, design challenges emerging from the projects help in identifying additional design inputs and suggestions to supplement literature review findings.

The third step in the research process is to synthesize literature review and explorative design findings into a meaningful framework that provides a holistic understanding of high density. The synthesis process assimilates and conjoins literature review and explorative design into a framework named Density Dynamics whose elements provide a theoretical understanding of essential qualities of meaningful high density environments, design goals which includes essential qualities of meaningful high density environments, relevant design goals, and specific guidelines that can contribute to creating and understanding meaningful high density environments. The framework is structured in such a way to function both as an evaluation tool as well as a design tool in considering high density environments.

# CHAPTER 2
# METHODOLOGY AND PROCESS

# 2





# METHODOLOGY AND PROCESS

There were two questions to be answered through this research project; (1) What constitutes a holistic understanding of high density environments, and (2) How can we create desirable high density environments? These questions were answered through an articulated methodology comprising literature review, explorative design exercises, and synthesis of findings from literature review and explorative design exercises.

Literature review provided a theoretical understanding of various concepts related to high density environments. The process of literature review included identifying, classifying, reviewing, and analyzing relevant literature sources. Explorative design provided an opportunity to visualize various theories and design ideas in two distinct real world scenarios—Village Plaza in Manhattan, KS; and 2013 Annual Gerald D. Hines Student Urban Design Competition, organized by the Urban Land Institute (ULI). Explorative design exercises also served as a platform to explore design challenges and design measures that contributed to a better understanding of high density environments. Finally, findings and conclusions drawn from literature review and explorative design were synthesized to develop a framework of concepts and guidelines that answers the two key research questions adequately.

Even though this project uses two distinct methods, the process of literature review and design exploration were intermingled and simultaneous to enable a logical synthesis of a clear and articulated understanding of high density environments. Figure 2.1 illustrates the details of the methodology and process of this project. Individual elements of the methodology—literature review, explorative design, and synthesis—are elaborated in the following sections.

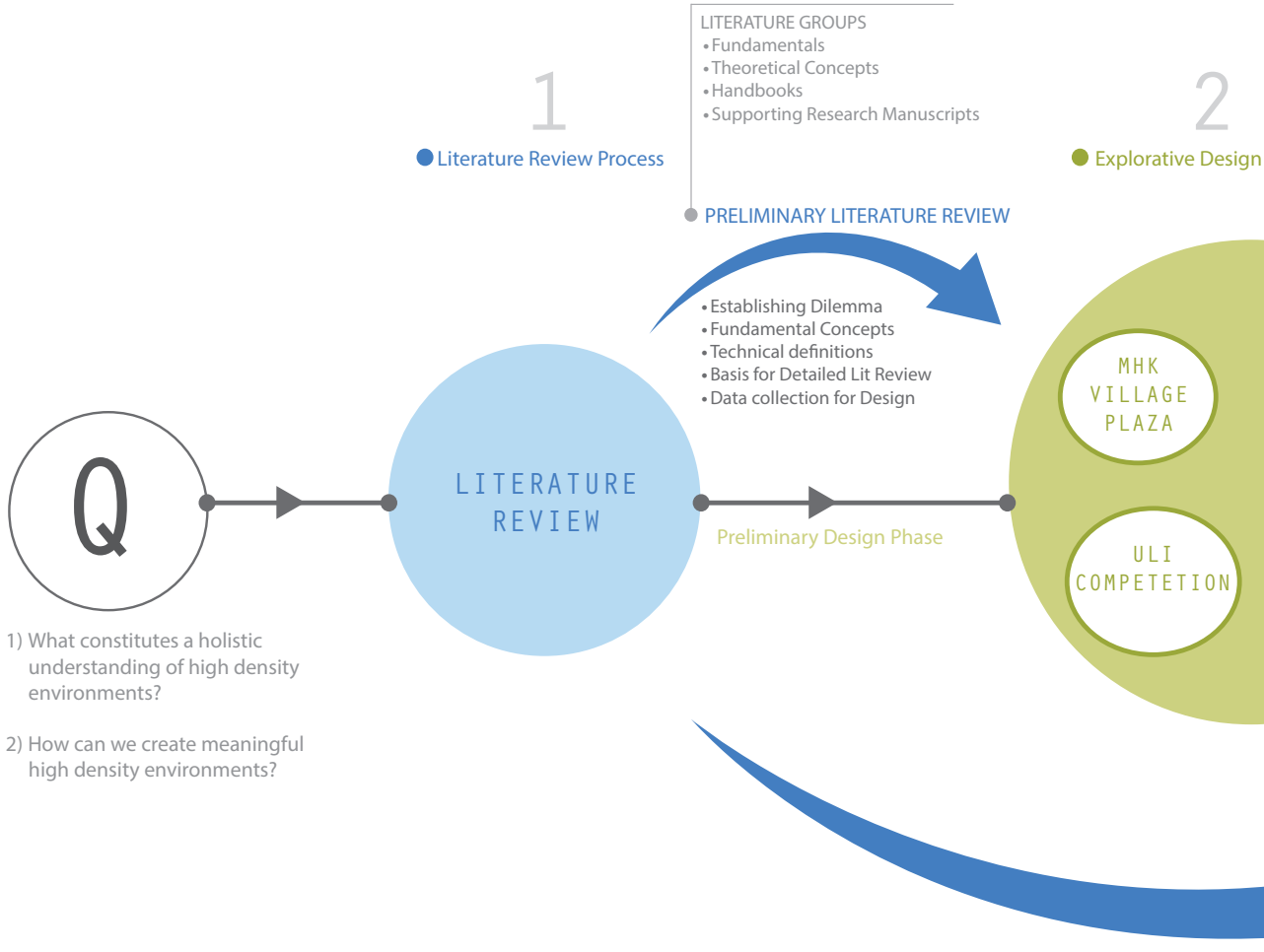
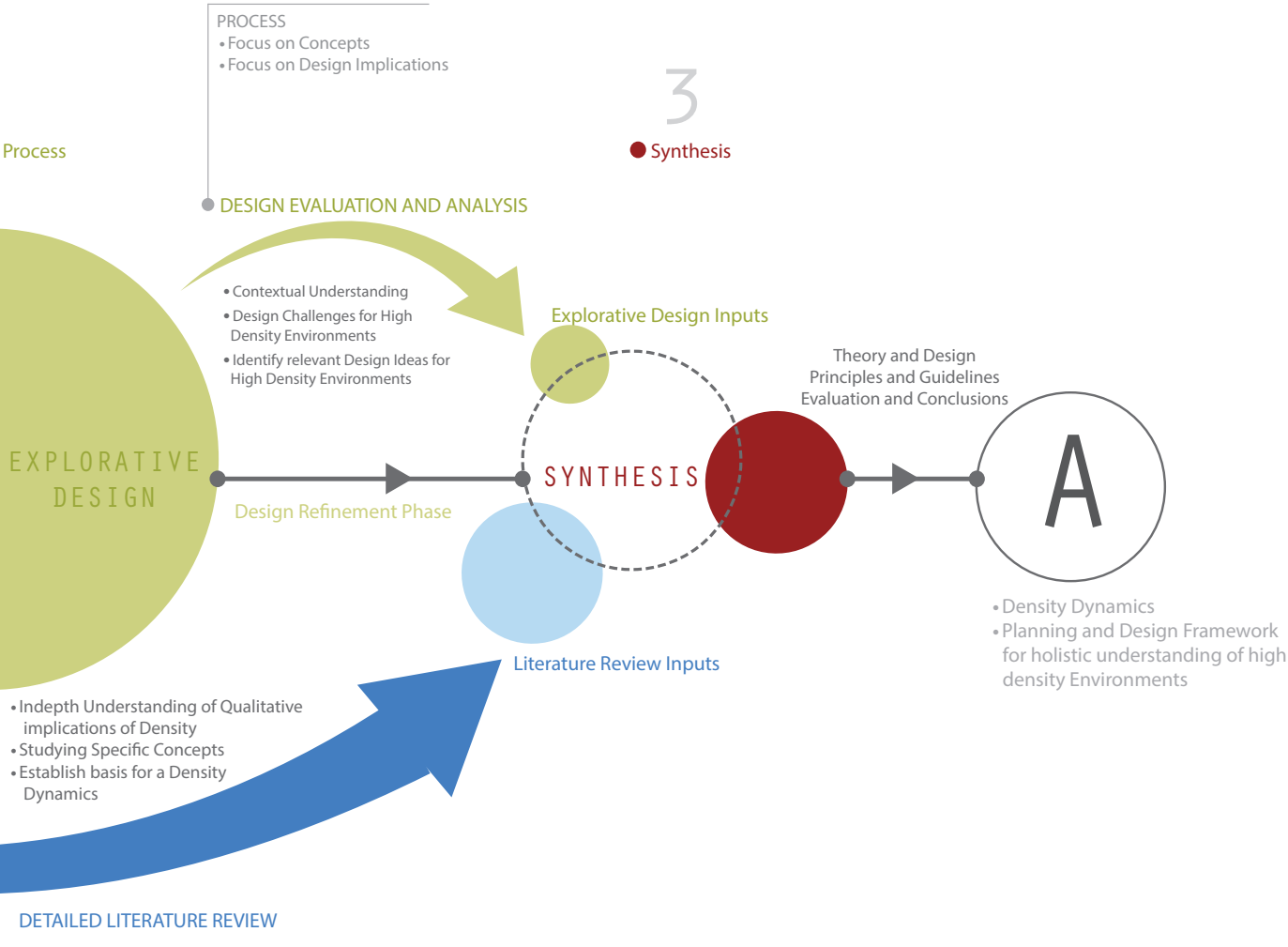



FIGURE 2.1: METHODOLOGY AND PROCESS DIAGRAM (BY AUTHOR, 2013).

## 2.1 LITERATURE REVIEW PROCESS

Literature review formed a key component of the research methodology. Literature review consisted of a preliminary literature review that established a basis for the project and provided fundamental understanding of the concept of density alongside its implications in urban design. Literature review further involved a detailed review of relevant literature sources that established a more holistic understanding of the concept of density.

Preliminary literature review suggested that high density environments should be understood as a matter of design and performance. A detailed literature review explored various aspects of design and performance related to creating meaningful high density environments. A wide range of literature sources were used to understand and substantiate specific concepts and ideas relating to design and performance of high density environments. All the Literature sources used for literature review can be categorized in the following four groups. Literature sources under these groups were more fluid than monolithic, meaning; one literature source may represent more than one category




(Figure 2.2).

(a) Fundamentals – Sources that provided a fundamental understanding of the concept of density and established a basis for the project.

(b) Theoretical Concepts – Sources that provided general theoretical concepts, strategies, and guidelines associated with high density environments.

(c) Urban Design Handbooks – Sources that provided design specific strategies, guidelines, and data associated with high density environments.

(d) Supporting Research Manuscripts – Publications discussing a specific theoretical concept related to high density environments.

### PRELIMINARY LITERATURE REVIEW (BACKGROUND AND BASIS)

Preliminary literature review involved sources that jumpstarted the research process with basic information and knowledge relating to the concept of density and its implications in urban design. These sources included key authors like Mathew Carmona and Colleagues (2003); Vicky Cheng (2010); Julie Campoli & Alex S. MacLean

FUNDAMENTALS

THEORETICAL CONCEPTS

Understanding Density and High Density ( Cheng, V., 2010 )

Architecture, Society, and Space: The High-Density Question Re-examined (Cuthbert, A. R., 1985)

The forms of Residential Density in the Contemporary City. The Case of Santiago, Chile (Vicuna, M., 2012)

Reshaping Metropolitan America (Nelson, A., 2013)

The Last Landscape (Whyte, W. H.,1968)

The Death and Life of Great American Cities (Jacobs, J. ,1961)

Public Places Urban Spaces, The Dimensions of Urban Design (Carmona et.al., 2003)

Community Design and the Culture of Cities:The Crossroad and the Wall (Lozano, E.,1990)

True Urbanism, Living In and Near the Center (Hinshaw, M. L., 2007 )

The Urban Design Reader ( M. Larice, & M. Elizebeth., 2013)

The Good City: Reflections and Imaginations (Jacobs, A. B., 2011)

HANDBOOKS

Visualizing Density (Campoli, J., & Maclean, A, 2007)

Responsive Environments: A Manual for Designers (Bentley et.al, 1985)

Getting real About Urbanism: Contextual Design for Cities (Porter, D. R., & Zyscovich, B., 2008)

Retrofitting Suburbia: Urban Design Solutions for Redesigning Suburbs (Jones, E. D., & Williamson, J., 2009)

Getting Density Right: Tools for Creating Vibrant Compact Development (Haughey, R. M, 2008)

Creating Walkable Places: Compact Mixed Use Solutions (Schmitz, A., & Scully, J., 2006)

Mixed-use Development Handbook (Schwanke, D., 2003)

Multifamily Housing Development Handbook (Schmitz, A., 2000)

Explaining Residential Density. Places (Ellis, J. G. , 2004)

Density by Design (Fader, S., 2000)

Shared Parking (Smith, M. S., 2006)

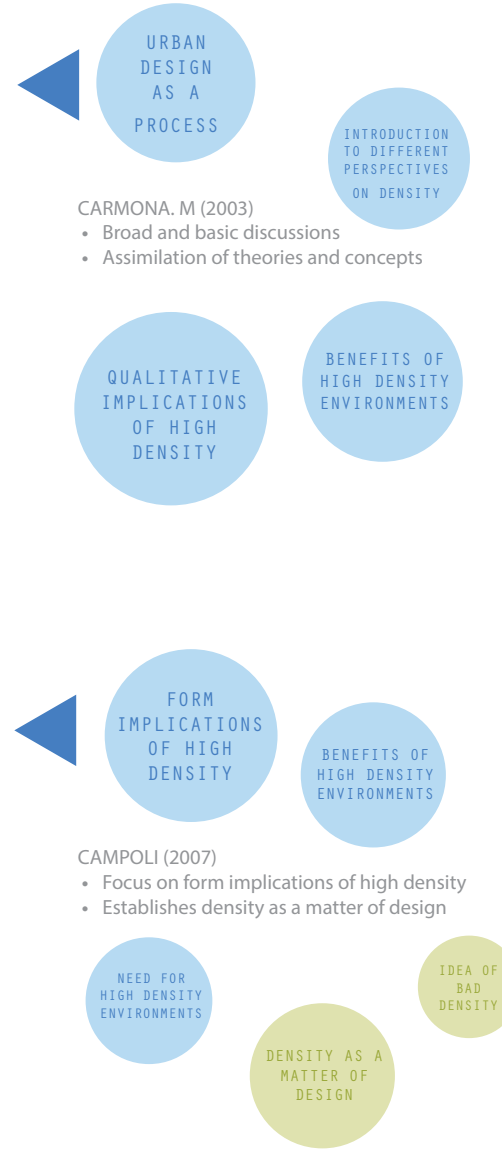
FIGURE 2.2: LITERATURE INVENTORY AND MAPPING (BY AUTHOR, 2013).


Dilemma
Necessary Definitions
Social Significance
Technical Descriptions
Disentangling the Concept of Density – (Churchman.A., 1999)
Complexity Involved
BACKGROUND & BASIS
Need for High Density
Socio-cultural context
Housing Preferences
How does the planning goal 'urban density' correspond to people's residential choices and everyday life? – (Werner. I.B., 2009)
Density as a Matter of Design and Performance
Higher-Density Development, Myth and Fact – (Haughey, R. M., 2005)
Economic Implications
Valuing the Consumption Benefits of Urban Density – (Couture.V., 2012)
Density Vs Crowding
DENSITY PERFORMANCE
Density and Community
URBANISM
Locational Effects
Density and Urbanity
Innovation
Urban Density, Creativity, and Innovation - (Knudsen.B. et.al., 2007)
Density and Creativity in U.S. Regions – (Knudsen.B. et.al., 2008)
Compact Development
Diversity
Strategic Nodes
Mix of Uses
Contextual Design
Density Threshholds
High Density Housing and Transportation – (City of Ashland, 2011)
Placemaking
Project Scale Classification
Walkability
Connectivity
Street Connectivity and Urban Density: Spatial Measures and Their Correlation – (Peponis, J. et.al., 2007)
Proximity
Transit
Impacts of Mixed Use and Density on Utilization of Three Modes of Travel: Single-Occupant Vehicle, Transit, and Walking – (Frank, L. & Pivo, G., 1994)
Infrastructure and Services
Design Guidelines for Walkability
Community Characteristics Promoting Transit and Walking – (Holtzclaw, J.,2007)
Design Precepts for Urbanism
Urban Design Manual
Building Design Strategies
Form Implications of Density
DENSITY DESIGN
Building Typologies
Strategies from Built Projects
Best Planning Practices
Best Development Practices: A Primer for Smart Growth – (Ewing, R., 1998)
Density Classification
Infill
Contextual Form Standards
Shared Parking Design
Open Space Guidelines

(2007); Jane Jacobs (1961); William H. Whyte (1968); Arthur C. Nelson (2013); Alexander R. Cuthbert (1985); Magdalena Vicuna (2012); and Arza Churchman (1999). Together, these sources provided the necessary technical and theoretical understanding of the concept of density; established associated dilemmas; and also pointed towards a holistic understanding of high density. Central themes of primary sources as it relates to this research is discussed below.

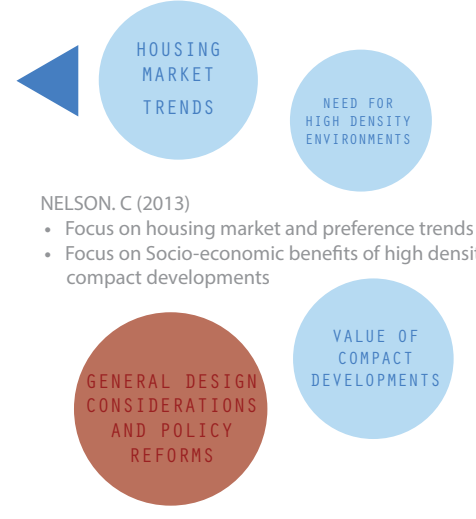
Mathew Carmona, Tim Heath, Taner Oc, and Steve Tiesdell (2003) in their Public Places, Urban Spaces—The Dimensions of Urban Design, present a broad portrait of urban design. This book is an attempt to establish urban design as a process of making better places for people than would otherwise be produced (Carmona, et al., 2003 p. 3). The authors assimilate, conjoin, and synthesize ideas and theories from a wide range of sources to identify six inter-related dimensions of urban design—morphological, perceptual, social, visual, functional, and temporal dimensions. The authors argue that a holistic urban design approach requires simultaneous consideration of all these dimensions.

"Visualizing Density" by Julie Campoli and Alex MacLean (2007) falls under three categories of the above mentioned literature classifications. This book provides fundamental ideas about the concept of density, theoretical concepts related to high density, and also serves as an urban design handbook. Visualizing Density justifies the case for high density developments by presenting trends of population growth, a need to preserve farmlands, and benefits of high density. The authors argue that density is a matter of design and present desirable planning and design patterns for high density developments on regional, district, and site scale. The most valuable aspect of this book is a density catalogue that illustrates form implications

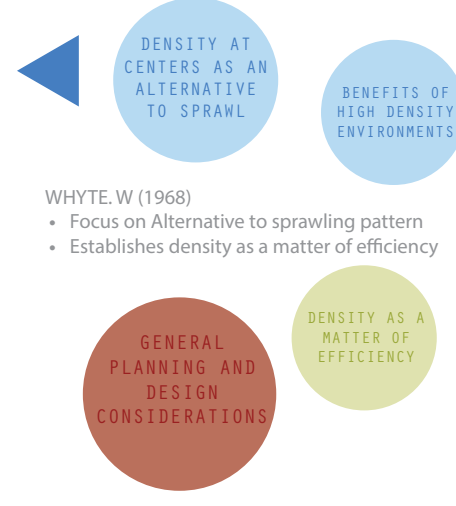


of different levels of density through aerial photography and diagrams of different sites and locations within America. The density catalogue enables this book to be used as a design manual as well.

"Reshaping Metropolitan America" by Arthur C. Nelson (2013) is a valuable literature source to understand general trends in market, housing preferences, and development patterns in America. Nelson argues that emerging trends in population and housing demands point towards a need for more compact communities in future. He also emphasizes the value of compact developments over sprawling areas in generating environmental, economic, and social benefits. The final chapter in his book presents an agenda to reshape metropolitan America which includes revitalizing suburbs and promoting compact developments through various design considerations and policy reforms. This source offers an understanding of social-economic significance and empirically validates the need for high-density developments.

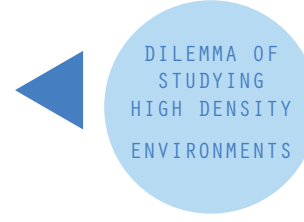



William H. Whyte (1968), in his much acclaimed book "The Last Landscape" discusses the dynamics of urban sprawl and its impact on urban landscape. The book is focused on ways to channel growth through a desirable and aesthetic development pattern. The last chapter of the book, "The Case for Crowding" specifically addresses high density and concentrated developments. Whyte clearly discusses the physical and socio-economic dilemmas pertaining to concentration and high density. According to Whyte (1968), high density and concentrated developments cannot be justified by shortage of land because there is none. He argues that concentration provides efficiency and it provides maximum access to the urban needs of people. This chapter also elaborately discusses the benefits of high density developments in



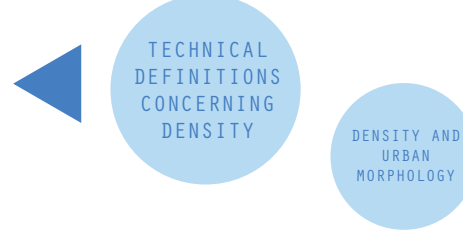
terms of performance and aesthetics. Apart from providing a general theoretical understanding of the concept of density, this source also facilitates broad and general planning and design measures for desirable high density urban communities.

"Architecture, Society, and Space" by Alexander R. Cuthbert (1985) examines high-density developments from a sociological and economic stand-point. He argues that high density environments emerge largely from the general socio-economic structure of the society and since density is a determinant of architectural form, city forms is a product of inherent social order of the society. Additionally, Cuthbert (1985) points towards a need for more study in understanding sociological impacts of high density environments, specifically high-rise buildings. Even though this source focuses on high-rise high density structures within city centers, it provides valuable insights in terms of establishing a general dilemma related to the concept of density and a basis for the project.

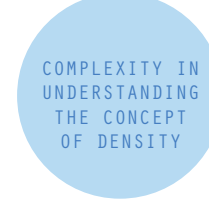



CUTHBERT. A (1985)
- Focus on high density as a reflection of society
- Focus on a need for more qualitative study of density


In addition to foundational theoretical understanding of the concept of density, the preliminary literature review involved sources that focus on technical understanding of the concept. Vicky Chen (2010) in "Understanding Density and High Density" provides technical definitions and illustrations of various terms associated with the concept of density.
This source explains density as a numerical measurement and lists various types and subtypes of density measurements. Chen (2010) also discusses in detail how density measurements determine urban morphology. The understanding of density as a numerical measurement is further widened through research publications by Arza Churchman (1999) and Magdalena Vicuna (2012). These publications ascertain and elaborate the complexity associated with the interpretation

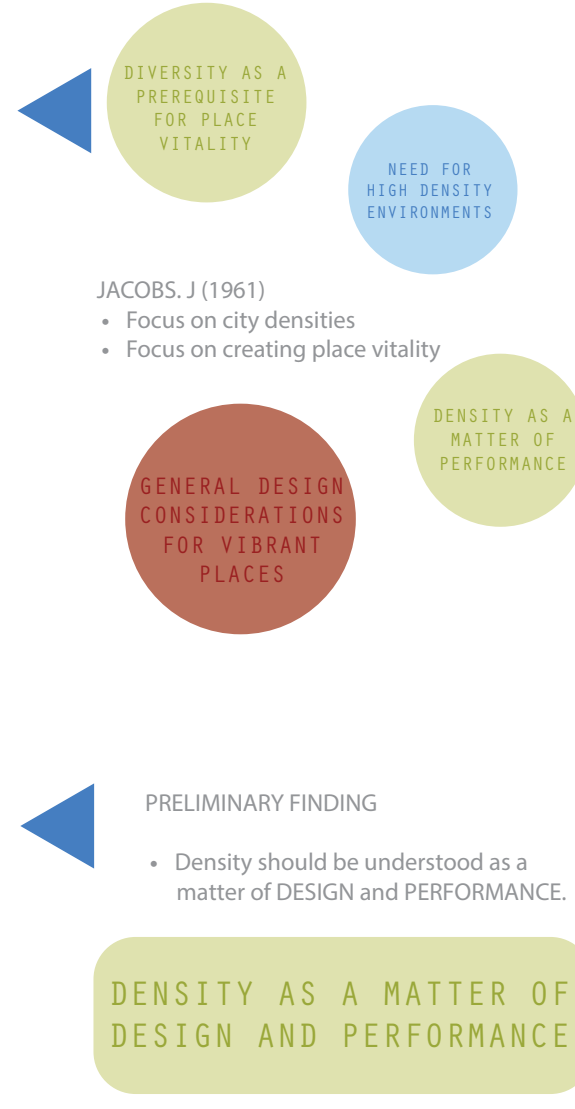



CHEN. V (1985), CHURCHMAN (1999), VICUNA (2012)
- Focus on basic understanding of the concept of density



and application of the concept of density. A primary literature source that goes across the literature groups and establishes the fundamentals of this project is "The Death and Life of Great American Cities" by Jane Jacobs (1961). In this work, Jacobs presents her critical outlook on contemporary city planning principles based on her observations of ordinary events that make cities work. The central argument made by Jacobs is that cities need an intricate and close-grained diversity of uses which constantly support each other socially and economically. According to her, a lack of this mutually supporting diversity of uses leads to the failure of cities. Jacobs argues that there is a very complex relationship between the density of dwellings and the presence of diversity as well as other conditions required for diversity. She finds it difficult to establish a number as the required appropriate human density but suggests: "As a general rule, I think 100 dwellings per acre will be found to be too low" as the requirement varies with different cities (Jacobs, 1961, p. 212). The vital point is that all the talk on diversity and all efforts to achieve social and economic diversity are wasted if there are not enough people. Jane Jacobs (1961) in her book illustrates high density developments as a matter of performance and offers broad design ideas to achieve desirable performance of higher densities.

A preliminary literature review of sources discussed above helps to (a) clearly identify the dilemma that drives the project; (b) to understand the socio-economic and socio-cultural context that applies to high density environments; (c) to technically define the concept of density; and (d) to clearly understand the need for and benefits of high density development. The aforementioned information drawn from various literature sources provides a fundamental basis for the project which is that successful high density environments are largely a matter of design and performance, rather than achieving a density measurement. Therefore, the value of high density environments must be understood in terms of its physical qualities and socio-economic performances rather than mere density measurements. Such an understanding channelizes a detailed literature review that explores high density in terms of its design and performance.



## DETAILED LITERATURE REVIEW (DESIGN AND PERFORMANCE)

A detailed literature review involved sources that provided a holistic understanding of the concept of density. It included a more elaborate review of works by Jane Jacobs (1961) and Julie Campoli & Alex S. MacLean (2007). It also included works from other authors that contribute to a theoretical understanding of the concept of density such as, Eduardo E. Lozano (1990); Mark L. Hinshaw (2007); and Allan B. Jacobs (2011). The City Reader (2003) and The Urban Design Reader (2013) which are collections of essays by eminent researchers and authors also shed light on the concept of density as well as urban design in general and are used as support sources in the process of literature review. Detailed literature review also included the following design handbooks:

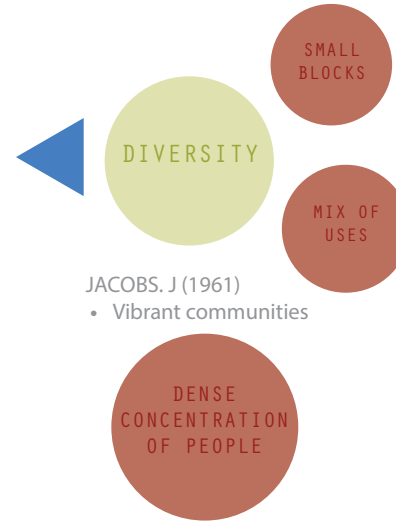
- Responsive Environments: A Manual for Designers (1985);
- Getting Real about Urbanism: Contextual Design for Cities (2008);
- Retrofitting Suburbia: Urban Design Solutions for Redesigning Suburbs (2009);
- Getting Density Right: Tools for Creating Vibrant Compact Development (2008);
- Creating Walkable Places: Compact Mixed Use Solutions (2006);
- Mixed-Use Development Handbook (2003);
- Multi-family Development Handbook (2000);
- Explaining Residential Density (2004);
- Density by Design (2000);
- Shared Parking (2006).

Preliminary literature review suggests that high density environments are desirable and meaningful only if they perform in manner that is beneficial to its users. Therefore, a detailed understanding of social and economic performances of high density environments becomes inevitable for this research project. Primary literature sources that provide

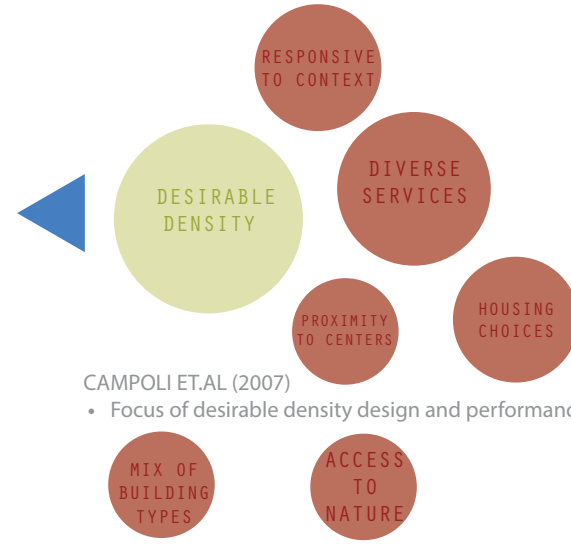
valuable insight on design and socio-economic performances of high density environments are discussed below.

Jane Jacobs' (1961) seminal work "The Death and Life of Great American Cities" focuses on ways to create city districts and environments that are functionally and economically vibrant. In the first part of her book, she discusses lively streets and neighborhood parks as assets to city environments. As already discussed the central theme of her work is the idea of diversity which she argues can be generated by four essential conditions; (1) Districts serving more than one primary use; (2) Small block size that facilitate frequent turns; (3) Buildings with a variety in age and conditions; and (4) Dense concentration of people (Jacobs, 1961, pp. 151-152). According to Jane Jacobs, the above four conditions together result in functionally and economically vibrant communities. And that each condition by itself cannot produce wholesome diversity.

Campoli and MacLean in "Visualizing Density" present an argument that successful high density environments are largely dependent on how they are planned and designed (Campoli & Maclean, 2007, p. 14). They suggest that desirable high density environments must provide benefits such as urban living, opportunities for human interaction, reduced dependence on automobiles, possibility of diverse and specialized services, and a wide range of housing choices. In terms of planning, the authors argue that high-density developments must be located in close proximity to employment centers, transit systems, and in under-used areas. In terms of design, the authors suggest a wide range of design considerations such as establishing connectivity to the context; programming a variety of uses; designing for diversity in architecture; providing sufficient private and public open spaces; designing building forms that respond to the site context and human scale; providing multifamily residential options; designing a mix of building types; providing access to nature; and optimal parking spaces.

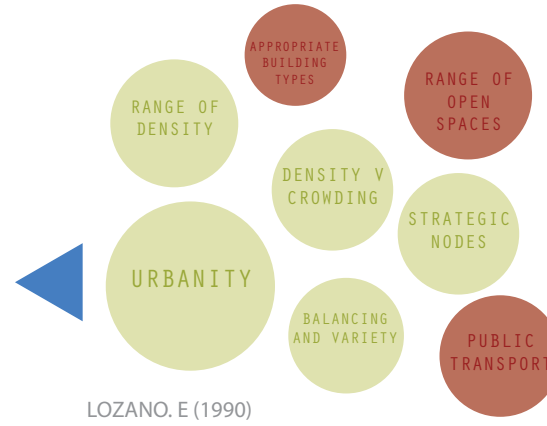



JACOBS. J (1961)
- Vibrant communities




CAMPOLI ET.AL (2007)
- Focus of desirable density design and performance

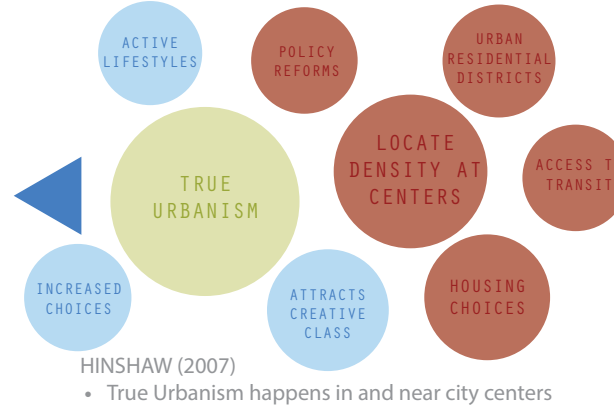
Eduardo E. Lozano's book is generally based on community design in an urban context. He extensively discusses urban design traditions and socio-cultural phenomena of cities. He focuses on the idea of urbanity, which he defines as "the potential capacity of the inhabitants of a town or city to interact with a sizable number of people and institutions concentrated in that town or city" (Lozano, 1990, p. 157). According to him urbanity is the cause and effect of dense clusters of human settlement. He suggests that urbanity emerges at certain density thresholds. His work effectively informs us about the difference between density and crowding. He also emphasizes on the existence of over-urban density and sub-urban density, two extreme situations in density, both of which could be problematic. He argues that human interaction and urban relationships are vital aspects of community design and that high density promotes interaction and therefore, plays a key role in building communities. Lozano proposes several strategies to achieve desirable urban densities such as balancing crowding experience; providing a range of densities on a regional level; providing a range of open spaces from small semi-private spaces to large park-like spaces; regulating density through design features; responding to the scale of existing development patterns; designing strategic nodes of employment with access to public transport; and designing appropriate building types.




LOZANO. E (1990)

- High Density as the cause and effect of Urbanity

In "True Urbanism-Living In and Near the Center," Mark L. Hinshaw develops the idea of True Urbanism by looking at various cities in United States of America. He draws on the principles of Louis Wirth's idea of Urbanism which emphasize on size, density, and heterogeneity of an environment. Hinshaw presents his ideas as an alternative to New Urbanism. He argues that true urban places accommodate diversity in terms ethnicities, races, culture, age groups, income




HINSHAW (2007)

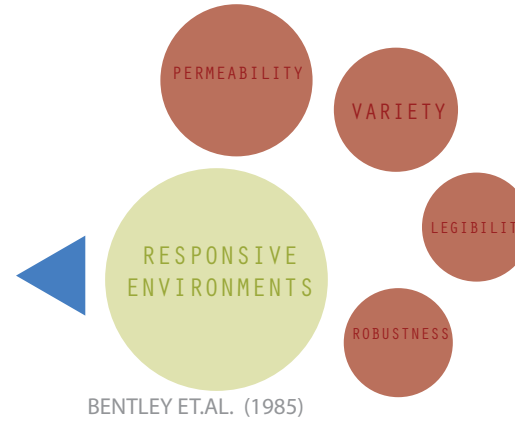
- True Urbanism happens in and near city centers
- Density at the core of true Urbanism

levels, and various other aspects. According to Hinshaw, density is at the core of true urbanism and current trends show rising number of urban communities in and near urban centers that show a preference for diversity. Hinshaw makes a case for high density environments by suggesting that it lead to true urbanism and offer benefits such as active lifestyle, increased choices, attracting creative class, and cultivating culture. Hinshaw proposes that desirable high density environments could be achieved by reversing development trends back to urban centers. "The Good City- Reflections and Imaginations." Allan Jacobs put forth the idea that good cities are those where people primarily live within close proximity to one other in relative comfort. He extends the notion of a good city by emphasizing that such environments must possess essential qualities of Livability, Opportunity, Identity, and Authenticity. He further emphasizes that building good cities is a complex process and therefore, accounts to several other details such as meeting desired density thresholds; efficient public spaces and transportation systems; presence of economic and activity centers; and aesthetic design.


JACOBS. A (2011)

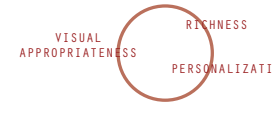
- Idea of Good Cities
- People living in close proximity in comfort.
- Density and Good Cities

"Responsive Environments" is a work by Ian Bentley, Alan Alcock, Paul Murrain, Sue McGlynn, and Graham Smith which is written as an urban design manual or handbook. The book is targeted towards creating urban places with dense concentration of people. The central theme of the book is "Responsiveness," which according to the authors is the ability of an urban place to maximize the degree of choices available to its users. Drawing from several theoretical concepts, the Responsive Environments authors identify seven key qualities that can promote responsiveness, namely (1) Permeability, (2) Variety, (3) Legibility, (4) Robustness, (5) Visual appropriateness; (6) Richness; and (7) Personalization. Permeability



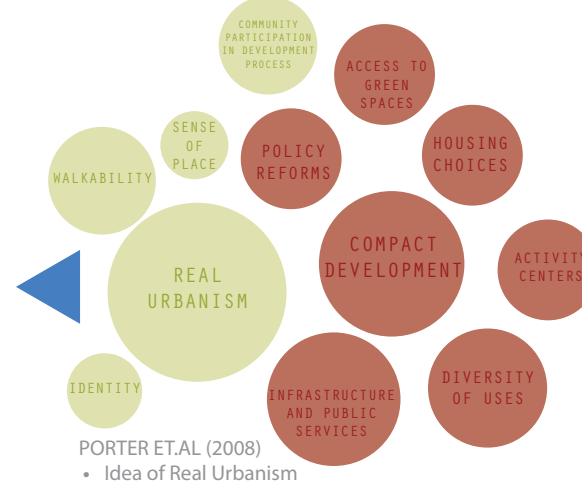

BENTLEY ET.AL. (1985)

- Idea of Responsive Environments
- Designing place that maximize choices



refers to offering choices of visual and physical access to a place. Variety refers to experiential choices in a place through a wide range of uses. Legibility is the quality that makes a place mentally graspable. Robustness refers to offering choices to use a place for different purposes. Visual appropriateness, Richness, and personalization are smaller scale qualities that relate to the design of buildings. These smaller scale qualities make all available choices visible, offer sensory choices and allow personal intervention in a place. To achieve permeability, the authors suggest extending existing street connections into the site to get a preliminary street-block pattern, which can be further adjusted or subdivided to achieve appropriate block sizes. They also emphasize on the need to secure privacy and enrich private life by carefully designing the public-private street interface. In order to achieve variety, the authors suggest mixing primary uses (residences and work places) and secondary uses (uses such as coffee shops, restaurants, bookstore etc.) With respect to variety, the authors identify the need to place various uses in a manner that allows concentrated pedestrian flow. To achieve legibility, they suggest the inclusion of five key physical elements that aid people to understand and remember a place, namely; paths, nodes, landmarks, edges, and districts. The authors emphasize the need for both open spaces and buildings to be robust and flexible enough to offer choices of being used for more than one purpose.

"Getting Real about Urbanism – Contextual Design for Cities" is a ULI handbook authored by Bernard Zyscovich and Douglas R. Porter. The central theme of the book is the idea of "Real Urbanism" which according to the authors is creating plans that reflects the physical, social, and cultural context of the environment. They argue that in addition to considering fundamental urban design guidelines it is important to take a contextual approach to impart character and identity to urban developments. A contextual approach would include efforts to discover the past of the development site; creating new visions to promote urban living and vitality; a focus on process rather than formula; establishing dynamic connections in terms of the physical, visual, and economic context; and imparting individuality to a project without compromising diversity. The authors draw upon various built urban design projects to propose eight guiding principles that form the precepts of real urbanism; (1) Compact development of the built environment; (2) Diversity of uses, activity centers, and neighborhoods; (3) Range of housing, employment, and lifestyle opportunities; (4) Variety of transportation choices and walkability; (5) Efficient provision of infrastructure and public services; (6) Distinctive communities with a strong sense of place; (7) Preserved green spaces, natural features, and farmlands; (8) Fair, predictable, and cost-effective development decisions based on community involvement and collaboration.

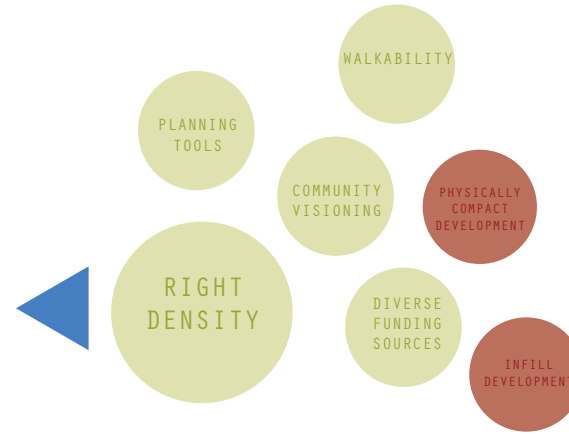



PORTER ET.AL (2008)

- Idea of Real Urbanism
- Contextual design at the heart of Real Urbanism

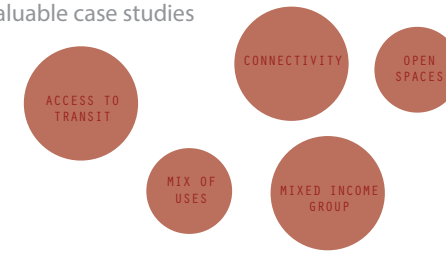
Another ULI Handbook that is of value to this project is "Getting Density Right- Tools for creating vibrant compact Development" by Richard Haughey. This handbook discusses planning tools that can enable planners develop successful compact developments. Haughey through various community case studies present various design and planning tools that can be used for high density developments. Case studies show how communities have used form-based codes, mixed-use zoning, Planned Unit Developments as tools to create compact developments. He argues that Brownfield redevelopment, Cluster development, Infill development, and transit-oriented development projects can effectively result in compact and dense communities. He also emphasizes the role of community visioning and education in making dense communities work. Key design ideas for high density environments emerging from various case studies are physically compact development, Infill and Conservation developments, Physical connectivity, Access to Transit, Walkability, Human-scaled environments, Mix of uses, facilitating Mixed-income groups, and providing welcoming open spaces and parks.

Literature review is further supported by a range of handbooks that offer valuable insight into planning and design implications of high density environments. "Creating Walkable Places" and "Mixed Use Development Handbook" focus on mixed use developments and their benefit. These handbooks using case study analysis makes of case that density plays an important role in creating successful mixed use and walkable communities. These handbooks also elaborate upon the planning, designing, and development process of mixed use projects. "Multifamily Housing Development handbook" and "Density by Design" focuses on residential design. Through several case study analyses, these handbooks offer valuable planning and design insights related to high density residential development projects.




HAUGHEY (2008)

- Planning tools for high density communities
- Desirable qualities of high density environments
- Valuable case studies




The literature review process also included review of research manuscripts and planning documents that studied specific concepts leading to a better understanding of high density environments. In totality, literature groups discussed above provided a range of theoretical concepts and design ideas which are further explored through design exercises and finally synthesized to develop a theoretical framework that can serve as a planning and design tool in considering high density environments.

