

Transforming Borders and Crossing Frontiers :  
A Trans-Border Light-Rail System for the City of El Paso and Juarez.

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**Abstract**

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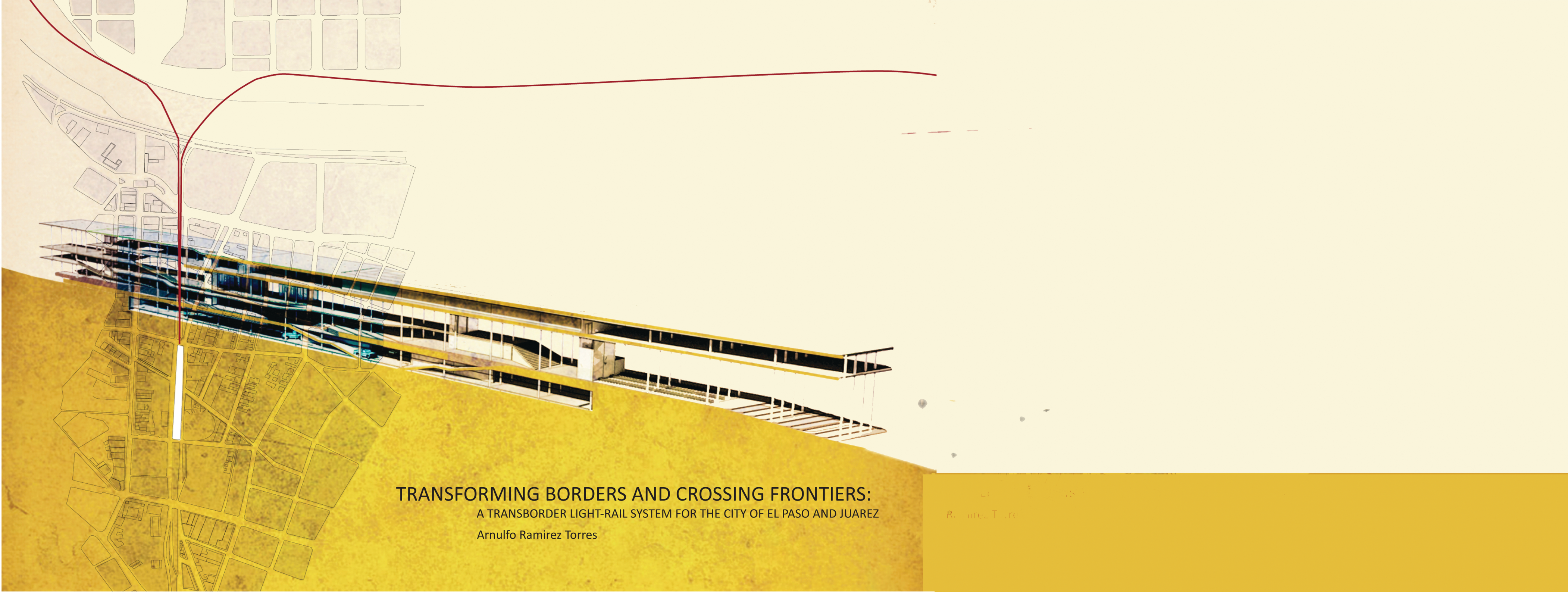
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The border-towns of El Paso, Texas and Juarez, Chihuahua are a place of deep trans-border cultures and home to 2.1 million people (“Demographic Data for El Paso”). Many of the residents of this binational metropolitan area that live in Mexico work in the United States and have learned to live with the process of crossing this international border every day. This commute can sometimes produce waiting times of up to two hours for pedestrians and drivers, while creating emissions from waiting cars, and making commuters victims to the drug violence of Ciudad Juarez. The traditional border crossings are incapable of inspecting the high volume of people and automobiles at an efficient rate without sacrificing safety. These border crossings use a centralized system that bottlenecks traffic to points of security that are located directly on the border. This thesis project proposes a light rail system that reduces emissions, and provides a faster and safer method of crossing the border, by decentralizing the border crossing and transforming the border into a usable form of infrastructure that creates a sense of unity between the border cities of El Paso and Juarez.



## TRANSFORMING BORDERS AND CROSSING FRONTIERS:

A TRANSBORDER LIGHT-RAIL SYSTEM FOR THE CITY OF EL PASO AND JUAREZ

Arnulfo Ramirez Torres

EL PASO  
ARCHITECTURE

This thesis is dedicated to the immigrant.

As a Mexican boy I grew up crossing the Rio Grande, and at an early age came to the understanding that El Paso and Juarez were both my home. Every time my mother and I crossed the Santa Fe Bridge she would hold my hand as I struggled to jump a small gap at the top of the bridge. This gap was a one inch expansion joint at the top of the Santa Fe bridge that split the bridge in two. I would stop and stare through that inch and see the Rio Grande beneath my feet. That expansion joint was one of the first fears I faced as a child, and the more I crossed this gap, the smaller it got. This gap is sometimes a different size for every person, my father's gap stretches from the city of El Paso to the state of Oaxaca, Mexico. The gap for my mother stretches across the state of Chihuahua. The journey every person takes to be in this country is different, and unique, but the frontier we see on the other side of the border is very similar.

Gracias por todo su apoyo Mama y Papa.

Thank you Arnulfo, Maria, Lizzet and David for all your support all these years. Only you know the struggles that I have brought upon you as a son and a brother, and I hope I one day make up for them.

Thank you Melissa for all your support, thank you for jumping aboard a sinking ship and making it float. Koala.

I would also like to thank my professors: Kimo Griggs and Nicole Huber for their guidance and patience through out my design development. Not only was I the epitome of a defiant and stubborn student, I was at work most of the time. Thank you both very much. I would also like to especially thank Jessica Miller for her help through out my thesis. I brought her an idea and she helped me create a concept through her knowledge and guidance.

