Grounded Aerial Futures

Humanism + The City in the Aerial Age

By

Joshua Matthew Brooks

Bachelor in Landscape Architecture
Louisiana State University
Baton Rouge, Louisiana

Submitted to the Department of Urban Studies and Planning
in partial fulfillment of the requirements for the degree of

Master in City Planning

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2019

Author_____
Department of Urban Studies and Planning
May 22, 2019

Certified by _____
Professor Eran Ben-Joseph
Department of Urban Studies and Planning
Thesis Supervisor

Accepted by_____
Professor of the Practice, Ceasar McDowell
Co-Chair, MCP Committee
Department of Urban Studies and Planning

Grounded Aerial Futures

Humanism + The City in the Aerial Age

By
Joshua Matthew Brooks

Submitted to the Department of Urban Studies and Planning
on May 22, 2019 in partial fulfillment of the
requirements for the degree of Master in City Planning

ABSTRACT

New technologies directly related, and tangentially linked to airport services and functions will drastically change the airport infrastructure typology including city connectivity, space allocation, environmental circumstances and security. With this change, there will be a need for cities to redefine their relationships with airports and plan new models.

In urban context like Boston, there is an opportunity for the development of a new urban typology, one that includes new forms of aviation services while creating different centers for growth, open spaces, increased regional connectivity, and places for people. Due to its size and proximity, the current legacy urban airports of the 20th century provide an urban asset with tremendous potential for change.

This thesis explores a speculative future for the current Logan Airport site, in the center of the Boston metropolitan region, as a prototype of this new urban typology. The first half of this thesis utilizes research on technology, precedents, current physical, social, and economic issues, and theories of city development as a starting point for how cities might conceive a future for legacy urban airports. The second half of the thesis presents a framework vision for how a new urban typology might unfold. In concert with this vision specific urban design issues related to humanism, ecological resiliency, and city connectivity are explored through a series of design objectives. Additionally, a discussion and suggestions of implementation policies frame the project within its larger social and urban construct. Finally, this particular vision is presented as a prototype for other cities and legacy urban airport sites of similar condition.

Thesis Supervisor: Eran Ben-Joseph
Title: Department Head, Department of Urban Studies and Planning

Grounded Aerial Futures

Humanism + The City in the Aerial Age

A Masters in City Planning Thesis for the
Department of Urban Studies and Planning at
the Massachusetts Institute of Technology

Spring 2019

Joshua Brooks


PERCHED, OVERLOOKING THE ATLANTIC OCEAN, BOSTON'S LOGAN AIRPORT IS ROUGHLY 1,800 ACRES OF LAND THAT SITS LESS THAN TWO MILES FROM CITY HALL IN DOWNTOWN...
WHAT IS THE FUTURE OF THIS SITE?

Executive Summary

The research presented within this thesis is centered around an understanding of the Logan Airport site in central Boston as a “Legacy Urban Airport” typology. What is explored throughout this work is how this typology relates to the larger development trends in airports and aviation mobility, how technology might change the way certain aspects of this industry function, and how this unique typology might allow for a new model for how these sites function in relation to their host cities. At the end of this work a series of prototype ideas for how to think about the redesign and redevelopment of these sites are presented along with a conceptual vision for how the Logan Airport site could look given these changes.

This inquiry started based on a curiosity of the future condition of the Logan site in particular. As a massive piece of land, over 2.5 square miles, this site holds a central place in the larger urban fabric of Boston. Focusing initially on the question of infrastructural and industrial adaptation the original research question centered on whether Logan should exist as an airport site or if it should see new life with other urban uses.

The research question quickly evolved into trying to understand Logan’s particular relationship with the city and how it fit into the larger trends in the aviation industry and the subsequent ‘aerotropolis’ development model that many cities around the world are utilizing to position themselves in an ever-globalizing society. That line of questioning positioned Logan as a typology that didn’t quite fit into the conversations that were happening related to the planning and design of airports and their relationship with cities. This new typology resulted in the need to think about technological advancements directly and tangentially related to airport services and infrastructure. The rational was that if future technologies change the way that airports and the aviation industry function than perhaps this typology that Logan represented might play a critical role in seeing these new forms and operations. Before embarking on this exploration research was conducted to ensure that this new typology that was being developed was not just a one off condition, but that Logan was a prototypical condition of many other places. Once this fact was established the work shifted to exploring how a design and planning exercise for Logan, given the various impacts of economics and technology, could offer a model for how other sites with similar conditions could be transformed. The goal was to bring design thinking to the conversation around urban air mobility nodes which has been largely dominated by technologist.

Through this process this thesis utilized a humanistic perspective to ensure that not only were the needs of technologies being met but the foundations of successful urban habitats were also considered.

Research + Design Process

This thesis research followed a process that allowed for each subsequent set of inquiries to build upon one another and while this process was generally linear the chapters of the thesis do not follow that exact order. To further clarify the overall process of this work the below description and diagram on the following page demonstrate the linear process that was used to achieve the outcomes presented in this work.

This entire research and design effort started with the site. The question started as what could a better use for this site be? This question is shallow. After all, the aviation industry that currently uses this site is an expanding industry and the proximity to the city center makes Logan are very convenient experience. The question then became, 'what would make this site change?' To answer that question the research effort started by understanding the current conceptual thinking on airport development around the world and the resulting economies that follow or predate. This research line framed this inquiry in a much broader conversation around the globalization of our society and the growing importance of the aviation industry in that change. That inquiry then led to characterizing Logan within this larger trend as a "legacy urban airport" typology, which sought to group Logan with other like places so that further questions around its change had larger implications than just one particular site.

The next step built on the question of what would make the physical and operational components of Logan change. This led to asking questions about the advancements in technology for the various spatial realms of an airport. A significant amount of effort was spent characterizing and understanding the future advancements of technologies covering the full operational aspects of airports, as well as advancements in new forms of transportation that would impact current operational models. Within this analysis a particular focused was placed on thinking about how the "legacy urban airport" typology might benefit from these advancements. This research was focused on understanding changes to the physical form and operational and experiential aspects of the airport with particular attention paid to the relationship between the surrounding urban fabric and less on the complex operations of vehicles and people within airport sites. This analysis concluded by describing a split in the aviation industry represented by a dichotomy between regional aerial transportation, which will become more nimble and less obtrusive, and long-haul national and global travel which will become an even larger operation.

Research + Design Process

The Site
A general interest in Logan Airport Site as a potential site within the City of Boston for large scale urban change? Questions about why it would change and what it might look like?

Framing
What is the conceptual understanding of the role of airports in the larger city fabric? How are these places thought about as economic engines? What are the forms they take, specifically their interaction with the city? How is Logan similar or different in these context? Growth as an underlying aviation trend.

The Typology
Logan seen as a quintessential representation of the "Legacy Urban Airport Typology". What are the forces as play in shaping the future of these places? Technology; Macroeconomics, Environmental Factors. What is unique about these places and is there an opportunity to capitalize on future changes for the betterment of the city?

The Decision
Long-Haul aviation services should be moved from Logan to another regional airfield and in its place a new model for an urban airport should exist that utilizes new technologies to create opportunities for redevelopment of a large portion of the site for other uses.

Spatial Analysis
What can be learned from looking at Logan from various scales? How does it fit into to larger patterns of transportation? What are the physical and social issues that are present at various scales?

Technology
What are the technologies that are shaping the future of aviation and airports? How might they change the operational, physical, or perceptional model of the current infrastructure? What is unique to "Legacy Urban Airports"? What opportunities are present for re-imagining a better form of urban airport?

Models of the City
How might we conceive large scale urban change given advancements in technology? How have others thought about airports and city form? What are some underlying urban concepts that should be utilized to think of a new urban district of the future?

Past Infrastructure Transformation
How have other cities and site undergone similar scaled transformations of industrial lands and what are some things that can be learned from those places and utilized on this new typology?

Implementation + Externalities
Given such a large scale urban change and a rather futuristic topic how can we utilize common methods of implementation such as governance and finance to ground this in reality? What are larger city policy issues that should be considered?

Design Objectives + Planning Frameworks
What is the model for thinking about the transformation of these places from a planning, design, and development standpoint? What are key issues that every site will need to overcome?

Vision for Logan
Given all of these issues, constraints, concepts, design objectives and planning goals what might a vision for Logan actually look like? How can this give us an understanding of the order of magnitude and design character of the redevelopment of this site, and sites like it?

Above: This diagram demonstrates the linear research and design process undertaken within this thesis starting with the initial interest in the Logan Airport site and ending with a model for how cities should embrace changes in aviation related technologies through the re-imaging of Legacy Urban Airport Sites.

Next, a spatial analysis from multiple scales was conducted to better understand the Logan airport site. This analysis focused on the global economic connections, the regional characteristics, the urban patterns, and the social and environmental issues surrounding the Logan site. This analysis was conducted with an understanding of the Logan site as a unique typology and with an understanding of the changing technological landscape. This analysis was used in the end to construct a spatial argument for moving pieces of the current aviation operations from Logan and seeing this site as an opportunity to embrace new forms of urban air mobility. This set up the rest of the thesis which explored what that change would mean for the Logan site and the larger typology.

Next, literature reviews of model city forms were explored to develop a conceptual underlay for what this new urban typology might look like and how it might function. To further answer that question, past transformations of industrial sites were explored through several brief case studies to develop best practices for thinking of such large scale urban change.

All of this previous research led to the point in which a series of six design objectives were explored as simple ideas. These six themes represented issues that all “legacy urban airport” site would face and offered design ideas for how to think about solutions. The goal was to offer a model for how to consider the future of these sites. These design objectives deal with the changes in technology and the resulting physical and experiential changes to these sites. Additionally, they consider environmental and social aspects of these new places. The overall objective was to establish guiding principles that, on one hand embrace new forms of technology and the changes that it would bring, and on the other hand ensure that a humanistic perspective is utilized to create a balanced and robust urban form.

The next step consisted of outlining a practical implementation schematic that could demonstrate how something like this could unfold. Additionally, it was important to understand what the impacts of these changes would mean to the larger urban context. To explore these concepts a high level conversation around externalities was utilized to discuss policy frameworks that should be considered in tandem with the design ideas presented.

All of this led to a schematic vision for the future of the Logan site which utilized the design objectives that were developed as part of the thesis. This vision demonstrates the full embracing of new forms of aviation technologies and describes a future urban form that capitalizes on a globally connected existence while simultaneously utilizes a human focused development pattern. This vision demonstrates the tremendous development potential of these large urban sites and shows how the design objectives can be utilized to deliver unique outcomes for these future issues. The end goal was to show that the “legacy urban airport’ typology represents a unique opportunity to provide tremendous development potential centered around a new hybrid urban conditions brought on by advancements in technologies.

Acknowledgments

I believe that cities are part of our natural landscape. Just as the Grand Canyon, the Amazon River Basin, and the Sahara Desert are part of this world, so are cities. They are another type of habitat; human habitat. When we think of cities as part of their environment instead of in competition, opportunity unfolds. Urbanization and globalization are but another evolution in the long arc of history. It is role of the planner and designer to work tirelessly to ensure that our collective habitat is best suited to serve this generation and lay the groundwork for the next generation.

I stumbled into this thesis in a search for a project where I could explore large scale human-centered city building. What I began to realize is that these concepts cannot be explored in isolation; rather they must be explored as part of larger societal and technological change. What if we thought about how technology changes, how infrastructure changes, and how society changes to provide a proactive framework for how an area of the city continuously evolves? The aviation industry is the physical manifestation of our modern global society. What better site exist than an urban airport to explore the inter-relation between technology, transportation, urbanism and humanism.

I want to thank my teachers and mentors at Louisiana State University, specifically Bruce Sharky, Van Cox, Lake Douglas, and Brad Cantrell, for expanding my notion of Landscape Architecture and setting me on the course of urban exploration. I want to that my past colleagues at Design Workshop and Spackman Mossop Michaels, for whom I grew with and came to appreciate the power of planning and design, especially Kurt Culbertson and Robb Berg.

I want to thank the professors at MIT who continuously challenge the normative ideas of urbanism, especially Anne Spirn, Marie Law Adams and Mary Anne Ocampo. Also to my thesis advisor Eran Ben-Joseph for calling me out when the easy route seemed more compelling. And to my classmates at DUSP who's intellect and candor could humble anyone.

To my family, my brother and sister, and especially my parents. I would not be the person that I am without the constant support of my parents who instilled in me a passion for life and nurtured that passion to my unique interest. Your *Lego Boy* has done it!

Finally, to my wife Anna. None of this would be possible without her tremendous sacrifice of moving across the country for me, and never allowing me to settle even when it was not in her best interest, and for supporting me through this time. I love you and I look forward to our future has partners in life.

Table of Contents

Introduction

This chapter introduces the structure and purpose of the thesis project as well as framing what the thesis is responding to from a theoretical and pragmatic standpoint. Each of the four main research topics are introduced and framed in their relationship to the Logan Airport site. Then a brief overview of how the design response is structured is laid out.

Thesis Purpose

What does the future of the aviation industry look like? How do new technologies landside -- such as autonomous vehicles, within the terminal -- such as facial recognition, and airside -- such as vertical take-off aircraft change the entire experience of air travel and the associated airport infrastructure built out around the world during the 20th Century? Finally, and most important to this inquiry, does this future scenario completely change the relationship between an airport and its urban context, if so how?

Utilizing Boston's Logan International Airport as case study, this project explores the long-term changes that are possible as new technologies unfold and open up opportunities to redefine the role that airports play in an urban setting. Through a speculative design exercise, ideas around site redevelopment, greater ecological services, increased connectivity, and social and economic impacts are explored. With a particular focus on the "cityside" of airports, the work provides a framework for the reallocation of space and the subsequent integration of airports into their context.

The research centers around Logan as a prototype of the "Legacy Urban Airport", a unique infrastructural typology that varies from the traditional notion of airport sites. The legacy urban airport is one usually built in the early to mid-20th Century that is now constrained by land and water. These sites are usually built on land that was previously filled in from oceans, estuaries, or wetlands or built on land that was previously hinterlands that has now been subsumed into the urban fabric. These places are on average five-times closer to the city center than newer airports and typically one-half to one-quarter the size of their more contemporary counterpoints. For the purpose of this thesis, their definition should be thought of as airports that are in close proximity to the city center, with limited or no room to expand, and constantly struggling to manage social and environmental issues that arise due to their geographies.

While there has been much discourse by authors such as Kasandra on the idea of new Aerotropolis growing out of hinterlands around the globe, there has been less planning and design conversation around legacy airports that remain in close proximity to city centers and even less on the impacts of new forms of urban air mobility. This is in-part due to the constrained nature of these sites like Logan, which has existing urban fabric and water on all sides, limiting its ability to grow and for airport related land uses to develop nearby. Additionally, there has been a gap over the last thirty years in the United States on airport infrastructure spending, with Denver's International Airport (1995) being the last major airport built in the country. This particular project relocated the Denver Airport onto a 28,000-acre parcel over 18 miles from the city center.

Finally, on a global scale most of the new airports that have been constructed, largely in Asia, Africa, and the Middle East, have been built in the hinterlands following Kasandra's Aerotropolis model. These trends have dominated contemporary discourse and largely left out urban design and planning in the conversation around the management and planning of legacy urban airports. While the design of an airport has always been a centerfold of the architecture profession, in recent years there has been a resurgence of interest in the airport site by the urban design and planning profession. This is due to increased globalization and the importance of air travel in our globalized transportation network. However, much of this new thinking has been largely reactionary, responding to market pressures for development near airport sites.

This thesis takes a futurist perspective, understanding that there will be changes to the airline industry and airports based on technology that is not currently to market. With this in mind, there is a unique space to venture what might be the opportunities that arise as currently speculative technologies and industries become the norm. While this thesis is not a direct critique of the current Aerotropolis model, it is an attempt to add a uniquely humanistic lens to the conversation. This new perspective may offer a new model of airport that serves two masters; human and market. Under this framework the hypothesis becomes:

New technologies directly related, and tangentially connected to airport services and functions will drastically change the current airport infrastructure typology including city connectivity, space allocation, and security. With this change, there will be a need for cities to redefine their relationships with airports.

Particularly in urban context like Boston, there is an opportunity for the development of a new hybrid urban typology, one that includes new forms of aviation services while creating new centers for growth, greater open space, increased regional connectivity, and places for people. Due to its size and proximity, the current legacy urban airports of the 20th century demonstrate an urban asset with tremendous potential for change.

Project Importance

So why is this important? Almost all large cities in the world have a major airport site. Some, like Boston, San Diego, New York or Washington D.C, maintain large airfields consisting of thousands of acres directly adjacent to or extremely close to existing urban fabric. Others, like Denver or many growing cities in China, Africa and the Middle East, are imagining entire new urban nodes outside of the city centers. In the next century these places and projects could be obsolete or more likely inefficient; changed drastically by advancements in the industry that they are built to serve. While much thought has been put into the planning and design of places like Songdo next to Incheon Airport in South Korea, which represents the model Aerotropolis, little thought has been put into understanding the long term future of places like Logan Airport in Boston.

It has been a little over 100 years since scheduled air service began. In that time, it has transformed the world by reducing transportation cost and time and bringing people closer to absolutely everything. As of a few years ago, nearly 8 million people flew every day and over 3 billion flew a year. In an increasingly global society and economy, upward trends can only be expected. Additionally, aviation infrastructure is expensive and therefore requires long-range planning and thoughtful analysis about its roll well into the future.

New technology, however, has the possibilities to drastically change air travel and its associated infrastructure. Companies are experimenting with electric planes that could reduce noise and pollution. Advancements in vertical take-off and landing or short take-off and landing could drastically reduce the amount of space that airports need or create entire new regional air travel markets – currently over 70% of Logan's roughly 1,800 acres is devoted to run-ways and taxi. Autonomous vehicles could render the thousands of parking spaces that airports maintain useless. Facial recognition, which Logan has been experimenting with, is changing the relationship that security checkpoints and secure areas will have with the outside world. These technologies, and more, present an opportunity to imagine an urban typology that is very different than today's airport. Even more, these changes provide cities an opportunity to reimagine this homogeneous land use into an integrated part of the existing city fabric. There will become increasing opportunities for more socially, financially, and ecologically responsible uses of this land.

The question then becomes, how does urban design respond? This project explores ideas for how a city can grow and morph around this new changed world and how opportunities can be capitalized on to provide new urban districts that become part of the daily function of the city. This project can serve as a useful thought exercise as the technological impacts unfold and cities across the world face similar scenarios.

With this in mind; this work is important for two primary reasons. The first is that it explores an opportunity for the City of Boston to capitalize on an amazing asset and think strategically about the long-term vision of such a large footprint within its city boundary. For a city as land constrained as Boston this represents an opening to create new housing, commercial, and manufacturing space on a scale not previously available as well as integrating resilient and sustainable ecosystem services. The second aspect of significance is that Logan's issues and conditions are not alone. This design and planning exercise uncovers model responses to many issues that other cities with legacy urban airport sites can utilize.

How can urban design be proactive versus reactive? This thesis explores this concept by planning for change that has not yet happened. A fundamental assumption is the role of technology in shaping opportunities in the urban environment. While this project does not explore the details associated with specific technologies, it does seek to understand the impacts that each will have on urban form and function and the opportunities that arise from their acceptance. This thesis is not a wholesale repurposing of the Logan airport site based on a future condition but rather a process oriented design exercise that imagines urban change in concert with changes in technology. Though certain assumptions are made about political viability of system wide issues this thesis is designed to primarily explore the district scale master plan and urban redevelopment scales. Through this work, concepts of human scaled urbanism and ecological urbanism in the context of the new urban typology are of particular focus. That is the fundamental difference between the market driven Aerotropolis response and the conclusions of this thesis.

Thesis Structure

This thesis organized into nine chapters and an introduction. Chapters one through four layout the issues and conceptual framework in which this project is built on. The result is a conclusion, chapter five, which offers a series of design principles that the remainder of the work is built upon. Chapters six through eight offer a site specific urban design and planning vision for the long term future of the Logan Airport site. Through drawings and text the urban organization and performance is described. Chapter nine concludes the work by offering thoughts on how this work is applicable to others cities that have similar urban airport sites. On the next page is a brief description of each chapter.

Chapter 1: Economic Trends + Models of The City
This section frames the role of airports in the context of contemporary and historical planning ideologies as well as introducing local social and economic factors and larger macroeconomic trends that frame the importance of the topic of urban airports. An analytical literature review places sources into categories based on planning theories and economic and social themes. Then a brief descriptive review is utilized to discuss local and macro-economic factors.

Chapter 2: Impacts of Technology
This section explores the impacts of various technologies on the aviation industry and more specifically on airport sites as well as the time-line for how such changes might unfold. The study focuses on technologies that will have the biggest impact on urban airports such as Logan with a specific purpose of defining a new relationship between urban surroundings. The analysis is structured to uncover how space, time, comfort, and capitol will be impacted and the opportunities that arise with the onset of these technologies. Additionally, a brief description of what will not change within air travel is discussed and how that, in fact, has huge implications for what cities should be considering for their airport infrastructural assets.

Chapter 3: Six Scales of Spatial Inquiry
This section utilizes six scales of thinking – Global, Macro-Region, Direct Region, Metropolis, Urban Home, and The Site – to uncover issues and opportunities related to the physical, economic, and social context of Logan Airport specifically. Each scale utilizes a synthesized map and a brief description to discuss various topics that arise at each scale.

Chapter 4: Lessons from Precedents
This section places Logan in context to other large airports within the United States and other major airport development projects around the globe. Additionally, a historical understanding of how cities have dealt with changing infrastructural demands on large central sites is presented. This qualitative and quantitative analysis provides a framework for how Logan should be understood in its physical, economic, and typological context.

Chapter 5: Point of Departure
This section synthesizes the research conducted in chapters one through four into a series of planning and design objectives that underpin the remaining proposal. While each design objective is derived from a specific understanding of how issues relate to the Logan Airport site, they are framed in the context of how they might apply to the urban airport as a typology found throughout the world.

Chapter 7: Pulling it All Apart
This section describes the larger physical, environmental, transportation, and land use frameworks that organize the design and development response to the opportunities and constraints of the site. This section focuses on describing how the new urban typology is constructed utilizing diagrams and narrative text that describe a series of six design objectives.

Chapter 6: Long-Term Vision
This chapter demonstrates an illustrative vision for the future of the Logan Airport site utilizing the design objectives and planning frameworks. These drawings are schematic and focus on a order-of-magnitude understanding of the qualitative and quantitative aspects of this new urban typology.

Chapter 8: Governance + Externalities
This section discusses the positive and negative externalities that design and development might present to the city of Boston and how these might be mitigated or capitalized. The section discusses these aspects in a broad sense, and while it offers a spectrum of possible solutions it does not seek to resolve every benefit or impact that could result from the proposal. Rather, it acknowledges the role of a proposal such as this in the larger urban context.

Chapter 9: The Broader Field of View
This section presents an argument for how the design and development decisions represented in the context of Logan Airport can be translated to other cities and other urban airport sites that are and will grapple with the same issues and how this thesis creates a proactive vision for a future urban typology.

This thesis explores a speculative future for the current Logan Airport site, almost 2,000 acres in the Center of the Boston metropolitan region as a prototype of this new urban typology. The first half of this thesis utilizes research on technology, precedent places, current physical, social, and economic issues, and theories of city development as starting point for how cities might conceive a new future for legacy urban airports. The second half of the thesis presents a framework vision for how a new urban typology might unfold. In concert with this vision specific urban design issues related to humanism, ecological resiliency, and city connectivity are explored through a series of design objectives. Additionally, a discussion of implementation policy frames a project of this magnitude within its larger social and urban construct. Finally, this particular vision is presented as a prototype for other cities and legacy urban airport sites of similar condition.

This is in Response to...

The iconic futuristic TV show *The Jetsons* first aired in 1962 and told the story of your average family going about their daily lives flying from place to place in their personal flying car. Ten years later there was just under 500 Million commercial air travelers world wide. Forty years later that number is over three billion and is only expected to rise as more individuals world wide move out of poverty and become part of the ever increasing globalized world. While we certainly don't live in a Jetsons world, to say that air travel and the associated infrastructure is part of the daily function of cities would be an understatement. In the book *Aerotopolis*, Greg Lindsay and John Kasarda argue that the 21st Century will be defined by air travel and that cities who are eager to compete in the global economy must fully embrace the sky life. *If this trend is accurate, do we embrace a ubiquitous urbanity and repeat a model across the globe or do we focus on developing unique urban relationships between a city and its skies?*

Every major city in the world has an Airport. They come in all shapes and sizes, and in some regions of the world like Asia, they are being built at an amazing pace. Contrary to that, the United States has only built one major airport, Denver's International Airport, in the last 30 years. This begs the question of how airports, and airlines, are capturing the growing demand for air travel. While efficiencies have been created, the real answer is that many airports are running at capacity. This may be in-part due to the fact that the operational model of commercial aviation hasn't changed all that much since the invention of the jet engine over half a century ago. However, there are many exciting technological advancements that may play out of the coming decades that could revolutionize our interactions with the sky. The United States' lack of major investment in new

"The traveler in his airplane, arriving from Constantinople... suddenly see appearing through the wavering lines of river... that clear imprint which makers a city which has grown in accordance with the spirit of man: the mark of the human brain at work." - Le Corbusier

physical aviation infrastructures is a strong conceptual underpinning of this inquiry. *How might these potentially disruptive technologies impact the most physical of aviation infrastructures: the airport?*

Enter, Logan Airport. Built in 1923, with its first commercial flight taking off in 1927, it represents a nearly perfect prototype of the legacy urban airport. At only two miles from City Hall, this site must contest with noise complaints, growth constraints, climate change, tangled webs of infrastructure, and more, while offering a perfect test facility for the revolutions in aviation. However, should we be asking why such a challenged facility exist in such a location when, over the course of the 20th century, many cities in the U.S. had pushed their airports to edges of urbanity? This trend is now being reproduced world wide. Or, should we see this as an opportunity to finally play out Le Corbusier's vision for *The City of to-morrow* with its center city aerodrome?

Some have speculated that Boston's airport should be moved offering room for this city to grow. While politics would likely be the biggest hurdle for such an inquiry, it is important to think about this question in the context of the needs of the modern city, the role this space serves in the larger regional system, and the possibilities

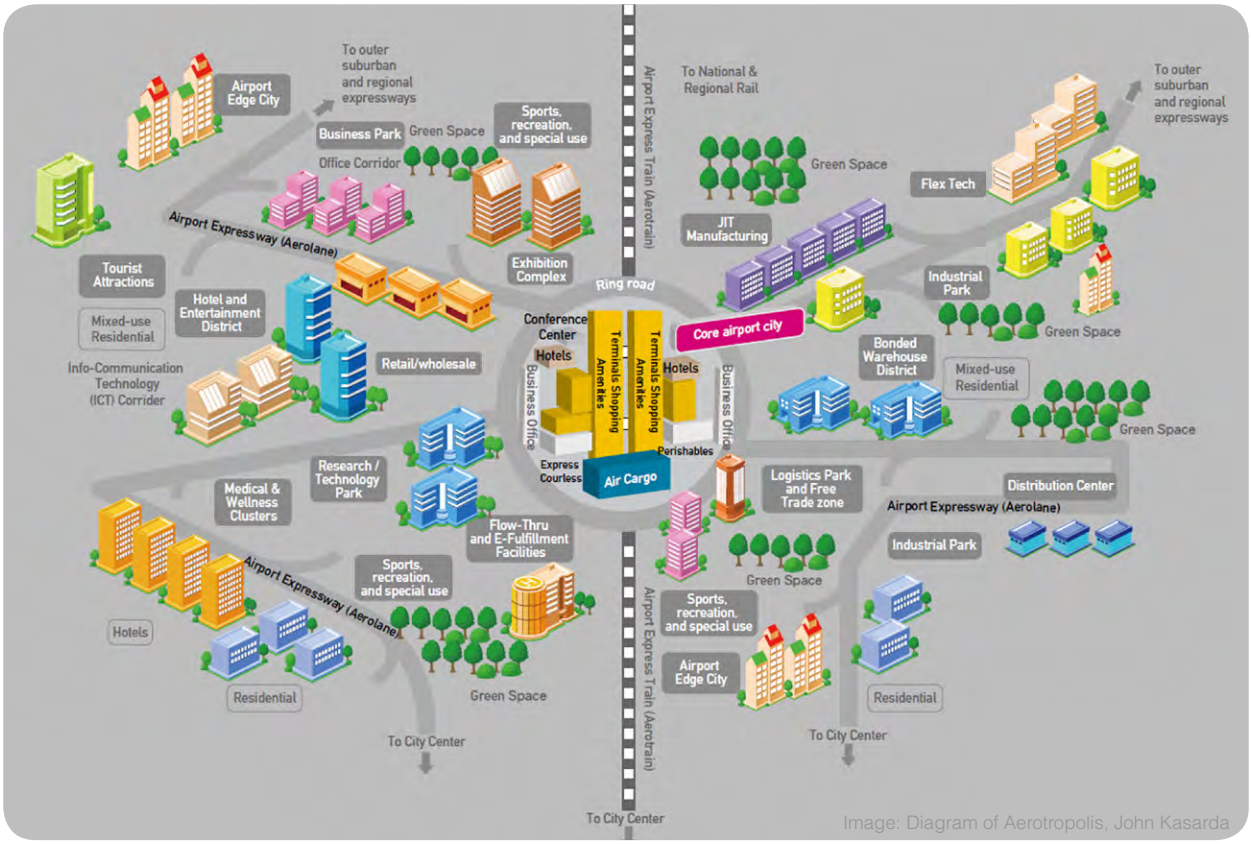
Image: Logan on the footsteps of the city. Source: Boston Globe

that such a move might afford. *How does Logan airport fit into its larger urban, regional, and global context? And what can be learned from understanding these spatial conditions?*

Finally, much can be learned from looking at other places. Precedents play an important part in understanding the contentious evolution of our built environments. Historical examples of how past infrastructures have transformed, such as the port-lands of the late 19th and early 20th centuries demonstrate that what seems to be a fixed condition of a city can always have new life. Additionally, understanding how other places are reacting to economic trends and societal shifts such as globalization offer a glimpse into possible futures for airports and their role in the city. Just as important to such critical questions of urban development are understanding the baseline conditions and how a given site and given circumstances relate to what other places are up against. *What can be learned from looking at the past, present, and future of places that have dealt or are dealing with similar or related conditions and issues?*

The following work is a speculative exercise in planning and design. It is intentionally futuristic in its exploration but utilizes a humanistic lens when examining questions ranging in scale from global economic trends to detailed site responses. While not every possible scenario can be understood, we can hypothesize on our future world and make recommendations for how we should respond to changes in the future.

In summary this thesis explores, through the site specific lens of Logan Airport, the opportunities and challenges presented by **(1) Macroeconomic Trends + Models of the City; (2) Impacts of Technology; (3) Six Scales of Spatial Inquiry; and (4) Lessons from Precedents.** Each of these four topics is described in further detail on the following pages. Through these topics we ask the question, what could be the future of Boston's Logan Airport? Then, using that answer we embark on a design exercise to think about what that might look like, and how it can function.



Economic Trends + Models of Cities

This section explores topics related to globalization and the role that airports play. We consider the increase in world wide urbanization and economic agglomeration as well as current patterns in global transportation. There has been substantial investigation into current trends being experienced by cities and how those places are positioning themselves to best serve this global society. Additionally, theoretical models of city design ranging from The Human City to The Mechanical City are analyzed to construct an ideal condition for the 21st Century Logan site. We consider that now, and in the future, cities need both “velocity and density” and that our ideal model must be both “locally dense and globally connected”. We ask the question of what that might look like and what the role of the airport in creating that ideal condition might be. We also analyze several critiques of what could be considered the “Aerotropolis Model”, a market driven urban development pattern fueling many large projects around the world, and discuss how those feed into the thinking about the future of the Logan Airport site.

An increase in global connectedness fuels the reliance on air travel. This supply of ever increasing convenience induces greater demand thus creating a cycle that underpins our global society. How does this influence local forms of urbanism that support this way of life?

Impacts of Technology

This section identifies and categorizes potential technologies that will likely impact the physical and psychological construct of airports and their surrounding urban context. These technologies are organized as land-side, terminal and air-side, and range from autonomous technologies and machines to new forms of vehicles and economies. We think about the impact of these technologies in terms of space, time, comfort, and capitol. Additionally, we explore the projected time-line of these technologies based on academic research and interviews with industry experts to identify how they will impact the evolution of the Boston Logan Airport site. Finally, we discuss who these technologies might impact and why. While it is impossible to predict all future advancements in technologies, this project seeks to create proactive responses for those that we know are likely to come.

How does the future evolution of technologies connected to air travel and airport infrastructure provide opportunities to explore new urban forms?

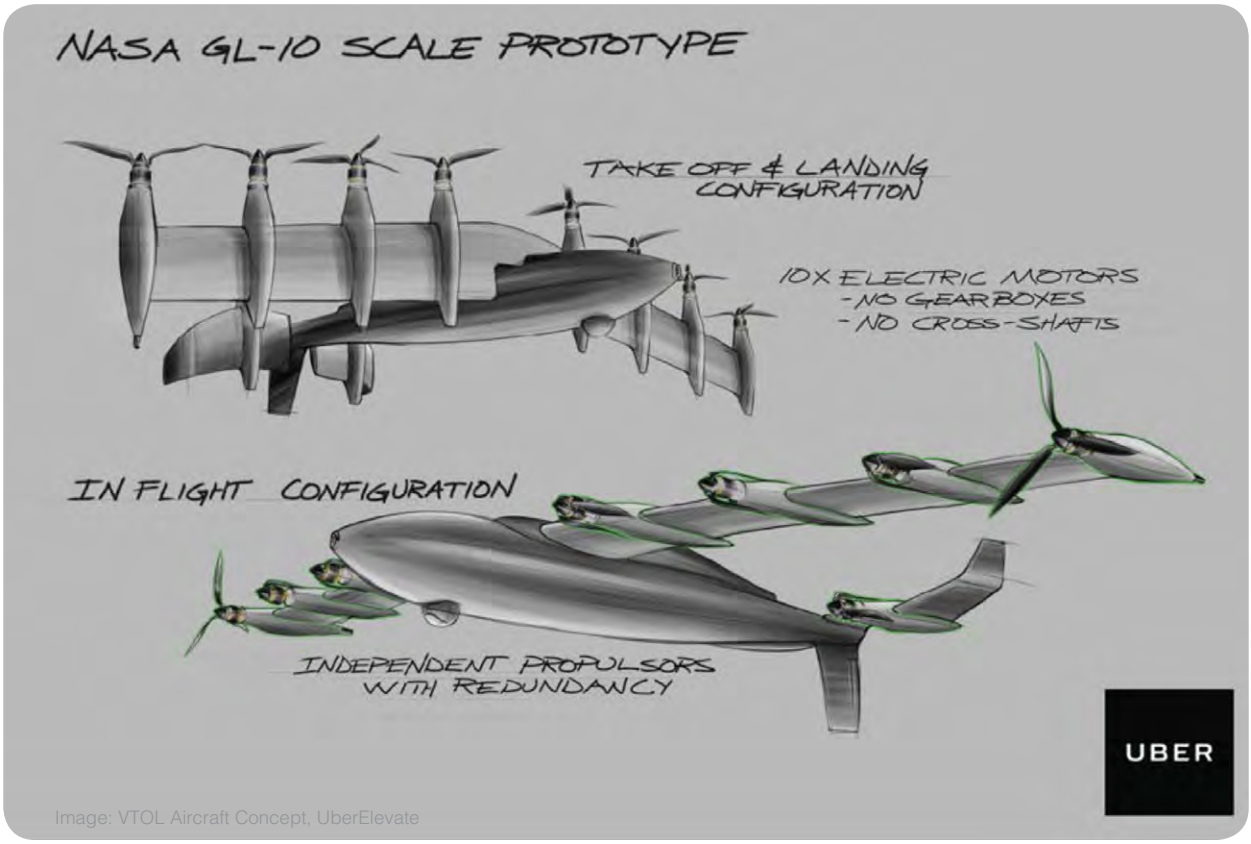


Image: VTOL Aircraft Concept, UberElevate

Six Scales of Spatial Inquiry

These section explores the spatial context and make-up of the Logan Airport site from six scales: (1) Global, (2) Macro-Region, (3) Direct Region, (4) Metropolitan Area, (5) Urban Home, and (6) Site. These six scales seek to explain the existing conditions and issues associated with the site and its relationship to its physical and economic connections. Thinking through this range of scales allows us to consider both the role this site plays in the larger urban flows of people, capital, and goods as well as understanding the specific physical issue associated with possible interventions that are suggested as part of this proposal. In this section we examine social, infrastructural, environmental, transportation, and economic systems and how they impact the way the site could perform in the future. While limited time is spent discussing the historical development of the area it is briefly accounted for within this section. Ultimately, this section seeks to guide the physical development of the design portion of this project.

What issues and opportunities arise as one examines the spatial context of the Logan Airport site from various scales? How does design and planning respond at multiple scales?

Lessons from Precedents

This section explores precedent projects and cities from three different perspectives. The first perspective is an exploration in how Boston and Logan Airport compare to other cities in the U.S. The second perspective identifies and analyzes several major projects in two different categories: new airport/Areotropolis development and existing airport relocation/ redevelopment. The third and final perspective analyzes other types of industrial re-purposing or repositioning projects that have happened in other cities around the world. While not directly related these projects offer a glimpse into major urban developments that have been spurred by changes in technologies and economies. Together, these three precedent perspectives offer valuable lessons on how cities change and adapt over time, how Logan airport fits into larger trends of airport development, and how the relationship between Boston and its airport compare to other cities.

What can we learn from an examination of past transformations of urban infrastructure? How does Logan Airport relate to other major airports in the United states and how does that condition relate to the trends in the air service industry?

Image: VTOL Aircraft Concept, Uber Elevate

Design + Planning Response

After an examination of the economic and social trends, physical context, technological change, and precedent cities this thesis proposes a major change to the Logan Airport site. This change is built on three overarching planning frameworks and six design objectives. Together these nine elements guide the detailed site design and implementation plan for the Logan Airport site as well as larger systemic and governmental change that would be needed.

The first planning framework is the **Institution of a Multi-Airport System**. This framework idea is born out of technological changes in aircraft and the physical limitations and issues with the Logan airport site. The proposal is to establish a second airfield within the Boston metro area to assume all functions of long-haul and international air travel leaving regional air-traffic to the Logan site. The second planning framework is the **Creation of a Governing Entity**. This idea is borne out of the need to implement such an ambitious proposal over such a long time period. The proposal suggest a quasi-governmental agency that would serve as the master developer of the site. The third planning framework is to **Build the City You Want to See**. This idea centers around establishing positive externalities that could be achieved through such a project. This framework suggest a series of policy initiatives to achieve larger societal goals.

The six design objectives are focused on guiding the physical development of the Logan Airport site. These objectives are **Anticipation through Phasing, Stitching the Urban Seam, Ecological Resiliency, Hyper Local Hyper Global, Interconnected Transportation, and People First**. Each of these objectives relates both to the final urban form as well as the process to achieve the vision.

With both the larger planning frameworks and the design objectives a new vision for a grounded aerial future is established for the Logan Airport site. This new vision includes new forms of aerial travel and the repurposing of large portions of the site for new non-aviation uses. Together they represent a vision for how the City of Boston, and Massport can capitalize on changing technologies to deliver a more lucrative, ecologically resilient and socially beneficial Logan Airport Site.

On the Next Page: This Master Plan representation demonstrates the potential full build out of the new Logan district utilizing the design objectives and the planning principles further described in this thesis.

Chapter 1

Economic Trends + Models of The City

This section frames the role of airports in the context of contemporary and historical planning ideologies as well as introducing local social and economic factors and larger macroeconomic trends that frame the importance of the topic of urban airports. An analytical literature review places sources into categories based on planning theories and economic and social themes. Then a brief descriptive review is utilized to discuss local and macro-economic factors.

Conceptual and Analytical Framework

This thesis is born out of the core conceptual logic that there is a missing piece of urban planning and design in the current literature and practice related to long-term planning around airports and the role and relationship to cities. So much of the current discourse related to airport planning is focused on two major themes.

In the newer markets like Central and South America, Asia, Africa and the Middle East major infrastructural investments are building massive new international portals to the world on previously undeveloped land far away from existing city centers. These architectural icons are opening up international travel to more and more people and solidifying these growing economies' place in the modern global society. While fun and exciting to look at, these mega-projects follow a very similar pattern to what was accomplished in America and Europe in the past century as almost all major cities constructed airports in their hinterlands.

In more mature markets, North America and Europe, much of the focus in the past several decades has been around attracting and delivering new industries and urban development closer and closer to the islands that were once created. In cities that have moved their original airports like Denver or Chicago, major office, industrial, and residential developments have followed. In areas that have not moved their original airports, like New York, or Washington D.C. major companies like Amazon are locating near to enjoy the benefits of urban proximity and global connectivity.

These two major themes of airport-centric urban planning and designed are summarized well by Nate Cherry and his team at RTKL. Their research lays out three functional diagrams that explain the relationship between urban node and airport. This research uses the terminology of Aerotropolis and Airport City similar to how John Kasandra has used this language in his writing on the subject. For these purposes an Aerotropolis is an entire metropolitan area that has differentiated itself from other major cities by its global connectedness. Airport cities, on the other hand, are the physical and functional urban forms directly planned in synergy with the airport such as Reston Town Center near Dulles outside of Washington D.C. or Songdo next to Incheon Airport near Seoul.

The long arc of history keeps moving. We have transitioned from thinking about cities as made up of flows of goods, materials, and capital to thinking about cities as flows of information, ideas, and people. Around the globe we have seen ports and industrial lands in our cities transition into new neighborhoods. Are airports next? And if so, how?

The first model, 'Organic' demonstrates the condition of many cities in mature markets. The city of Los Angeles is a good example in which the urban environment has subsumed the airport over time and now offers industries and individuals global access. The second model, 'Remote' is one in which the airport has been constructed in the hinterlands and a new urban node is being developed around it. This is much like Schiphol Airport outside of Amsterdam. The final model, 'Niche', describes secondary airports within a larger Aerotopolis that have grown to serve niche markets and are largely

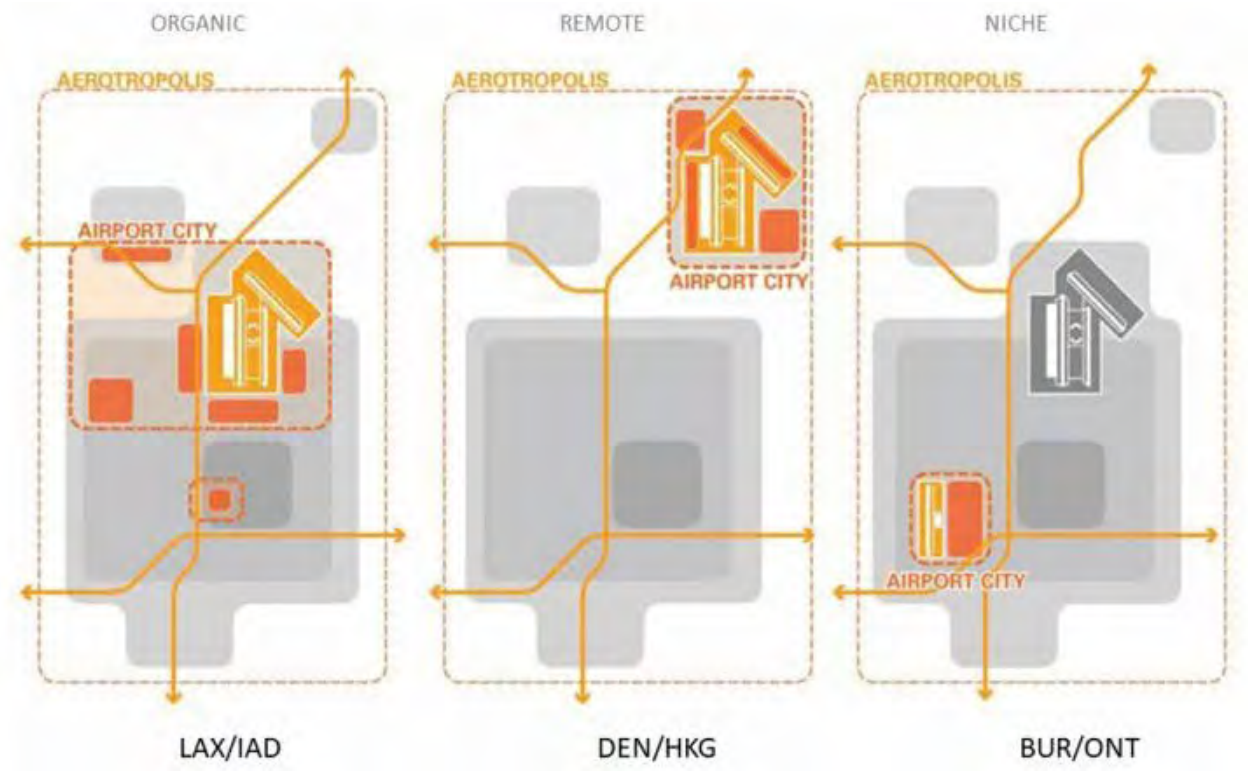


Image: https://www.callisonrtkl.com/you-are-here/the-evolution-of-airports-and-community-part-i/

supported by the proximity to an even larger airport. Again, for this we can look at the Los Angeles metropolitan area and its Bob Hope and Ontario airports.

These three models are constructed based on historical and current conditions of the aviation industry and its associated technology and infrastructure. So what is missing?

This thesis explores a new and different model. This new form is born out of technological change and the resulting economic change that will come with it. This model deals with a type of Aerotropolis that has received less planning and design attention, the legacy Aerotropolis.

Boston, and Logan Airport, represent this typology perfectly. The airport was more or less built into the urban fabric just steps from the urban center and thus has missed out on the opportunity of much of the development that has occurred in association with other airports. This is due to the very limited space to expand or attract new development. While this might have served as a constraint in the past century and in the present, there is an opportunity to think about how these sites might serve as a major benefit in the future. By understanding changes to technology a new model of Aerotropolis can be constructed. This new model explores how new forms of air travel can be conceived within an urban environment, taking advantage of the existence of legacy urban airports as their central terminal. In concert with an expansion of typical airport services in a more suburban or exurban site, this new central Airport city will take on a very different form than a current airport site, one that has a unique integration into everyday urban life.

This fundamental relationship between everyday life and global connection is the major driver behind the concepts presented in this thesis. In the following pages local and global trends are presented that outline why this work is critical and why this site is ideal for exploration. Additionally, past and current planning theories are utilized to construct an ideal form for this new urban model.

Above: The diagram created by Nate Cherry and his team at Callison-RTKL demonstrates three models of Airport Development that have grown out of current urban conditions around the world and supported by global economic pressures. These models largely assume no change in current technologies that could impact these functional diagrams.

When considering future forms of urbanism it is important to understand a historical context of how models of the city have been conceptualized. Starting in the early 20th Century when travel by air became possible much has changed in the world. In this time, there has been an evolution in planning theory and changes in how urban form and habitation have been delivered. To develop a conceptual framework for how a new form of city could be thought about a non-linear analysis of literature was conducted. Within this analysis a sampling of literature, directly and indirectly related to the conceptualization of urban form associated with the aviation industry, was placed into a series of over arching categories for the planning themes and economic/ social themes. The purpose of which was to construct a theoretical basis for the subsequent planning and design work for the future scenario at the Logan Airport site.

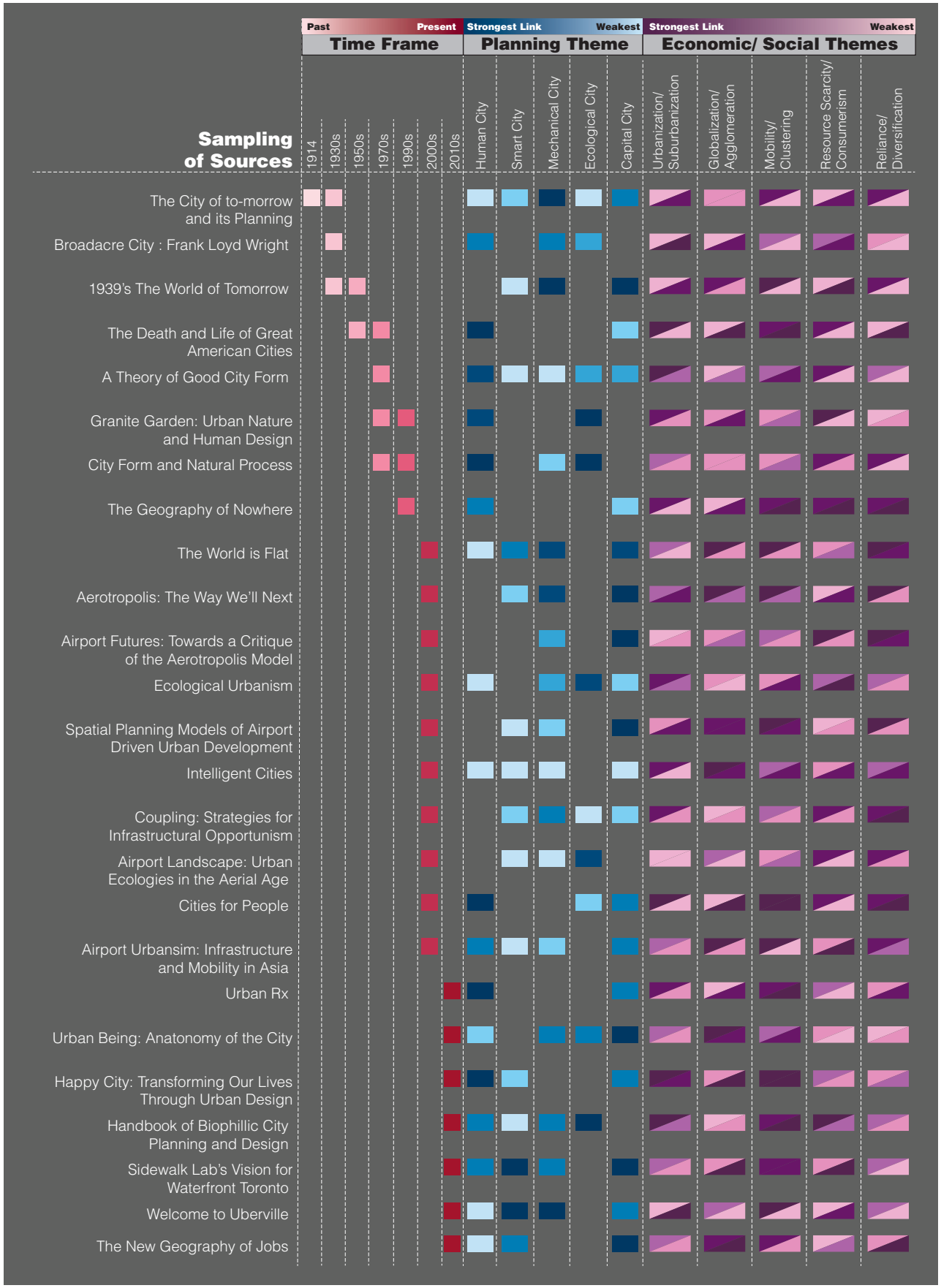
Models of the City

Five overarching planning themes stood out as relevant to this project: **The Human City, The Smart City, The Mechanical City, The Ecological City, and the Capital City**. While there is no particular time-line utilized in this analysis these themes do tend to correspond to periods in time; however, many crop up in varies time frames. These themes are intended to be summations of multiple sources and multiple authors and a have been developed through this project's lens. For the purposes of organization the themes are described below in chronological order.