## 2.2 EXPLORATIVE DESIGN PROCESS

Two design projects were used as vehicles to explore theoretical ideas and design guidelines emerging from literature review (Figure 2.3). Two development plans for high density environments were proposed for village plaza and downtown Minneapolis sites. Both the projects were considered within their respective context and the proposed plans were based on site specific dilemmas, needs, and market trends. Both the sites offered several design opportunities and challenges in terms of creating meaningful high density environments. Drawing upon literature review findings and general urban design principles, explorative design exercises aimed at resolving site-based dilemmas by designing them as meaningful high density environments as understood through literature review. In the process, emerging design opportunities, challenges, and design solutions pertaining to high density environments were identified. These opportunities, challenges and solutions identified through explorative design served as valuable inputs alongside literature review findings in developing a design framework for meaningful high density

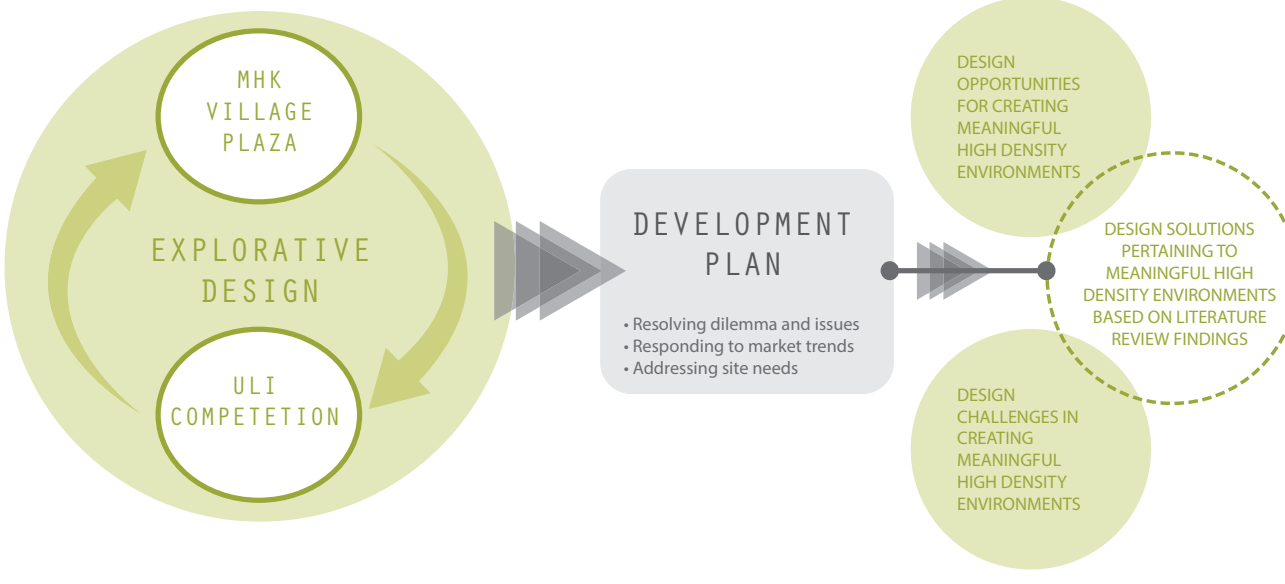



FIGURE 2.3: REPRESENTATION OF EXPLORATIVE DESIGN PROCESS (BY AUTHOR, 2013).

environments through synthesis.

## 2.3 SYNTHESIS PROCESS

The final step of the methodology was synthesis of literature review and explorative design findings. Design implications of meaningful high density environments, performance aspects of meaningful high density environments, and design solutions emerging from opportunities and challenges in explorative design exercises were the key findings. These findings were synthesized to develop a design framework—*Density Dynamics*—that provides a holistic understanding of meaningful high density environments (Figure2.4). Firstly, the framework provides a theoretical understanding of meaningful high density environments. The framework then lists specific planning and design goals that can help in creating meaningful high density environments. Finally, the framework incorporates specific planning and design guidelines to achieve these goals. The design framework in totality provides a holistic understanding of meaningful high density environments and can potentially serve as a design and assessment tool for high density environments.

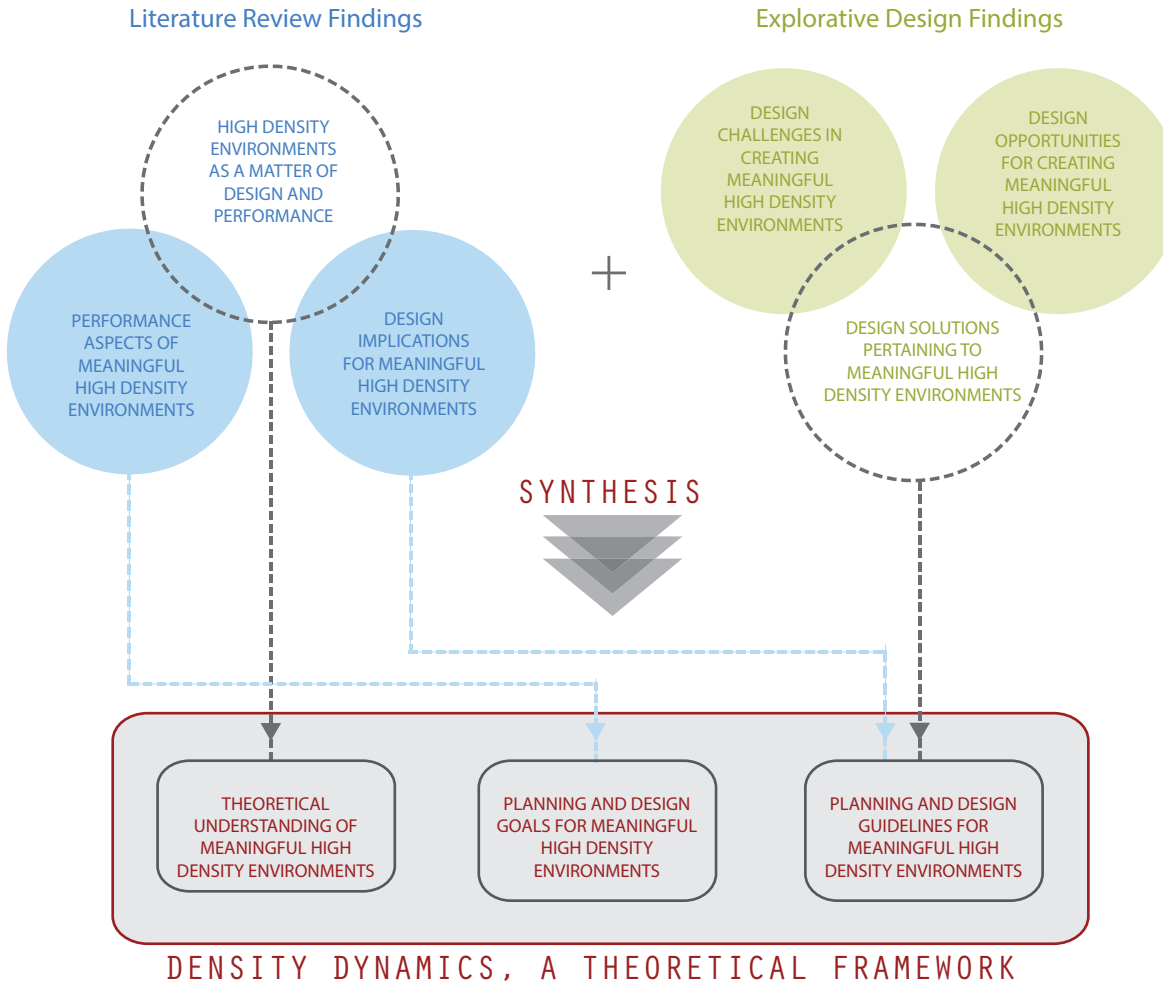



FIGURE 2.4: REPRESENTATION OF SYNTHESIS PROCESS (BY AUTHOR, 2013).

# CHAPTER 3
# LITERATURE REVIEW

# 3



DENSITY IS BASIC TO SETTLEMENTS BECAUSE IT GENERATES URBANITY, THAT ELUSIVE YET ESSENTIAL QUALITY THAT IS BOTH CAUSE AND EFFECT OF DENSE CLUSTERS OF HUMAN HABITATS.....LOZANO (1990)

# LITERATURE REVIEW

## 3.1 THE CONCEPT OF DENSITY

Density is a complex concept. On the one hand, it is an objective and neutral quantity (Churchman, 1999); and on the other hand, it represents subjective and relative perceptions by people (Campoli & Maclean, 2007). The concept of density finds varied applications and implications in the field of urban design and planning, hence, it is important to explore the concept of density holistically. This chapter discusses the findings of literature review that lead to a holistic understanding of the concept of density and high density environments. The discussion involves a general understanding of the concept of density and the need for high density environments. The discussion also establishes that physical design and performance of high density environments provide a basis for a holistic understanding of high density environments.

### DENSITY AS A MEASUREMENT TOOL

For the purpose of planning and urban design, density is the concentration of physical or non-physical elements such as people, buildings, employment, and landuses. This research is focused on physical density. Cheng (2010) offers a clear understanding about density measurements and defines physical density as a "numerical measure of the concentration of individuals or physical structures within a given geographical unit" (Cheng, 2010, p. 03). Physical density is the ratio of resident population or dwelling units to a specific land area. Cheng (2010) broadly categorizes physical density into (a) people density and (b) building density where, people density is the number of people or households per reference land area and building density is the ratio of building structures to a reference area unit.

People density can be measured on regional, neighborhood, and site scales (Figure 3.1). On

a regional scale people density is generally expressed as the number of people living within a specific geographic area. At neighborhood and site scales, people density measurement may use either resident population or dwelling units. In calculating residential density, the reference land area can result in different types of density measurements. For instance, when the reference land area includes land used for residential uses, non-residential uses, and local roads, the resultant measurement is gross density. On the other hand, when the reference land area includes only the land used for residential uses along with the local roads, the resultant measurement is net density. A more concentrated measurement of density called site density results from considering only the residential site as the reference land area. Because of such variations, it is important that reference land areas are explicitly defined while calculating and using density measurements (Cheng, 2010, p. 03). According to Cheng, building density is measured in terms of floor area ratio (FAR) and site coverage. FAR is the ratio of total gross floor area of the development to its site area and site coverage is the ratio of building footprint area of a development to its site area. In most cases, we can clearly define

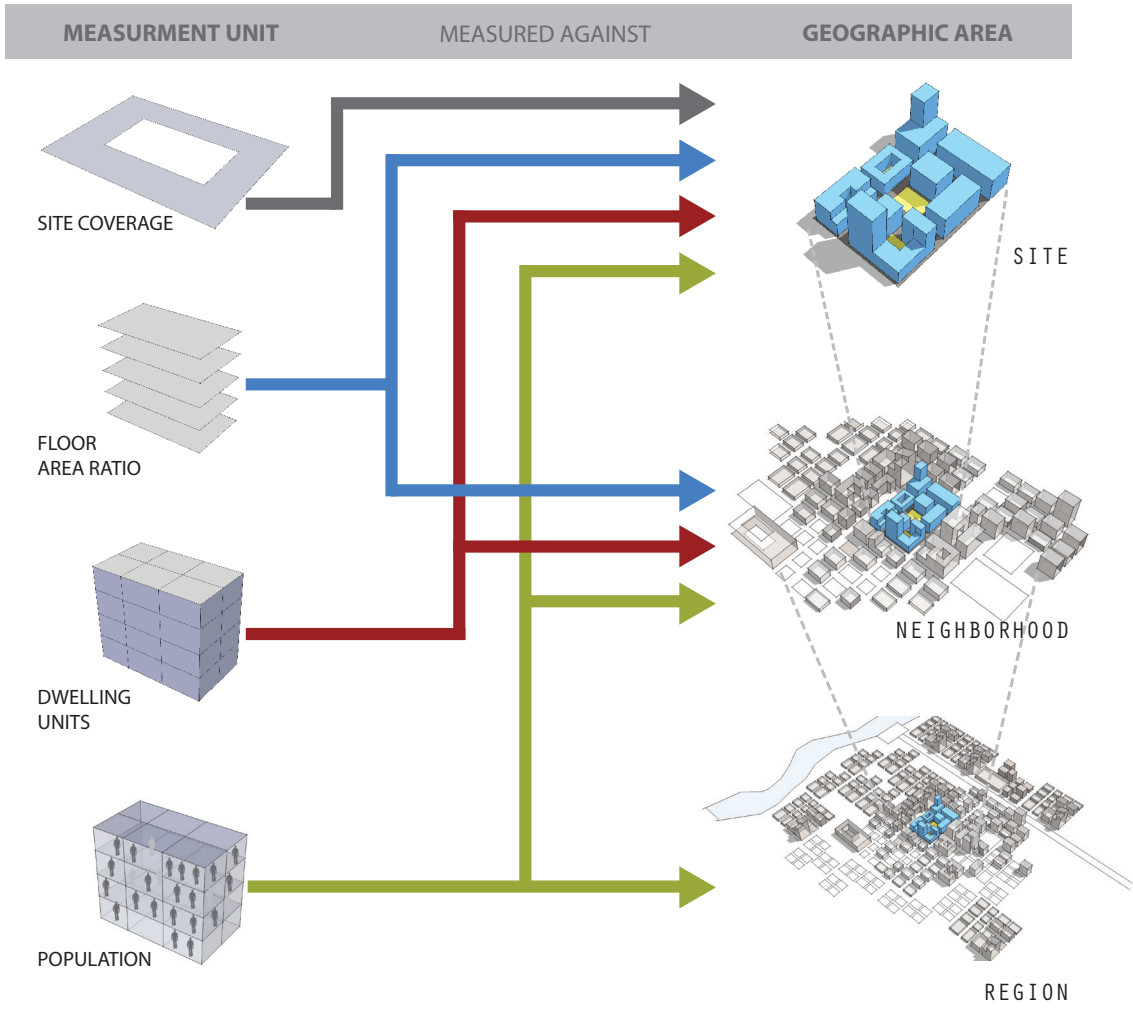



FIGURE 3.1: DENSITY MEASUREMENT AT DIFFERENT SCALES (BY AUTHOR, 2013; ADAPTED FROM WWWW.DENSITYATLAS.ORG).

site area, gross floor area, and building footprint, therefore, building density is often considered as a reliable mode of density measurement and hence widely used in planning and urban design practices (Cheng, 2010, p. 5).

## COMPLEXITIES ASSOCIATED WITH DENSITY

Density as a concept in urban design and planning is broad and complex, given the relative understanding and varied applications of the term. Vicuna (2012) identifies three aspects of complexity related to the concept of density. First aspect of complexity relates to the difficulty in measuring density which is largely because of an array of different ways to measure density (Vicuna, 2012, p. 03). Using different density measurements may result in different density values for the same study area.

Secondly, there is a complexity associated with the meaning and implications of density which differs based on the context and scale of design and analysis (Vicuna, 2012, p. 03). Simply put, this means that density measurements can be used in several different ways. As a planning tool, density helps to determine the distribution of population and infrastructure on a regional scale. On a neighborhood scale, it helps to assess and determine infrastructure needs and forms the basis for zoning and landuse control. On a site scale, density is used to express and determine the built form and its intensity.

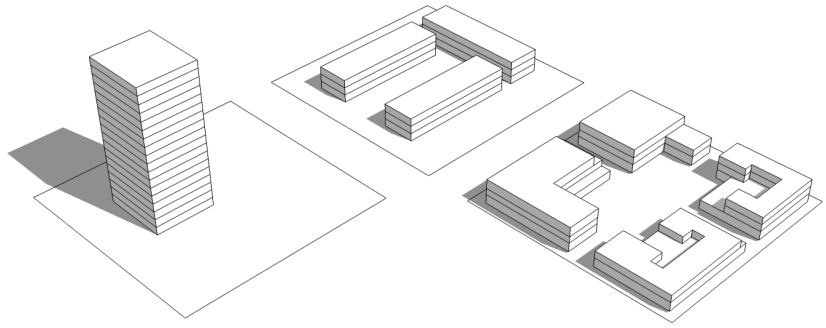
Beyond the objective quantitative aspects of density, a third aspect of complexity relates to the subjective qualitative implications of density such as social performance of the physical environment and how density is perceived (Vicuna, 2012, p. 03). A measurement of people density does not provide a complete understanding in terms of the feel of the place and how it performs. Density measurements largely describe a place quantitatively in terms of lot size, floor space ratio, building height, street width, and land uses, which cannot be a complete picture about how a place feels and performs.

## MORPHOLOGICAL IMPLICATIONS OF DENSITY

The concept of density plays a major role in understanding, assessing, and determining urban morphology. Cheng (2010) argues that an intricate relationship exists between building density and urban morphology and therefore different combinations of FAR and site coverage would manifest into a wide range of built form intensities (Cheng, 2010, p. 09). Building density measurements; FAR and site coverage combined are good indicators of built form intensities but are largely limited to site scale. In considering density measurements at neighborhood level or a scale comprising multiple sites, planners and designers use people density measurements which are not good indicators of built form intensities.

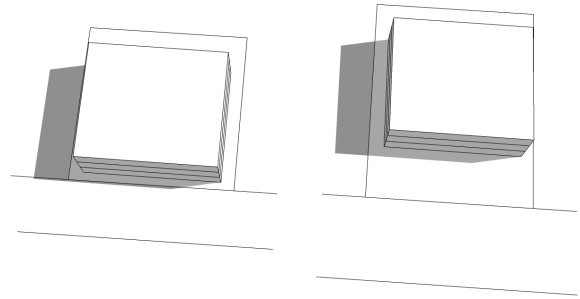
A relationship exists between people density and urban morphology; but it is not absolute (Figure 3.2). A particular density measurement can be materialized in many different built form typologies and often times a particular built form typology can present different density values (Vicuna, 2012, p. 04). Also, at larger scales of design and analysis, density measurements include the overall area of open space and do not indicate its distribution (Landcom, 2011, p. 13). Residential densities are generally measured in terms of dwelling units per geographic area. Residential density is often classified as low density, medium density and high density and these classifications maintain certain building typologies (Ellis, 2004). Different configurations of these typologies determine the overall character of the neighborhood. Low density

developments often range from 10 to 12 du/acre and the building types are generally either single family houses on lot sizes ranging from 3000 to 5000 Sq Ft or semi-detached houses on 3000 Sq Ft parcels (Ellis, 2004) (Figure 3.3). At medium densities of 15-25 du/acre development types can change to row houses comprising two or three stories with width ranging from 16-25 feet (Ellis, 2004). Medium densities of up to 40 du/acre can be developed as four-story stacked up townhouses over their own garage or five-story stacked flats with one level parking having one space per unit (Ellis, 2004) (Figure 3.4). For high density residential developments ranging above 45 du/acre offers a great number of building typologies and configurations such as mid-rise stacked flats (less than eight stories- up to 75 du/acre) or high rise stacked flats (over eight-stories with density above 75 du/acre) (Ellis, 2004) (Figure 3.5). For medium to high densities, parking becomes an issues and may require basement parking or separate multi-level parking structure. A combination of these various typologies can result in higher density neighborhoods. It is important to, therefore, note a wide range of form possibilities for high residential densities.



SAME NUMBER OF DWELLING UNITS
SAME LAND AREA
SAME DENSITY

DIFFERENT BUILT FORM



SAME NUMBER OF DWELLING UNITS
DIFFERENT LAND AREA
SAME DENSITY

SAME BUILT FORM

MORPHOLOGICAL IMPLICATIONS OF DENSITY

FIGURE 3.2: MORPHOLOGICAL IMPLICATIONS OF DENSITY (BY AUTHOR, 2013).

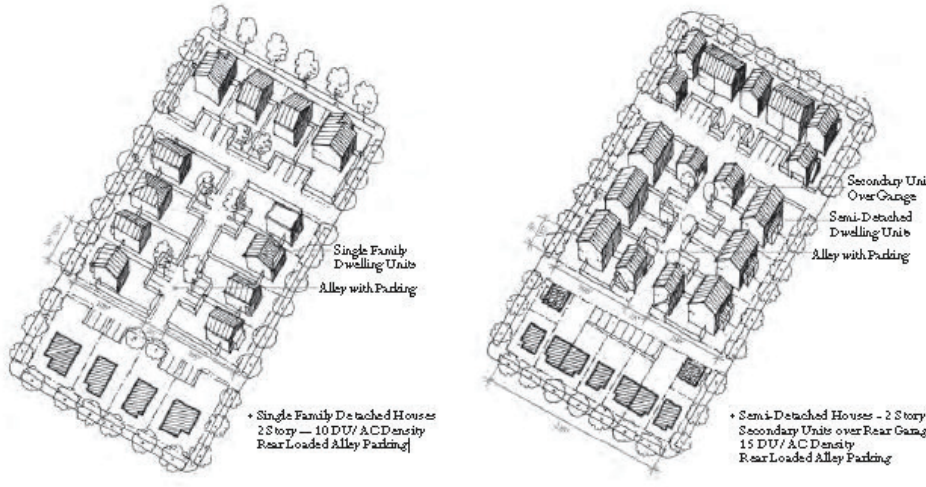



FIGURE 3.3: DEVELOPMENT TYPOLOGIES FOR LOW RESIDENTIAL DENSITY DEVELOPMENTS. SOURCE: (ELLIS, 2004), USED WITH PERMISSION)

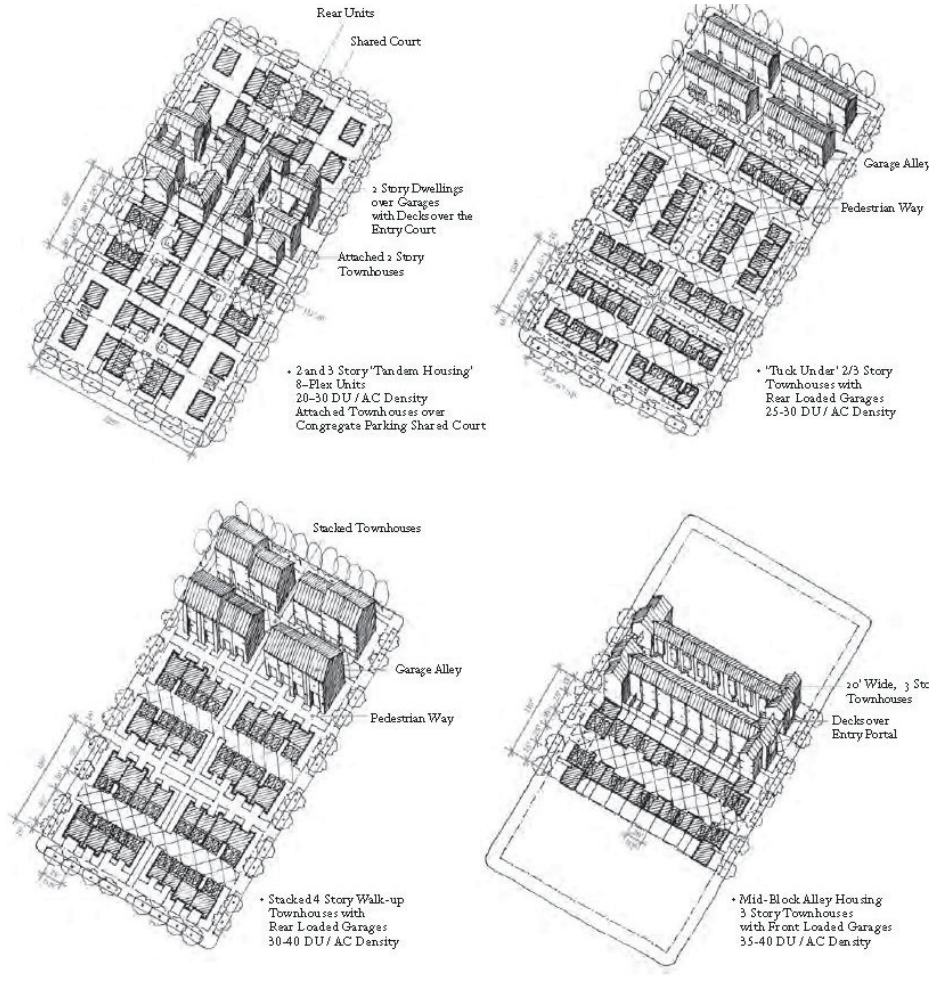



FIGURE 3.4: DEVELOPMENT TYPOLOGIES FOR MEDIUM RESIDENTIAL DENSITY DEVELOPMENTS. SOURCE: (ELLIS, 2004), USED WITH PERMISSION)

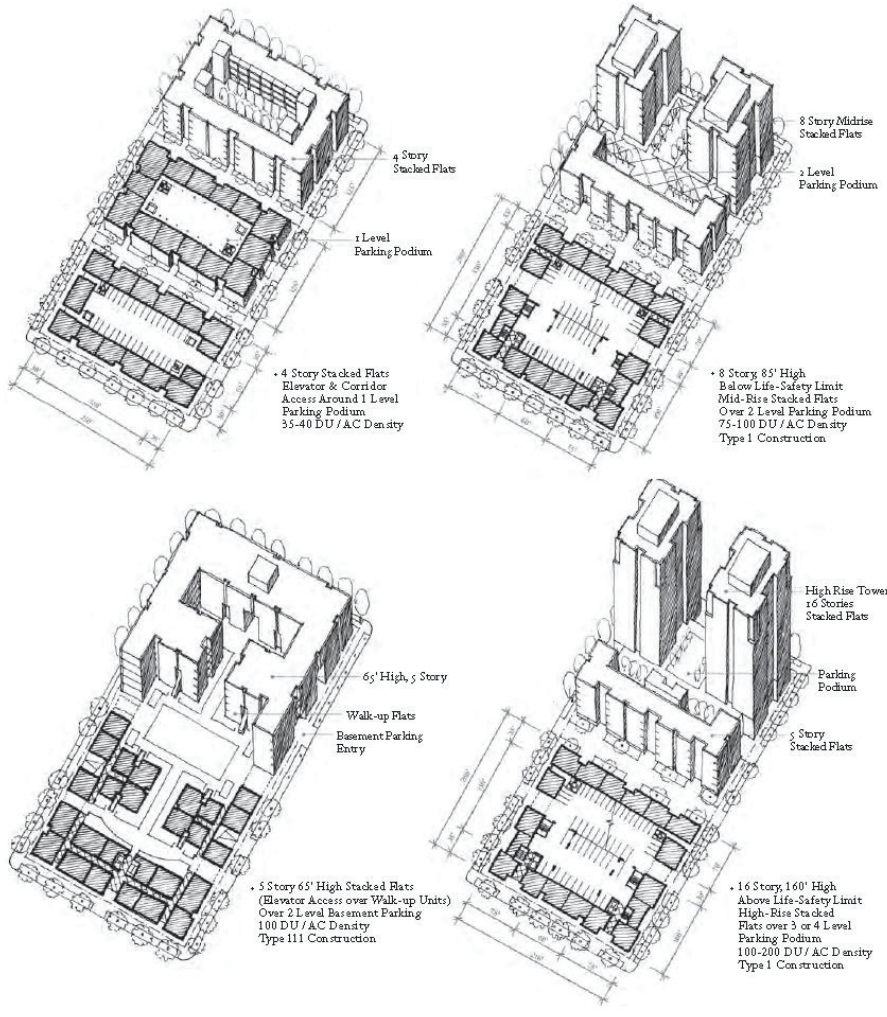



FIGURE 3.5: DEVELOPMENT TYPOLOGIES FOR MEDIUM RESIDENTIAL DENSITY DEVELOPMENTS. SOURCE: (ELLIS, 2004), USED WITH PERMISSION)

## DENSITY PERCEPTION

High residential densities are an essential character of city centers and densities reduce as one move away from city centers—from urban to sub-urban to rural densities. Therefore, perception of residential density is relative to the context; for example, a density of 30 dwelling units would be considered high in a suburban context but is considered low in city centers (Whyte, 1968, p. 335). Residential densities are usually a product of perceived economic and social trends. In planning practices, communities tend to maintain different allowable densities depending on the location of projects, nature of projects, and prevalent social and economic trends. Residential density considerations also rely heavily on the market demand for residences in a particular area. Market demand is a product of location and land prices, and directly dictates density decisions (Schwanke, 2003, p. 170). Developers discuss these issues in terms of the economic viability and feasibility of a project. With increasing land costs, developers intensify developments to maximize returns through mixing of uses and achieving high residential densities. Such practices often times result in very high over-urban densities in city centers and very low sub-urban densities in peripheral

residential area, which are both bad urban conditions (Lozano, 1990, p. 158). Demographic structure, housing preferences, and social norms also play an important role in density decisions. The promotion of the concept of "American Dream—owning big houses on large lots" and the existence of a demographic structure dominated by families led to a preference for low density suburban residential environments (Hinshaw, 2007, p. 01). This, in turn led to an outburst of suburban residential developments away from city centers. About housing preferences and social norms that promoted low-density suburban development, Campoli and Maclean states, "We can't seem to get the low-density suburban out of our minds, which makes it easy to continue to build it. It's what everyone expects—the architects and engineers who design it, developers who build it, and the homeowners who move in. The low-density subdivision has achieved a kind of inevitability" (Campoli & Maclean, 2007, p. 2).

People often times use the terms 'high density' and 'crowding' interchangeably. Historically, city centers were dense and accommodated people of various economic classes. Due to the heterogeneity of economic class in city centers and very high densities, certain areas experienced crowding and offered poor living conditions. This led to people intuitively associating high density environments with crowded slums and uncomfortable lifestyle for a long time. The notion of crowding along with other factors such as private automobiles, a desire to recreate village life, a desire to segregate social classes, and governmental policies supporting suburbanization have led to the prevalent sprawling development pattern (Lozano, 1990, p. 158). A preference for lower density residential environments is often justified by the notion of crowding. However, there is a difference between high density and crowding.

According to Lozano (1990) density is the ratio of people or dwelling units to a certain land area and crowding is the ratio of people to dwelling unit or rooms. Crowding can also be understood as a subjective perception that a certain level of density is too high and uncomfortable (Campoli & Maclean, 2007, p. 11). Even though not all high density environments feel crowded, high density environments, if not designed appropriately, may be perceived as crowded and uncomfortable. The perception of crowding has a close relationship to the way amenities such as streets, open spaces, and building common areas are designed. Since the problem of crowding and discomfort are consequences of poor design rather than a result of high density, through appropriate design approaches we can create high density environments that are desirable and comfortable.

## 3.2 THE NEED FOR HIGH DENSITY ENVIRONMENTS

Creating higher density environments have been a major quest since the latter part of twentieth century to promote meaningful and sustainable environments (Carmona, Heath, Oc, & Tiesdell, 2003, p. 183). Prominent urban design movements such as new urbanism and smart growth have identified achieving higher residential densities as an efficient way to manage growth. An emphasis on the need for high density developments is largely a result of fast growing population, ill effects of long-practiced horizontal sprawling development pattern, socio-economic benefits of higher densities, and changing demographic patterns. Different scholars have justified the need for high density environments differently. Trends in population growth suggest increasing demand for housing and associated commercial developments. It is projected that by 2030 we will need approximately 60 million dwelling

units and 104 billion square feet of commercial, industrial, and institutional spaces (Campoli & Maclean, 2007, p. 05). Given such a great future need for development, sprawling pattern of development would have a detrimental effect on our environment and economy in terms of depletion of valuable agricultural land and increasing the burden of infrastructure cost. Campoli and Maclean suggest that we cannot afford to use the land and resources to support our growing population at low densities.
Some have argued that building high density environments closer to city centers is a more efficient way to manage growth. Whyte (1968) argues that the case for higher densities must rest on the fact that it is a more efficient way to accommodate growth. Focusing on high density environments can offer a wide range of social and economic benefits such as enhanced opportunities for community building and sociability and reduced environmental and infrastructural costs. Changing demographic trends which are marked by rising population and decreasing size of households and a projected rapid rise in the senior citizen population, also point towards a need for high density environments. Living close to city centers in high density environments can efficiently fulfill the needs of these emerging demographic groups (Hinshaw, 2007, pp. 01-03).

Nelson (2013) presents a robust case for compact high density environments by studying various demographic and socio-economic trends. In recent years, energy costs have risen dramatically, incomes have fallen, unemployment rate have spiked, and institutional support for home ownership have gone down since the recession of 2008 – 2009, thereby impacting ability of people to own and maintain single family houses on large lots. Additionally, by 2030 there will be an increase in aging population from 13% to 20% (Nelson, 2013, p. 05). This implies a need for housing choices that offer mobility choices. Demographic trends also suggest that by 2030, the average household size would reduce and single persons will occupy more than half of the growth in households, which according to Nelson generates a huge housing demand. National surveys have also suggested a demand for residential choices with less commute, walkability, and proximity to different activity centers (Nelson, 2013, pp. 38-39). These trends clearly points towards a pressing need for compact high density environments in the years to come. Regarding a need for high density environments, Haughey says, "demographic shifts; high infrastructure and construction costs; population growth; the long term out-look for energy; and anticipated climate change make more-compact development inevitable despite the lingering opposition to higher density" (Haughey, 2008, p. 03).

## 3.3 TOWARDS A HOLISTIC UNDERSTANDING OF HIGH DENSITY ENVIRONMENTS

Given the complexities involved in the concept of density, a need for high density environments and an emerging preference for benefits of high density environments, it is important for planners and designers to holistically understand the dynamics of high density environments. More and more communities are aiming at creating higher density environments to meet the growing housing demand. In doing so, communities must understand that mere achievement of high density housing options by itself is not meaningful because higher density developments must be part of a comprehensive and integrated land use plan and impart good design that meets various social needs (Danielson & Lang, 1998, p. 01). Also, successful high density environments are difficult to define in absolute quantitative terms.

Moreover, we cannot define optimal or desirable density by one particular value because on a larger scale, optimal density is a continuum and it takes varying densities to fulfill varying needs of a large population (Lozano, 1990, p. 175). Therefore, density measurements cannot be used as a design tool because achieving a certain density count by itself will not lead to meaningful high density environments.

In order to be meaningful, high density environments should be designed to perform in a manner that allows individual users and the community at large to experience a range of social and economic benefits. This notion has been discussed by Jane Jacobs (1961) and Campoli (2007). According to Jane Jacobs, ideal densities are a matter of performance (Jacobs J. , 1961, p. 208) and according to Campoli, perceptions about higher densities largely depends on the environment's physical design (Campoli & Maclean, 2007, p. 36). Also, the emergent need for high density environments is largely a factor of design and performance of these environments. Therefore, high density environments should be understood as a matter of its design and performance.

A forward step towards holistically understanding high density environments is to distinguish between good and bad densities. Unlike good densities, bad densities do not address human needs effectively and they fail to offer valuable social, economic, and environmental benefits (Campoli & Maclean, 2007, p. 11). Compactness and people concentration are two essential conditions of high density environments because, by definition, high densities result from a dense concentration of people within a relatively compact built environment. So, good and bad densities emerge based on how these relatively compact built environments respond to the needs of its resident population and what benefits do such environments offer. Design and performance aspects of good densities are discussed below in terms of physical compactness, human needs in high density environments, and socio-economic benefits associated with good densities.

## GOOD DENSITIES PROMOTE COMPACTNESS

According to oxford dictionary, the word compact means "closely and neatly united or packed together." Compactness can therefore, be understood as the quality of built environments to be closely and neatly united. Like the concept of density, compactness is also a relative term and we cannot define it in absolute terms. Compact developments are those built environments in which buildings and activities are closely united to minimize land consumption (Porter & Zyscovich, 2008). To achieve good densities, developments must be compact on different levels. Compactness should start at a regional scale. Determining where high density environments should be located is the first step towards achieving overall compactness (Figure 3.6). Locating high density environments within and around existing densely built-up areas and avoiding natural resource lands result in good densities that contribute to the overall compactness of the region (Figure 3.7). Contributing to regional compactness is vital in creating good densities because it leads to (a) saving farmlands; (b) minimizing infrastructure costs; and (c) maximizing proximity to existing services, activities, and infrastructures (Campoli & Maclean, 2007, p. 15).

The next level of compactness is on a neighborhood scale. Together, the street-block system, building height, massing, and the surrounding context determine compactness on a neighborhood scale. The street-block system

FIGURE 3.6: BAD DENSITIES RESULT IN THE WASTAGE OF VALUABLE NATURAL RESOURCE LAND. (SOURCE: ALEX MACLEAN, HTTP://WWW.ALEXMACLEAN.COM/, USED WITH PERMISSION).

plays a great role in fostering compactness by creating connectivity within and between developments (Schmitz & Scully, 2006, p. 40). Large monolithic developments forming super blocks undermine compactness, at least as a matter of perception. On the contrary, smaller blocks that are designed with an inter-connected street-network produces a sense of compactness by closely connecting various building units. Such a street-block system results in physical and visual permeability, which is the quality of a place to offer accessibility and choice of routes (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985, p. 12). Connecting new street networks to existing main pedestrian network corridor enhances accessibility on a neighborhood level. In terms of compactness, a permeable street-block system is meaningful only when it extends to the surrounding context and maximizes connectivity at neighborhood level because proximity without accessibility is of no use. Apart from generating a sense of compactness, smaller block development is valuable to high density environments as it maximizes the economic opportunities and public life by increasing the number of possible turns one can make (Jacobs, 1961, pp. 180-181). Also, a quantitative study on the relationship between street density

FIGURE 3.7: GOOD DENSITIES ARE INTEGRATED WITH THE EXISTING DEVELOPMENT AND PROMOTE PHYSICAL COMPACTNESS. (SOURCE: ALEX MACLEAN, HTTP://WWW.ALEXMACLEAN.COM/, USED WITH PERMISSION).

(length of street per square kilometer) and urban densities conducted by John Peponis and colleagues within high density neighborhoods in and around downtown Atlanta shows a positive correlation between street density, the number of choice intersections and parcel density. So as the street density and number of intersections increase in a sample area, the parcel density also increases (Peponis, Allen, French, Scoppa, & Brown, 2007).

Compactness in good densities also results from responding to the surrounding context in terms of its urban form. Since high densities can have varied form implications, a sense of compactness is also dependant on the building mass and height of the surrounding context (Porter & Zyscovich, 2008, p. 24). High density does not necessarily mean high rise buildings, but in very dense city centers, the context could demand high rise buildings to efficiently accommodate density. Also, exceptions need to be made for certain uses that require larger buildings such as city halls, libraries, courthouses, and museums, but they should be strategically located so as to not hamper compactness. Designing buildings that respond to the existing pattern of development is very important to achieve


FIGURE 3.8: GOOD DENSITIES ARE RESPONSIVE TO THE CONTEXT IN TERMS OF HEIGHT AND MASSING. (SOURCE: WIKIMEDIA COMMONS, HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/5/56/HAGERSTOWN_DOWNTOWN_POTOMAC_ST.JPG, ACCESSED ON AUGUST 12, 2013).

a sense of compactness (Figure 3.8). Buildings that are out of scale (covering multiple blocks) and context not only hamper compactness, but also results in over-urban densities and environmental conflicts (Lozano, 1990, p. 177). In Summary, good densities promote physical compactness regionally as well as on smaller levels of neighborhood and site through proximity, connectivity and responding to the context.

## GOOD DENSITIES MEET THE NEEDS OF A DENSELY CONCENTRATED POPULATION

Good densities are responsive to human needs. Despite the advantages of high density environments, a resistance towards density is largely because of poor planning and design that does not consider human needs and concerns (Campoli & Maclean, 2007, p. 11). Planning and designing with a concern for human needs are vital in creating successful high density developments. Studies by Urban Land Institute, National Association of Realtors, and Smart Growth America suggests that people holding a

negative view about high density change their perception when shown images of high density and lower density developments and also that people chose communities with qualities such as presence of sidewalks; public transportation; and proximity to shops, schools, restaurants over communities with large lots but limited options to walk (Haughey, Higher-Density Development, Myth and Fact, 2005, p. 7). People strive for living environments where they can comfortably enjoy day-to-day life. Livability, which is the idea that urban environments must allow everyone to live in relative comfort, is an essential human need (Jacobs A. B., 2011, p. 177). Livability includes basic human needs such as water, pollution-free environment, and well-managed spatial surroundings. Apart from basic infrastructural provisions, good densities achieve livability by striking a balance between housing and population. When the housing units or the sizes of each housing units are too less for the population they are housing, the environment can be perceived as overcrowded and thereby, affect livability. So there exists a distinction between a built environment being dense in population and being dense in housing units, an understanding needed for good densities (Campoli & Maclean, 2007, p. 12).

In addition to the basic needs of livability, good densities meet the needs of diverse social and demographic classes by offering housing choices, transportation choices, and activity choices. People are diverse and so are their preferences and needs. Needs and preferences vary across age, marital status, economic class, profession, and so on. Housing needs of a single person vary from that of a single parent or a married person, mobility varies across age, some people prefer walking to driving, and households with children need playgrounds and open spaces in close proximity. Good densities are able to accommodate diverse demographic groups by offering choices. Demographic structure has changed drastically in the past couple of decades with an increasing proportion of childless households, population growth from immigration and the aging population (Nelson, 2013, p. 22). There has also been a trend of various demographic groups such as aging population and empty nesters shifting preference to high density city settings. Such trends point towards a need for housing choices. Good densities and truly urban environments is able to accommodate a wide range of people with diverse incomes, ethnicity, and lifestyles (Hinshaw, 2007, p. 11), which is largely possible by providing a wide range of multi-family housing choices (Figure 3.9). Multi-family housing choices increases residential density and promote demographic diversity by offering convenience, affordability and flexibility (Schmitz, 2000, pp. 03-04). In addition to multi-family housing choices, a variety in optimal dwelling unit sizes also allows different choices to suit different demographic groups (Fader, 2000, p. 12).

In environments with dense concentration of residential population, choice of activities and mobility become essential. Also, choice

FIGURE 3.9: GOOD DENSITIES PROMOTE DIVERSE HOUSING CHOICES. (SOURCE: HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/E/E9/DSCN3187_PROSPECTNEWTOWN_E_600.JPG, ACCESSED ON SEPTEMBER 21, 2013).


FIGURE 3.10: (LEFT) GOOD DENSITIES OFFER CHOICE OF ACTIVITIES AND MOBILITY. (SOURCE: PHOTOGRAPH BY AUTHOR) | (RIGHT) BAD DENSITIES ARE OFTEN RESTRICTED TO RESIDENTIAL USE AND AUTOMOBILE USAGE. (SOURCE: ALEX MACLEAN, HTTP://WWW.ALEXMACLEAN.COM/, USED WITH PERMISSION).

of activities and mobility are inter-related. On the one hand, high residential densities make mass transit systems and a variety of uses, activities, and services feasible and on the other hand, the presence of these choices results in good densities. Segregated residential use with mobility restricted to automobile are not responsive to human needs and therefore, result in bad densities. Good densities respond to the need for a variety of activity choices in close proximity as well as support alternative modes of transportation to get to these activity centers (Figure 3.10). Good densities are located near mass transit systems and/or meet necessary density threshold to support one or more modes of mass transit system (Jacobs A. B., 2011, p. 182). Segregating workplaces, residences and services through land use homogeneity restrict mobility to automobile. Therefore, by mixing of offices, commercial uses, small stores, and services with residential uses, good densities provide choice of activities in close proximity which, in turn, promotes alternative transportation choices such as walking and biking.