Thank you to Ken Gorski, Memo Barajas, Nicholas Markovich, and Morris Brown for your faith in me as a student of architecture.

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Figure1: (Latella, Trolley Posters)

## The Concept

The conceptual idea for the light rail station was born out of an admiration for the art of Peter Svarzbein. During a time of violence and drug crime, Svarzbein's inspiring pieces, a series of wheat pasted posters, planted a seed of hope in the people of the border towns of El Paso, Texas and Juarez, Mexico (figure 1). These simple posters were a fictional advertisement for the re-opening of a trolley route that had been out of commission since the 1970's. Svarzbein's posters began to create questions about the exact date of the re-opening, even though the poster was only a piece of art; it started a movement among citizens of both El Paso and Juarez. Svarzbein is currently in the process of raising money to establish a small route that could circulate one of the vintage trolleys that still lay out in the El Paso desert, across the border (figure 2). More than a vital part of the public transportation of El Paso and Juarez, this trolley symbolized the unity among sister cities that have grown apart in recent years due to the violence cause by drug cartels.

Taking this meaning of hope that the trolley brought to the people of El Paso and Juarez, and analyzing it as proof of the communion that once existed between the city of El Paso and Juarez, one can begin to see how something as small as a trolley can create a sense of unity among cities divided by national borders. The unity of these two cities has nothing to do with their nationality and all to do with their culture, roots, food, and families, which have cemented ties on both sides. The city of El Paso and Juarez are in need of a form of public transportation which not only transports people to and from each side of the Rio Grande, but one that also symbolically unites the people of this region by establishing a sense of safety in a time of turmoil. The proposed light rail station is more than a border crossing; it will act as a dynamic community center to facilitate the interaction and social wellness between the communities of El Paso and Juarez.



Figure2:(Svarzbein, Peter & the Trolley)

## Shaping the Border-town and its History

The cities of El Paso and Juarez sit isolated in the Chihuahuan Desert with no other major city for at least four hours driving in each direction. The geographical remoteness of the region and its proximity to the Rio Grande can be considered an important factor to the solidarity and unity that El Paso and Juarez once had. The city of El Paso del Norte, or as it is currently known, Juarez, was the first major border town established along the now Mexican-American border (figure 3). Merchants and Missionaries established this region in 1659 on their way to Santa Fe from Mexico City (“El Camino Real”).

El Paso del Norte’s central location along the Camino Real Trail made it an ideal place for the travelers to rest and trade before continuing their journey north. Some travelers never left, the Rio Grande River provided water and the Franklin Mountains shelter for those who chose to make El Paso del Norte their home (“Texas State Historical Association”).

The nineteenth century was a time of economic and political uncertainty for the El Paso del Norte region. In

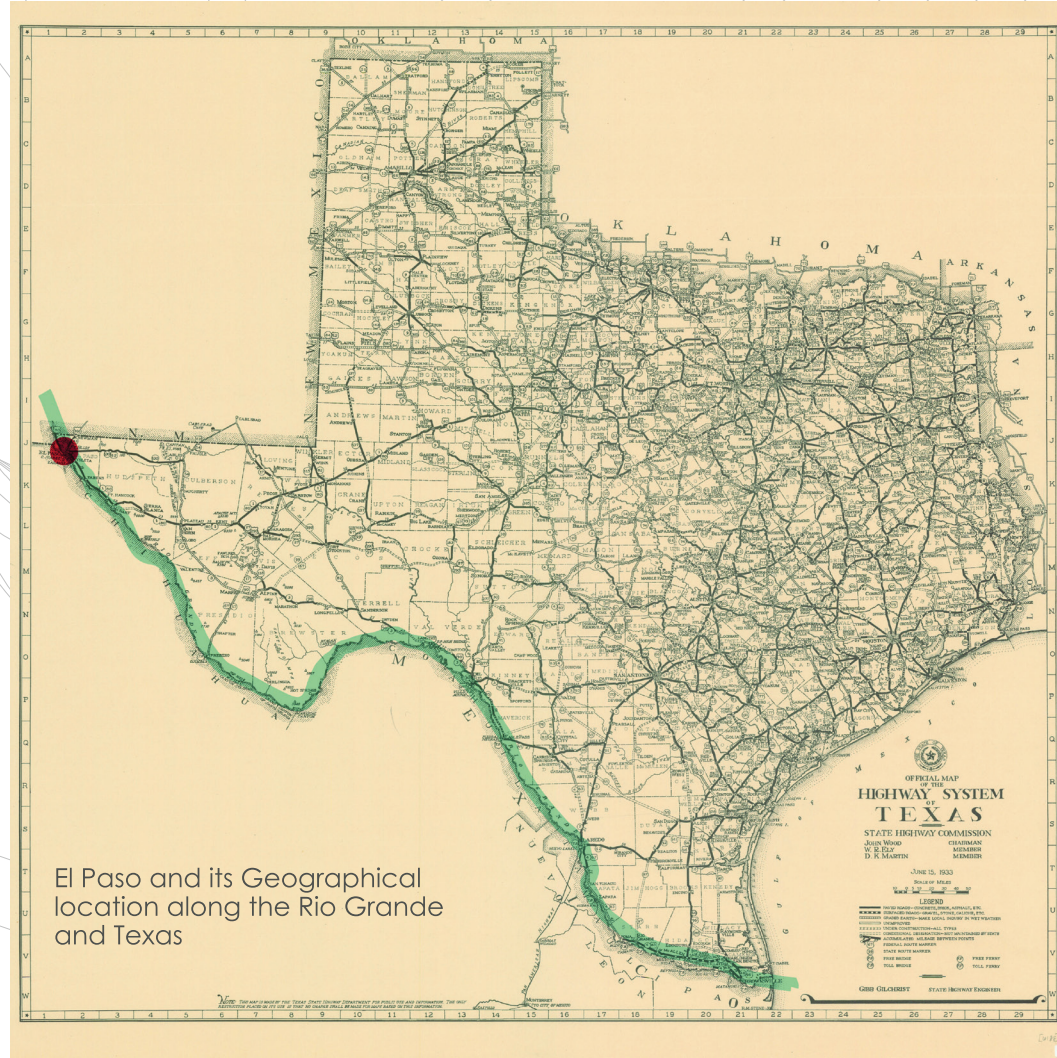


Figure3:( Texas State Highway, Location of El Paso)