The Mechanical City is a theme born out of the early-to-mid 20th century as industrialization gave way to consumerism. Authors such as Le Corbusier and Frank Loyd Wright imagined rational and functional urban forms directly related to the production of goods and the efficient movement of such. Perhaps most clearly depicted by the 1939 exhibit *The World of Tomorrow,* this theme defines the city as a machine of progress, undertones of which can be seen in contemporary theories outlined by Kasandra in his book *Aerotropolis*. The main takeaway from this theme is how urban form can be organized to service industry and commerce.

The Human City can be seen as a direct critique of the outcomes of urban changed ushered in by the Mechanical thinking. Most widely championed by Jane Jacob's in her diatribe *The Death and Life of Great American Cities* this theme conceptualizes the city as an amalgamation of cultural and social processes. Human-centered neighborhoods later, and more clearly, defined by the likes of Jan Gehl are the cornerstone of this planning theme. It was concluded, as described in Charles Montgomery's *Happy City* that if cities are created with people in mind first, than economic, social, and environmental resiliency will follow.

On the Next Page: This matrix was used to organize and analyze a sampling of sources that serve as a theoretical background for the planning and design work.


Past
Present
Time Frame
Strongest Link
Weakest
Planning Theme
Strongest Link
Weakest
Economic/ Social Themes
Sampling of Sources
1914
1930s
1950s
1970s
1990s
2000s
2010s
Human City
Smart City
Mechanical City
Ecological City
Capital City
Urbanization/ Suburbanization
Globalization/ Agglomeration
Mobility/ Clustering
Resource Scarcity/ Consumerism
Reliance/ Diversification
The City of to-morrow and its Planning
Broadacre City : Frank Loyd Wright
1939's The World of Tomorrow
The Death and Life of Great American Cities
A Theory of Good City Form
Granite Garden: Urban Nature and Human Design
City Form and Natural Process
The Geography of Nowhere
The World is Flat
Aerotropolis: The Way We'll Next
Airport Futures: Towards a Critique of the Aerotropolis Model
Ecological Urbanism
Spatial Planning Models of Airport Driven Urban Development
Intelligent Cities
Coupling: Strategies for Infrastructural Opportunism
Airport Landscape: Urban Ecologies in the Aerial Age
Cities for People
Airport Urbansim: Infrastructure and Mobility in Asia
Urban Rx
Urban Being: Anatonomy of the City
Happy City: Transforming Our Lives Through Urban Design
Handbook of Biophillic City Planning and Design
Sidewalk Lab's Vision for Waterfront Toronto
Welcome to Uberville
The New Geography of Jobs

The Ecological City grew out of an increased understanding of the impact urbanization has on the world. Early authors such as Anne Spirn and Michael Hough outlined how city form could, and should, be informed by the specific environment. This would result in positive economic and anthropocentric externalities. In more recent years, furthering these concepts, biophilic planning and design has taken this theme even further ushering in new forms of infrastructure and architecture designed to mimic and work within natural processes.

The Capital City is a theme that describes both human and financial capital as the primary driver of urbanization. It speaks to the changing role of the workplace and the worker as described in Enrico Moretti's *The New Geography of Jobs* where innovation and idea hubs become the drivers of supporting economies. Additionally, this concept speaks to the increasing globalization of the economy and the reliance on national and foreign connections for economic stability.

The Smart City is a theme born out of the every increasing development of technology and data associated with our lives. Often described as an almost Utopian vision, this theme can be seen across computer science and planning literature as well as new proposal's such as Sidewalk Lab's vision for the Toronto Waterfront. These concepts often mirror those seen nearly a century ago of efficiency and functionalism in both infrastructure and daily life. Regardless of their duplication it is a theme that will likely continue as more of our world relies on automation and ubiquitous data.

In the formation of this thesis's planning and design response no one theme is taken as is, rather it is thought that none of these themes are mutually exclusive. Pulling aspects from each of these theoretical frameworks, a new model fore the city is proposed. This new model starts with humans as the primary driver and negotiates the opportunities and constraints at multiple scales acknowledging the benefits of the past theories. From the Mechanical City a level of efficiency and convenience is overlaid to ensure space and movement for both people and goods. From the Human City, scale and social interaction drives the arrangement of buildings and open space. From the Ecological City, systemic thinking and natural system planning consider long term environmental change and new forms of infrastructure. From the Capital City, global connectedness creates a hyper-local and hyper-global neighborhood. Finally, from the Smart City, technology and the use of sensing and data collection instill flexibility and change into the plan.

Social + Economic Themes

In an effort to understanding how this proposal fits into the larger social and economic condition of our society, this analysis considered how the previous and current authors resolved planning theories with larger trends. For the purposes of this literary analysis five competing themes were selected. These trends were selected to help guide the subsequent urban form, land use frameworks and mobility strategies of the proposal as well as to justify the

project as a whole. The thought was that if the proposed project could begin to resolve these competing issues than it could be seen as a necessary effort. The following descriptions demonstrate how each of the five themes was utilized.

Urbanization versus Suburbanization was considered as a base understanding of where we should be pushing populations too. Should housing options increase near the city center or should we rely on new suburban growth? The Logan Airport site is extremely urban. Given this condition and the review of literature around successful human habitat such as Montgomery's *Happy City* it is argued that opportunities for urban redevelopment and increased reliance on existing urban fabric would be more successful in the long run.

Globalization versus Agglomeration speaks to how a neighborhood might look and function when it is both hyper-local and hyper-global. These trends are both economic and physical in that it will dictate the types of businesses and people that will locate here as well as the form that this place will begin to take.

Mobility versus Clustering is directly related to the technologies under discussion. While this is discussed in more detailed in the next chapter it was an important aspect in considering why a proposal like this should take place. The question is, if mobility technologies allow for faster and further transportation will people choose to disperse or cluster. This project seeks to make an argument for the latter.

Resource Scarcity versus Consumerism was considered as a driver for the importance of this proposal. The aviation industry is often used as a scapegoat for extreme amounts of carbon emissions but our reliance on international shipping and travel will likely not yield. Therefore, it is important to consider new forms of travel that could help resolve this tension.

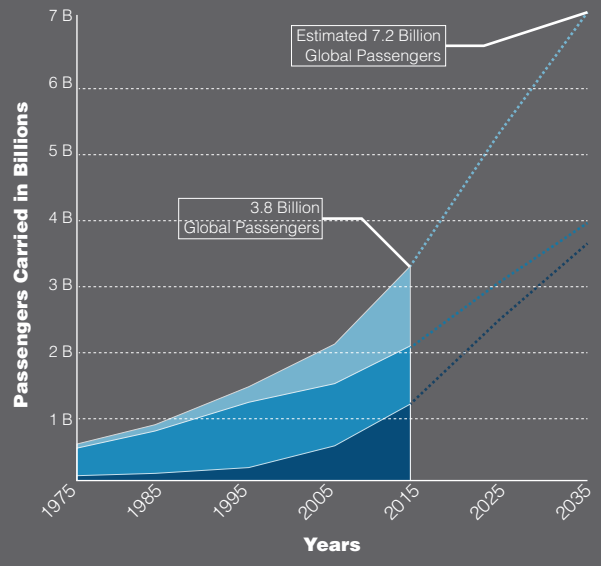
Finally, **Reliance versus Diversification** is used as a justification in thinking about homogeneous land uses. Should we build areas for a single purpose or should portions of the city be able to adapt to changing economic and social forces. Additionally, how can space and objects be designed to reduce obsolescence? For example, in *Coupling: Strategies for Infrastructural Opportunism* it is argued that designing multiple functions into large scale physical interventions will result in longer, and ultimately more sustainable, life cycles.

On the following pages, a closer examination of macroeconomic trends and local conditions further the argument for the necessity of this planning action. While the proposal in no means solves any particular issue fully, it can be justified by the existence of these conditions and effort can be taken to ensure resolution of the strongest contradictions. Additionally, while this proposal is situated in a larger futuristic condition it must be grounded in a particular understanding of the economic and social issues of the Boston metropolitan area and how any design and planning decisions can help make Boston a better place overall.

Macroeconomic Trends

Global Aviation Trend

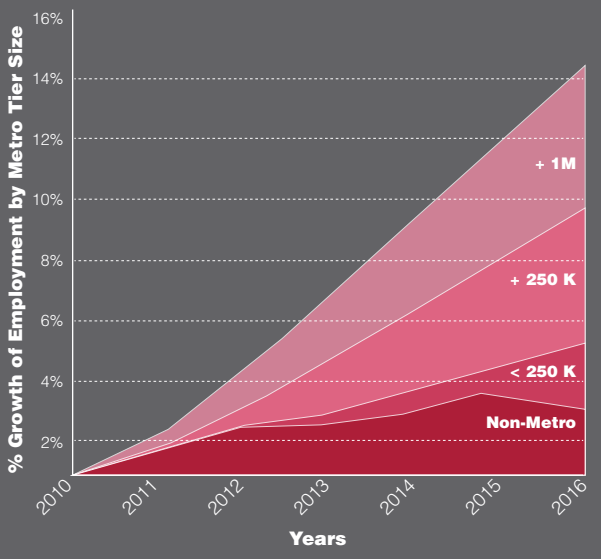
Air travel is increasing at a rapid rate world wide, with Asia being the largest contributer to growing passenger numbers. However, even in mature markets such as the U.S. and Europe there is still high year-over-year growth. This is critical to consider for places like Logan Airport which is currently functioning at capacity and has essentially zero room for expansion to absorb any further demand. Global business connections are also of critical importance for places like Boston which serve many economic functions that have come to rely on these global connections. It is projected that there will be twice as many passengers within just 20 years, if that trend continues, airports like Logan may need to look to other regional airfields to service regional demand.



Source: World Development Indicators; World Bank

Urban Job Agglomeration

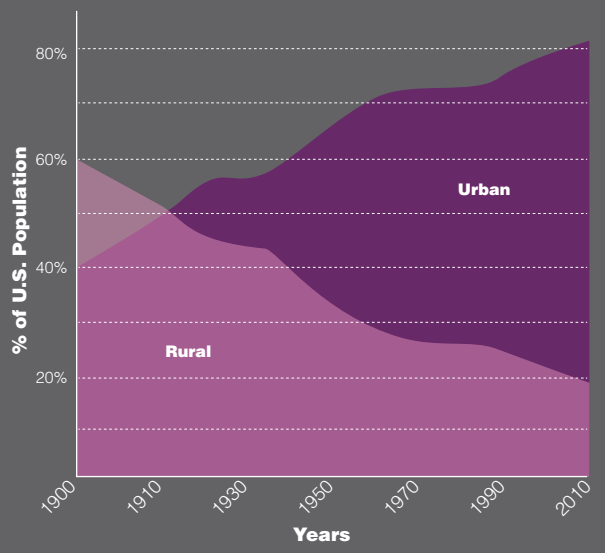
In recent years urban job growth has far outpaced suburban and rural job growth, a trend that is expected to continue. Cities like Boston, which have transitioned to high-tech, knowledge based economies are becoming, and will continue to be areas of high demand and population growth. It is critical that the city of Boston continue to consider large scale growth areas as a means of supplying land for this increased demand. With such established higher education institutions, Boston is likely to continue seeing an increase in jobs within the knowledge economy at an even higher rate than other metropolitan areas. This trend requires propinquity between new development and existing job and knowledge centers.



Source: World Development Indicators; World Bank

Urbanization

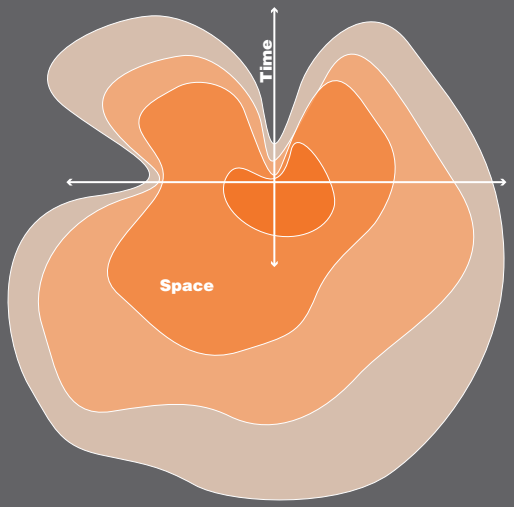
In the long arc of history urbanization is a steady state. Globally this trend is more extreme, but within the U.S. their has still be a move away from rural counties towards urban ones. In the last 30 years, the rate of this trend has grown with even more people moving into urban areas. In land locked cities such as Boston, this means that growth must happen vertically, or through the redevelopment of previously non-residential areas. Major redevelopments like the Boston Seaport has given a glimpse as to how that might happen, but the diversity of housing types delivered within that development have been limited. The question becomes how can cities capture multi-generational demands through new housing.



Source: STEEMI, https://steemit.com/rural/@prescottpaul/out-of-the-countryside-into-the-city

Space-Time Compression

Transportation and communication technologies have drastically changed the human concept of space. With forms of rapid transportation like bullet trains and airports, distance is meaning less and less. This has resulted in strong economic and social connections between cities that are rather far apart. Long-haul direct flights connect cities globally while increased ease in regional connectivity through new forms of transportation could compress time and space even further. Traditionally this concept was thought that it would decrease the demand for agglomeration and urbanization but recent thought is that they are actual complimentary concepts, this could mean that cities like Boston can serve as even more important regional and global centers.



Jobs Percentage by Industry

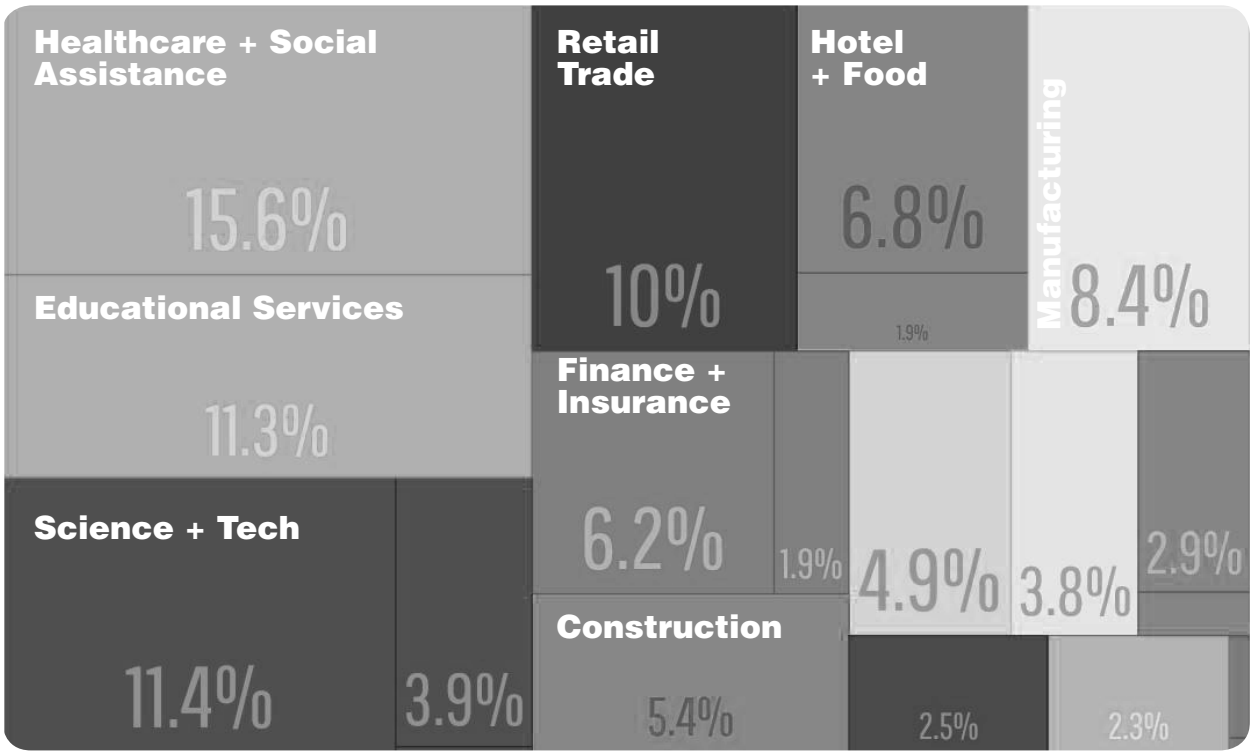


Image: Jobs by Industry , Source: DataUSA. 2016

Boston's Major Industries

When compared to other metropolitan areas around the country Boston has a significantly higher number of professional, scientific, technology, and financial services. All of these industries are supported by the large educated workforce that exist within the city. However, these industries also service a globalized economy and rely heavily on easy access to other metropolitan areas within the larger region as well as further connections to major economic centers across the globe.

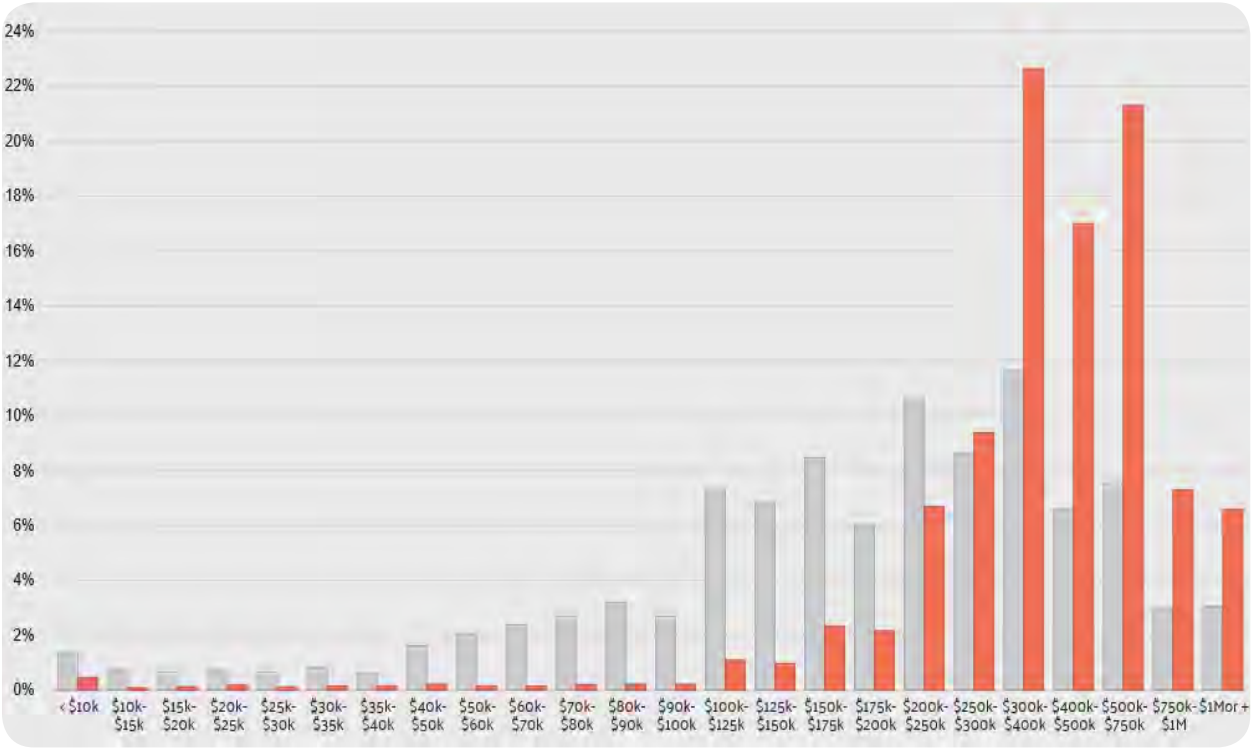
In recent decades, these industries have demonstrated the forces of urban agglomeration through the redevelopment of large urban sites such as Kendal Square, the Seaport and others. As these industries will continue to dominate the global economy it will be critical for Boston to continue to be able to grow with the demand while servicing the needs of that workforce and the spill over impacts that it creates.

These industries are also uniquely urban. Relying on large square footages embedded directly into the urban fabric and in close proximity to other centers of innovation.

As these trends continue they will demand greater connectivity locally, regionally, and globally as well as new spaces for innovation, manufacturing, offices and the supporting residential and services.

With Boston's exiting density and established urban fabric many issues can begin to arise that could stifle the metropolitan area's ability to continue to absorb future growth. This can be demonstrated by many of the major issues that the region is beginning to see such as high housing cost and increased traffic. This proposal offers an outlet for that growth through the redevelopment of large portions of the Logan Airport site.

Housing Share by Property Value



Source: DataUSA. 2016

Boston's Major Issues

Housing and Transportation. Anecdotally, those are Boston's biggest issues. In recent years, like many high demand cities around the country, Boston has experienced rapid growth in the cost of housing. As of 2016 Boston's median property value was over two-times higher than the national average. In recent years that has only worsened with 2018 showing an average two and one half times higher. The rental market is no different with the average rental price being also two times higher than the national average. In addition to the discrepancies in the average housing cost the market also skews proportionally to the higher side meaning that not only is the average price higher but that there are even more housing units that are unattainable to the average citizen.

This trend has made affordable housing a priority for the city. However certain policy interventions have limited capability at curbing the supply and demand issues. Large scale construction of new housing is a need and in geographically confined city such as Boston creative measures to repurpose land must be utilized.

Additionally, with a continued influx of people, locating those new individuals conveniently near existing transportation networks will work to reduce the stresses on the existing transportation infrastructure. This is important because in recent years the Boston metro area has seen an increase in commute time with a higher percentage of the population having commute times greater than thirty minutes when compared to the national average. Given this issues it is suggested that new development be centered closer to existing urban assets as opposed to the fringes of the existing city.

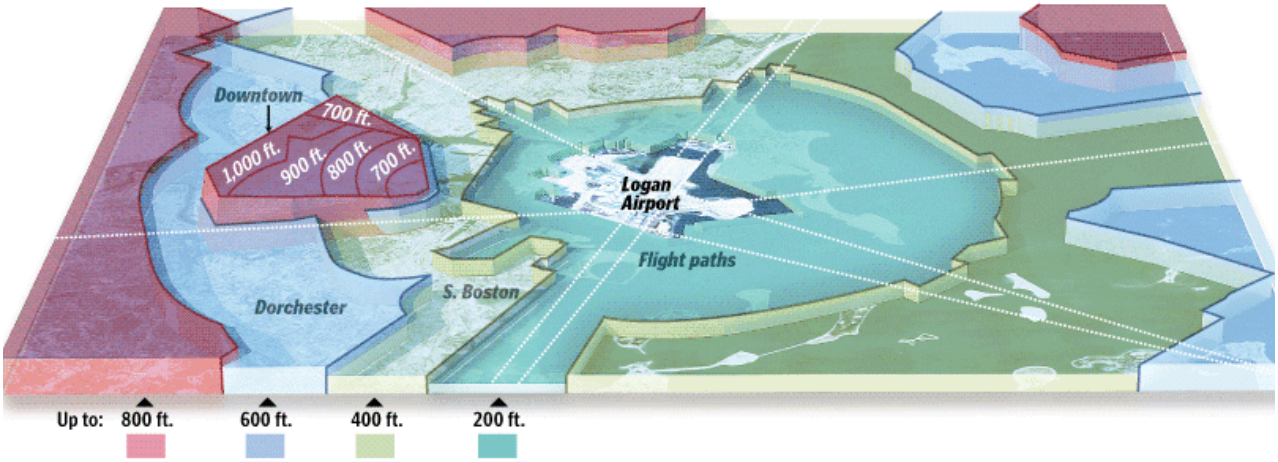


Image Source: MassPort

Land Values Around Logan Airport

While there is certainly a positive economic benefit to the proximity of Logan Airport to the city center there is also a negative externality due to building height restrictions around the airport site. These restrictions extend across large portions of Boston, Cambridge, Somerville and the other surrounding municipalities. After a certain distance these regulations become mute because the demand for taller buildings is not supported by land use and transportation patterns. However, in areas such as East Boston, Seaport, South Boston and others this restriction has resulted in lost economic opportunity.

The reason for the lost economic opportunity is two fold. In certain areas where land values are high and demand exist such as the Seaport developers would likely build taller buildings to reduce their cost per square foot of development which would reduce rental cost and also result in higher land values that the city could tax and gain additional revenue. The second in conjunction with shear proximity to airport infrastructure could eliminate development all together due to an inability to deliver a reasonable real estate product for the cost of land.

These restrictions also greatly impact the ability to create variation in urban form by forcing developers to max out the buildings volumes in a reduced height causing bulky short buildings that restrict sun light and have other detrimental impacts on urban space.

The severity of the issue is somewhat unique to Logan due to its adjacency to the city center which is further explained in later chapters. Even with expected changes to aviation technologies these restrictions will remain if large aircraft are still utilizing the Logan site. This aspect is a critical rational for the addition of a second airfield within the metropolitan area.

Image: Rendering of Terminal E Future, Boston Globe

Investments to the Logan Airport Site

Any conversation around the future of the Logan Airport site must be borne out of an understanding of the recent, and future investments that have and will change this space. There has been a tremendous amount of money invested in the Logan airport site and it is critical that any proposal utilize these investments efficiently.

New upgrades to vehicular circulation to and from the airport site as part of the Big Dig, including the Ted Williams Tunnel, offer tremendous access across Boston Harbor for vehicles. This infrastructure was built in the early 2000s and has many decades left within its life-cycle. These features will be taken as a given in the overall urban structure.

Additionally, MassPort has made great strides in recent decades to upgrade many of the terminal buildings within the Airport. They also have future plans to continue to upgrade these facilities and well construct a dedicated people-mover connecting terminals and ground transportation. This proposal recognizes those investments and ensures that none will be wasted.

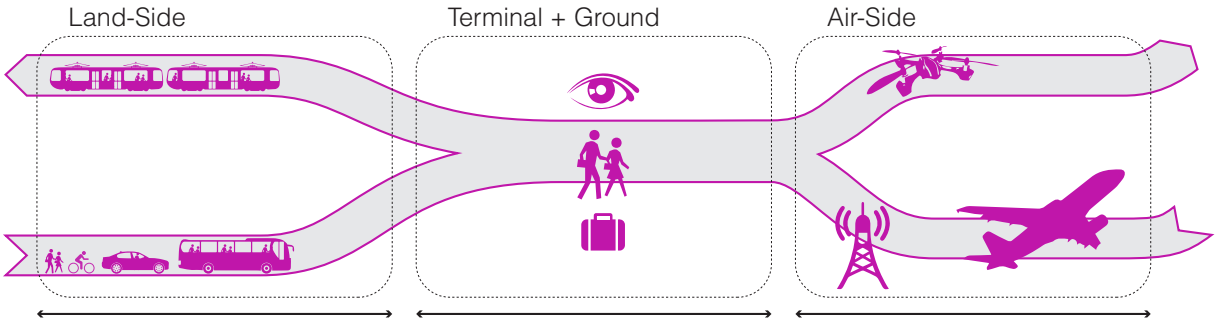
As changes to this site, described in more detail in later chapters, happen consideration will be placed on re-purposing structures for new uses. Furthermore, the existence of existing facilities and uses is a main driver behind the overall phasing strategy that is integral to this projects proposal. With this being said, it is important to note that there is virtually no room for further airport expansion on this existing site. Other than increased efficiency, which is likely to be marginal, there is little room for increased capacity thus opening up the conversation for new models of service that would need to include both different forms of travel as well as different sites. This concept is explored in later chapters.

Chapter 2

Impacts of Technology

This section explores the impacts of various technologies on the aviation industry and more specifically on airport sites as well as the time-line for how these might unfold. The study focuses on technologies that will have the biggest impact on urban airports such as Logan with a specific purpose of defining a new relationship between urban surroundings. The analysis is structured to uncover how space, time, comfort, and capitol will be impacted and the opportunities that arise with the onset of these technologies. Additionally, a brief description of what will not change within air travel is discussed and how that, in fact, has huge implications for what cities should be considering for the airport infrastructural assets.

Technology Realms



Example: Autonomous Vehicles could render thousands or parking spaces and nearly 75 acres of land obsolete.

Example: Facial recognition could make security lines and thing of the past.

Example: NextGen air traffic control could make regulated airfields more precise an offer more space for development.

Technological Framework

While predicting technological advancements is challenging, this thesis utilizes primary and secondary sources from private companies, government agencies, and academic researchers to capture a broad understanding of potential technologies, their reasonable timeliness, and their influences on airport infrastructures. The work utilizes a conceptual framework for understanding what technologies are most relevant, where they might happen, and how they might influence. Along these lines the framework is broken into two main concepts, spatial realms, and impact areas. Additionally, at the end of this chapter an analysis of what is not changing in the aviation industry summarizes the extents of technological change.

Spatial Realms

In order to better understand the impacts of future technologies we first must identify where these technologies may happen. While many might think of airports solely as runways and planes they have developed into complex urban ecosystems in-and-of themselves, employing tens of thousand of people and serving as economic engines for surrounding areas. With this in mind it is crucial to consider not only air-side functions of airports but rather the full spectrum of physical footprint that an airport has which can be broken down into three main areas: Land-Side, Terminal + Ground, and Air-Side.

The Land-Side aspects of an airport should not be underestimated. This includes major pieces of infrastructure such as parking garages, passenger pick-up and drop-off operations, public transportation options, rental car facilities and others. Additionally, this can also include tangentially related elements such as airport centric development like shipping, warehouse, and office functions. Just as refrigeration technologies revolutionized the way that food is shipped around the world creating entire new typologies adjacent to airports, this analysis considers the full range of possible technologies in examining this spatial realm. These elements range from things like autonomous vehicles, to on-line shopping and same day delivery, to smart baggage technologies.

Above: This schematic represents the movement of an individual in both directions from home, work, or another place to the moment of take-off. The opportunity that certain technologies offer to compress this process and make it more comfortable should not be overlooked.

Overall these land-side functions really start at the home or anywhere people may be coming from. They have huge implications on the surrounding urban fabric as well as the perceptional qualities of using the airport system. Is it far away or is it convenient? Changes in this realm have implications across the board.

Terminal + Ground functions consist of airport operations getting people from their personal or public vehicle to the aircraft. This includes baggage and people movement and host critical functions such as security and check-in. Historically, this aspect of air travel has changed drastically with new security protocols and the proliferation of app-based check-in and ticketing. Right now, this is really the barrier, both cognitive and real, between ground and air which creates a disconnect between the functions of the city and the functions of the airport. With advancements in automation, artificial intelligence, and digital interfaces these spaces and the time needed to navigate them can be compressed.

The biggest barrier to change in the realm is the security process. Already an intimate and invasive process, new technologies centered around facial recognition and other forms of sensing are often challenging for people to understand and thus slow to implement. However, in the long-term we can imagine a much broader reliance on these functions.

Air-Side aspects include all movements of aircraft and other vehicles on the runways, taxi-areas, and parking aprons. This realm is by far the largest consumer of land and thus seeks to have the largest spatial impact with the changes in technology. New forms of communication between various moving components that rely on global positioning as opposed to radar offers much more precision. This allows for safety buffers to shrink and thus creates more capacity within the same amount of space or reduce space use. Additionally new advancements in vehicle technology perhaps offer the most radical impact. Vertical take-off aircraft (VTOL) or extreme short take-off aircraft (ESTOL) could reduce the space needed for runways. On the other side of space consideration, larger aircraft such as the Airbus A-380 or super-sonic aircraft could actually require additionally space. All of these considerations come with the caveat that there are limitation in the applications of many of these technologies. Therefore, any proposal must consider where, when, and how these new types of technologies unfold. It is very likely that these elements will not all happen in the same location.

To further examine how these various spatial realms might be affected and what sorts of opportunities are created for this proposal an analysis was conducted to explore the impact areas of each technology.

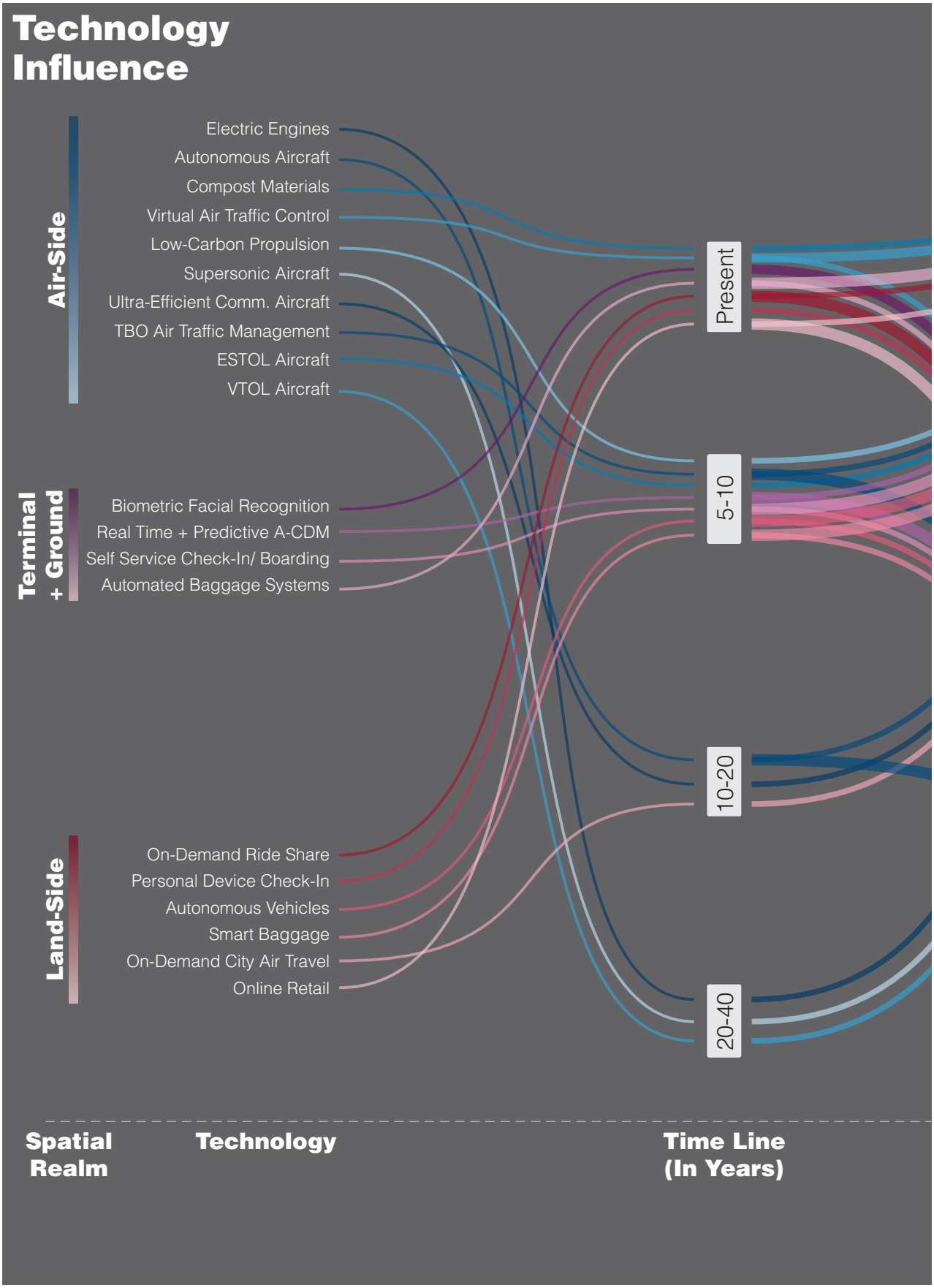
Impact Areas

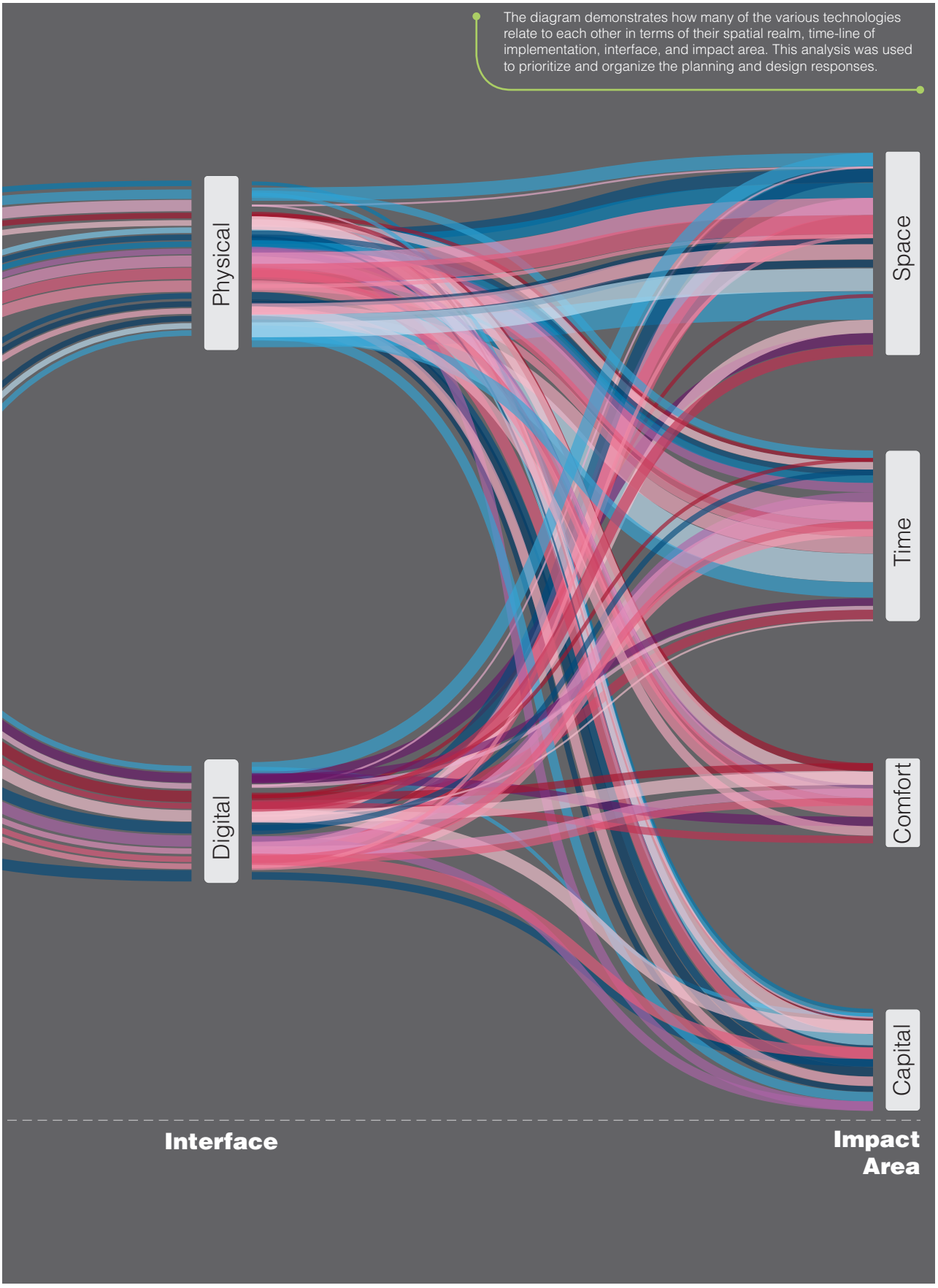
This analysis defines the impact areas as space, time, comfort, and capital. Each technology was considered in regards to its spatial realm, time-line of implementation, interface, and then finally its impact area. The purpose of this analysis was to gain an understanding of the types of opportunities that would arise for planning and design and when those opportunities might come on-line. This serves as a major point of departure for the design exercise and is an underlying component of the phasing strategy that is used. While not every possible technology was analyzed or every outcome projected an overall logic is constructed for thinking about the future of Logan Airport given these new opportunities.

On the following pages each of the four areas of impact are explored in more detail offering more specific understanding about where design opportunities may arise.

Space, Time, Comfort, and Capital can be used to describe how technology might change the relationship of airports and their cities.

Technology Influence




The diagram demonstrates how many of the various technologies relate to each other in terms of their spatial realm, time-line of implementation, interface, and impact area. This analysis was used to prioritize and organize the planning and design responses.
Physical
Digital
Space
Time
Comfort
Capital
Interface
Impact Area

What is Changing?

Changing Time

Air travel has compressed space and time, drastically reducing the barriers to regular national and international travel. This allows for everything from fresh foods from far away lands to business trips around the world in less than a day. This phenomenon is predicted to only get stronger with certain advancements in technology. For the purposes of this thesis we will focus on four major compressions of space and time.

On the grandest scale, long-distance flights are both romantic and terrifying to many people. The idea of sitting in a plane for over ten hours or having to transfer once or twice to make it to any international destination is daunting. Two major trends in technology are changing that. Supersonic aircraft, aircraft that fly faster than the speed of sound, have been banned from flying over most areas around the world due to the extreme noise associated with them. However, NASA, along with several other companies, are advancing the design of these aircrafts to reduce noise to acceptable levels. It is expected that in two decades we could imagine mainstream supersonic travel. Additionally, more fuel efficient engines which have been advancing rapidly in recent years are making longer and longer flights more economical and less detrimental to the environment. These two technologies have major implications for increasing global connections and shortening the perceived and real distances from places far-away. Both of these technologies however come with constraints in that they need even longer runways and larger clear spaces for take-off and landing making places like Logan almost unsuitable.

On a slightly smaller scale, pioneering companies such as Uber Elevate, TranscendAir, and Zunum Aero are creating new aircrafts typologies that are promised to connect closer distances (within 5-700 miles) more quickly. These smaller aircraft are imagined to utilize vertical take-off and shorter take-off distances, electric engines, and more direct routes to more places thus reducing transfers a creating a new economy of regional air travel. This new economy, and its associated infrastructures could function more like an inner city train station than an international airport. With that in mind, legacy urban airports become the perfect center for such technologies to be deployed.

On an even smaller scale, new technologies like autonomous vehicles, which will likely reach mainstream use within the decade, and on-demand air-travel which is slightly further out could reduce the time it takes for people to get to and from an airport site. This has two main implications. The first is that it could mean that the direct access that Logan currently has to a major population center is less important. Secondly, it could reduce the overall time of “air travel” which includes the land-side aspects. In the future, new technologies, will make

it necessary to view airports as more integrated nodes within the larger regional transportation system.

Finally, at the airport scale new sensing technologies and digital interfaces could make the check-in and security process drastically faster, offering and almost seamless transition between city and flight. Many of these technologies such as facial-recognition and remote baggage scanning could reach mainstream not so distance future having been already under testing around the world. Facial recognition and remote biometric scanning could essential eliminate security lines and security checkpoints. This would reduce much of the bottle neck that happens at the airport and would allow greater connection between the city and the airport. Remote baggage checking, which several companies are experimenting with would essential function like a same-day deliver system, picking up baggage in one location and dropping it off at another. Together these technologies can further compress space and time making air-travel, both locally and far away, more convenient and attainable.

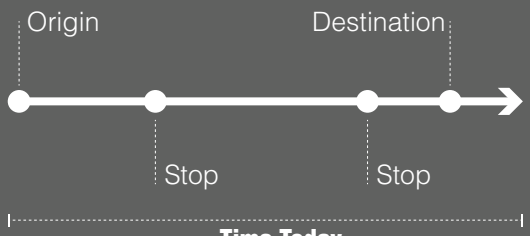
Changing Space

Airports are huge. Boston's Logan Airport site is over 1,700 acres (2.5 square miles). Thats larger than all of downtown Boston stretching from the North End to the Boston Garden and from Longfellow Bridge to Fort Point Channel. It represents a huge opportunity as new technologies come on-line for the repurposing of that land into other uses. This analysis focuses on four of those opportunities.

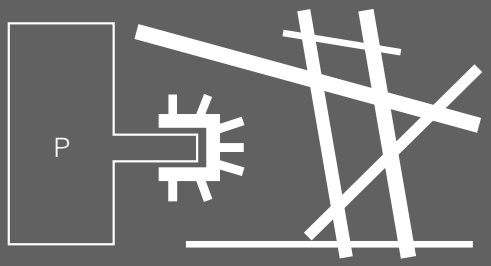
As mentioned in the previous section there are two technological evolutions that would change runway and taxi dimensional requirements. Long-haul and super sonic aircraft would actually increase the space needed for take off and landing, something that would be impossible at Logan Airport. On the other hand, vertical take-off aircraft (VTOL) would allow for the virtual elimination of runways while extremely short take-off aircraft (ESTOL) could reduce runway dimensions down to a little over 2,000 feet which is about one-quarter the distance of Logan's three main runways now. It should be noted that these technologies are applicable only on smaller aircraft and would likely not be coming on-line for another twenty years. However, this new aircraft typology with max distances of 500-700 miles and holding twenty to sixty people seems well adapted to urban airport sites such as Logan and could offer a shift in regional travel.

In addition to aircraft technology, advancements in air-traffic navigation and scheduling for both in-air movements as well as on the ground movements has implications on space. These technologies allow for tighter controls in space and reduce buffer areas between aircraft and between aircraft and other vehicles. Advancements here have impacts on both airport space as well as restrictions on surrounding real-estate. Currently the FAA regulates the heights of buildings surrounding airports. In Boston this includes all of downtown and the surrounding districts as well as parts of Cambridge and the other surrounding municipalities. Greater efficiencies in air-traffic control will result in marginal improvements to those restrictions thus increasing land values that had been previously restricted.

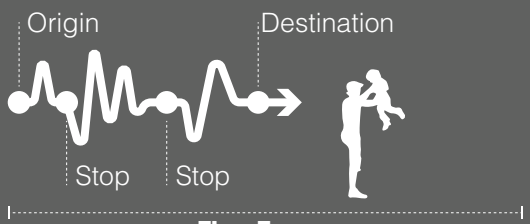
From an operational stand point there is also opportunities. The new forms of air-traffic navigation that utilizes advanced autonomous systems can increase the complexity and capacity of the system. This means that more aircraft will be



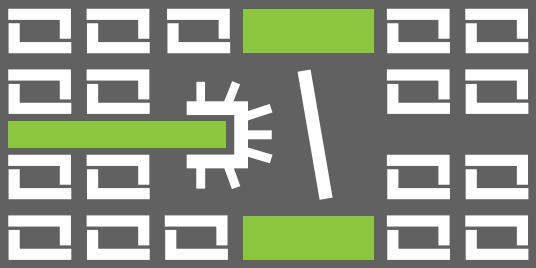
Time Today



Space Today



Time Tomorrow

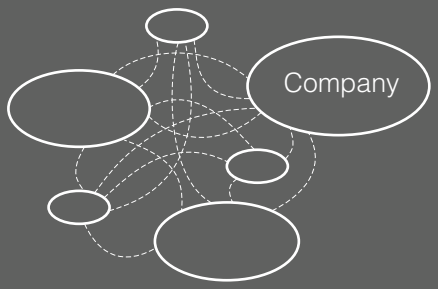


Space Tomorrow

CHANGING TIME

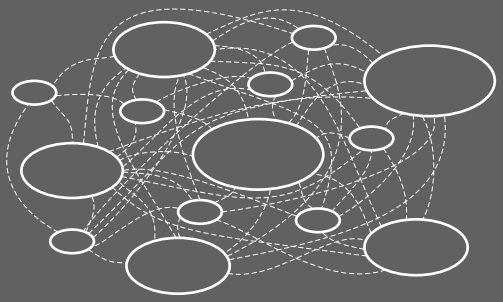
CHANGING SPACE

Comfort Today



Capital Today

Comfort Tomorrow



Capital Tomorrow

CHANGING COMFORT

CHANGING CAPITAL

able to fly around in a more confined three-dimensional space. With that greater precision and capacity smaller, less obtrusive aircraft could find their way in more urban spaces and in closer proximity to where people live work and play. This nodes could become integrated into other architectural and urban massing that further reduces that space requirements for air-travel specific infrastructure.

The impact of personal vehicles on airport sites should not be overlooked. On the Logan Airport site nearly 100 acres of land is utilized for surface parking, parking garages, and rental car facilities. Autonomous vehicle technology has the ability to drastically reduce the need for such space. Coupled with other recent and future advancements and transportation such as on-demand ride sharing and air-travel the need for such facilities could be virtually eliminated. According to many of the major car manufactures this technology will likely be mainstream by 2030. This, along with the reduction in parking demand due to current ride-share technologies offers early phase opportunities for this proposal.