Providing a sense of place is necessary for any living environment but it becomes a pressing need in case of high density environments (Danielson & Lang, 1998, p. 03). Sense of place relates to people's association of meaning and value to the physical environment. It is argued that when people associate certain felt meaning that are built upon lived experiences, they change spaces into places (Carmona, Heath, Oc, & Tiesdell, 2003, p. 97). Good densities foster a sense of place and offer value, meaning, and identity. Even though sense of place is subjective and intangible, the process of place-making encourages a sense of place through planning and design of the built environment. Placemaking involves multiple layers of design and utilities integrated into a plan that creates an attractive and functional environment for users (Schmitz & Scully, 2006, p. 25).

The design of the public realm has a heavy bearing on sense of place and the public realm involves various elements. Pedestrian-friendly streets, interactive public-private interface, aesthetically rich architecture, and access to nature, characterize the public realm in good densities. In good high density environments, the presence of well-connected activity choices in close proximity is the first step towards a sense of place, because this promotes walkability because of which people become a part of

the public realm. Good densities enhance the experience of the public realm by designing sociable streets (Figure 3.11) with street-facing buildings, informal seating areas, tree-lined sidewalks, bike path, amenities for pedestrians, and clear signage (Hinshaw, 2007, pp. 61-68). Good densities balances the need for privacy and public life through building designs with provisions for quasi-public courtyards and private balconies and terraces to achieve an interactive public-private interface offering varying degrees of public-private interaction (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985, p. 14). Architectural aesthetics also plays an important role in fostering a sense of place in the public realm (Figure 3.12). The overall design of the built environment in good densities results in a distinctive character and identity which meets people's need for identity and association (Porter & Zyscovich, 2008, pp. 38-41). Good densities further meet the need for visually rich experiences in public life through visually appropriate and rich architectural features (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985, pp. 10-11). There is no one way to design visually appropriate buildings but some of the ways include building design that reflects the function of the buildings (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985), de-emphasizing garage doors, and designs reflecting local building traditions (Danielson & Lang, 1998). Access to nature and open spaces is also critical in promoting a sense of place and enriching the public realm (Figure 3.13). With increase in density, it is difficult to provide open spaces, but good densities meet the need for access to nature and open spaces (Campoli & Maclean, 2007, p. 45) by providing open spaces and plazas that result as a part of the urban pattern (Lozano, 1990, p. 177) and are clearly defined and enclosed by surrounding buildings (Jacobs A. B., 2011, p. 183).


FIGURE 3.11: SOCIABLE STREETS OFFER A SENSE OF PLACE IN GOOD DENSITIES. (SOURCE: PHOTOGRAPH BY AUTHOR).

FIGURE 3.12: DISTINCTIVE CHARACTER & IDENTITY IN GOOD DENSITIES. (SOURCE: HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/B/B2/BRIDGE_STREET,_CHESTER.JPG, ACCESSED ON JULY, 29, 2013).

FIGURE 3.13: GOOD DENSITIES PROVIDE A SENSE OF PLACE THROUGH ACCESS TO NATURE. (SOURCE: HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/D/DD/GREENACRE_PK_215_E51_JEH.JPG, ACCESSED ON NOVEMBER 12, 2013).

## SOCIO-ECONOMIC BENEFITS OF GOOD DENSITIES

Residential densities have social and economic implications. Density plays an important role in building and sustaining communities. The role of density in community design can be understood through the idea of *urbanity* which is defined as "the potential capacity of the inhabitants of a town or city to interact with a sizable number of people and institutions concentrated in that town or city (Lozano, 1990, p. 157). The capacity for such interactions leads to a wide range of social and economic benefits to individuals as well as the community at large. According to Lozano (1990), urbanity is dependent on two mutually dependent variables—concentration of people in dense settlements and diversity of activities and services. The relationship between urbanity and density is dependent on viable thresholds because certain density levels produce enough concentration of people to support certain services and activities and these activities and services in turn facilitate people-interactions (Lozano, 1990, p. 163). Good densities support urbanity and offer the benefit of physical and socio-economic interactions, primarily, by supporting a dense concentration of people through high residential densities (Figure 3.14).

Good densities offer the benefit of physical interaction between people and place by supporting multiple transportation choices such as walking, biking, and public transportation (Figure 3.15). Walking and biking is possible through the presence of activity centers in close proximity. The relationship between high density environments and modes of public transportation, with its cost and capacity is a matter of viable thresholds. Higher the population density, more accessible mass transit becomes. For example, on a regional scale, Boston has a population density of 21 people per acre and Paris has a population density of 84 people per acre, which is four times that of Boston. As a result, every Parisian is within four to five blocks of one of 279 Metro stations where trains run every 60 to 90 seconds. For Boston to achieve such a service, it would need four very expensive miles of subways, which Paris achieves in only one mile (Lozano, 1990, p. 164). According to Campoli (2007), transit-friendly densities begin at 6 dwelling units per acre and extend into hundreds. Density threshold required for various level of service of transit system can be summarized as follows (Litster, 2011), (Holtzclaw,


FIGURE 3.14: APPROPRIATE DENSITY THRESHOLDS ALLOWS THE PROVISION OF A VARIETY OF ACTIVITIES AND SERVICES. (SOURCE: HTTPS://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/0/01/11-11-06-FAREASTCAFE-LITTLETOKYO.JPG, ACCESSED ON SEPTEMBER 22, 2013).

2007):

- Local Bus Service (1 bus per hour): 4 to 5 du/acre
- Intermediate Bus Service (1 bus every 30 minutes): 4 to 5 du/acre
- Frequent bus service (1 bus every 10 minutes): 12 to 15 du/acre
- High Capacity Transit systems (Street car): 25 to 50 du/acre

Good densities offer the benefit of social and economic interaction amongst people and between people and institutions by being able to support diverse activities and services (Figure 3.16). Good densities are an asset to the community in terms of generating an efficient consumer producer unit and there is a close connection between dense concentration of people, diversity of uses and accessibility (Jacobs J. , 1961). High densities are needed to economically support small stores, restaurants, bakeries, coffee shops, and a range of other activities. In turn, the existence of these diverse activities promotes sociability amongst people. Also, these diverse activities when in close proximity draws people from around to impart non-residential people concentration on streets and public spaces, which leads to more social


FIGURE 3.15: APPROPRIATE DENSITY THRESHOLDS ALLOW THE PROVISION OF PUBLIC TRANSPORTATION. (SOURCE: HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/0/06/DART_DOWNTOWN_PLANO_STATION_2009-11-23.JPG, ACCESSED ON SEPTEMBER 29, 2013).

and economic interactions between communities (Jacobs A. B., 2011, p. 183). Additionally, through a mix of primary uses such as residences and work places and secondary uses such as restaurants, retail, and recreational open spaces, good densities provide other benefits such as place vitality, and street safety (Jacobs J. , 1961). A Strategic location of various uses can allow concentrated pedestrian flows that are much needed for social interactions (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985, p. 33). Good densities that maximize such social interactions also offer the benefit of innovation and creativity.  Quantitative studies done by Knudsen, Florida, Gates, and Stolarick suggest a positive correlation between high densities and metropolitan patenting activity. They conclude that high density and the possibility of interactions between creative workers is a key component of knowledge spill-over and innovation (Knudsen, Florida, Gates, & Stlarick, 2007).

Good densities with diverse activities and services in close proximity also offer the benefit of parking optimization through shared parking. Form follows parking and parking plays an important role in shaping a place (Schwanke,


FIGURE 3.16: GOOD DENSITIES ALLOW SOCIAL AND ECONOMIC INTERACTION AMONGST PEOPLE AND BETWEEN PEOPLE AND INSTITUTIONS. (SOURCE: HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/8/8D/YBORCITYTAMPAFLO2.JPG, ACCESSED ON OCTOBER, 30, 2013).

2003). In high density environments, the requirement of 1–2 off-street parking spaces per housing unit becomes a major consideration. As density increases, parking should become more highly organized and space efficient (Campoli & Maclean, 2007). In good densities with a mix of uses, parking optimization through shared parking lots and structures serve to avoid vast sea of parking lots. Shared parking is the use of a parking space to serve two or more individual land uses without conflict or encroachment. The ability to share parking spaces is the result of two conditions (a) variations in the accumulation of vehicles by hour, by day, or by season at the individual landuses, and (b) relationships among land uses that result in visiting multiple land uses on the same auto trip (Smith, 2006, p. 1).

## 3.4 SUMMARY AND CONCLUSIONS

Literature review involved reviewing a range of literature sources to establish a holistic understanding of the concept of high density (Figure 3.16). Density being a subjective and complex concept leads to the problem of subjective perception and morphological manifestation of high density environments. There is an emergent need for high density environments that can perform efficiently in addressing various environmental, demographic, economic, and social concerns through its design. Therefore, as suggested by Jane Jacobs (1961) and Campoli (2007) high density environments should be understood as a matter of their design and performance.

Campoli (2007) presents the idea of good and bad densities, which is valuable in presenting a holistic understanding of high density environments. Based on the definition of high density environments and Campoli's discussions on high density environments, good densities can be understood as compact developments that efficiently meet the needs of a densely concentrated population by offering a range of environmental, social, and economic benefits.

Other literature sources provided further insight into the idea of good densities in terms of physical compactness, needs of a densely concentrated people, and benefits offered by high density environments. Compactness in good densities can be understood in terms of regional compactness and compactness on a neighborhood scale. Regional compactness results from locating high density environments within and around existing developments. Compactness on a neighborhood level is characterized by small blocks, interconnected street-block system, and building height and massing that respond to the existing and surrounding pattern of development. Needs of a densely concentrated people include need for commuting choices, need for accessibility and activity choices, basic needs of livability, need for housing choices, need for a sense of place, and a need for access to nature.

Benefits of good densities include environmental benefits, urbanity which include physical and socio-economic interactions, and parking optimization. Environmental benefits of good densities include farmland preservation and reduced energy consumption. Urbanity is the quality of an environment to allow physical and socio-economic interactions between people and institutions. Good densities allow the presence of transportation, activity choices, and economic institutions, thereby facilitating physical and socio-economic interactions. Good densities allows parking optimization through shared parking which benefits the environment in creating a sense of place and promoting physical compactness. In summary, meaningful high density environments should be designed to perform as a desirable alternative to sprawling residential environments.

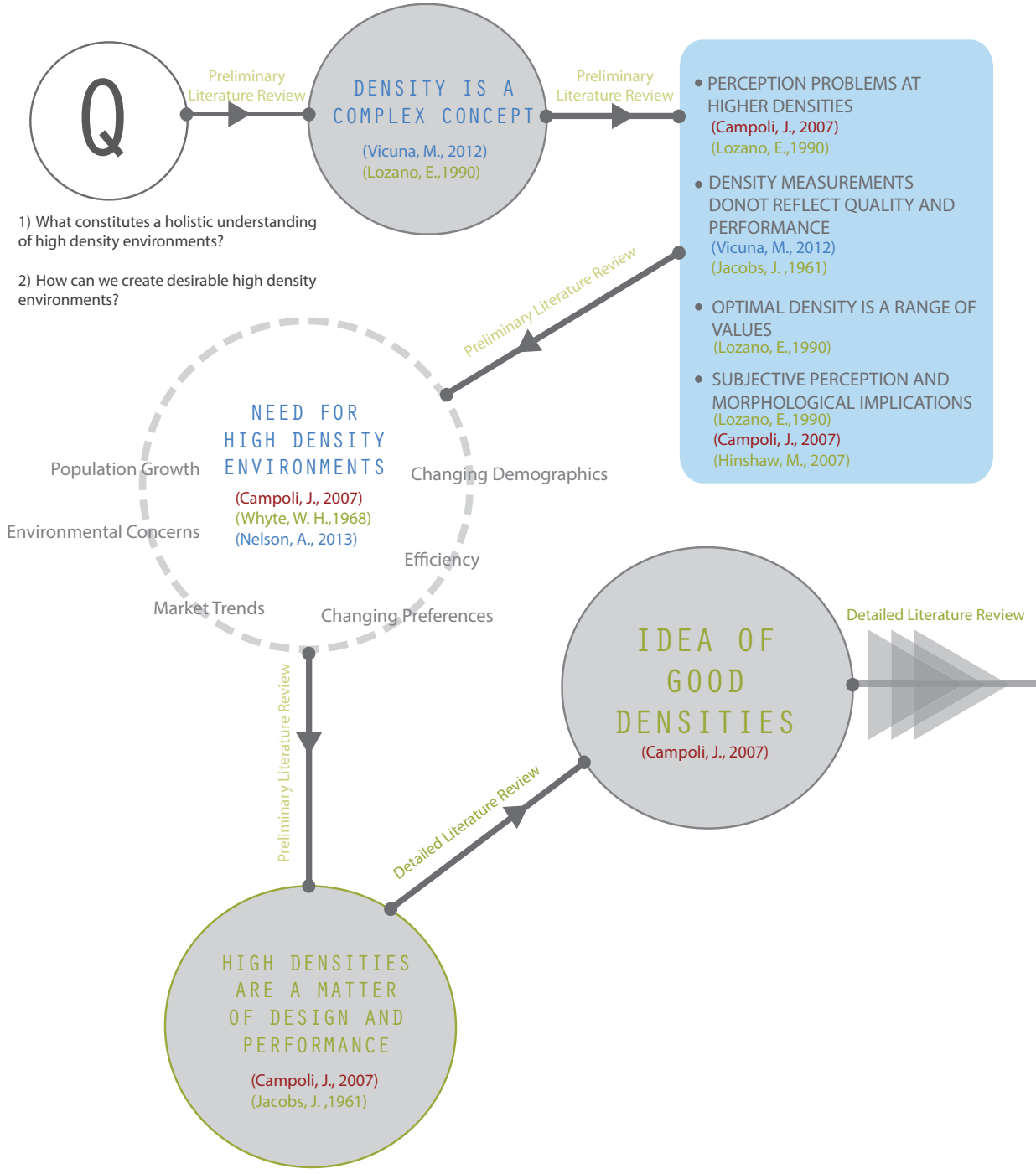



FIGURE 3.17: SUMMARY OF LITERATURE REVIEW. (BY AUTHOR, 2013).

### REGIONAL COMPACTNESS
Good Densities are located within and around existing densely built-up areas

### COMPACTNESS AT NEIGHBORHOOD LEVEL
Through smaller blocks that are designed with an inter-connected street-network, Good densities produce a sense of compactness by closely connecting various building units.

### NEED FOR COMMUTING CHOICES
Good densities are located near mass transit systems and/or meet necessary density threshold to support one or more modes of mass transit system.

### NEED FOR ACCESSIBILITY & ACTIVITY CHOICES
By mixing of uses, good densities provide choice of activities in close proximity which, in turn, promotes alternative transportation choices such as walking and biking.

### BASIC NEEDS OF LIVABILITY
Good densities meet basic human needs such as water, pollution-free environment, and well-managed spatial surroundings. Good densities achieve livability by striking a balance between housing and population.

### NEED FOR HOUSING CHOICES
Good densities are able to accommodate diverse demographic groups by offering diverse amenity choices.

Multi-family housing choices, and a variety in optimal dwelling unit sizes also allows different choices to suit different demographic groups.

### ENVIRONMENTAL BENEFITS
Good densities contribute towards preserving farmlands and minimizing energy consumption and pollution.

### BENEFIT OF PHYSICAL INTERACTION
Good densities offer the benefit of physical interaction people and place by supporting multiple transportation choices such as walking, biking, and public transportation.

### PROMOTES URBANITY
Good densities support urbanity and offer the benefit of physical and socio-economic interactions, by supporting a dense concentration of diverse people through high residential densities.

## GOOD DENSITIES ARE PHYSICALLY COMPACT

### COMPACTNESS AT NEIGHBORHOOD LEVEL
Compactness in good densities also results from responding to the surrounding context in terms of its urban form.

Good Densities foster a sense of compactness by designing buildings that respond to the existing pattern of development.

## GOOD DENSITIES MEET THE NEEDS OF DENSELY CONCETRATED PEOPLE

### NEED FOR A SENSE OF PLACE
Good densities offer a sense of place by designing sociable streets with street-facing buildings, informal seating areas, tree-lined sidewalks, bike path, amenities for pedestrians, and clear signage.

Good densities balances the need for privacy and public life through building designs with provisions for quasi-public courtyards and private balconies and terraces to achieve an interactive public-private interface.

Good densities meet the need for visually rich experiences in public life through visually appropriate and rich architectural features.

### NEED FOR ACCESS TO NATURE
Good densities meet the need for access to nature and open spaces by providing open spaces and plazas that result as a part of the urban pattern and are clearly defined and enclosed by surrounding buildings.

## GOOD DENSITIES OFFER A RANGE OF BENEFITS

### BENEFIT OF SOCIO-ECONOMIC INTERACTION
Good densities support diverse economic instituitions, promotes sociability, offer safe and vital places, drives innovations, reduces infrastructural costs of the community at-large.

### BENEFIT OF PARKING OPTIMIZATION
Good densities with diverse activities and services in close proximity also offer the benefit of parking optimization through shared parking.

# CHAPTER 4
# EXPLORATIVE DESIGN

# 4



HOW WE PERCEIVE DENSITY HAS EVERYTHING TO DO WITH HOW IT IS DESIGNED NOT THE ACTUAL RATIO OF UNITS TO ACRE.....CAMPOLI (2007)

# EXPLORATIVE DESIGN

Theoretical ideas from literature review were explored through two urban redevelopment projects. Design challenges and opportunities emerging from these projects further contributed towards a holistic understanding of high density environments. The first project is the Gerald D. Hines Student Urban Design Competition (ULI Project). The site for this project is located in downtown Minneapolis which is a highly urbanized setting (Figure 4.1). The second project is the MHK Project, the site for which is Village Plaza - a suburban shopping district (Figure 4.2). This chapter documents these two projects as it relates to answering the research questions.

FIGURE 4.1: SITE CONTEXT FOR THE GERALD D. HINES STUDENT URBAN DESIGN COMPETITION PROJECT. (SOURCE: HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/A/AC/DOWNTOWNEAST-SUPERSIZE-051207.JPG, ACCESSED ON SEPTEMBER 27, 2013).


FIGURE 4.2: SITE CONTEXT FOR THE MHK VILLAGE PLAZA PROJECT. (SOURCE: HARPER, 2013).

## 4.1 ULI COMPETETION PROJECT

### THE SITE

The site for the ULI project is an under developed multi-block area in downtown Minneapolis, Minnesota. The general location of the site and parcels to be redeveloped is shown in Figure 4.3. In addition to the marked project area, some adjacent parcels marked in grey are the parcels available for redevelopment if need be. The site is located in the Downtown East neighborhood which is defined by the Mississippi River to the north, Interstate 35W to the east, 5th Street to the south, and Portland Avenue to the west. The site is in close proximity to Mississippi River and several parks such as Elliot Park, Gold Medal Park, and Mill Ruins Park. The site is also adjacent to the Metrodome which is home to the Minnesota Vikings of the National Football League. The site and adjacent area is serviced by light rail and a bus system. Washington Avenue to the north, I-35 to the east, and Hennepin Avenue to the west serve as major thoroughfares. The parcels in the site predominantly comprise surface parking lots with advertising billboards. Even though these parcels generate income, they are aesthetically undesirable and need redevelopment. The site also houses "The Armory", which is listed on the National Register of Historic Places.


FIGURE 4.3: SITE DESIGNATION. (SOURCE: ZUNDEL, 2013).

### PROJECT BACKGROUND AND REQUIREMENTS

The Gerald D. Hines Student Urban Design Competition brief guided the ULI project by providing project requirements and relevant background information. Downtown Minneapolis is the largest employment center in Minnesota. However, much of the activities are concentrated in Downtown West. Most of the residential developments in the area are located in Downtown East. Mill District, which is located north of the project area along the Mississippi River, houses several high-end loft apartments. Other housing opportunities in downtown east are targeted towards lower income residents. Elliot Park area has several multi-family housing, senior housing and some single-family housing. There have been much planning efforts by the City of Minneapolis and the Downtown Council to increase residential density in Downtown Minneapolis, thereby, creating opportunities for mix of uses, enhancing transit, and creating bicycling as a transportation choice. The City aspires to make downtown a model for urban living and has already invested in promoting transit, bikeways, and higher residential densities within downtown. The project area, which is


currently dominated by surface parking and billboards is a hindrance to this aspiration. Key project requirements set by ULI are as follows:

- The project area should be able to promote Downtown as a model for urban living.
- The proposal for the project area must include regional and neighborhood destinations.
- The development plan should communicate important elements of design such as connectivity, landuses, and overall design characteristic for the site.
- The proposed plan must include a vision for the new Vikings Stadium.
- Extension of existing skywalk system into the project area is not permitted.
- "The Armory" should remain on the site but can be subjected to adaptive reuse.
- The development plan should identify a phasing plan with a detailed concept plan for proposed development within the ten-year hold.
- The proposed plan should be a market-feasible proposal that creates value for property owners, city residents, and region as a whole.

## DILEMMA, AND STRATEGIES

The project area in its current state is spatially disconnected from its surrounding context. Multiple blocks of surface parking breaks the spatial continuity within the area in terms of landuses and pedestrian activities. The project area being devoid of uses and activities that can attract people also creates an identity crisis for this area. The vast wasteland of surface parking lots has become a pass through area with nothing to hold people except on game days. This situation is the major dilemma to be resolved through redevelopment of the project area. Additionally, there is a need for more housing choices, especially affordable housing and senior living in Downtown East area (Appendix 3). Another important issue to be addressed is for the project area to engage the new Viking Stadium as well as other key proximal activity centers.

Primary strategy needed to resolve this dilemma included creating spatial continuity through a mix of market feasible landuses and establishing connectivity corridors. Proposing an anchor landuse that is relevant to the regional socio-economic climate and creating meaningful public spaces was identified as strategies to provide a new identity to the site. Infill of the project area with appropriate residential density and mix of retail; commercial uses; and public places cumulatively can potentially revive the site as a model for urban living.

## SITE CONTEXT: PROXIMITY, ACCESSIBILITY AND CONNECTIVITY

The ULI competition project site is located amidst an urban context with surrounding neighborhoods consisting of residential, employment and entertainment centers. In spite of a dense urban context, the site retards continuous urban experience in the project area because of dominant on-site surface parking lots.

The site is in close proximity to various activity centers (Figure 4.4). To the north of the site is Mill District which houses some newly developed condominiums and various cultural institutions such as Guthrie Theater, Mill City Museum, and MacPhail Center for Music. To the west is the downtown core which is an employment center. To its south is Elliot Park residential area which provides a range of housing and recreation choices. To its east is the University of Minnesota which is also an important activity center in terms of housing, recreation and employment.

There exists transit and bicycle infrastructure traversing the site and it's surrounding area (Figure 4.5). A proposed light rail system further connects the site with the university area. The site parcels are part of a grid-iron street-block system that has strong pedestrian and vehicular corridors that extends into the surrounding area. There are also other historically significant commercial and residential neighborhoods surrounding the site such as Warehouse District, Dinkytown, Marvy-Holmes, and Cedar-Riverside.

In summary, the site has the benefit of residential, commercial, and cultural activity centers in close proximity; basic infrastructure for pedestrian access to these activities; and infrastructure for alternative transportation that enhances local and regional connectivity between the site and surrounding areas.

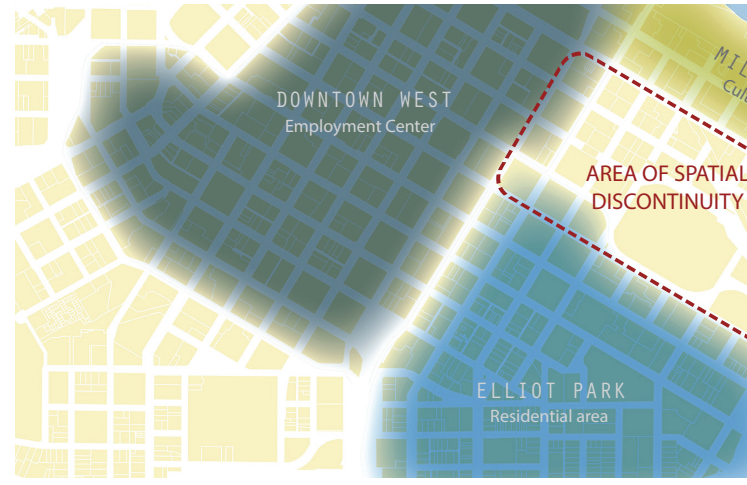



FIGURE 4.4 ADJACENT DISTRICTS.(ZUNDEL, 2013).

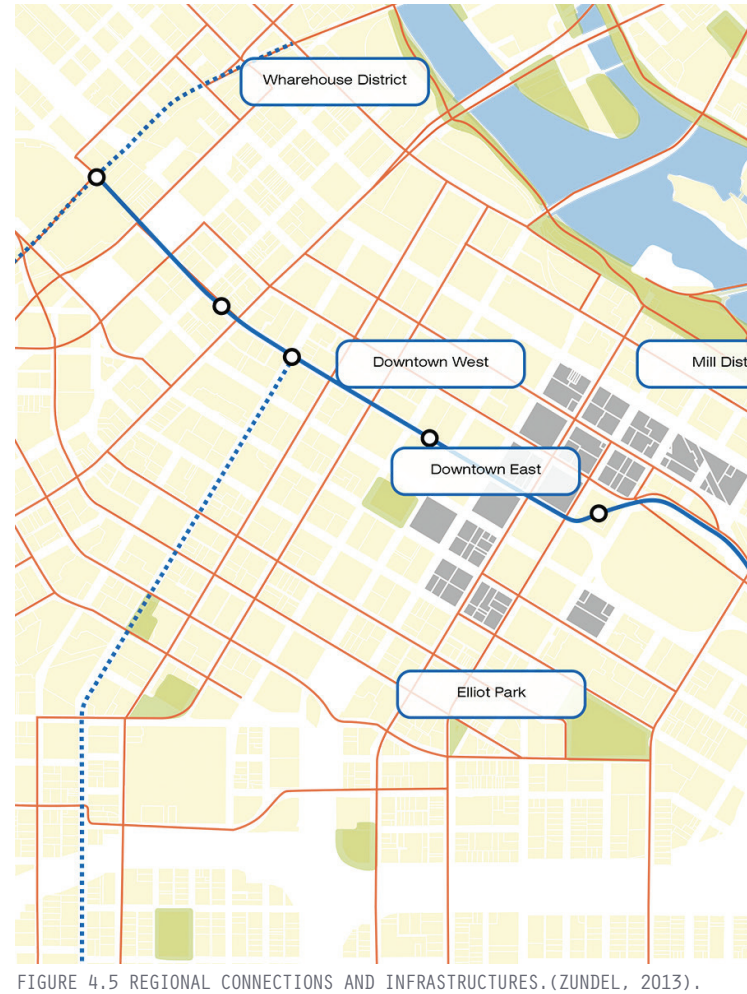



FIGURE 4.5 REGIONAL CONNECTIONS AND INFRASTRUCTURES.(ZUNDEL, 2013).



Exploring design opportunities emerging from site location and context is important in terms of a holistic understanding of meaningful high density environments. The location and surrounding context of the site is favorable in terms of physical compactness as understood through literature review. Firstly, the site being an urban infill site within existing development facilitates regional compactness. As a result, the site has the benefit of a variety of existing services and activity centers in close proximity. The presence of existing and proposed transit systems further enhance regional compactness, thereby, providing opportunities for the redeveloped site to be regionally well-connected. Also, proximity to Mississippi river and several parks of varying sizes provide an opportunity of physical and visual access to nature.

Secondly, the site is part of an existing grid-iron street-block system which comprises streets connected to nearby main pedestrian corridors and blocks of approximately 350 ft X 350 ft. As a result, the site has the benefit of permeability and pedestrian accessibility to its surrounding areas which provides opportunity for a compact development at neighborhood level. Also, the existing block sizes provide opportunities to accommodate a wide range of uses and to promote physical and visual permeability as understood through literature review.

The site is, therefore, strategic in terms of being physically compact and offering a wide range of socio-economic benefits if redeveloped as a high density environment. Redevelopment of the site with high residential density would be meaningful considering the opportunity it offers for physical compactness; its proximity to a variety of activity centers; existing transportation choices; access to nature; and pedestrian accessibility.

## SITE CONTEXT: RESIDENTIAL DENSITY

The surrounding context of the site accommodates high residential density. Figure 4.6 illustrates density distribution around the project area based on U.S. Census data by census block. The geographic definition of each census block in the area coincides with the street-block system. Gross density of blocks with residential uses ranges from 0 to 129 dwelling units per acre (Figure 4.6). The number of dwelling units in blocks with residential uses range from 1 to 1144.

High residential density in the area results largely from multi-family housing choices ranging from condominiums, apartments, and duplexes. Morphologically, residential densities in the downtown area manifest in different massing and typology. The area houses high-rise condominiums, mid-rise apartment buildings and few duplexes (Figure 4.7, Figure 4.8, and Figure 4.9). Some of the mid rise apartment buildings such as Loring Park Apartments (Figure 4.7) are three to four stories high. The high-rise residential buildings such as Marquette Place Apartments (Figure 4.9) range between 36 – 40 stories. Therefore, the surrounding context offers

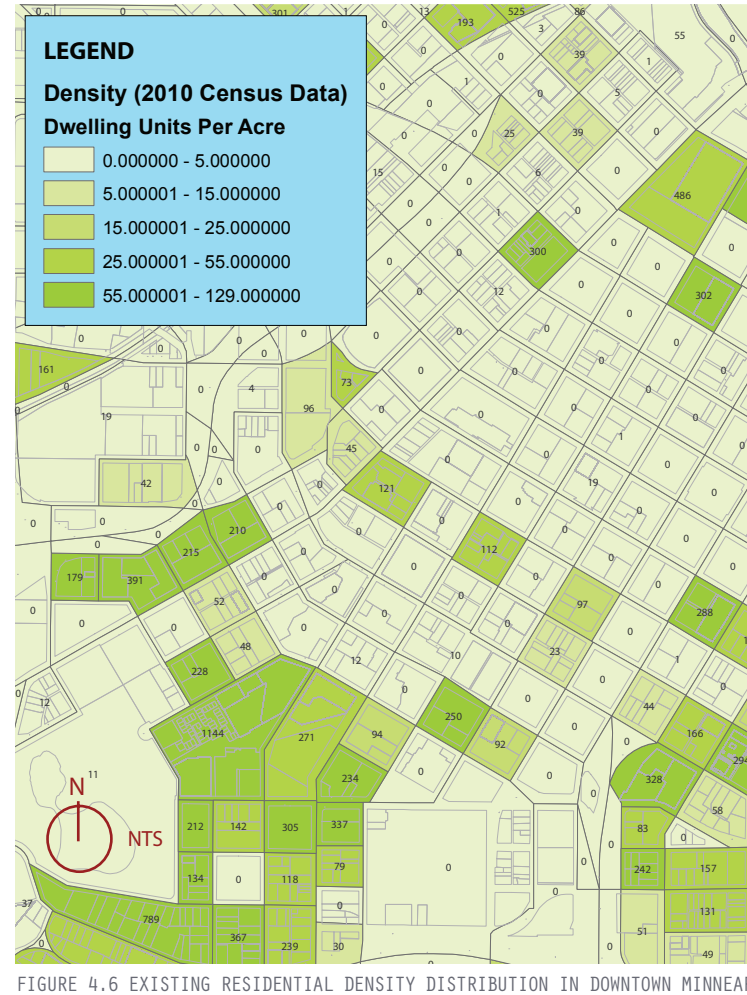



FIGURE 4.6 EXISTING RESIDENTIAL DENSITY DISTRIBUTION IN DOWNTOWN MINNEAP


FIGURE 4.7 MID-RISE APARTMENT LORING PARK APARTMENTS. (SOURCE: HTTP://MEDIALIBRARYCDN.PROPERTYSOLUTIONS.COM/MEDIA_LIBRARY/2843/5283A2F2BAAF3569.JPG, ACCESSED ON NOVEMBER 12, 2013)

FIGURE 4.8 PANORAMIC VIEW OF SITE CONTEXT. (SOURCE: HTTP://UPLOAD.WIKIM ON NOVEMBER 14, 2013).

POLIS.(BY AUTHOR, 2013).

EDIA.ORG/WIKIPEDIA/COMMONS/E/E4/2008-0712-MPLS-PANORAMA.JPG, ACCESSED

high residential density with different building massing and typologies. High residential density in the surrounding context offers several design opportunities in terms of redeveloping the site as a meaningful high density environment. The surrounding high residential density contributes to density thresholds required to support different activities and services, thereby allowing a variety of non-residential uses for the site.
In terms of building height and massing, the surrounding context offers the opportunity to redevelop the site with mid-rise and high-rise residential buildings depending on the long-term and current market demand for housing.

FIGURE 4.9 HIGH-RISE CONDOMINIUM MARQUETTE PLACE APARTMENTS.(SOURCE: HTTP://UPLOAD.WIKIMEDIA.ORG/WIKIPEDIA/COMMONS/E/E4/2008-0712-MPLS-PANORAMA.JPG, ACCESSED ON NOVEMBER 14, 2013).

# KINETIC MINNEAPOLIS

Kinetic Minneapolis is envisioned as a conceptual framework for social and economic sustainability. The word 'kinetic' in this context relates to activity, dynamic movement, human friction, and progress. Kinetic places have an inherent ability to trigger and channelize intellectual productivity, social vibrancy, and physical activity (Figure 4.10). The regional socio-economic forces strongly suggest the potential of Downtown Minneapolis to become such a place; with the East Downtown Redevelopment Site as an important center. This concept is applied to transform the site into a hub for intellectual, social, and physical kinetics by designing a high density mixed-use district, which is characterized by the synergy of an anchor bio-tech business incubator and supporting residential, retail, and recreational uses. The Minneapolis St. Paul region has emerged as a global hub for research and innovation in medical devices and bio-science. Home to establishments like St. Jude Medical, Medtronic, University of Minneapolis, and Mayo Clinic, Minneapolis is a leader in medical device innovations. Growing trends of collaborative innovation efforts between the medical device industry and emerging bio-pharmaceutical industries creates great opportunities for innovation and entrepreneurship. With only two small-scale support centers for small businesses, downtown Minneapolis lacks sufficient entrepreneurial infrastructure to capitalize these opportunities. Thus, the introduction of an advanced bio-tech business incubator would consolidate existing entrepreneurial infrastructures and channelize regional innovative forces towards achieving business vitality. Given the socio-economic climate, the incubator advances the downtown core and attracts the creative class who drive innovation. The selection of other supporting land uses is based on regional demographic factors such as mixed-income population, high percentage of young adults, growing affluent retired population, and a high percentage of urban renters compared to national average. The residential component of the district includes market-rate & affordable housing units, luxury condos, and senior living to cater to the dominant demographic segments. Variety in the district's housing typologies helps generate social diversity. The commercial component of

FIGURE 4.10 VIEW OF KINETIC PLAZA (HEERMAN, 2013).

FIGURE 4.11 URBAN MARKET (JOHNSTON. 2013).

the district includes a boutique hotel, a movie theatre, a community grocery store, retail spaces, and medical offices (Figure 4.11). This variety of commercial uses makes the district a destination for regional commuters and residents of neighboring districts as well. Also, the adaptive reuse of the Minneapolis Armory into a neighborhood recreation center serves to be an important amenity for residents. These uses are strategically located to maximize influx of regional transit commuters; pedestrians from neighboring districts; real estate value; and meaningful vistas (Figure 4.12, Figure 4.13).

Such a fine grain mix of uses activates a lively public realm. The central plaza, which is framed by street-level retail and the incubator, enhances the district's public realm (Figure 4.10). The plaza acts as a node of friction between residents, regional commuters, and the creative-class. Kinetic Minneapolis, a synergy of residential, employment, and commercial destinations, connects the surrounding districts through an experiential continuum and therefore, maximizes the use of existing transit, bike routes, and pedestrian connections. As a whole, the district presents a sustainable model for urban living through intellectual, social, and physical kinetics.


FIGURE 4.12 MASTER PLAN OF KINETIC MINNEAPOLIS.(ZUNDEL, 2013).

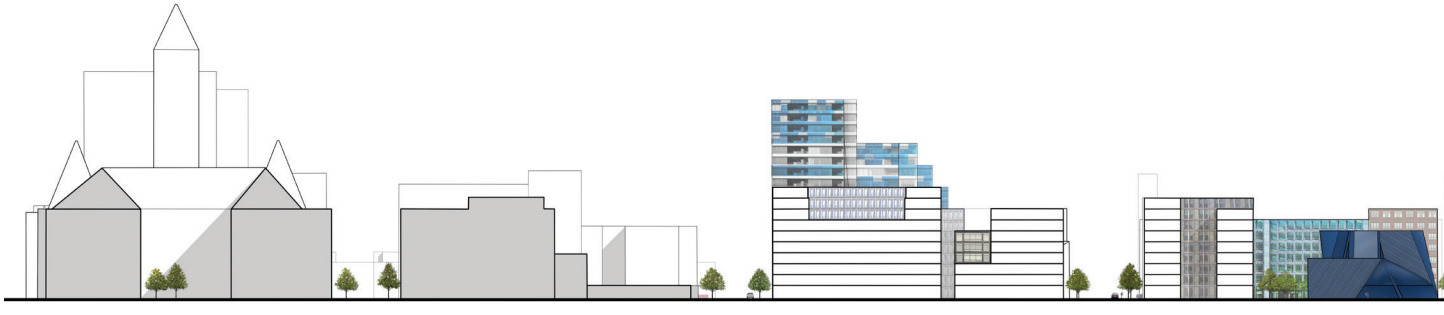
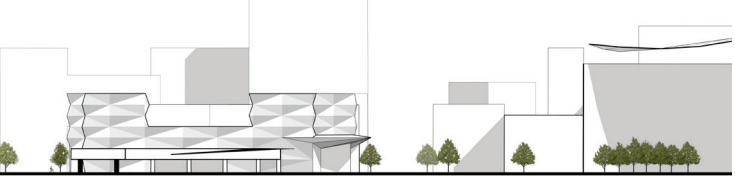


FIGURE 4.13 SECTIONAL VIEW OF KINETIC MINNEAPOLIS.(ZUNDEL, 2013).

KINETIC
MINNEAPOLIS

1 New Vikings Stadium

2 Rec Center - Minneapolis Armory

3 Metrodome Light Rail Station

4 Medical Offices

5 Incubator Offices

6 Incubator

7 AMC Theater

8 Urban Grocery

9 Kinetic Plaza

R Residential

R Retail Below - Residential Above

## SPATIAL CONTINUITY, FLOWS, AND CONNECTIVITY

Kinetic Minneapolis solves the primary dilemma posed by a lack of spatial continuity in the project area through strategic land uses and maintaining connectivity. Using existing transit system, street networks, and proposed activities, Kinetic Minneapolis maximizes local and regional influx into the project area. Regional influx to the project area happens along Washington Avenue and 5th Avenue which facilitates vehicular traffic and the light rail public transit line, respectively. The Local influx occurs in the corridors of Portland Avenue and Chicago Avenue which serve to link the Neighborhoods of the Mill district and Elliot Park, primarily through pedestrian means (Figure 4.14). Kinetic Minneapolis maximizes both the local and regional influx by creating an experiential continuum along these key corridors. Acting upon design opportunities emerging from site location, Kinetic Minneapolis is designed as an environment that is compact, both regionally and at a neighborhood level. Also, enhanced connectivity and pedestrian flows meet the need for commuting choices and offers the benefit of physical interaction between people and places as understood through literature review.

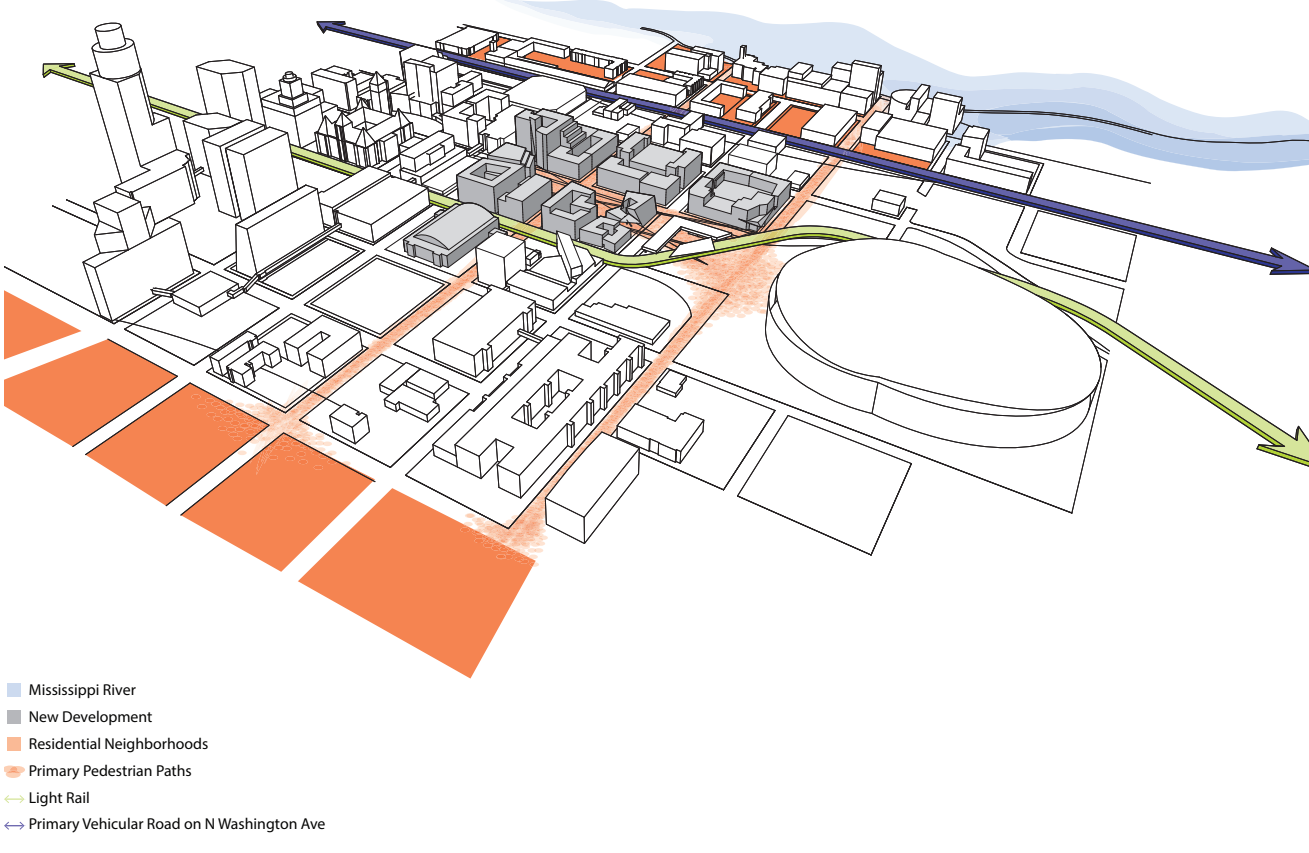



FIGURE 4.14 REPRESENTATION OF CONNECTIVITY AND FLOWS AT KINETIC MINNEAPOLIS (JOHNSTON, 2013).

## DENSITY AND MASSING

Kinetic Minneapolis is envisioned as a high density mixed use environment. Gross residential density of blocks in the proposed district ranges from 61 dwelling units per acre to 217 dwelling units per acre. The gross residential density of the project area (including blocks with non residential uses) is 62 dwelling units per acre (Figure 4.15). Buildings in the proposed district are between six to ten floors. The proposed density is such that the massing and heights of buildings in the proposed district do not overpower the surrounding context in terms of its physical form.