1821 Mexico received its independence from Spain resulting in a weak and unstable national government. Soon after Mexico lost the state of Texas in 1836 due to weak territorial control of its northern lands and was forced to sign the Treaty of Guadalupe Hidalgo in 1848 (Hughes). This treaty marked the end of the two-year Mexican- American War, and the establishment of the Rio Grande as the international border between Mexico and the United States. The Rio Grande, a river that once provided life in an otherwise arid region now came to serve as a separation line between two countries. The border physically divided El Paso del Norte into two cities, Juarez and El Paso and established an economic threshold, which is still present in the region.

## Economic Dependency

The factors underlying the economic stability of Juarez and El Paso are dynamic and complex. The economic relationship between these two distinct economies can be traced back to the Mexican Revolution of 1910 when El Paso flourished through the illegal sale of arms to the Mexican Revolutionaries (Sandos 203), or when Juarez turned to “sin” industries to compensate for the war’s losses (Dear, ch. 3). This exploitation of the border as a means to find profit in alternate methods of production or labor has been repeated at various points through the history of the cities.

Juarez thrived economically when the prohibition of alcohol took place in the United States from 1920-1933 ( Dear, ch. 3). American brewing companies opened plants in Juarez to continue the production of alcohol and American citizens visited Juarez to indulge without legal repercussions from U.S. authorities.

Even after the prohibition of alcohol ended in the United States, Juarez remained a place of interest for many industries. For example textile and tech-companies introduced the maquiladora to the city of Juarez (Colantuoni). The cost of labor in the city of Juarez is significantly cheaper than that of an American worker (figure 4), and its proximity to the United States makes it a good place to outsource their labor companies like Delphi, Bosch, Sumimoto, and Boeing. Despite the growth of jobs in Juarez from large Maquiladora complexes, Juarez continues to see workers commute to El Paso for better pay. The Juarez minimum wage can range from 4.20 dollars per day to 7.00 dollars per day in a well-paid maquiladora (Valdez), compared to El Paso's 7.25 dollars per hour (figure 4).

In many ways the “sin” industry never truly left Juarez either. In the section titled “NARCO-STATE OR FAILED

## WAGES

1 HOUR =



1 DAY =



U.S.

MEXICO

Figure4:( Economic Disparity between El Paso and Juarez)

STATE?” Michael Dear notes that:

“The Prohibition era in the US set in motion an undercover drug smuggling apparatus that would eventually become transformed into a multibillion-dollar industry in which organized criminal gangs (or “cartels”) sought to monopolize territories (or “plazas”) for the distribution and sale of illicit substances.”

(Dear, ch.8)

The drug cartels are estimated to generate revenues of about \$35 billion for the U.S. and \$45 billion for Mexico every year (Pastrana). The high profit that this destructive industry yields fuels the drug-wars enacted along the border. The violence rate along the border peaked in 2010 with a record of 3,116 deaths and a total of more than 9,000 people killed between 2007 and 2011 in the city of Juarez (Smith). The violence and drug smuggling are some of the driving factors for increased security along the border.

El Paso's economy can be broken down into three main sectors: education, call centers and the military/ Homeland Security. The city's public education system is one of the biggest employers of the area, with over 19,000 employees (Major Employers, El Paso Texas) followed by the University of Texas at El Paso with 3,600 employees. Call centers for companies like EchoStar and WEST Telemarketing employ over 10,000 people. According to the El Paso Times, Fort Bliss and the Beaumont Army Medical Center have an annual impact of \$6 billion in El Paso, creating nearly 62,000 military and civilian jobs (Schauer). The Immigration and Naturalization Services (INS), the Drug Enforcement Agency (DEA), and the U.S. Customs Service also have major impacts on the economy of the region (Herrman).

## The Border-town Socio-culture

The El Paso-Juarez region, much like its economy, has developed a fluid migrating workforce that crosses the border influencing a likely exchange of politics, capital and culture. Much of this workforce is comprised of immigrants that come from southern parts of Mexico and South America, seeking job opportunities in the United States. This inflation of workforce contributes to the low wages across the border and creates sub-standard living conditions for many workers; However this influx of immigration was not always frowned upon- the Bracero Program of 1942, was an agreement of the Mexican and American government during World War II that allowed thousands of workers to legally work in the United States (Mandeel). These “Braceros,” as they were called, were essential to keeping the U.S. crop fields running while most of the American men were at war. The El Paso Herald Post recorded this flow of workers as more than 80,000 braceros crossing the El Paso border alone. They’re part of an army of 350,000 or more that marches across the border each year to help plant, cultivate and harvest cotton and other crops throughout the United States” (“The Bracero Program”). The border town has continued to serve as a supplier of cheap labor to the present day. When the Bracero program ended in 1964 the Braceros (figure 5), were picked up from various American states and returned to Mexico through Ciudad Juarez where many decided to stay, greatly increasing

the population of Juarez (Marentes).