Finally, advancements in security and check-in procedures discussed in the last section also over opportunities for more efficient use of space. Primarily located in terminal buildings this saved space, in concert with other changes, could offer the opportunity to better integrate city functions with the functions of the airport itself. A larger portion of terminal buildings are devoted to ticketing, security, and waiting. If these are drastically reduced, as discussed in the Time section, there space could be utilized for other things such as additional retail or other uses.

All-in-all, there are opportunities and constraints associated with space consumptions that can drive a new form of urban airport that is much different than the current model. However, this will likely mean that some functions of air travel are relocated to more appropriate venues with the spatial capacity to absorb future needs.

Changing Comfort

To many, air travel is a burden. Baggage, transfers, getting to and from and security creates a psychological barrier to an otherwise easy process. However, more and more people fly every year. New technologies have promise to reduce some of the stresses and create an overall more comfortable experience. Additionally, at the urban scale, airports create discomfort for nearby residents in the way of noise pollution. Advancements in this realm have opportunities to reduce that daily nuisance. Four overall categories exist that have the opportunity to increase internal and external comforts associated with airport sites and their use.

The first aspect, and one that comes to everyone's mind, is noise. In fact, Logan has continuously struggled with noise complaints since its existence, causing extremely restricted hours and other bans. New technologies associated with engine performance and noise offer drastic reductions in decibel levels

To the Previous Page: These four major impact areas of time, space, comfort, and capital are where the opportunities lie for this proposal. Changes in technologies create movements of design and planning intervention that previous did not exist.

and are quickly become mainstream as older generation aircraft are phased out. Additionally, for smaller aircraft like the VTOL and ESTOL type that have previously been spoken about, manufactures are aiming for no marginal increase in noise from urban environmental levels. This would mean that for certain aircraft types there would be no perceived noise. This would allow for housing, and other functions to sit even closer to facilities creating a more integrated site.

Advancements in baggage handling, and new technologies such as smart baggage and new industries such as same-day delivery of luggage could reduce the burden of traveling to and from the airport. Several companies are experimenting with logistics and prototypes that would allow for individuals to tap into on demand services that could deliver their luggage to their final destination similar to how packages and postage are utilized today. While this technology is still in its infancy this, along with other on demand services, could reduce the burden of getting to the airport drastically.

Along with that, advancements in check-in and security process that have been previously discussed could eliminate lines and the hassle of going through security. Biometric scanning, facial recognition, and other advanced sensing technologies could allow for a person to walk off the street and onto an aircraft without ever having to stop while still maintaining security protocols. This would create an amazing opportunity the develop a stronger relationship between the city and the airport similar to how many central train stations function.

Finally, transfers are everyone's nightmare. Advancements in long-haul aircraft through increased efficiency and supersonic speeds will make longer travel easier and more cost effective. Additionally, smaller electric aircraft have the ability to serve more smaller markets. This would reduce the reliance on the hub-and-spoke model that the airline industry currently uses, a trend that can already be seen in low-cost carriers. This reduction in transfers for both short and long flights could change perception and increase demand for air travel.

Together these new technologies can make air travel more convenient overall and the airport site less of a nuisance. When thought about in association with other opportunities in space and time a different model of urban airport begins to emerge. This new model is fully integrated into the city and serves as an extension of other mobility networks.

Changing Capital

With changes to technologies there will be changes to industry and the flows of money. New companies will enter the market, new services will be provided, and new consumers and users will create demand. Related to this project there are four major trends that could impact airport sites such as Logan and create new opportunities for a different model.

The first is an ongoing trend and one that has been in the work for several decades. The proliferation of on-line retail and other mail-order items has increased the demand for shipping services creating new sources of revenue for commercial carriers as well as new hubs of shipping near many airports. This trend will likely continue and even grow offering the need for new warehousing and distribution centers which Logan currently struggles with as well as new opportunities for more frequent and diversified air traffic which could make

deliveries faster to more places. This also has implications of manufacturing and distribution economies that could drive these type of services into more urban environments. As autonomous trucking, mechanized warehousing, and other forms of technology make manufacturing cheaper and less space intensive these facilities could utilize more vertical arrangements and integrate better into other urban land uses such as housing and office spaces.

Secondly, the cost of air travel has gone down overtime thus opening it up to new markets. Particularly in the international realm, middle income individuals represent the biggest gain in market share over the past several decades. New aircraft types and services that offer more convenient and cheaper options could increase the availability of air travel to more and more people. Additionally, as engines become more efficient on longer-haul flights the cost of those services will go down as well. All-in-all there is a trend in the increase of air-travel and opportunities for even more given new models of service. With these new models, new companies will enter the market. This can already be seen by companies like Uber Elevate and other which are started to plan for roll out of their services in the coming decade. These new companies will result in a much more diverse landscape than the current airport and air travel model which is largely dominated by a few bigger companies.

Additionally, and almost more importantly, as engines become more efficient, and shorter routes switch entirely to electric aircraft the carbon emissions from the airline industry will drastically be reduced. This is monumentally important from an environment standpoint because the airline industry is a massive producer of global carbon emissions. However, there are other benefits as well such as the elimination of massive on-site storage containers and the further decarbonization of the economy.

Finally, within the airport site major changes have already occurred and will only be amplified by the further proliferation of ride-sharing and on-demand services as well as the roll out of autonomous vehicles. Parking revenues at airports, including Logan, have dropped. This has made single use structures and areas like parking lots and parking garages huge investments that see little return. Recently airports have been trying to cover this revenue differential through the increase in other services such as retail and food. However, in the long run as the demand for parking goes down there will likely need to be a more aggressive shift in the utilization of that land. This brings in opportunities for new development.

These technological changes, along with others that have been discussed in this section, offer an opportunity to realize a new type of airport model and new types of airport services. It is imperative that cities take a proactive approach to planning for these changes.

What is not Changing?

While there are many things on the horizon for the aviation industry resulting in new opportunities for air travel and in particular urban airports it is critical to note the elements that will not be changing. These elements are as important as the aspects that are changing because they speak to how the industry and the infrastructure may change over the course of time. While new opportunities become available for these urban airport sites their existing services will need to

be maintained either on site or at other locations. This is a fundamental aspect of this proposal and one that will be discussed in more detail later.

Large airplanes that fly far distances require a lot of energy. Even with advancements in engine performance and battery storage the likely hood of vertical take-off aircraft that can also fly to a different continent with any level of efficiency are far off or impossible. As one MIT researcher put it, "... the physics just isn't there." Furthermore, aircraft that are being built today are being built to run for many more decades. While tremendous research is being conducted to reduce cost and increase efficiency there is little promise of drastically different types of long-haul aircraft.

Taking that into account there will need to remain typical airport services that can support large aircraft that require long run-ways and ample clear space for take-off and landing. While these types of airplanes may be replaced by others for services from Boston to New York they will not be replaced for services from Boston to Los Angeles or further. Long-haul aircraft that carry hundreds of people and travel thousands of miles will remain in similar form for many decades to come. Additionally, supersonic aircraft, as previously mentioned could create even more demand for large airport sites with more typical runway configurations.

International flight numbers have generally been increasing, a trend that will likely continue, and coupled with increased globalization, places like Boston will demand to be even more connected to the rest globe. So its can be expected that the Logan airport site will continue to struggle with servicing larger and more space consuming aircraft.

Conclusion

All of this means that traditional air services are not going anywhere, at least for now. Large runways, massive expanses on concrete, and all the other physical attributes that come with airports will continue to be a staple of the aviation industry. However, what has been described in this chapter is a series of opportunities that exist due to changes in technologies. Legacy urban airport sites such as Boston's Logan are prime candidates to capitalize on these new technologies. Therefore, this thesis speculates, there could and should be a divergence of services within the industry where new centers of smaller aircraft fleets take-off and land right into the urban fabric and larger airfields continue to service long-haul and larger aircraft in more suburban or exurban context.

What this would mean for the Logan site is that much of the existing service would be phased over time to a different location within the metropolitan region. This site would most likely be an existing airfield that has the room to expand more easily than Logan. While that relocation process is not the core study of this thesis, this issues is discussed in following chapters. Meanwhile, the current Logan airport site would assume these new models of service that have been described in this section. Together this new multi-site system represents a new model of Aerotropolis.

On the Next Page: Long-Haul Aircraft like this Airbus A350 have the capabilities to fly from Boston to Singapore without stopping. This type of aircraft is being built today to last for many decades to come and has very little chances of being replaced by new technologies. Source: Business Insider


SINGAPORE AIRLINES
AIRBUS A350-900

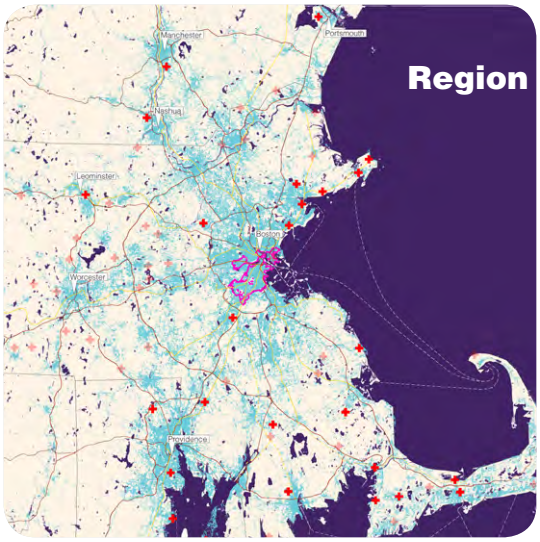
Chapter 3

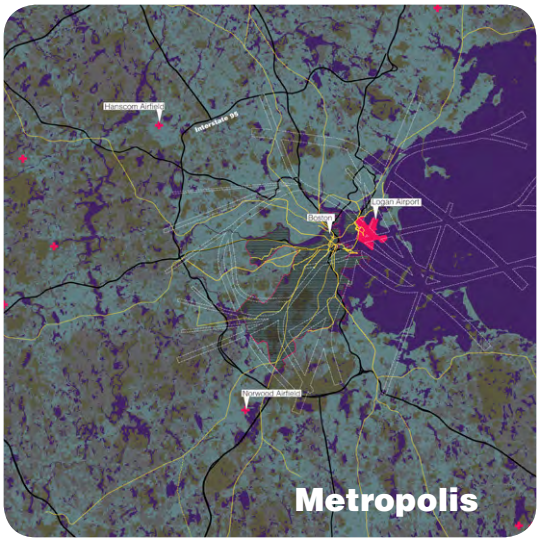
Six Scales of Spatial Inquiry

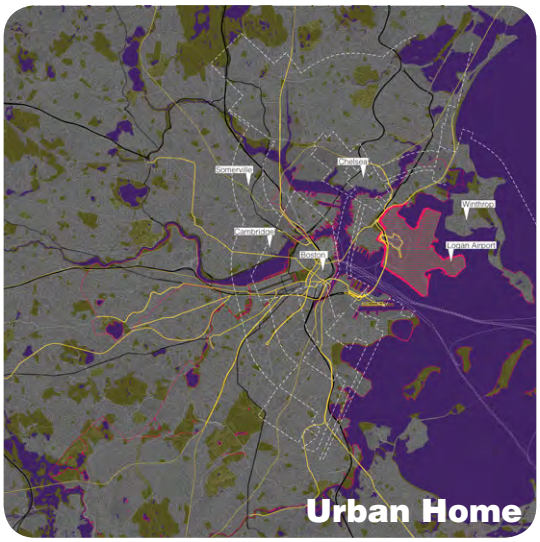
This section utilizes six scales of thinking – global, macro-region, direct region, metropolis, urban home, and the site – to uncover issues and opportunities related to the physical, economic, and social context of Logan Airport. Each scale utilizes a synthesized map and a brief description to discuss various topics that arise at each scale.


Global


Macro-
500 Miles Radius


Region
Manchester
Portsmouth
Nashua
Leominster
Boston
Worcester
Providence


Hanscom Airfield
Interstate 95
Boston
Logan Airport
Norwood Airfield
Metropolis


Somerville
Everett
Watertown
Cambridge
Boston
Logan Airport
Urban Home


The Site

Six Scales of Spatial Inquiry

To understand and propose large scale urban change, context it critical. This project utilizes a multi-scaler approach that examines the physical, social, and economic surroundings of the Logan Airport site as a means to both justify the proposal and to guide the direction. Six scales, starting from the Global and working down to the Site, frame the issues and opportunities that are further explored through design and planning.

Each scale was chosen based on an understanding of the functional systems that this proposal must work within. The **Global Scale** is defined by the economic and aviation relationships that Boston has with the rest of the world. Physical connections through direct flights assist with the exchange of culture and people. Moving down in scale, the **Macro-region** is defined roughly by a 500 mile radius around Boston and comprises many of the major cities on the East Coast. At the **Regional** scale several metropolitan areas from Providence to Manchester create the urban agglomeration that currently supports Logan International Airport. At the **Metropolis** scale physical issues begin to emerge and the precise location of the Airport site become more important. Even smaller, the **Urban Home** situates the Logan site as a major geographic feature within the city and the surrounding area. Finally, the **Site** scale reveals the infrastructural and physical relationships that the airport has to its direct surroundings.

At each scale, consideration was given to both the existing conditions as well as the future sceneries based on the explorations in technology and economy in previous chapters. Transportation, economic flows, social and cultural conditions, and environmental concerns were all studied resulting in a series of takeaways at each scale. While the design and planning intervention happens mostly at the Site scale considerations of larger system changes result from the findings in this analysis.

As a different model of Aerotropolis is considered, physical changes to the varies systems at play must be considered. In the following section each scale is discussed, both in terms of the issues that exist as well as the resulting proposal's considerations.

On the Previous Page: Six-Scales of Inquiry demonstrates the various opportunities and constraints that exist for future planning and design interventions. Each scale corresponds to considerations of transportation, social systems, economic considerations and environmental concerns.

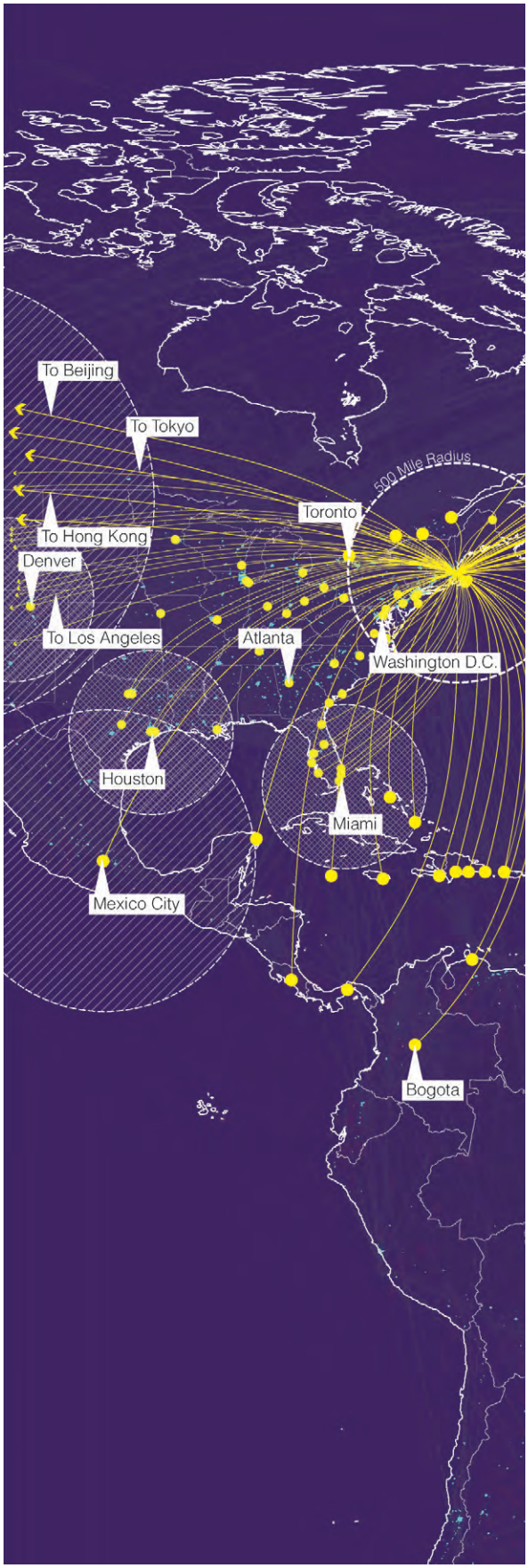
Global Positioning

Logan Airport is a portal to many international destinations in Europe, Asia, and the Middle East. These connections support the robust innovation economy that exist within the city. Concentrations of higher learning facilities and the proliferation of technology companies means that Boston holds high economic hopes for the future.

Potential connections to other growing metropolises in South America, Africa, and the Middle East also strengthen the importance of Boston on the global stage.

With this in mind it is critical that Boston's international air presence must maintain a level of service that does not stifle any increase in global demand. As direct long-haul flights and supersonic travel become a daily reality, Boston must be able to absorb these new services. Increasing the capacity of international services will mean that Boston does not loose out to other East Coast Airports such as New York's Newark Airport which currently serves a much larger share of international travel. Logan, currently struggles with supporting larger planes, and has limited capacity for expansion to service new technologies such as Supersonic travel. What this means is that there will need to be investments made to the existing site that would likely be impossible due to spatial constraints.

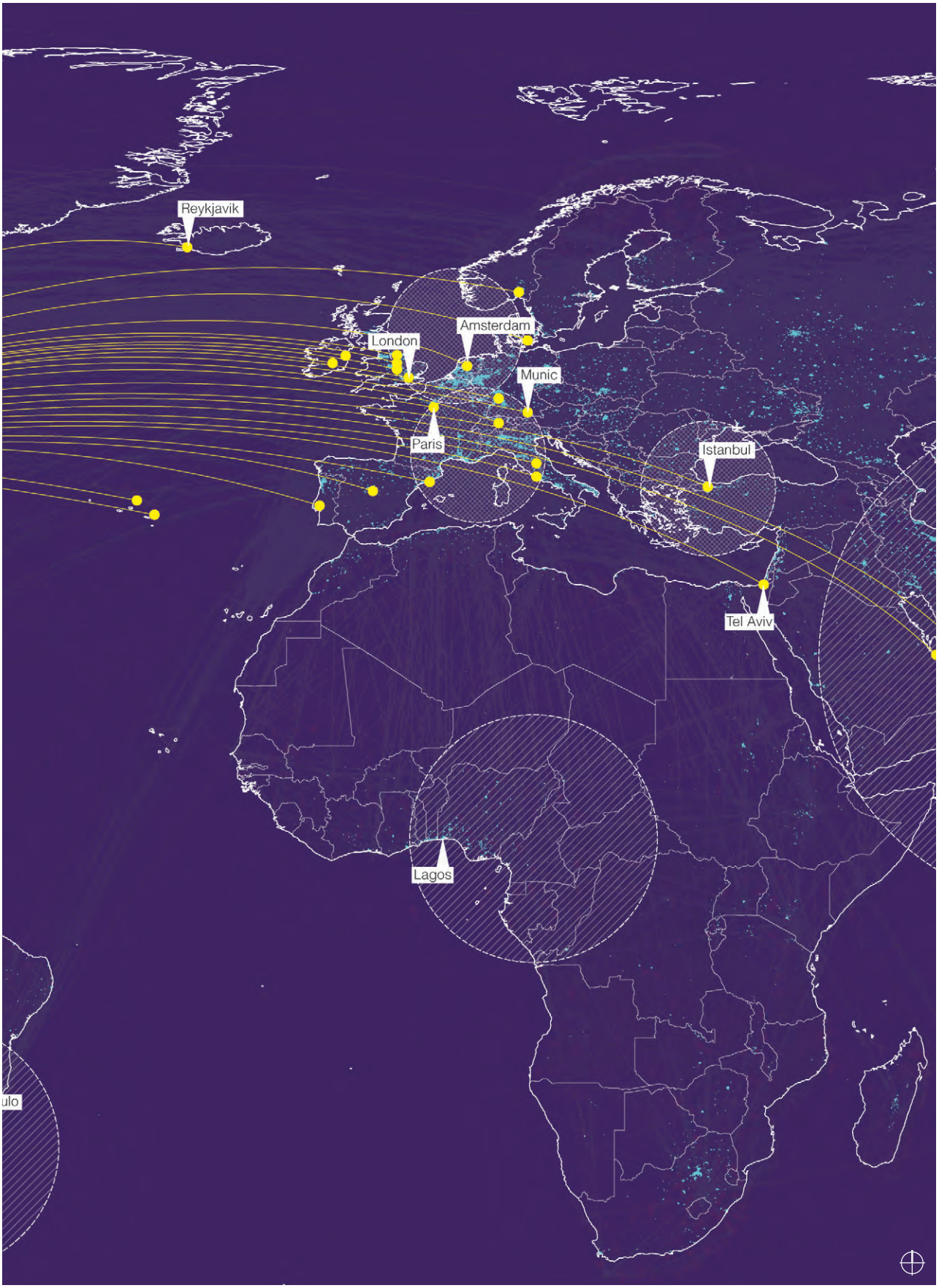
These concerns arise in the reality of an increased globalized economy.



Urban Areas

Current Destinations

Growing Urban Centers

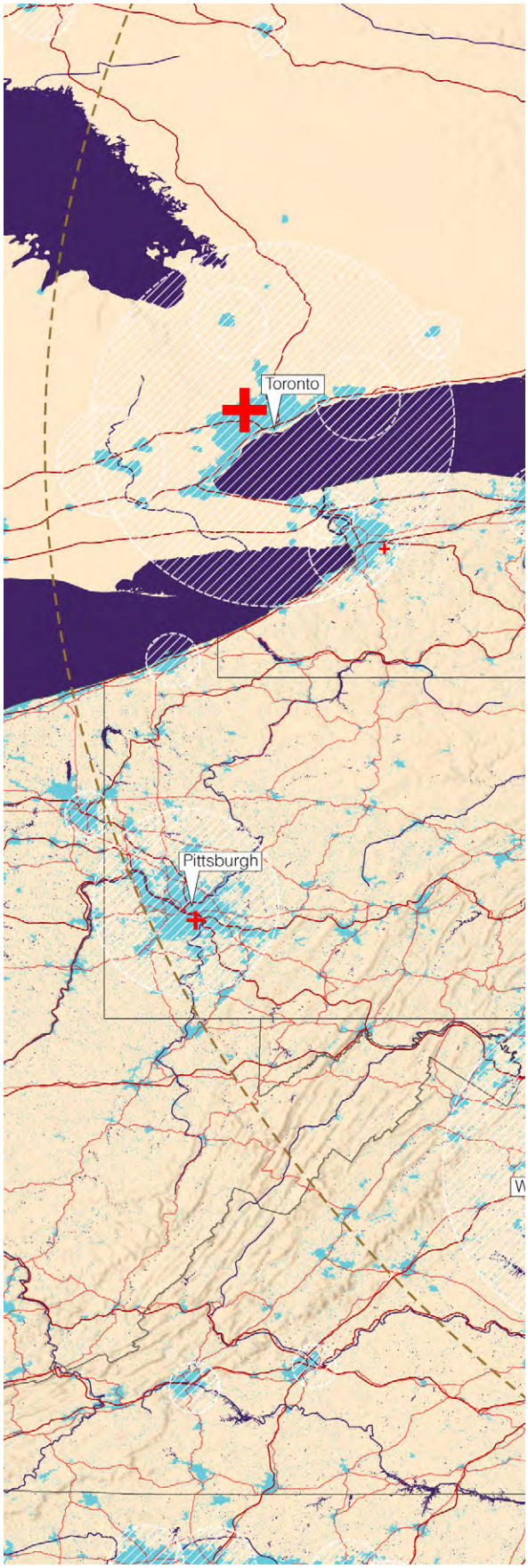

Reykjavik
London
Amsterdam
Munic
Paris
Istanbul
Tel Aviv
Lagos

The Macro-region

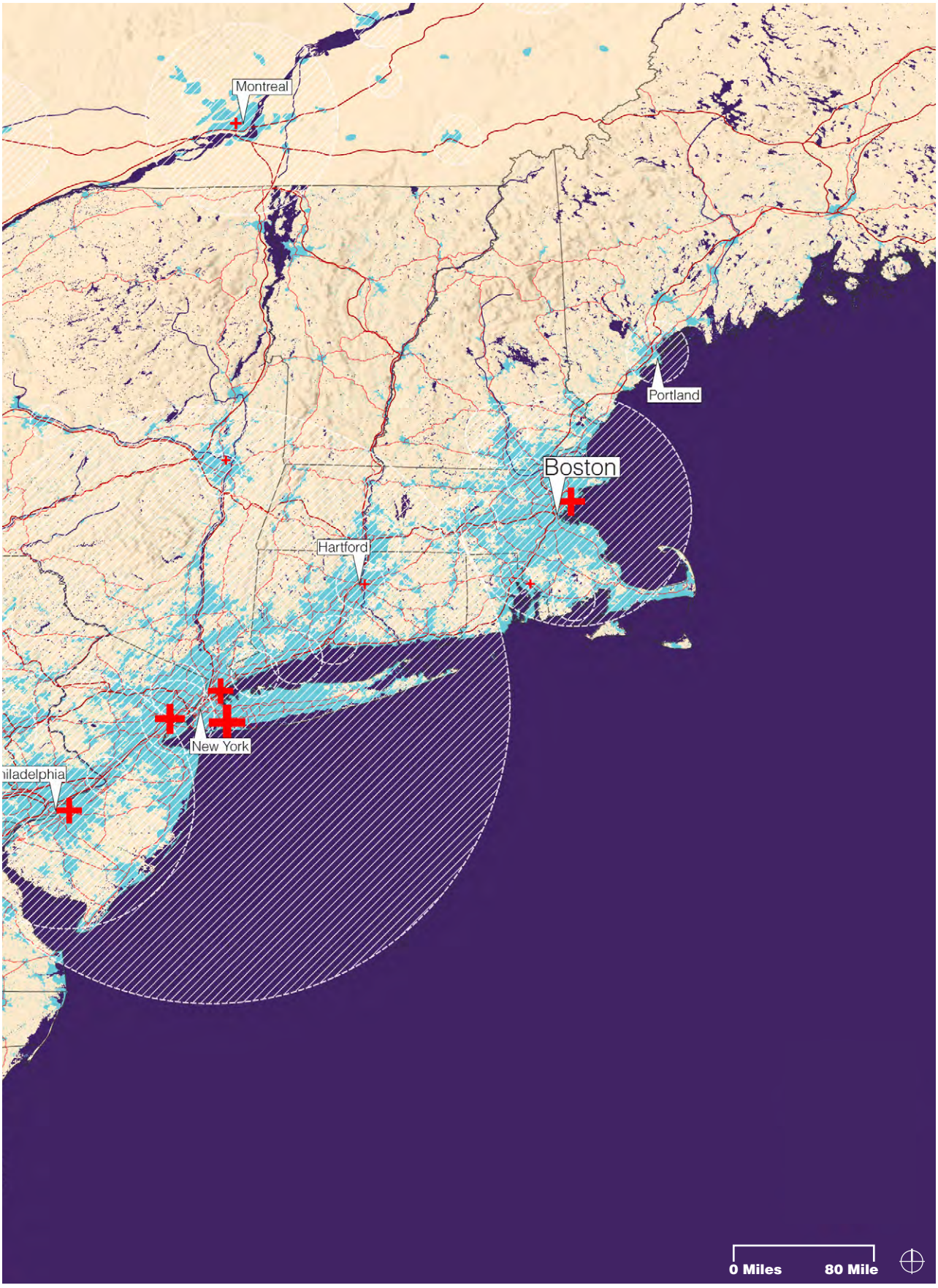
Roughly 90 Million People live within a 500 Mile Radius of Boston, with many more millions living within a 700 mile radius. These dimensions correspond to the projected technological limitations that have been discussed in previous sections. This density of people make new forms of air travel highly relevant for the East Coast. Connectivity between these cities is, and will, remain critical in the future as urban agglomeration concentrates more and more jobs into these existing urban centers. Currently the East Coast shares numerous cultural and economic connections. Any future proposals for large scale urban change should take into account this macro-scale perspective, taking advantages of knowledge and goods sharing.

While debate on better regional rail networks has raged on for many decades, the built out nature of the east coast will remain a barrier for new ground connections. The new technologies that have been proposed utilizing smaller, more regional aircraft have the capabilities to link cities up and down the east coast from Washington D.C, Philadelphia, New York, and over to Pittsburgh and Toronto.

This proposal recognizes the significance of these connections, situating Boston as a city that can take advantage of these new technologies.



Water
Interstate Road Network
Rail Network
Urban Areas
Major Airports
Relative Population Size

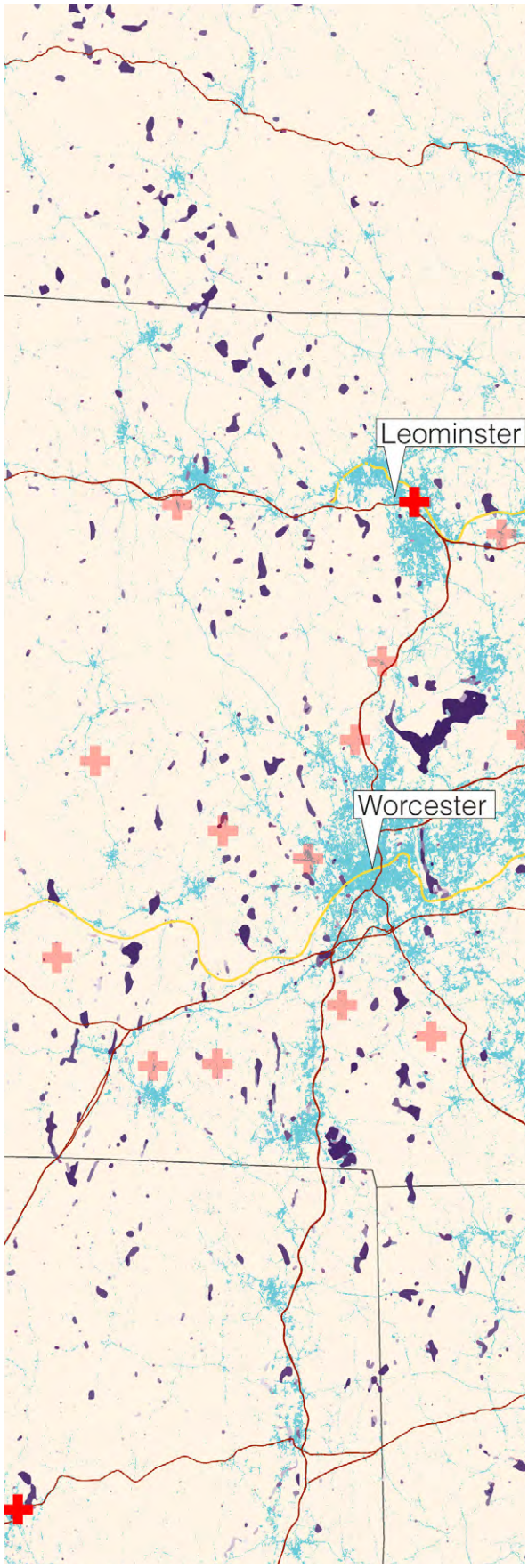

Montreal
Portland
Boston
Hartford
New York
iladelphia
0 Miles
80 Mile

Direct Region

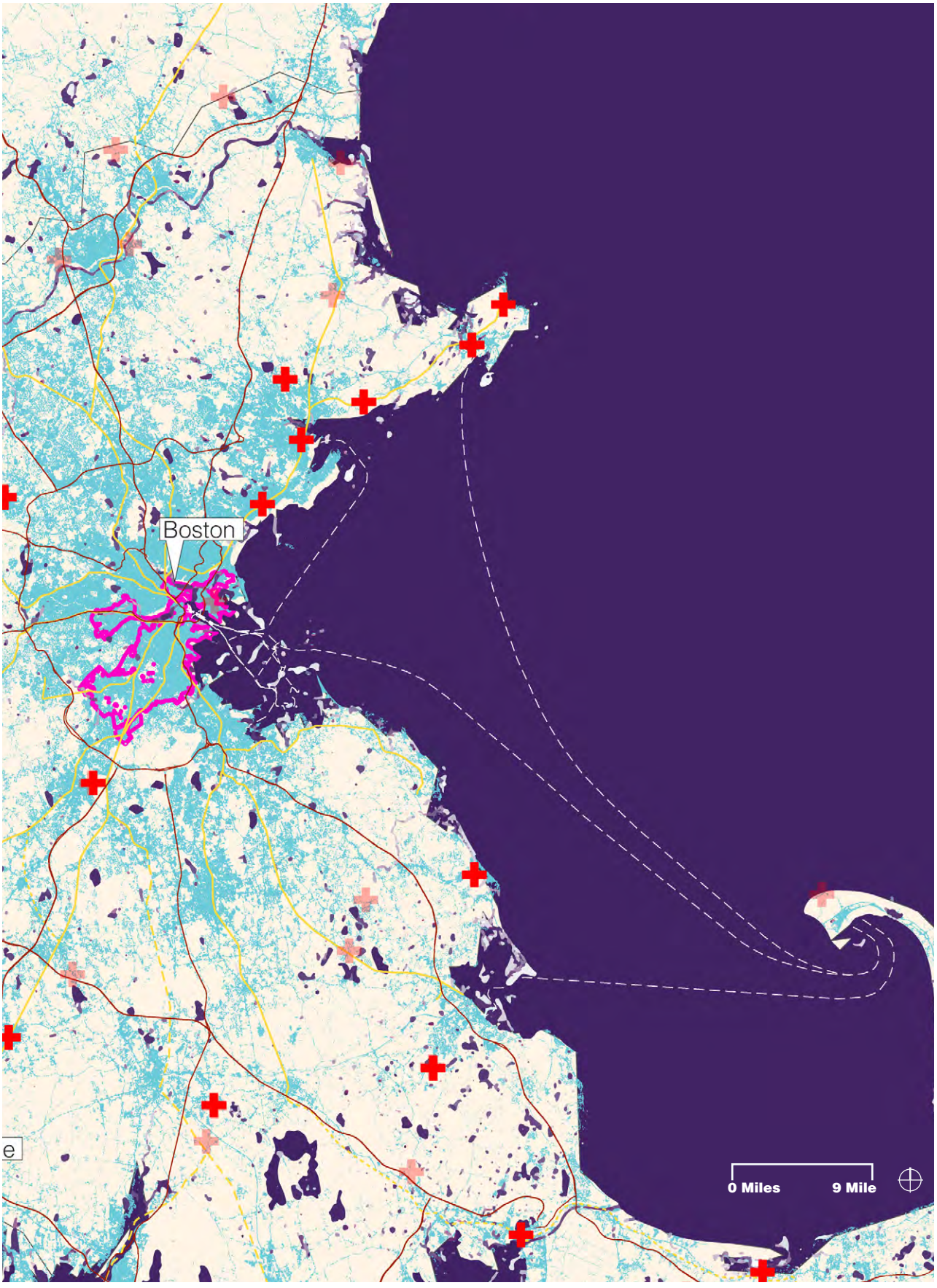
At this regional scale the conglomeration of metropolitan areas that provide for Logan Airport's current demand are present. At this scale the location of major airports is determined by access via existing transportation systems, adjacent land uses and environmental impact. One of the fundamental assumptions of this proposal is that long-haul air travel operations would move to a different site within the Boston Metro Area.

In this region, international travel and cross-country travel draws from Providence to Manchester and west to Worcester. Within the metro area, there are several candidate sites that meet the criteria to assume some of the operations of the Logan Airport site. Those criteria are existing airfields with direct access to existing highway infrastructure, potential access to mass-transit infrastructure, relatively low population density, space for large aircraft operations and a central location which allows for the same, if not better access to the largest number of people. When reviewing these criteria both the Norwood Memorial Airfield and the Hanscom Airfield meet the test and could offer suitable alternatives.

It should be noted that a decision like this has very large political implications. While that is not the focus of this thesis exercise, the externalities of this project are discussed in later chapters.



City of Boston Boundary
Water
Major Road Network
Mass-Transit Lines
Ferry Service
Urban Areas
Regional Airports
Other Airfields

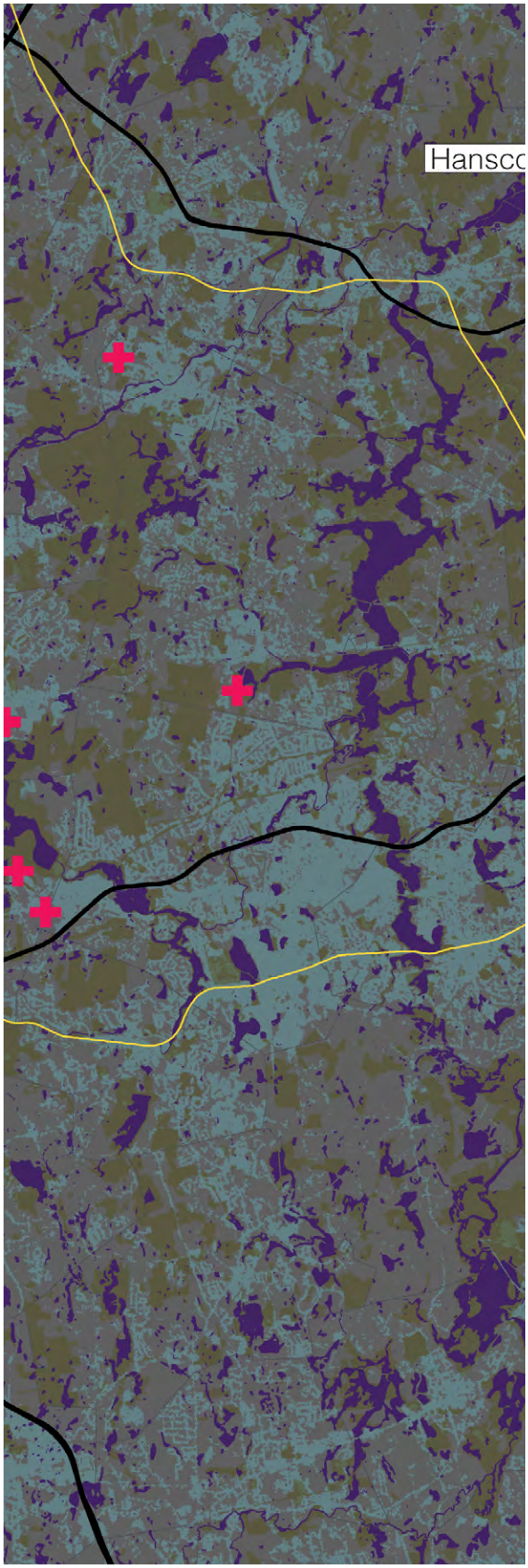

Boston
0 Miles
9 Mile

Metropolitan Area

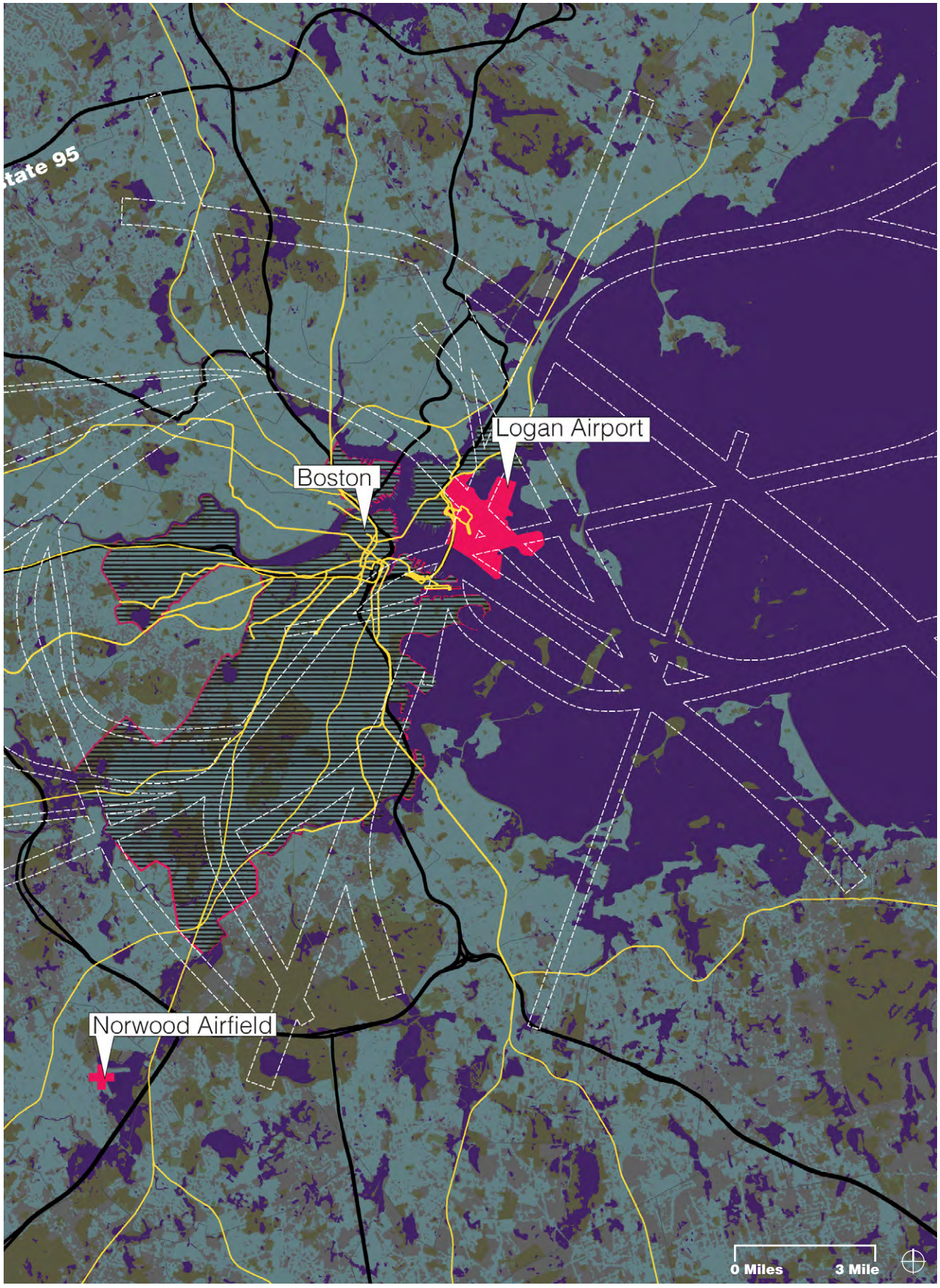
At the metropolitan scale the issues associated with the current Logan Airport Site begin to unfold. Additionally, an understanding of how the site, and potential locations for a new airport site are situated within the larger urban context is visible. These two aspects drive much of the logic associated with this proposal.

One of the main issues associated with urban airports is the noise. In recent decades, MassPort has taken great effort to consolidate flight paths to the most logical places in order to reduce the extents of the noise contours. While these efforts have moved a lot of flights over the water, over 50% of the flight take paths that must fly over the most densely populated neighborhoods in the region. While certain advancements in navigation technologies and engine performance will help, the issue will remain a major aspect of the ongoing management of the Airport site well into the future.

With the location of an additional airport site, access it critical. The existing highway infrastructure and existing commuter rail corridors could service both Norwood Memorial Airfield and the Hanscom Airfield with relatively similar convenience with certain upgrades. This could reduce overall noise complaints with the new Logan Airport typology only servicing new-age quieter aircraft over the densest areas of the region.



City of Boston Boundary
Water
Major Road Network
Commuter Transit Lines
Mass-Transit Lines
Existing Airfields
Concentrated Flight Paths
Conserved Park Space


tate 95
Logan Airport
Boston
Norwood Airfield
0 Miles
3 Mile

Urban Home

At the Urban Home scale several issues arise with the current location of the Logan Airport site. Additionally, the size of the site in relation to downtown Boston is evident.

One of the negative externalities of the current airport location is one that is not immediately noticeable but has huge implications on the surrounding urban fabric. The Federal Aviation Administration maintains height regulations for structures around airports. Around Boston, this has been a constant struggle for real estate developers and city planners who have tried to build out areas within the flight paths. While downtown Boston has been somewhat grandfathered in its 1000' height limit still makes certain complex sites not financially feasible for development. In areas surrounding the downtown core such as the Seaport, Suffolk Downs and many other areas that have seen increased development pressure major limitations on height have stifled development not allowing for the density that the market might demand.

From a positive standpoint, any redevelopment that is proposed through this project benefits from amazing transportation connectivity and a stunning geographic location. However, care must be given to ensure that development is respectful of the surrounding communities of East Boston and Winthrop which are very different than the downtown core and adjacent areas in terms of demographics, economic standing, and physical urban form.

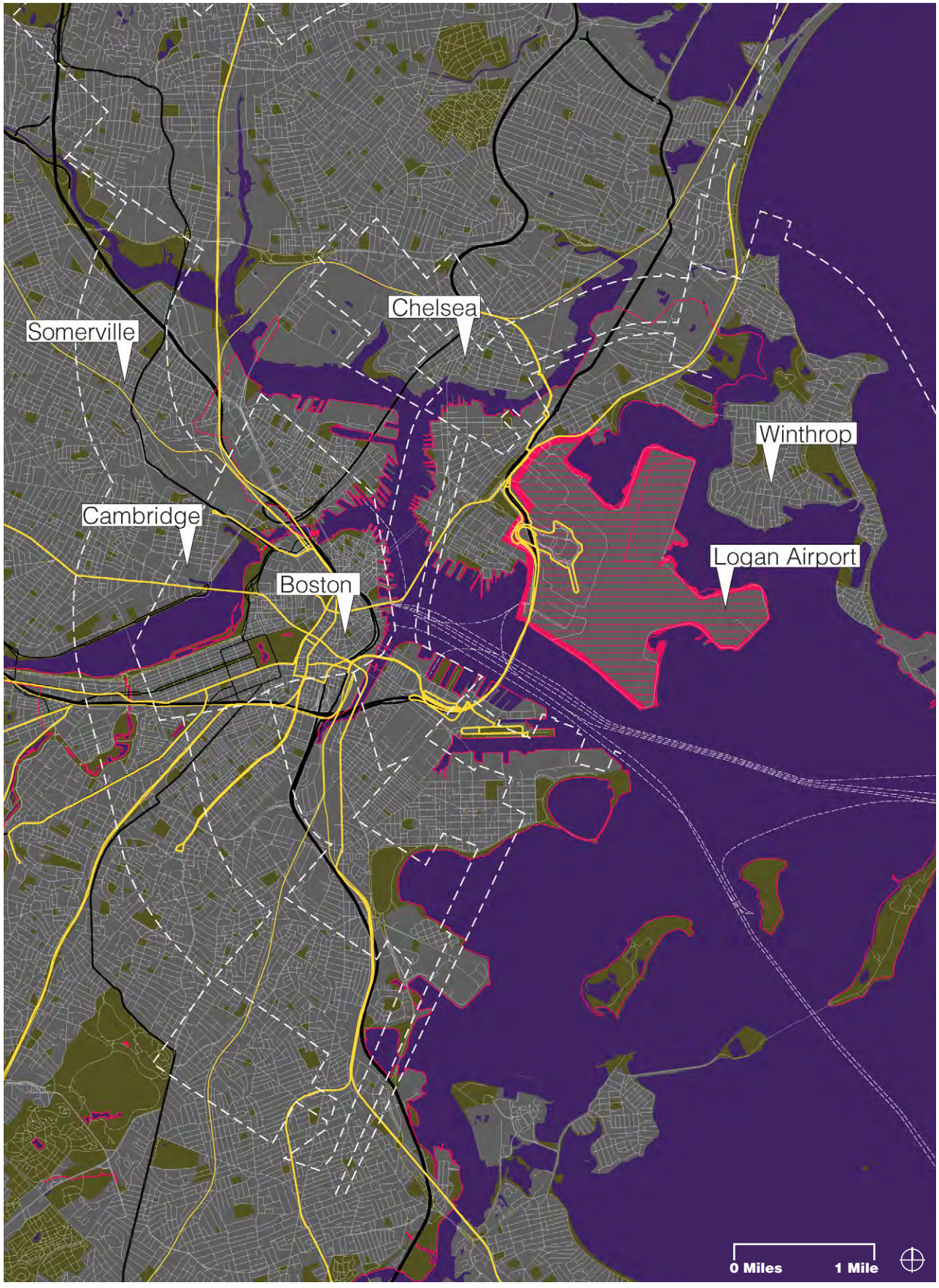
City of Boston Boundary

Water

Major Road Network

Mass-Transit Lines

Build Height Contours


Somerville
Chelsea
Winthrop
Cambridge
Logan Airport
Boston
0 Miles
1 Mile

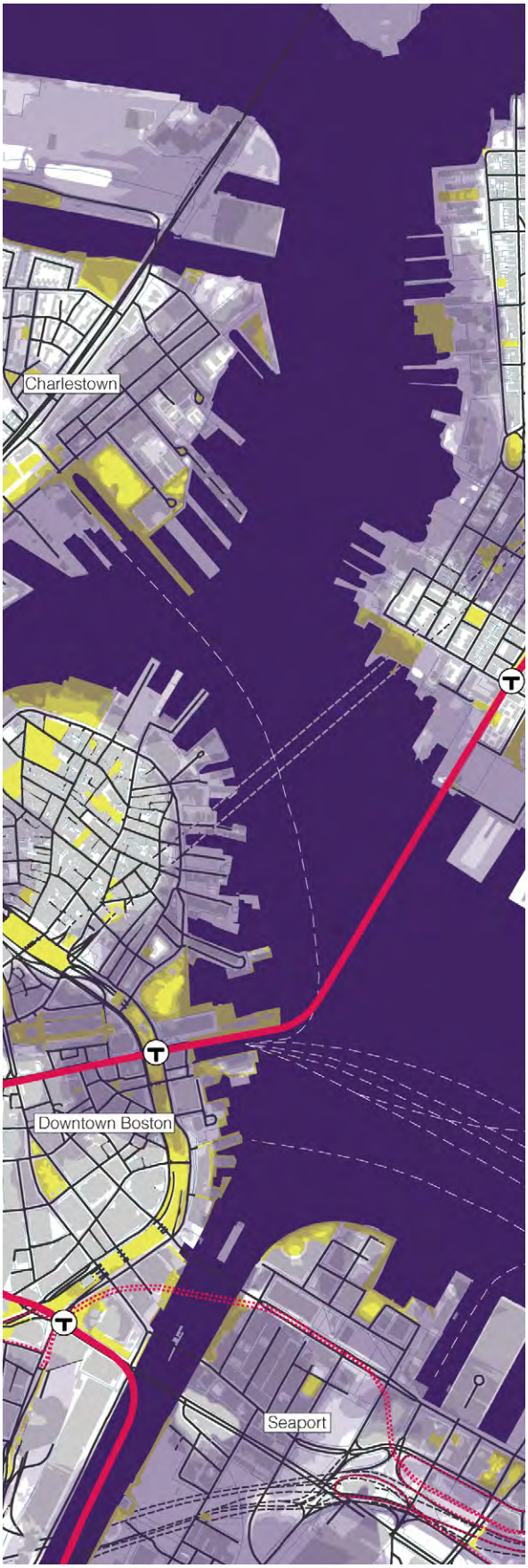
The Site

Finally, at the urban scale the juxtaposition of the airport with the surrounding urban community is evident. Additionally, at this scale the environmental concerns of sea level rise emerge with large portion of the site expected to be inundated in this century.