Even though density is relative, literature review suggest that meaningful high density environments achieve certain density thresholds that can support alternative transportation modes and other small scale activities and services. Regional market trends in the project area provide opportunities for increased residential densities. However, the proposal maintains a balance between achieving density thresholds and creating building heights and massing that is context responsive. This is a valuable input in terms of creating meaningful high density environments.

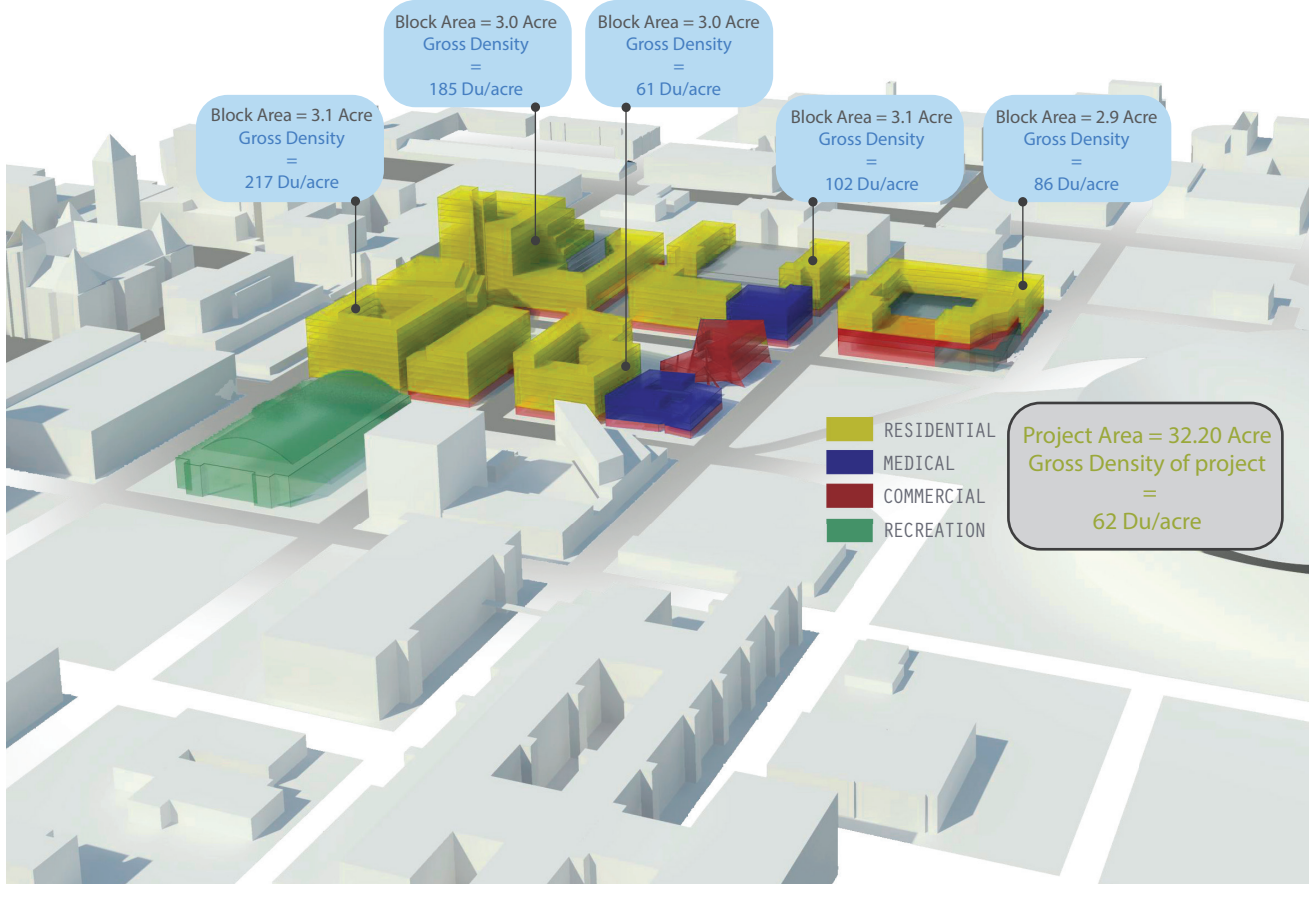



FIGURE 4.15 DENSITY DISTRIBUTION IN KINETIC MINNEAPOLIS (BY AUTHOR, 2013 - ADAPTED FROM HEERMAN, 2013)

## DEMOGRAPHICS AND LANDUSES

Kinetic Minneapolis supports a mix of landuses that cater to a wide range of demographic groups. Regional demographic data highlights factors such as mixed-income population, high percentage of young adults, growing affluent retired population, and a high percentage of urban renters. The largest demographic base in the region is that of young professionals (56.5%) followed by affluent retired population (19.4%). The other dominant target demographic groups include urban renters (4.8%), college students (4.7%) and metro renters (4.4%). Figure 4.16 represents details about the target demographic groups in terms of their age, employment, income, and preferred amenities.

Landuses and activities in Kinetic Minneapolis are based on market demand and the needs of the dominant target demographic groups. The proposed district supports a dense residential environment with a variety of housing types including market-rate & affordable housing units, luxury condos, and senior living (Figure 4.17). These housing types efficiently cater to the needs of dominant demographic groups and are responsive to the existing market forces. Commercial uses in the district include a boutique hotel, a movie theatre, a community grocery store, retail spaces, and medical offices. Alongside catering to the needs of the residents, these commercial uses also make the district a destination for regional commuters. Also, the adaptive reuse of the Minneapolis Armory into a neighborhood recreation center result in becoming an important amenity in the district. The central Kinetic Plaza binds these landuses together and serves as a hub for casual social interaction and enhances urban life within the district. All these uses are strategically located to maximize local and regional influx; real estate value; urban pedestrian life; and meaningful vistas.

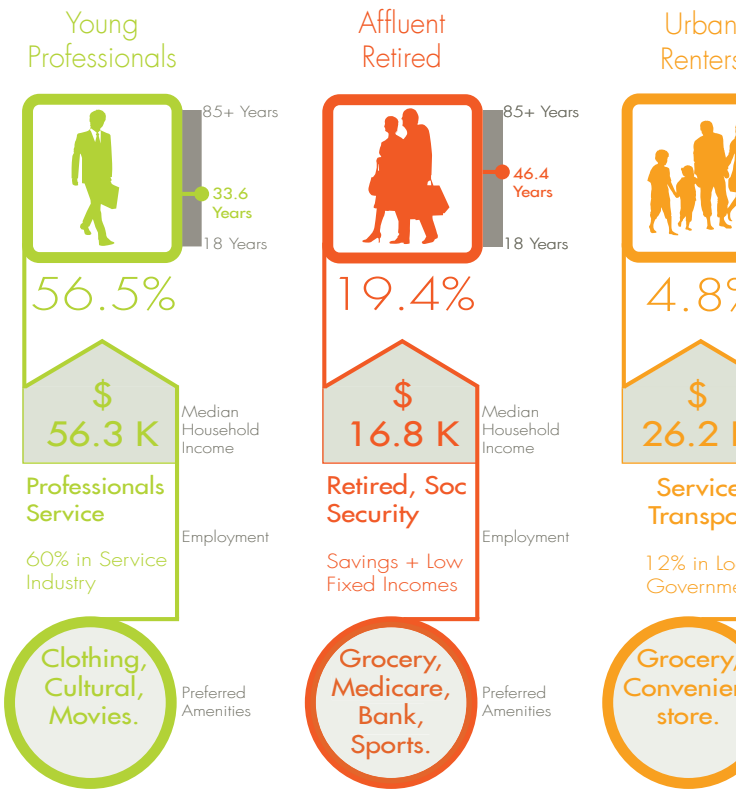



FIGURE 4.16 INFORMATION ON TARGET DEMOGRAPHIC GROUPS AND THEIR NEEDS (BY

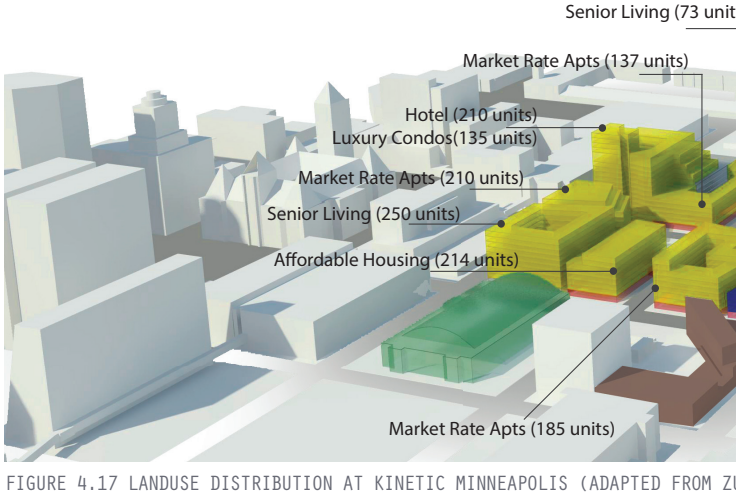
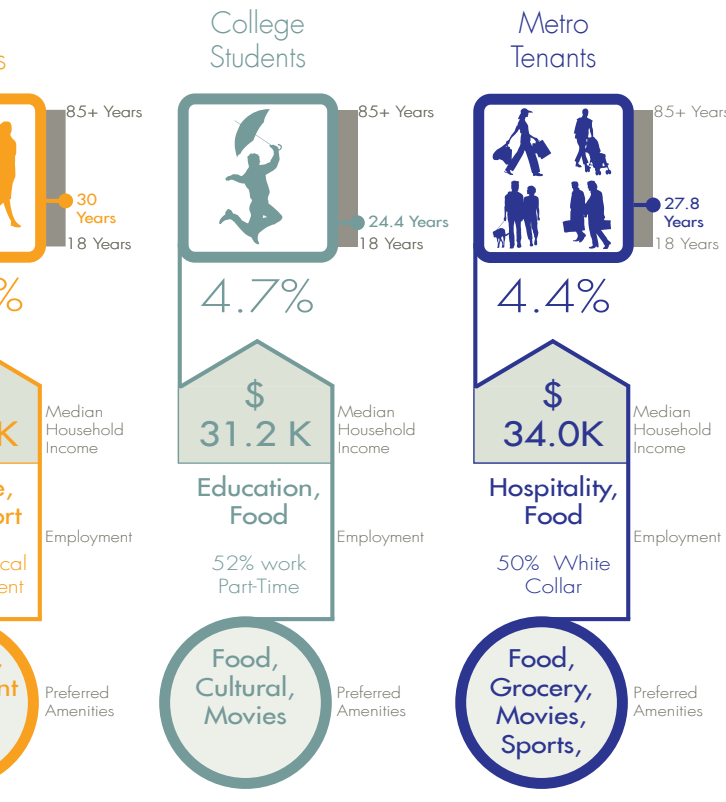
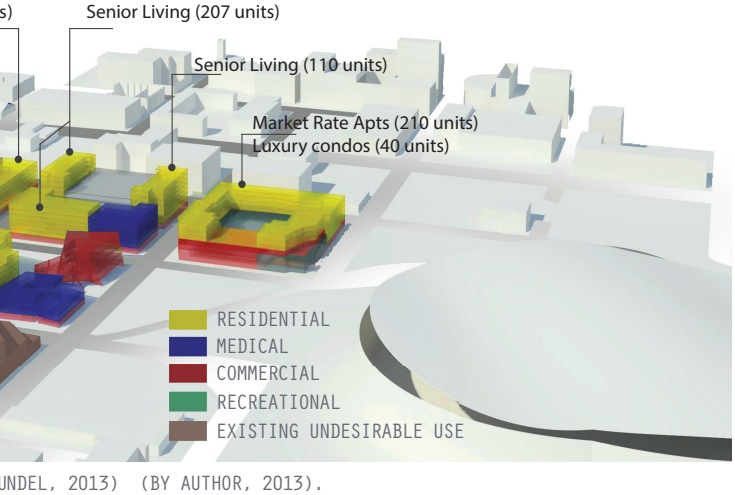



FIGURE 4.17 LANDUSE DISTRIBUTION AT KINETIC MINNEAPOLIS (ADAPTED FROM ZU




Y AUTHOR, 2013).




UNDEL, 2013) (BY AUTHOR, 2013).

Kinetic Minneapolis allows exploration of ideas such as demographic diversity; mix of primary and secondary uses; and offering benefits of socio-economic interactions. Literature review indicates that these are important elements of meaningful high density environments. Regional demographic and market trends provide the opportunity to maintain demographic diversity in the neighborhood through designing a wide range of housing types. Also, a high demand for other commercial uses and services provides the opportunity to maintain a variety of uses and activity choices through a mix of primary uses (housing, incubator, and office spaces) and secondary uses (medical shops, retail stores, and restaurants).

The ULI project design exercise also provides several valuable inputs in terms of creating meaningful high density environments. In case of locations with dense urban context, there is a need for creating nodes of intensive use to maximize pedestrian activities that enhance socio-economic interactions. Kinetic Minneapolis achieves such a node in the form of kinetic plaza which is surrounded by secondary uses such as coffee shops and other retail shops and services at street level and primary uses on upper levels. The design exercise also points towards a need to address undesirable uses affecting the value of residential buildings. The County Juvenile Detention Center (JDC) is located adjacent to the ULI project site. Such undesirable uses can negatively affect the value of residential buildings because of people's aversion towards such uses. In case of Kinetic Minneapolis, the transit line visually and physically separates the JDC. Also, the design and location of the JDC building minimizes it's negative impact on adjacent residential buildings. Therefore, measures to separate existing or proposed undesirable uses from residential uses become critical in considering high density environments.

## PHASING

Kinetic Minneapolis is envisioned as a carefully planned private, public, and organizational investment/ partnerships that can potentially offer financial, intellectual, economic, and social benefits for all involved parties. As a part of the project requirement, development of the district is planned over the course of three separate phases spanning from year 2013 to 2024 (Appendix 1). The phasing strategy follows forecasted demand based on market analysis of the defined trade area, surrounding areas, and correlations with key national trends.

Figure 4.18 shows the proposed buildings to be developed in each phase. The development comprises a total of 3,030,624 square foot built-up area of which 1,021,625 Square feet is built in the first phase; 1,007,049 Square foot is built in the second phase; and 1,001,950 Square foot is built in the third phase. Figure 4.19 shows the percentage of floor area dedicated to different landuse type in each phase. The development comprises a total of 3,030,624 square foot built-up area of which 1,021,625 Square feet is built in the first phase; 1,007,049 Square foot is built in the second phase; and 1,001,950 Square foot is built in the third phase.

Phase 1 of the development plan focuses more on residential uses compared to other uses. Provision of structural parking is based on the parking needs in each phase. Due to an immediate demand for affordable housing, all of the affordable housing units are proposed to be built in Phase 1. Seeing a future demand for market rate apartments and senior living, these housing types are focused mostly in Phase 2 and Phase 3. In summary, the phasing strategy for Kinetic Minneapolis is all about responding to market demands; achieving maximum profitability; and creating catalytic market effects that can benefit the development.

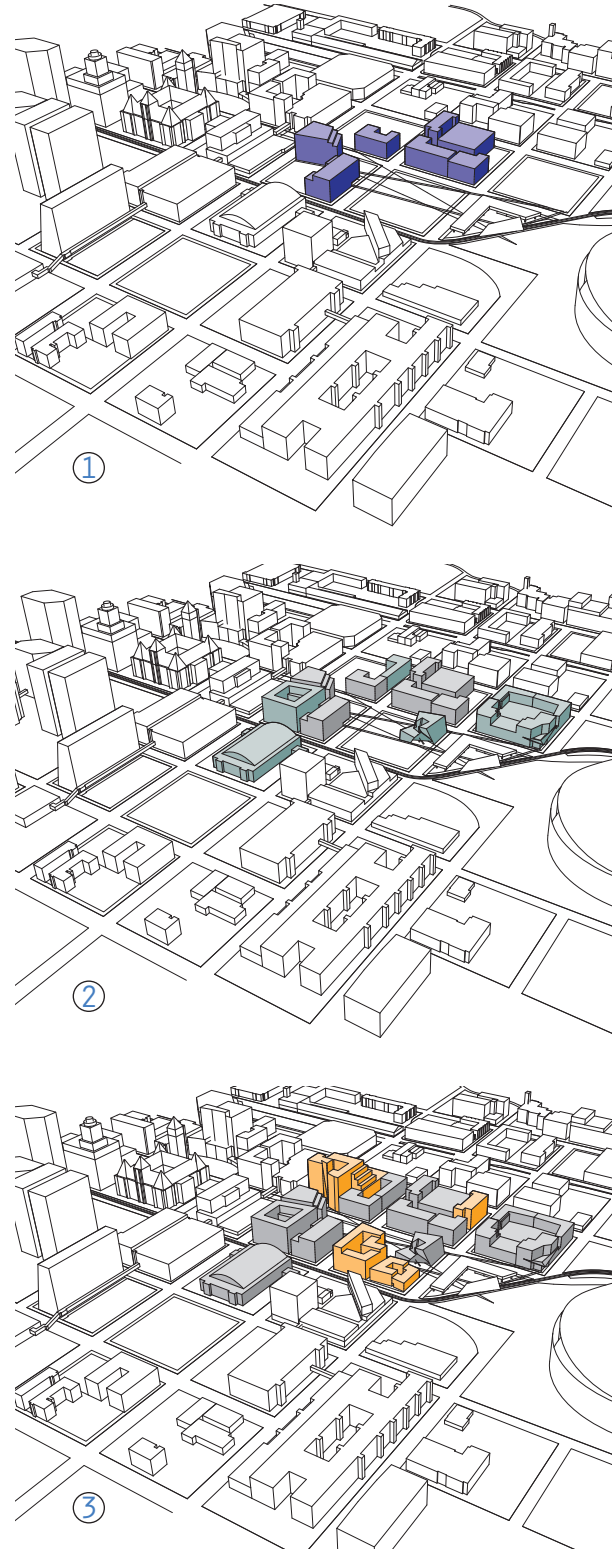
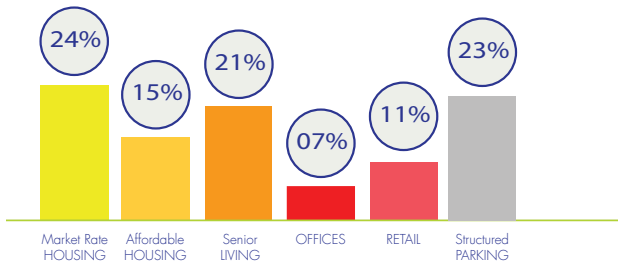
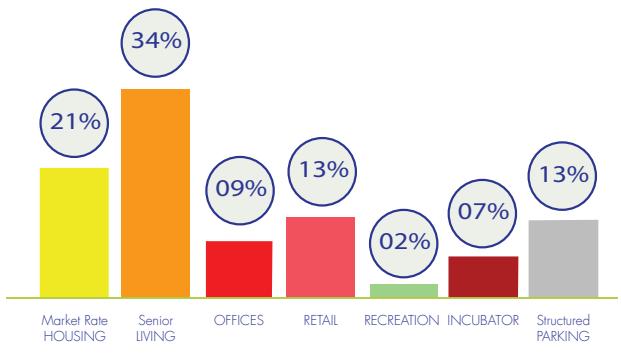


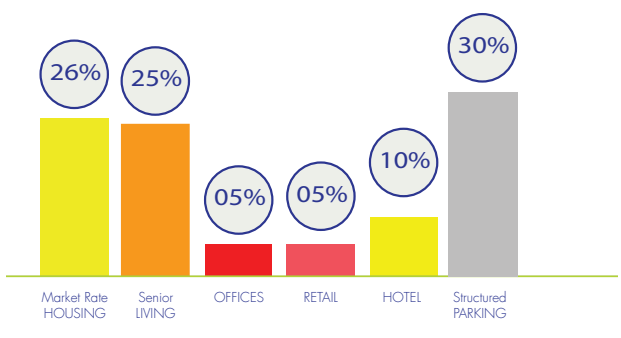

FIGURE 4.18 BUILD OUT IN THREE PHASES (HEERMAN, 2013).




PHASE 1




PHASE 2




PHASE 3

FIGURE 4.19 PHASING OF LANDUSES BASED ON FLOOR AREA (HEERMAN, 2013).

Through the ULI project design exercise, phasing emerges as an important strategy in the process of creating meaningful high density environments. Phasing allows incremental development, thereby, reducing financial risk. Phasing also brings efficiency to the overall project management in terms of construction cost and occupancy. In a strategically phased high density development, there is incremental occupancy of various buildings which results in shorter time for revenue generation. Also, strategic phasing can alter market effects to some extent in a manner that can allow variety of landuses for high density environments.

In case of Kinetic Minneapolis, maximizing residential uses in the first phase generates more demand for commercial uses such as offices, restaurants, and other needed services in the subsequent phases. Strategic phasing can incrementally help achieve higher residential densities over time to meet necessary density thresholds. As evident from ULI design exercise, strategic phasing can also be useful in generating market demand for non residential uses and services, thereby, promoting a wide range of activity choices in high density environments. Given the benefits of strategic phasing in terms of project management, revenue generation, creating opportunities for a mix of uses, and efficient occupancy management; one may conclude that phasing is inevitable in large-scale multi-block high density developments.

## PARKING OPTIMIZATION

Kinetic Minneapolis is proposed on blocks which previously served as surface parking lots for the surrounding area. Therefore, parking becomes an important consideration for the development plan. Parking in Kinetic Minneapolis is strategically positioned in the periphery to be able to serve the neighborhood as well as surrounding areas (Figure 4.20). Peripherally

positioned parking also enhances walkability at the core of the district. Site location and mix of uses within the district provide the opportunity for parking optimization through shared parking (Appendix 2). Using ULI shared parking analysis; Kinetic Minneapolis is able to reduce parking requirements up to 60%. Based on commuting data and studies in (Frank & Pivo, 1994), the proposed district leads to a shift in mode of commuting to work as shown in figure 4.21).

Parking optimization is a key factor in considering high density environments because with increasing dwelling units the parking needs increase. Literature review findings suggest that excessive provision of parking can be detrimental to a sense of place. ULI project design exercise allows exploration of parking optimization as an important design guideline in considering high density environments. However, it is important to note that parking optimization within a high density environment is largely dependent on the existence of alternative modes of transportation and a mix of diverse landuse types. Also, parking optimization efforts should not result in parking shortage and must meet parking needs of the project.

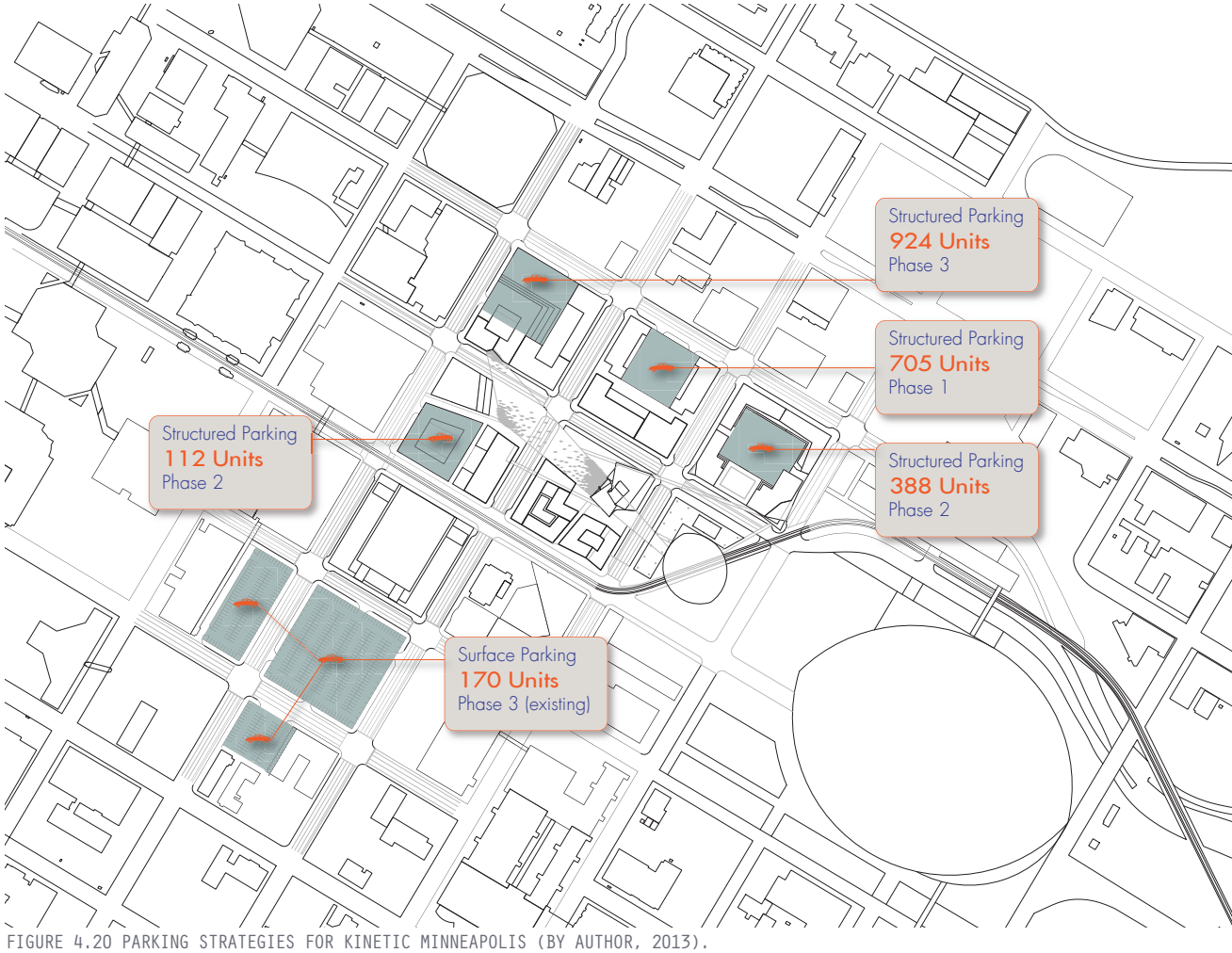



FIGURE 4.20 PARKING STRATEGIES FOR KINETIC MINNEAPOLIS (BY AUTHOR, 2013).

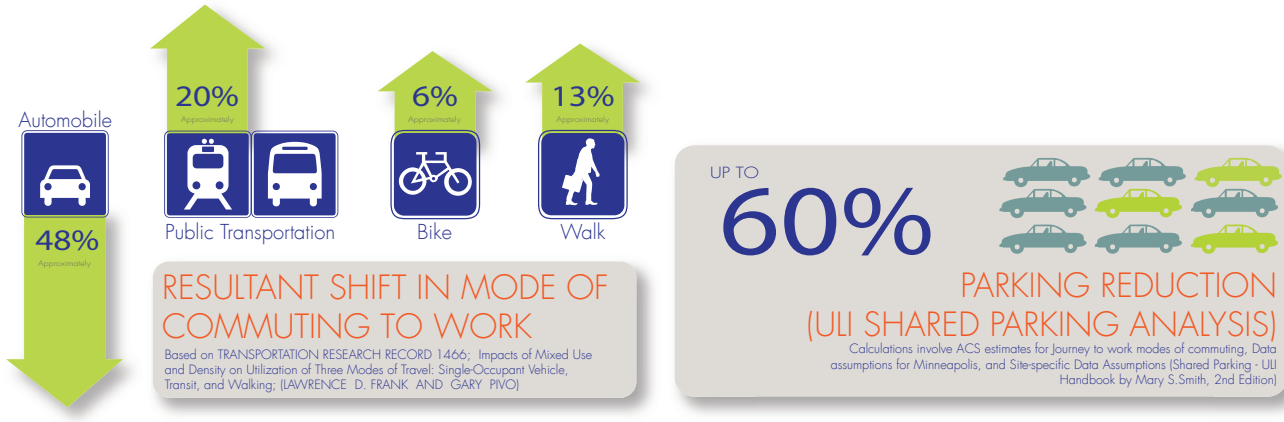



FIGURE 4.21 GRAPHICAL REPRESENTATION OF PARKING OPTIMIZATION AT KINETIC MINNEAPOLIS (BY AUTHOR, 2013).

## ULI PROJECT EXPLORATION SUMMARY

ULI project allowed design exploration of literature review findings. Literature review findings were explored through design opportunities and challenges related to creating meaningful high density environments. Design exploration of literature review findings through the ULI project can be summarized as follows:

• Firstly, site location plays an important role in making Kinetic Minneapolis a meaningful high density environment. Regional connectivity through existing transit system, pedestrian connectivity through existing street-block system, a high density context, and activity centers in close proximity provides an opportunity to explore the idea of compactness as understood through literature review. These factors also allow parking optimization. Site location also provides the opportunity to explore the concept of urbanity in terms of socio-economic interactions and physical interaction between people and places. Resultant design implication is to create nodes of intensive use to promote both regional and local influx and considering shared parking to minimize parking requirements.

• Secondly, market trends with high demand for housing as well as other commercial uses provide opportunities to achieve density thresholds that can support a mix of uses. Provisions for a mix of uses further allow parking optimization. Market trends also allow exploration of phasing as an important strategy in the process of creating meaningful high density environments. Resultant design implications of opportunities provided by market trends include maximizing residential density, considering strategic phasing to maximize density and mix of uses, and considering parking optimization through shared parking.

• Finally, ULI competition project brings to notice that presence of undesirable can negatively affect the value of residential buildings in high density environments. Resultant design implication of the presence of an undesirable use next to the site is to strategically locate residential uses with respect to undesirable uses. Undesirable uses deter housing occupancy leading to financial losses and this is an important issue in considering developments with high residential density. Therefore, in considering high density environments, residential uses must be separated from undesirable uses through either distance or design.

## 4.2 MHK PROJECT

### THE SITE

The site for MHK Project is located in Manhattan, Kansas on the south-west side of Seth Child Road and Anderson Avenue intersection. The site is bound by Seth Child Road to the east, Anderson Avenue to the north, Village Drive to the west, and Wildcat Creek to the south. Both Anderson Avenue and Seth Child Road are arterials with heavy traffic. Anderson Avenue is the primary access to the site and Seth Child Road being elevated cannot connect to the site. The site is approximately 4 miles from downtown Manhattan, KS and is in close proximity to the western city limit. The site is presently a suburban shopping district called Village Plaza. The site currently houses some retail, restaurant and other services. There is also a gas station, bank, and an abandoned fire station on the site. Current businesses in Village Plaza include Ray's Apple Market, Max Fitness, and 4 Olives Restaurant and bar. Village plaza has been under-performing for decades, and hence requires revival in terms of real estate value. The site is surrounded by suburban residential areas including a large neighborhood park. The general location of the site is shown in Figure 4.22.

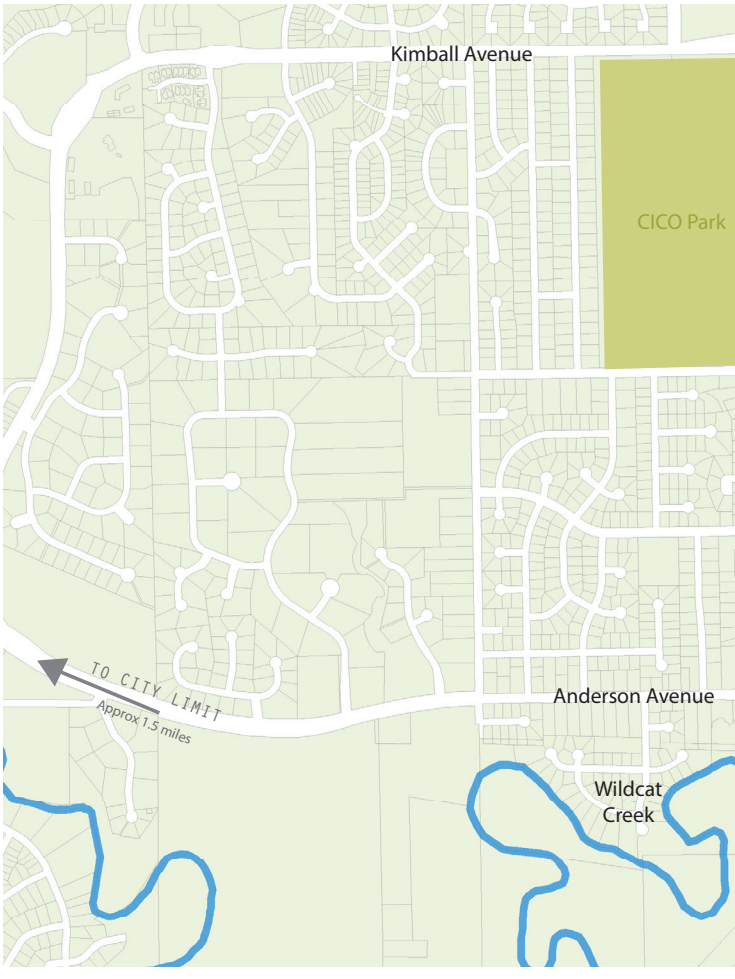



FIGURE 4.22 GENERAL LOCATION OF VILLAGE PLAZA (BY AUTHOR, 2013).

### PROJECT DILEMMA AND BACKGROUND

Village plaza represents a stagnant real estate entity, in that; it is neither well-performing nor completely dead. Due to a large parking lot and no street presence, Village Plaza lacks an identity (Figure 4.23). Therefore, one of the main challenges in redeveloping Village plaza would be to revitalize the under-performing retail stores and give it an identity. Also, the plaza currently suffer from poor design, programming, vehicular circulation, and pedestrian access. Yet because of the site's location near a major arterial intersection and because of the proposed future population growth of Manhattan, Village Plaza


FIGURE 4.23 VIEW OF VILLAGE PLAZA (HARPER, 2013).


has potential for economic growth (UDD, 2012). Village Plaza also faces regular flooding from the Wildcat Creek which would be an environmental challenge in redeveloping the site.

Manhattan, Kansas is a rapidly growing college town. 2010 Census data suggests a high market demand for housing in Manhattan, KS. According to Census 2010, Manhattan, KS has a homeowner housing vacancy rate of 2.4% and rental housing vacancy rate of 6.2%. Such low housing vacancy rates definitely suggest high demand in housing. Such a demand is projected to increase further because of increasing enrollment at Kansas State University, the military base, and the proposed National Bio and Agro-Defense Facility. A projected high demand for housing indicates housing as a major element in redeveloping Village Plaza. However, because of considerable distance from the university campus and flooding issues, the site would not be easily adapted for housing development. Additionally, an auto-centric site location and context poses a challenge in considering high density for the site. Therefore, the major dilemma in redeveloping Village plaza would be to develop it as a meaningful high density environment considering the site and its context.

## SITE LOCATION AND CONTEXT:

Village Plaza represents a suburban site. Being a suburban site, Village Plaza is at a considerable distance from the city center and the city's major employment centers including Kansas State University. The site's immediate context includes a commercial center, single family residences, and CICO Park. Being a suburban site, Village Plaza is also largely automobile dependent because it is not served by any transit or bus system. Figure 4.24 illustrates the regional context of Village Plaza.

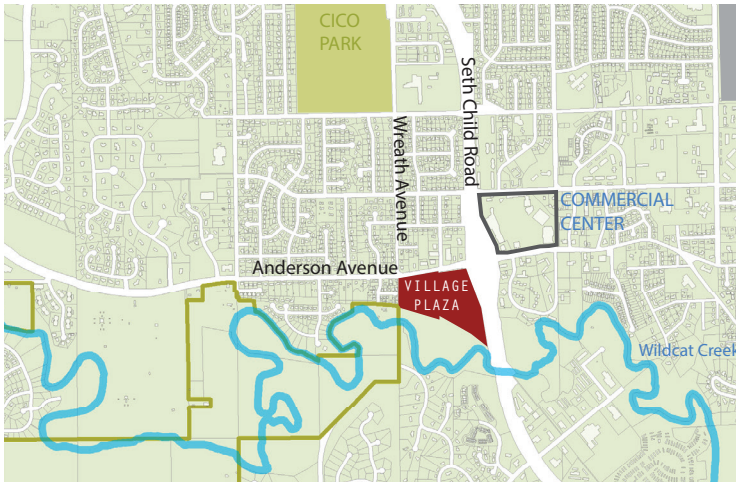



FIGURE 4.24 REGIONAL CONTEXT OF VILLAGE PLAZA (BY AUTHOR, 2013).

Figure 4.25 elaborates the immediate context of Village Plaza. Present morphological design of the site and its context is automobile-oriented (Figure 4.26). The surrounding context is predominantly low in residential density and largely houses single-family residences . Existing commercial land uses in the area do not include small-scale pedestrian oriented businesses (Figure 4.27). Even though Anderson Avenue has sidewalks, they are not pedestrian friendly in their design and land-uses along Anderson Avenue are not targeted towards pedestrians (Figure 4.28). Additionally, Seth Child Road is elevated from the site level and acts as an edge barrier for pedestrian movement (Figure 4.29).

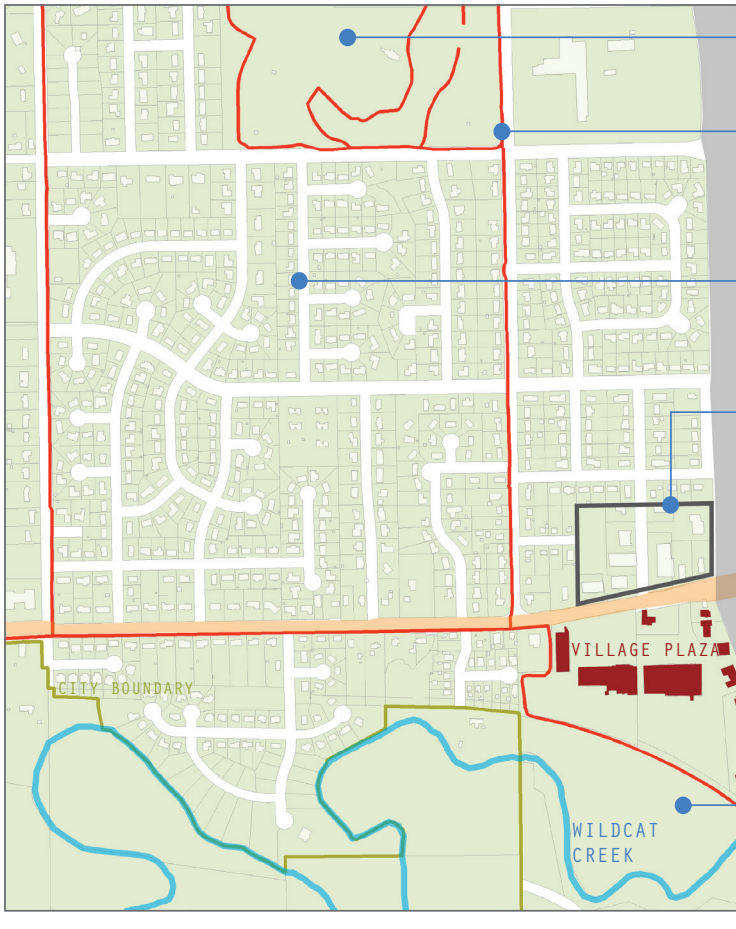
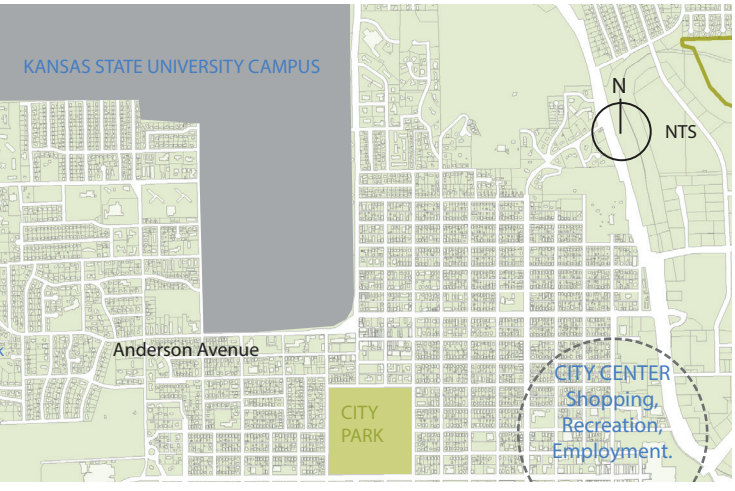
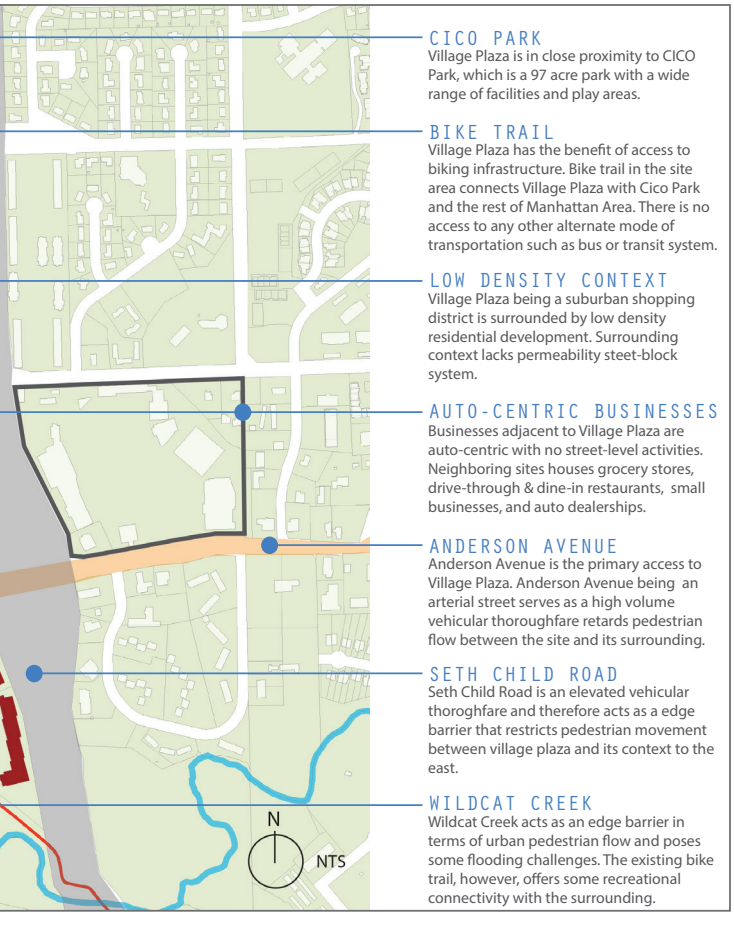



FIGURE 4.25 IMMEDIATE CONTEXT OF VILLAGE PLAZA (BY AUTHOR, 2013)

Being an auto-oriented suburban context, there is a high demand for parking in the area. To manage parking needs, a surface parking lot at street level currently dominates Village Plaza. The presence of a dominant surface parking lot retards pedestrian movement within the site as well as creates a negative identity (Figure 4.30). To the south of the site is Wildcat Creek. The area between the site edge and wildcat creek is unused due to flooding issues. The only available access to the southern side of the site is the existing recreational bike trail that runs along the site boundary connecting the project area with other nearby recreational areas (Figure 4.31).