Today the population of Ciudad Juarez is approximately 1,332,131 residents all in a city of approximately 4,853.80 squared kilometers or a population density of about 5,130 residents per square kilometer (“Demographic Data Juarez City and County”). In 2011 the City of El Paso Texas was estimated to have 800,647 residents, and a population density of 790.3 residents per square mile (“Demographic Data for El Paso County and City of El Paso”). The weak infrastructure of Ciudad Juarez and low economy of the region is flooded every year with more cheap labor. The Border only marks the beginning to many of the residents of Ciudad Juarez. The Mexico Border is also a common destination for immigrants from Guatemala, Honduras, El Salvador, China and India that seek to cross to the United States for work, or to reunite with relocated families.

In 2012 the Department of Homeland Security recorded over 80,000 apprehensions of immigrants from countries other than Mexico, but as seen in the following graph (figure 6), the number of Mexicans apprehended in the last five years is drastically higher than any of the other countries. The number of immigrants in Juarez that live, work and commute continues to

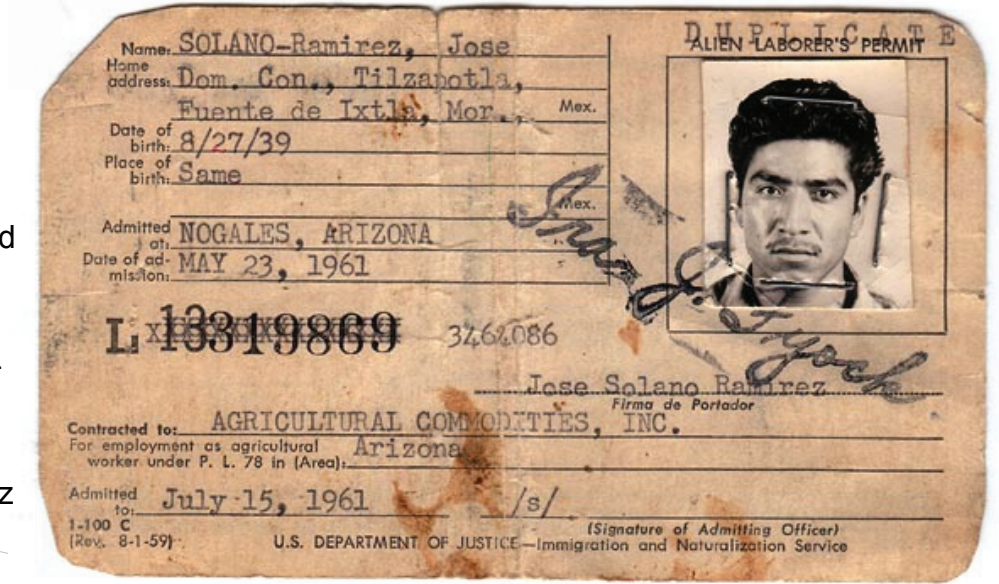


Figure5:(Meraji, the Bracero Permit)

grow and has become a natural part of a city that is home to many immigrants.

The economic disparity that exists within a mile of the border has created an opportunity for those who seek to cross this boundary, legally or illegally. Despite the high levels of immigrants that are constantly migrating back and forth from Mexico to the United States, many have made El Paso-Juarez their home. The border becomes a natural part of life for the immigrant; it becomes the beginning of their frontier, a place of opportunity and the idea of a better life.

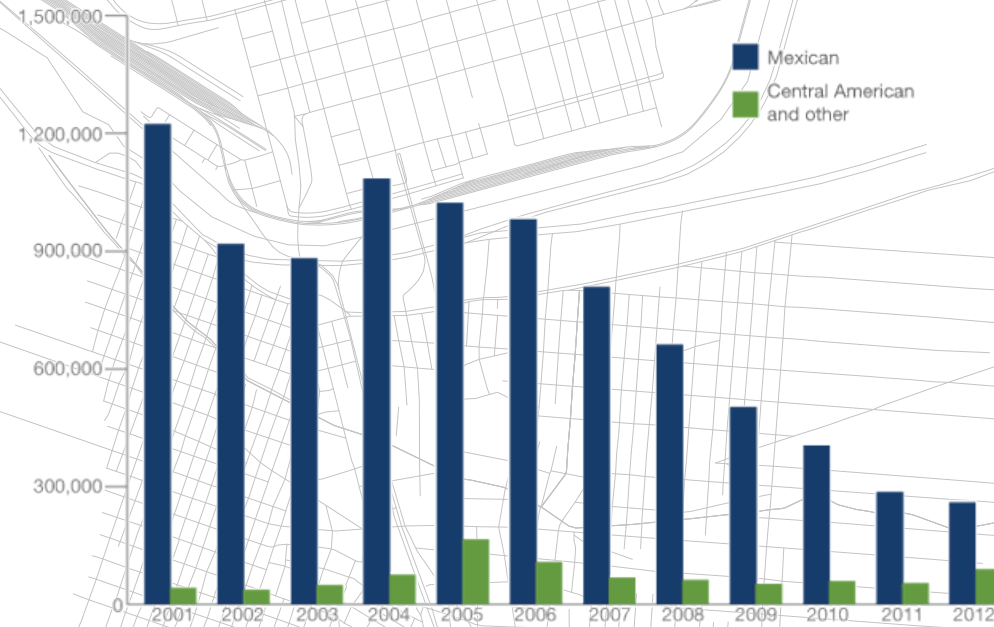


Figure6: (Dept. of Homeland Security, Immigration)

## The Border

The border is usually seen as the territorial line between two distinct geographical or political areas that have reached the limits of their expansion. Lawrence Herzog described the border in the modern era as a “manifestation of nation-state actions to make political power real and explicit by linking it directly to territory” (Herzog, 17). The idea of power associated with the ownership and control of land is represented in the border as an actual or symbolic boundary of space.