With such a long term plan, projection is necessary. Numerous studies have found that in several decades airport operations would be impacted by sea level rise and storm surge with almost all of the site seeing issues towards the latter part of this century. Any proposal must take that into account offering means of protection and new urban forms that work with water.

Additionally, the levels of population density adjacent to the airport are almost unparalleled with only New York's La Guardia airport having more people within a one mile radius. This begs the question of equity and environmental justice. Furthermore, the existing site has virtually no room for expansion or adjustments given its surrounding urban fabric and other geographic conditions.

At this scale the opportunities for urban redevelop and ecological services manifest themselves. Connecting to existing street networks and urban scale, while taking advantage of existing transit corridors and stations could work in parallel with the expansion of ecological functions such as the tidal marshes. These unique geographic conditions begin to drive the design response.



Park Space
Water
Major Road Network
Mass-Transit Lines
Sea Level Rise/ Storm Surge
Ferry Network


Interstate 90
Terminal Buildings
Shipping Buildings
0’
1600’


ATLANTIC OCEAN
REVERE
WINTHROP
LOGAN AIRPORT
EAST BOSTON
BOSTON HARBOR
SEAPORT
DOWNTOWN
SOUTH BOSTON
SOUTH END

Making the Spatial Case

This proposal departs with two major points. In the future decades major portions of the current Logan Airport functions should be relocated to another site within the metropolitan area and in its place a new form of urban airport should exist with associated new urban neighborhoods. While those two concepts will be explained further in later chapters it is important to define what this multi-scaler spatial analysis has revealed.

On one hand it has become evident that this site could serve as a place for major expansion of Boston offering massive amounts of space for new housing, commercial and industrial uses. The shear size, proximity to existing populations, multi-modal connectivity, and geographic location offer an amazing opportunity. What would this look like if the airport wasn't there? However, that is not the whole question. Given new forms of air travel associated with changes in technology this site offers a unique opportunity to imagine the aerial neighborhood of the future. The same benefits for a more typical redevelopment exist, with Boston's unique spatial and economic context offering even further justification for this thought experiment.

On the other hand, for this proposal to work another site would need to absorb the services that have been described in previous chapters are not changing. This requires a suitable site within the metro area that has the size and connectivity opportunities. It has been demonstrated is that there are two sites that can be seen as easily suitable given the existing urban form. Additionally a logic must be constructed that provides enough evidence of negative externalities of the existing site to warrant this move. When added to the benefits of redevelopment the various nuisances such as noise and height restricts offer a reasonable justification for this move.

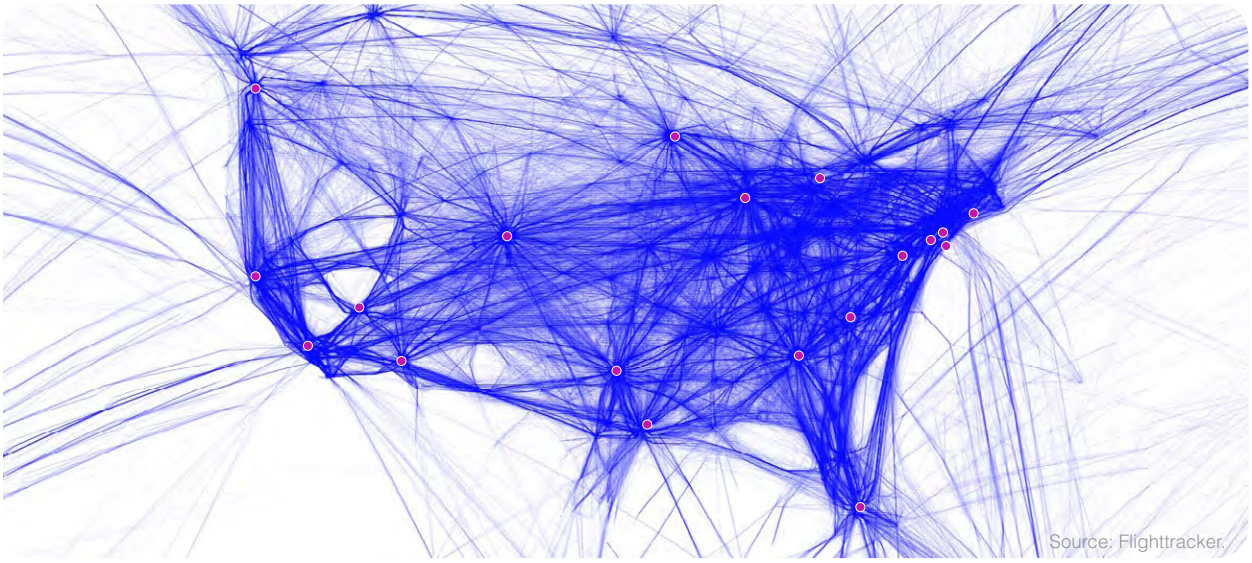
Given both the positive benefits of redevelopment and its associated externalities as well as the negative constraints that the current site has a new potential is worth exploring. While this thesis is speculative in nature this chapter has demonstrated a real world logic for the proposal. In the next chapter a further exploration for how the Logan Airport site compares to other airports in America as well as future trends in the industry further justifies this logic of move and adopt.

On the Previous Page: The existing Logan Airport site and its geographic context surrounded by water and existing urban fabric.

Chapter 4

Lessons from Precedents

This section places Logan in context to other large airports within the United States and other major airport development projects around the globe. Additionally, a historical understanding of how cities have dealt with changing infrastructural demands on large central sites is presented. This analysis is meant to provide a framework for how we should understand the Logan site in its physical, economic, and typological context.



Source: Flighttracker.

Source: Changi Airport

Source: Nordhavn

Three Types of Precedent Projects

To understand the physical, economic, and typological context of the Logan Airport site is to understand what is possible and why it is important to think about it. This precedent analysis expands the idea of Logan as an island of aviation operations. Instead it considers the Logan site as a part of a larger physical and temporal system. The study employs three precedent considerations through the below questions:

1) How does Logan Compare spatially and demographically to the other top 20 busiest airports in the country?

This question places Logan into its spatial context, which is both unique and prototypical. It is unique in that out of other major airports, specifically in the United States, Logan is substantially more urban. This means that it is smaller, more constrained and closer to larger population centers than most major airports. It is prototypical in that there are other important airports, like New York's La Guardia or San Diego International, that fall into a similar category.

2) What is the global trends in airport infrastructure construction?

This question grounds this entire inquiry in an understanding of what other cities and other airports are considering as they plan and build their future. A global approach is taken here because the United States has not seen as substantial investments in aviation and airport infrastructure as other places around the world. Particular focus is placed on geographic

On the Previous Page: Three types of precedents that have been analyzed are: (Top) Twenty Busiest Airports in the Country, (Middle) Current International and National Airport Projects, and (Bottom) Large Scale Industrial Land Redevelopment Projects

Given Logan's urban context and the changing landscape of airport infrastructure there is a need to think about the future of the site and how it interfaces with the surrounding community and the region. Global trends and historic precedents from other infrastructural typologies offer a loose framework for how to think about these issues.

location, connections to the city, economic positioning, and technology. Many of these precedents support the economic and city model of Aerotropolis in which cities are more increasingly relying on there global connections for economic growth.

3) How have other cities planned for future central infrastructural transitioning or re-purposing?

This question looks to the past for answers. The basic premise of this thesis is that Boston and the Logan site will need to adapt to changing demands and shifts in technology. Since there are not existing precedents for this future scenario, proxies are used. The port lands of the 20th Century offer many lessons on how cities plan and implement ambitious city changing ideas for large centrally located infrastructural sites.

More typical airport redevelopments in which the entire operations were moved were specifically not chosen as there is more similarity to adapting port lands in which there are ongoing operations than to full-sale switch in use.

How Does Logan Stack Up with the Top 20?

In order to ask how might the site of Logan Airport change over the next half century it is important to understand how Logan compares to other major airport sites within the United States. Is there something that makes Logan ripe for change?

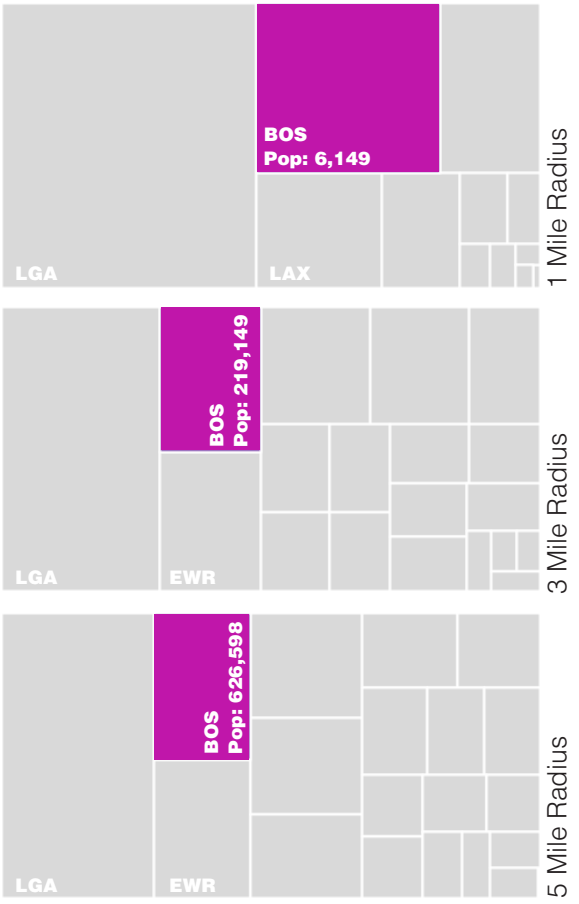
A spatial and demographic study of the top 20 busiest airports in the U.S. reveals that Logan Airport's relationship to its major metropolitan hub is unique amongst other major airports. Out of these twenty airports Logan (1,760 acres) is three times smaller by acreage than the average (5,217 acres) site. What is even more striking is Logan's spatial relationship to the downtown core of Boston, which at one and one half miles (straight line distance), is seven times closer than the average airport from the city center. These spatial conditions result in increased issues such as noise complaints, limited expansion opportunities, and operational restrictions.

Additionally, there are issues from the city side. Out of the 20 airports analyzed within this study, Logan has the second highest population numbers within a one, three, and five mile radius of the airport despite being surrounded by water, often a chief argument for the location. While these individuals are subjected to noise, traffic, and depressed land values there is an additional physical impact on building heights of the surrounding city which has been discussed previously within this thesis.

Since Logan represents an extreme example of so many issues related to maintaining urban airports it represents a perfect case study for how we might think about the role that such sites play in the future and the changes that will become possible for other urban airport sites around the country and around the world.

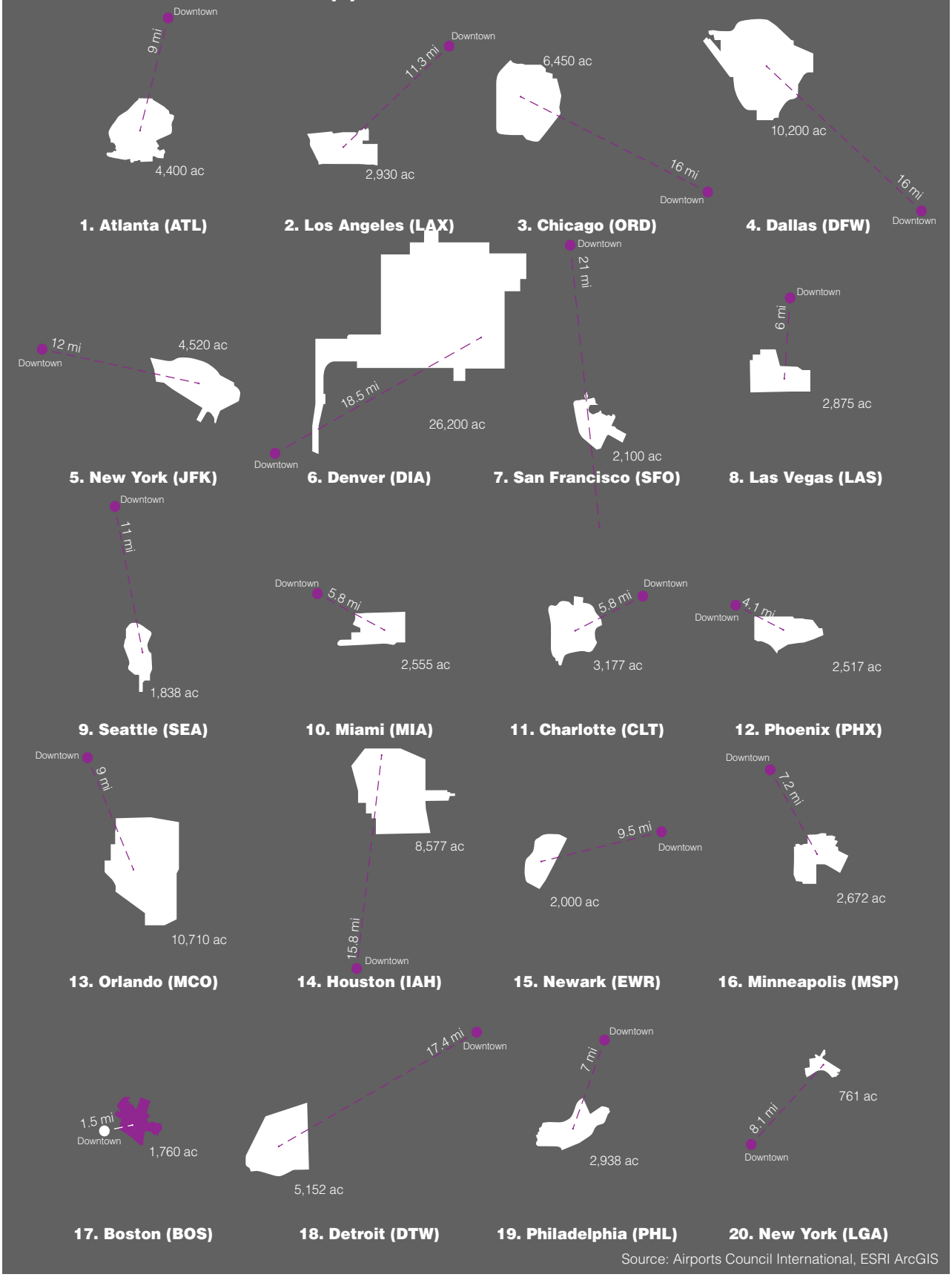
Logan is unique. It is the second smallest site, with the second highest number of people living in close proximity to its borders out of the top twenty busiest Airports in the U.S. Also, it is seven times closer to the city center than the average site studied.

Population Comparison By Radius



Source: American Community Survey, 2012-2016

Size + Distance to Downtown(s)



Source: Airports Council International, ESRI ArcGIS












What is happening around the world?

Air travel is up. More and more people are, and will continue to, move around by airplane both regionally and globally. To respond to this growing demand and to compete for the piece of economic pie that comes with it, cities around the world are upgrading their airport infrastructures. But what does this look like? And, what does it have to do with Logan?

A broad international inventory of current airport projects revel several things. The first is that Asia and the Middle East are rapidly upgrading their infrastructure for air travel. This includes giant multi-billion dollar airports constructed on artificial islands, new rapid mass transit services and entire cities being built around these new global ports. That last point demonstrates the second observation. Airports are no longer seen as simply portals to an airplane but rather destinations and experiences within-and-of themselves. These new amenity rich economic centers are being constructed as part of a larger ecosystem of urban services, industries and experiences. The third element that this inventory reveals is that airports are getting bigger. Even in Europe which has similar growth rates in the aviation market, airports are expanding to meet the growing demand as cities realize that aerial access is the key to participating in the globalized economy.

While, most of these new facilities are built from scratch in a modernist approach with entire new cities planned around them there are numerous examples of expansions of facilities in which there is room to grow. At first glance some of these projects seem ambitious beyond practicality; however, they are not too different from what many American and European cities did in the middle to late parts of the 20th Century.

The question that this inventory uncovers is one that Kasandra eludes to in *Aerotropolis: The Way We Will Live Next*. What about cities that have geographically constrained airport sites that have not relocated since their initial conception? Many cities with such a condition have added additional airfields into the system or have considered moving their airports

How could changes in technology nudge a change in the way Massport manages its Boston metropolitan airfields to continue to services Boston's global economy well into the future.

On the Previous Page: A snapshot of major airport infrastructure projects from around the globe. The the trend is expansion. From left to right and top to bottom: Singapore; Bejing, Dubai, Ho Chi Min, Newark, Manchester, Icheon, Istanbul, La Guardia, Warsaw, Sydney, Hong Kong. Sources: Varies

How Have we Transformed Before?

The nature of speculating on a future of an urban environment based on events that have not yet happened requires the development of proxies for precedent analysis. In this case, four waterfront industrial sites of considerable scale have been chosen that have similarities to the Logan Airport site. While each of these projects is different in its own right, they all have lessons learned for how a city might undertake ambitious development goals for long-term plans that can be categorized in four themes.

Development Management and Governance Each of these four projects are managed by a separate public subsidiary solely focused on the redevelopment of these sites. These organizations provide increased maneuverability and maintain focus on the project over its long life cycle. All of these organizations are created through some sort of legislative measure that provides them with the needed authority to operate. These organizations are utilized to authorize land deals and figure out ways to finance critical infrastructures.

Construction Time Line and Sequencing The three projects which are under construction have reported build-out rates that have been much faster than expected which has been attributed to built up demand for these urban districts. To organize build out, each of these projects have developed some form of districting that has allowed for relatively complete neighborhoods to come on-line at once which has reduced the feeling that residents are living within a construction zone.

Sustainability and Resiliency Innovations While each project is unique in regards to specific innovations there are many overlaps including district energy, waste, and water management, requirements for individual building performance, integrated transportation networks, and provisions for nature. Additionally, sites adjacent to sea level have utilized "Warfts" to effectively raise the level of the grade to prevent future flooding.

Each of these sites in Malmo, Sweden; Copenhagen, Denmark; Hamburg, Germany; and Toronto, Canada demonstrate large city building exercises largely driven by the municipality, not private development.

Framework and Flexibility All of these plans have focused on a method of establishing a strong framework for development while allowing for market flexibility and adaptation over time. Many of the sites established minimum land use requirements that included built in flexible space allocations. The intention is that if the project stalls or is never complete at a given point, then the areas that have been complete can stand on their own.

The Human Scale Finally, every one of these projects has established human scale urbanism as a core goal creating dense, walkable neighborhoods that are rich in amenities and public spaces. Many have even used the term "5-Minute Neighborhoods". This demonstrates that even "city's of the future" are cities for people.

On the Next Page: These four projects represent major inner-city transformations that have been managed through creative partnerships to ensure the long-time horizon of development is not hindered by personal oscillations. This projects also anticipated changes that would happen and created proactive approaches to phasing that allowed for land transformation to not lag years or decades behind industry change.

Vastra hamnen | Malmo

Originally conceived as a means of transitioning Malmo from an industrial city to a knowledge city this development has become a model for sustainable housing and energy. In addition to the BoO1 area, the sites most iconic project the rest of the former ship building district has been transformed into a dense mixed use village with ample green space and connections back to the central city. One interesting aspect of this project is the means by which the city served as the master developer, with individual parcels and small project being taken down by different development and design teams.

Source: City of Malmo

Nordhavnen | Copenhagen

Visioned as the “sustainable city of the future” to be realized over the next 50 years, this area is already beginning to take shape on the near sides while active port operations continue further out. This project divides over 1,000 acres into a series of districts divided by canals and open space. The concept is to create a 5-minute city that supports a diverse population of up too 50,000 new people. Through early conversations with development partners the framework plan creates market flexibility within a larger vision. The first phase is currently under construction.

Source: City of Copenhagen

HafenCity | Hamburg

Representing 157 hectare, this development has increased the city area by 40%. The former industrial port lands have been repurposed as a fine grained mix use environment that has been built out much quicker than anticipated due to its success. Managed by a public subsidiary, this project has implemented to date space for roughly 45,000 new jobs and 15,000 new residents including many families. The entire development utilizes an innovative flood protection strategy and integrated open space that seamlessly integrates back into the existing city.

Source: HafenCity inc.

Port Lands | Toronto

Probably most widely known as Google’s first foray into city development, this area of Toronto has yet to see any major ground breaking. The project demonstrates how ecology can be a large driver of urban form as the Lower Don River is being re-naturalized and realigned as part of this project. Additionally, with a development agreement being signed between the City and Google subsidiary, Alphabet, many ideas related to, not yet market ready technology, are being considered as primary drivers of urban form. Finally, this project demonstrates how large tracts of publicly owned land can be redeveloped by a city.

Source: City of Toronto

Chapter 5

Point of Departure

This section synthesizes the research conducted in chapters one through four into a series of planning and design objectives that underpin the remaining proposal. While each design objective is derived from a specific understanding of how issues relate to the Logan Airport site, they are framed in the context of how they might apply to the urban airport as a typology found throughout the world.

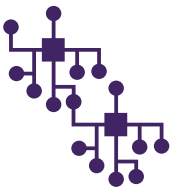
Design + Planning Framework

The resulting series of overarching planning frameworks and design objectives should be utilized to understand a conceptual model for how legacy urban airports should be treated by their host cities. While, these concepts are applicable to the larger trend, they have been specifically tailored to the urban design and development of the Logan Airport site that is described in the remainder of this thesis.

Based on the research presented in the preceding chapters an argument can be made that there will be a better use for the Logan Airport site than its current condition. Local issues - economic, social, and physical - as well as imminent technological change will create an opportunity to create a new urban form at Logan. This new urban typology is an evolution of its current state and not an abandonment of its current use. Rather then simply seeing legacy urban airports as a nuisance this thesis explores the opportunity of rebirth in the light of future possibilities.

The foundation of this proposal is a series of three larger planning frameworks and six urban design objectives. Together these nine foundational principles guide both physical form and policy approaches for achieving this future. Briefly described below, these concepts will be explored further in the remaining chapters.

Planning Framework #1 | Institute a Multi-Airport System



At the core of this proposal is the institution of a Multi-Airport system. This is not dissimilar to what many major urban cities utilize such as Chicago's O'Hare and Midway, Houston's George Bush and Hobby, and New York's LaGuardia, JFK, and Newark. The rational for this change is two fold. First, Logan is running at capacity and has very limited room for expansion. Efficiencies that will be gained from new air traffic control systems are marginal and will not out-pace growing demand. The second is due to the evolution in regional aircraft. These aircraft will function differently than the current model. Small vertical aircraft (VTOL) and medium sized extremely short take off aircraft (ESTOL) will require different airport maneuverability and in a physically limited site such as Logan this will be nearly impossible to accommodate. Additionally, as these types of aircraft are developed the companies working on this technology have imagined a much more dense and diversified landscape of air service touch points. This proposal anticipates this future and begins to establish the infrastructure for this new air service. Norwood Memorial Airfield and the Hanscom Airfield as demonstrated earlier in this thesis are identified as the most likely candidate for this second Airport within the System. While the planning of that second site is outside the scope of this project there is a brief discussion in later chapters.

Therefore, what is being proposed is that larger long-haul and international flight functions are relocated to another airfield within the metropolitan area over time to provide space for the roll out of these future technologies. In its place, on the Logan site, remains a local and regional airfield that is serviced by these new air travel functions. Together these sites will improve overall service and capacity. While a move of this magnitude would be an intense capital investment the subsequent redevelopment of the existing Logan Airport site could be utilized to generate revenues that could pay for improvements needed to the new airfield and any transportation upgrades that would need to be made such as extensions of rail services. In order to service these financial obligations and ensure implementation the next planning framework is defined.

Planning Framework #2 | Create a Governing Entity

With the institution of a Multi-Airport system the land required to run air services at Logan is greatly reduced. In its place a major growth opportunity exist for the city of Boston. Over 1,000 acres of land (larger that all of Downtown Boston) will exist for redevelopment as housing, commercial, industrial, and park lands. The magnitude of this development is large. Ten's of thousands of new residential units, tens of millions of new square feet of other development, and hundreds of acres of new open space is possible. In order to realize a vision for such an ambitious city building exercise it is proposed that a third party quasi-governmental entity be constructed to oversee this project. Examples of this can be seen on other larger scale urban redevelopment efforts that are equivalent in scale such as HafenCity in Hamburg.

The purpose of this entity would be to ensure continuity that a government entity or private party could not promise. Since the land is owned by Massport, transfers and sales or parcelization is greatly simplified. Additionally, an organization such as this would allow for a more simplified municipal accounting processes. This organization would essentially serve as the master developer and would act as a liaison between the City and additional private development entities that would be involved in a project of this magnitude. The managerial structure of an organization such as this would be made up of both permanent and elected board of directors including members that would represent Massport, the City of Boston, the State, surrounding community members, and others.

Planning Framework #3 | Build the City You Want to See

One of the key benefits of new development in Boston is the structure that has been set up that establishes linkage fees and other forms of payments that assists with city services. These policy mechanisms channel funds from private development across the city to targeted needs such as affordable housing and infrastructure. A project of this magnitude will establish a consistent revenue stream for decades. Prior to ground breaking, work would need to be done that ensures positive social benefit for the entire city through value capture mechanisms. These techniques would ensure that the impacts of this project reach beyond the boundaries of the site.

In addition to the positive externalities that could be created, particular focus could be placed on creating a model urban form due to the relative blank slate that would be the starting point. The publicly owned aspect of the land would allow for specific objectives related to environmental, social, and economic resiliency to be established before anything is constructed. Together the external benefits and the future site conditions can deliver a lasting legacy for the City that allows for growth while benefiting the existing city and her people.

Six Design Objectives

In addition to these three planning frameworks a series of six design objectives has been established. These six elements guide the physical form and operational structure of the urban redevelopment that is proposed on the Logan Airport site. These objectives are: **Anticipation through Phasing, Stitching the Urban Seam, Ecological Resiliency, Hyper Local Hyper Global, Interconnected Transportation, and People First**. Together these objectives guide the resulting plan which is intended to be process oriented and flexible meaning that certain ambiguities are built into the details. Each of the design objectives is born out of either detailed site conditions or larger economic or technological trends. Together they outline the urban design response that guides land use, transportation, public realm, infrastructure, and physical form decisions at a multitude of scales. Taken as a whole they establish a new vision for the Logan Airport site that is both locally and regionally significant, uniquely Boston, and resilient on multiple levels.

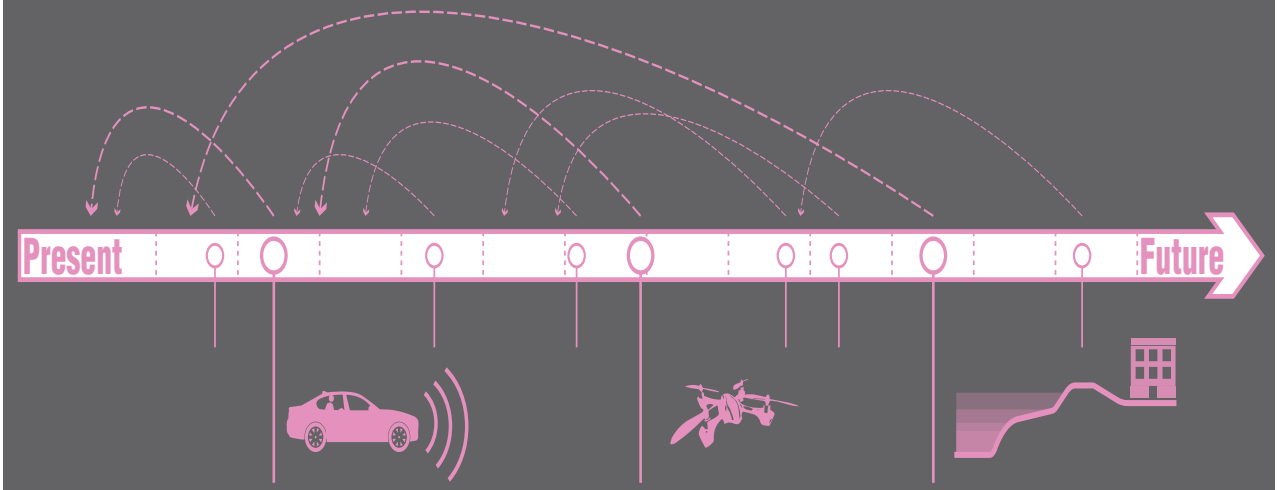
A more detailed description of each design objective is provided in the following pages. The physical implications of these design objectives is explored in later chapters.

Conclusion

Together these nine foundational principles guide both physical form and policy approaches for achieving this future. They establish the point of departure for the rest of this thesis which explores the detailed possibilities that exist given the conditions that have been described thus far.

On the Next Page: Logan Airport (2018) Source: Google Earth. The shear magnitude of the site in comparison to the Seaport and Downtown (on the left hand side) give an understanding of the potential of this site as a different urban form. Given its scale and context the site offers an opportunity to provide a diversity of urban form.


1 Mile



Design Objective 1
Anticipation Through Phasing

Obviously a redevelopment proposal of this magnitude would be phased over multiple decades. However, what is proposed here is more than just phasing based on market absorption. Rather, it lays out a proactive approach to city building that outlines quick wins that can serve the City today while setting up a framework for future conditions. Additionally, while most phasing plans for infrastructural repurposing start when the infrastructure is already obsolete this proposal establishes a path for successful and streamlined roll out of future technologies.

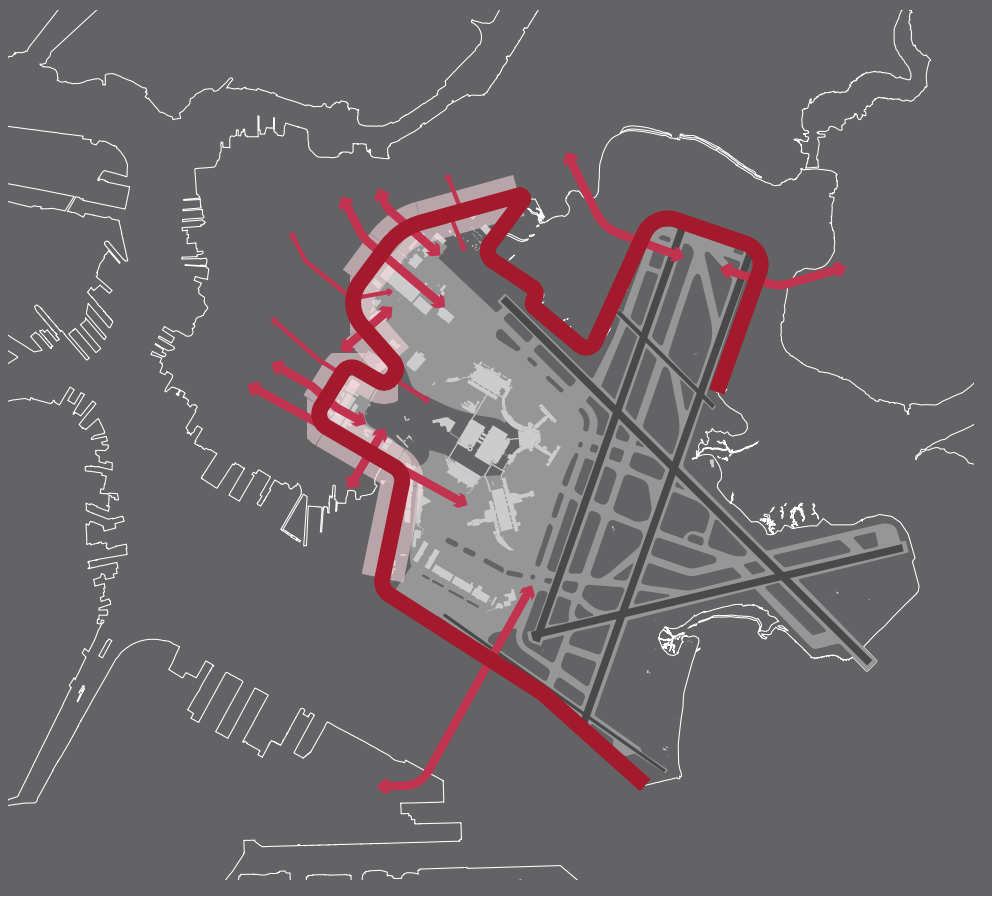
This process oriented approach establishes Boston as a testing ground for new ideas and places it at the forefront of the future of the aviation industry. Each phases creates a working urban ecosystem, acknowledging the fact that years and decades will unfold before substantial or full build out. To do so, systemic elements like infrastructure and ecology are weaved into existing functions, temporary uses are utilized, compact neighborhoods are established, and major moments are anticipated by removing barriers to implementation.

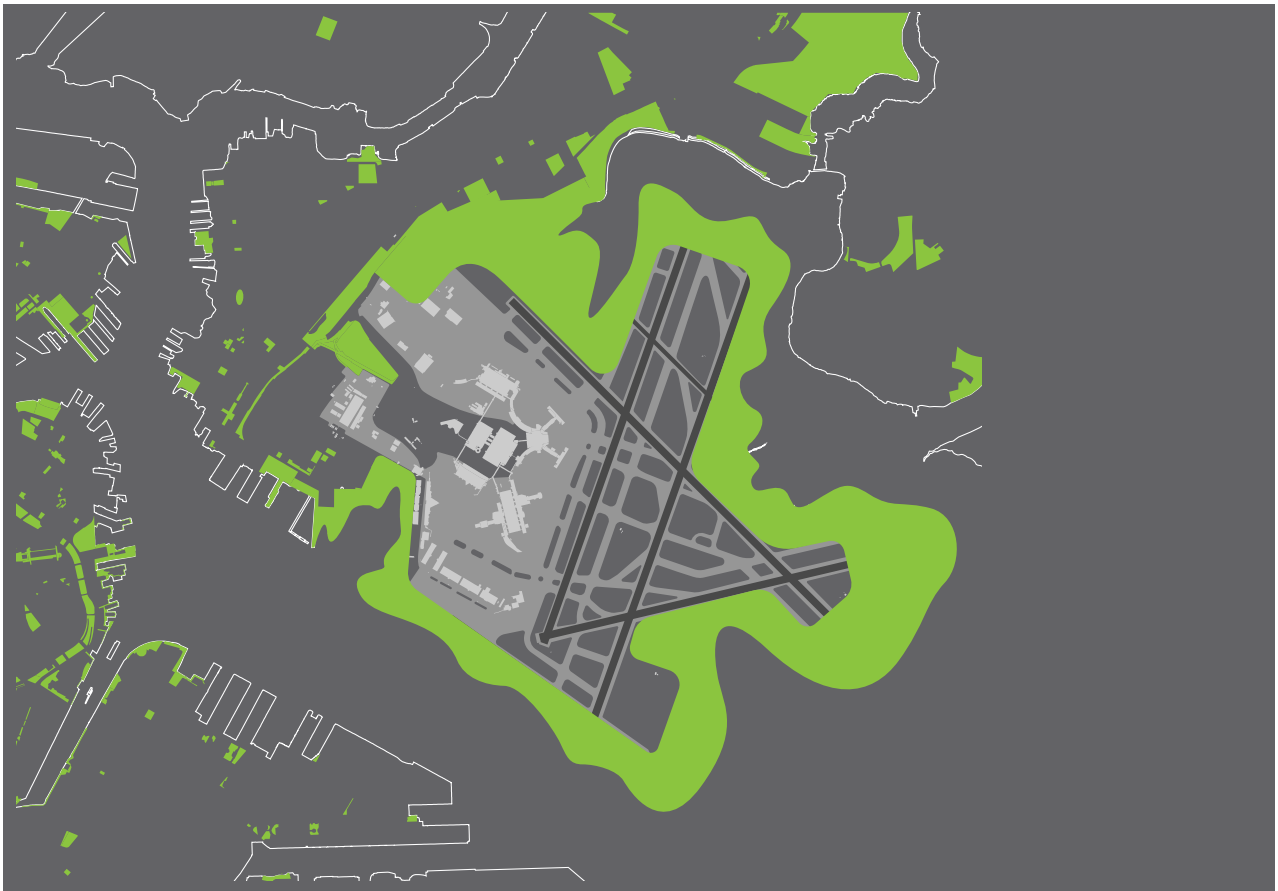
This phasing plan lays out a final vision but also a vision for each step within the larger process ensuring that the site is never a place waiting to be finished but rather a point in time of a functioning urban environment.

Design Objective 2
Stitching the Urban Seam

Right now the line between what is Airport and what is City is a harsh and strong line. On the airport side, support services like car rental facilities, parking structure, maintenance facilities, and hotels are isolated accessible only by shuttles driving in loops through a web of elevated roadways. On the city side abandoned buildings, underutilized parcels, and remnant chunks of park space turn there back to the airport and create a perceived no-mans land that jogs back and forth.

This proposal breaks down that barrier over time. Through strategic connections between city and site, land use changes, and more formal established urban linkages this proposal stitches the Airport site back into East Boston creating a seamless extension of the city. However, this proposal does not erase the line. A large portion of the barrier is a regionally significant part of the transportation infrastructure hosting the Blue Line (mass transit) and Interstate-90 which is a critical north-south connection and an important link between East Boston and the rest of Boston across the inner harbor. Additionally, this is a relatively new piece of infrastructure that was constructed as part of the Big Dig in the early portion of this century. Rather, this proposal works within this constraint by reducing the negative impacts and turning a constraint into an asset.





Design Objective 3
Ecological Resiliency

Sea Level Rise is of particular consideration on this site. Both in terms of short term protections and long term site viability this proposal ensures that ecological resiliency is at the forefront of the plan. As demonstrated in earlier chapters this site is susceptible to storm surges today and will be extremely vulnerable in the future. As such this proposal utilizes a three fold approach to resiliency.

The first is the establishment of a soft edge along the exterior of the site that serves as a first line of defense against storm surge. These ecological functions will transition into an extensive public space over time offering protection and recreation. Second, as the site is developed the effective ground floor elevation will be raised through the creation of warfts. At the same time strategic canals will be cut into the landscape providing fill material and creating an urban form that lives with the water that it is built upon. Finally, building an urban district from the ground up allows for the employment of sustainable infrastructure that is often precluded from infill projects. This includes an integrated and shared energy system, waste system, water system, and food systems.

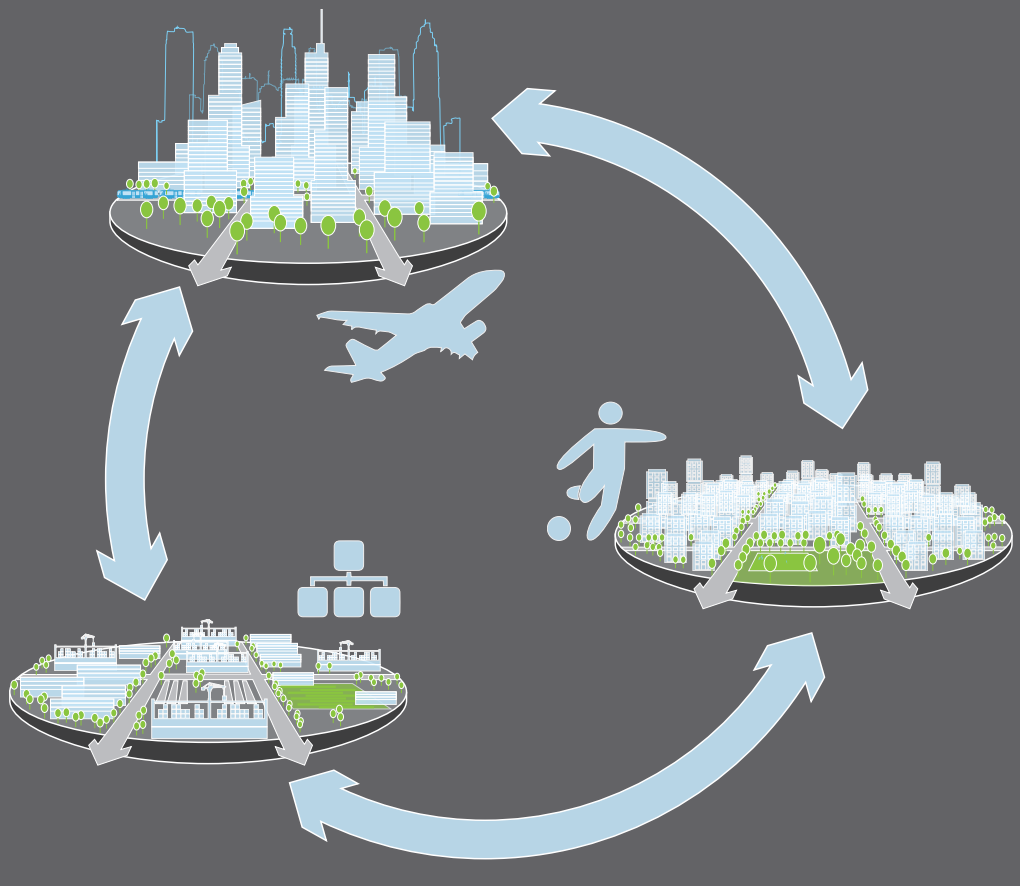
Together these systems will create a model for urban living that utilizes sustainability and resiliency as a foundational aspect.

Design Objective 4
Hyper Local Hyper Global

The concept of building an urban neighborhood centered around aerial travel is rooted in contradiction. With equal access to places far away and near this neighborhood will be unique. That contradiction becomes a foundational element of this proposal. How do we build a place that is both hyper local and hyper global? How is this place different from the ubiquitous “airport cities” that are being built in conjunction with major airports in Asia and the Middle East.

The form of this city addition must be both inherently global and inherently local. That means that land uses decisions must support the aerial infrastructure that exist. Manufacturing, shipping, and office products that would benefit from unparalleled access to regional and global markets are welcome. On the other side, the creation of housing and everyday services at this scale must welcome people of every social and economic level and at every stage of life.

This requires a highly diversified and integrated land use pattern that respects the adjacent exiting fabric of East Boston, and Winthrop while also providing robust centers for commerce that compliment Downtown and the Seaport districts. Additionally, the inherent nature of such a connected district means the mass movement of people in and out of this area on a regular basis. That must be balanced with characteristics of neighborhood comforts.



Design Objective 5
Interconnected Transportation

This new district sits at the intersection of global travel and local transportation. Also, the addition of hundreds of thousands of potential residents and workers to this area will require an unparalleled level of connectivity both within the district as well as into the city.

Unlike large scale master plans that are situated in the hinterlands of an existing city this site is in a central location to the metropolitan area with adjacent mass transit and vehicular circulation systems that connect it to everything. Additionally, the non-existence of internal infrastructure patterns allows for a full conception of a new form of movement.

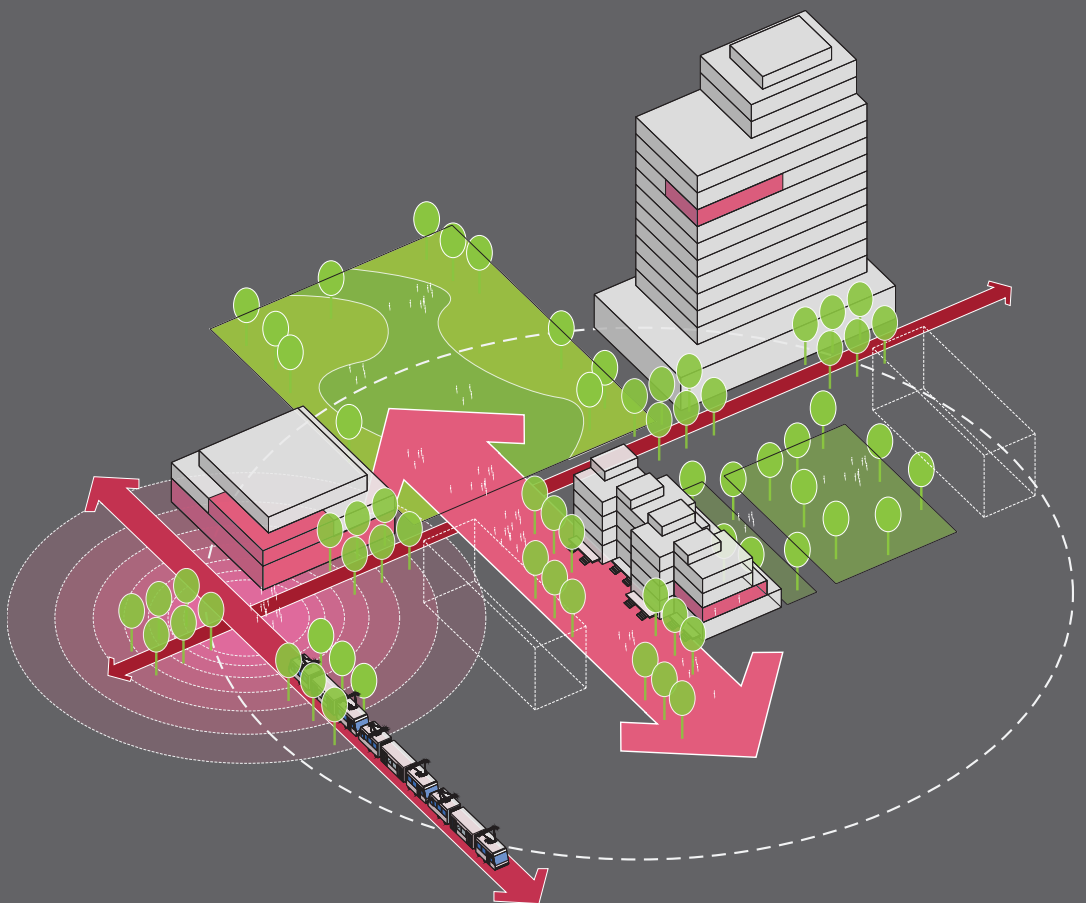
This proposal will plan for a future in which personal cars are not the primary form of transportation. Mass transit, ride sharing, autonomous vehicles, active means, and aerial transportation will be the foundation of an interconnected pattern of transportation. This proposal allows for the exploration of the future of transportation at the district scale demonstrating how these various modes interact with each other and allow for different urban forms to take shape as a result.

Design Objective 6
People First

Finally, people come first. A major critique of the Aerotropolis model is that it is driven first and foremost by the market. Large urban nodes built to service the airport. This proposal flips that concept and creates an urban district in which an airport is in service to. While this is only possible due to the changes in technology that will happen it is none-the-less different. This is also inherently different due to its proximity to the existing urban fabric.

This concept transcends all aspects of the proposal. The means in which public space is articulated, the scale and patterns of the buildings and their uses, the layout of the transportation system, the types of housing products that are provided will all be centered around creating a human-scaled, human-centric urban form. The reason this is so important is to ensure that the broadest cross section of people is attracted to this place as well as ensuring that the framework provides for changing dynamics of our society.

Finally, this concept lays a foundation of diversity. How do we create something for everyone? That means there must be a balance of regional draws, institutional centers, places to make things, places to work, places to live, places to play, places to get away, and places to be together. Due to the size, this site allows for all of these concepts to be explored.



Chapter 6

Pulling it All Apart

This section describes the larger physical, environmental, transportation, and land use frameworks that organize the design and development response to the opportunities and constraints of the site. This section focuses on describing how the new urban typology is constructed utilizing diagrams and narrative text. The section is organized around the six design objectives presented in earlier sections.

Constructing a New Urban Typology

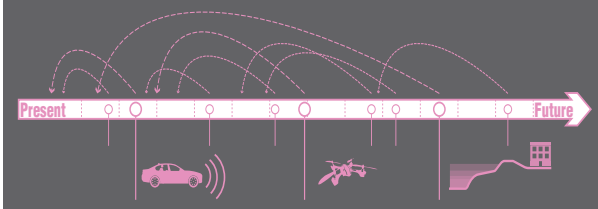
In the previous chapter an overall vision for this new Logan Airport Site was introduced. This concept is one of many forms that this could take. Just like cities and neighborhoods of different location but of similar size look and function differently, so too can another place born of the same constraints but within a different context. That is why this thesis utilizes the term typology. As previously noted and describe further in later chapters, the legacy urban airport, which Logan represents, is not unique to Boston. Because of these larger implications the goal becomes, what we can learn from this exercise that can be applicable to other places?

This redevelopment proposal is unique. Unlike the repurposing of an existing industrial site for new uses the effort here centers around the creation of a new hybrid landscape which serves multiple functions. On its face, this is the creation of an 'aerial neighborhood' however, instead of simplifying that down into an idealistic vision this project seeks to establish what that might look like in context of the existing city. Furthermore, what sites are an ideal candidate for this new typology is the more rudimentary foundation for this exercise.