**CICO PARK**
Village Plaza is in close proximity to CICO Park, which is a 97 acre park with a wide range of facilities and play areas.

**BIKE TRAIL**
Village Plaza has the benefit of access to biking infrastructure. Bike trail in the site area connects Village Plaza with Cico Park and the rest of Manhattan Area. There is no access to any other alternate mode of transportation such as bus or transit system.

**LOW DENSITY CONTEXT**
Village Plaza being a suburban shopping district is surrounded by low density residential development. Surrounding context lacks permeability steet-block system.

**AUTO-CENTRIC BUSINESSES**
Businesses adjacent to Village Plaza are auto-centric with no street-level activities. Neighboring sites houses grocery stores, drive-through & dine-in restaurants, small businesses, and auto dealerships.

**ANDERSON AVENUE**
Anderson Avenue is the primary access to Village Plaza. Anderson Avenue being an arterial street serves as a high volume vehicular thoroughfare retards pedestrian flow between the site and its surrounding.

**SETH CHILD ROAD**
Seth Child Road is an elevated vehicular thoroughfare and therefore acts as a edge barrier that restricts pedestrian movement between village plaza and its context to the east.

**WILDCAT CREEK**
Wildcat Creek acts as an edge barrier in terms of urban pedestrian flow and poses some flooding challenges. The existing bike trail, however, offers some recreational connectivity with the surrounding.

The site location and its context pose several challenges and opportunities in terms of creating a meaningful high density environment. Firstly, the site does not offer the benefit of access to multiple activity centers, employment centers, and transit systems due to its suburban nature. Due to the absence of transit system, site does not offer the benefit alternate modes of transportation. Secondly, a low density surrounding context results in a challenge of cumulatively achieving necessary density thresholds to support various activities and services in the project area. Thirdly, edge barriers in the form of Wildcat Creek and Seth Child Road limit permeability and connectivity between the site and its surroundings.

Finally, a high parking demand resulting from the suburban context is a challenge in considering Village Plaza as a high density environment. Very high parking demand can negatively affect walkability of the site. A high parking demand makes achieving high residential density difficult because of the land area required for parking lots and garages. A need for large parking lots and garages can also negatively affect a development's sense of place. Together, the aforementioned factors can adversely affect the functioning of Village plaza as a meaningful high density environment in terms of the needs of a densely concentrated population and the benefits of meaningful high density environments. In terms of meeting the needs of a high density resident population, opportunities offered by the site and its context include the existence of the recreational bike trail that connects the site with rest of the city area and the site's proximity to a neighborhood park. In summary, Village Plaza does not represent a very favorable site for meaningful high density environment in terms of its location and context as understood from literature review.


FIGURE 4.26 DRIVE-THRU RESTAURANTS ADJACENT TO VILLAGE PLAZA (HARPER, 2013).

FIGURE 4.27 AUTO DEALERSHIPS ADJACENT TO VILLAGE PLAZA (HARPER, 2013).

FIGURE 4.28 PRESENCE OF SIDEWALK ALONG ANDERSON AVENUE (HARPER, 2013).

FIGURE 4.29 SETH CHILD ROAD ACTING AS AN EDGE BARRIER (HARPER, 2013).


FIGURE 4.30 LACK OF IDENTITY DUE TO HUGE PARKING LOT (HARPER, 2013).

FIGURE 4.31 BIKE TRAIL CONNECTING VILLAGE PLAZA WITH MANHATTAN CITY AREA (HARPER, 2013).

## DENSITY

Manhattan, KS has only few areas with high population density. Figure 4.32 shows population density distribution in Manhattan, KS. The site and its surrounding areas are low in population density and the maximum density in the area is 25 persons per acre. Gross residential density of prominent multi-family residential developments in the area ranges between 10 and 25 dwelling units per acre. There is an increasing trend of high density multi-family residential developments in Manhattan, KS. Some of the recent developments in Manhattan, KS achieve gross residential density ranging between 32 and 61 dwelling units per acre.

A low density context is the primary reason that makes Village Plaza unfavorable for creating a meaningful high density environment. A low density context is the primary reason that makes Village Plaza unfavorable for creating a meaningful high density environment. Because of low residential density, the project area cannot presently support a mix of land uses, alternate modes of transportation, and pedestrian life; thereby, resulting in an automobile oriented environment.

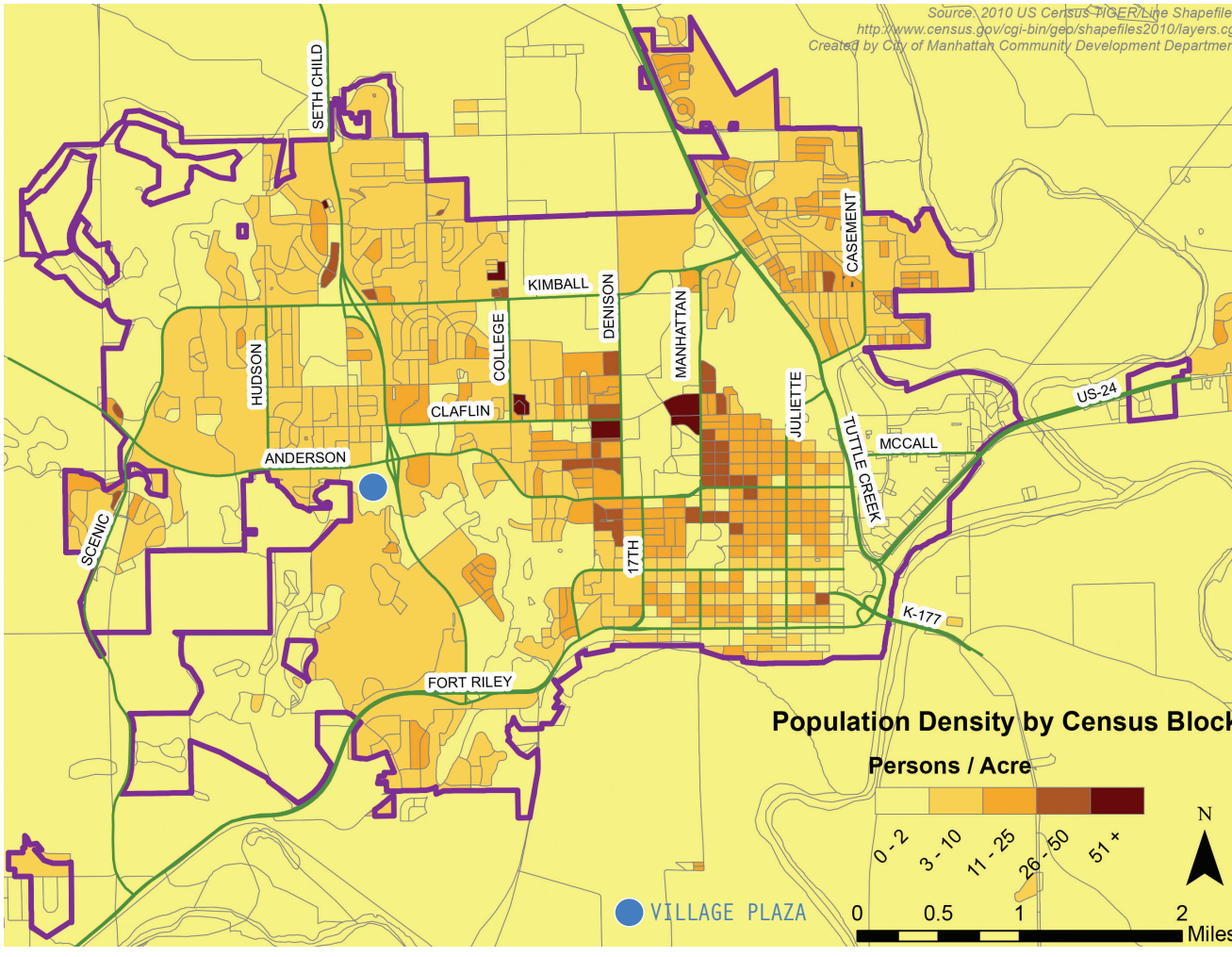



FIGURE 4.32 DENSITY DISTRIBUTION IN CITY OF MANHATTAN, KS (SOURCE: CITY OF MANHATTAN, KS).

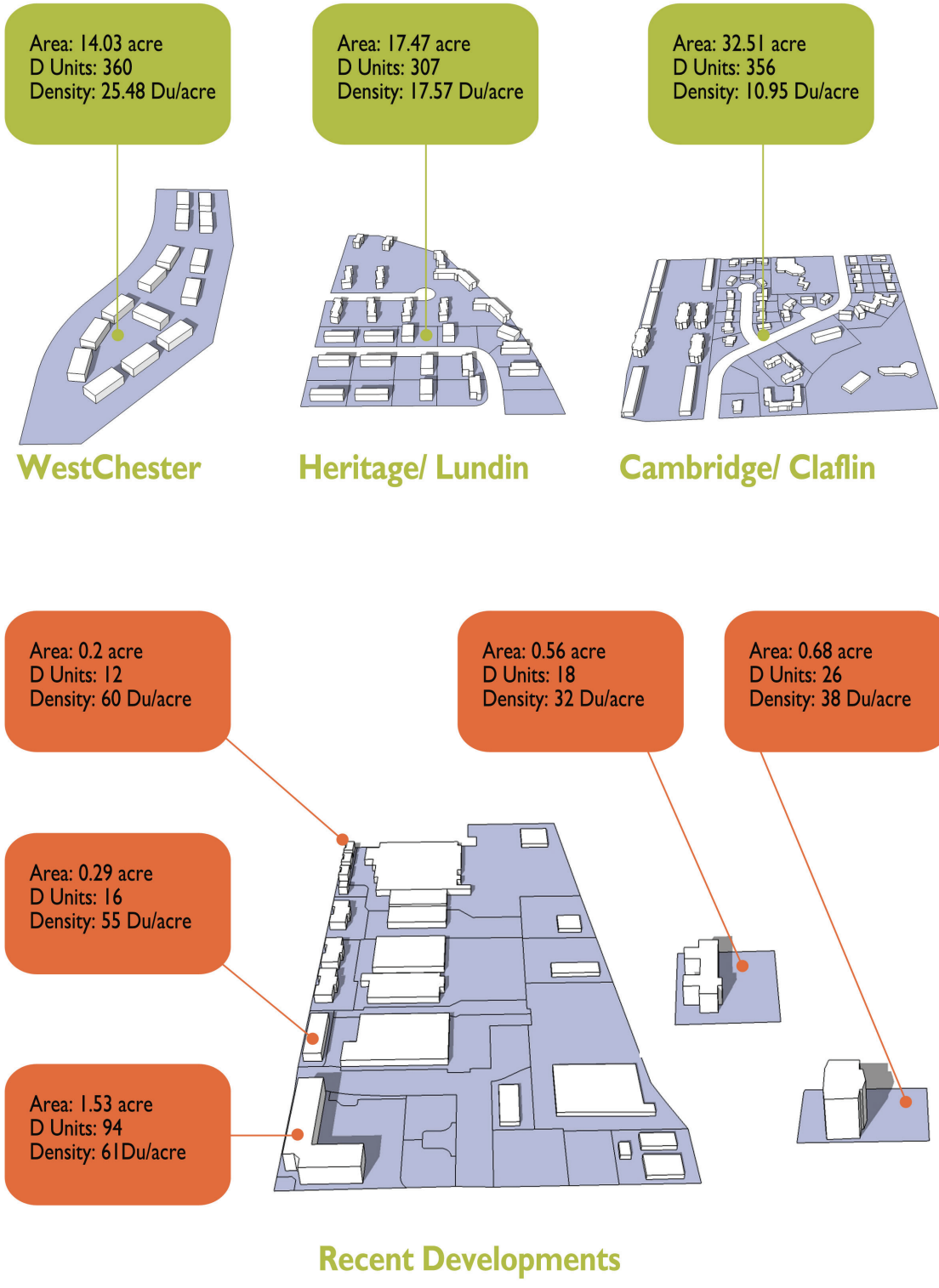



FIGURE 4.33 DENSITIES IN RESIDENTIAL DEVELOPMENTS IN MANHATTAN, KS (BY AUTHOR, 2013).

## DEMOGRAPHICS AND MARKET FORCES

Manhattan's population grew by 16.62% between 2000 and 2010. There is a large percentage of young population between the age of 20 and 44. Around 30% of the total population is in the age group of 20 and 24 years; 17% of the total population in the age group of 25 and 34 years; and 8% of the total population are between 35 and 44 years of age. Education attainment trends in Manhattan are progressive. In 2010, 96.8% of people 25 years and over had at least graduated from high school and 52.8% had a bachelor's degree or higher. In 2010 there were 20,008 households in Manhattan, KS. Families made up 47.3 percent of the households in Manhattan. This figure includes both married-couple families 32.7% and other families 14.6%. Non-family households made up 54.8% of all households in Manhattan. Most of the non family households were people living alone, but some were composed of unrelated people living in a household.

Market forces in Manhattan, KS are favorable for high density environments. There is a high housing demand due to factors like increasing population, proposed NBAF, and a limited housing stock. A high housing demand is also reflected in the low owner-occupied housing vacancy rate of 2.4% and rental housing vacancy rate of 6.2%. Recent studies carried out by the City of Manhattan also suggest a high demand for hotels and hospitality business due to a high inflow of out-of-town visitors (estimated 1.0 million visitors per year). Also, it is forecasted that recent developments such as Flint Hills Discovery center and the Downtown Manhattan Redevelopment District will increase annual visitation to the Manhattan area by 120,000 to 380,000 people (City of Manhattan, 2006). Even though there has been a steady market for retail in Manhattan, the site location cannot support small businesses due to a low residential density. High education attainment levels in Manhattan, the presence of Kansas State University, and proposed NBAF makes Manhattan a potential market for innovation driven research institutes and businesses that especially focus on animal health, food science, and grain science.

In summary, potential uses for the redevelopment of Village plaza include housing, research related facilities such as incubators and accelerators, hotels, and other small-scale retail (Figure 4.34).

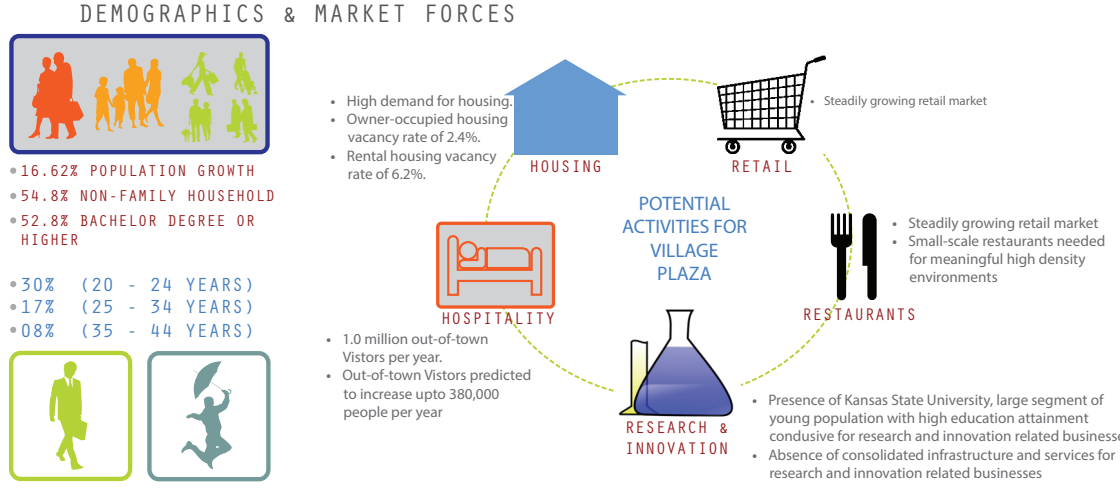



FIGURE 4.34 DEMOGRAPHICS AND MARKET FORCES IN MANHATTAN, KS (BY AUTHOR, 2013).

# START-UP VILLAGE

Start-up Village is envisioned as a live, work, and play environment with an emphasis on supporting and propagating entrepreneurship. Start-up Village is based on the region's potential for innovation and entrepreneurship. Start-up village caters to the creative class within the large section of Manhattan's young professionals. The proposal for Start-up Village makes up for the lack of consolidated services, facilities, and environments that encourage innovation and provide entrepreneurship opportunities for the young creative class in Manhattan. A business incubator and accelerator anchor Start-up Village. Other facilities include a boutique hotel, a wide range of housing choices, retail stores, restaurants, and office spaces (Figure 4.35). The development plan for Start-up Village explores various literature review inputs to make it a meaningful high density environment and also identifies design implications that can contribute to the development of a framework for understanding meaningful high density environments.


FIGURE 4.35 START-UP VILLAGE DEVELOPMENT PLAN (BY AUTHOR, 2014).

## DENSITY AND MASSING

Start-up Village site is unique in terms of achieving high density measurements. On the one hand, there is a high demand for housing in the area and on the other hand, a suburban context restricts the design of high-rise structures. In designing Start-up Village, there is an attempt to strike a balance between achieving high residential densities and responding to the context in terms of massing. Residential buildings are considered to offer diverse multi-family housing types and to meet density thresholds necessary to support services and infrastructures needed for its performance as a meaningful high density environment. This emerges as a design implication for suburban sites with a low density context and the benefit of high demand for residential uses. Start-up village achieves a gross residential density of 12 dwelling units per acre which can support a bus service and small retail stores (Figure 4.36). As a response to the surrounding low density residential area, Start-up Village includes only two and three storied buildings. Even though Start-up Village does not achieve very high density measurements and building heights, it can potentially serve as a catalyst for future high density environments in the adjacent areas.

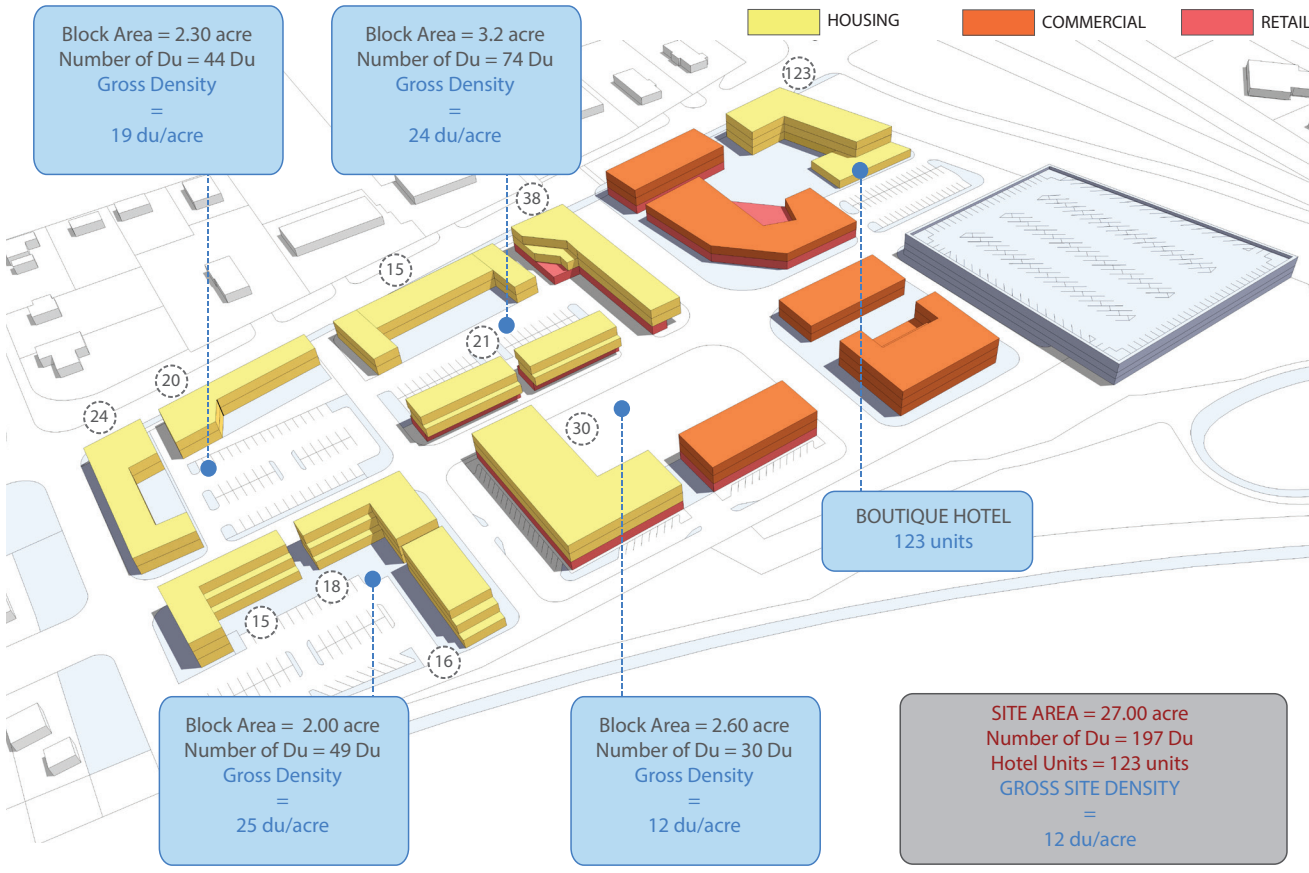



FIGURE 4.36 RESIDENTIAL DENSITY DISTRIBUTION AND MASSING IN START-UP VILLAGE (BY AUTHOR, 2014).

## LANDUSES AND ACTIVITIES

Start-up village is conceived as a high density mixed use environment with residential, commercial, retail and recreational landuses. Being a suburban site, choices of activities are minimal in the surrounding areas. Therefore, to create a meaningful high density environment it is important to maximize on-site activity choices depending on market forces. Firstly, to overcome the challenge of maximizing regional influx into the site, creating an anchor landuse emerges as a logical design implication. Therefore, as an anchor landuse, Start-up Village houses a business incubator and accelerator targeting dominant research and business sectors in the region. Start-up village also allocates supporting facilities which are necessary for innovation-driven environments. These include office spaces, a range of retail, a wide range of residential choices, urban market, and a boutique hotel. Secondly, Start-up Village as a high density environment provides access to nature by including a large recreational open space in the flood plain. Start-up village is also designed for a lively pedestrian life by providing a peripheral bike trail, designing quasi-public courtyards, street-level retail, and a central public plaza surrounding by pedestrian-oriented retail.

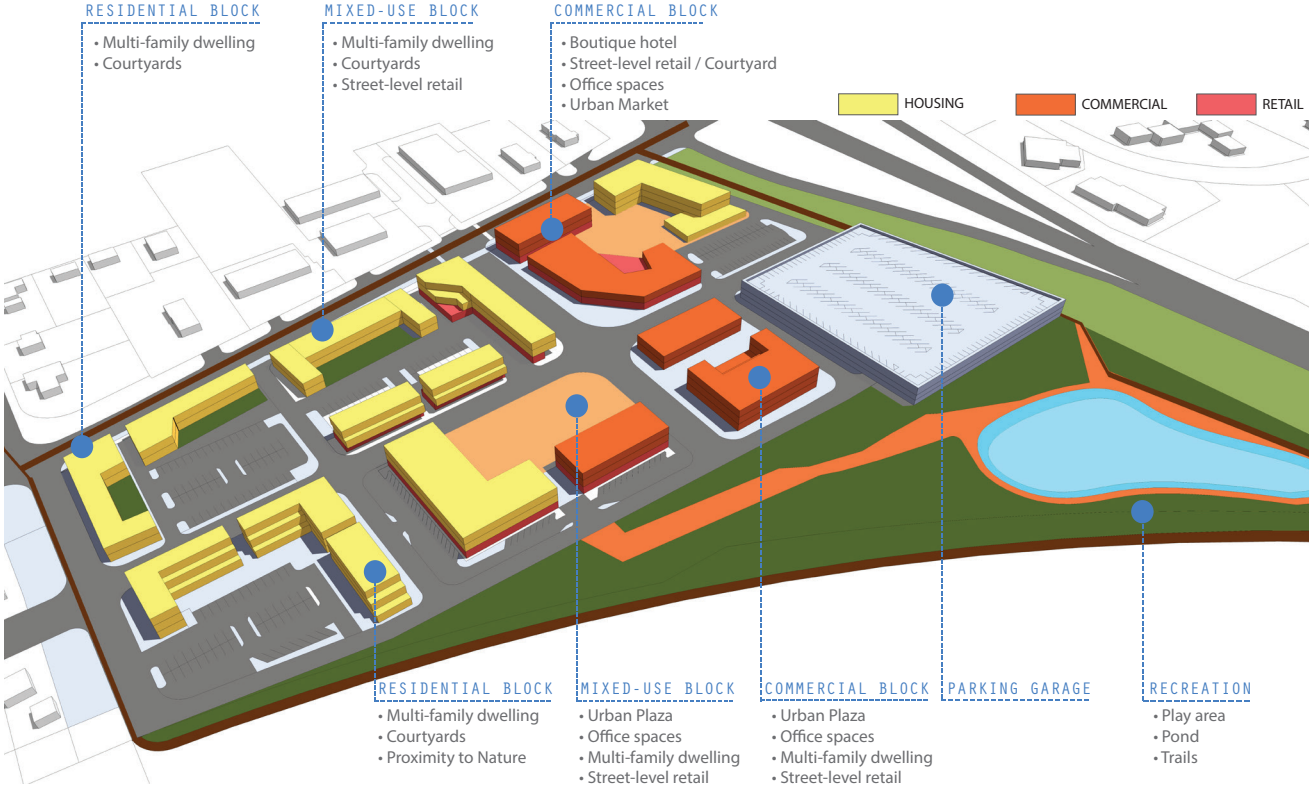



FIGURE 4.37 PROPOSED LANDUSES IN START-UP VILLAGE (BY AUTHOR, 2014).

## PHASING

The suburban nature of the site for Start-up Village provides limited opportunities for a fine-grain mix of uses. A relatively low demand for non-residential uses poses a challenge in developing the site as a meaningful high density environment. To overcome this challenge strategic phasing of the development emerges as a valuable design implication.

Start-up Village is proposed to be developed in two phases. First phase of the development aims at developing an anchor use to facilitate regional influx of people and establishing sufficient density to support other uses and services. Phase one includes the business incubator, accelerator, parking garage, boutique hotel, and multi-family housing with different dwelling unit configurations. The first phase of the development potentially increases the demand for non-residential uses such as retail, small shops, and offices. The second phase, is built on this change in demand and aims at further increasing density as well as including landuses necessary to make Start-up Village a meaningful high density environment. Figure 4.38 summarizes phasing strategy for developing Start-up Village.

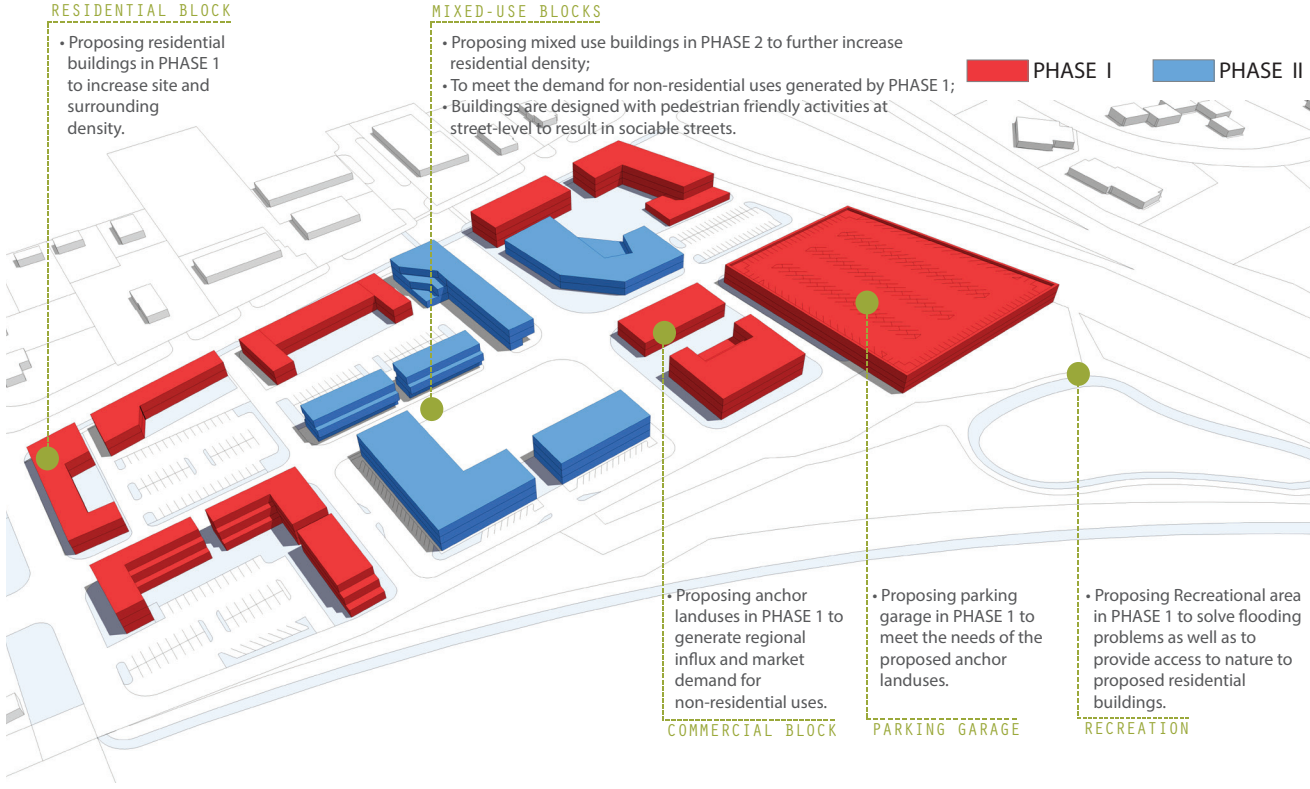



FIGURE 4.38 PHASING STRATEGY FOR DEVELOPING START-UP VILLAGE (BY AUTHOR, 2014).

## CONNECTIONS AND CONNECTIVITY

Regional connections and on-site connectivity are important factors in creating meaningful high density environments. Presently, the site is lacking in connectivity. Anderson Avenue is high in vehicular traffic and is not designed in a pedestrian-friendly manner. Sethchild Road acts as an edge barrier and limits pedestrian connectivity. For start-up village to perform as a meaningful high density environment, it is important to foster connections and connectivity. Firstly, Start-Up Village is based on a permeable street-block system with layers of vehicular and pedestrian connections, thereby facilitating on-site pedestrian connectivity. Proposed streets in Start-up Village are reinforced by street-level activities, hierarchical open spaces and a node of intense pedestrian use in order to make them sociable (Figure 4.39) . Additionally, a proposed bus system fosters regional connections. As a response to the challenge of existing edge barrier, the existing bike trail is extended along Anderson Avenue and the site periphery. Also, the proposed bike trail is further enhanced with tree-lining and providing pedestrian and bike friendly amenities. Such a solution emerges as a design implication for creating meaningful high density environments on unfavorable sites.

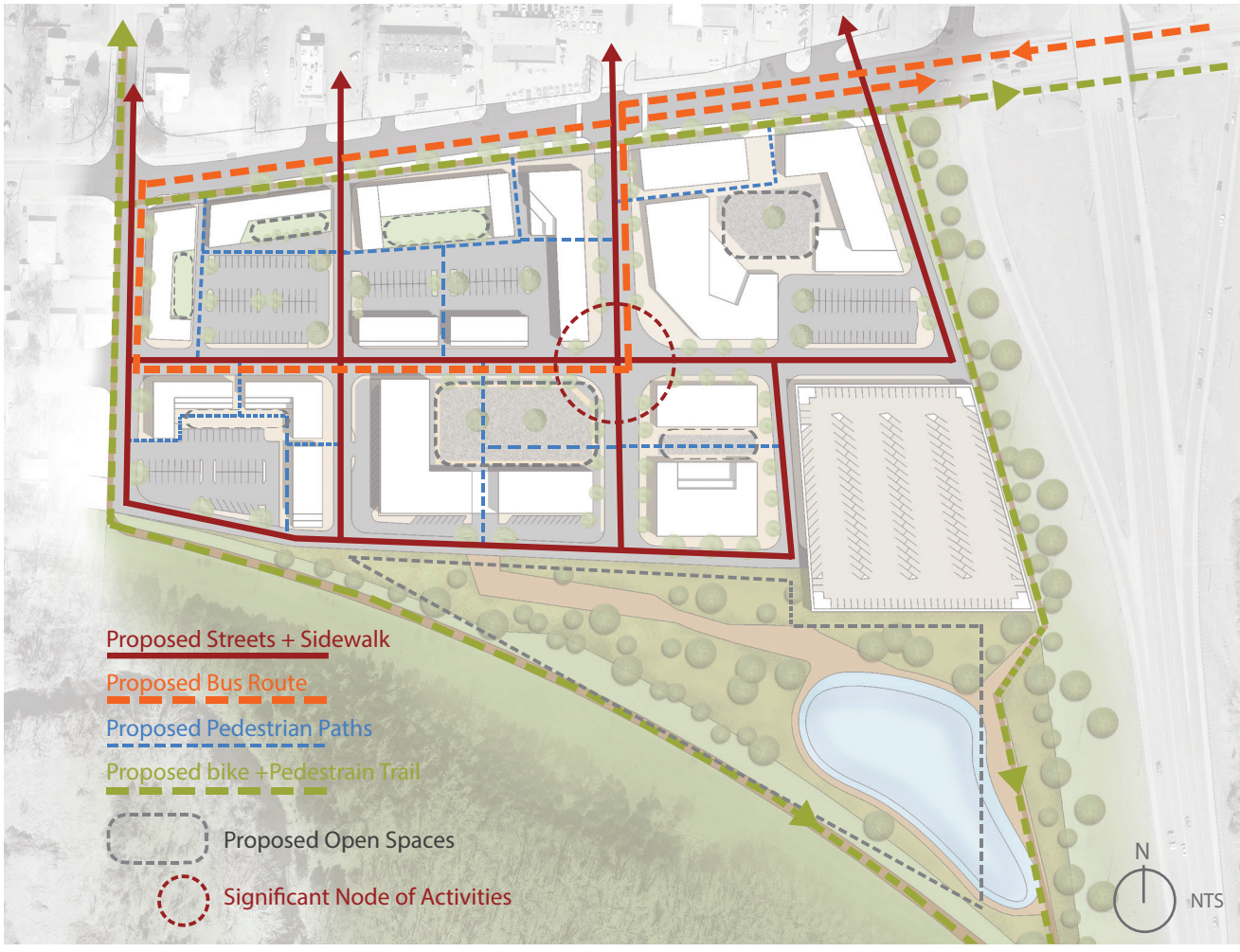



FIGURE 4.39 SUMMARY OF CONNECTIONS AND CONNECTIVITY IN START-UP VILLAGE (BY AUTHOR, 2014).

## MHK PROJECT EXPLORATION SUMMARY

MHK project allowed design exploration of various literature review findings. Literature review findings were explored through design opportunities and challenges involved in the project that related to creating meaningful high density environments. Design exploration of literature review findings through MHK project can be summarized as follows:

• Firstly, market for housing plays a major role in creating high density environments especially on sites with a low density context. Housing trends in the Manhattan area provided the opportunity to consider high residential densities for proposed Start-up Village. However, the site location was a deterrent in achieving very high density measurements because of its low density suburban nature. Also, relatively low demand for non-residential uses in the area makes it difficult to achieve a fine-grained mix of uses within the site. Design implication for a high housing demand and low demand for non residential uses is to maximize on-site residential density incrementally through strategic phasing. Strategic phasing also allows managing market demands in a manner that is helpful in creating meaningful high density environments.

• Secondly, the site location included other challenges as well. An automobile oriented context resulted in (a) the absence of any alternate modes of transportation; (b) limited pedestrian connectivity due to edge barriers; and (c) high parking demand. These challenges affect meaningful performance of high density environments. Resultant design implication emerging from the MHK project is to propose pedestrian connections and designing these connections with amenities and features that elevates walking and biking experiences. Figure 4.40 summarizes explorative design findings and conclusions.

## 4.3 EXPLORATIVE DESIGN SUMMARY AND CONCLUSIONS

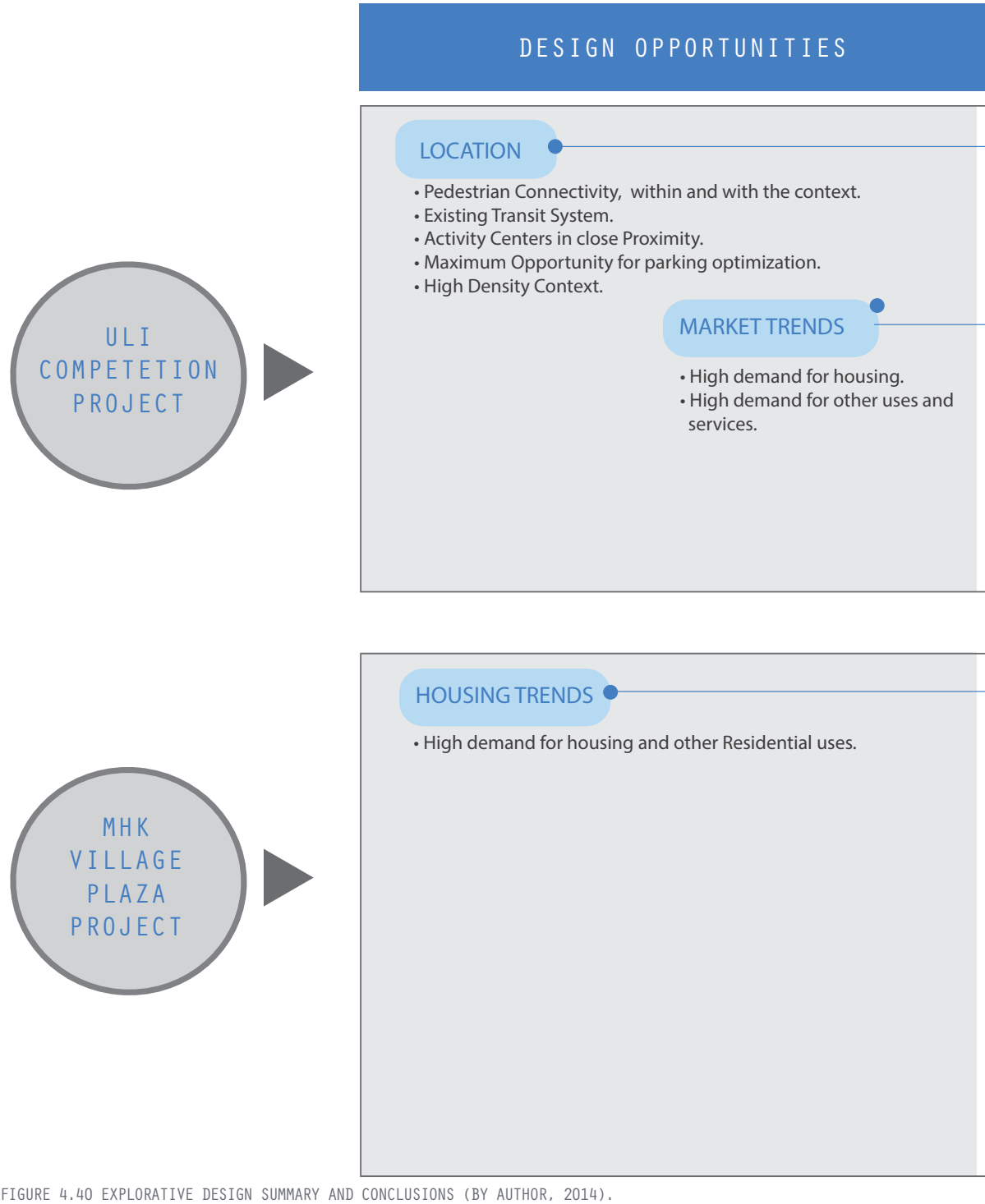


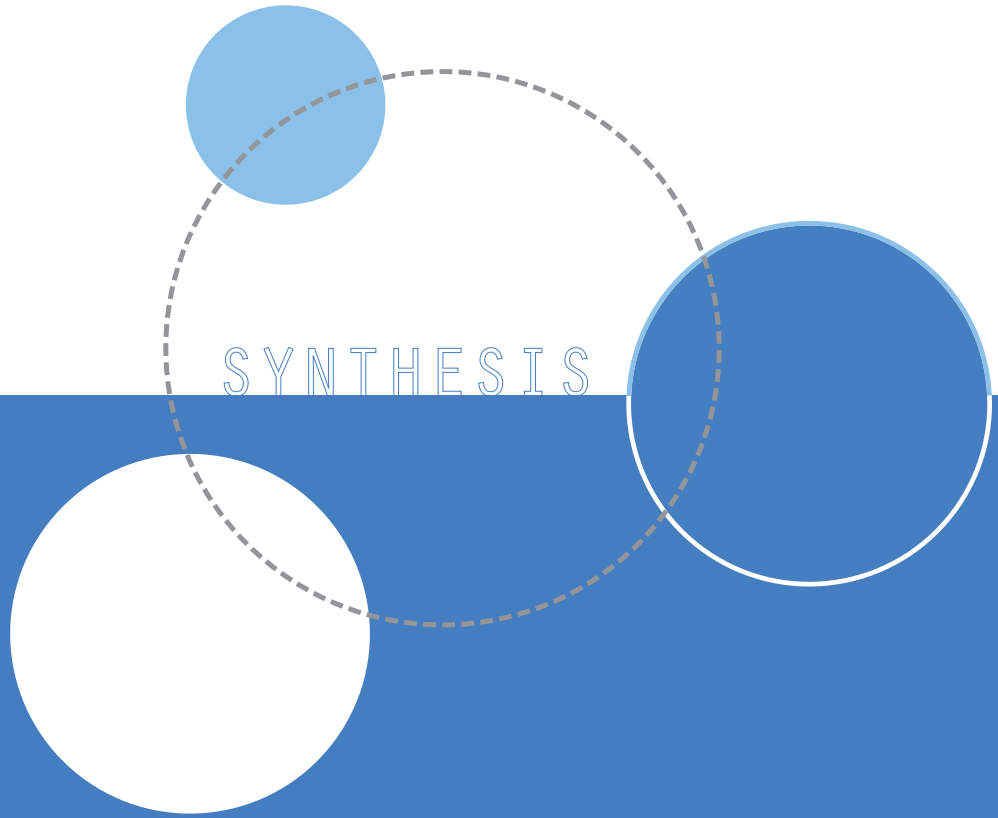

FIGURE 4.40 EXPLORATIVE DESIGN SUMMARY AND CONCLUSIONS (BY AUTHOR, 2014).

| DESIGN CHALLENGES | DESIGN IMPLICATIONS/ SUGGESTIONS |
| --- | --- |
| | • CREATE NODES OF INTENSE USE<br>• MINIMAL PARKING REQUIREMENTS |
| | • ACHIEVING HIGH RESIDENTIAL DENSITIES<br>• DEMAND MANAGEMENT THROUGH PHASING |
| UNDESIRABLE USE<br>• Presence of a Juvenile Detention Center. | • SEPERATE RESIDENTIAL USES FROM EXISTING UNDESIRABLE LANDUSES EITHER THROUGH DISTANCE OR DESIGN |
| | • ACHIEVING HIGH RESIDENTIAL DENSITIES BY CONSIDERING DIFFERENT HOUSING TYPES. |
| LOCATION<br>• Low density context, away from city center, & Lack of Transit System.<br>• Barriers limiting pedestrian connectivity.<br>• Limited activity centers in close Proximity.<br>• Auto-oriented context.<br>• High demand for parking lots. | • PROPOSE PEDESTRIAN CONNECTIONS AND DESIGN THESE CONNECTIONS WITH AMENITIES AND FEATURES THAT ELEVATES WALKING AND BIKING EXPERIENCE<br>• CREATE ANCHOR USE TO FOSTER INFLUX |
| MARKET TRENDS<br>• Relatively low demand for non-residential uses.<br>• Limited opportunity for a fine-grain mix of uses. | • ACHIEVE DENSITY THRESHOLDS IN INCREMENTS THROUGH PHASING<br>• GENERATE DEMAND FOR NON-RESIDENTIAL USES THROUGH PHASING |

# CHAPTER 5
# SYNTHESIS

# 5





# SYNTHESIS

After literature review and explorative design exercises, synthesis is the final step in the project's research methodology. Theoretical ideas from literature review and design implications emerging from design exercises are synthesized into a framework that can be a used as a tool for understanding and creating meaningful high density environments. This framework marks the culmination of the research project and is named "Density Dynamics." The name signifies various morphological and socio-economic dynamics involved in a holistic understanding of meaningful high density environments. This chapter discusses Density Dynamics.