Herzog notes in his book *Where North meets South*, that the border “imposes an artificial line on a landscape (16)” which often times is overshadowed by its physical and social geography. This is the case on the El Paso-Juarez border, where thousands cross the boundary line between the U.S. and Mexico every day. In 2013 2,688,109 pedestrians crossed the Santa Fe Bridge (The city of El Paso international Bridges), which begins to put into perspective the amount of people that commute from Juarez to El Paso. The fluid and dynamic relationship of the cities of El Paso and Juarez reflect the complexity of the border’s spatial experience along the U.S. and Mexico- politically, economically and culturally.

Michael Dear describes the border as a part of “the evolution of borderland mentalities: frontier, border, line, and third nation.” (ch. 10). Each of which is the result of higher political and social tension. He talks about the re-definition of the frontier as “border places” after the Treaty of Guadalupe Hidalgo, and the creation of the line after the US Border Patrol was created. The “third nation” as Dear calls it in his Preface, can be seen as the expansion of the border as it consumes the border-towns of El Paso and Juarez to create the “membrane” that unites these cities despite their distinct nationalities.

## Frontier

The border that the El Paso- Juarez people cross today is very different from that of a person crossing the same border fifty years ago. Factors of security and economy have transformed the calm frontier-like border of the 1950's (figure 7), to the militarized dead-zone that can be seen today (figure 8). Ladis K.D. Kristoff explains that the frontier was a phenomenon of the facts of life, "a manifestation of the spontaneous tendency for growth of the ecumene – thus the frontier was not the end, but rather the beginning of the state; It was the spear head of light and knowledge expanding into the realm of darkness and of the unknown." The idea of the frontier conveys a sense of discovery and opportunity that represents what lies beyond a border. Just like the frontier stood for opportunity for a developing America, so does the other side of the border for the immigrants that cross the Mexico-American border legally and illegally every day.

The El Paso-Juarez border has grown from a single river to a concrete fenced channel of about 200 feet wide in the vicinity of the Santa Fe Bridge (figure 8). This prison like border crossing has become one of the most trafficked border crossings of the United States since Mexico and the U.S. established the North American Free Trade Agreement (NAFTA) in 1993 (Manufacturing in Mexico). The Santa Fe Bridge, the Bridge of the Americas, and the Zaragoza

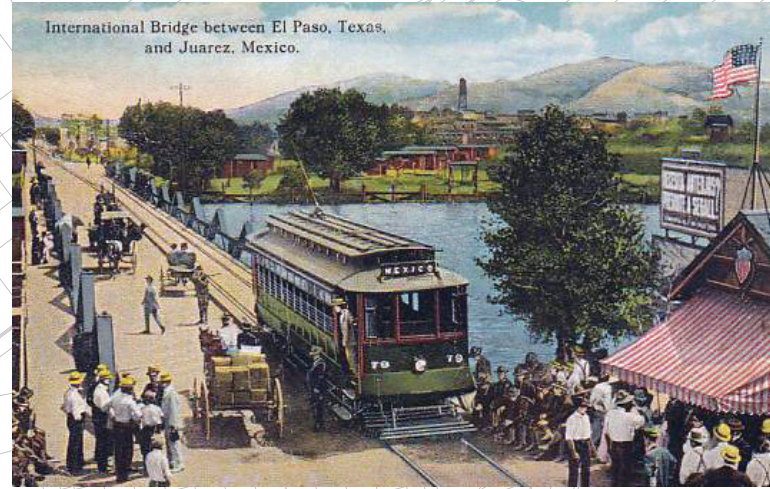


Figure7:(Transpress NZ, The Santa Fe Border)



Figure8:( Washington Office of Latin America, Santa Fe Bridge/ Border)

Bridge have all played an important role in the overall economy of Mexico as a manufacturing country. In 2011 the city of El Paso recorded more than 3.6 million passenger vehicles, 4.2 million pedestrians and 300,000 commercial vehicles (The City of El Paso International Bridges). This number continues to grow every year along with the number of immigrants moving to the northern area of Mexico, and the number of maquiladoras producing foreign goods. Ciudad Juarez has a population of about 1,332,131 residents, and the state of Chihuahua, which Ciudad Juarez is a part of, has a population of 3,406,465. One in three residents of the state of Chihuahua comes to Juarez for the maquiladora industry, and sometimes a chance to cross the border. El Paso and Juarez have transformed as fast as the transportation industry has needed them too. The train and the car were both of great influence to the development of this area, and continue to play an important role in the urbanization of the border.

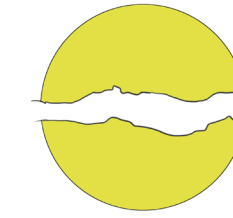
## Border Types

This thesis begins its investigation of the border town by categorizing the spatial experience of the border between the U.S. and Mexico along the Rio Grande. The categories that these border types will be cataloged are:

1. Soft Border
2. Symbolic Border
3. Hard Border
4. Dead Zoned.

These categories help to clarify the balance of frontier and boundary in each type of border as it is affected in its context. These types of borders can all be seen as an evolution of the border as it is exposed to the political, social, and economical tensions between the United States and Mexico.

## Border Type: Soft



The first U.S.-Mexico border type is a natural region of the Rio Grande (figure 9), where the river acts as the border with no help from man-made structures. This type of border can be found outside the cities, in areas of little or no human settlements. In Chapter 1 of "Fencing the Borderline after 1990," Michael Dear describes this type of border:

"Outside the cities at this time, the boundary line remained a non-descript affair, if it existed at all. Sometimes it consisted of low fences that resembled freeway traffic-lane separators, or a few strands of barbed wire fence occasionally bent wide to accommodate passing human form. No obstacles prevented people from crossing freely to shop, attend school, or join in the weekend softball game on the other side."