Building off of these questions and topics, the design and planing for the Logan Airport Site and by definition, this new urban typology, a series of six design objectives are constructed as constituent parts that come together to make the larger plan. The following chapter defines and describes each of these six elements in both their general sense as well as their application to the Logan Airport site. Then a brief discussion about how these elements aggregate together, introduces the scalability and replicability of these concepts.

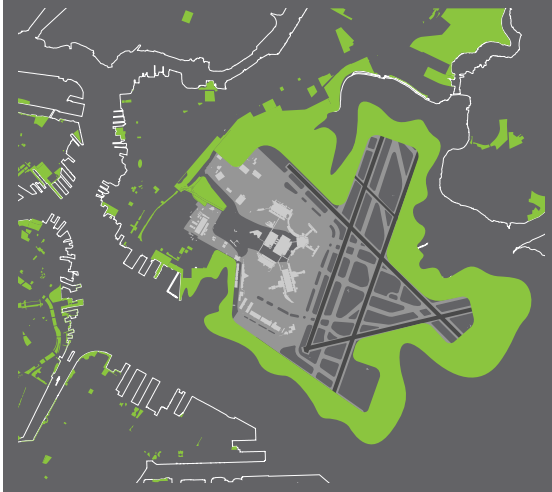
Together these six design objectives outline a framework for which civic life can unfold. This proposal is devoid of architectural style, economic anchor institutions, and social expectations. Intentionally, the effort is to consider the operational aspects of daily life by creating a scaffolding in which a plurality of futures can occur.

On the Next Page: These six design objectives form the underlying DNA of this new urban typology. Each objective delivers a series of site specific changes that when executed on site create a unique urban form but could also be understood as a model for use on other sites.

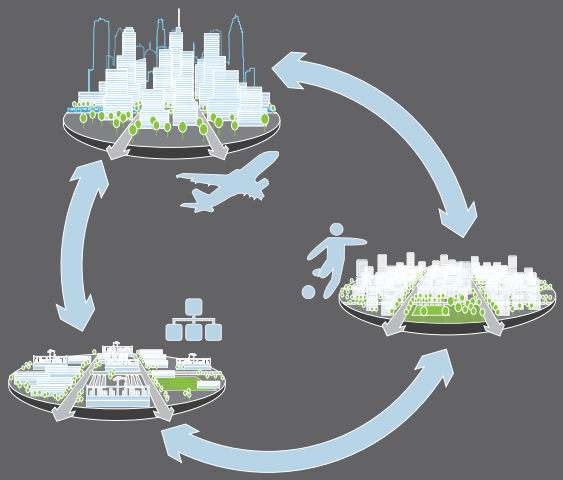


Anticipation Through Phasing

Stitching the Urban Seam

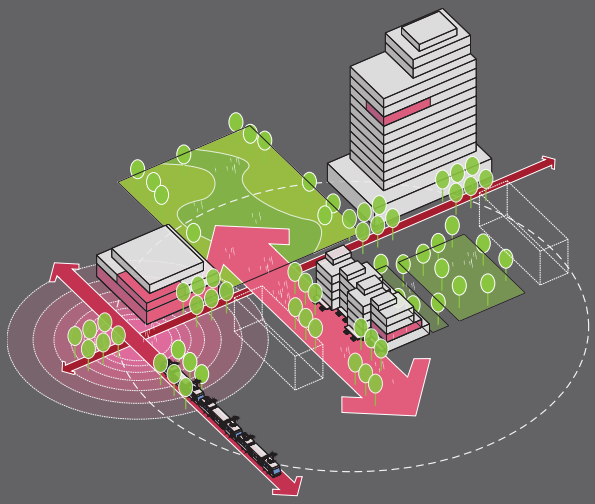


Ecological Resiliency



Hyper Local Hyper Global

Interconnected Transportation



People First

Anticipation Through Phasing

When discussing large scale city change establishing accurate time-lines can be challenging. Further complicating this particular effort is the fact that what is being planned for is not yet demanded. In today's market-driven real estate world this is even more challenging. However, one of the fundamental underscores of this thesis is the notion of proactive planning. That is, how do we imagine a new urban form prior to its evolution for the purposes of guiding that urban form to a desired outcome. This is in contrast to many major urban redevelopments in which a piece of land that has been based on a now defunct industry is transformed. Hints of this proactive approach can be seen in the City Copenhagen's plan for the Nordhavn District which was profiled earlier in this thesis. The process oriented thinking applied in that project has led to a continued use of the land for port and industrial operations while allowing for a continued and ongoing transformation to new uses.

How does this process oriented approach apply to the Logan site and the legacy urban airport typology? First, a few points should be established:

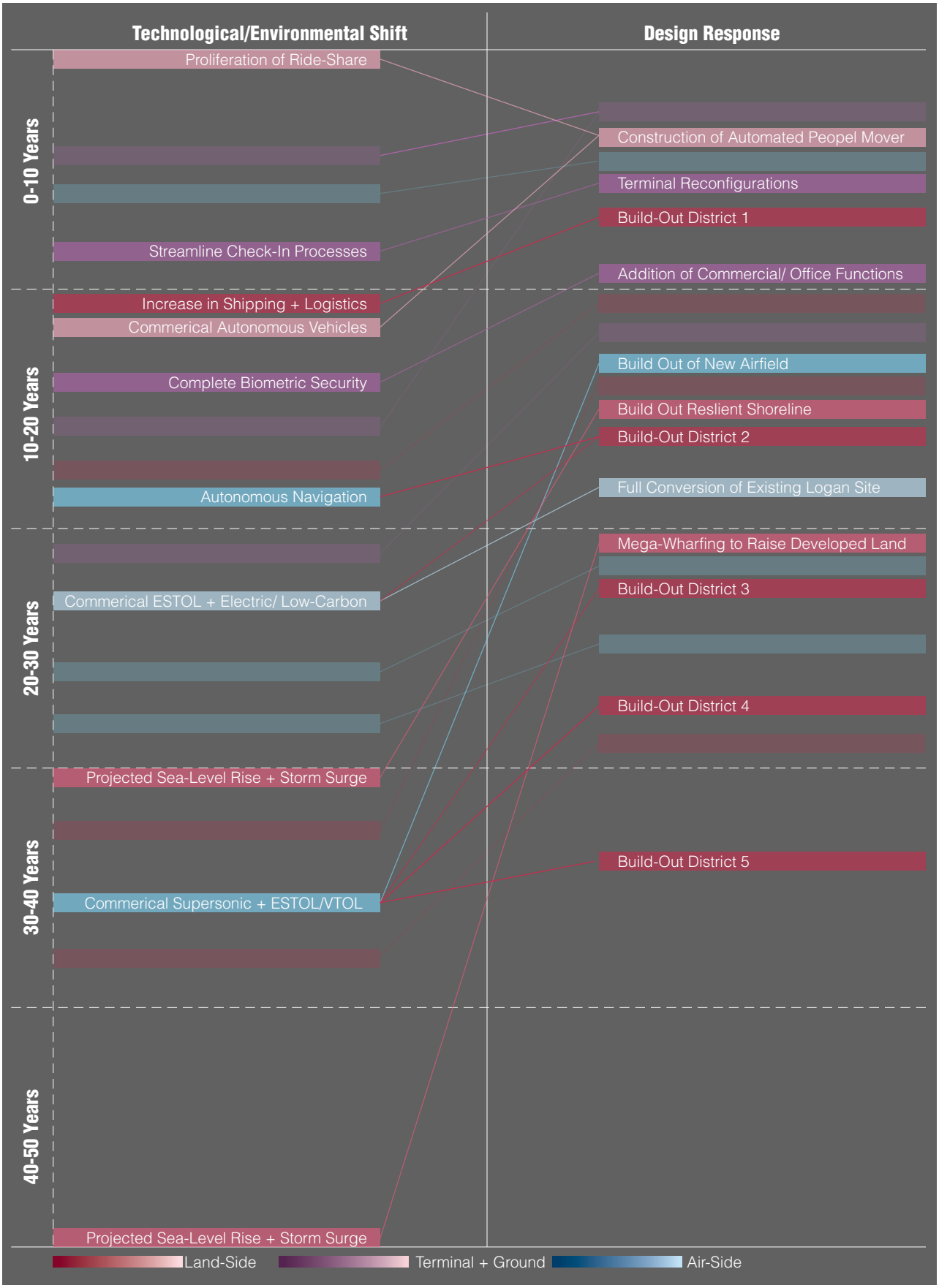
- Legacy urban airports (and Logan) are land constrained and have no room for expansion.
- Cities, especially Boston, are becoming increasing challenged to provide room for growth within their boundaries.
- Technology, directly and tangentially related to aviation services, is changing
- Environmental vulnerabilities, such as increased flooding, are placing increasing pressure on these sites.

With these given issues and constraints, how can planning and design respond? The premise of this design objective is to proactively adapt to the probable future and in the process create opportunities for new technologies and forms of habitation to take shape.

Establishment of the Temporal Framework

Much like how the Commissioners' Plan of 1811 for Manhattan established a framework that allowed for Manhattan to unfold in a rather predictable manner this plan establishes general physical guidelines for the same reason. More

On the Next Page: This diagram demonstrates some examples of the temporal framework which seeks to create a proactive approach to removing barriers to entry for new technologies and industries while building out need infrastructure prior to critical development and environmental issues.


Technological/Environmental Shift
Design Response
0-10 Years
10-20 Years
20-30 Years
30-40 Years
40-50 Years
Proliferation of Ride-Share
Streamline Check-In Processes
Increase in Shipping + Logistics
Commerical Autonomous Vehicles
Complete Biometric Security
Autonomous Navigation
Commerical ESTOL + Electric/ Low-Carbon
Projected Sea-Level Rise + Storm Surge
Commerical Supersonic + ESTOL/VTOL
Projected Sea-Level Rise + Storm Surge
Construction of Automated Peopel Mover
Terminal Reconfigurations
Build-Out District 1
Addition of Commercial/ Office Functions
Build Out of New Airfield
Build Out Reslient Shoreline
Build-Out District 2
Full Conversion of Existing Logan Site
Mega-Wharfing to Raise Developed Land
Build-Out District 3
Build-Out District 4
Build-Out District 5
Land-Side
Terminal + Ground
Air-Side

importantly however, is the temporal framework. This proposal suggest that new physical infrastructure, recommissioning of existing facilities, and operational changes predate the generated demand. Doing this allows the City to guide development in a desired direction. This is not a new idea, but it does sit largely in contrast to the current model of city building, particularly in the United States.

The diagram on the previous page illustrates this concept of unlocking land, building infrastructure, and repurposing structures prior to the full effects of the given technology or environmental or economic condition take place. A few specific examples can be utilized to further describe this concept.

One example is the notion of creating a multi-airport system due to the growing demand of air travel and the relative site constraints of Logan. While certain technologies like, electric extreme short take-off (ESTOL) aircraft and super sonic aircraft are several decades from coming to market and environmental stresses such as sea-level rise are decades away from becoming critical to Logan the construction of a second airfield would allow for the Boston metro area to support additional air-travel while still utilizing Logan in its current capacity. This strategic action would allow, in the future, for Logan to seamlessly transition to new forms of services while the new airfield absorbs the services that would not be able to utilize Logan like the future of long-haul aircraft. Additionally, this transition away from full services would allow for the adaptation of the land to be more resilient in the face of climate change. The benefits of this strategy are twofold. First, it removes the barrier to entry for many of these new technologies by providing a strategic place within the city fabric for their deployment. Second, it reduces the conflict between immediate need and long-term planning which often results in less than ideal end products.

Below is a more illustrative example utilizing the impacts of autonomous cars, airport parking, and vertical take-off aircraft.

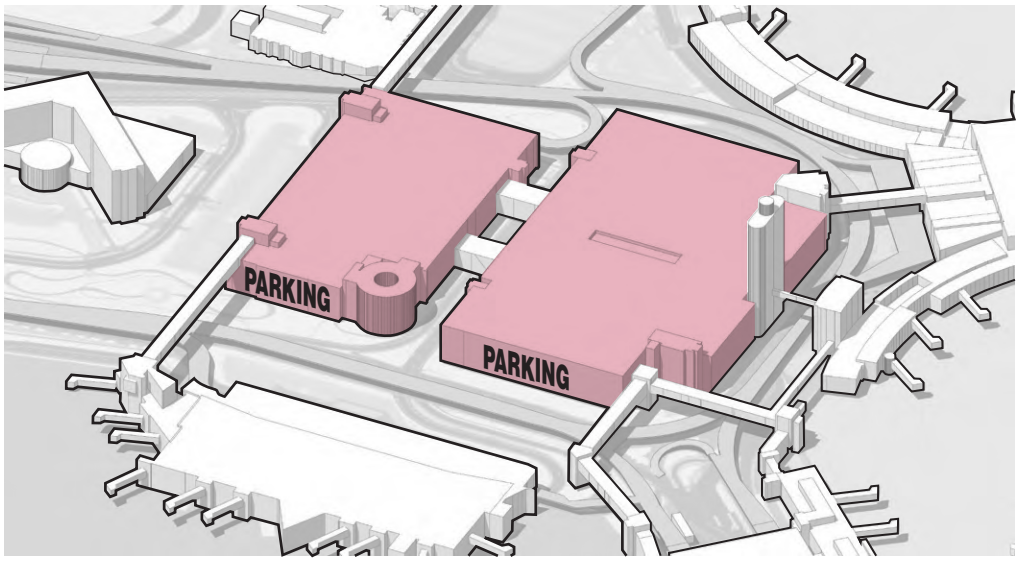
Specific Case Study: Autonomous Cars + Airport Parking Structures

The diagram on the following page illustrates the transition over time from a single use airport parking garage to a hub of new transportation and activity. In this example, current use of ride-share technologies and challenges with traffic management create both a supply and demand issue. In the future these structures will become even more obsolete with the advent of autonomous vehicles and increased public transit access. To combat the slow decline of these facilities and the eventual repurposing or demolition, this plan proposes the evolution of strategic uses to an eventual end point as a hub of transportation and production.

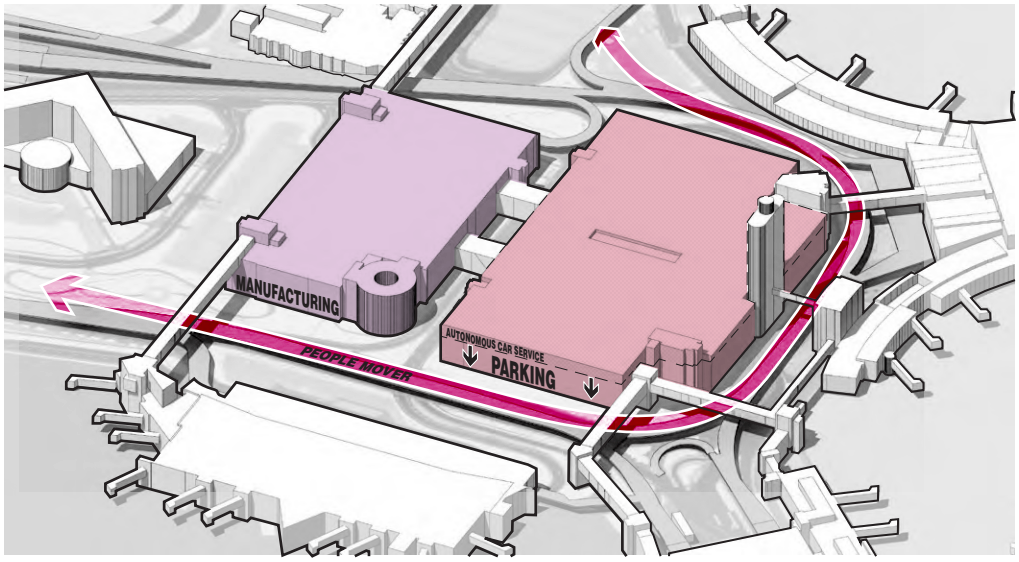
In its second life these parking structures should be reimagined as some sort of productive facility such as a large scale urban agricultural hub or manufacturing. The large flat open floor plates, provide unlimited flexibility and

On the Next Page: In this diagram one particular case is explored. The repurposing of existing parking structures into a hub of new economic and transportation activity. The various stages of evolution of the structure take capitalize on trends and breath new life into the design prior to obsolescence.

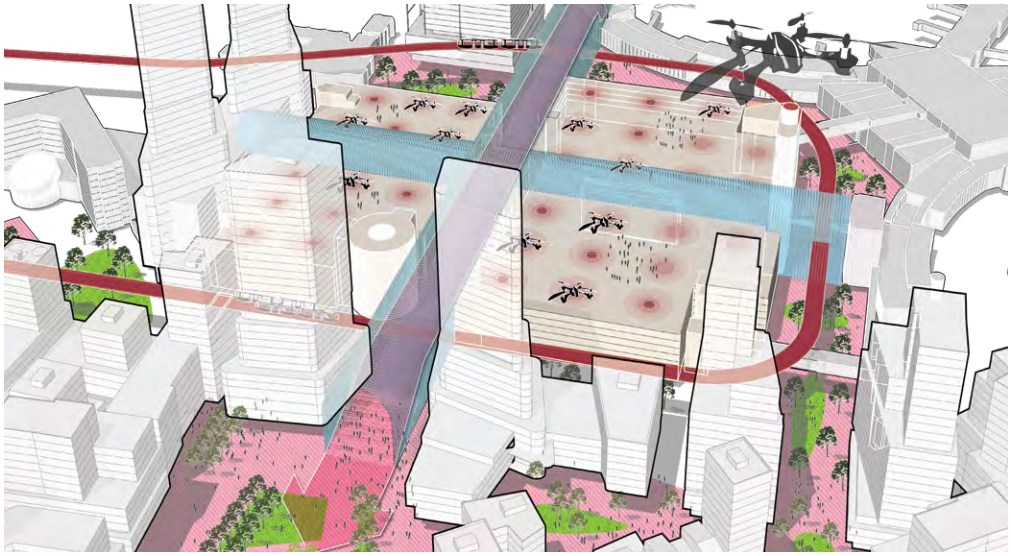
Current Condition
Shown here is Logan's current airport parking garage which is singular use and largely disconnected from the surrounding fabric. This structure is serviced by a web of above and below grade roads and consumes nearly 70 acres of land.

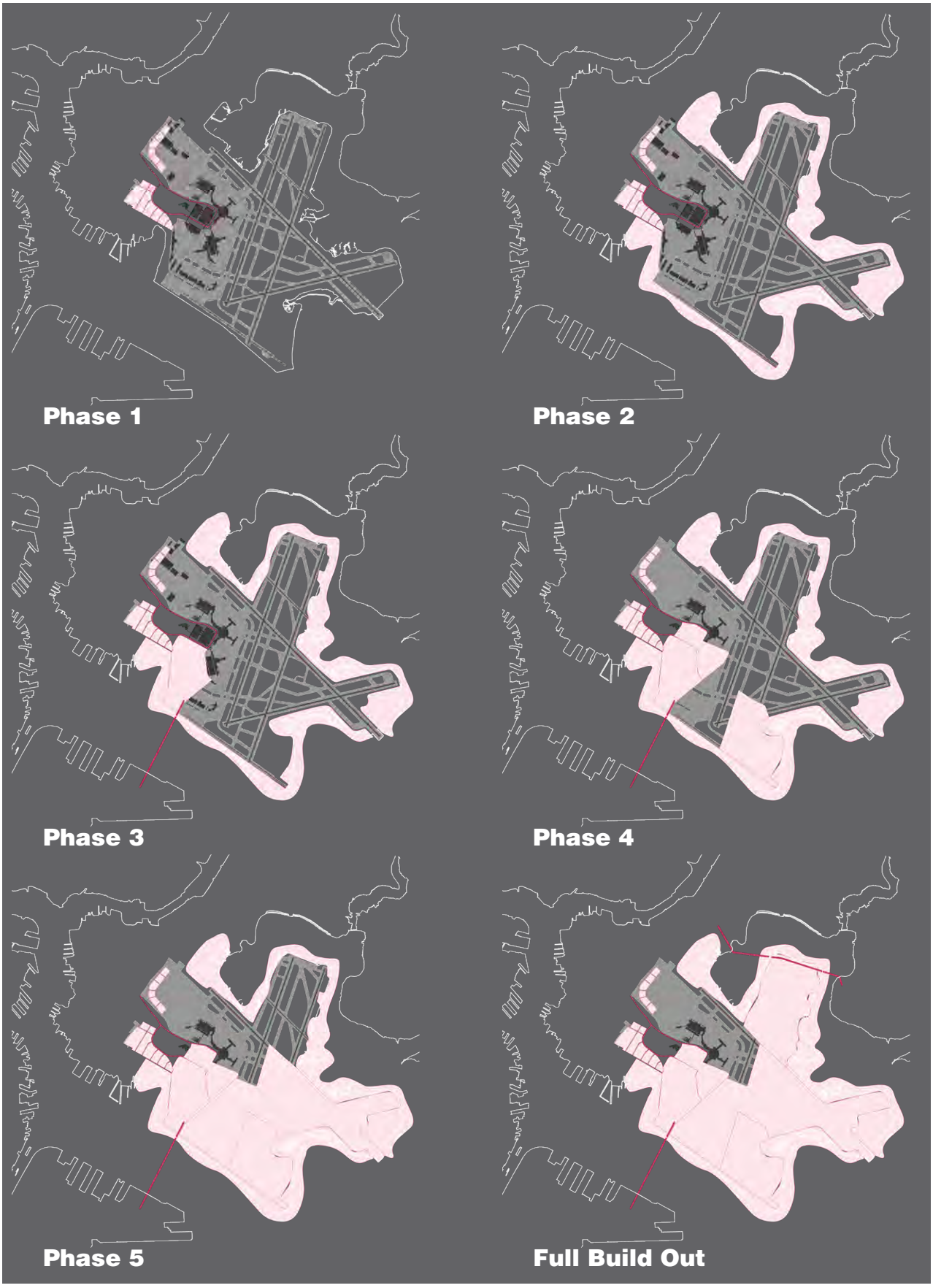


Interim Condition
As autonomous vehicles, and ride sharing become more integrated into everyday life the demand for airport parking will be reduced. These technologies will be deployed long before VTOL and E-STOL aircraft. While the airport still serves its current function new uses can be integrated into facets of this structure including food production, warehousing, or server farms while still maintaining some forms of parking.



Future Condition
The parking structures find new life as the large platforms for new aerial transportation technologies. New uses at the ground floor integrate into daily civic life while floors above are utilized for uses such as food production, warehousing, distribution or automated manufacturing. Other forms of development situated closer to these structures integrating them into the larger city fabric.




Phase 1
Phase 2
Phase 3
Phase 4
Phase 5
Full Build Out

access to both aerial and ground transportation systems which provide methods for distribution. The realization of a facility such as that would provide Massport with an additional increased revenue stream in an era when parking revenues are declining at airports.

The third life of this existing facility could be imagined as a fully functional vertical production facility and on its roof a space for vertical take-off aircraft. By utilizing this space for these new aircraft type the overall spatial footprint of the future airport can be reduced. Additionally this facility can capitalize on the access to the future people mover that will be installed at Logan which will wrap around the current parking garages to service all of the terminals.

This continuous evolution of the physical environment represents the opportunities that new technologies afford and how proactive planning and design can allow for the beneficial deployment of these new capabilities.

Physical Implications + Guided Growth

One consideration that is important to ensuring success is ensuring that speculation, which is needed, does not result in an overbuilt condition. As the site evolves from its current state to a future state particular care must be taken to ensure that each step functions and feels “complete”. This concept means that the spatial evolution must follow a logical pattern that builds off of existing assets and opportunities first, and then uses each subsequent phase to unlock another series of opportunities and assets.

From an neighborhood standpoint, development should be guided into manageable segments that ensure when products come on-line that they are associated with a complete neighborhood including transit, amenities, and park space. From a functional standpoint that means certain infrastructure moves will need to serve multiple functions over different periods of time. On example of this would be the establishment of flood protection measures that serve the existing airport functions that can easily transition into a future configuration as waterfront park space.

Conclusion

The goal of this design objective is to reduce, or eliminate, the times of obsolescence between uses of land and structures. Additionally, this proactive approach unlocks many of the barriers to entry for new technologies and places the City as an equal partner in ensuring that the future economies and industries of the city are delivered in a mutually beneficial way. The ultimate agenda is to create a platform in which civic life can unfold. Overtime, this strategy provides for a continuous evolution of the city and removes the notion of a ‘finished’ product allowing for adaptation to various needs.

On the Previous Page: This series of thumbnails demonstrate the high-level phasing approach developed as part of this proposal. Shown is the creation of full districts that are instigated as airport functions change over time, freeing up land in the process. In the first several phases current airport functions are protected as technology changes and a new airfield is constructed.

Stitching the Urban Seam

Legacy Urban Airports are islands. Over the course of time these sites have become separated from their host cities, not by distance but by physical and perceptional barriers. While some of these barriers have been planned, such as highway infrastructure and security fences, others have happened more organically such as the decaying land uses and remnant open space that surround many of these sites. Logan is no different.

Too reconceptualize this site as something new means understanding its place within the larger city fabric. As such, great care must be taken to ensure that these barriers that exist are bridged, stitching the airport site back into the city fabric that once supported it.

This concept has been embraced by some existing urban airport sites by increasing distribution and manufacturing land uses in the surrounding urban voids and by others who are planning entire urban districts directly adjacent to the current airfield.

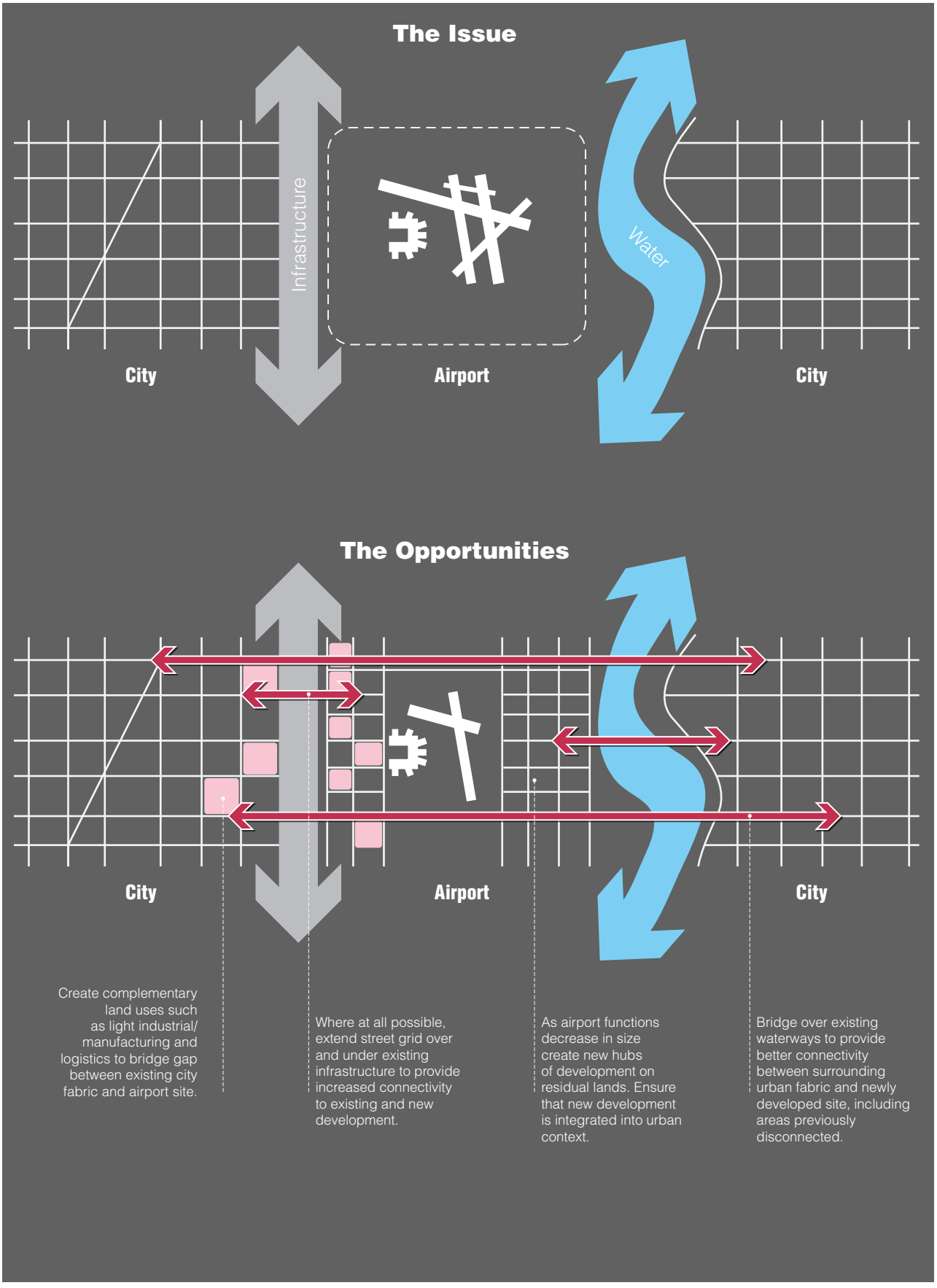
In the future, as aviation technology makes these sites less and less obtrusive the goal would be to create a seamless transition from airport to city. To do this planning and design must overcome natural and built barriers through physical connections, the blurring of land uses, and the full integration of development adjacent to the airport. The end result is not an airport and the city but rather an airport within the city. The diagram on the following page summarizes these opportunities and constraints.

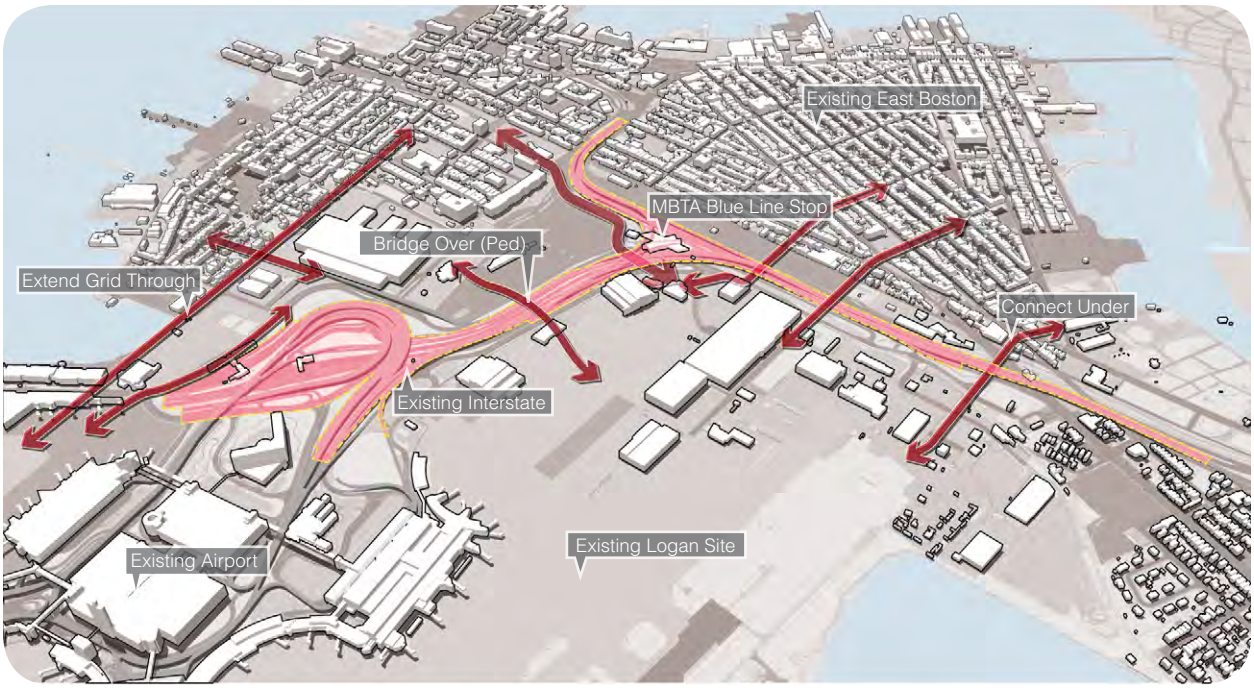
Through Connections and Uses

Zooming into the Logan Airport site the most noticeable barriers are the surrounding harbor and the interstate highway the runs along the eastern edge. However, there are more subtle, psychological barriers that have formed that further divides East Boston from the Logan site. These are based on the way land uses have been laid out, often creating a 'back-of-house condition on the city side for uses that service the existing airport.

To overcome this divide a two-prong approach should be considered. First, strategic physical connections should be established that render the

On the Next Page: This diagram represents the issue of the airport island in today's configuration as well as the future strategies to create an interconnected district that bridges that divide between the site and the surrounding city fabric.


The Issue
Infrastructure
Water
City
Airport
City
The Opportunities
City
Airport
City
Create complementary land uses such as light industrial/ manufacturing and logistics to bridge gap between existing city fabric and airport site.
Where at all possible, extend street grid over and under existing infrastructure to provide increased connectivity to existing and new development.
As airport functions decrease in size create new hubs of development on residual lands. Ensure that new development is integrated into urban context.
Bridge over existing waterways to provide better connectivity between surrounding urban fabric and newly developed site, including areas previously disconnected.



infrastructural barriers void. At certain Legacy Urban Airport sites there may be an opportunity, and a need, to fully redesign these infrastructural barriers due to the current place in their life-cycle. Unfortunately for Logan, the interstate highway is a relatively recent investment constructed as part of the Big Dig in the early part of this century. Therefore a more surgical approach of weaving under and over is more appropriate.

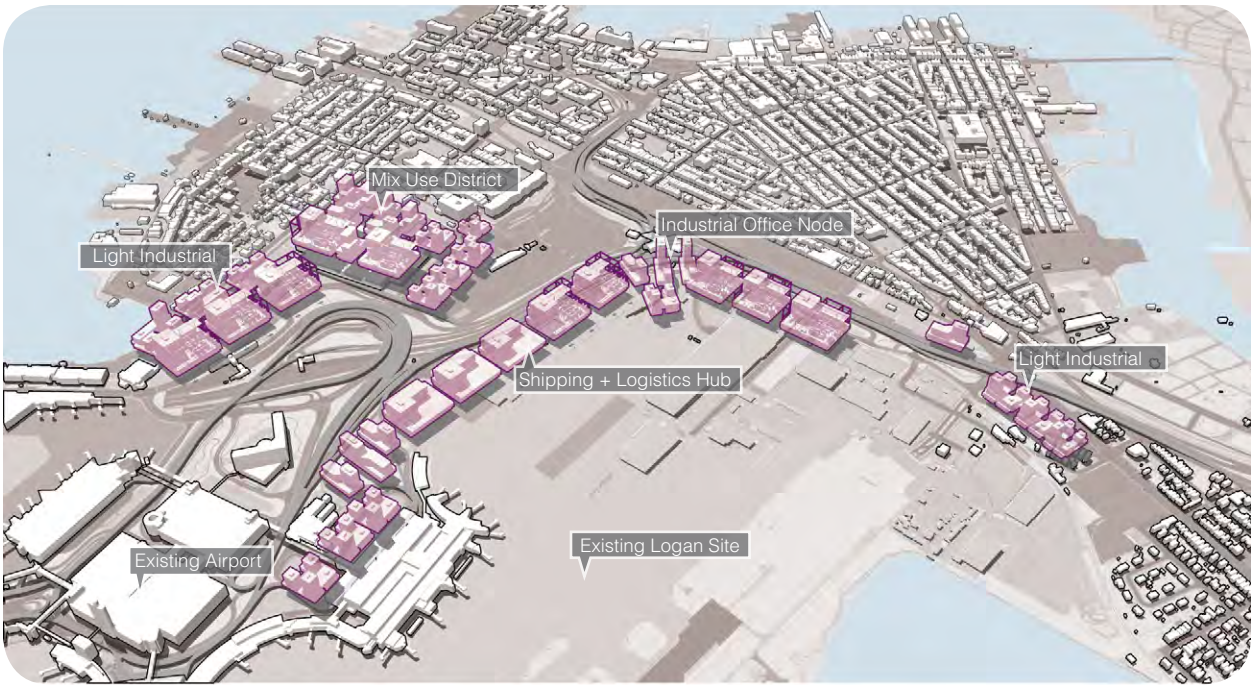
The strategy should be to utilize every opportunity to create new pedestrian, bike, and vehicular connections through this barrier by way of new bridges, roads, and park connections. A particular focus should be placed on existing major corridors in East Boston. This particular effort should be among the first efforts utilized in the redevelopment process.

In the long run, however, as this infrastructure reaches the end of its life cycle a less invasive form should be achieved. This could take the form of a surface street or a burred highway as the use of personal automobiles decreases.

The second strategy to overcome these barriers is to target underutilized and vacant lands on either side of the barrier for aviation-complementing uses. This could be seen as an economic development strategy for East Boston providing working-class job creation in the near-term. In the long-term these lands can

Above: This diagram demonstrates the strategic connections above and below the Interstate Highway corridor that currently divides the Airport site from East Boston. This connections are critical to ensuring that new development functions as an integrated part of the larger urban context.

On the Next Page: This diagram demonstrates the concept of focusing compatible and complementary land uses along the current Interstate Highway Corridor helping to reduce the physiological barrier that currently exist. Near-term uses could provide additional jobs and tax base while future uses create a hybrid industrial district.



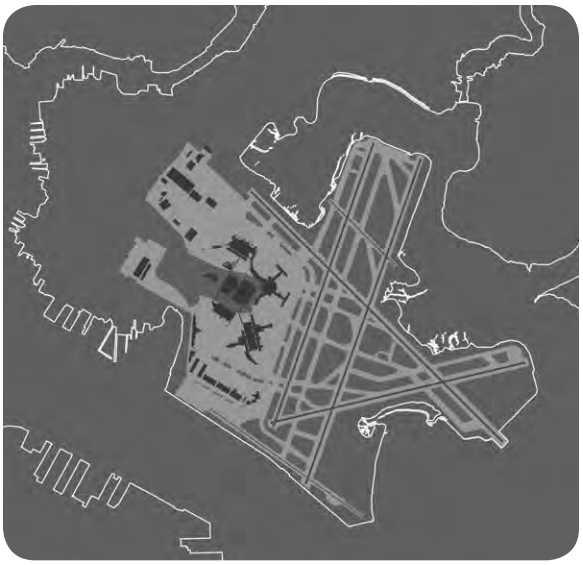
provide a valuable light-industrial tax base for the city while providing valuable places for new forms of distribution and manufacturing technologies that will be born in concert with new aviation services.

These new industrial, manufacturing, and logistics based facilities would benefit from unparalleled access to both highway and aviation infrastructure in both the near and long term as well as being located in close proximity to mass transit services that workers could utilize. Together these two strategies turn a current constraint into a valuable community assets.

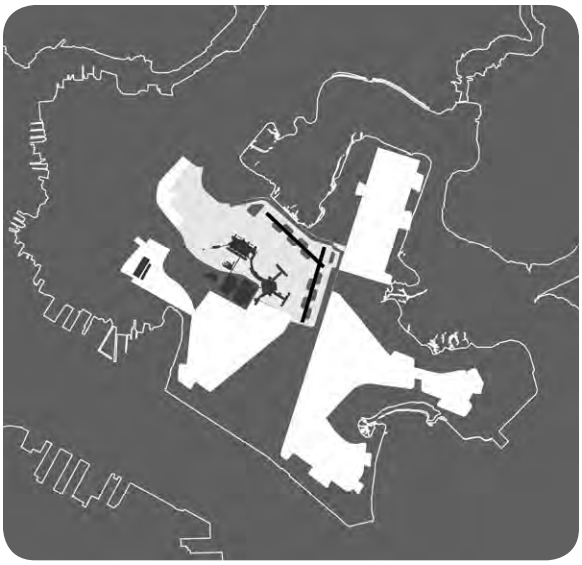
Fully Integrated

As previously stated, the opportunity to realize a fully integrated and seamless transition between city and airport is a core goal of this design objective. With new technologies in security, baggage, and ground transportation the city can push closer and closer to the airport as land-side aspects become reduced. However, the most drastic aspect of this proposal is the shear reduction in the physical size of the airport given new forms of aircraft.

This proposal envisions a full switch at the Logan Airport site from large, long-haul commercial aircraft to smaller regional electric jets and vertical take-off aircraft. In this scenario the infrastructure to support these new forms of aviation services is much different. For small scale electric regional jets a run-way length of 2,000' is what is estimated. That is 8,000' shorter the current major runways at Logan and 700' shorter than Logan's shortest runway. Additionally, these aircraft are smaller and with increased precision in trafficking technology the taxi and apron spaces of the airport would also be smaller. Finally, as previously discussed the proposal envisions the utilization of current roof space of the parking garages as the platform for vertical take off aircraft, essentially eliminating the required ground space. With these new spatial requirements and reorganization of various components of the airport such as shipping, storage



Before



After

(no required gasoline storage), and aircraft servicing, the overall footprint of the airport could be reduced by as much as 80% and still maintain the projected future services.

This frees up massive amount of land; in Logan's case almost 1,500 acres.

What is envisioned in its place is the creation of new urban districts that are arranged around the required flight paths and situated to connect back to the existing urban fabric. In between these new urban districts large open spaces can be created.

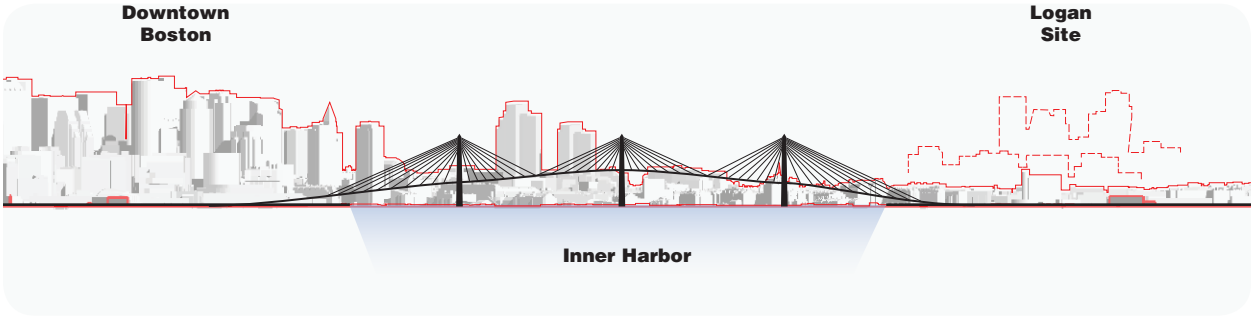
While in today's world the FAA regulates how close residential can be to an airport, with future advances in electric engines one can expect an unnoticeable increase in noise. This will unlock the possibilities of various mixes of land use to migrate closer and closer to these facilities. What this proposal imagines is a type of 'Grand Central Station' of the aviation world, where people can live, work, and play around these facilities. Shown in the diagram above is a figure ground of before and after which demonstrates this dramatic reduction in aviation space and the large blocks of development areas that could be created.

Major Gateways

As previously stated in this section, connectivity to the existing urban fabric is something that is seen as a necessity for this proposal to be successful. While

Above: This diagram demonstrates the nearly 80% reduction in the size of airport services given new forms of aviation and aircraft. What is left can be utilized as development parcels that respect the needed flight paths.

On the Next Page: This diagram shows a potential representation of the new Inner Harbor Bridge that is proposed as part of this development scheme. This iconic element could serve as a gateway feature for the city and could utilize existing architectural vernaculars to tie the new urban districts to the existing Boston Central Business District.



strategic connections and complimentary land uses can go a long way, there are certain barriers that must be broken by more ambitious efforts. Adding as many people and jobs to this area as this proposal describes would demand a lot of mobility options and would put stresses on the existing transportation systems such as the Ted Williams Tunnel and the MBTA Blue Line which serves as the most direct access to Boston. Therefore this scheme proposes a new Inner Harbor Bridge which would service limited vehicular traffic but would host a mass transit line as well as pedestrian, cyclist, and other active transportation modes. This bridge would be similar to Tilikum Bridge in Portland Oregon and would connect the Seaport Directly to this new district while creating an iconic architectural addition to the Boston skyline.

Additionally, this scheme also proposes two additional bridge connections that links Winthrop and the Orient Heights area of East Boston to the site. These new connections further reinforce the integration of existing urban fabric into this new district.

Conclusion

The goal of this design objective is to ensure that this redevelopment becomes an integral part of the fabric of Boston. While the current use of the airport site presents itself as a theoretical blank slate, developing a vision that does not integrate would be short sighted.

Through surgical approaches for dealing with existing infrastructural barriers, placement of complimentary land uses, establishment of new urban districts surrounding aviation services, and the establishment of major gateway's into the site, this new urban typology services the needs of the existing city in addition to providing opportunities for growth. Fundamentally, this approach supports the concept of bolstering existing urban assets as opposed to creating brand new ones, a process that is being seen in many aviation centered developments world wide.

Ecological Resiliency

The land that Boston Logan Airport sits on was created out of water, filling in coastal marshes and open harbor and connecting islands back to the mainland. This fact is not dissimilar to many of the other Legacy Urban Airports that have made their home out of wetlands, riparian flood plains, and coastal waters. The ecological oversights of the past planners and engineers gives and opportunity to rethink the concept of ecological resiliency with these large urban land masses.

Sites like Logan are anything but natural and as such require a different understanding of ecological resiliency. Instead of working with natural systems to influence urban form and provide ecosystem services entire ecologies must be constructed, land must be manipulated and systems put in place. While different sites and cities would require different techniques to be utilized, an overarching theme and philosophy can be garnered from this exercise. In these places in which all semblance of 'natural' has been stripped away effort should be taken to manipulate the landscape for greater social and ecological function. This notion takes advantage of the relative flexibility offered by the flat mono-culture of topography and hydrology and ask what can be established that will assist in functions related to resiliency, habitat creation, open-space and recreational provisions, resource uses and production.

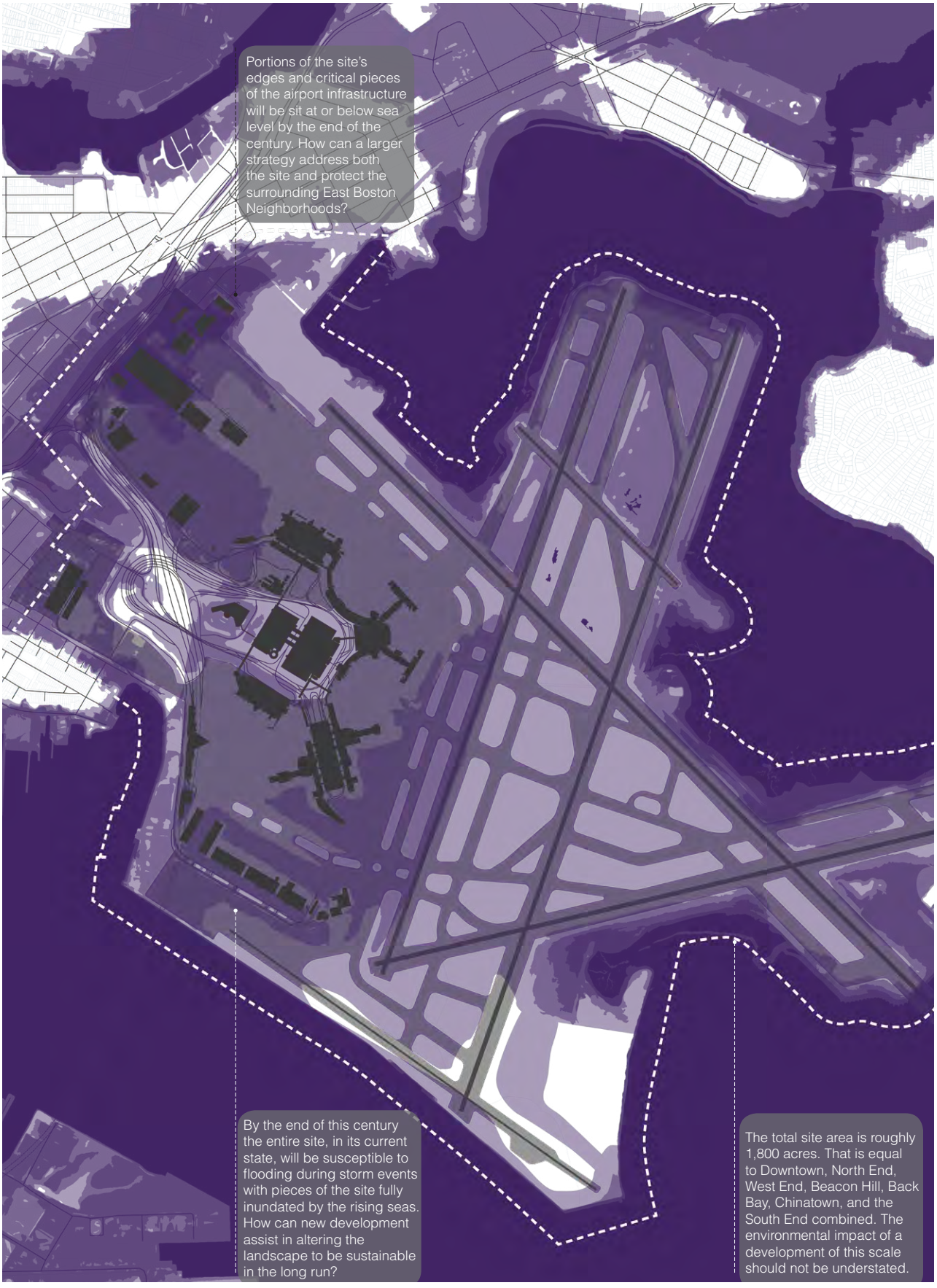
At the Logan Site in particular these concepts manifest themselves based on the particular constraints of the site.