## 5.1 DENSITY DYNAMICS

Density Dynamics as a theoretical framework potentially answers the project's research questions; (a) what constitutes a holistic understanding of high density environments; and (b) how can we create meaningful high density environments. There are four elements in the framework. The first element identifies three necessary qualities that together make high density environments meaningful. These three qualities are; (a) the quality of an environment to be physically compact; (b) the quality of an environment to promote urbanity; (c) the quality of an environment to offer livability and sense of place. These three qualities synthesized from literature review provide a theoretical basis for the development of the framework. The second element identifies planning and design goals corresponding to each of the qualities necessary for a meaningful high density environment. The third element comprises specific design and planning guidelines for meeting these goals. The fourth element comprises certain supplementary guidelines to provide additional inputs to the planning and design guidelines identified in the third element of the framework.

Density Dynamics is based on synthesis of inputs

from literature review and explorative design exercises (Figure 5.1). Inputs from Literature review is the "idea of good densities," which is that good densities are physically compact; they meet the needs of densely concentrated people; and offer a range of socio-economic benefits (detailed in Chapter 3). Design implications of opportunities and challenges posed by the two design projects serve as inputs from explorative design. As a part of the synthesis process, literature review and explorative design findings are analyzed, assimilated, and conjoined to derive the four inter-related components of the framework—essential qualities; goals; guidelines; and supplementary guidelines for creating meaningful high density environments (Figure 5.2).

Together, literature review and explorative design findings are comprehensive in providing valuable inputs for a holistic understanding of high density environments but they lack a meaningful structure necessary for its application as a design and evaluation tool. Synthesis of these inputs into a theoretical framework imparts a necessary structure and organization needed to be meaningful as a design and evaluation tool. Figure 5.3 illustrates the general structure

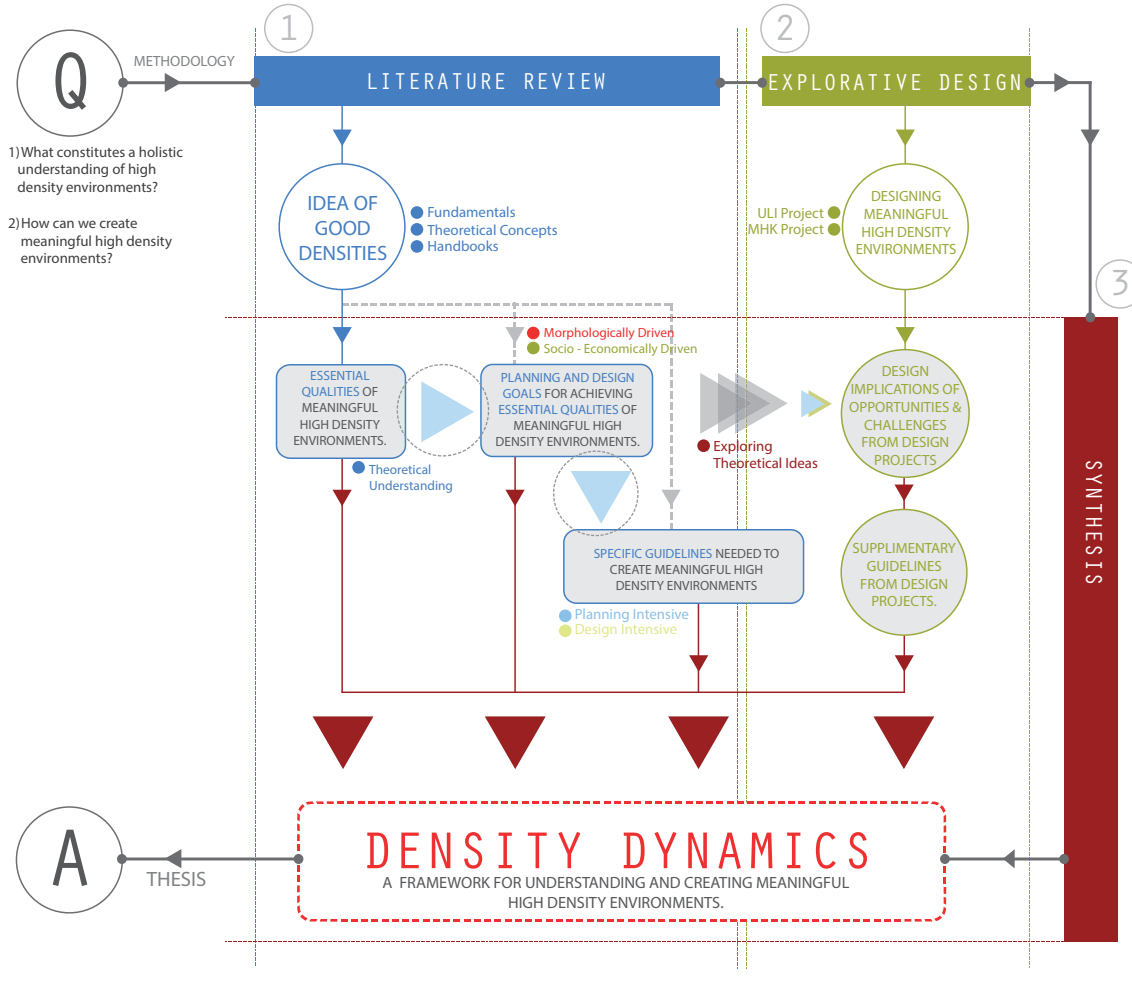



FIGURE 5.1 SYNTHESIS PROCESS INVOLVED IN THE DEVELOPMENT OF DENSITY DYNAMICS (BY AUTHOR, 2013).

of Density Dynamics. Theoretical understanding of the essential qualities in density dynamics is largely derived from literature review. Goals and guidelines in the framework are literature review inputs that are explored in the design projects. Supplementary guidelines are derived based on the challenges in exploring literature review inputs through the design projects. The structure and organization of the framework is hierarchical and based on the generally practiced design process. The horizontal progression from essential qualities to design goals to design guidelines to supplementary guidelines for meaningful high density environments follows a hierarchy from broad concepts to specific design inputs. Also, the vertical progression of each element in the framework follows the hierarchy from large scale elements to small-scale elements or urban planning and design process. In summary, Density Dynamics provides a holistic understanding of high density environments through theoretical ideas, broad design goals and specific design guidelines. Density Dynamics as a framework can be used as a design and/or analysis tool in considering high density environments. Following sections elaborate upon Density Dynamics in terms of its various elements.

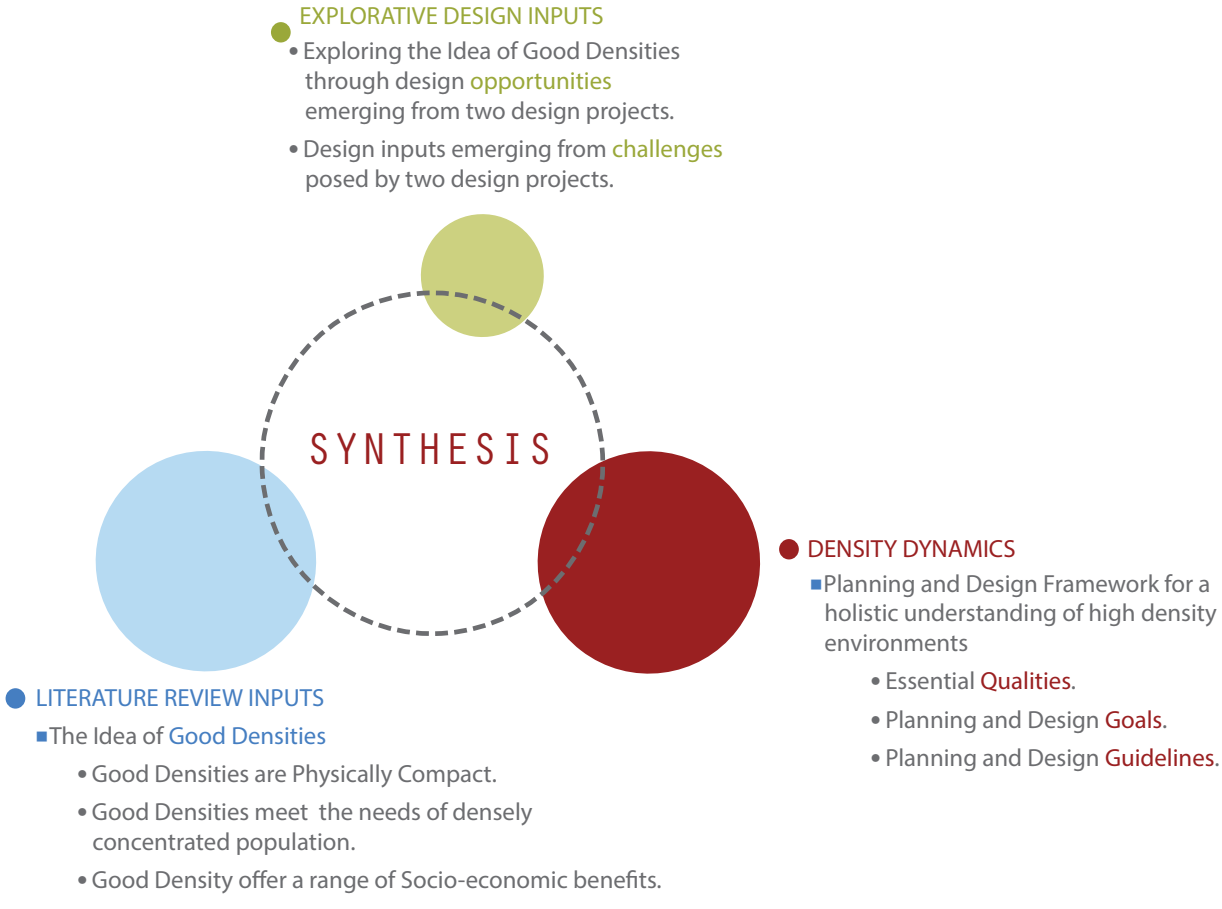



FIGURE 5.2 EVOLUTION OF DENSITY DYNAMICS (BY AUTHOR, 2014).

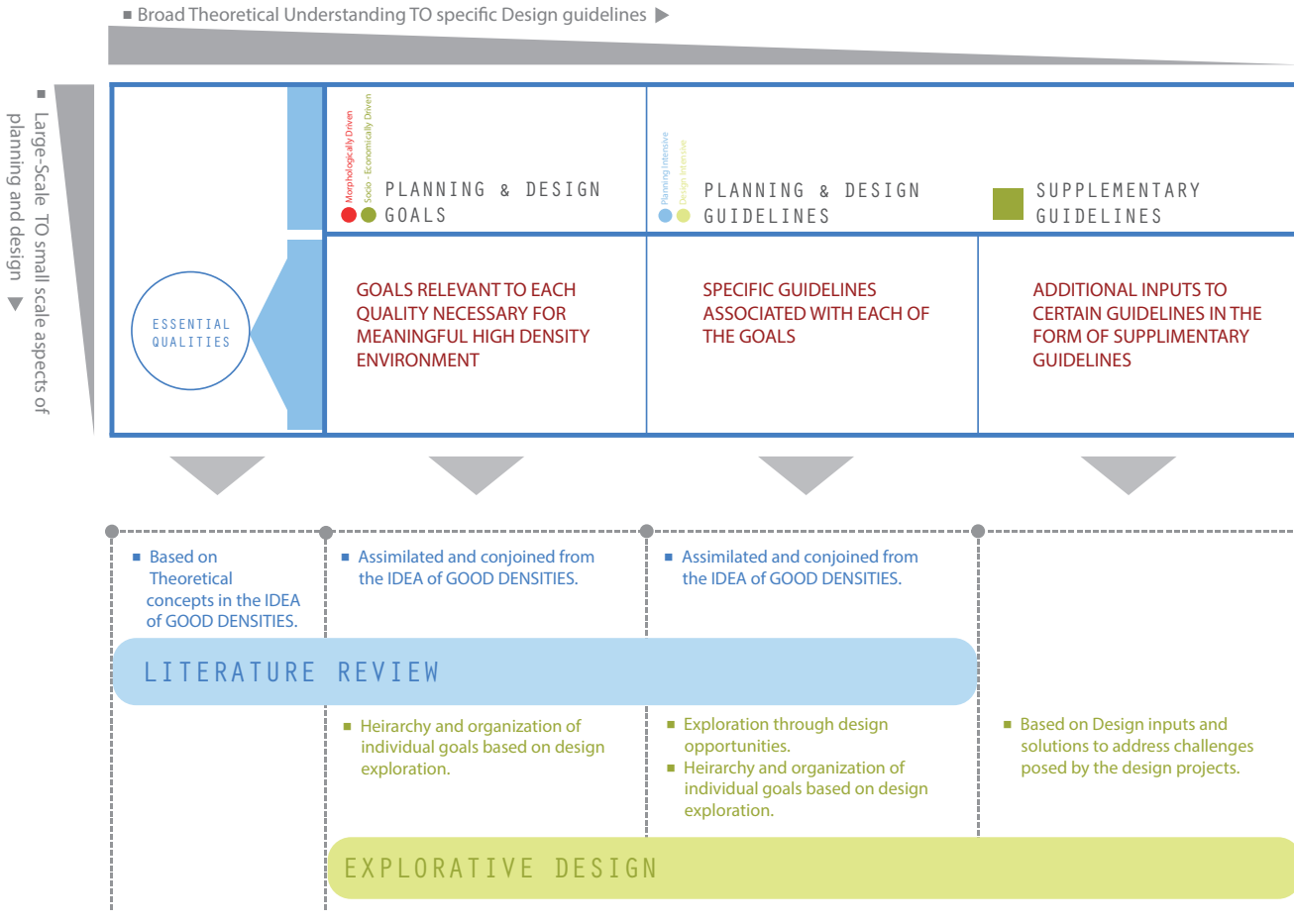



FIGURE 5.3 GENERAL STRUCTURE OF DENSITY DYNAMICS (BY AUTHOR, 2014).

## MEANINGFUL HIGH DENSITY ENVIRONMENTS SHOULD BE PHYSICALLY COMPACT

The first quality that defines meaningful high density environments is the quality of physical compactness. Compactness is the morphological quality of a built environment to be closely united in a small area. Compactness maximizes density. Meaningful high density environments are physically compact at both regional and neighborhood levels. Regional compactness is a matter of location, in that; high density environments should be located close to existing developments to facilitate proximity and accessibility. Compactness at a neighborhood level is a matter of how compact the environment is from within and how its form responds to its immediate context. Therefore, for a high density environment to be physically compact; planning and design of the environment should be driven by the following goals:

(a) Proximity and accessibility to existing developments;
(b) Compact block and building design.

Following specific planning and design guidelines can help achieve these goals. Firstly, meaningful high density environments are well integrated and connected with its context and maintain close proximity to activity centers, employment centers, and transit systems. Therefore, high density environments should be located on sites with access and proximity to existing activity centers, employment centers, and transit systems (Figure 5.4). Proximity to activity centers through strategic site selection allows pedestrian movement from the site to the surrounding context. To enhance regional influx into new high density environments, it is important to create nodes of intensive pedestrian activities. Such nodes with useful activity choices at street level can draw people and enhance street life. In case of sites that are not in close proximity to high density context, new high density developments must include anchor uses such as shopping attraction, market place, or an entertainment center in order to facilitate regional influx. To enhance pedestrian accessibility to the surrounding context, establishing physical and visual connectivity is vital. This can be done by extending existing main pedestrian street system into the site (Figure 5.5). However, establishing physical and visual connectivity can be difficult in sites with natural or man-made edge barriers. In such cases, site barriers can be overcome by proposing pedestrian connections that are designed with amenities and features that elevate walking and biking experience.

Secondly, meaningful high density environments have compact block and building design. The design includes closely spaced blocks and buildings with minimal horizontal spread. First step towards achieving the goal of compact block and building design is to design smaller blocks that are defined by inter-connected street system and secondary pedestrian connections that enhance on-site walkability and visibility (Figure 5.6). Large blocks should be designed as exceptions to accommodate public buildings or iconic buildings that are potential landmarks adding to the neighborhood's character. Apart from horizontal spread of a building, compact building design is also a matter of building heights in relation to the surrounding (Figure 5.7). For sites located in city centers, mid-rise buildings and high-rise towers generally define the context and similarly city peripheries are defined by low-rise to mid-rise buildings. Therefore, in creating high density environments, it is important to design low-rise, mid-rise, and high-rise buildings depending on the context. Together, the aforementioned goals and guidelines can result in high density environments that are physically compact.

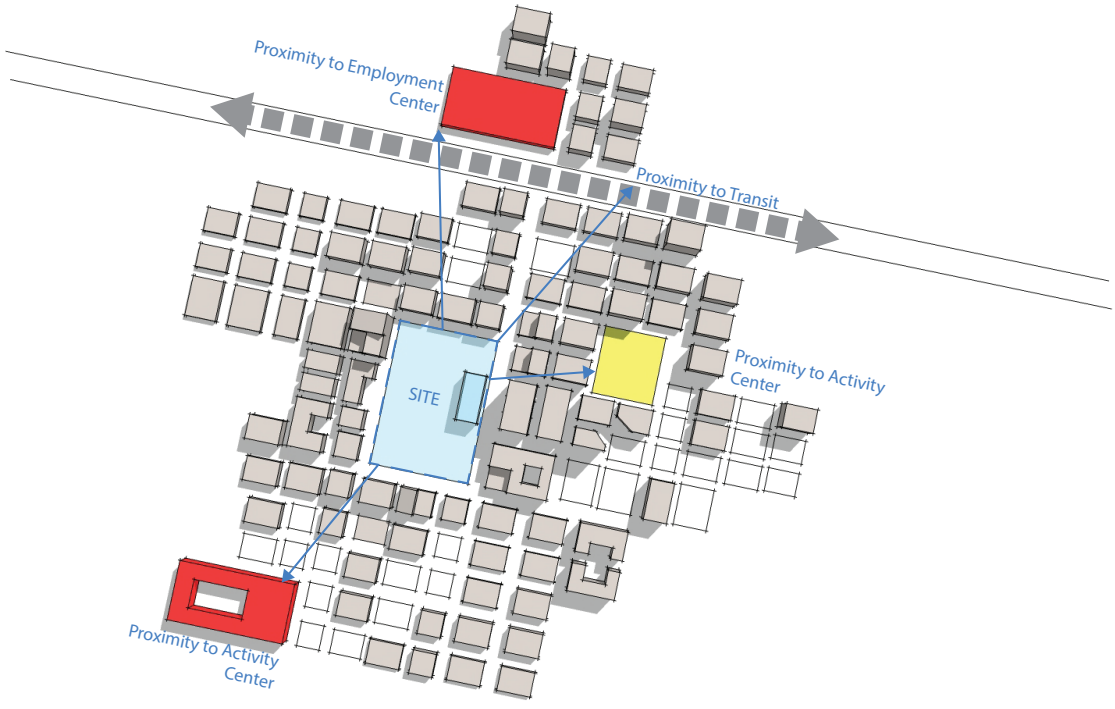



FIGURE 5.4 CONCEPTUAL DIAGRAM EXPLAINING PROXIMITY AND ACCESSIBILITY. (BY AUTHOR, 2013).

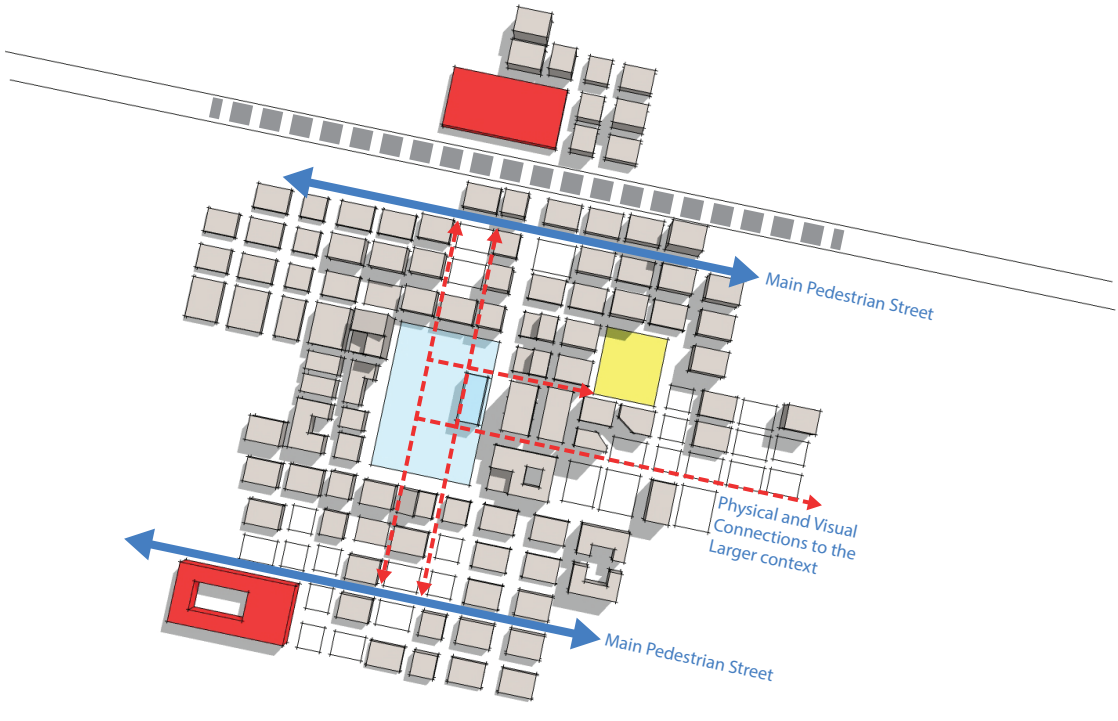



FIGURE 5.5 CONCEPTUAL DIAGRAM ILLUSTRATING DESIGN FOR CONNECTIVITY. (BY AUTHOR, 2013).

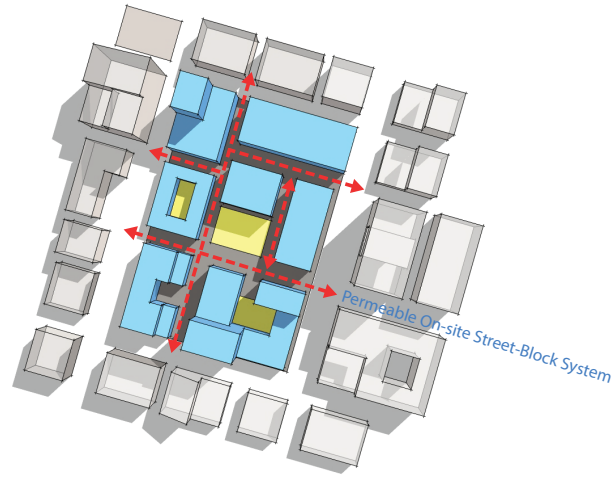



FIGURE 5.6 CONCEPTUAL ILLUSTRATION OF DESIGN FOR COMPACT AND PERMEABLE STREET-BLOCK SYSTEM. (BY AUTHOR, 2013).

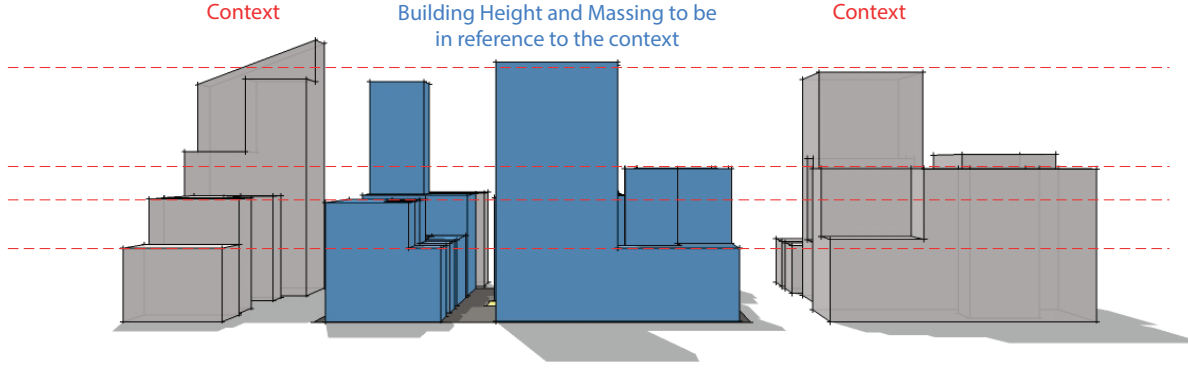



FIGURE 5.7 CONCEPTUAL ILLUSTRATION OF DESIGNING MASSING AND HEIGHT THAT RESPONDS TO THE CONTEXT. (BY AUTHOR, 2013).

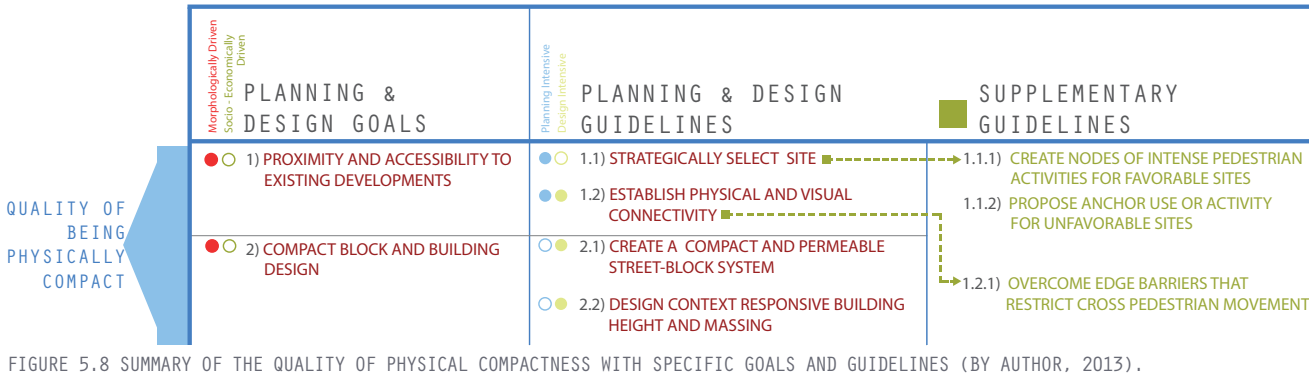



FIGURE 5.8 SUMMARY OF THE QUALITY OF PHYSICAL COMPACTNESS WITH SPECIFIC GOALS AND GUIDELINES (BY AUTHOR, 2013).

Figure 5.8 organizes the four elements of density dynamics as it relates to the quality of physical compactness. Synthesis process identifies two goals, four primary guidelines and three supplementary guidelines that can be used to understand meaningful high density environments in terms of the quality of physical compactness.

## MEANINGFUL HIGH DENSITY ENVIRONMENTS SHOULD PROMOTE URBANITY

The second quality that defines meaningful high density environments is their ability to promote urbanity. Urbanity, according to Lozano (1990) is the quality of built environments to allow its inhabitants to interact with a large number of people and institutions. According to Lozano (1990), high residential density and the idea of urbanity are inter-related because the key elements driving urbanity include a large number of people and institutions. Designing high density environments for the quality of compactness helps promote urbanity to some extent because compactness provides several existing services and institutions in close proximity. Therefore, apart from designing for compactness, efforts to create meaningful high density should aim at maximizing people and institutions within the development in order to promote urbanity. To maximize people and institutions, planning and design of high density environments should be driven by the following goals:

(a) Achieving people concentration;
(b) Achieving a variety of activities;
(c) Supporting demographic diversity.

These goals can be achieved through specific planning and design guidelines. Meaningful high density environments promote urbanity by supporting a dense concentration of residential and non-residential population. Since density is relative, creating high density environments should aim at achieving sufficient residential dwelling units to meet the thresholds required to support a wide range of activities and services. However, for sites with low density surrounding context, density thresholds can be achieved incrementally through a strategic phasing of residential development. Density thresholds required to support various activities and services are discussed in detail in chapter 3.

People concentration in a high density environment can also be achieved through an influx of non-residential population. Through planning and designing of facilities that can accommodate multiple modes of commuting including walking, biking and public transportation; high density environments can maximize inflow of non-residential population from surrounding neighborhoods. This would allow human exchange between neighborhoods, thereby promoting urbanity. Meaningful high density environments promote urbanity by also providing a wide range of activity choices. Variety of activities in a high density environment can be maximized by achieving a mix of compatible primary uses (residential uses, and work places) and secondary uses (recreational uses, retail stores, and restaurants) depending upon market forces and site context (Figure 5.9 left). Since market forces determine uses for a site, future demands for primary and secondary uses should be managed by strategically phasing the development plan for sites that do not have a market demand for a mix of uses. Variety of activity choices can also be achieved by materializing any practicable opportunities for adaptive-reuse of existing buildings because it can attract uses and activities that cannot afford newly built structures (Figure 5.9 left).

Promoting urbanity is also dependent on demographic diversity because housing opportunities for diverse demographic groups can maximize people concentration by widening the pool of potential residential population. Different demographic groups have different housing preferences. Therefore, to achieve demographic diversity in high density environments it is important to maximize a variety of multi-family residential development types such as apartments, condos, studios, and

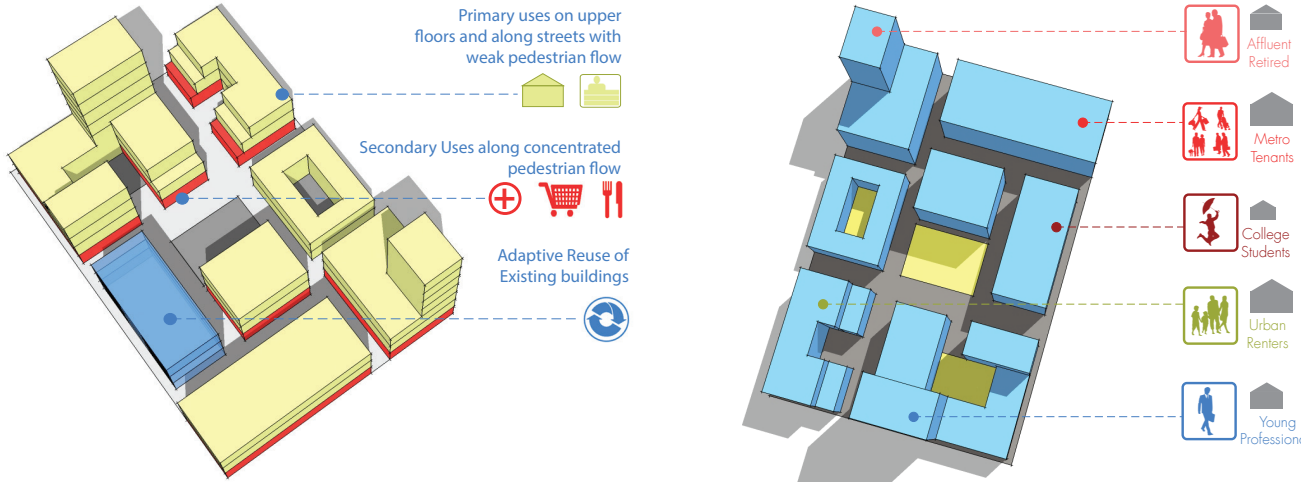



FIGURE 5.9 CONCEPTUAL ILLUSTRATION OF DESIGNING FOR MIX OF USES (LEFT) AND DEMOGRAPHIC DIVERSITY (RIGHT). (BY AUTHOR, 2013)

townhomes based on market demand. Also, to ensure occupancy of these housing types, it is important that high density environments achieve optimal dwelling unit sizes. Different demographic groups have different spatial needs and levels of affordability. Therefore, to ensure demographic diversity within a high density environment, it is important to consider these varying needs and levels of affordability. Considering optimal dwelling unit sizes for different housing types result in a range of spatial configurations and housing cost, thereby, catering to a larger demographic spectrum (Figure 5.9 right). Application of aforementioned goals and guidelines can result in high density environments that promote urbanity. Figure 5.10 organizes the four elements of density dynamics as it relates to the quality of an environment to promote urbanity. Synthesis process identifies three goals, six primary guidelines and two supplementary guidelines that can be used to understand meaningful high density environments in terms of the quality of an environment to promote urbanity.

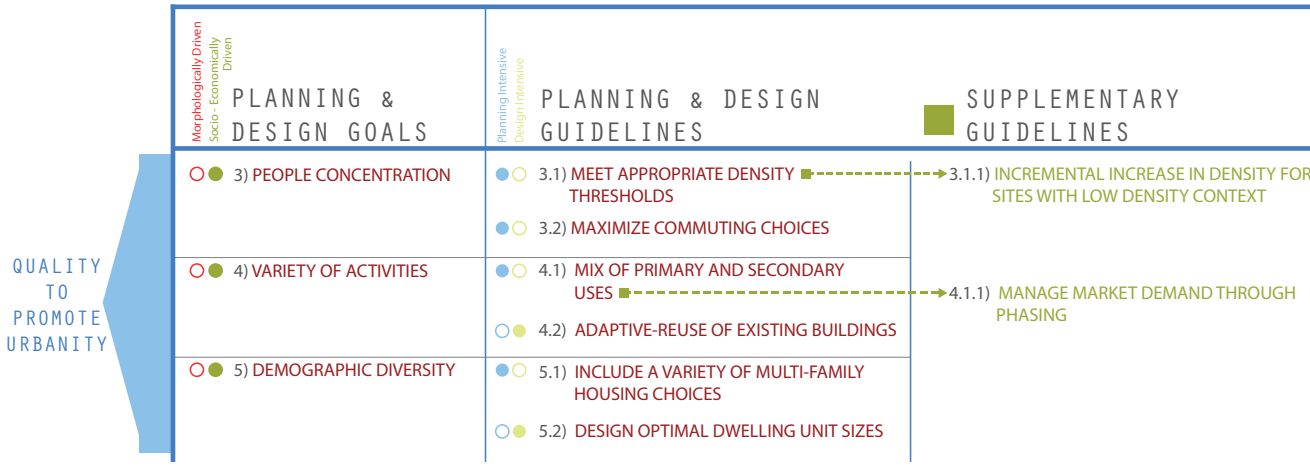



FIGURE 5.10 SUMMARY OF THE QUALITY TO PROMOTE URBANITY WITH SPECIFIC GOALS AND GUIDELINES (BY AUTHOR, 2013).

## MEANINGFUL HIGH DENSITY ENVIRONMENTS SHOULD OFFER LIVABILITY AND SENSE OF PLACE

The third and final quality that defines meaningful high density environments is their ability to offer livability and a sense of place. Livability includes basic human needs such as water, pollution-free environment, and well-managed spatial surroundings. Livability is generally manifested through high quality building design and provision of adequate utilities. Sense of place relates to people's association of meaning and value to their physical environment. Sense of place in urban environments is largely manifested through a sociable public realm including lively street life and access to open spaces.

Livability and a sense of place are necessary qualities for high density environments because they directly influence housing preferences, thereby, influencing success of a high density development. Livability and sense of place have socio-economic implications because they meet human needs as well as impart economic value to a development. Meaningful high density environments should, therefore, be livable and offer a sense of place. Livability and sense of place within an environment result from a range of morphological and social considerations within multiple layers of planning and designing of the project. In addition to designing for compactness and urbanity, setting certain goals and following certain guidelines can impart livability and sense of place to high density environments. To maximize livability and sense of place, planning and designing high density environments should be driven by the following goals:

(a) Creating high quality built environments;
(b) Creating sociable streets;
(c) Providing access to nature.

Meaningful high density environments offer livability and sense of place through planning and design of a high quality built environment. First step towards achieving a high quality built environment is to plan and design for adequate and necessary infrastructure including water, sewer, and other building services. Provision of adequate infrastructure ensures livability by meeting basic housing needs. Additionally, high quality built environments requires creating an identity through appropriate architectural design and aesthetic elements. Visually appropriate architecture and rich aesthetic design in high density environments can contribute to a sense of place by creating a visually pleasing public realm with strong visual identity.

Secondly, meaningful high density environments offer a sense of place through well-planned and designed sociable streets. Sociable streets is a product of pedestrian activity, therefore, specific design measures to maximize pedestrian activity should be undertaken in the process of creating high density environments. Strategic spatial allocation of uses and activities is vital in creating sociable streets. Site areas lacking concentrated pedestrian flow should be reinforced with primary uses such as residences and offices. Presence of primary uses can generate on-street pedestrian activity. Retail and secondary uses such as restaurants, book stores, and Laundromats should be located on street level and upper levels should be allocated for residences and offices (Figure 5.9, left). Strategic allocation of various uses ensures distribution of people within the site and provides opportunities for sociable activities at street level. In allocating various uses, separate residential uses from existing undesirable uses such as prisons and power plants through either distance or design. This is important because such undesirable uses can negatively affect the value of residential buildings because of people's

aversion towards such uses.

The public-private interface, i.e., the street-facing façade of buildings also plays an important role in creating sociable streets (Figure 5.11). Blank street-facing façades can retard a lively pedestrian experience. Therefore, in creating high density environments, it is important to design interactive private-public interface. One way to make pedestrian experience interactive is by designing street-facing semi-private spaces at upper levels of buildings. This can potentially add a human element to building facades and allows people on streets to have a wide range of visual experience. Pedestrian experience can further be enhanced by designing contextually appropriate and architecturally rich street-facing facades. Parking design can also affect sociability of streets. Vast surface parking lots can deter on-street pedestrian life. Therefore, it is important to reduce parking demand through parking optimization by applying ULI shared parking analysis method (Figure 5.12). Also, incorporating visually pleasing design for parking structures and lots can reduce its negative impact on sociability of streets.

Finally, access to nature and open spaces in high density environments contribute to livability and a sense of place (Figure 5.9). Meaningful high density environments offer a sense of place and livability by maximizing residents' access to

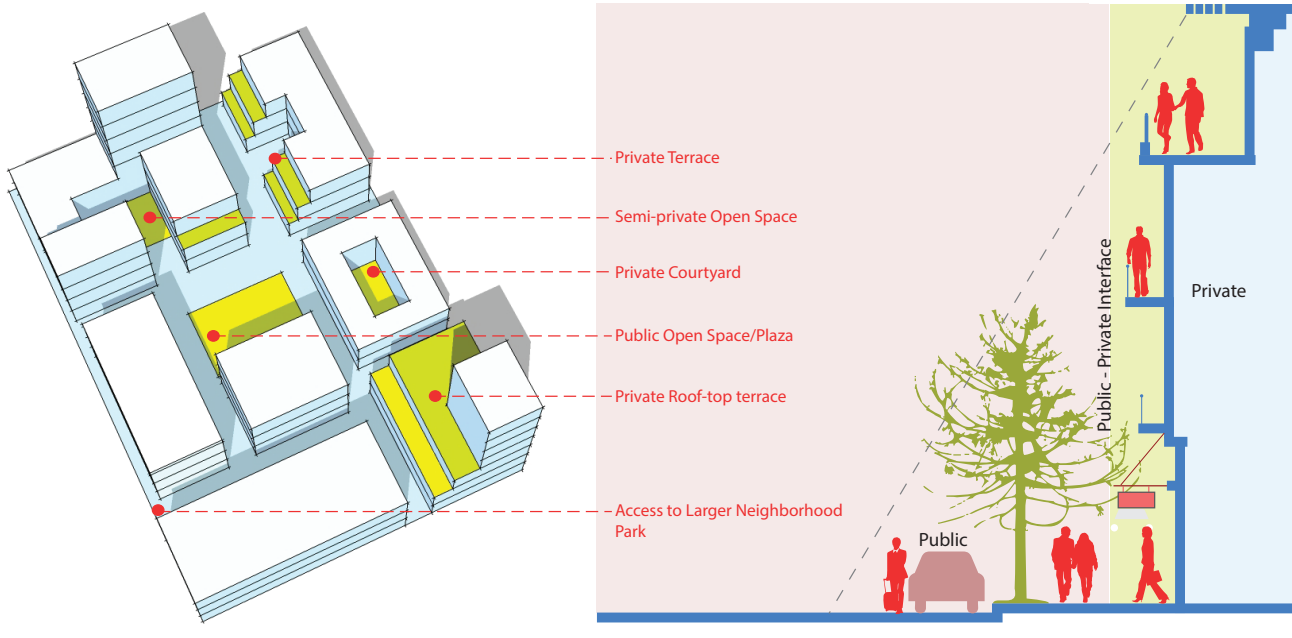



FIGURE 5.11 CONCEPTUAL ILLUSTRATION OF DESIGNING FOR HIERARCHICAL OPEN SPACES AND PUBLIC-PRIVATE INTERFACE (BY AUTHOR, 2013)

nature and open spaces. Therefore, high density environments should incorporate hierarchical open spaces ranging from large community parks to small courts and terraces. Designing a large community park is not always possible for high density developments. In such cases, it is important to provide access to surrounding parks in close proximity. Access to nature and open spaces is a key element of housing preferences, therefore, it is important to design quasi-public and private open spaces within residential blocks to enhance sense of place. In addition to open spaces, designing tree-lined streets and street amenities for pedestrians and bikers also provides access to nature within a built environment. Together, application of aforementioned goals and guidelines can result in a meaningful high density environment in terms of offering livability and a sense of place. Figure 5.13 illustrates the four elements of density dynamics as it relates to offering livability and sense of place. Synthesis process identifies three goals, seven primary guidelines and one supplementary guideline that can be used to understand meaningful high density environments in terms of its ability to offer livability and sense of place.