Figure9: ( Bracke, Soft Border)

### Border Type: Symbolic

This region of the U.S.–Mexico border is composed of a series of obelisks that symbolically create a boundary, while visually framing the frontier beyond them (figure 10). These boundary markers were located based on a series of surveys that underwent a series of variations in the 1850's, 442 more markers were placed in 1975, and 51 lastly in 1984 (Dear, ch1). In their initial stages these boundary markers were but a heap of stones, which quickly evolved to concrete. One of the predicaments with this type of border is its inaccuracy to demarcate the border, and its vulnerability to be broken or removed.



Figure10:( Taylor, David,Symbolic Border)

### Border Type: Hard

The region depicted in figure 11, will be described as a hard border in this study. This type of border is commonly built of metal fencing, or leftover aircraft landing mats. These walls started to go up in the 1990's along the Mexican-American border after California passed its Gate Keeper Act and El Paso started 'Operation Hold the Line' in an effort to secure the border. In 2006 the Secure Fence Act, "specified the construction of 850 miles of additional fencing." (Dear, ch.9). Some of the disadvantages of this type border are: its disruption on the desert wildlife, damages the image of the border, and increases taxes.



Figure11:( Taylor, Hard Border)

### Border Type: Dead Zone

The Border type which this paper categorizes as a dead zone is the result of the unpredictable character of the Rio Grande and its tendencies to flood its vicinity. The Rio Grande Canalization Project of 1936 created the canal that controls the flow of the Rio Grande, it extends 105 miles from Caballo New Mexico to American Dam in El Paso Texas ("Rio Grande Canalization"). This canal has given the city the ability to control the river but has created a void between El Paso and Juarez (figure 12).



Figure12:( Brooks, The Dead Zone)

### Border Crossings

Within the cities of El Paso and Juarez exist four highly trafficked border-crossing bridges: the Santa Fe Bridge, the Stanton Bridge, the Bridge of the Americas, and the Zaragoza Bridge. All of these bridges have been built to accommodate different aspects of commerce, reflecting the historic shift from pedestrian traffic to one of rails and finally to the car. The Santa Fe Bridge and the Stanton Bridge (figure 13) are the oldest links that connect El Paso and Juarez. These bridges were established in 1882 (Dawson) and rebuilt in 1967 as part of the Chamizal Treaty work in a transition from a vehicular and track bridge to one of pure vehicular access ("The City of El Paso").

The Zaragoza Bridge was originally built in 1938 as part of the U.S.-Mexico River rectification project ("The City of El Paso"), and was remodeled in 1990 to provide inspections for the high level of commercial trucks crossing the border (figure 14).

The Bridge of the Americas was originally built during the Chamizal Treaty of 1967 ("Texas-Mexico International") and rebuilt between 1996 and 1998 during the peak time of the Maquiladora in Juarez to serve the demanded high volumes of raw materials transported to Mexico, and to check the final products made in Juarez on their way back into the United States (figure 15).



Figure13:( Santa Fe and Stanton Bridge )



Figure14:( Zaragoza Bridge )



Figure15:( Bridge of the Americas)

**Program**

The program and concept of a border crossing will be explained and two case studies will be examined. Each of the border stations researched was built to accommodate unique circumstances of geography and socio-political relations, and is expressed in its architectural form and its connection to infrastructure.

The American border crossing has been created in response to very specific needs of control and flow of traffic, while maintaining the security of the border, which can be generalized into four core elements of security:

The first part of any border station is the primary inspection booth area, which concentrates on the verification of legal documents for people crossing the American border (vehicular or pedestrian). The primary inspection booth is the first form of defense against undocumented pedestrians and drivers; the primary inspection booth area prevents the entrance of undocumented foreigners, slows the flow of the pedestrian and vehicular traffic as a security measure, and filters suspicious vehicles and pedestrians to a secondary inspection area. The secondary inspection area is an impor-

tant part of the border crossing that thoroughly inspects the targeted vehicles and pedestrians. The k-9 agents are used in this area to inspect the vehicles while the drivers sit in a designated waiting area. The interrogation area is a third level of investigation, which is used to question suspects, and dismantle cars. The last area of the border crossing is the arrest and detention area (figure 16).

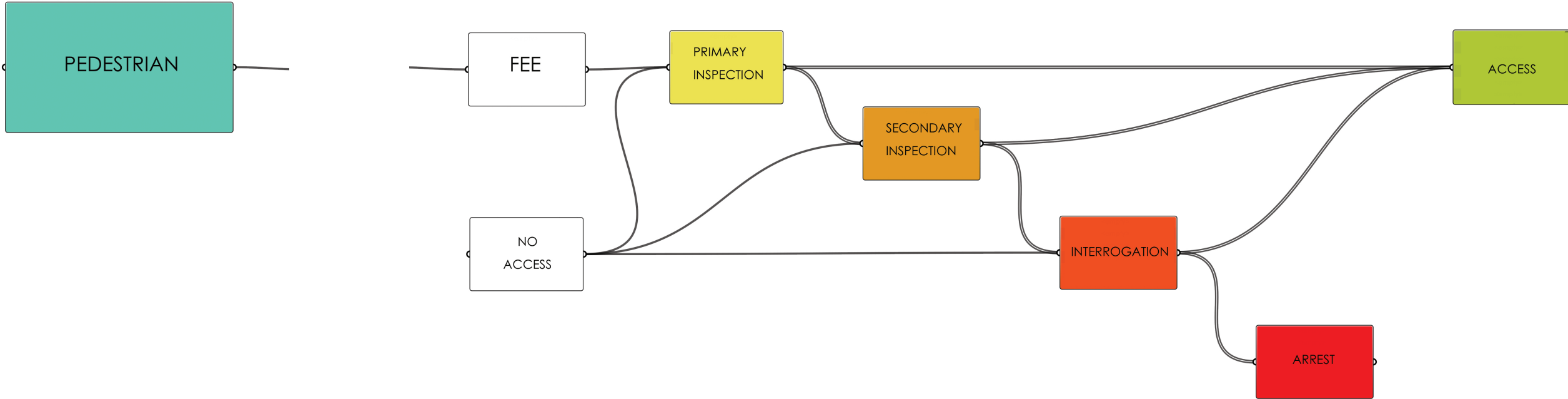


Figure16:( Elasticity of Border)