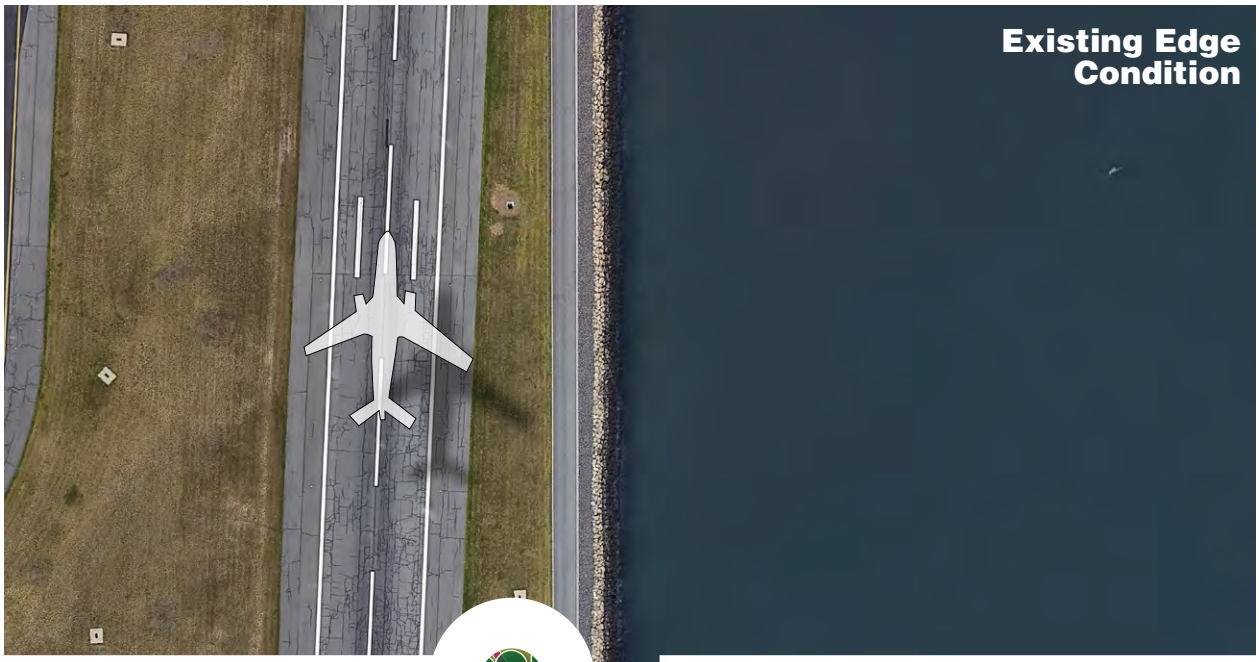
Rising Tides

Almost all of the Logan Airport site will be vulnerable to some level of frequent flooding by the end of this century even under conservative estimates. Portions of the edges of the site will give way to open water, while a large portion will receive frequent annual flooding from king-tides and storm surges. The 'Climate Ready-Boston' plan demonstrates these site constraints and while Massport has given some consideration to these changed conditions, they focus more on the protection of critical infrastructure today as opposed to setting up a situation for tomorrow.

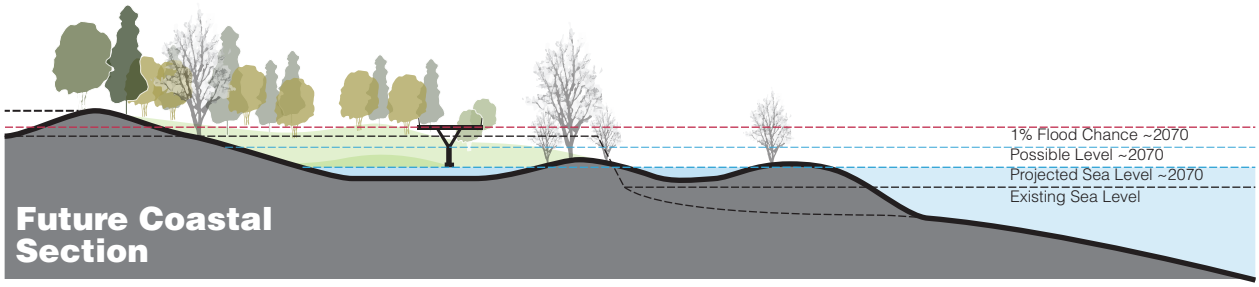
In addition to lands that fall within the project's defined boundaries their are implications to the surrounding areas, such as East Boston. This proposal utilizes a holistic approach to building in such precarious areas.

On the Next Page: This plan demonstrates the vulnerabilities of the Logan Airport site with portions of the site project to be underwater while a majority of the site will be vulnerable to storm surge and higher tides towards the end of the current century.


Portions of the site's edges and critical pieces of the airport infrastructure will be sit at or below sea level by the end of the century. How can a larger strategy address both the site and protect the surrounding East Boston Neighborhoods?
By the end of this century the entire site, in its current state, will be susceptible to flooding during storm events with pieces of the site fully inundated by the rising seas. How can new development assist in altering the landscape to be sustainable in the long run?
The total site area is roughly 1,800 acres. That is equal to Downtown, North End, West End, Beacon Hill, Back Bay, Chinatown, and the South End combined. The environmental impact of a development of this scale should not be understated.


Existing Edge Condition


Future Edge Condition
Park Flood Buffer
Public Access
Coastal Marshes
New Development


1% Flood Chance ~2070
Possible Level ~2070
Projected Sea Level ~2070
Existing Sea Level
Future Coastal Section

Establish a Living Edge

The first strategy within this design objective is to establish a living edge. The current configuration of a large majority of the airport's aquatic edge is a shear rip-rap slope. Within the time line presented earlier in this proposal there are two phases that can be utilized.

In the near-term, areas of the airport edges that do not host run-ways and taxi-ways could be re-sculpted by creating a shallower slope that tapers into the harbor and creates a berm on the land side. This, in addition to coastal marsh benches could reduce the overall impact of wave action and protect critical infrastructure in the present. A strategy like this could replace the current Massport plan to install further seawalls and provide additional open space to current residents.

In the future this concept of a living edge can be fully expanded as the footprint of airport services decrease and new development takes shape. The overall concept is to establish a green necklace around the entire development. This undulating topography would move in and out of the harbor, and along with small islands and coastal marshes would create aquatic habitat, increase water quality, and provide flood protection and recreational space for the new development. The strategy would utilize a balance of cut and fill material by both pulling water into the land and pushing land out into the water. This would reduce the need for additional earthen material and would be overall more cost effective.

This strategy, depicted on the previous page, would be dramatically different than Boston's current waterfront but is supported by many current and past planning efforts that the city has undertaken to establish a more sustainable future. This strategy would also contribute a huge amount of the land to open space, benefiting both people and the larger harbor ecosystem.

Living with Water

The notion of a living edge is a strong component of this overall design objective. However, to further the resiliency measure the plan must fully embrace water in the urban form. This strategy can be seen in other large scale coastal developments and offers an opportunity to further raise the effective finish floor elevation of the development while creating room for water to move through. This concept can also be seen within the city's 'Climate Ready Boston' plan but this particular area affords the ability to utilize it on a grand scale.

Wharfting, as it is called, is the process of dredging canals through the land and utilizing the earthen material to then raise the surface of the adjacent land to build on. Furthering that technique, parking structures and other non-critical spaces can be place on the ground or half buried with the displaced soil volume again being utilized to raise the surrounding landscape.

On the Previous Page: These diagram demonstrate the establishment of living shorelines that simultaneously provide increased open space and habitat while protecting the future development sites and airport operations.

This proposal suggest the use of these techniques across the entire site to effectively raise the level of the land to be built on and lower the land that would serve as parks and open space. Additionally new water-ways would be carved through the site offering a means for water to flow through.

The diagram on the next page shows a high level cut and fill strategy that would raise the streets and urban open space to the highest level (above projected end of the century storm surge marker) whilst raising the development pads slightly lower than that. In this delta parking garages, storage, and certain submersible infrastructures and uses could be housed. The parks and green edges would actually be carved into the land offering space for water to be absorbed and discharged during large storm events.

This new constructed topography would offer a unique juxtaposition of urban form and could strengthen peoples relationship with water. This strategy, together with the living shoreline could provide benefits not only for this particular site and redevelopment but also for East Boston by creating flood protection measures, such as earthen berms, at critical interface points between the airport site and the surrounding community.

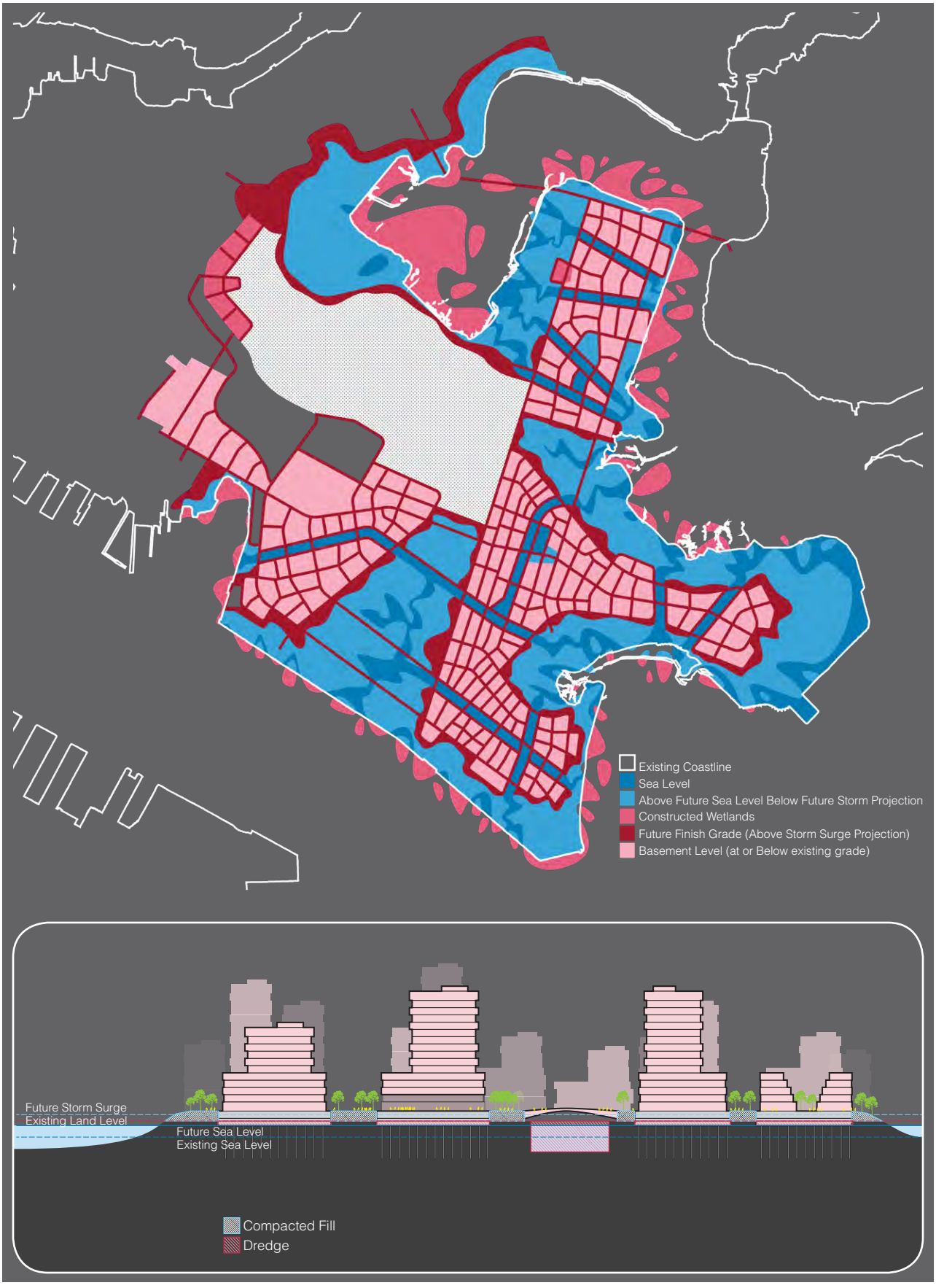
Sustainable Infrastructure

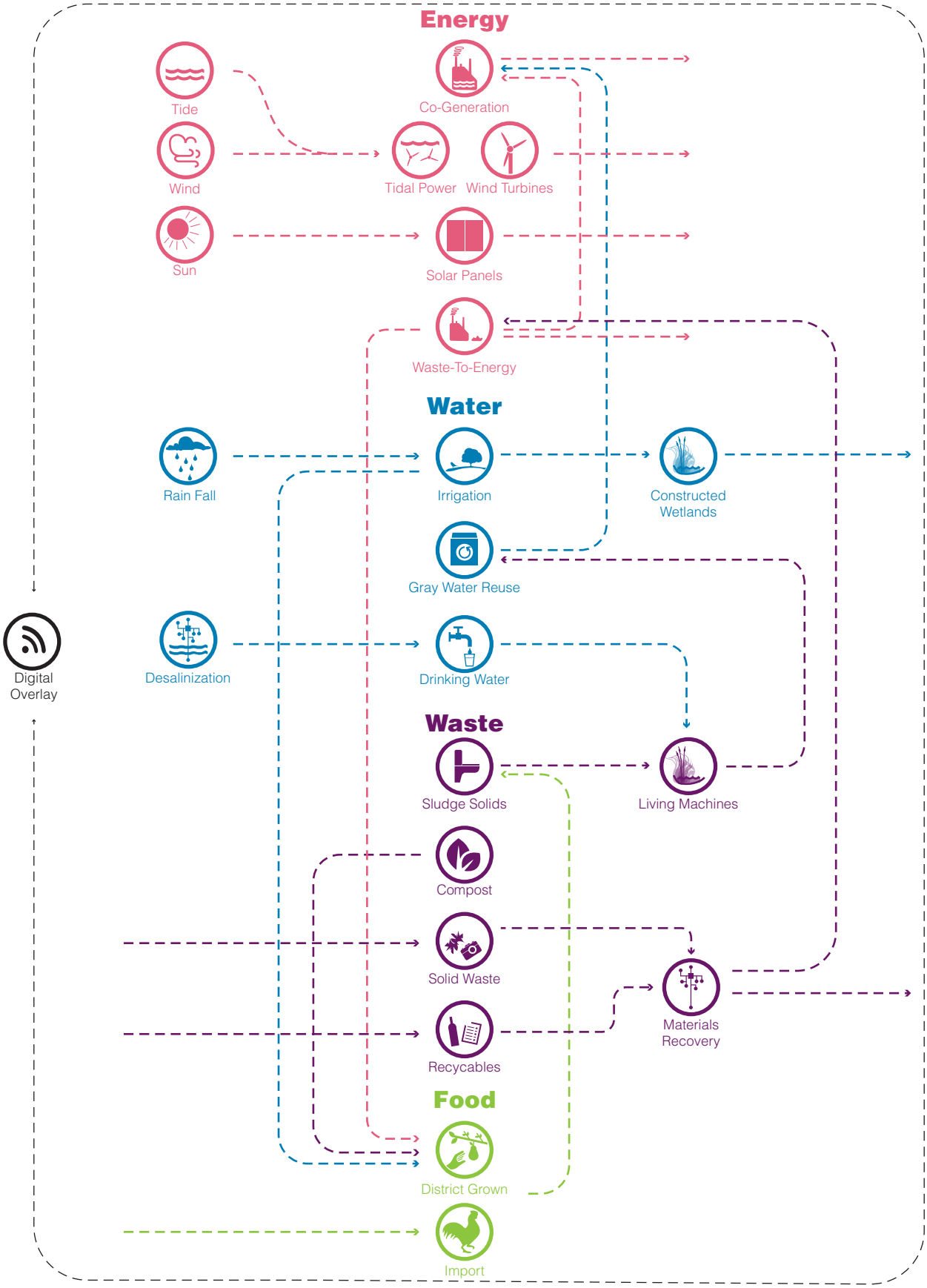
The last strategy within this design objective is the utilization of holistic and full-cycle infrastructure. This includes provisions for energy, water, waste, and food and focuses on the reduction of both inputs and outputs. With a redevelopment scheme of this magnitude and on land that was essentially undeveloped an all new infrastructure systems needs to be conceived.

On the energy side a diverse range of supply should be established and should utilize decentralized solar facilities for both water heating and electricity production. Wind Facilities should be established along the coastal edge to supply additional power and capitalize on the high wind speeds within the area. Additionally, larger scale facilities such as cogeneration plants and geothermal heating and cooling systems should be utilized. Power can also be generated by tidal flows which happen on a daily basis through the use of subsurface turbine facilities. Finally, a waste to energy plant could be built on site providing both a method for waste disposal and energy production with little to no harmful emissions. These strategies together with active and passive measures for energy reduction such as architectural massing and building design can reduce the overall load requirements of the district and create no additional demand on existing Boston systems.

On the waste side the installation of a waste-to-energy plant could handle a large supply of in-organic waste while a robust composting and recycling program could be established to handle other waste streams. Organic waste should be collected and reused in the production of food, which also can happen on site. A district recycling facility could be established within the light

On the Next Page: This diagram demonstrates the concept of cutting and filling that would be utilized to create a more resilient urban form to protect from rising sea levels and increased storm frequency and intensity. This concept takes the concept of wharfting and expands it across the entire site.


Existing Coastline
Sea Level
Above Future Sea Level Below Future Storm Projection
Constructed Wetlands
Future Finish Grade (Above Storm Surge Projection)
Basement Level (at or Below existing grade)
Future Storm Surge
Existing Land Level
Future Sea Level
Existing Sea Level
Compacted Fill
Dredge


Energy
Tide
Co-Generation
Wind
Tidal Power
Wind Turbines
Sun
Solar Panels
Waste-To-Energy
Water
Rain Fall
Irrigation
Constructed Wetlands
Gray Water Reuse
Digital Overlay
Desalinization
Drinking Water
Waste
Sludge Solids
Living Machines
Compost
Solid Waste
Materials Recovery
Recycables
Food
District Grown
Import

industrial bands and offer the final key to a partially closed system. These new waste streams could be supported by subterranean pneumatic transfer systems that utilize the underground volumes created in the wharfting process for the instillation of tubes, making participation in this system effortless and reduce the need for garbage collection services and storage on a building-by-building basis

On the water side human effluent generated in homes and businesses should be handled by 'living-machine' systems which utilize biological processes to clean waste water and allow for the reuse of that water in non-potable uses such as irrigation and toilet flushing. Rainwater should also be collected and stored and utilized for non-potable uses such as heating and cooling. Finally, potable water supply should capitalize on the adjacency to the ocean by utilizing desalinization processes to provide potable water for the district.

Finally, food production should also be factored into the infrastructure cycle through the creation of both small scale personal agriculture opportunities and also large scale production facilities that utilize indoor intensive vertical and hydroponic faculties to produce food within the new district. Access to high quality aerial distribution networks could make this a formidable component of the district infrastructure.

Together these systems can create a robust and resilient infrastructure system. While not all of these systems are currently in widespread use, there are precedents, and with such a large scale and long time-line project role out, these processes become more feasible. Additionally, as advancements in sensor technology and automation become more ubiquitous this new district will have an overlay of digital infrastructure that controls many facets of the infrastructure system and allows for real-time recalibration thus creating even greater efficiency. Overall, this new district should be seen as an opportunity to built a new form of resilient and sustainable urban services that demonstrate best practices.

Conclusion

The goal of this design objective is to establish a vision for a built environment that actively works to benefit the environment while creating greater independence from large scale centralized infrastructure systems. A development of this magnitude, done in a conventional manner, would create a tremendous amount of new demand on current systems which are already stressed. Additionally, the land in which the site inhabits is vulnerable to environmental stresses and as such must be built in a way that mitigates those negative conditions.

Together a resilient infrastructure system and environmental form can create a lasting urban district and novel habitat. These concepts presented here largely align with biophilic city planning and the tenants of ecological urbanism as a means to achieve these larger resiliency and sustainability goals.

On the Previous Page. This diagram demonstrates the comprehensive infrastructure systems that should support a development of this magnitude. The goal is to reduce inputs and outputs to create a more closed loop, independent, district.

Hyper Local
Hyper Global

Airports today are ubiquitous non-places, disconnected culturally from the cities that they serve. This is due in part to proximity but also due to necessary security measures. But what happens when those lines, physical and psychological, no longer exist? With new aviation technologies this proposal imagines a type of airport city where jumping on an aircraft becomes as easy as getting on a bus, subway, or in car. This new aviation freedom is supported by advancements in security technologies that remove the need for security lines and scans and by smart baggage services that make traveling as easy as ordering a same day Amazon package.

But what are the negative externalities of this? How could an urban form create a ubiquitous non-place that spills out of the airport and into the city that is now even closer to the front door? That is the premise of this design objective, which seeks to establish goals and strategies for the creation of a real 'place' that is of the City that it is built in.

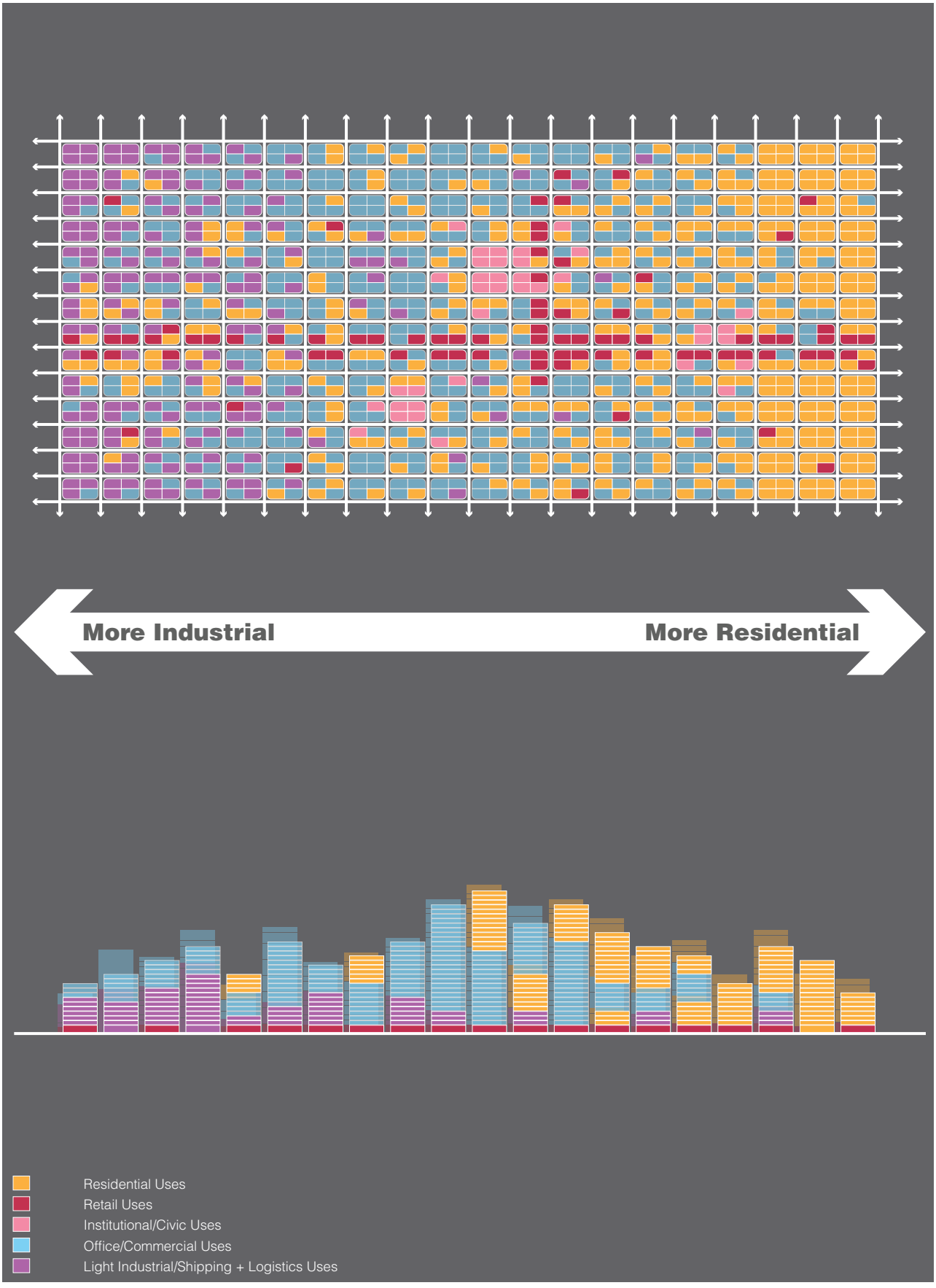
Legacy Urban Airport developments that become new nodes of air travel could run the risk of becoming places that, as Max Hirsh wrote about in her book Airport Urbanism, "service the mobile elite" and exacerbate issues of segregation and inequity in the world. To combat that, this new form of airport city most be both hyper-global, serving industry and commerce, but more importantly must by hyper-local, serving people who live there.

This need speaks to concepts of "radical mix-use" which has been seen in numerous urban proposal such as Sidewalk Lab's proposal for the Quayside in Toronto. In layman's terms this new district must provide a balanced and mix set of land uses that support both daily life and global economies. This has implications at the district, block, and building scale. Utilizing strategies that can be seen both locally, in Boston, as well as in other major redevelopment schemes to great success, these objective utilizes several key strategies.

Land Use Gradients

There should be no master land use plan for this urban district. Rather a set of procedural guidelines about proximity, compatibility, density and character should be utilized. Working alongside the other design objectives this concept should manifest itself in a gradient of land uses that blurs lines between various

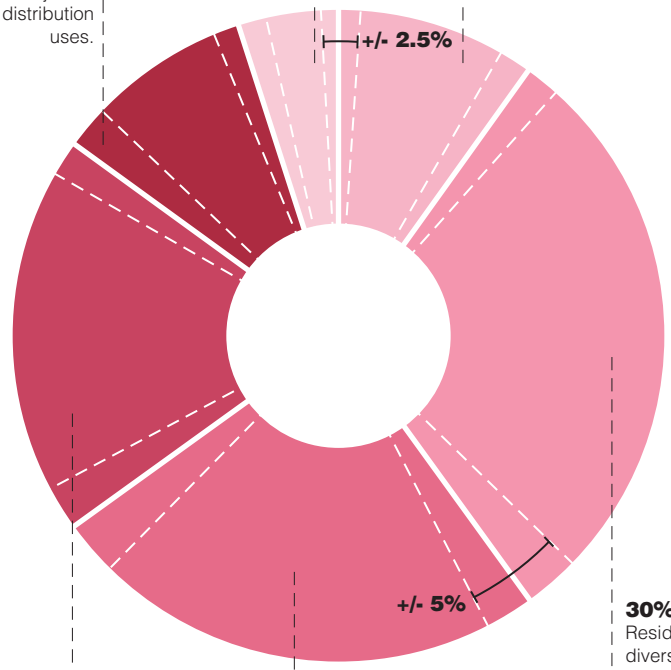
On the Next Page: This diagram demonstrates the concept of blurred lines between various uses both on a horizontal and vertical plane. The concept is to ensure that this district can support the full life-cycle of city functions, from housing to production.


More Industrial
More Residential
Residential Uses
Retail Uses
Institutional/Civic Uses
Office/Commercial Uses
Light Industrial/Shipping + Logistics Uses

5% Cultural
There should be room within the plan to host special and iconic cultural facilities like new museums, public markets, libraries and other facilities that create civic attractions. This elements should be located on prominent sites with direct access to public space.

10% Institutional
There should be room within the plan for the establishment of institutional offerings including new schools, churches, and other institutional products. These should be distributed throughout the project geography to ensure access for all people.

10% Retail + Service
There should be a concerted effort to establish neighborhood retail, restaurants, and service corridors and nodes through the project. Additionally, large scale facilities could cater to the hyper global residents and could serve as store fronts to adjacent manufacturing and distribution uses.



30% Residential
Residential offerings should be diverse, ranging in size, unit count, configuration, and target market. There should be a mix of both rental and for-sale product that targets the full life-cycle of housing ranging from young single individuals to families to older populations.

20% Production
Production facilities including manufacturing, distribution, R&D, and logistics based economies should be established along site edges and distributed throughout the project offering direct access to those jobs from nearby residences.

25% Commercial
Commercial offerings should be diverse offering both conventional office space as well as smaller more diverse product types. This could also include hospitality based industries like hotels and conference spaces.

uses both on a horizontal and vertical plane. This ingrained flexibility provides for greater market flexibility across the district and strategically situates people close to where they live and work and close to where they shop.

This is not a radical idea, but it does still go against the grain of traditional development, particularly in the United States. This strategy goes beyond the concept of “mix-use” development and stresses the importance of mixing everything. There should be a mix of height, a mix of density, a mix of uses, and a mix of people. This intentional mixing creates the vibrancy that supports both daily life of a neighborhood as well as the flexibility for global operations to set up shop within this district. This idea is of critical importance because as forms of work change based on transportation and communication technologies the lines between various aspects of a persons life will continue to blur.

Instead of using land use as a determining factor of nuisance and thus the determining factor in segregation of uses, a more metric-driven and functional set of rules should be established. This means that a pollution generating factory still cannot release exhaust into a residential courtyard, but someone making something can certainly inhabit the same block or building as a resident. In this case controls would need to be established to guide aspects of life like noise, pollution, and traffic.

The Right Mix

While creating ultimate flexibility in where things happen is one strategy, ensuring a robust city is another. Within this larger flexible framework there is a need to guide land use decisions to create the hyper-local/hyper-global desired outcome.

This proposal, as demonstrated on the diagram on the previous page, suggest a mix of land uses - residential, commercial, production, retail, cultural, institutional - that would ensure a vibrant and diverse city. These percentages take precedent from several other large scale redevelopments of this magnitude that have proven successful. Within these overarching percentages there should be built in flexibility.

Residential uses should support a diverse housing mix including high-end market-rate, workforce and affordable units in various configurations and various levels of density ranging from walk-up units to larger apartment buildings. There should be a goal of ensuring a diversity of unit sizes to support the full life-cycle of a person from a single-bedroom or studio unit to larger three and four bedroom options.

Office space should be delivered in both large scale products to attract larger companies as well as smaller buildings to allow for small businesses, co-working, and live-work options.

On the Previous Page: This diagram demonstrates the ideal mix of uses that could be achieved within the development scheme with the idea of supporting both a local and global population and industry mix. The ultimate goal is to promote a robust and thriving place that capitalizes on its connections, both near and far.

Productive land uses should include spaces for large scale food production, various forms of manufacturing, distribution, and research-and-development. Facilities should be integrated into the surrounding district and there should be options for larger format facilities that need direct access to aviation and ground transportation as well as smaller scale facilities that may co-located with other businesses and other uses.

Retail uses should be distributed throughout the district and configured to service both neighborhood needs such as, grocery, day-care, health care and other services as well as destination places like shopping malls and entertainment facilities that could serve a larger regional population. In addition this new district should support additional cultural facilities like museums, theaters, and sports facilities as well as institutional facilities like schools and universities.

Mixed Blocks are Better Blocks

In addition to providing a mixed pattern of uses focused on creating the right balance of global and local vibrancy this district should embrace diversity in form. As the diagram demonstrates on the next page, use, density, and shape can be intermixed within the same block to provide a myriad of experiences for various people. This strategy combats the homogeneous patterns so often found in cities and provides social vibrancy and economic resiliency. While care would need to be taken to ensure that uses are compatible, many forms of office space and industrial uses can fit into residential fabric without issue.

Blocks should be arranged to work with the overall transportation system described in the next section and should be sub-divided into smaller units so that no one 'project' can consume the entire block. In addition to creating urban vibrancy, this strategy also allows for the continuous evolution of the built environment through incremental change without the full reconstruction of entire blocks.

Conclusion

The goal of this design objective is to ensure that this new 'airport city' serves two masters, the global and the local. In creating this new urban district these guidelines ensure the allowance of large scale corporate headquarters that would greatly benefit from the unparalleled connectivity of this new district while ensuring that daily life of the city is not forgotten.

The end result is not a 'non-place' like the current airports of today and their surroundings but rather a 'hyper-place' that sits at the intersection of local culture and global commerce. This is not a glorified urban office park, nor is it a home for solely global travelers with no tie to place. This is first a foremost an extension of the city, connected to everything.

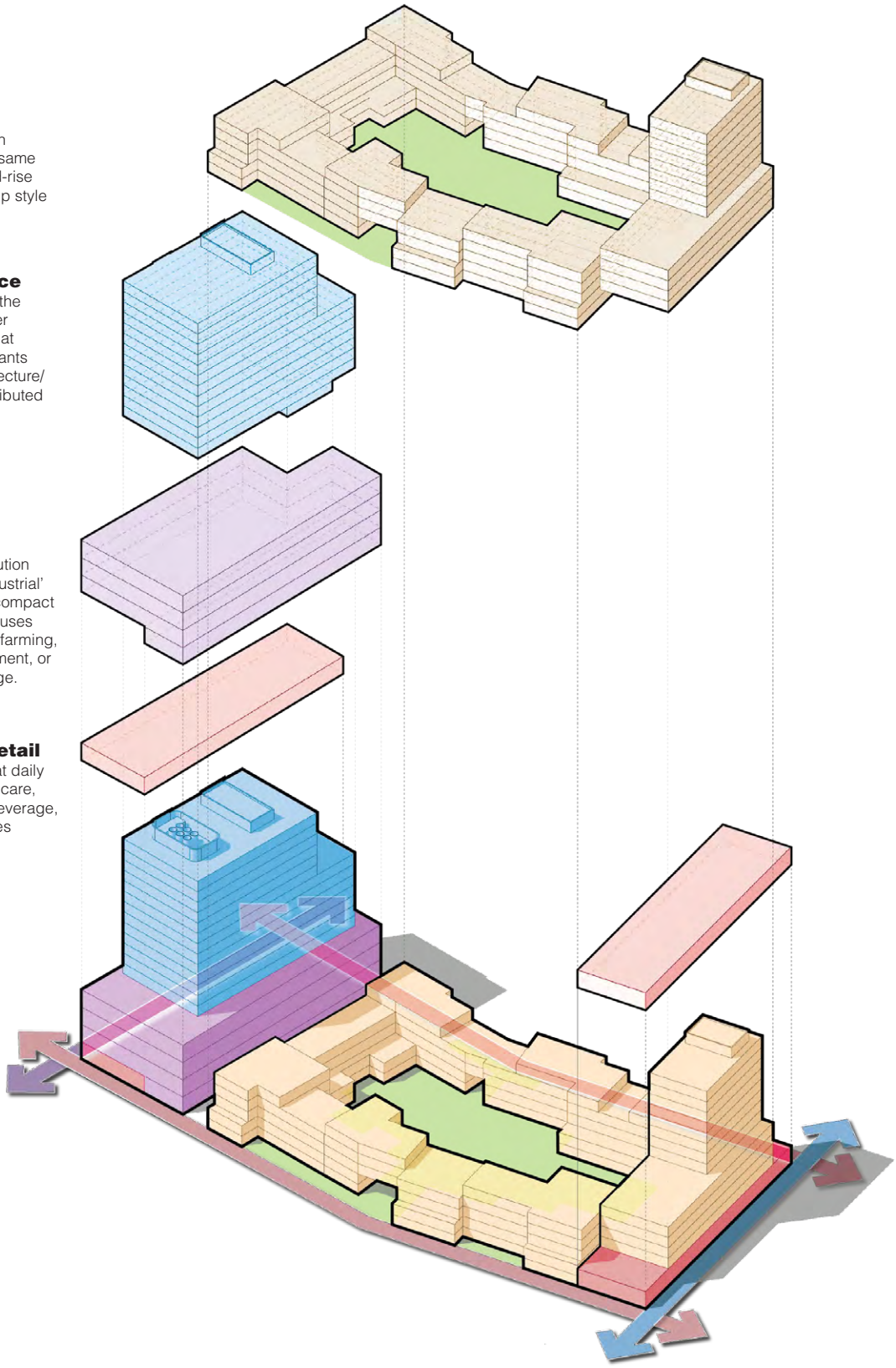
On the Next Page: This diagram demonstrates the concept of mixed-block typologies which can be reconfigured to be more or less of a particular use. The idea is that various forms, uses and densities can find themselves throughout the plan thus creating greater market resiliency and geographic flexibility.

Residential
Housing should take on many forms within the same block offering both mid-rise apartments and walk-up style units.

Commercial Office
Intermixed throughout the project should be larger format office spaces that allow for traditional tenants like law, tech, or architecture/ engineering to be distributed throughout the district.

Production
Manufacturing, Distribution and other forms of 'industrial' uses that utilize more compact spaces. This could be uses such as urban vertical farming, research and development, or retail distribution storage.

Neighborhood Retail
Small shops targeted at daily services such as child care, dry cleaning, food + beverage, and other essential uses



Interconnected Transportation

The possible future of urban air transportation could be bleak. Ever wonder why in the *Jetson's,* the family didn't have any friends? The idea of flying from point A to point B without ever having to interact with city could lead to this world. Just like long commutes in personal cars have proven to increase social isolation so too could these new technologies. To combat this possibility, it is important to think about these new technologies in concert with all other modes of transportation.

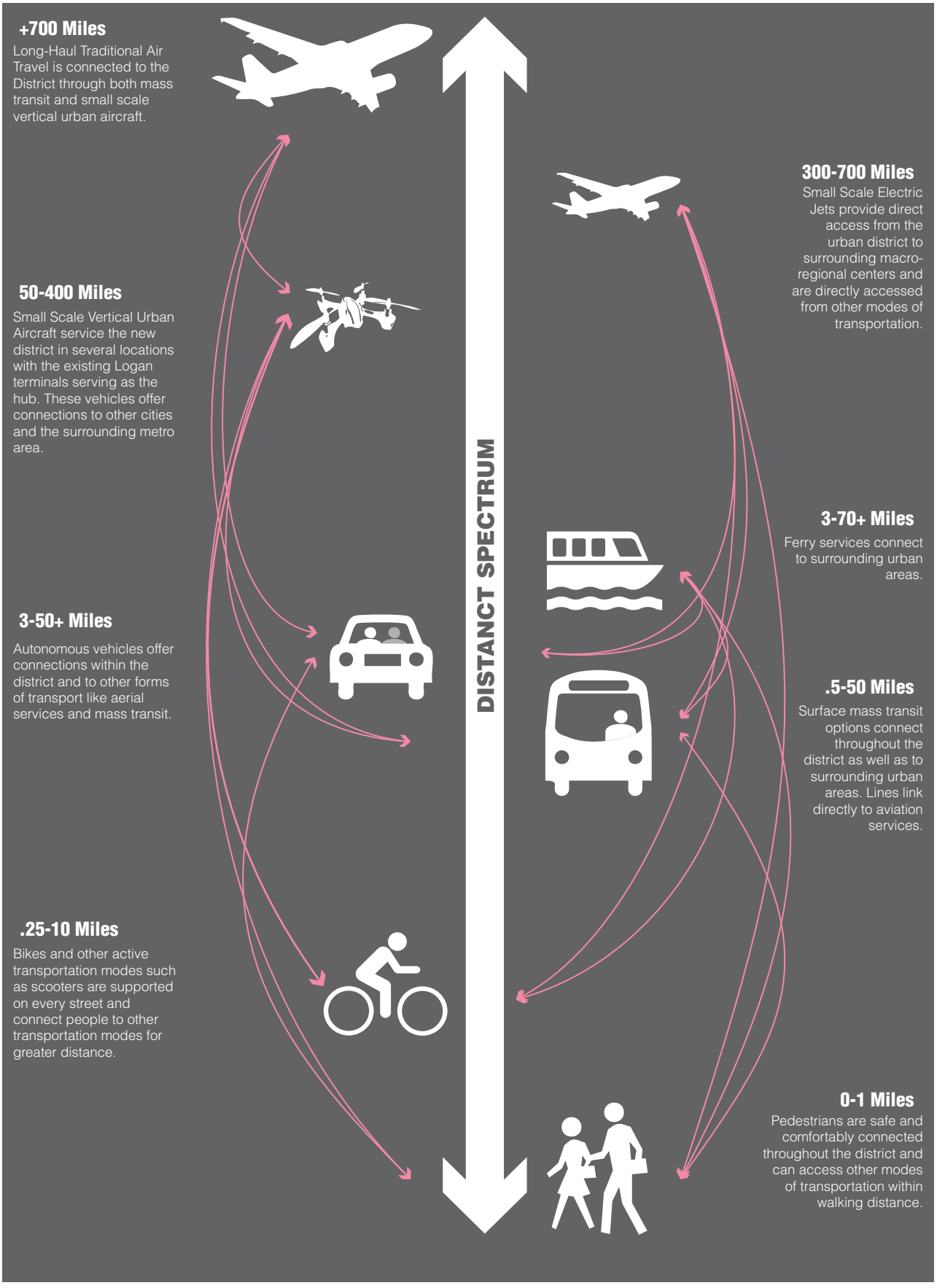
This new aerial neighborhood should be just as connected to itself and the city around it as it is connected to places far away. To ensure this, the new district is imagined as an integrated fabric as previously noted. Supporting that notion is a robust transportation network that allows for the seamless transition between mode choices. The notion of autonomous vehicles and increased means of ride sharing also factor heavily into this understanding. It is unimaginable to think that every person in this new district would use an autonomous car for every trip. These ideas get to a fundamental question about the impacts of increased mobility options. Will they make us disperse, or come closer together. This proposal argues that their is a need to come closer together, creating a more efficient use of each mode. Ensuring that these technologies are integrated eloquently into the urban fabric is a must.

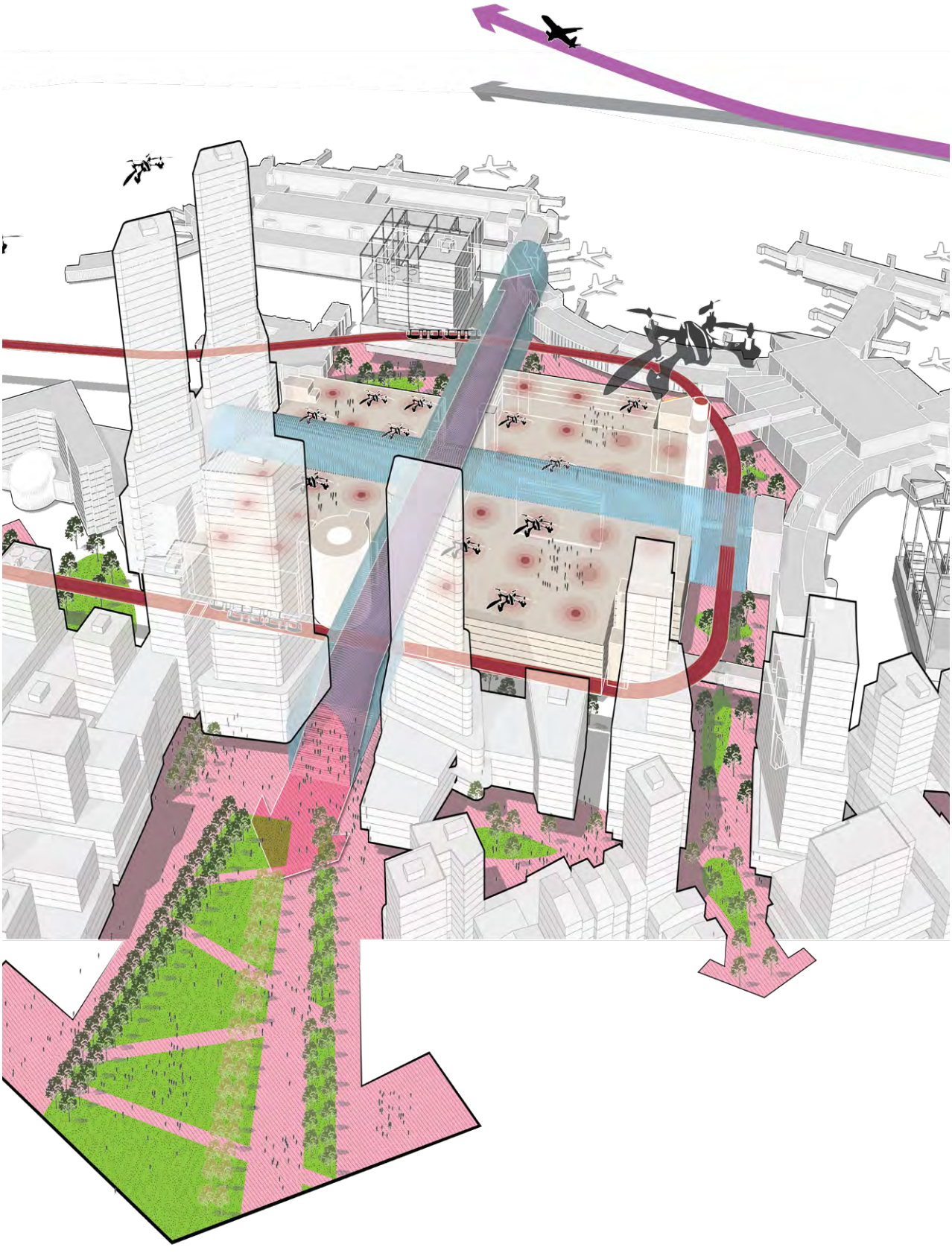
Understanding the Full System

This proposal delivers the full spectrum of transportation mode choices ranging from a robust pedestrian network to the ease of flying several hundred miles away. Each of these mode choices has a purpose and is more convenient given a specific distance. In the planning of this district each of these various networks should connect allowing for a person to transition between modes given their specific needs.

With the advent of these new urban air mobility options, this proposal takes the stance that other forms of mass, and active transportation become even more important, decreasing issues with last-mile logistics. If a person is commuting to this district from hundreds of miles away to work, they will need the ability to go from the point-of-drop off to their final destination. This new district would be supported by a robust network of surface mass-transportation options that

On the Next Page: This diagram demonstrates the various levels of transportation that influence the design and planning for this project. The critical point is the interconnectedness of all the various modes into one unified network.


+700 Miles
Long-Haul Traditional Air Travel is connected to the District through both mass transit and small scale vertical urban aircraft.
50-400 Miles
Small Scale Vertical Urban Aircraft service the new district in several locations with the existing Logan terminals serving as the hub. These vehicles offer connections to other cities and the surrounding metro area.
3-50+ Miles
Autonomous vehicles offer connections within the district and to other forms of transport like aerial services and mass transit.
.25-10 Miles
Bikes and other active transportation modes such as scooters are supported on every street and connect people to other transportation modes for greater distance.
DISTANCT SPECTRUM
300-700 Miles
Small Scale Electric Jets provide direct access from the urban district to surrounding macro-regional centers and are directly accessed from other modes of transportation.
3-70+ Miles
Ferry services connect to surrounding urban areas.
.5-50 Miles
Surface mass transit options connect throughout the district as well as to surrounding urban areas. Lines link directly to aviation services.
0-1 Miles
Pedestrians are safe and comfortably connected throughout the district and can access other modes of transportation within walking distance.



would link new aviation hubs to the rest of the district and into the existing city. Additionally, this scheme does not prioritize transportation forms, instead it provides space for all to work in tandem with each other.

At the Center of It All

At the end of the day this is a proposal for a new aviation district, and at the center of that district is the hub. While other concepts for urban air mobility imagine a completely dispersed system that is stitched into the existing disconnected fabric, this proposal ask what would this look like if a new district was built around this technology. In considering options, a centralized station provides increased efficiency while creating a space for economic and cultural concentration. In current model's that have been described aircraft ranging in size from 6-60 passengers still benefits to centralized spaces that allow other forms of transportation to provide services within a mile to two mile radius.

The diagram on the previous page demonstrates a vision for this new central facility that integrates the various forms of urban air transportation directly into the city. Utilizing Logan's exiting terminal buildings and parking structures this facility services both ESTOL (Extremely-Short Take-Off and Landing) and VTOL (Vertical Take-Off and Landing) aircraft and is connected to mass surface transportation options and adjacent urban districts by way of pedestrian and other active transportation options as well as shared-vehicles.

The facility would function like a grand central terminal for this new district offering regional and global connections at the doorstep of the city. For ESTOL aircraft there is still a need for a runway, roughly 2000', to service regional air-travel up to 700 miles in electric aircraft. These facilities would be serviced by the existing airport terminals and runways that are consolidated directly north of the existing airport. VTOL aircrafts require less space and no taxi space thus making roof-top space an ideal candidate for landing and take-off. This scheme proposes utilizing the existing airport parking facilities as the base for these new services with the floors of the parking structure utilized for limited baggage handling and limited waiting space which is rendered less important by other forms of technology that have been previously discussed in this thesis.

A mass transit-line that connects this facility to the existing MBTA Airport Blue-line station and to the surrounding district is weaved in between the existing terminals and the existing parking structure and follows the alignment of the proposed people-mover that Massport is considering as a means to respect future investments that may be made.

Connecting People to Places

Part of the success of these new aerial transportation options, is the ability to integrate into other systems and into the urban form. As previously discussed this proposal places this idea at the center of its function. To do so two strategies are utilized.

On the Previous Page: This diagram demonstrates the idea of an interconnected transportation hub that connects new forms of aerial travel to existing and new transportations systems. The concept is that these new forms of aerial transport must integrate into the existing system to be successful.

The first strategy is to ensure that there is a robust network of mass transit options that connect through the district and link back to existing transit services and to future aerial nodes. The arrangement of these lines and nodes creates a condition in which every address is within a 5-minute walk of a station. These lines then connect at multiple points to Boston's existing transportation system including the Blue-line at Airport and Orient-Heights Stations and the Red Line at South Station. These connections would replace existing Silver-line services offering dedicated right-of-way and travel lanes. These new lines could take the form of street-car, rapid bus, or light rail and could help build out a more robust segment of the 'urban-ring' transit line that has been discussed in Boston for many decades. Furthermore, future autonomous technologies would allow for all of these mass transit lines to be driver-less and integrate into the larger smart-networks that command smaller autonomous cars as well.

This new district would be linked to other urban air mobility nodes that are located within the larger metro area and within the region. This would likely support polycentric development as other aerial nodes are constructed, creating both a network at the site scale and a network at the metro and regional scale.