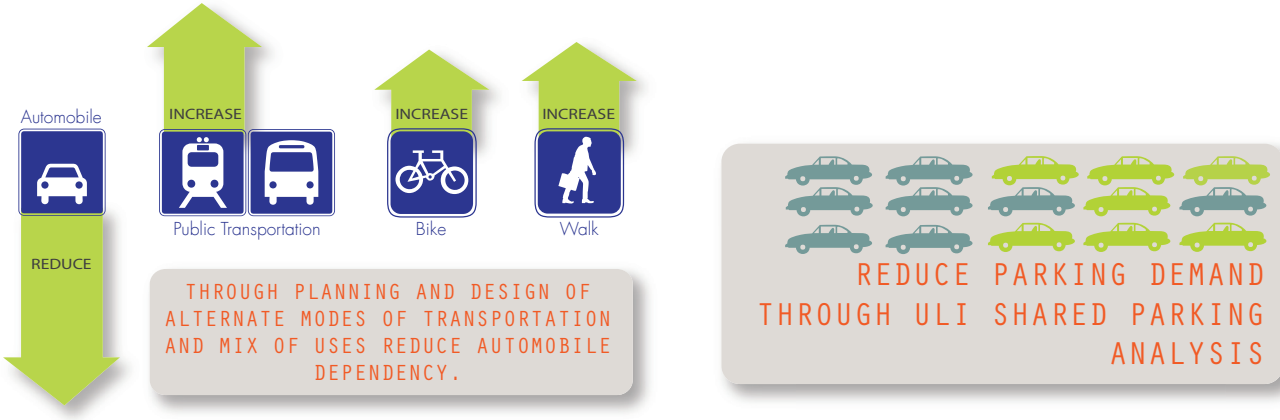



FIGURE 5.12 GRAPHICAL REPRESENTATION OF PARKING OPTIMIZATION STRATEGY (BY AUTHOR, 2013).

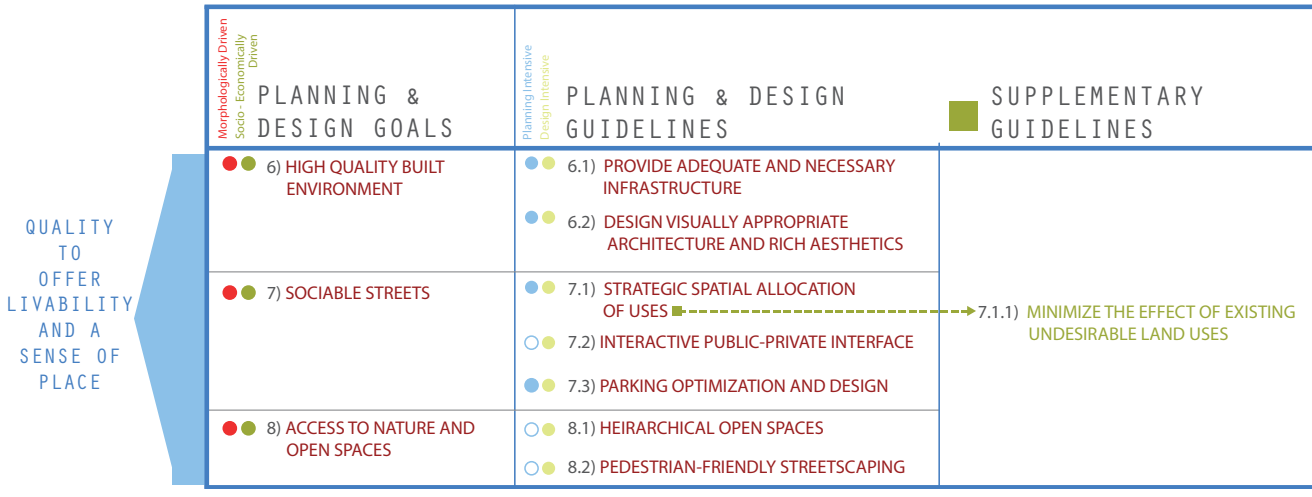



FIGURE 5.13 SUMMARY OF THE QUALITY TO OFFER LIVABILITY AND SENSE OF PLACE (BY AUTHOR, 2013).

## 5.2 SYNTHESIS SUMMARY

The process of synthesis aims at developing a holistic understanding of high density environments by providing valuable theoretical and practical inputs for creating meaningful high density environments. Drawing from literature review and explorative design inputs, synthesis process result in Density Dynamics—a theoretical framework to understand meaningful high density environments. Density dynamics largely focuses on the qualitative aspects of high density environments. This is because preliminary literature review findings establish that meaningful high density environments are a matter of design and performance rather than mere achievement of high number of residential units per unit land area. "Density Dynamics" synthesize literature review and explorative design inputs into a framework of four hierarchical and inter-related elements that relate to the qualitative aspects of high density environments:

(a) Necessary morphological and socio-economic qualities of meaningful high density environments;

(b) Planning and design goals needed for the manifestation of these necessary qualities;

(c) Planning and design guidelines needed to meet each of these goals;

(d) Supplementary guidelines needed to strengthen applicability of some of the aforementioned guidelines.

The first element of "Density Dynamics" provides a theoretical understanding of meaningful high density environments. Synthesis process identifies three necessary morphological and socio-economic qualities of meaningful high density environments which are—(a) Physical compactness; (b) Ability to promote urbanity; (c) Ability to offer livability and sense of place. Even though these three qualities can generally define meaningful high density environments, a more detailed understanding is required which leads us to the other elements of "Density Dynamics." The second element of "Density Dynamics" enlists planning and design goals needed for the manifestation of the three theoretical qualities necessary for meaningful high density environments. These goals elaborate upon each of the qualities in terms of relevant large-scale morphological and socio-economic considerations. The third and fourth elements further elaborate upon these large-scale goals by identifying specific planning and design guidelines that can potentially help in meeting these goals. Figure 5.14 summarizes "Density Dynamics" and elaborates each element of the framework in detail.

There exists a hierarchy in the framework both horizontally and vertically. Horizontally, three rows provide information regarding each quality of meaningful high density environments in increasing detail from left to right starting with necessary quality, then general planning and design goals followed by specific guidelines. Vertically, the goals and guidelines correspond to a development's planning and design process, in that, they initially address larger-scale aspects followed by smaller scale elements. Hierarchical structure of the framework makes it an effective design and analysis tool in considering high density environments. On the one hand, it provides an action plan for new high density projects in terms of goals and guidelines and on the other hand, it serves as an effective checklist of necessary elements to be considered while evaluating existing high density projects. By serving as a design tool as well as a theoretical framework, density dynamics effectively answers the two key research questions; (a) what constitutes a holistic understanding of high density environments; and (b) how can we create meaningful high density environments.

DENSITY DYNAMICS

MEANINGFUL HIGH DENSITY ENVIRONMENTS

SHOULD

BE PHYSICALLY COMPACT

PROMOTE URBANITY

OFFER LIVABILITY AND SENSE OF PLACE

Morphologically Driven

Socio - Economically Driven

PLANNING & DESIGN GOALS

1) PROXIMITY AND ACCESSIBILITY TO EXISTING DEVELOPMENTS
Meaningful high density environments are well integrated and connected to its surrounding context and hence maintain close proximity to activity centers, employment centers, and transit systems.

2) COMPACT BLOCK AND BUILDING DESIGN
Meaningful high density environments have closely spaced blocks and buildings with minimal horizontal spread.

3) PEOPLE CONCENTRATION
Meaningful high density environments promote urbanity by supporting a dense concentration of residential and non-residential population.

4) VARIETY OF ACTIVITIES
Meaningful high density environments promote urbanity by providing a wide range of activity choices.

5) DEMOGRAPHIC DIVERSITY
Meaningful high density environments promote urbanity by supporting demographic diversity.

6) HIGH QUALITY BUILT ENVIRONMENT
Meaningful high density environments offer livability and sense of place through planning and designing of a high quality built environment.

7) SOCIABLE STREETS
Meaningful high density environments are characterized sociable streets that are planned and designed to offer livability and a sense of place.

8) ACCESS TO NATURE AND OPEN SPACES
Meaningful high density environments offer a sense of place and livability by maximizing residents' access to nature and open spaces.

FIGURE 5.14 SUMMARY OF DENSITY DYNAMICS (BY AUTHOR, 2013).

Planning Intensive
Design Intensive

## PLANNING & DESIGN GUIDELINES

## SUPPLEMENTARY GUIDELINES

1.1) STRATEGICALLY SELECT SITE
- Select sites with access and proximity to activity centers, employment centers, and transit systems.

1.2) ESTABLISH PHYSICAL AND VISUAL CONNECTIVITY
- Extend existing main pedestrian street system in to the site.

2.1) CREATE A COMPACT AND PERMEABLE STREET- BLOCK SYSTEM
- Design small blocks defined by interconnected street system and secondary pedestrian connections that enhances on-site walkability and visibility.
- Design large blocks as exceptions for public buildings or iconic buildings that are potential landmarks and add character to the neighborhood.

2.2) DESIGN CONTEXT RESPONSIVE BUILDING HEIGHT AND MASSING
- Design Mid-rise buildings to High-rise towers for City Centers.
- Design Low-rise to mid-rise buildings for City peripheries.

3.1) MEET APPROPRIATE DENSITY THRESHOLDS
- Consider sufficient residential dwelling units to meet the thresholds required for a wide range of activities and services.

3.2) MAXIMIZE COMMUTING CHOICES
- Depending on density levels, plan and design facilities that can a accommodate multiple modes of commuting including walking, biking and public transportation to allow human exchange between neighborhoods.

4.1) MIX OF PRIMARY AND SECONDARY USES
- Achieve a mix of compatible Primary Uses [residential uses, work places, and grocery] and Secondary Uses that rely on primary uses [recreational uses, retail stores, restaurants, etc] based on market forces and context.

4.2) ADAPTIVE-REUSE OF EXISTING BUILDINGS
- Materialize any practicable opportunities for adaptive-reuse of existing buildings. This can attract uses and activities that cannot afford newly built structures.

5.1) INCLUDE A VARIETY OF MULTI-FAMILY HOUSING CHOICES
- Maximize a variety of multi-family residential development types such as apartments, condos, studios, and townhomes based on market demand.

5.2) DESIGN OPTIMAL DWELLING UNIT SIZES
- Achieve optimal dwelling unit sizes required to ensure ocupancy.

6.1) PROVIDE ADEQUATE AND NECESSARY INFRASTRUCTURE
- Ensure adequate provision of basic infrastructure including sewer, water, and other building services.

6.2) DESIGN VISUALLY APPROPRIATE ARCHITECTURE AND RICH AESTHETICS
- Create an identity through appropriate architectural design and aesthetic elements.

7.1) STRATEGIC SPATIAL ALLOCATION OF USES
- Locate primary uses on site areas lacking concentrated pedestrian flow.
- Locate retail and secondary uses on street level.
- Allocate upper level spaces for residences and offices.

7.2) INTERACTIVE PUBLIC-PRIVATE INTERFACE
- Design street facing semi-private spaces at upper levels of buildings.
- Design contextually appropriate and architecturally rich street-facing facades.

7.3) PARKING OPTIMIZATION AND DESIGN
- Plan for shared parking.
- Design parking based on context to minimize impact on sense of place.

8.1) HEIRARCHICAL OPEN SPACES
- Provide access to or design large community level open spaces such as parks and plazas.
- Design quasi-public and private open spaces as a part of residential blocks.

8.2) PEDESTRIAN-FRIENDLY STREETSCAPING
- Design tree-lined streets to enhance green infrastructure.
- Design adequate amenities for pedestrians and bikers so as to promote walking and biking.

1.1.1) CREATE NODES OF INTENSE PEDESTRIAN ACTIVITIES FOR FAVORABLE SITES
- For sites that have high density context with activity centers employment centers, and transit systems, create nodes of employment and other pedestrian activities to allow regional influx.

1.1.2) PROPOSE ANCHOR USE OR ACTIVITY FOR UNFAVORABLE SITES
- For sites that have low density surrounding context, propose an anchor use such as shopping attraction, market place, or entertainment center in order to facilitate regional influx.

1.2.1) OVERCOME EDGE BARRIERS
- For sites that are bound by natural or manmade edge barriers, propose pedestrian connections and design these connections with amenities and features that elevates walking and biking experience.

3.1.1) INCREMENTAL INCREASE IN DENSITY FOR SITES WITH LOW DENSITY CONTEXT
- For sites with low density surrounding context, achieve density thresholds incrementally through a strategic phasing of residential development.

4.1.1) MANAGE MARKET DEMAND THROUGH PHASING
- Generate demands and support future demands for primary and secondary uses by strategically phasing the development plan.

7.1.1) MINIMIZE THE EFFECT OF EXISTING UNDESIRABLE LAND USES
- Seperate residential uses from existing undesirable uses such as prisons and powerplants through either distance or design.

## 5.3 PROJECT SUMMARY AND THESIS

This project is driven by a dilemma of understanding and clearly defining meaningful high density environments. The project is set up as a collaborative meshwork between four students who while working on individual focus areas operated as an umbrella group with a general focus on urban design and development. In order to resolve the primary dilemma, the project attempts to answer the following two research questions.

1) What constitutes a holistic understanding of high density environments?

2) How can we create desirable high density environments?

Research methodology for the project includes literature review, explorative design exercises, and synthesis of concepts and ideas. Literature review uses a wide range of literature to understand the concept of high density and its design implications. Explorative design exercises include two design projects; one representing a dense urban setting and the other a suburban setting. Inputs from literature review and explorative design exercises are then synthesized to generate a theoretical framework that can potentially answer the two research questions.

Density is a complex concept. This is largely because of—(a) perception problems related to high density environments in terms of overcrowding; (b) Density measurements do not reflect quality and performance; (c) Optimal density is not absolute and is represented by a range of values; (d) Subjective perception and morphological implications of density measurements. Aforementioned complexities associated with the concept of density and an elaborate understanding of the need for high density environments suggest that meaningful high density environments cannot be defined solely based on density measurements. Meaningful high density environments should therefore, be understood as a matter of design and performance. There are three necessary morphological and socio-economic qualities of meaningful high density environments. Meaningful high density environments should:

(a) Be physically compact;

(b) Promote urbanity;

(c) Offer livability and sense of place.

Physical compactness of high density environments depends on— (1) Proximity and accessibility to existing developments; (2) Compact Block and building design. The ability of high density environments to promote urbanity depends on— (1) People concentration; (2) Variety of activities; and (3) Demographic diversity. The ability of high density environments depends on— (1) High quality built environment design; (2) Sociable streets; and (3) Access to nature. These factors can serve as planning and design goals in creating meaningful high density environments. Aforementioned essential qualities and goals provide a theoretical understanding of meaningful high density environments. Additionally, applying the following planning and design guidelines can result in meaningful high density environments:

1) Strategically select site;
   - Create nodes of intense pedestrian activities for unfavorable sites,
   - Propose anchor use or activity for unfavorable sites.

2) Establish physical and visual connectivity;
   - Overcome edge barriers.

3) Create a compact and permeable street-block system;

4) Design context-responsive building heights and massing;

5) Meet appropriate density thresholds;
    - Incremental increase in density for sites with low density context.

6) Maximize commuting choices;

7) Mix primary and secondary uses;
    - Manage market demand through phasing.

8) Adaptive re-use of existing buildings;

9) Include a variety of multi-family housing choices;

10) Design optimal dwelling unit sizes;

11) Provide adequate and necessary infrastructure;

12) Design visually appropriate architecture and rich aesthetics;

13) Strategic spatial allocation of uses;
    - Minimize effect of existing undesirable uses.

14) Interactive public-private interface;

15) Parking optimization and design;

16) Hierarchical open spaces;

17) Pedestrian-friendly streetscaping.

Together, these essential qualities, goals, and guidelines constitute Density Dynamics—a theoretical framework to understand meaningful high density environments. Density Dynamics include various morphological and socio-economic implications of meaningful high density environments. Planners and designers can use density dynamics as a tool to create and evaluate high density environments. Density Dynamics as a research project was time-bound and dependent on two explorative design projects. Therefore, elements of Density Dynamics can be further explored and evaluated through additional literature review and design explorations.

# GLOSSARY

# GLOSSARY

# GLOSSARY OF TERMS

ADAPTIVE REUSE: Redesigning existing buildings within redevelopment projects to accommodate new uses (Fader, 2000).

COMPACTNESS: Compactness is the morphological quality of a built environment to be closely united or concentrated in a small area. Compact developments are those built environments in which buildings and activities are closely united to minimize land consumption (Porter & Zyscovich, 2008).

DENSITY: Concentration of people in a given geographical area (Campoli, 2007).

DENSITY MEASUREMENT: The number of people residing in unit land area (Landcom, 2011).

EDGE BARRIERS: Natural or man-made morphological features that restrict cross-pedestrian movements.

FLOOR AREA RATIO (FAR): Floor Area Ratio is the ratio of total gross floor area of a development to its site area (Cheng, 2010).

GOOD DENSITIES: High density environments that address human needs effectively and offer valuable social, economic, and environmental benefits (Campoli, 2007).

GROSS DENSITY: Density measurement where the reference land area includes land used for residential uses, non-residential uses, and local roads (Cheng, 2010).

LIVABILITY: The idea that urban environments must allow everyone to live in relative comfort with access to basic human facilities such as water, pollution-free environment, and well-managed spatial surroundings (Jacobs A. B., 2011).

MIXED-USE: A development which combines residential, commercial, retail, and/or office uses, either vertically or horizontally (Schwanke. 2003).

MULTI_FAMILY HOUSING: A housing type where multiple separate housing units are contained within one building or several buildings within one complex (Schmitz, 2000).

NET DENSITY: Density measurement where the reference land area includes only the land used for residential uses along with the local roads (Cheng, 2010).

OPEN SPACE: An area set aside or reserved for public or private use with very few improvements (Schwanke, 2003).

PARKING OPTIMIZATION: Providing an optimal number of parking spaces in a development by considering minimal parking needs through time and space adjustments and shared parking (Smith, 2006).

PERMEABILITY: Permeability is the morphological quality of an environment to provide visual and physical access within. Permeability implies a well connected street-block system (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985).

PHASING: Planning incremental development of large-scale projects with specific parts of the project developed within a specified time-frame (Schwanke, 2003).

PRIMARY USE: Those landuses that induce people to spend time in the area—essentially businesses, residences, and a few special institutions like museums or libraries (Jacobs, 1960).

PUBLIC_PRIVATE INTERFACE: The interface between private buildings and public open spaces. Public-private interface includes building façades and streetscaping (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985).

QUALITY OF LIFE: Those physical and socio-economic aspects of an environment that affect whether a community is considered a desirable place in which to live or do business (Porter, D. R., & Zyscovich, B., 2008).

SECONDARY USE: Those landuses that sprout up to serve people who are already in the neighborhood for other reasons such as restaurants, book stores, and laundromats (Jacobs, 1960).

SENSE OF PLACE: Sense of place relates to people's association of meaning and value to the physical environment. (Carmona, Heath, Oc, & Tiesdell, 2003).

SOCIABLE STREETS: Streets that support pedestrian activities and promote walkability by the virtue of design and allocation of landuses Porter, D. R., & Zyscovich, B., 2008).

SPRAWL: Sprawls relates to patterns of urban growth that include large acreage of low-density residential development, separation between residential and commercial uses, leapfrog development in rural areas away from urban centers, and minimal support for non-motorized modes of transportation (Campoli, 2007).

UNDESIRABLE LANDUSE: Landuses that can negatively affect the value of residential buildings because of people's aversion to such uses. Undesirable landuses include powerplants, jails, and cellphone towers (Whyte, 1968).

URBANITY: Urbanity is the quality of built environments to allow its inhabitants to interact with a large number of people and institutions

(Lozano, 1990).

WALKABILITY: The morphological quality of an environment to promote walking between various destinations (Whyte, 1968).

MIXED-USE: A development which combines residential, commercial, retail, and/or office uses, either vertically or horizontally (Schwanke. 2003).

# APPENDIX

# APPENDIX

# APPENDIX

## 1. Summary Pro Forma

Team 0578

| | | Complete | Year 0 | Phase I | Mid-Year | Phase II | | Beg-Year | Phase III | | Beg-Year | | | Reversion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2013-2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | Calculation |
| **Net Operating Income** | | | | | | | | | | | | | | |
| Market-rate | Rental Housing | | $ - | $ - | $ 2,385,509 | $ 2,948,489 | $ 3,290,022 | $ 4,802,881 | $ 5,229,652 | $ 5,532,123 | $ 5,788,057 | $ 6,011,122 | $ 6,223,272 | $ 6,423,079 |
| | For-Sale Housing | | $ - | $ - | $ - | $ - | $ 6,824,486 | $ 8,591,270 | $ - | $ 21,290,750 | $ 40,204,033 | $ 11,293,678 | $ - | $ - |
| Senior | Rental Housing | | $ - | $ - | $ 2,166,387 | $ 2,355,344 | $ 2,489,847 | $ 6,069,211 | $ 6,424,934 | $ 6,903,852 | $ 6,734,861 | $ 10,544,099 | $ 11,031,902 | $ 11,480,609 |
| Affordable | Rental Housing | | $ - | $ - | $ 1,108,420 | $ 1,406,308 | $ 1,549,751 | $ 1,614,392 | $ 1,638,608 | $ 1,663,187 | $ 1,688,135 | $ 1,713,457 | $ 1,393,311 | $ 1,435,110 |
| Office | Medical/Commercial | | $ - | $ - | $ 1,059,923 | $ 1,390,064 | $ 1,438,984 | $ 2,499,031 | $ 2,730,301 | $ 2,977,321 | $ 3,494,455 | $ 3,840,049 | $ 4,207,507 | $ 4,356,610 |
| | Existing | | $ 13,032,560 | $ 6,516,280 | $ 6,516,280 | $ 3,750,543 | $ 3,750,543 | $ 3,750,543 | $ 3,750,543 | $ 3,750,543 | $ 3,750,543 | $ 3,750,543 | $ 3,750,543 | $ 3,750,543 |
| Retail | Market-Rate | | $ - | $ - | $ 1,603,021 | $ 2,014,356 | $ 2,120,137 | $ 3,588,293 | $ 4,355,931 | $ 5,084,824 | $ 5,467,674 | $ 6,159,677 | $ 6,779,516 | $ 6,982,901 |
| Hotel | | | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ 5,312,931 | $ 5,472,319 | $ 5,636,488 | $ 5,805,583 |
| Structured Parking | | | $ - | $ - | $ 259,775 | $ 276,568 | $ 293,865 | $ 1,089,269 | $ 1,130,947 | $ 1,173,876 | $ 3,242,269 | $ 3,348,537 | $ 3,457,993 | $ 5,700,160 |
| Surface Parking | | | $ 8,516,452 | $ 2,922,982 | $ 3,010,672 | $ 1,976,234 | $ 2,035,521 | $ 2,096,587 | $ 1,671,052 | $ 1,721,183 | $ 1,772,819 | $ 1,826,003 | $ 1,880,784 | $ 1,937,207 |
| Rec Center | | | $ - | $ - | $ - | $ - | $ - | $ 273,743 | $ 285,445 | $ 297,499 | $ 309,914 | $ 322,701 | $ 335,872 | $ 349,438 |
| Incubator | | | $ - | $ - | $ - | $ - | $ - | $ 892,032 | $ 928,653 | $ 966,372 | $ 1,005,223 | $ 1,045,239 | $ 1,086,456 | $ 1,128,909 |
| **Total Net Operating Income** | | | $ 21,549,012 | $ 9,439,262 | $ 18,109,985 | $ 16,117,906 | $ 23,793,157 | $ 35,267,252 | $ 28,146,066 | $ 51,361,530 | $ 78,770,913 | $ 55,327,424 | $ 45,783,645 | $ 49,350,149 |
| **Development Costs** | | | | | | | | | | | | | | |
| Market-rate | Rental Housing | | $ - | $ 36,200,778 | $ - | $ 20,970,813 | $ - | $ - | $ - | $ - | $ - | $ - | $ - | |
| | For-Sale Housing | | $ - | $ - | $ - | $ 11,385,337 | $ - | $ - | $ 48,758,066 | $ - | $ - | $ - | $ - | |
| Senior | Rental Housing | | $ - | $ 29,876,188 | $ - | $ 46,720,447 | $ - | $ - | $ 35,413,400 | $ - | $ - | $ - | $ - | |
| Affordable | Rental Housing | | $ - | $ 20,504,502 | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | |
| Office/Commercial | | | $ - | $ 12,255,072 | $ - | $ 11,859,730 | $ - | $ - | $ 6,934,651 | $ - | $ - | $ - | $ - | |
| Retail | Market-Rate | | $ - | $ 13,342,658 | $ - | $ 15,942,169 | $ - | $ - | $ 6,446,883 | $ - | $ - | $ - | $ - | |
| Hotel | | | $ - | $ - | $ - | $ - | $ - | $ - | $ 17,759,858 | $ - | $ - | $ - | $ - | |
| Structured Parking | | | $ - | $ 5,303,890 | $ - | $ 5,950,217 | $ - | $ - | $ 14,174,899 | $ - | $ - | $ - | $ - | |
| Surface Parking | | | | | | | | | | | | | | |
| Rec Center | | | $ - | $ - | $ - | $ 2,742,379 | $ - | $ - | $ - | $ - | $ - | $ - | $ - | |
| Incubator | | | $ - | $ - | $ - | $ 8,400,765 | $ - | $ - | $ - | $ - | $ - | $ - | $ - | |
| Demo &Remediation | | | | $ 346,930 | | $ 499,838 | | | $ 95,392 | | | | | |
| Land Acquisition | | | | $ 5,282,935 | | | | | | | | | | |
| Total Infrastructure | | | $ - | $ 6,727,365 | $ (300,000) | $ 6,877,009 | $ - | $ - | $ 5,974,005 | $ - | $ - | $ - | $ - | |
| Indirect costs | | | $ - | $ 6,492,016 | $ - | $ 6,567,435 | $ - | $ - | $ 6,777,858 | $ - | $ - | $ - | $ - | |
| **Total Development Costs** | | | $ - | $ 136,332,333 | $ (300,000) | $ 137,916,140 | $ - | $ - | $ 142,335,012 | $ - | $ - | $ - | $ - | |
| **Annual Cash Flow** | | | | | | | | | | | | | | |
| Net Operating Income | | | $ 21,549,012 | $ 9,439,262 | $ 18,109,985 | $ 16,117,906 | $ 23,793,157 | $ 35,267,252 | $ 28,146,066 | $ 51,361,530 | $ 78,770,913 | $ 55,327,424 | $ 45,783,645 | |
| Total Asset Value | | | | $ 129,893,327 | $ 230,467,221 | $ 243,059,270 | $ 370,866,120 | $ 407,560,501 | $ 435,382,762 | $ 480,898,502 | $ 621,417,269 | $ 646,099,339 | $ 698,217,576 | |
| Total Costs of Sale | | | | $ 5,213,024 | $ 11,888,280 | $ 12,577,610 | $ 19,486,653 | $ 22,016,014 | $ 23,604,221 | $ 24,452,334 | $ 32,743,413 | $ 34,080,088 | $ 41,893,055 | |
| Total Development Costs | | | $ - | $ 136,332,333 | $ (300,000) | $ 137,916,140 | $ - | $ - | $ 142,335,012 | $ - | $ - | $ - | $ - | |
| **Net Cash Flow** | | | $ (105,954,257) | $ (126,893,071) | $ 18,409,985 | $ (121,798,234) | $ 23,793,157 | $ 35,267,252 | $ (114,188,946) | $ 51,361,530 | $ 78,770,913 | $ 55,327,424 | $ 45,783,645 | $ 702,108,166 |
| **Debt Service** | | | | | | | | | | | | | | |
| | Equity | | $ 127,503,269 | | | | | | | | | | | |
| | Construction Loans Pmts | | $ - | $ (9,202,432) | $ (3,919,555) | $ (5,344,250) | $ (7,930,178) | $ - | $ (9,607,613) | $ (8,184,263) | $ - | $ - | $ - | |
| | Perm Loan Pmts | | $ - | $ - | $ (4,217,878) | $ (8,435,756) | $ (8,435,756) | $ (16,969,513) | $ (16,969,513) | $ (16,969,513) | $ (25,776,693) | $ (25,776,693) | $ (405,602,503) | |
| | Loan Proceeds | | $ - | $ 136,332,333 | $ - | $ 137,916,140 | $ - | $ - | $ 142,335,012 | $ - | $ - | $ - | $ - | |
| **Leveraged Net Cash Flow** | | | $ (105,954,257) | $ 236,830 | $ 10,272,552 | $ 2,337,899 | $ 7,427,222 | $ 18,297,739 | $ 1,568,940 | $ 26,207,754 | $ 52,994,220 | $ 29,550,731 | $ 296,505,663 | |
| **Net Present Value** | | **12%** | $ 59,389,831 | | | | | | | | | | | |
| **Loan to Value Ratio (LVR)** | | | 59.15% | | | 37.19% | | | 29.60% | | | | 54.40% | |
| **Unleveraged IRR Before Taxes** | | | 11.40% | | | **Current Site Value (start of Year 0)** | | | $ 127,503,269 | | | | | |
| **Leveraged IRR Before Taxes** | | | 18.15% | | | **Projected Site Value (end of Year 10)** | | | $ 698,217,576 | | | | | |
| **Debt Service Coverage Ratio** | | | 3.37 | 2.23 | 1.17 | 1.45 | 2.08 | 1.06 | 2.04 | 3.06 | 2.15 | 1.78 | | |

## 2. Multiyear Development Program

| | | | Total Buildout | Year-by-Year Cumulative Absorption 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Buildout by Development Units** | | | | | | | | | | | | | | |
| Market-rate | Rental Housing | (units) | | | | 347 | | | 201 | | | | | 549 |
| | For-Sale Housing | (units) | | | | | | | 49 | | | 185 | | 234 |
| Senior | Rental Housing | (units) | | | | 207 | | | 323 | | | 245 | | 774 |
| Affordable | Rental Housing | (units) | | | | 214 | | | | | | | | 214 |
| Hotel | | (rooms) | | - | - | - | - | - | - | - | - | 210 | - | 210 |
| Structured Parking | | (spaces) | | - | - | 705 | - | - | 388 | - | - | 924 | - | 2,017 |
| Surface Parking | Existing | (spaces) | | - | (591) | - | (429) | - | - | (170) | - | - | - | (1,190) |
| Other | | | | | | | | | | | | | | |
| **Project Buildout by Area** | | | | | | | | | | | | | | |
| Market-rate | Rental Housing | (s.f.) | | - | - | 245,429 | - | - | 142,175 | - | - | - | - | 387,604 |
| | For-Sale Housing | (s.f.) | | - | - | - | - | - | 63,624 | - | - | 257,083 | - | 320,707 |
| Affordable | Rental Housing | (s.f.) | | - | - | 148,799 | - | - | - | - | - | - | - | 148,799 |
| Senior | Rental Housing | (s.f.) | | - | - | 209,217 | - | - | 327,174 | - | - | 247,993 | - | 784,384 |
| Office/Commercial | | (s.f.) | | - | - | 66,215 | - | - | 90,643 | - | - | 53,001 | - | 209,859 |
| Market-rate Retail | | (s.f.) | | - | - | 107,213 | - | - | 128,101 | - | - | 51,803 | - | 287,117 |
| Rec Center | | (s.f.) | | - | - | - | - | - | 21,983 | - | - | - | - | 21,983 |
| Incubator | | (s.f.) | | - | - | - | - | - | 66,851 | - | - | - | - | 66,851 |
| Hotel | | (s.f.) | | - | - | - | - | - | - | - | - | 96,390 | - | 96,390 |
| Structured Parking | | (s.f.) | | - | - | 225,636 | - | - | 124,118 | - | - | 295,680 | - | 645,434 |
| Surface Parking | | (s.f.) | | - | - | - | - | - | - | - | - | - | - | - |
| **Total** | | (s.f.) | | - | - | 1,002,509 | - | - | 964,669 | - | - | 1,001,950 | - | 2,969,128 |
| | | | | | | | | | | | | | | 0 |

## 3. Unit Development and Infrastructure Costs

| **Development** | | **Unit Cost** | **Total Costs** |
|---|---|---|---|
| Market-rate | Rental Housing | ($ per unit) | $ 107,719 | $ 59,109,610 |
| | For-Sale Housing | ($ per unit) | $ 263,176 | $ 61,517,648 |
| Senior | Rental Housing | ($ per unit) | $ 149,726 | $ 115,931,955 |
| Affordable | Rental Housing | ($ per unit) | $ 99,473 | $ 21,248,497 |
| Office/Commercial | | ($ per s.f.) | 152.95 | $ 32,098,749 |
| Retail | | ($ per s.f.) | 129.45 | $ 37,167,297 |
| Hotel | | ($ per room) | $ 87,515 | $ 18,338,198 |
| Rec Center | | ($ per s.f.) | 129.75 | $ 2,852,294 |
| Incubator | | ($ per s.f.) | 162.08 | $ 10,835,210 |
| Structured Parking | | ($ per space) | $ 16,940.80 | $ 34,169,276 |
| Surface Parking | | ($ per space) | - | $ - |
| Total | | | | $ 373,390,355 |
| **Infrastructure Costs** | | **Public** | | **Private** |
| Plaza Landscaping | | | | $ 1,537,400 |
| Streetscaping | | | | $ 1,979,040 |
| Hardscaping | | | | $ 1,649,200 |
| Other Infrastructure | | | | $ 14,712,739 |
| **Total Infrastructure Costs** | | | | $ 19,878,379 |
| **Total Development Costs** | | | | $ 419,331,137 |

## 4. Equity and Financing Sources

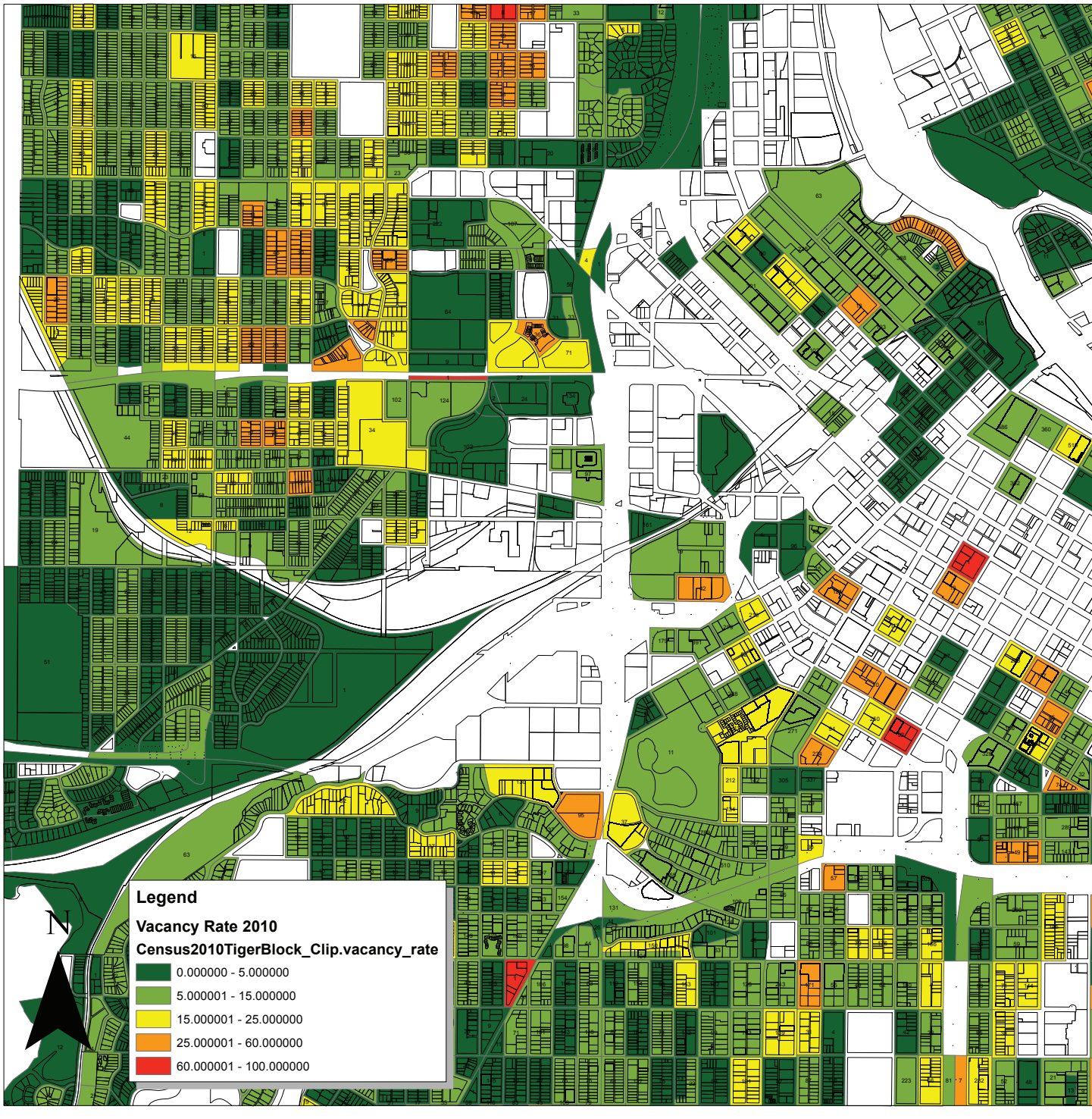
| | | | **Amount** | **Percent of Total** |
|---|---|---|---|---|
| **Equity Sources (total)** | | | | |
| Equity | | Owner 1 | $ 61,903,630 | 11.25% |
| | | Owner 2 | $ 65,599,639 | 11.92% |
| | | **Total Equity** | $ 127,503,269 | 23.17% |
| **Financing Sources (total)** | | | | |
| Phase I | | Construction Loan | $ 136,332,333 | 24.77% |
| | | Permanent Loan | $ 136,332,333 | |
| Phase II | | Construction Loan | $ 137,916,140 | 25.06% |
| | | Permanent Loan | $ 137,916,140 | |
| Phase III | | Construction Loan | $ 142,335,012 | 25.86% |
| | | Permanent Loan | $ 142,335,012 | |
| | | **Total Permanent Financing** | $ 416,583,485 | 75.70% |
| **Public Subsidies (total, if any)** | | | | |
| | | Infrastructure Subsidy from Minneapolis | $ 600,000 | 0.11% |
| | | Affordable Housing Tax Credit | $ 2,606,791 | 0.47% |
| | | Federal Historic Preservation Income Tax Subsidy | $ 229,380 | 0.04% |
| | | PPP w/University Incubator Program (const) | $ 2,100,191 | 0.38% |
| | | PPP w/University Incubator Program (subsidy) | $ 717,810 | 0.13% |
| | | Private Sponsorship (3M) | $ 1,076,715 | 0.20% |
| | | **Total Public Subsidies** | $ 6,254,172 | 1.14% |
| **Total** | | | $ 550,340,926 | 100.00% |

APPENDIX 1: KINETIC MINNEAPOLIS PRO FORMA (ARNDT, 2013)

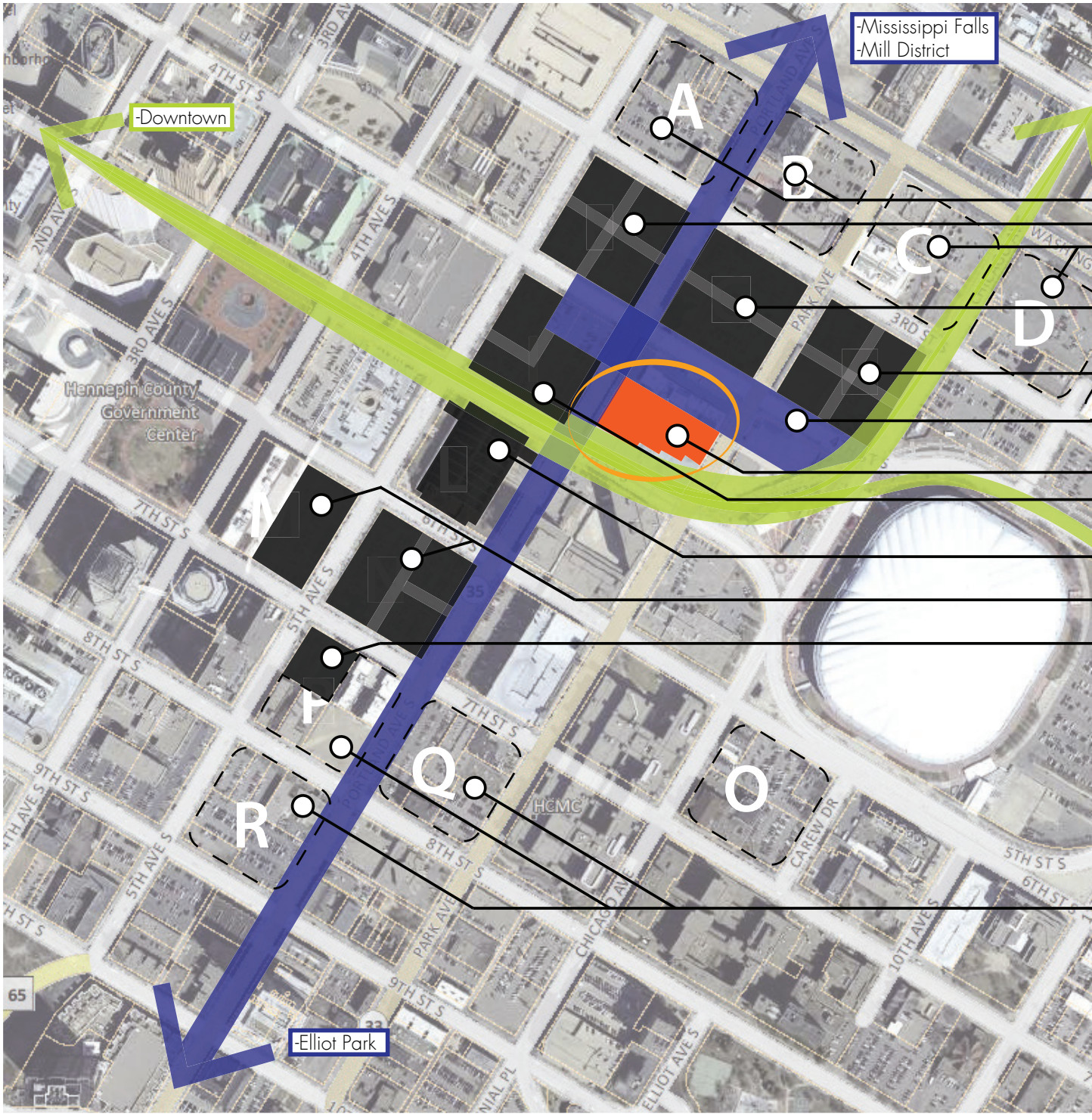
| PHASE 1 | | | Unadjusted parking demand | | | | Monthly adjustment | | Peak Hour Adjustr | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | WEEKDAYS | | WEEKENDS | | DECEMBER | | 7am - 6pm | 6p |
| Land use | Sq Footage | Units | Visitor | Employee | Visitor | Employee | Visitors | Employee | Weekdays | W |
| Office (< 25,000) | 50,000 | - | 15 | 50 | 2 | 18 | 100% | 100% | 100% | |
| Incubator | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 100% | |
| Rec Space | - | - | 0 | 0 | 0 | 0 | 90% | 100% | 70% | |
| General Retail | 50,000 | - | 100 | 15 | 100 | 15 | 100% | 100% | 90% | |
| Grocery | 50,000 | - | 100 | 35 | 160 | 40 | 100% | 100% | 70% | |
| Theater | - | - | 0 | 0 | 0 | 0 | 67% | 80% | 40% | |
| Senior Housing | - | 150 | 23 | 300 | 0 | 300 | 100% | 100% | 60% | |
| Affordable Housing | - | 180 | 27 | 360 | 0 | 360 | 100% | 100% | 60% | |
| Market Rate housing | - | 300 | 45 | 600 | 0 | 600 | 100% | 100% | 60% | |
| Hotel | - | - | 0 | 0 | 0 | 0 | 67% | 100% | 55% | |
| Condos | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 60% | |
| Medical office | 60,000 | - | 120 | 90 | 120 | 90 | 100% | 100% | 70% | |
| | | | 430 | 1450 | 382 | 1423 | | | | |
| | | | | **1880** | | **1805** | | | | |
| **PHASE 2** | | | | | | | | | | |
| **Land use** | **Sq Footage** | **Units** | | | | | | | | |
| Office | 65,000 | - | 20 | 65 | 2 | 23 | 100% | 100% | 100% | |
| Incubator | 60,000 | - | 15 | 60 | 2 | 19 | 100% | 100% | 100% | |
| Rec Space | 21,983 | - | 88 | 9 | 121 | 5 | 90% | 100% | 70% | |
| General Retail | 175,000 | - | 350 | 53 | 350 | 53 | 100% | 100% | 90% | |
| Grocery | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 70% | |
| Theater | - | 700 | 133 | 7 | 182 | 7 | 67% | 80% | 40% | |
| Senior Housing | - | 225 | 34 | 450 | 34 | 450 | 100% | 100% | 60% | |
| Affordable Housing | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 60% | |
| Market Rate housing | - | 152 | 23 | 304 | 23 | 304 | 100% | 100% | 60% | |
| Hotel | - | - | 0 | 0 | 0 | 0 | 67% | 100% | 55% | |
| Condos | - | 31 | 5 | 62 | 5 | 62 | 100% | 100% | 60% | |
| Medical office | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 70% | |
| | | | 667 | 1,009 | 718 | 923 | | | | |
| | | | | **1,676** | | **1,641** | | | | |
| **PHASE 3** | | | | | | | | | | |
| **Land use** | **Sq Footage** | **Units** | | | | | | | | |
| Office | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 100% | |
| Incubator | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 100% | |
| Rec Space | - | - | 0 | 0 | 0 | 0 | 90% | 100% | 70% | |
| General Retail | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 90% | |
| Grocery | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 70% | |
| Theater | - | - | 0 | 0 | 0 | 0 | 67% | 80% | 40% | |
| Senior Housing | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 60% | |
| Affordable Housing | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 60% | |
| Market Rate housing | | | 0 | 0 | 0 | 0 | 100% | 100% | 60% | |
| Hotel | - | 75 | 75 | 19 | 68 | 14 | 67% | 100% | 55% | |
| Condos | - | 125 | 19 | 250 | 19 | 0 | 100% | 100% | 60% | |
| Medical office | - | - | 0 | 0 | 0 | 0 | 100% | 100% | 70% | |
| | | | **94** | **269** | **86** | **14** | | | | |
| | | | | **363** | | **100** | | | | |
| | | | | **3918** | | **3546** | | | | |