## Case Studies

The following case studies will be examined through the programmatic organization of their core elements in relation to their context through a series of color diagrams. The Pt. Roberts border station that connects Washington and Canada was designed in 1996 by Miller /Hull Partnership. Located at the lowest point of the Tsawwasse Peninsula, Pt. Roberts is home to 1,314 people according to the 2010 Census (Dougherty). The geographic location of Pt. Roberts is isolated in Canadian land, meaning it can only be reached by traveling through Canada to reach the U.S. mainland by land. The Pt. Roberts border crossing was originally built in the 1930's and has been rebuilt twice since, once in the 1950's and again in 1996 (Eric). The station is located at the intersection of Roosevelt Way and Tye drive where it controls the flow of traffic coming from the U.S. The proximity of Canadian residential developments to the American border, illustrate the low level of hostility in the area. The border station consists of 4 primary car inspection booths and four lanes for secondary inspections. Due to its isolated location this crossing does not receive a high level of pedestrian traffic.

Figure 17 shows the simple organization of core elements in the Pt. Roberts border crossing. The blue-green area of the border station is the primary inspection booth area for pedestrians, where an agent validates the documentation for access to the United States. The area in red is the canopy that extends over the primary vehicular inspection booths, and the blue area is the canopy that hangs over the secondary inspection area. The administrative offices and car in-pound area are highlighted in yellow (figure 18). The architectural organization of this border station is guided by its location on the Tye Drive that connects the U.S. to Canada. Its architectural expression is simple and transparent, its use of steel glass and wood give this border station the symbolic presence of a border crossing. The core elements are designed to their minimum requirements due to the low risk of drug smuggling and human trafficking that happens in this Canadian-American border.

The overall organization of this border crossing and the housing development that sits in its proximity speaks to the friendly relationship between Canada and the U.S. In contrast to the vast dead zone that separates the U.S. from Mexico, a narrow road running parallel on the American side demarcates the border here.

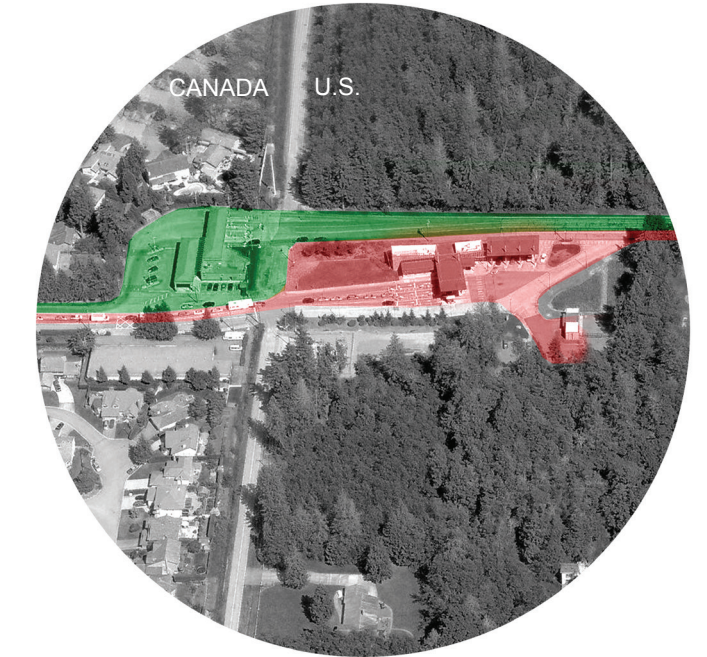


Figure17:( Pt.Roberts Bordercrossing)

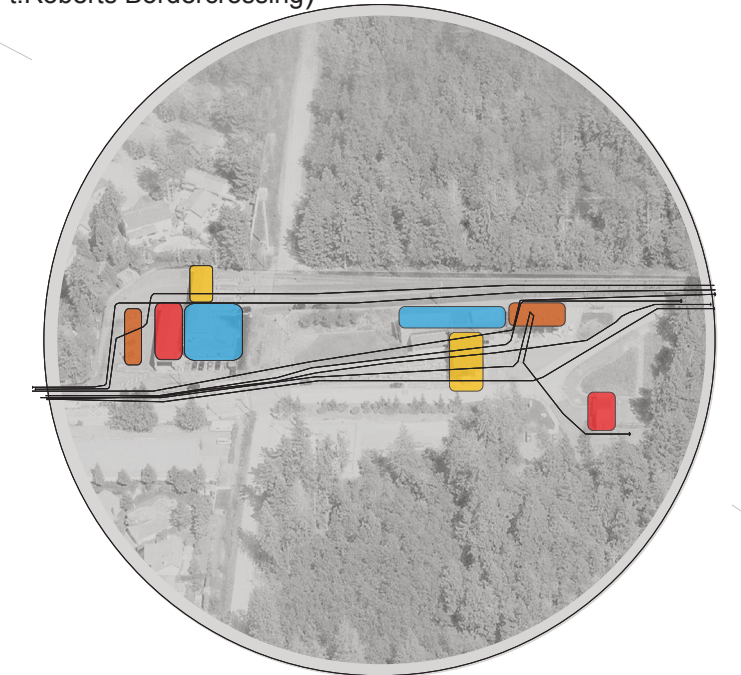


Figure18:( Pt. Roberts Core Elements)

The Calexico East port of Entry is located along the river that flows between Mexicali and Calexico in the eastern desert region of California. This border crossing was built in 1996 to divert the high levels of traffic of the centrally located West Port of Entry in downtown Calexico. The city of Calexico has a population of 38,572 residents, is located about 125 miles from San Diego and borders the Mexican city of Mexicali, with a much higher population of 689,775 people (“Datos Demograficos de Mexicali”). The Calexico East Port of Entry has been designated as the commercial vehicle port of entry, but also serves non-commercial vehicles and pedestrians. The river that flows between Mexicali and Calexico demarcates the border in the same fashion that the Rio Grande does for the El Paso-Juarez border (figure 21). The border station serves as an entrance and exit of the United States for commercial and non-commercial vehicles. The commercial lanes entering the United States open into a docking area for a second inspection (blue), and the lanes exiting the U.S. are shown in light blue (figure 19).