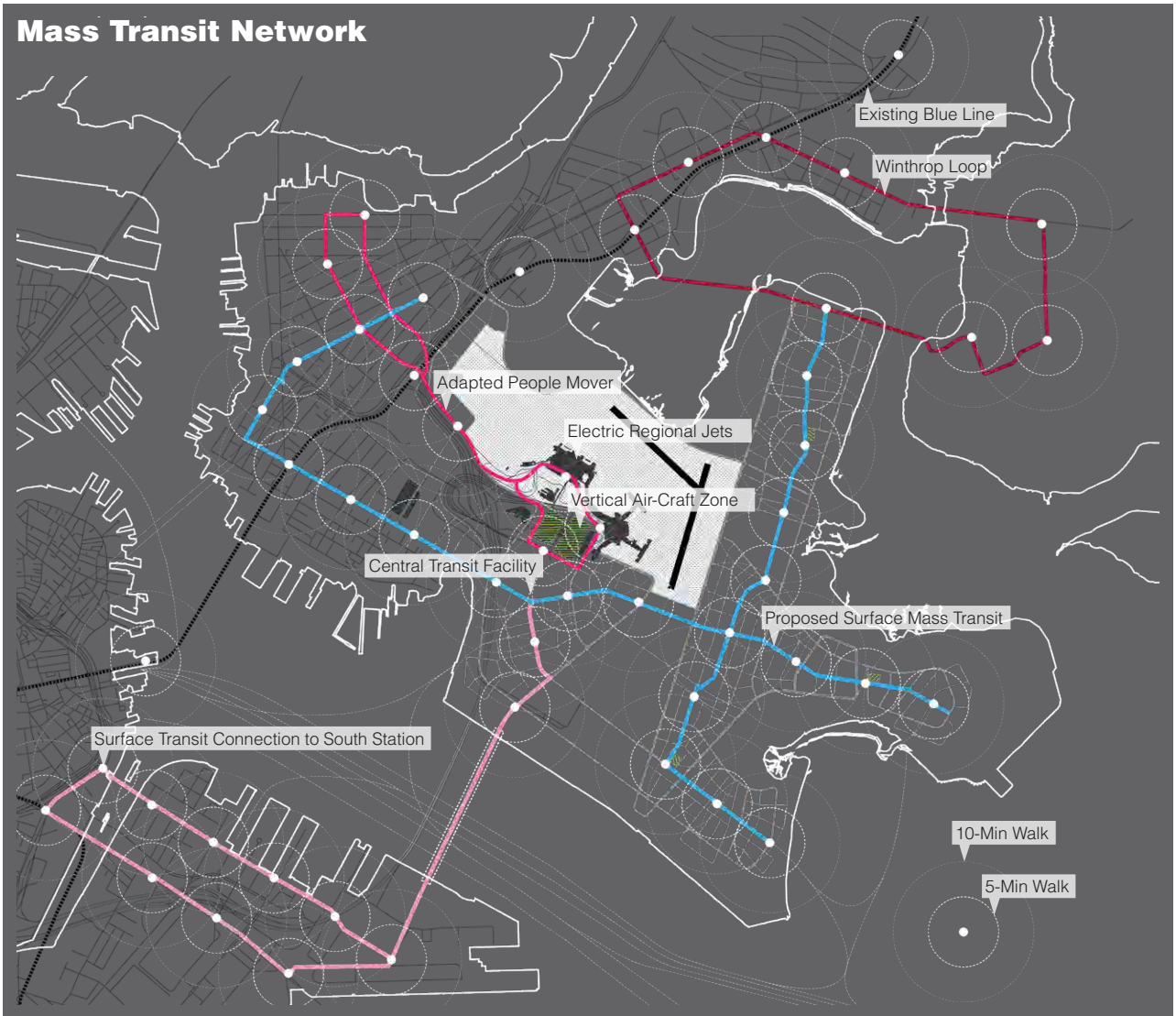
The next strategy is to ensure that the street hierarchy supports robust and effective mobility. This proposal utilizes a 'super-block' strategy which has been deployed in other cities across the globe to create a hierarchy that distributes equitable space for pedestrians and active transportation modes, autonomous vehicles and ride share, and mass transit through the offsetting of large blocks. This system sets up a scenario where every block is serviced by pedestrian on all sides, vehicles, on two sides, and mass transit within two blocks. This transport pattern would help distribute land uses that match mode-choice with higher residential spaces locating along pedestrian corridors, commercial, retail, and cultural spaces locating along mass-transit corridors, and production spaces and other commercial spaces locating along vehicle corridors. Along all corridors people are prioritized and the spatial guidelines presented on the next page ensure comfort and convenience. It is important to consider that the function of this network will be very different than today's 'streets' in that modes of transportation will be much more spatially mixed as autonomous technologies advance allowing for reduced conflicts. However, with these advancements comes a need to manage spaces appropriately allowing for the most vulnerable of transportation modes to come first.

Conclusion

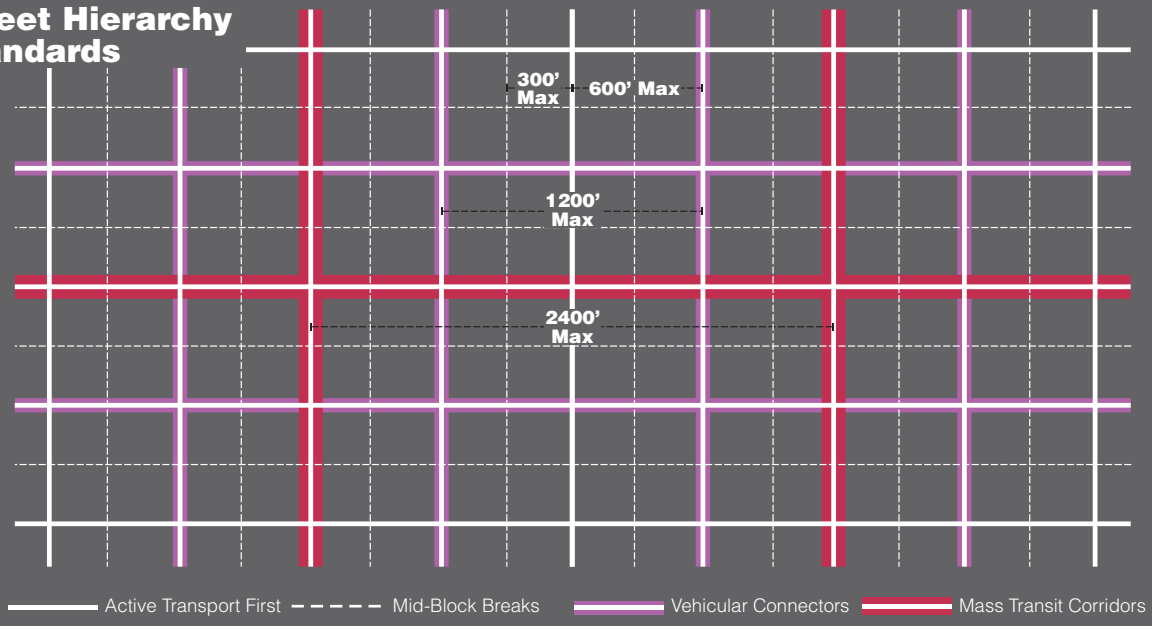
The goal of this design objective is to ensure that this new aerial district functions within itself and within the surrounding city just as well as it functions on the regional, macro-regional, and global scales. This objective also goes hand-in-hand with the other design objectives, specifically the idea of hyper-local and hyper-global, and especially the idea of people first. Together they create a strategy that allows for the evolution of urban air mobility while demonstrating how these systems can be integrated together to create a functioning urban district.

On the Next Page: (Top) This diagram demonstrates the integration of mass transit services into this new urban district, connecting back out to the larger city fabric. (Bottom) This diagram demonstrates the overall street hierarchy and classification scheme utilized to ensure a robust and connected network for all forms of transportation.

Mass Transit Network



Street Hierarchy Standards



People First

The last design objective is centered around the understanding that all urban places are for people, and as such, people should be placed at the center of everything. One critic of the 'Aerotropolis' model that this thesis has presented is its focus on the 'Mechanical' and 'Capitol' City, which seeks to deliver economic and industrial efficiency over social cohesion and cultural identity. As we imagine an aerial future, how do we infuse human-centered design into the very DNA of a place? While the other design objectives are largely born from an analysis of technology or an understanding of the site, this objective stems from the planning theories and precedent research that was completed.

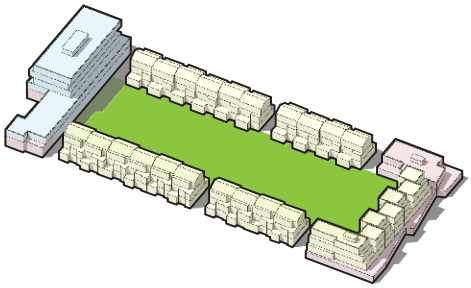
Legacy Urban Airports are largely, if not entirely, void of a human-centered past and as such require the importing of concepts to help drive urban form. Utilizing concepts supported by literature such as Anne Spirn's *Granite Garden,* or Jan Gehl's *Cities for People* and an analysis of other large scale urban redevelopment projects several overarching strategies are created. Together these work to ensure that even in an age of hyper-mobility the concept of 'home' has a voice.

The Neighborhood Unit

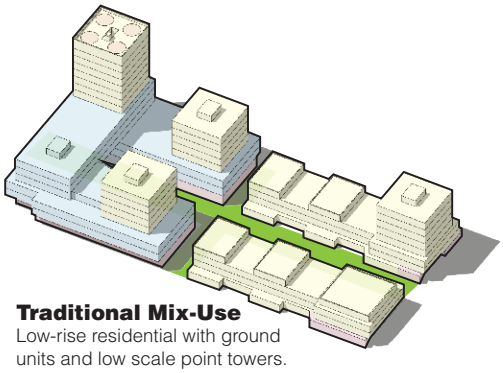
At the center of everything is the understanding of the neighborhood unit, designed to support a person's everyday life within a 5-minute walk. These units are repeated, and while they all can have different levels of various uses and special features, there are core attributes that each one must ensure. This concept builds on the distinct neighborhood culture that is already familiar to Boston and, from a larger typological standpoint, delivers guidelines to reduce mono-cultural districts, ensure equitable development and create diverse and lively places that function throughout they day, week, and year. Core functions of the neighborhood unit include service like, but are not limited too:

- Housing Diversity (Unit Type, Unit Size, Building Form, Affordability)
- Business Diversity
- Daily Amenities (Grocery, Daycare, Schooling, Medical Services, Dry Cleaning, Barber, Religious Institution, Banking, etc.
- Access to Central Gathering Space
- Access to District/Regional Transit
- Access to Life Style Amenities (Restaurants and Bars, etc.)

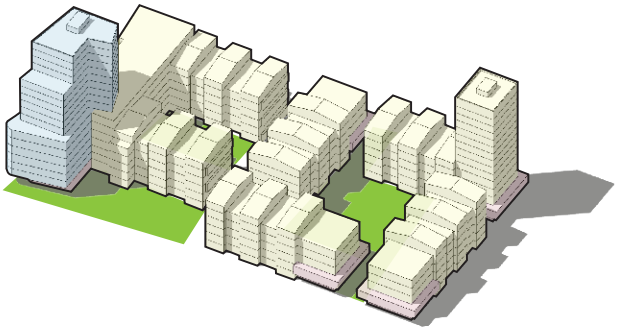
On the Next Page: This diagram demonstrates on of the neighborhood units within the larger plan. The idea is that regardless of density, use mix, and location that all areas provide a baseline series of amenities, services, and spaces.



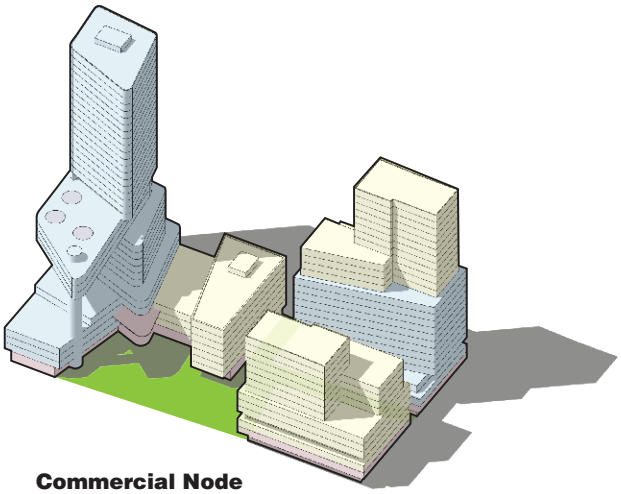
Low Scale-Residential
Walk-up residential in block interior with retail and loft style residential along one edge and commercial space along the other. Central open space with private backyards and common space.



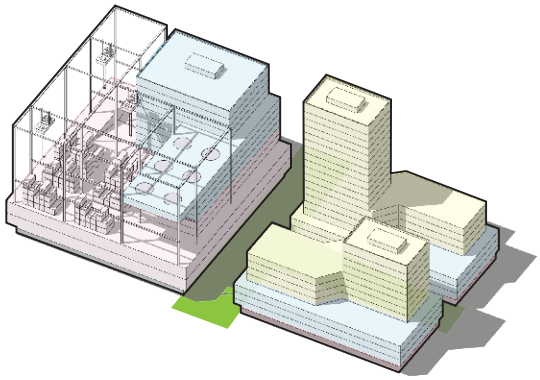
Traditional Mix-Use
Low-rise residential with ground units and low scale point towers. Large scale office space with residential point towers. Internally front porch facing public space.



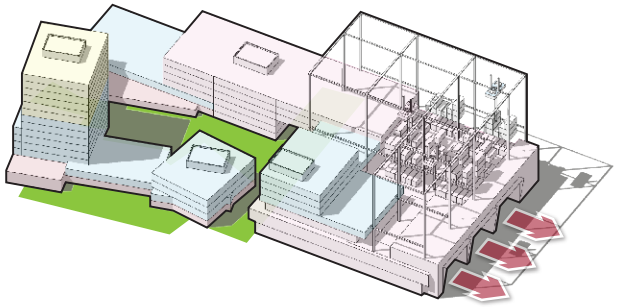
Residential Courtyard
Dense walk up residential with select point towers for both residential and commercial space. Corner retail and semi-private residential courtyards.



Commercial Node
Dense, large format commercial space with large scale retail/ entertainment center. Residential dispersed vertically and horizontally. Central outdoor gathering space and access to vertical aviation services.



Industrial Mix Use
Vertical manufacturing and distribution centers with integrated commercial office space. Residential point tower above commercial spaces. Access to vertical aviation services.



Airport Facing
Mixed blocks surrounding shared courtyard space. Manufacturing and distribution services connect to airfield to stream line logistics.

Together these attributes create a unit in which people can take ownership over. These units would be bound by distinguishing edge features like district-significant commercial and transportation corridors, water, or larger park spaces while being linked together through all modes of transportation. Added together they create a cognitive map that allows for the cultural evolution of these spaces so that, overtime, they begin to take on a character unique to the people who live there.

One important component in this strategy is that even within the spectrum of larger land uses their should be an effort to create comprehensive neighborhoods. Coupling this strategy with the Hyper-Local/Hyper-Global design objective the district will have neighborhoods with higher concentrations of production uses or commercial uses but will ensure residential populations and the supporting amenities needed to make those places livable. This leads to the next strategy in which embracing mixed block typologies creates the physical form for this larger neighborhood unit goal to be achieved.

Block Typologies

The next strategy is the elimination of single use and single owner blocks in favor for smaller more diverse block forms. In this strategy no single building or use can consume an entire block. While certain exceptions could be made for things like large cultural or institutional facilities this strategy ensures flexibility for incremental change, breaks down the scale of architectural massing, and incentivizes diverse and mixed land uses.

The diagram on the previous page demonstrates several prototypical block patterns that could be utilized across the spectrum of land use concentrations. While certain areas of the overall district may be more residential others may be more production oriented or commercial. What this strategy ensures is that even within this spectrum other land uses make their way into the mix.

Additionally this strategy focuses on the delivery of human scaled massing. This concept seeks to establish street level activation through not only uses like retail and restaurants but also through residential doors and porches, commercial ‘storefronts’, permeable facades, and lower level balconies. The concept is to deliver multiple forms of ‘eyes-on-the-street’. This strategy also deploys horizontal articulation and variation to reduce the visual length perception by catering to slower speeds of travel as well as to increase the porosity of block massing. This includes things like mid-block pass-through spaces, social eddies, and the increased repetition of building openings regardless of the uses.

The other aspect of this strategy is to create a spectrum of spaces that transitions from private to public and provides various levels of serendipitous social interaction. What this means is the creation of indoor and outdoor spaces designed for various aspects of people’s day that extend the concept of ‘home’ or ‘work’ out of individual residential units or individual office space. This would

On the Previous Page: This digram shows several potential block configurations for various concentrations of uses ensuring that human scale design and people amenities and spaces are provided throughout the urban fabric.

include spaces like interior semi-private courtyards for residential buildings and various pocket plaza formations throughout the built fabric. This strategy builds off of concepts presented in literature by authors like Jan Gehl, Charles Montgomery, and Jane Jacobs and seeks to create an ideal human habit that combats the inevitable disconnection that hyper mobility would create.

Human Comfort

The next strategy creates a series of guidelines to ensure indoor and outdoor human comfort from both a physical and mental standpoint. It focuses on ensuring mitigation of wind effects due to building form and orientation, access to sunlight both inside and outside, and visual access to green space. These elements have been proven to have cumulative impacts on both physical and mental health.

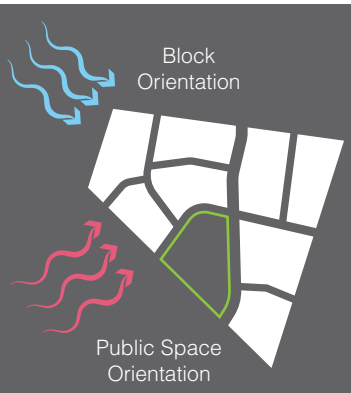
Block and building orientation should be configured to channel summer winds and block winter winds by way of street orientation. Additionally, long strait streets should be minimized to dissipate wind patterns while building massing, especially taller buildings, should utilize deep lower level step backs to reduce wind shear at the street level. Towers should also be staggered to allow for free movement of air and the reduction of channelization. These guidelines also impact access to sun and the casting of shade. Set backs should be utilized to ensure maximum sun exposure of street and lower building levels while block and massing orientation should ensure that all side of a building receive some access to direct sunlight at some point during the day. These guidelines should also dictate the formation of public and private open space to maximize access to sunlight and protect from negative climatic factors like wind and rain. This would include things like street level colonnades and awnings as well as strategic analysis of block massing to ensure ideal solar conditions for interior courtyards and larger public spaces.

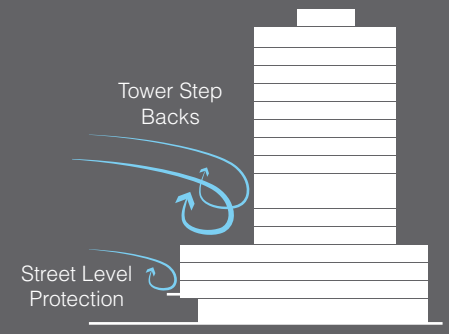
Finally, effort should be taken to ensure that every point within the new district has direct visual access to natural elements like street trees, courtyards, parks and gardens and that within a five to ten minute walk there is access to larger, more robust natural spaces that allow for retreat from the density and excitement of the urban district. This idea is supported by research that notes the positive mental and physical health impacts of physical a visual connections to green space.

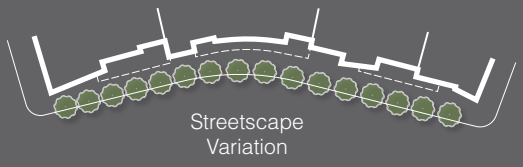
Conclusion

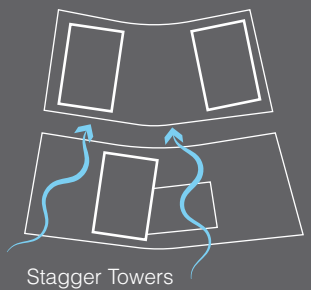
The goal of this design objective is to ensure a healthy and happy city for all people that establishes a sense of ownerships and agency amongst its residents and workers. The proposal takes the stance that even in a era of increased mobility and global connections that the notion of ‘place’ is even more important.

On the Next Page: A critical component of ensuring places for people is understanding human comfort and the impact that the built environment can have. With today and tomorrow’s technological ability to test and understand climatic conditions great care should be given to ensure ideal protection and advantages for the various elements such as wind, sun, rain,etc.

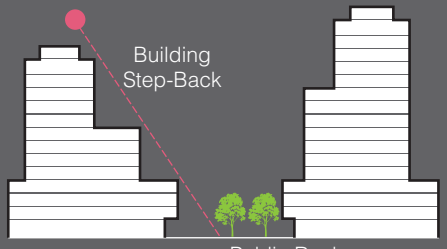


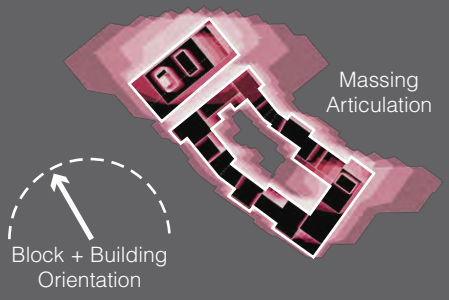




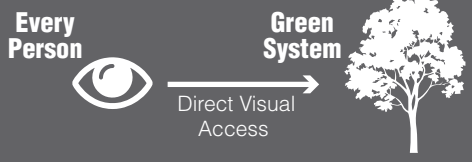


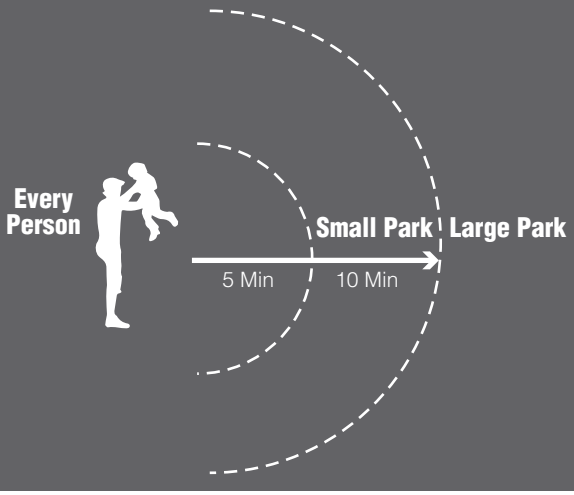
Mitigating Wind Impacts





Access to Sunlight





Access to Green Space

Putting It All Together

Together these design objectives outline the fundamental pieces of a vision for an aerial future. This vision is centered around new forms of aviation devices and urban air mobility but considers these changes in the larger context of city function, in terms of cultural vitality, ecological sensitivity, economic efficiency, and personal ability. This vision is set on a realistic site to understand both the larger urban implications and influences of a development such as this, as well as for a means to understand the urban prototype that this project represent.

The conclusion is an urban form that embraces global connections and hyper-mobility on one end and emphasizes the importance of 'place' and personal connection of the other end. This grounded aerial future takes a humanistic perspective to the integration of new forms of transportation and technology, such as urban air mobility and autonomous cars and demonstrates how Legacy Urban Airports could serve as a catalytic opportunity to build a district uniquely situated to serve both global commerce while celebrating local culture.

Each design objective is meant to build upon the next and has major implications on both the urban form and the social and economic operations of a place like this. In summary, these places should utilize process to anticipate future conditions, integrate seamlessly into the existing city, establish a resilient constructed ecological function, serve both a hyper-global and hyper-local society and economy, create a robust and interconnected transportation system, and be designed built to serve people first and foremost.

Shown here as a prototype, the Logan Airport site, represents a future for Legacy Urban Airports to provide cities with a new district typology, by infusing new form and function into currently contentious sites. This vision allows for the reuse and reimagination of urban assets that respects the sites past and present uses while laying a groundwork for a more effective and efficient future.

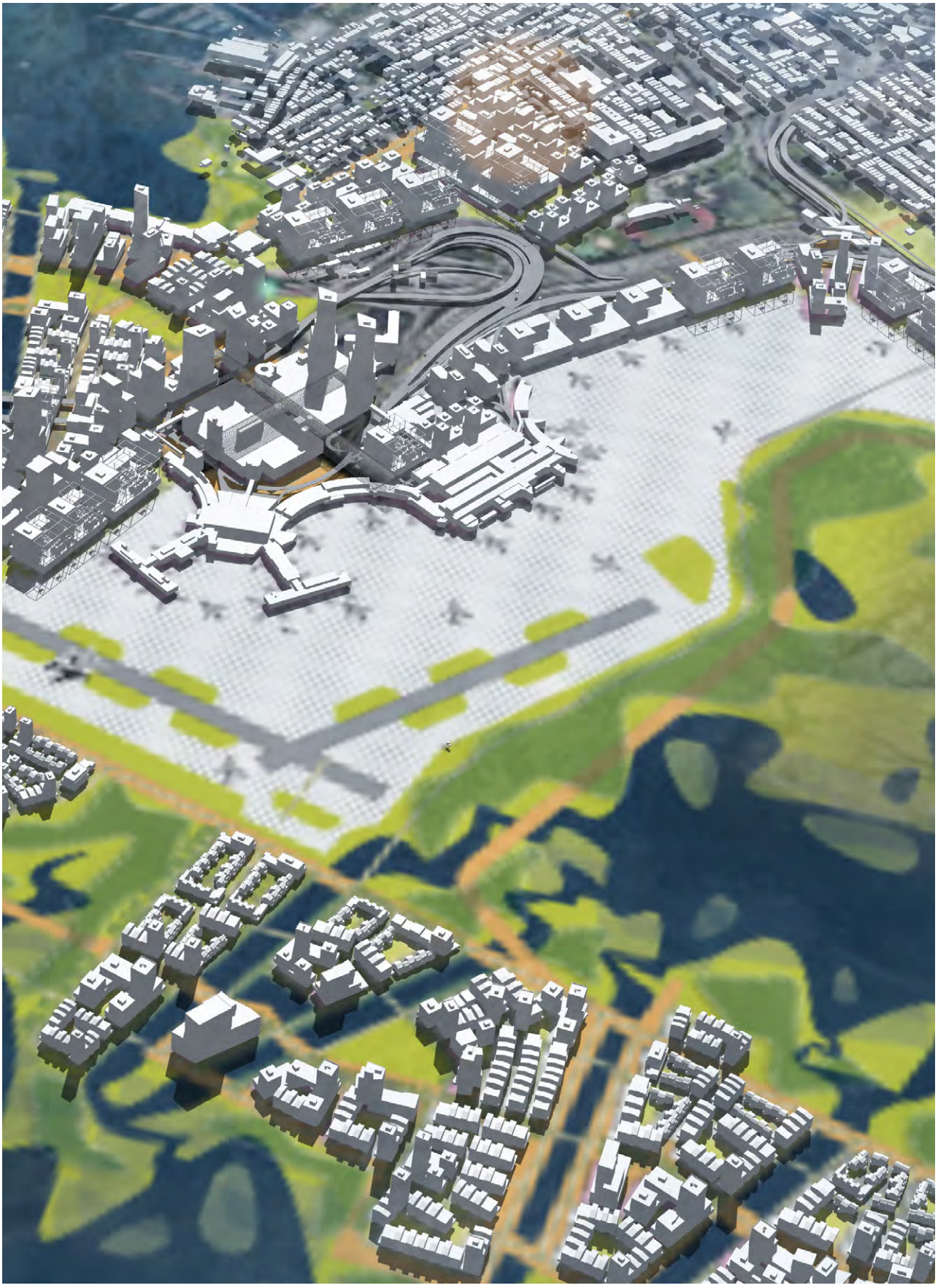
The following chapter demonstrates an illustrative representation for the potential of this site and discusses the order of magnitude scale of urbanity under consideration.

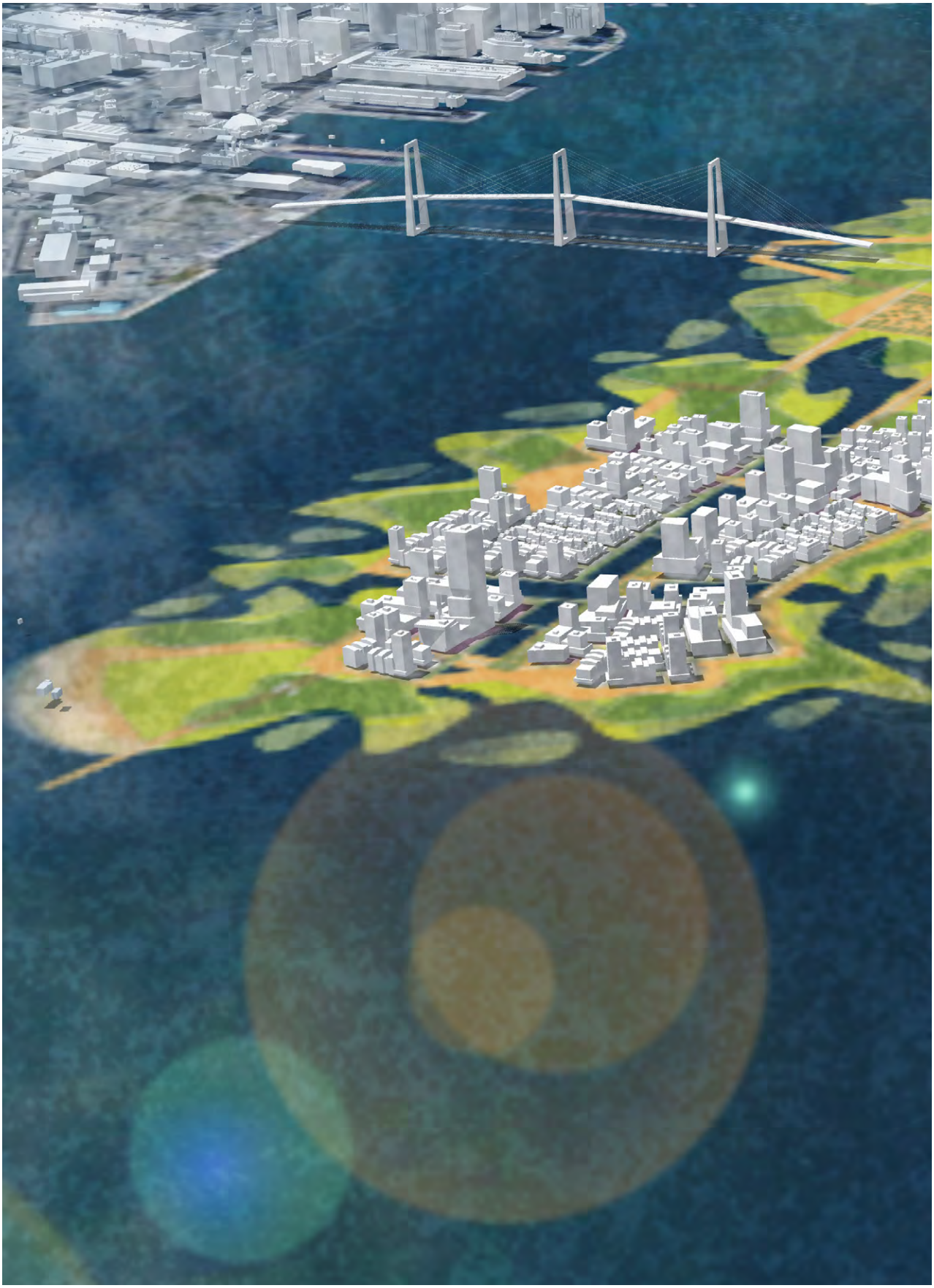
On the Next Page: The overall conceptual plan is a culmination of the various design objectives. While the plan could take on various shapes the overall concept and functionality should remain.

Chapter 7

Long-Term Vision

This chapter demonstrates an illustrative vision for the future of the Logan Airport site utilizing the design objectives and planning frameworks. These drawings are schematic and focus on a order-of-magnitude understanding of the qualitative and quantitative aspects of this new urban typology.





FutureLogan: A Prototype for Legacy Urban Airports

The urban design plan presented here and on the previous pages is for representational purposes only. The intention of this thesis was not to create a specific urban design plan, but rather a generalized typology that demonstrates the core objectives and framework ideas. While this vision aligns with the planning frameworks and design objectives outlined in this thesis it is important to note that not every detail represented is of consequence. Instead, what should be gathered from an image like this is the overall concept and pattern of urbanity that is being achieved. With that being said there are right and wrong answers. It would be a mistake to assume irrelevance to the way the blocks are shaped, the way the park space interacts with the development, the way the aviation functions are situated and the way that certain land uses interact with one another. This represents a new urban typology of a grounded aerial future for legacy urban airports and a specific vision for how Logan could be transformed as a prototype for this larger model. In the process of developing this typology it was critical to think of it in the context of a real site and about the various interactions that would take place between these sites and their surrounding context.

① Central Aerial Hub
② Regional E-STOL Runways
③ Metro VTOL Hubs
④ Industrial Clusters
⑤ Cultural Nodes

Important Public Spaces
Neighborhood Centers
Natural Spaces
Water


0'
300'
600'
1200'

Understanding the Order of Magnitude

Overall Site Area

Total Land Area in Acres	1,766
Total Land Area in Square Feet	76,914,522
Total Land Area in Square Miles	2.76

Total Development Size

Total Land Area in Acres	550
Total Land Area in Square Feet	23,853,790

Total Open Space

Total Land Area in Acres	930
Total Land Area in Square Feet	40,529,618
Acres per 1,000 Residents	10.5

Aviation Space

Total Land Area in Acres	290
Total Land Area in Square Feet	12,531,114

Land Use Metrics

Residential	
Total Population	~90,000
Average Density	~85 Dwelling Units Per Acre
Total Dwelling Units	~46,000
Commercial Office	
Total Square Footage	~28,600,000
Number of Jobs	~200,000
Industrial	
Total Square Footage	~7,200,000
Number of Jobs	~24,000
Retail	
Total Square Footage	~5,000,000
Civic +Institutional	
Total Square Footage	~5,000,000

This conceptual urban design plan allows for the understanding of the order of magnitude for a redevelopment effort of this scale. While the final configuration could take many shapes, the general scale of build out would be relatively similar to what is being shown in this plan if the conceptual model is followed. To that end, this analysis uses similar density measures to those seen in other Boston inner city neighborhoods for both housing and jobs. Additionally, general allocation of land uses follow similar patterns to those of other large scale urban redevelopment efforts in the North America and Europe.

With roughly 50% of the site being given over to parks and public spaces the development shown would provide over 40,000 residential units housing roughly 90,000 people. The average residential density of 85 dwelling units per acre would be similar to those densities seen in the Back-Bay or South End neighborhoods in Boston with some areas being more dense and some being less dense. This magnitude of housing would provide a significant dent in the roughly 70,000 residential units that the City has deemed needed by 2030 while providing continued room for growth over the coming decades. The densities shown would allow for a wide range of housing types as well, from apartment towers to row homes and residential flats. In addition, the shear number the number of affordable housing units that could be created would also be substantial.

In addition to housing this redevelopment effort could host tens of millions of square feet in commercial office, light industrial, institutional, and retail space that could provide jobs for well over 200,000 people. This number is similar in scale to the number of people that currently work in downtown Boston. The form of this development would vary from relatively dense office environments similar to downtown or the Seaport to lower scale and distributed forms.

The density of workers and residents is offset by a relatively larger amount of open space which is used for ecological functions and storm surge protection. The nearly 1,000 acres of park space is equal to over twenty Boston Commons and would provide just over ten acres per 1,000 residents which is largely considered a bench mark and is often only met in more suburban environments. This development attribute would provide existing and new residents with an increase in quality of life and supports many of the City's resiliency and park goals.

Finally, the development shown accounts for nearly 300 acres of aviation space, housing new models for urban air mobility as a central component of this plan. This space would provide for small scale vertical aircraft functions as well as slightly larger regional electric aircraft.

The following chapter explores several of the larger city-wide implications, both positive and negative, of this type of project and discusses means for implementation and governance.

On the Previous Page: The numbers shown here demonstrate the order of magnitude size of development that this scheme could achieve. These calculations utilize similar densities to existing Boston neighborhoods as a comparison.

Chapter 8

Governance + Externalities

This section discusses the positive and negative externalities that the design and development might present on the city of Boston and how these might be mitigated or capitalized. The section discusses these aspects in a broad sense, and while it offers a spectrum of possible solutions it does not seek to resolve every benefit or impact that could result from the proposal.

Implementation Framework

Realizing a project of this magnitude is a complex endeavor requiring many stakeholders and financial pathways. There are issues of land ownership, regulatory jurisdictions, federal aviation requirements, local and state politics, private interest groups, and surrounding residents. While the full spectrum of implementation is not the central focus of this thesis it is imperative to understand these issues at a high level. For this discussion it is important to summarize the proposal and for these purposes a 'finished' condition will be utilized, although what has been presented in this thesis would unfold over many decades.

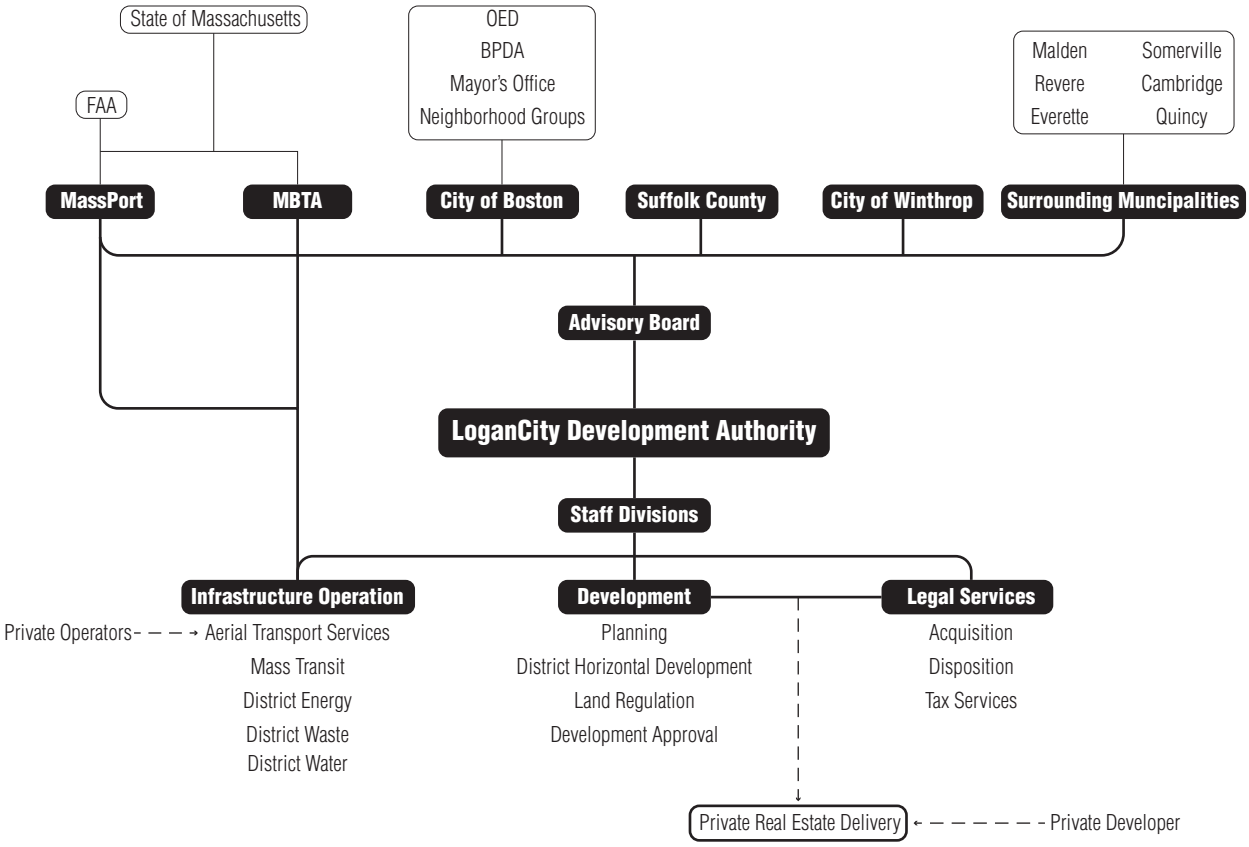
What is being proposed is a relocation of more 'typical' aviation services to a second airfield within the Boston metro area. In place of the uses and space at the current Logan Airport site, a new urban district would be developed centered around an aviation hub that services new forms of air travel within a much smaller footprint. These two facilities would function as a multi-airport system, offering both regional and global connections to the Boston metro area. The new urban district would host a diverse mix of land uses including housing, commercial, institutional, and industrial uses that would be integrated into the existing Boston urban form. This district represents a new urban typology that maintains both distant and near-by connections on an unprecedented level creating a unique hyper-global and hyper-local neighborhood.

This section explores two major ideas. The first is the institution of a separate governing entity, which is a fundamental planning framework idea presented earlier in this thesis. The second idea is a description of the high-level financing pathways that could be utilized to deliver what has been proposed in this document.

Governmental Structure

Building off precedent research exploring both airport development projects as well as other large scale redevelopment efforts of post industrial lands this proposal utilizes a governmental structure created for the soul purpose of developing and operating the new urban district. This new structure, diagrammed on the following page, would be a state level redevelopment authority with powers to tax and regulate land. This new entity would be created to ensure consistency across political time cycles and would represent a much larger stakeholder group than both the City of Boston and Massport, the current land owners and regulatory agencies.

The purpose of this authority would be three-fold, serving infrastructure operations, horizontal development, and legal services and would be guided



by an advisory board made up of the various stakeholders at both a state and municipal level. Within this advisory structure there would be certain stakeholders that have a stronger representation that others given their stake in the project, either financially or socially.

Infrastructure operations would include aerial transport services, mass transit, and district energy, waste, and water. While direct pathways would exist for MassPort and the MBTA to maintain operational oversight over their various systems certain components could go above and beyond the capacity of those agencies. For example, MassPort could maintain ownership and operations of the airport buildings and could still manage the contracts of the various private operators to provide aviation services while the new entity could assume management of the supporting infrastructure such as energy, waste, and water. Similarly, MBTA could maintain operations of the mass transit services but the various lines and stations could be built by this new district entity. As previously discussed in this thesis, this proposal suggest an infrastructure system that would be mostly separated from other city infrastructure. Utilizing a separate government entity would allow for this aspect of the project to happen.

On the development front, this agency would be responsible for the overall district planning and horizontal development of the site including infrastructure

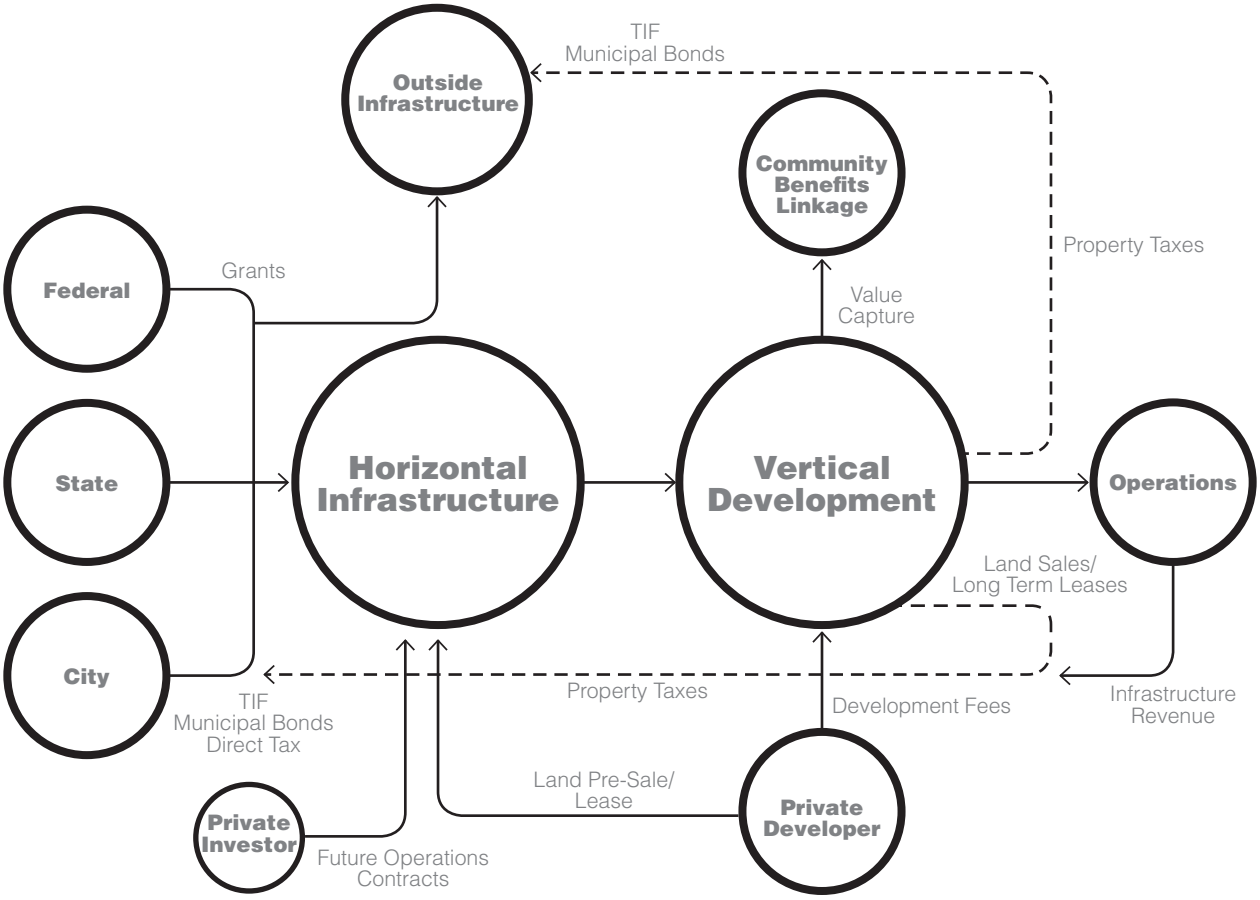
Above: This diagram demonstrates the conceptual governance and implementation framework that would allow for a redevelopment of this magnitude to take place. Demonstrated are the various partners and the organizational structure that could be utilized.

and land parcelization. Once areas of the site are ready for vertical construction this entity would be responsible for land regulations and development approval processes. Private developers would then be responsible for vertical construction of the various buildings, neighborhoods, and institutions and would utilize land sales or long term leases to acquire rights to build on various parcels. This entity would also have the ability to set taxes for use within the district, creating revenue streams that could services the various financial needs of the district.

While this district would still fall within the boundaries of the City of Boston, this separate governing entity would serve as a means to both protect the City from financial obligations as well as ensure a more streamlined approach in the delivery of this district. The structure presented here mirrors what other cities have done to assist in the creation of these mega-developments allowing the City to continue to focus on other needs within its jurisdiction while allowing this place to unfold.

Financing Pathways

The delivery of this new urban typology would not be cheap, but through strategic development mechanisms a profitable endeavor could be created. As outlined below this new entity could utilize a number of typical economic development mechanisms to jump start the development of this place. Utilizing



a mix of federal, state, and local dollars horizontal construction could be financed through tax incremental financing, municipal bonding, or a direct tax on current airport users or the city as a whole. Additionally, private investors that are interested in the future of these technologies could enter into deals for upfront financing that would allow for them to operate certain components of this new district. Private development dollars could also be utilized through pre-sale/ pre-lease mechanisms. This project also has the potential to tap into various forms of federal grant assistance through transportation, energy, resiliency and other pathways.

As the horizontal development commences on a neighborhood by neighborhood basis, land sales or long term lease revenues would be utilized for debt services incurred for the horizontal development or other outside infrastructure expenditures necessary to make the district happen.

Once vertical development commences there would be a need capture value generated for other community benefits such as affordable housing or discounted retail or office space as well as additional community benefits that may lie outside the bounds of the district. Those value capture mechanisms might also be applied to other areas that may benefit from increased land values from the development and infrastructure created for this district.

Operational expenditures would be financed through development fees as well as ongoing service payments of tenants, the profits of which would be put back into debt service until that is payed off. Those ongoing fees, as well as direct taxes such as property or hospitality taxes would also be utilized to fund ongoing operations.

Conclusion

From an urban design perspective, this thesis introduces a new urban typology into the city fabric. This new district, in form and function, is different than the surrounding city. However, past examples from other large scale redevelopment efforts both domestic and abroad give a road map for how this new typology might be realized utilizing a distinct governing structure that capitalizes on public-private development and multiple stakeholders to reduce risk and maximize feasibility. This new entity would allow for a streamlined financial model that utilizes multiple pathways over many years to create an economically sustainable urban district.

While a full implementation plan, governing structure, and financial plan are outside the scope of this thesis, this section has given a high-level picture for how these elements of the project might be thought of. The next section discusses the larger implications that a project such as this could have on various aspects of the region and offers insights for how these various externalities might be mitigated or capitalized upon.

On the Previous Page: This diagram demonstrates the high-level financing structure of a project of this magnitude utilizing various streams of funding throughout the process.

Positive + Negative Externalities

With a project of this magnitude and diversity it is critical to consider the implications that extend beyond the site boundaries and direct stakeholders. This sections discusses the physical, social and economic externalities through several lenses and offers ideas about how to mitigate or capitalize on many of these elements. This narrative does not represent an exhaustive list, nor does it detail out any mitigation efforts; rather it utilizes narrative to broaden the understanding of this site specific proposal and the urban typology that it represents.

One of the core planning frameworks presented in earlier chapters was the idea of building the city that you want to see. To accomplish this, an outline of the various positive and negative externalities helps to decipher various policy and program initiatives that could be developed to both mitigate and capitalize on certain elements. Presented below are high level discussions. Following this section is a more specific discussion about several physical regional projects that should be understood in concert with this project. Overall, the idea here is to outline how a project like this could offer benefits to the region that go beyond the site boundaries.