APPENDIX 2: KINETIC MINNEAPOLIS SHARED PARKING ANALYSIS (BY AUTHOR, 2013)

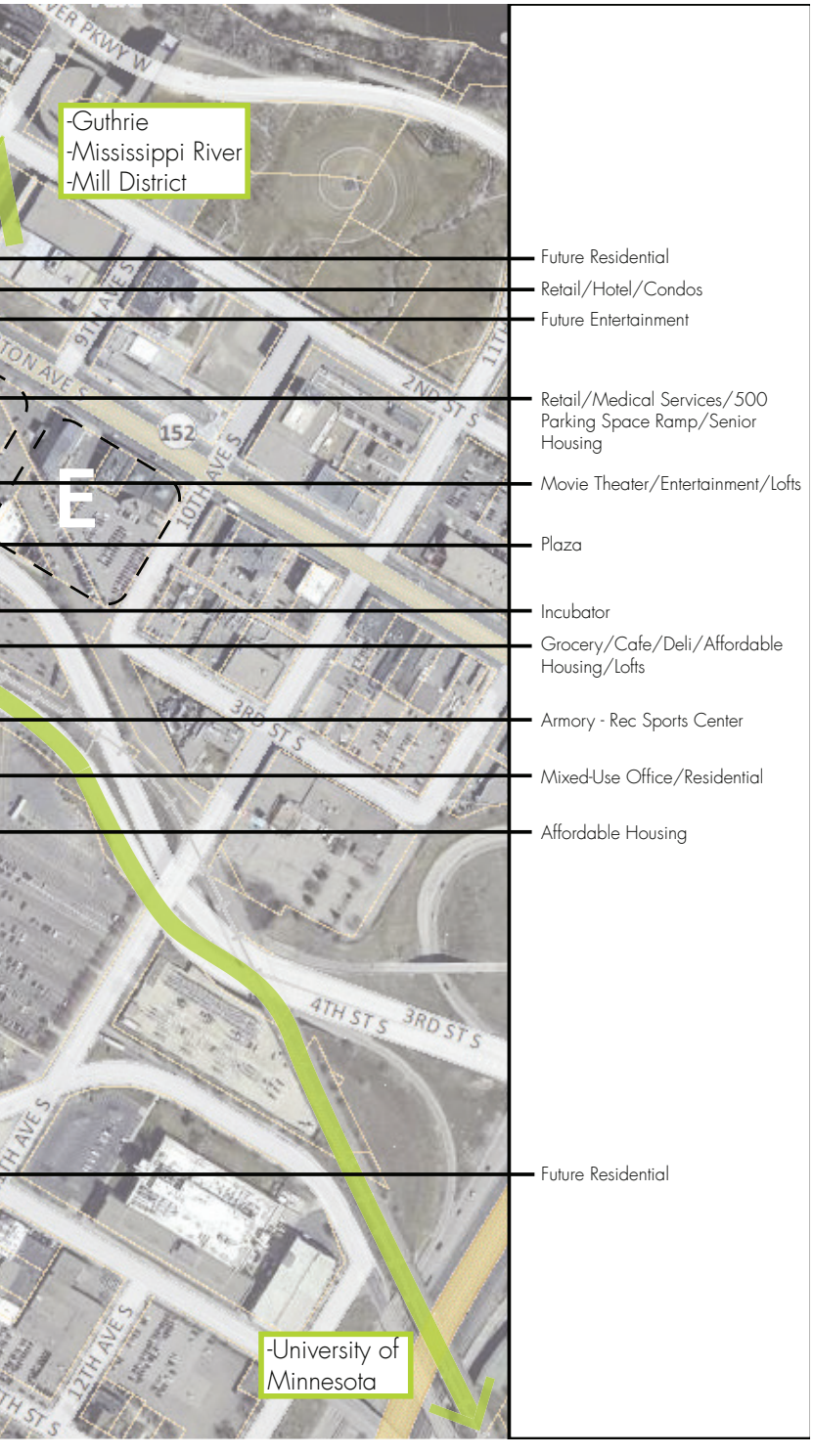
| ment | Mode Adjustment | | Parking Demand | | | |
|---|---|---|---|---|---|---|
| pm - 2am | DAYTIME | | WEEKDAYS | | WEEKENDS | |
| eekends | Visitor | Employee | Visitor | Employee | Visitor | Employee |
| 0% | - | 75% | 15 | 38 | 2 | 13 |
| 0% | - | 75% | 0 | 0 | 0 | 0 |
| 100% | - | 75% | 0 | 0 | 0 | 0 |
| 60% | - | 75% | 81 | 9 | 54 | 6 |
| 100% | - | 75% | 63 | 17 | 144 | 27 |
| 100% | - | 75% | 0 | 0 | 0 | 0 |
| 90% | - | 75% | 14 | 101 | 20 | 203 |
| 90% | - | 75% | 16 | 122 | 24 | 243 |
| 90% | - | 75% | 27 | 203 | 41 | 405 |
| 100% | - | 75% | 0 | 0 | 0 | 0 |
| 90% | - | 75% | 0 | 0 | 0 | 0 |
| 60% | - | 75% | 59 | 33 | 50 | 28 |
| | | | 275 | 521 | 335 | 925 |
| | | | | **796** | | **1260** |
| | | | | | | |
| 0% | - | 75% | 20 | 49 | 2 | 17 |
| 0% | - | 75% | 15 | 45 | 2 | 14 |
| 100% | - | 75% | 1 | 0 | 12 | 0 |
| 60% | - | 75% | 32 | 4 | 21 | 2 |
| 100% | - | 75% | 0 | 0 | 0 | 0 |
| 100% | - | 75% | 188 | 2 | 182 | 5 |
| 90% | - | 75% | 20 | 152 | 30 | 304 |
| 90% | - | 75% | 0 | 0 | 0 | 0 |
| 90% | - | 75% | 14 | 103 | 21 | 205 |
| 100% | - | 75% | 0 | 0 | 0 | 0 |
| 90% | - | 75% | 3 | 21 | 4 | 42 |
| 60% | - | 75% | 0 | 0 | 0 | 0 |
| | | | 292 | 375 | 274 | 590 |
| | | | | **667** | | **864** |
| | | | | | | |
| 0% | - | 75% | 0 | 0 | 0 | 0 |
| 0% | - | 75% | 0 | 0 | 0 | 0 |
| 100% | - | 75% | 0 | 0 | 0 | 0 |
| 60% | - | 75% | 0 | 0 | 0 | 0 |
| 100% | - | 75% | 0 | 0 | 0 | 0 |
| 100% | - | 75% | 0 | 0 | 0 | 0 |
| 90% | - | 75% | 0 | 0 | 0 | 0 |
| 90% | - | 75% | 0 | 0 | 0 | 0 |
| 90% | - | 75% | 0 | 0 | 0 | 0 |
| 100% | - | 75% | 28 | 25 | 68 | 10 |
| 90% | - | 75% | 11 | 84 | 17 | 169 |
| 60% | - | 75% | 0 | 0 | 0 | 0 |
| | | | 39 | 109 | 84 | 179 |
| | | | | **148** | | **263** |
| | | | | **1611** | | **2387** |




APPENDIX 3: VACANCY RATE IN DOWNTOWN MINNEAPOLIS (BY AUTHOR, 2013)



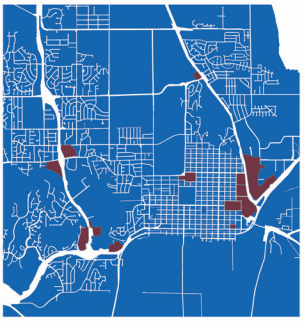

APPENDIX 4: PRELIMINARY DESIGN SCHEME FOR KINETIC MINNEAPOLIS (ZUNDEL, 2013)


-Guthrie
-Mississippi River
-Mill District
Future Residential
Retail/Hotel/Condos
Future Entertainment
Retail/Medical Services/500 Parking Space Ramp/Senior Housing
Movie Theater/Entertainment/Lofts
Plaza
Incubator
Grocery/Cafe/Deli/Affordable Housing/Lofts
Armory - Rec Sports Center
Mixed-Use Office/Residential
Affordable Housing
Future Residential
-University of Minnesota
2ND ST S
3RD ST S
4TH ST S
10TH AVE S
152

Modified from Bing Maps Aerial - © 2012 Microsoft Corporation

## Village Plaza Location

The site is located in the western portion of Manhattan, Kansas, at the intersection of Seth Child Road and Anderson Avenue.



## Retail Areas

Village Plaza has regional and neighboring retail competition. Westloop competition has many retailers who directly challenge the viability of rertailers in Village Plaza. There are also retailkers on site that lack necessary visibility.

## Flooding

This map illustrates the flooding challenges that occur in 10 & 50-year flood events. Recently, retailers in the south eastern portion of the site were challenged by 2010 & 2011 floods.

## Entrepreneurial Infrastructure

Currently entrepreneurship support is clustered in suburban style development at opposing ends of Manhattan. This does not fit with the desired lifestyle sought by most creative professionals. Luckily, opportunity exists to connect these clusters using a vibrant development typology in opportune location

# Existing Facilities

## Kansas Entrepreneurial Center (KEC)

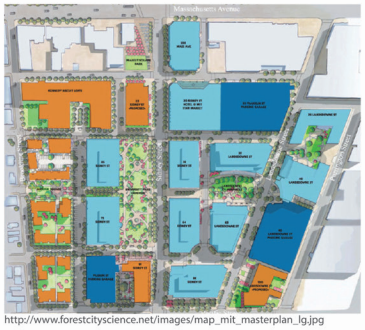
Modified from Bing Maps Aerial - © 2012 Microsoft Corporation

- 1-year, self-renewing lease for $1.00 per year
- 6,000 sq.ft. of Office space
- 6,000 sq.ft. of Wet Lab Space
- 4,400 sq.ft. of warehouse space
- Self-sustaining due to leasing of space
- 12 employees
- 6-10 tenets max., with primary focus on serving tenets
- Does not provide services to retailers
- Focus on start-ups
- 4 tenets, with 84% occupancy
- Tenets can only occupy 10-15% of the space
- Targets animal and plant health, food safety and biosecurity
- Advisory board of 15-25 board members
- Suburban and little passing traffic

http://www.manhattaned.org/index.aspx?NID=21
http://www.cityofmhk.com/DocumentView.aspx?DID=12117
http://www.ci.manhattan.ks.us/DocumentView.aspx?DID=3356

# Precedent Study

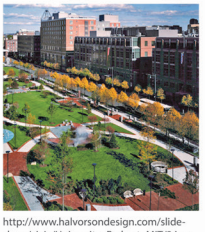
## University Park at MIT



http://www.forestcityscience.net/images/map_mit_masterplan_lg.jpg

- Site area = 27 acres
- Office = 1,400,000 Sf
- Retail = 75,000 Sf
- Residential = 460 units
- FAR = 7.4
- Density = 66 du/acre

http://www.forestcity.net/properties/PublishingImages/65Landsdowne.jpg

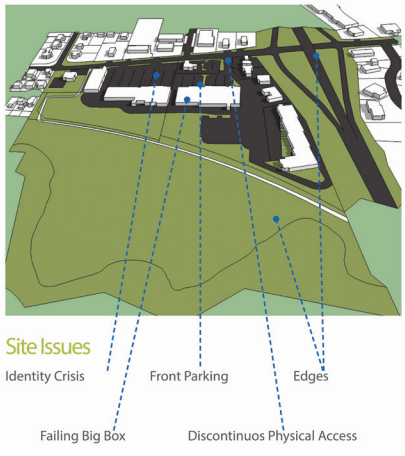


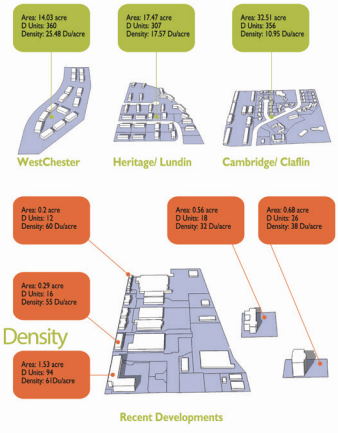
http://www.halvorsondesign.com/slide-show/civic/University_Park_at_MIT/3.jpg

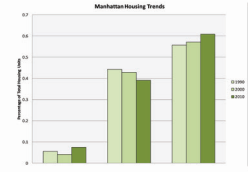
# LIVE, WORK & PLAY @VILLAGE PLAZA

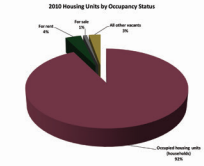
Jose Abraha

APPENDIX 5: PRELIMINARY DESIGN SCHEME FOR START-UP VILLAGE (ABRAHAM, BENNET, ZUNDEL, 2013)



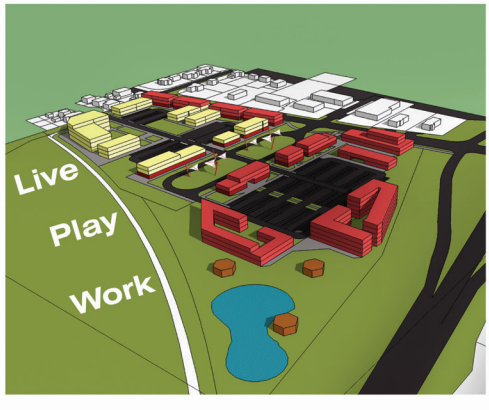



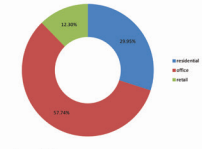

## Economics

Manhattan experienced a 14% net job gain from 2002 to 2012. The city currently ranks 3rd in the state for job growth. Additionally, Manhattan ranks 17th nationally for economic job growth in 2012 for small MSAs (www.areadevelopment.com). Trends show continuing declines in the proportion of husband-wife families, households with individuals under 18, and households with individuals over 65 since 1990. Proportion of vacant housing units grew to 7.5% in 2010 from 4.2% in 2000, and that of renter-occupied housing increased from 57.1% to 60.8% of all occupied housing units. Current housing demand in the area is increasing by about 386 units per year. Rental housing in greatest demand is 2- and 3-bedroom units with a monthly rent of $625 and above (723 units). These are closely followed by 1-bedroom units with same rent (300). Greatest demand for owner units are 2- and 3-bedroom units with a purchase cost of $186,000+ (540 units, or 52.6% total owner units demand). Great demand also exists for owner units at $85,000 and below (145 total units for 2- and 3-bedroom units).

# Schematic Design








Land Use

250 Residential Units

163,763 Gallons of Water Retained

# RESEARCH OVERVIEW

"High Densities are a matter of design and performance."
"Urban Developments are dynamic interplay between morphology and society within an economic framework over time."

Morphologically Driven
Socially Driven
Economically Driven

## PRINCIPLES

1) SITE-CONTEXT RELATIONSHIP
- Strategic site selection
- Establish physical connectivity
- Maximize visual linkages

2) SITE PERMEABILITY
- Create a permeable street- block system

3) DEMOGRAPHIC DIVERSITY
- Variety of multi-family housing choices
- Optimal dwelling unit sizes
- Adaptive-reuse of existing buildings

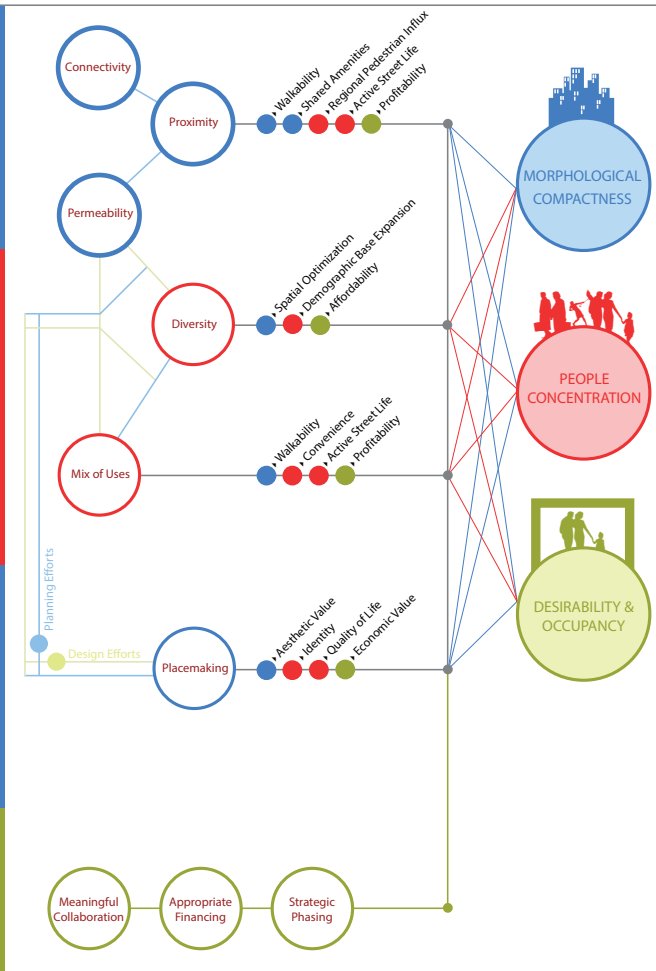
4) MIX OF USES
- Mix of primary and secondary uses
- Strategic spatial allocation of uses

5) SENSE OF PLACE
- Context responsive building typologies
- Interactive public-private interface
- Heirarchy of open spaces
- Parking optimization and design

6) EFFICIENT IMPLEMENTATION
- Establishing efficient collaborations
- Choosing appropriate financing options
- Strategic phasing plan

Morphologically Relevant
Socially Relevant
Economically Relevant

## DENSITY PERFORMANCE

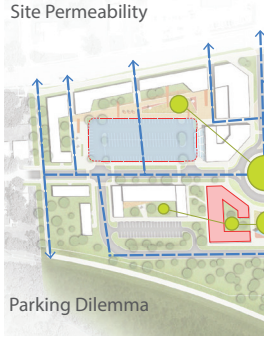


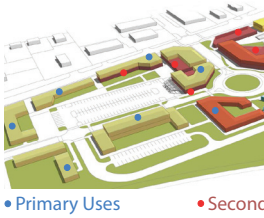

# HIGH DEN

## SITE-CONTEXT RE


## SITE PERMEABILI

## MIX OF USES



• Primary Uses • Second

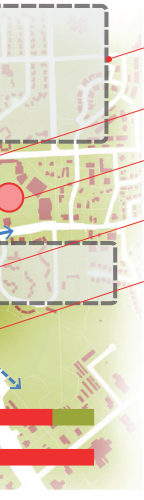
# DENSITY DYNAMICS

MORPHOLOICAL, SOCIAL, AND ECONOMIC STRATEGIES FOR SUCCES

APPENDIX 6: VILLAGE PLAZA SITE ANALYSIS BASED ON LITERATURE REVIEW FINDINGS (BY AUTHOR, 2013)

# SITY DEVELOPMENT AT VILLAGE PLAZA SITE

## LATIONSHIP



Limited Activity centers in close proximity

Weak Pedestrian Linkages

Auto-oriented activity center

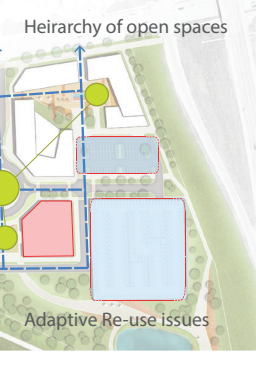
Edge Barrier

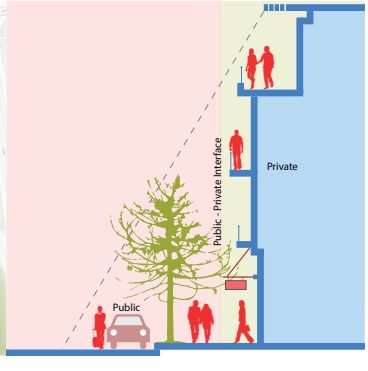
Bike trail Connectivity

Make Transit available

Need for Pedestrian Oriented Activity Centers

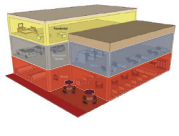
## TY, DIVERSITY, PLACEMAKING AND




Public-Private Interface

dary Uses



PERMEABILITY

DIVERSITY

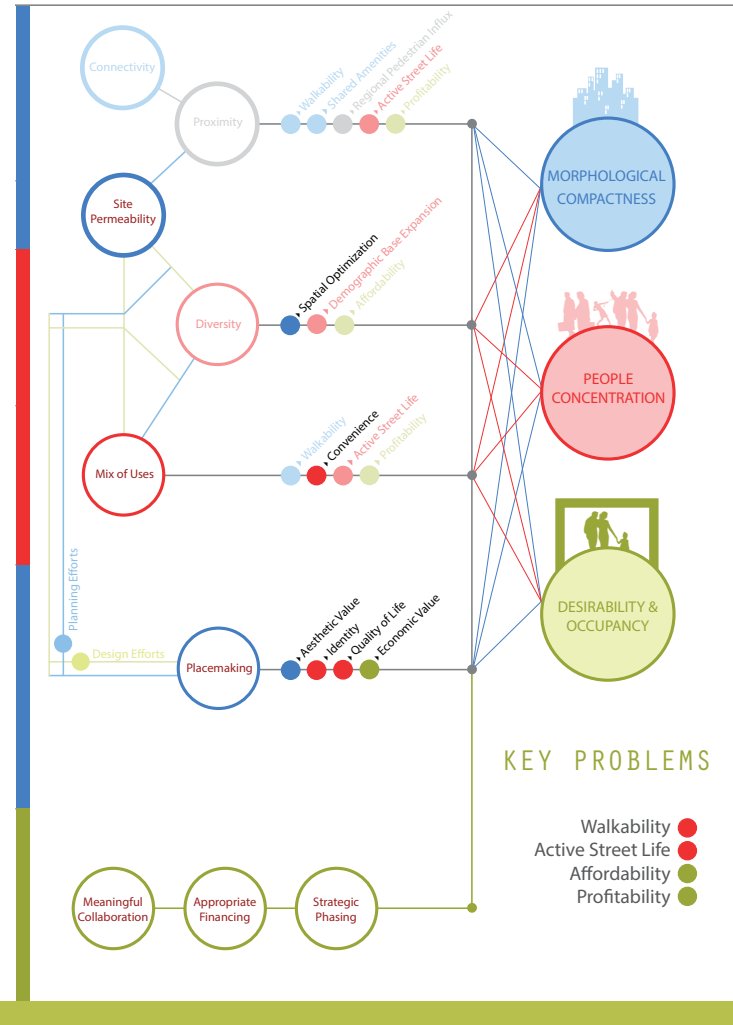
MIX OF USES

PLACEMAKING

The Village Plaza site offers several challenges in terms of high-density development, thereby impacting density peformance.

Morphologically Relevant
Socially Relevant
Economically Relevant

## DENSITY PERFORMANCE AT VILLAGE PLAZA




## KEY PROBLEMS

Walkability
Active Street Life
Affordability
Profitability

## SFUL HIGH DENSITY DEVELOPMENTS

# DENSITY DYNAMICS

Morphologically Driven · Socially Driven · Economically Driven

## PRINCIPLES

Planning Intensive · Design Intensive

## STRATEGIES / TOOLS

### 1) SITE-CONTEXT RELATIONSHIP

Successful high density developments are well integrated with its context and maintain close proximity to activity centers, employment centers, and transit systems.

- **STRATEGIC SITE SELECTION**
  - Select sites with access and proximity to activity centers, employment centers, and transit systems.
- **ESTABLISH PHYSICAL CONNECTIVITY**
  - Extend existing main pedestrian street system into the site.
- **MAXIMIZE VISUAL LINKAGES**
  - Maximize directness of existing pedestrian street system extensions within the site to promote visual permeability.

### 2) SITE PERMEABILITY

Successful high density developments are well-connected and permeable for pedestrian movement.

- **CREATE A PERMEABLE STREET- BLOCK SYSTEM**
  - Design "small blocks" defined by interconnected street system that enhances on-site accessibility and visibility.

### 3) DEMOGRAPHIC DIVERSITY

Successful high density developments maximizes housing opportunities for a wide-range of demographic types, especially Young Professionals, Empty nesters, Students, Single Parents, Young Couples, Senior Citizens.

- **VARIETY OF MULTI-FAMILY HOUSING CHOICES**
  - Maximize a variety of multi-family residential development types such as apartments, condos, studios, and townhomes based on market demand.
- **OPTIMAL DWELLING UNIT SIZES**
  - Achieve optimal dwelling unit sizes required to ensure ocupancy.
- **ADAPTIVE-REUSE OF EXISTING BUILDINGS**
  - Materialize any practicable opportunities for adaptive-reuse of existing buildings.

### 4) MIX OF USES

Successful high density developments support a fine grain mix of uses based on context and market forces.

- **MIX OF PRIMARY AND SECONDARY USES**
  - Achieve a mix of compatible Primary Uses [residential uses, work places, and grocery] and Secondary Uses that rely on primary uses [recreational uses, retail stores, restaurants, etc] based on market forces and context.
- **STRATEGIC SPATIAL ALLOCATION OF USES**
  - Locate primary uses on site areas lacking concentrated pedestrian flow.
  - Locate retail and secondary uses on street level.
  - Allocate upper level spaces for residences and offices.

### 5) SENSE OF PLACE

Successful high density developments offer a sense of place.

- **CONTEXT RESPONSIVE BUILDING TYPOLOGIES**
  - Design Mid-rise buildings to High-rise towers for dense urban settings.
  - Design Low-rise to mid-rise buildings for sub-urban settings.
- **INTERACTIVE PUBLIC-PRIVATE INTERFACE**
  - Design street facing semi-private spaces at upper levels of buildings.
  - Design contextually appropriate and architecturally rich street-facing facades.
- **HEIRARCHY OF OPEN SPACES**
  - Provide access to or design large community level open spaces such as parks and plazas.
  - Design quasi-public open spaces as a part of residential blocks.
- **PARKING OPTIMIZATION AND DESIGN**
  - Plan for shared parking.
  - Design parking based on context to minimized impact on sense of place.

### 6) EFFICIENT IMPLEMENTATION

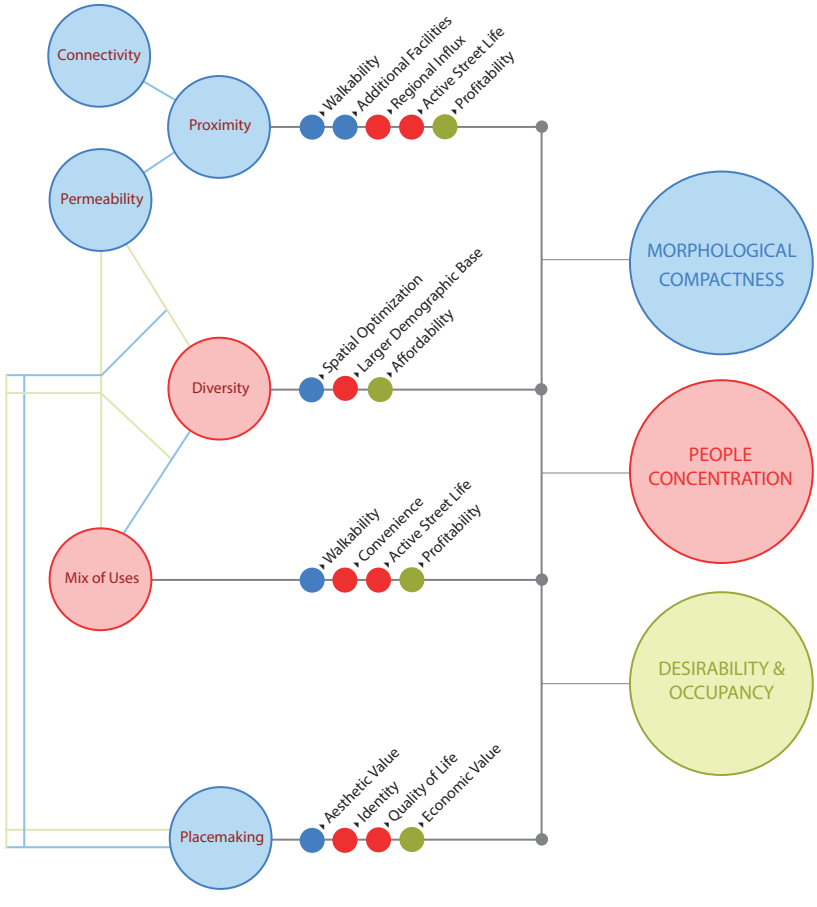
Success of a high density development project heavily depends on the manner in which it is implemented.

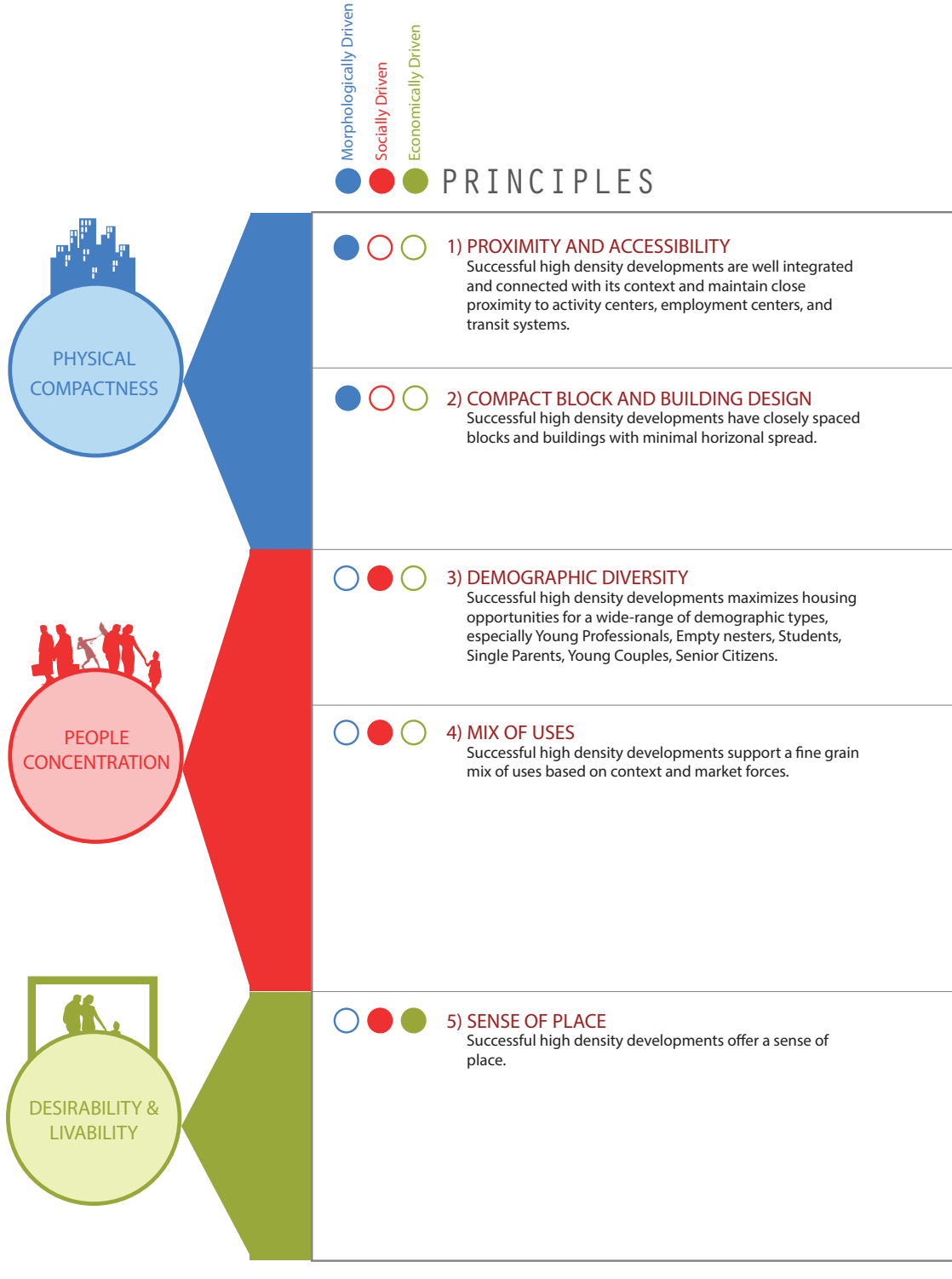
- **ESTABLISHING EFFICIENT COLLABORATIONS**
  - Public-Private partnership.
  - Community Charrettes and Vision workshops.
  - Branding.
- **CHOOSING APPROPRIATE FINANCING OPTIONS**
  - Tax Increment Financing (TIF).
  - Universities and Foundations.
  - Maintain Creativity and Flexibility as a planners and developers.
- **STRATEGIC PHASING PLAN**
  - Develop project-specific and market demand based Phasing plan

APPENDIX 7: PRELIMINARY MAPPING OF LITERATURE REVIEW FINDINGS (BY AUTHOR, 2013)

Morphologically Relevant
Socially Relevant
Economically Relevant

# PERFORMANCE






APPENDIX 8: PRELIMINARY FRAMEWORK OF DENSITY DYNAMICS (BY AUTHOR, 2013)

Planning Intensive
Design Intensive

# GUIDELINES

## STRATEGIC SITE SELECTION
- Select sites with access and proximity to activity centers, employment centers, and transit systems.

## ESTABLISH PHYSICAL AND VISUAL CONNECTIVITY
- Extend existing main pedestrian street system into the site.

## CREATE A COMPACT AND PERMEABLE STREET- BLOCK SYSTEM
- Design blocks defined by interconnected street system and secondary pedestrian connections that enhances on-site walkability and visibility.

## CONTEXT RESPONSIVE BUILDING HEIGHT AND MASSING
- Design Mid-rise buildings to High-rise towers for dense urban settings.
- Design Low-rise to mid-rise buildings for sub-urban settings.

## VARIETY OF MULTI-FAMILY HOUSING CHOICES
- Maximize a variety of multi-family residential development types such as apartments, condos, studios, and townhomes based on market demand.

## OPTIMAL DWELLING UNIT SIZES
- Achieve optimal dwelling unit sizes required to ensure ocupancy.

## ADAPTIVE-REUSE OF EXISTING BUILDINGS
- Materialize any practicable opportunities for adaptive-reuse of existing buildings.

## MIX OF PRIMARY AND SECONDARY USES
- Achieve a mix of compatible Primary Uses [residential uses, work places, and grocery] and Secondary Uses that rely on primary uses [recreational uses, retail stores, restaurants, etc] based on market forces and context.

## STRATEGIC SPATIAL ALLOCATION OF USES
- Locate primary uses on site areas lacking concentrated pedestrian flow.
- Locate retail and secondary uses on street level.
- Allocate upper level spaces for residences and offices.

## INTERACTIVE PUBLIC-PRIVATE INTERFACE
- Design street facing semi-private spaces at upper levels of buildings.
- Design contextually appropriate and architecturally rich street-facing facades.

## HEIRARCHICAL OPEN SPACES
- Provide access to or design large community level open spaces such as parks and plazas.
- Design quasi-public open spaces as a part of residential blocks.

## PARKING OPTIMIZATION AND DESIGN
- Plan for shared parking.
- Design parking based on context to minimize impact on sense of place.

# REFERENCES

# REFERENCES

# REFERENCES


Abraham, J., Bennet, M., Harper, K., Hoetmer, D., & Zundel, B. (2012). UDD. Kansas State University: Department of Landscape Architecture, Regional and Community Planning.

Arndt, Jonathan. (2013) TEAM 0578. University of Missouri, Kansas City: Department of Entrepreneurial Real Estate.

Bentley, I., Alcock, A., Murrain, P., McGlynn, S., & Smith, G. (1985). Responsive Environments: A Manual for Designers. Oxford: Elsevier Ltd.

Campoli, J., & Maclean, A. S. (2007). Visualizing Density. Cambridge, Massachusets: Lincoln Institute of Land Policy.

Carmona, M., Heath, T., Oc, T., & Tiesdell, S. (2003). Public Places Urban Spaces, The Dimensions of Urban Design. Oxford: Elsevier.

Cheng, V. (2010). Understanding Density and High Density. In E. Ng, Designing High-Density cities for social and Environmental Sustainability (pp. 03-17). London: Earthscan.

Churchman, A. (1999). Disentangling the Concept of Density. Journal of Planning Literature, 389-411.

City of Manhattan. (2006, August 07). Document Center: City of Manhattan. Retrieved from www.cityofmanhattan.ks.us: http://www.ci.manhattan.ks.us/DocumentCenter/Home/View/4988

Danielson, K. A., & Lang, R. E. (1998). The Case for Higher-Density Housing: A Key to Smart Growth? In U. L. Staff, ULI on the Future: Smart Growth-Economy, Community, Environment (pp. 01-07). Washington D. C: Urban Land Institute.

Ellis, J. G. (2004). Explaining Residential Density. Places, 16(2), 34-43. Retrieved from The Design

Observer Group.

Fader, S. (2000). Density by Design. Washington D.C.: Urban Land Institute.
Frank, L. D., & Pivo, G. (1994). Impacts of Mixed use and Density on Utilization of Three Modes of Travel: Single-Occupant Vehicle, Transit, and Walking. Transportation Research Record 1466, 44-52.

Harper, Kylie. (2013). UDD. Kansas State University: Department of Landscape Architecture, Regional and Community Planning.

Haughey, R. M. (2005). Higher-Density Development, Myth and Fact. Washington D. C: Urban Land Institute. Retrieved from National Multi Housing Council.

Haughey, R. M. (2008). Getting Density Right: Tools for Creating Vibrant Compact Development. Washington DC: Urban Land Institute.

Heerman, Andrew. (2013). TEAM 0578. Kansas State University: Department of Architecture.

Hinshaw, M. L. (2007). True Urbanism, Living In and Near the Center. Chicago: Planners Press, American Planning Association.

Holtzclaw, J. (2007). Environmental Update. Retrieved April 26, 2013, from Sierra Club: http://www.sierraclub.org/sprawl/articles/characteristics.asp

Jacobs, A. B. (2011). The Good City: Reflections and Imaginations. New York: Routledge.

Jacobs, J. (1961). The Death and Life of Great American Cities:The Failure of Modern Town Planning. London: Peregrine Books.

Johnston, Laurel. (2013). TEAM 0578. Kansas State University: Department of Architecture.

Knudsen, B., Florida, R., Gates, G., & Stlarick, K. (2007, May). IWM ECON. Retrieved July 22, 2013, from http://www.vwl.tuwien.ac.at/hanappi/AgeSo/rp/Knudsen_2007.pdf

Landcom. (2011, May). Publications: Landcom. Retrieved September 12, 2012, from Landcom: http://www.landcom.com.au/downloads/uploaded/Density%20Guide%20Book%20V9LR_0880.pdf

Litster, T. (2011, March 02). City of Ashland, TSP Update. Retrieved December 12, 2012, from City of Ashland: http://ashlandtsp.com/system/datas/114/original/AshlandTSP_HighDensityHousingWP_030211.pdf
Lozano, E. (1990). Community Design and the Culture of Cities:The Crossroad and the Wall. Cambridge; New York: MIT Press.

Nelson, A. C. (2013). Reshaping Metropolitan America, Development Trends and Opportunities to 2030. Washington D.C.: Island Press.

Peponis, J., Allen, D., French, S., Scoppa, M., & Brown, J. (2007). Street Connectivity and Urban Density: Spatial Measures and their Correlation. International Space Sytax Symposium (pp. 004,1-12). Istanbul: Retrieved from http://www.spacesyntaxistanbul.itu.edu.tr/index.html.

Porter, D. R., & Zyscovich, B. (2008). Getting real About Urbanism: Contextual Design for Cities. Washington D.C. : Urban Land Institute.

Schmitz, A. (2000). Multifamily Housing Development Handbook. Washington D.c.: Urban Land Institute.

Schmitz, A., & Scully, J. (2006). Creating Walkable Places: Compact Mixed Use Solutions.

Washington D.C.: Urban Land Institute.

Schwanke, D. (2003). Mixed-use Development Handbook. Washington DC: Urban Land Institute.
Smith, M. S. (2006). Shared Parking. Washington D.C.: Urban Land Institute.

Vicuna, M. (2012). The forms of Residential Density in the Contemporary City. The case of Santiago, Chile. Eighth International Space Syntax Symposium (pp. 1-24). Santiago: Space Syntax Symposia.

Whyte, W. H. (1968). The Last Landscape. New York: Doubleday & Company Inc.

Zundel, Bryan. (2013). TEAM 0578. Kansas State University: Department of Landscape Architecture, Regional and Community Planning.