Housing and Affordability

As previously discussed this proposal demonstrates the order of magnitude in terms of the scale of the development with roughly 100,000 people likely being able to call this new district home. That influx of housing would have major implications on the housing market within Boston.

From a positive side, it would serve as a release valve for the extreme demand pressure that currently, and will continue to exist. Boston is a geographically constrained city and as such has limited options for new development thus driving up cost of land and subsequently housing. This project would provide a market mechanism to help combat this. Additionally, the public ownership of the land would allow for creative financial mechanisms that could further drive down the cost of market-rate housing that is constructed.

The second aspect is the inclusion of Affordable housing options. Again, the public ownership of the current land would allow for certain restrictions to be placed on various components of the project. Overall the goal of a project of such magnitude should be to provide even more than the current market and housing policy conditions provide for in the City. Mechanisms for ensuring both deeply affordable housing as well a reasonable work-force housing could be delivered through various forms of public-private partnerships, community land

trust and other mechanisms that work within the site boundaries to ensure that the mix of housing is targeted to a diverse population.

Outside of the site boundary linkage policies could be established to channel money from the large scale redevelopment into the surrounding cities' affordable housing budgets to have an even greater impact across the metropolitan area.

Adjacent Land Use Pressure

Large scale change of this magnitude always has residual impacts on the directly adjacent lands which can be both good and bad. In certain areas where the economic status of individuals trends to the lower-income side this can cause issues of displacement and greater financial housing burden as property taxes, land prices, and rental cost rise. To combat this, various forms of tax abatement, homeownership programs, and rental assistance can work to ensure that current residents are able to stay.

In other areas where lands are currently underutilized, vacant, or residents' economic status trends to higher-income, various forms of value capture could be set up to channel the increase in land price and taxes collected to the specific needs of that area, such as the elements discussed in the previous paragraph. Additionally, these funds could be utilized for infrastructure and other public goods. In this particular case both of the above conditions exist. Within East Boston, Winthrop and other directly adjacent communities there are underutilized and vacant sites but there are also valuable industrial and commercial centers as well as existing vulnerable populations. It is important that certain policy protections be put in place to balance to positive and negative financial pressures.

Additionally, with the expansion of another regional airfield and the relocation of certain services to that new site, the land surrounding this new international hub would also see certain pressures. Growth of logistics, distribution and certain manufacturing trends could wish to concentrate around these new nodes. This is discussed in more detail in the next section. Home values could also see a decrease in value due to the proximity to the airport, although this is highly debated and in certain scenario's, as described in Kasarda's *Aerotopolis* model has actually trended the other way. Regardless, effort should be taken to mitigate negative impacts.

Traffic and Transportation

Both the new urban district built on the Logan Airport site and the new airfield located on the urban fringe would have impacts on the direct-surrounding and regional transportation patterns. This would require planning at various levels of government including city and state. At the current Logan site the increase in workers and residents into the mix along with the users of the aviation hub would require increased access to multiple forms of transportation including ferry service, mass-surface transportation, and roadway capacity. It would be important in this regard to ensure multiple points of access as a means to disperse transportation flows in multiple directions. At the new airfield on the urban fringe, there would be an entirely new trip generator requiring access to existing infrastructure as a criteria in the selected location. Specific aspects

of this are discussed in the next section. In both of these aspects the financial support can be generated from the development of the new urban district.

Open Space Accessibility + Climate Change

A critical issue in increasing of a city's population is ensuring that there is adequate access to parks and open space. With the infusion of hundreds of thousands of people into this new urban district it is important that both the new users as well as the existing users maintain healthy connections to natural spaces and recreational amenities. The redevelopment of such a large portion of the current airport site and the utilization of the previously discussed design objectives would allow for a substantial portion of the site to be converted into open space. The current public ownership of the land can help streamline that process and the utilization of those spaces for multiple purposes such as food production, storm-water storage, energy generation, and storm protection would have an overall positive benefit to the surrounding area. It would be critical to ensure that these new spaces are connected to existing open space networks and accessible to all people. Like the other externalities discussed, financial pathways could be established that would allow for revenues from both land-sales and tax collection to be channeled towards capital cost and operations of these new large open spaces.

Additionally, the development of these district could be utilized to channel populations impacted by future sea level to new homes. As the City and region contemplate buy-out programs for low lying properties along the cost this new land that is opened up could serve as a landing spot for these displaced residents and businesses. While this is not a direct externality created by the development of this new district it is none-the-less a positive outcome for a regional issue.

Economic Agglomeration

Finally, this new urban typology and large scale growth opportunity could bring the region increased economic attention from companies and people seeking global and macro-regional access. This new interest could come from logistics, distribution, and manufacturing but could also come from entities attracted by this new form of development and the personal benefits that it brings. Much of this growth could be consumed by the district itself but would need to be managed regionally for its impact on things such as housing markets and infrastructure.

Conclusion

The proposal presented in this thesis would have lasting impacts on the larger region and the direct adjacent urban areas. There would be both positive and negative externalities that though the creative use of policy and programs could be mitigated and capitalized upon. In thinking about large scale urban change it is critical to consider the broader field of view. While this section is certainly not an exhaustive list it introduces a lenses in which this could be thought about.

Specific Regional Project Implications

As previously indicated, a development project of this magnitude will have positive and negative externalities. Additionally, one of the fundamental premises of this design exercise is the understanding that a multi-airport system would be instituted in the Boston metro area. Each of these elements correlates closely with a series of regional projects that would be either necessary for the long term success of the discussed proposal, or would make their reality more likely.

First, the creation of a new international airport to serve as the second armature of the multi-airport system would be a challenging political project. While not the focus of this thesis, Hanscom and Norwood Airfields have been identified as possible candidates due to their low population density, existing infrastructure, access to major highways, and relative ease of increased transit access. If one of these sites were to be selected a series of infrastructural upgrades would need to take place.

For Hanscom, a large dedicated interchange already exist. This interchange and entry road would likely need to increase in capacity to support additional and more frequent vehicular traffic. Additionally, mass transit access would need to be provided. A likely scenario could be the extension of the MBTA Red Line subway, which currently stops at Alewife, along the Concord Turnpike right-of-way. This roughly 9-mile extension would require little, if any right-of-way acquisition and could offer additional transit-oriented growth along the length of the segment. This transit upgrade would require new construction of rail line as there is no current line along this right-of-way

Norwood, benefits from excellent access on two sides from Interstate-95. The northern interchange would likely suffice while the southern interchange would most likely need to be upgraded for increased capacity. Mass Transit could be provided through two alternative alignments with relative ease. Both the Nedham and Providence Commuter Lines run next to this site. In one scenario the Orange Line would be extended from Forest Hills southward along the existing commuter rail right-of-way. In the second scenario, a new MBTA Subway Line would be created running south from South Station along the existing commuter rail line and would service the Dudley, Dorchester, and Mattapan neighborhoods before continue south to Norwood. This last scenario would be part of an idea that has been discussed by the MBTA for many decades.

In both of these airfield options it is important to consider land use pressures that would likely be created by the installation of a new public airport in either of these locations. Light industrial, manufacturing, shipping and other logistic based land uses would have increased desire to locate near these sites. The current light-industrial band of land uses that exist along the Interstate Ring Rd would likely increase and concentrate closer to whatever site was chosen. This could have both positive or negative consequences but regardless it would be important to further plan for the efficient siting of new industrial lands and conservation of existing scenic resources in the area.

In addition to the projects associated with the new airport sites there are two inner-city projects that could be instigated by a development project of this magnitude. Both projects are existing ideas that have been considered in various planning documents in Boston over the years. The first project is the Boston urban transit ring and the second is the inner harbor storm surge protection measure.

The Urban Ring is a project that has been under discussion in the city for nearly the past century with detailed studies happening in the 1990s. This project would include a circumferential mass transit network meant to relieve inner-city congestion on the city's current subway system. The only piece of the proposal that has been constructed to date is the silver line which connects the South Station and Seaport area to towns north of East Boston like Chelsea. The development of the Logan airport site in accordance with this thesis would mean a tremendous amount more jobs and residents living in an area that would be serviced by this line. The increased demand would put pressure on the MBTA to deliver these services. Additionally, a development of this magnitude could be utilized to channel funds to the transit project through land leases/sales and ongoing tax collection.

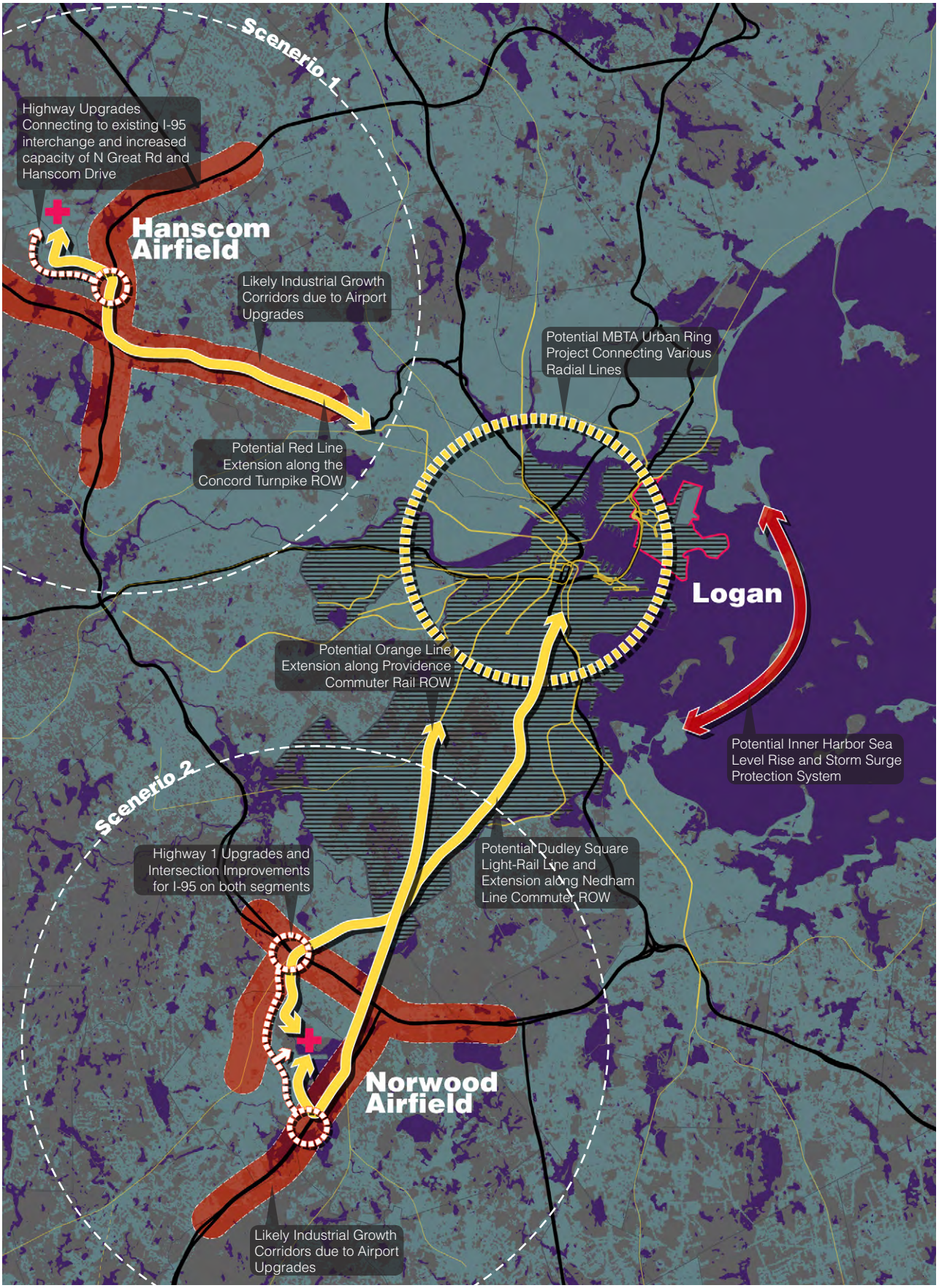
Another regionally significant project that could be both spurred and supported by the development of the Logan airport site in accordance with this thesis is the inner harbor sea level and storm surge protection system. This proposal, which is identified in the city's Climate Ready Boston report would connect the Harbor Islands with a series of storm walls and flood gates and would provide protection for all of Boston and several surrounding municipalities. The development of the Logan Airport site could provide a dedicated funding stream for this capital-intense project through land-leases and ongoing tax collection. Additionally, the increase in population and land values on the coast could provide additional political pressure for such a project.

Conclusion

When considering large scale urban redevelopment such as the project discussed in this thesis it is critical to consider regional impacts in both a positive and negative light. These series of projects discussed in this section would be considered largely beneficial for the entire region and thus provide potential political capital for the support of this proposed project.

While this section has focused specifically on the Logan Airport site and the Boston region many of these same issues and opportunities would present themselves at other Legacy Urban Airport sites in other cities. While each site and city would be different this section gives a framework for how other places might consider physical, social, and economic externalities as well as means for thinkings about regional project implications and implementation and financing frameworks. The next chapter discusses this proposal in the context of the prototype that it represents.

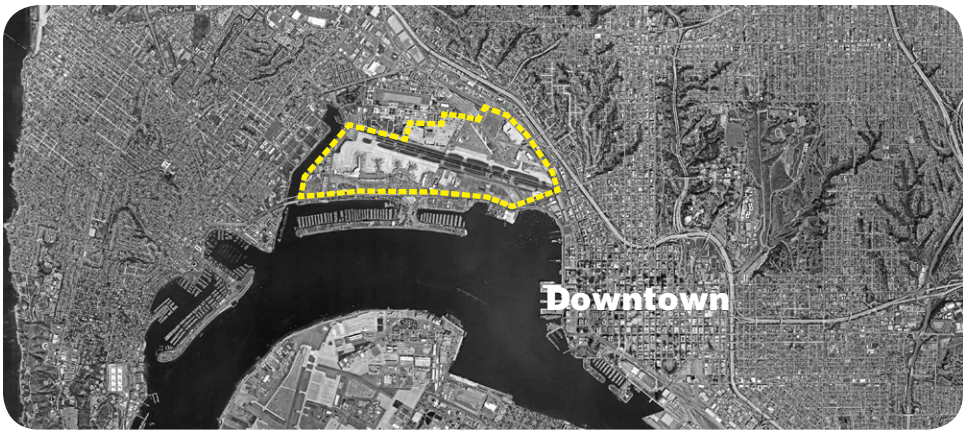
On the Next Page: This map locates a series of regional projects that either would be required for this proposal to happen or would be instigated by this proposal happening.

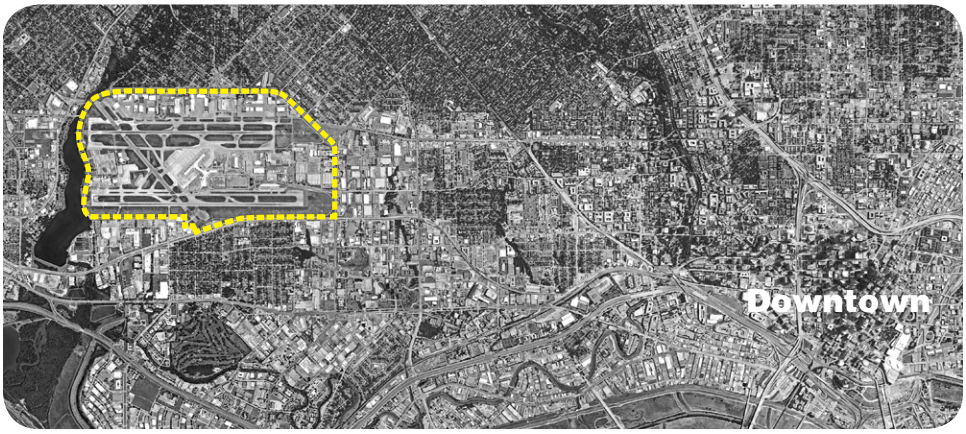

Scenerio 1
Highway Upgrades Connecting to existing I-95 interchange and increased capacity of N Great Rd and Hanscom Drive
Hanscom Airfield
Likely Industrial Growth Corridors due to Airport Upgrades
Potential MBTA Urban Ring Project Connecting Various Radial Lines
Potential Red Line Extension along the Concord Turnpike ROW
Logan
Potential Orange Line Extension along Providence Commuter Rail ROW
Potential Inner Harbor Sea Level Rise and Storm Surge Protection System
Scenerio 2
Highway 1 Upgrades and Intersection Improvements for I-95 on both segments
Potential Dudley Square Light-Rail Line and Extension along Nedham Line Commuter ROW
Norwood Airfield
Likely Industrial Growth Corridors due to Airport Upgrades

Chapter 9

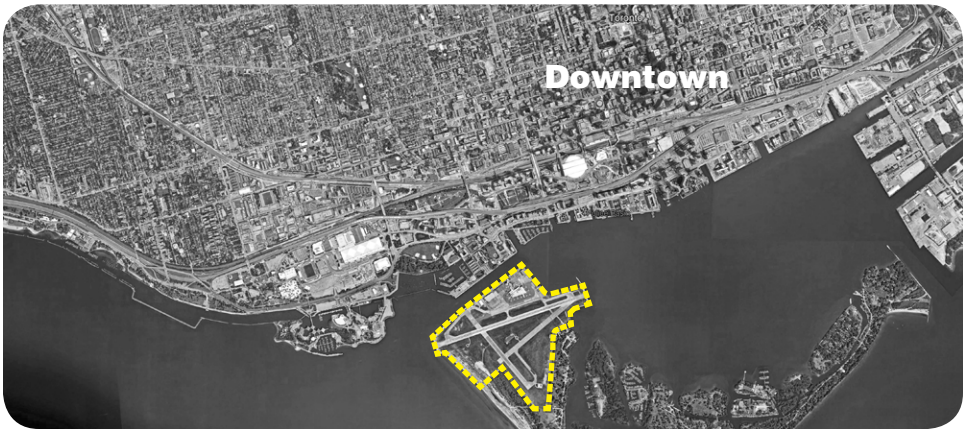
The Broader Field of View

This section presents an argument for how the design and development decisions represented in the context of Logan Airport can be translated to other cities and other urban airport sites that will grapple with the same issues and how this thesis creates a proactive vision for a future urban typology.


Downtown


Downtown


Downtown


Downtown

An Urban Typology

When considering this thesis, one of the fundamental ideas was that the thoughts and research generated were not only applicable to the Logan Airport site in Boston. Rather this proposal represents a new urban typology that will likely come to fruition in many cities across the world. Looking at North America more specifically, opportunities for cities to capitalize on technological change is even more concentrated due to the limited recent expansion of airport services within this market. Almost all major airports that are currently in service have been in operation for many decades.

Many cities maintain what this thesis has termed “legacy urban airports”. While not all of these sites are the same, many of them represent incredible opportunities for similar projects to what has been described in this thesis as new technologies come to market and environmental conditions make their current operations even more strained. The three planning frameworks and six design objectives offer a model for how cities could consider the evolution of these sites over the coming decades. Just as the port lands and rail yards of the 20th Century have evolved to house new life, so can the urban airports of the 21st Century see even more productive lives as hubs for global commerce, sustainable living, and inter-modal transportation.

Each city, and its associated airport site is different. Some that have been considered in this analysis are very similar to Logan in that they are the single international airport for the city, constrained on all sides and struggling to maintain daily operations. These are places like San Diego International Airport or Phoenix’s Sky Harbor. Other sites are part of existing multi-airport systems that have already been usurped by larger more suburban airfields. These sites, such as New York’s La Guardia or Dallas’ Love Field have possibly an easier barrier to entry for this new model as they have another airfield to assume their long-haul capacities. Still other sites like Toronto City Airport or New Orleans’ Lakefront Airport have been almost completely replaced in terms of their commercial aviation capacity. These sites represent an almost seamless transition from underutilized urban sites to new hubs of development as aviation technologies make smaller constrained sites more feasible.

On the Previous Page: Prototype Airports and Cities; from top to bottom: San Diego, Dallas Love-Field, New York La Guardia, Toronto Billy Bishop. These sites represent the spectrum of urban sites which meet the criteria of legacy urban airports. Each site type has a different level of challenges in order to realize a new life and thus a different time frame. However, each site could utilize a similar model of thinking as to what have been demonstrated in this thesis.
Image Source: Google Earth

While all of these sites differ in current function, level of use, size, and surrounding they all share similar traits that help meet the criteria of a legacy urban airport. It is this duality the helps to categorize these sites into three basic groups:

- **Single System Legacy Urban Airports** - Major national/international airports that still service a majority of aerial travel for a metropolitan area and are constrained by land, water, or development for future growth and are within close proximity to dense urban development or the city centers
- **Secondary Legacy Urban Airports** - An airport within a multi-airport system for a metropolitan area that still services a large amount of daily commercial interstate air travel and is constrained by land, water, or development and within close proximity to dense urban development of the city center
- **Remnant Legacy Urban Airfields** - Historic or defunct Airfields that have been replaced by larger national/international airports and largely service private and charter services but are within close proximity to dense urban development or the city center.

While the model that has been developed as part of this thesis can be applied to all of these categories the importance and use of each of the planning frameworks(Institute a Multi-Airport System, Create a Governing Entity, Build the City You Want to See) and design objectives (Anticipation Through Phasing,

Above: Shown here is San Diego's International Airport which has many similarities to the Logan Airport site due to its size, constrained area, and proximity to down town. Source: Google Earth

Stitching the Urban Seam, Ecological Resiliency, Hyper Local Hyper Global, Inter-Connected Transportation, People First) will differ. Additionally, the macro-regional and direct regional location of the host city will greatly influence the feasibility and market demand of this model. As indicated earlier, Boston resides within the northeastern portion of the United States and has well over 100 million people living within 700 miles in relatively dense urban clusters. This pattern of development and the interconnectedness of the economies of the cities in the region make intercity air mobility a more realistic future while cities that are in less densely populated regions may have less of a demand for such technologies.

For the first category of Single System Legacy Urban Airports all three planning frameworks would be necessary to realize the vision. Additionally all six design objectives would need to be utilized. While the exact physical manifestation of these various design ideas will take different shapes the function will essential remain the same.

For the second category of Secondary Legacy Urban Airports the need for the establishment of a new airport to take capacity from the existing airfield would not be needed. However, there would need to be a reallocation of the various types of aircraft that are serviced by each point in the system. Within this category all six design objectives would need to be utilized.

Finally, the third category of Remnant Legacy Urban Airfields would not need to utilize the first planning objective. Additionally, the scale of change would be substantially less and therefore could potentially be accomplished without the creation of a separate governing entity. In this third category the importance of the first two design objectives (Anticipation Through Phasing, Stitching the Urban Seam) are less important. This in part due to the non-critical uses of these current sites that could be ended or transfered with little to no impact of necessary air travel, and the general connectivity and proximity that many of these sites already maintain to existing urban fabric.

Understanding the scalability and applicability of the concepts discussed within this thesis is essential to the formation of a new urban typology. This typology is a new form of transit oriented development. While many groups involved in the discussions of urban air mobility have imagined an urban form entirely different then the contemporary city with no need for street life or other forms of transportation this thesis describes a typology that utilizes a foundational understanding of the comprehensive nature of cities. This typology builds off the aspects of cities that and seeks to integrate a new form of transportation into daily life rather than integrating daily life into a new form of technology.

Throughout this work great effort has been taking to think about how this new form integrates into the existing city and represents not a finished product but rather just a piece of an always evolving city landscape.

A Note about Urban Air Mobility

This thesis presents a markedly different vision for urban air mobility than has been discussed in main stream media and industry reports. This is due in part to the starting point of the discussion. While others may view the future from a technology standpoint, thinking mostly in terms of efficiency, limiting barriers to entry, and increasing market share, this thesis starts from people. People are the foundation of a city and their social habits and needs are the foundational qualities of urban planning and design. In order to ensure that these new technologies works within the much larger social, economic, and physical reality of the city there is a need for planning and urban design to participate.

Much of the imagery associated with urban air mobility presents Jetsons-like visions of urbanism with people swept away from a context-neutral scene in a matter of seconds as demonstrated on the previous page. Whether from on top of a high-rise building or from the middle of a suburban highway interchange these visions miss a fundamental element of transportation; that is, what happens after you go from point A to B. Transportation is interwoven with land use and social habits and cannot be thought of separately. If this technology falls victim to the same single track planning that has often plagued other transportation ideas we will continue to have the same first and last mile logistic issues, sprawl, inequities, and the whole host of other urban problems. Additionally, these visions have the potential of perpetuating many of the unsustainable practices of land consumption and social isolation that electric vehicles - of any kind - can not solve.

This thesis unfolds a vision for how a city might embrace forms of this new technology that is weaved together with land use decisions. This vision capitalizes on the existing location of legacy urban airports but also represents a more comprehensive method for planning around this new technology that could be used in other spaces and at other scales. These principals are not new. Transit-Oriented development, a staple of planning and design doctrine can still be used to understand this emerging technology. Without these principles, urban air mobility runs the risk of creating negative impacts and missing out on the opportunity of simultaneously building community for all people. A topic that is currently dominated by technologist, urban air mobility must fall within the realm of urban design and planning if it is to be successful. Additionally, this conversation needs to start with people and place as we start to consider its deployment.

On the Previous Page: Two typical versions that have been presented for urban air mobility nodes. Vertical options on top of high rises have been presented for dense areas of the city while underutilized infrastructure space has been proposed for more suburban places. Image Source: Fast Company (Top), Uber Elevate (Bottom)

Concluding Remarks

The impetus for this thesis was a curiosity in large scale urban redevelopment with a particular focus on humanistic qualities. The original intent prior to the commencement of the work was to consider the lands of Logan Airport as a new urban district, devoid of any aviation services. The idea was to look at how this new district would look if we put people above all else. Admiral in its ambition, the project was ultimately too idealistic. After all, urban planning and design, and more broadly urban change do not happen in a vacuum. Rather than add yet another 'model city' to the mix my curiosity pivoted to ask the question 'what *WOULD* make the Logan Airport change?'

This new question unlocked several important ideas that were explored in this thesis. The first was how technological change can create urban transformation. This is certainly not a new idea in the planning and design doctrine but this thesis tried to employee a slightly more grounded version of this idea. The second was the constant battle of proactive versus reactive which seems to be at the heart of much of what is talked about in urban circles. Here are just a few thoughts.

Grounded Aerial Futures

Often times technological change is seen as the silver bullet. Something to fix all of our problems. This utopic viewpoint often speaks of a various technologies in such a narrow lens that context is forgotten. It is this strategy that leads to visions for the future that look so drastically different than current forms of habitation that they are nearly impossible to believe. These architectural fairy tales may push the needle on certain topics but taken by themselves they can cause real damage. Towers in the park, fluid inner-city vehicular motorways, ubiquitous computing, autonomous vehicles are but a few historical and contemporary examples of these technocratic ideas.

To combat this, comprehensive thinking must be used to first place an idea within its context. Urban air mobility is no different, and as previously stated this project takes a markedly different stance on urban air mobility. This stance delivers an urban form that is not too different from what many people would recognize. After all, are there not great examples of cities that have already been built?

I call this 'Grounded Aerial Futures'. This notion is that new aviation technologies such as vertical take off aircraft should not drastically change they way that humans function, but rather they should be built and operated to deliver just one component of what makes cities successful. This idea is but one component of a complex transportation system which itself is but one component of a complex urban system.

Proactive Pragmatic Visioning

The second underlying idea that was grappled with is reactionary planning versus proactive planning. In simple terms do we wait for something to break before we fix it or do we keep it from breaking. I suggest the latter. I am a dreamer, in all senses of the word, constantly thinking about what could be instead of what is. It reminds me of a famous George Bernard Shaw quote. “You see things; and you say, Why? But I dream things that never were; and I say Why not?”.

This is such a challenge in many urban context today with people not wanting to see change; and while that sentiment can be understood it must be challenged as cities, by their very nature are constantly evolving things. With this in mind I believe, and this thesis demonstrates, that we should always be planning for change. New technologies come, the environment changes, social conditions evolve and instead of reacting to these things we should take a more proactive stance, removing barriers for positive change, and actively combating negative change.

At the same time this can not be done on a whim. As stated in the last section so much idealistic dreaming can cause real damage when enacted out of context. I call this ‘Proactive Pragmatic Visioning’. This notion is constantly asking ‘why not’ but ‘within reason’. Within my own personal practice I seek to imbue this philosophy.

O, What Could Have Been?

This entire thesis would be in vain if the limitation of this work were not discussed and while the list is long I seek to provide a brief summary through three main categories.

First, Advancements in aviation technology are extremely complicated with many people dedicating their entire lives to this research. Within the confines of this thesis it is impossible for me to understand all of the technical aspects of the various elements that were discussed. Additionally, the future is always uncertain and what is described within this thesis is an educated guess as to many implications, time-lines, and possibilities specifically related to technologies that have yet to come to market.

Second, The political will needed to enact such an ambitious plan can not be understated. The concepts presented here would require by-off and participation from all levels of government, a wide host of private actors, and the general support of the larger community. The idea of convening large scale urban change could be a dissertation in-and-of itself.

Lastly, there is only so much time, paper, energy and brain power. The ideas presented here are very high-level and would require years of design and planning and countless experts to truly implement, and for that matter, understand all the various aspects of a new urban district like this. There are dozens of separate engineering, architect, and planning thesis embedded in this project and while my intention was to simplify something very complex I can not end this without saying that this work does not include all the answers.

Further Inquiries

The issues discussed in this thesis are relatively new to the field of urban planning and design. Advancements in aviation technologies such a urban air-mobility are just breaching the academic circles and are currently largely driven by technologist. It is critical that urban planning and design research embrace these topics to ensure that human centered design and environmental sensitivities are considered. While this thesis laid that groundwork for understanding the full landscape of technologies that might need to be considered it only focused on one site typology in understanding the changes to the urban form.

Future research should consider the network of these sites that integrate into the larger transportation patterns and utilize similar lines of thinking. There are likely multiple scales to this inquiry. How would this happen that the metropolitan-group level or the city level? Much work is needed to ensure that this new technologies don't overshadow the need for other forms of safe, comfortable, and convenient ground and active transportation methods. Another field of research that could be built off of this is exploring the generalization of the design objectives and how other sites might utilize these themes to explore change.

That is it. Thank you for reading!

This page is left intentionally blank

Bibliography

Bibliography

Abel, D. (2015, May 04). Logan Airport Drafts Climate Change Plan. Retrieved from Boston Globe: https://www.bostonglobe.com/metro/2015/05/03/logan-plans-major-changes-address-climate-change/KXnlO6Q0DwqlqessUZd12H/story.html

Administration, F. A. (2017). 2017-commercial-service-enplanements. Washinton D.C.: FAA.

Aero, Z. (2017). Technology. Retrieved from Zunum Aero: https://zunum.aero/technology/

Alan Altshuler, D. L. (2003). Mega-Projects: The Changing Politics of Urban Public Investments. Washington D.C.: The Brookings Institution.

Anderberg, S. (2015). Western Harbor in Malmo. ISOCARP, 210-227.

Aradhana Aravindan, J. G. (2018). Singapore airport could use facial recognition to find late passengers. Retrieved from Wolrd Economic Forum: https://www.weforum.org/agenda/2018/05/singapore-airport-may-use-facial-recognition-systems-to-find-late-passengers

Bachman, J. (2017, July 21). The Airports of the Future Are Here. Retrieved from Bloomberg.

Baumgardner, K. (2017). Beyond Google's Cute Car. The Future Now, 38-43.

Beatley, T. (2016). Handbook of Biophilic City Planning and Design. Washington D.C.: Island Press.

Ben-Joseph, E. (2005). The Code of the City. Boston: MIT Press.

Ben-Yosef, E. (2007). The Evolution of the US Airline Industry: Technology, Entry, and Market Structure - Three Revolutions . Journal of AIr Law and Commerce: Volume 72, 305-349.

Biesecker, C. (2018, May 11). TSA Wants to Take Airport Security Into the Future. Retrieved from Avionics International: https://www.aviationtoday.com/2018/05/11/tsa-wants-take-airport-security-future/

Boston Planning & Development Agency. (2018, March 20). Urban Rin Transit Project. Retrieved from Boston Planning & Development Agency: http://www.bostonplans.org/planning/planning-initiatives/urban-ring-transit-project

Calthorpe, P. (n.d.). 7 Strategies for Sustainable Urban Planning. TED Conference. Berkeley: Urban Footprint.

Center for Urban Transportation Research. (2016). Evaluation of Automated Vehicle Technology for Transit. National Center for Transit Research.

Chase, R. (16, October 08). Self-Driving Cars Will Improve Our Cities. If They Don't Ruin Them. Retrieved from Wired: https://www.wired.com/2016/08/self-driving-cars-will-improve-our-cities-if-they-dont-ruin-them/

Cherry, N. (2018, September 29). Airports and Community. Retrieved from Linkedin: https://www.linkedin.com/pulse/airports-community-nathan-nate-cherry/

Christoff, J. (2017, August 03). Is This the Future of Airport Security? Retrieved from Travel Pulse: https://www.travelpulse.com/news/travel-technology/is-this-the-future-of-airport-security.html

City of Boston. (17, November 22). Climate Ready East Boston. Retrieved from City of Boston: https://www.boston.gov/departments/environment/climate-ready-east-boston#report

City of Boston. (2016). Climate Ready Boston. Boston: City of Boston.

City of Toronto. (2017). Portlands Planning Framework. Toronto: City of Toronto.

Civil Air Navigation Services Organization, Airports Council International. (2015). Managing the Impacts of Aviation Noise. CANSO.

CNN. (2018, October 03). Flying from Boston to NYC in 36 Minutes. Retrieved from CNN: https://www.cnn.com/videos/travel-play/2018/10/03/transcend-vertical-take-off-airplane-travel-orig.cnn

Copenhagen City and Port Development. (2009). Nordhaven Urban Strategy. Copenhagen: Copenhagen City and Port Development.

Copenhagen City and POrt Development. (2012). Nordhavnen From Idea to Project. Copenhagen: City of Copenhagen.

Corbusier, L. (1929). The City of To-morrow. London: The Architecural Press.

Cramer, N. B. (2019). Elastic Shape Morphing of ultralight structures by programmable assembly. Smart Materials and Structures, 28(5).

DATA USA. (2019, January 29). Data USA. Retrieved from Boston-Cambridge-Newton, MSA: https://datausa.io/profile/geo/boston-cambridge-quincy-ma-nh-metro-area/#housing

Dowling, S. (2014, January 30). 100 years of air travel: How planes shrank the globe. Retrieved from BBC: http://www.bbc.com/future/story/20140130-how-air-travel-shrunk-the-globe

Fagella, D. (2017, June 4). Self-driving car timeline for 11 top automakers. Retrieved from VB: https://venturebeat.com/2017/06/04/self-driving-car-timeline-for-11-top-automakers/

Falcus, M. (2018, October 24). 16 new airports and terminals we can't wait to fly into. Retrieved from CNN Travel: https://www.cnn.com/travel/article/new-airports-and-terminals/index.html

Federal Aviation Administration. (2006). The New England Regional AIrport System Plan. Burlington: FAA, New England Region.

Five Key Trends Affecting Commerical Aviation for the Next 20 Years. (2017, September 12). Retrieved from Aviation Week Network: http://aviationweek.com/commercial-aviation/five-key-trends-affecting-commercial-aviation-next-20-years

Five Key Trends Affecting Commerical Aviation for the Next 20 Years. (2017, September 12). Retrieved from Aviation Week: http://aviationweek.com/commercial-aviation/five-key-trends-affecting-commercial-aviation-next-20-years

Foletta, N. (2012). Case Study: Vasta Hamnen. ITDP Europe, 82-94.

Foundation, F. L. (2017, September 08). Revisiting Frank Lloyd Wright's Vision for "Broadacre City". Retrieved from Frank Lloyd Wright Foundation: https://franklloydwright.org/revisiting-frank-lloyd-wrights-vision-broadacre-city/

Frenchman, D. (2015). The City of Smart Emotions. Assiciazione Italiana di Sociologica. Catania: Universita Degli Studi di Catania.

Friedman, T. L. (2007). The World is Flat. New York: Farrar, Straus and Giroux.

Gehl, J. (2010). Cities for People. Washinton D.C.: Island Press.

Grossman, D. (2017, November 15). Is the Airbus A380 on its Last Legs? Retrieved from Popular Mechanics : https://www.popularmechanics.com/flight/airlines/a13732708/is-the-airbus-a380-on-its-last-legs/

HafenCity. (2006). HafenCity Hamburg: The Master Plan. Hamburg: HafenCity DEvelopment Corporation.

HafenCity. (2018). Facts and Figures: Important Information about HafenCity. Hmaburg: HafenCity.

HafenCity Development Corporation. (2017). Themes Quarters Projects. Hamburg: HafenCity.

Harrison Rudolph, L. M. (217, DEcember 21). Not Ready for Takeoff: Face Scans at Airport Departure Gates. Retrieved from Georgetown Law Center on Privary & Technology: https://www.airportfacescans.com/

Hirsh, M. (2016). Airport Urbanism: Infrastructure and Mobility in Asia. Minneapolis: Univeristy of Minnesota Press.

Hough, M. (1984). City Form and Natural Process. New York: Routledge.

Hr&A Advisors. (2016). Climate Ready Boston. Boston: City of Boston.

Hyatt, N. (2017, April 19). Autonomous driving is here, and it's going to change everything. Retrieved from recode: https://www.recode.net/2017/4/19/15364608/autonomous-self-driving-cars-impact-disruption-society-mobility

Jacobs, J. (1961). The Death and Life of Great American Cities. New York: Random House.

Jason Henderson, J. S. (2016). Autonomous Vehicles and Commercial Real Estate. Cornell Real Estate REview, 45-54.

Jeff Holden, N. G. (2016). Fast-Forwarding to a Future of On-Demand Urban Air Transportation. New York: UBER Elevate.

Joël Hazan, N. L. (2016, September 2016). Will Autonomous Vehicles Derail Trains? Retrieved from BGG: https://www.bcg.com/en-us/publications/2016/transportation-travel-tourism-automotive-will-autonomous-vehicles-derail-trains.aspx

John D. Kasarda, G. L. (2011). Aerotropolis: The Way We'll Live Next. New York: Farrar, Straus and Giroux.

John Hansman, L. J. (2017). Block 1 Procudedure Recommendations For Logan Airport Community Noise Reduction. Boston: MIT International Center for Air Transportation.

Jose Sanchez del Rioa, D. M. (2016). Automated border control e-gates and facial recognition systems. Computers & Security, Volume 62, 49-72.

Karp, A. (2018, Februrary 22). Biometric facial recognition boarding changing airport experience. Retrieved from Air Transport World: http://atwonline.com/security/biometric-facial-recognition-boarding-changing-airport-experience

Kasarda, J. D. (2017). Aerotropolis. Encyclopedia of Urban and Regional Studies.

KPF. (2016). Logan International Airport: Terminal E Modernization. Retrieved from KPF: https://www.kpf.com/projects/terminal-e-extension

Kunstler, J. H. (1993). The Geography of Nowhere. New York: Touchestone.

Lanctot, R. (2017). Accelerating the Future: The Economic Impacts of Emerging Passenger Economy. Strategy Analytics.

Levin, A. (2016, October 30). The Future of Airport Security Is CT Scans and Smarter Lines. Retrieved from Skift: https://skift.com/2016/10/30/the-future-of-airport-security-is-ct-scans-and-smarter-lines/

Limer, E. (2016, October 12). Why Non-Stop Flights Are the Future of Air Travel. Retrieved from Popular Mechanics: https://www.popularmechanics.com/flight/a23349/future-of-air-travel-a380-787/

Lubell, S. (2016, October 12). Here's How Self-Driving Cars Will Transform Your City. Retrieved from Wired: https://www.wired.com/2016/10/heres-self-driving-cars-will-transform-city/

Luke Jensen, J. T. (2017). Analytical Approach for Quantifying Noise from Advanced Operational Procedures. Twelfth USA/Europe Air Traffic Management Research and Development Seminar.

LuxBright. (2017, October 25). 3 Technologies Changing the Future of Airport Security. Retrieved from LuxBright: https://luxbright.com/3-technologies-changing-future-airport-security/

Lynch, K. (1981). A Theory of Good City Form. Boston: MIT Press.

massDOT Aeronautics Division. (2011). Massachusetts Statewide Airport System Plan. Boston: massDOT.

MassPort. (2011). Boston - Logan International Airport Composite of Critical Airspace Surfaces. Boston: MassPort.

MassPort. (2015). Boston-Logan International Airport Sustainability Management Plan. Boston: MassPort.

MBC Aries, M. A. (2015). Daylight and health: A review of the evidence and consequences for the built environment. Light Research Technology; Vol. 47, 6-27.

McFarland, M. (2018, May 8). Uber teams with NASA to make flying cars a reality . Retrieved from CNN Business: https://money.cnn.com/2018/05/08/technology/uber-nasa/index.html

Michael B.Charlesa, P. N. (2007). Airport futures: Towards a critique of the aerotropolis model. Futures, Volume 39, Issue 9, 1009-1028.

Michael Van Valkenburg Associates, Inc. (2010). Lower Don Lands Framework Plan. Toronto: Waterfront Toronto.

Mike E. Miles, G. B. (2007). Real Estate Development Principles and Process. Washington D.C.: Urban Land Institute.

Mitchell, W. J. (2007). Intelligent Cities. Journal of the Knowldge Society.

Mohamed, A. (2018). Shifty Gears: An Urbanist's Take on Autonomous Vehicles. Watertown: Sasaki.

Mohsen Mostafavi, G. D. (2011). Ecological Urbansim. Boston: Lars Muller Publishers.

Montgomery, C. (2013). Happy City: Transforming Our Lives Through Urban Design. New York: Farrar, Straus and Giroux.

Moon, M. (2018, August 23). US airports' new facial recognition tech spots first imposter. Retrieved from Engadget: https://www.engadget.com/2018/08/23/us-airport-facial-recognition-first-imposter/

Moretti, E. (2013). The New Geography of Jobs. New York: First Mariner Books.

NASA. (2017, September 13). Extreme Short Take_off and Landing (ESTOL) Aircraft. Retrieved from National Aeronautics and Space Administration: https://www.aviationsystemsdivision.arc.nasa.gov/facilities/ffc/estol.shtml

Nate Cherry, A. R. (2014). Urban Rx. Los Angeles: RTKL Associates Inc.

National Aeronautics and Space Administration. (2016). New Aviation . Washington D.C.: National Aeronautics and Space Administration.

National Association of City Transportation Officials. (2017). Blueprint for Autonomous Urbansim. New York: NACTO.

Navigating Transportation IT. (2017, September 25). Airport of the future: No more lines at airport security. Retrieved from DXC.technology: https://blogs.dxc.technology/2017/09/25/airport-of-the-future-no-more-lines-at-airport-security/

Nikolaus Lang, A. M.-P.-H. (2015, September 15). Revolution Versus Regulation: Make-or-Break Questions About Autonomous Vehicles. Retrieved from BGG: https://www.bcg.com/en-us/publications/2015/automotive-revolution-versus-regulation-make-break-questions-autonomous-vehicles.aspx

Nikolaus Lang, M. R. (2017, October 17). Making Autonomous Vehicles a Reality: Lessons from Boston and Beyond. Retrieved from BGG: https://www.bcg.com/en-us/publications/2017/automotive-making-autonomous-vehicles-a-reality.aspx

Nikolaus Lang, M. R.-P. (2016, July 21). Self-Driving Vehicles, Robo-Taxis, and the Urban Mobility REvolution. Retrieved from BGG: https://www.bcg.com/en-us/publications/2016/automotive-public-sector-self-driving-vehicles-robo-taxis-urban-mobility-revolution.aspx

Nova. (2016, January 13). Urban Transit's Uncertain Future. Retrieved from PBS: https://www.pbs.org/wgbh/nova/article/cities-autonomous-vehicles/

Office, I. L. (2011). Coupling: Stategies for Infrastructural Opportunism. Pamphlet Architecture 30, 58-65.

Peter James, R. F. (2015). A Review of the Health Benefits of Greenness. Environmental Epidemiology, 131-142.

Phillips, E. (2018). The Future of Autonomous Vehicles in American Cities. NYU Journal of Law and Public Policy, 288-316.

Quest, R. (2018, October 12). Singapore to New York: 5 things we learned on world's longest airline flight. Retrieved from CNN Travel: https://www.cnn.com/travel/article/singapore-to-new-york-5-things/index.html

RAMSEY, J. R. (2018, July 13). The Future of Air Traffic Control. Retrieved from New York Times: International Business: https://www.nytimes.com/2008/07/13/business/worldbusiness/13iht-RAIRGPS.1.14447637.html

Renner, R. (2018). Urban Being: Anatomy & Idenity of the City. Salenstein: niggli.

Richard de Neufville, A. O. (2013). Airport Systems: Planning, Design, and Management. New York: McGraw Hill.

Ricondo & Associates, Inc. (2017). Boston Logan Airport Noise Study. Boston: Federal Aviation Administration.

Robert Freestone, D. B. (2011). Spatial Planning Models of Airport-Driven Urban Development. Journal of Planning Literature, 263-279.

Roberts, J. J. (2017, March 11). How Eye Scans Could Be the Future of Airport Security. Retrieved from Fortune: http://fortune.com/2017/03/11/tascent-eye-scanning-airport-security/

Rudolph, W. (1958). Vertical-take-off aircraft and long-range urban planning considerations. Atlanta: Georgia Institute of Technology.

S. Tsach, L. L. (2015). ESTOL: Extremely Short Take-Off and Landing. Research Gate.

Sasaki. (2018). Den Real Estate Strategic Development Plan. Denver: Den Real Estate.

Sasaki,. (2018). Sea Change Boston. Retrieved from Sasaki: http://www.sasaki.com/project/360/sea-change-boston/

Schuttenhelm, R. (2016, February 25). Take a look at this graph: Global air travel increased 8 fold in 4 decades – and it's an accelerating trend. Yes we have a problem. Retrieved from Bits of Science: http://www.bitsofscience.org/graph-global-air-travel-increase-6848/

Side Walk Labs. (2017). Vision for Toronto's Eastern Waterfront. Toronto: City of Toronto.

Sisson, P. (2016, Februray 25). How Driverless Cars Can Reshape Our Cities. Retrieved from Curbed: https://www.curbed.com/2016/2/25/11114222/how-driverless-cars-can-reshape-our-cities

Smith, T. J. (2017, June). Bston Logan Renovates Int'l Terminal to Accommodate Wide-Body. Retrieved from Airport Imrprovement: https://airportimprovement.com/article/boston-logan-renovates-intl-terminal-accommodate-wide-body

Snyder, J. (2010, April 29). 1939's 'World of Tomorrow' Shaped Our Today. Retrieved from Wired: https://www.wired.com/2010/04/gallery-1939-worlds-fair/

Sonja Dumpelmann, C. W. (2016). Airport Landscape: Urban Ecologies in the Aerial Age. Boston: Harvard Graduate School of Design.

Spirn, A. W. (1984). The Granite Garden: Urban Nature and Human Design. New York: Perseus Books Group.

Stadig, A. (2018, August 23). Airport Parking in the Age of Uber. Retrieved from Airport Business: https://www.aviationpros.com/article/12423119/airport-parking-in-the-age-of-uber

Svn and City of Hamilton. (2018). Tall Buildings Guidelines. Hamilton: City of Hamilton.

Technology, A. (n.d.). Logan International Airport Expansion. Retrieved from Airport Technology: https://www.airport-technology.com/projects/boston-logan/

Tina Hjollund, C. o. (2014). Nordhavn Implementation Plan. Copenhagen: Transform.

Univeristy, T. (2017, December 2017). Cities and Self Driving Cars. Retrieved from Cities and Self Driving Cars: https://sites.tufts.edu/selfdrivecities/

US Department of Transportation. (2017). Automated Driving Systems: A Vision for Safety. Boston: US Department of Transportation.

Vascik, P. (2016). Operational Aspects of On Demand Mobility. AHS Transformative Vertical Flight Concepts Workshop. Hartford: MIT Aeroastro.

Vascik, P. (2018, September 27). PhD, Aerospace Engineering MIT. (J. Brooks, Interviewer)

Vasel, K. (2016, June 3). Is this the future of airport security? . Retrieved from CNNMoney: https://money.cnn.com/2016/06/03/pf/airport-security-checkpoints/index.html

Victoria Barton, D. Y. (2013, December 31). New Year's Day 2014 marks 100 Years of Commercial Aviation . Retrieved from IATA: https://www.iata.org/pressroom/pr/Pages/2013-12-30-01.aspx

Woodman, S. (n.d.). Welcome to Uberville. Retrieved from The Verge: https://www.theverge.com/2016/9/1/12735666/uber-altamonte-springs-fl-public-transportation-taxi-system

Yelena Ogneva-Himmelberger, B. C. (2010). Spatio-temporal Analysis of Noise Pollution near Boston Logan Airport: Who Carries the Cost? Urban Studies, 169-182.

Zachary Blackwood, G. K. (2018). Vertical Take-OFf unmanned Aerial Vehicle with Forward Flight Transition. The West Indian Journal of Engineering, 62-71.

This page is left intentionally blank

About the Author

Joshua is planner, urban designer, and landscape architect with a diverse professional portfolio including work for public and private clients across North America, Australia, and North Africa. Joshua's passion is in the creation of sustainable human habitat. Through district wide master planning, public realm design, and infrastructure creation Joshua's work seeks to create places of lasting social and ecological significance. Joshua is a graduate of the Robert Reich School of Landscape Architect at Louisiana State University and is a Senior Associate at Sasaki.

This thesis was produced as part of the requirements for the Master in City Planning degree for the Department of Urban Studies and Planning at the Massachusetts Institute of Technology.

DUSP
MIT