The Calexico Program Diagram (figure 20) of the station is very similar to that of El Paso and Pt. Roberts.

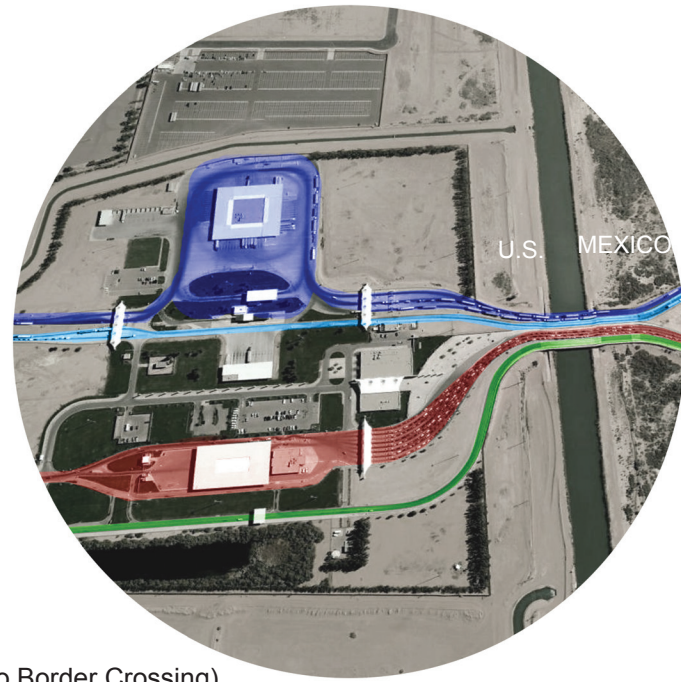


Figure19:( Calexico Border Crossing)

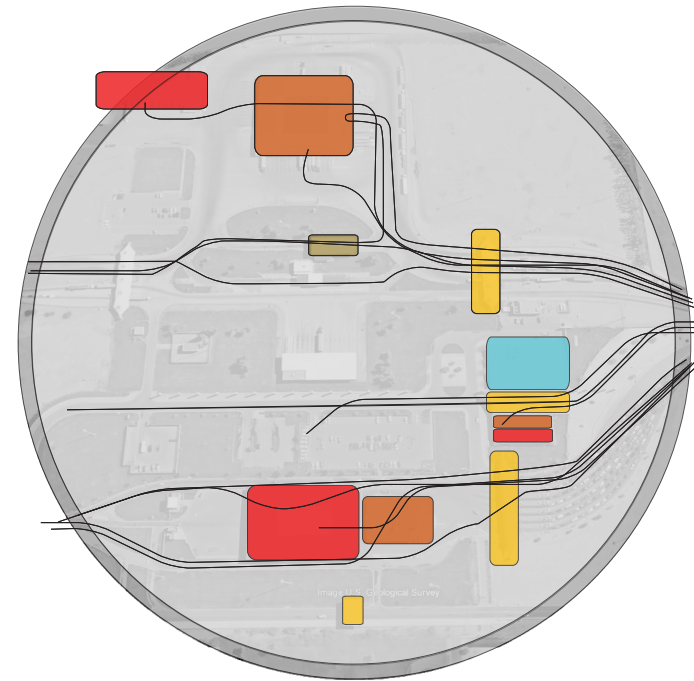


Figure20:( Calexico Elements)

The red area is the canopy that roofs the primary inspection booths, the blue and yellow compose the secondary inspection area and waiting area, and the blue-green building inspects the pedestrian traffic and the light-red areas are administrative offices and staff parking. The desolate region of this border crossing is dictated by the need to transport goods at a commercial level, not the need of two merging urban cultures like those of El Paso and Juarez (figure 21,22).

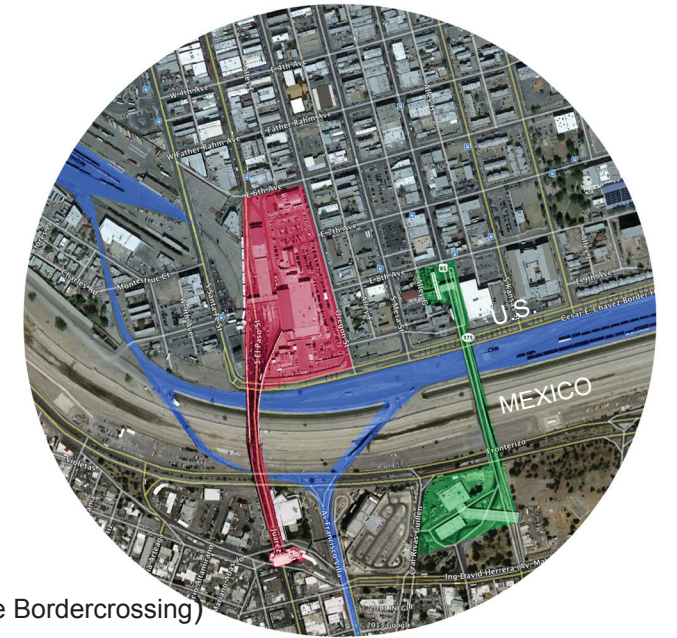


Figure21:( Santa Fe Bordercrossing)

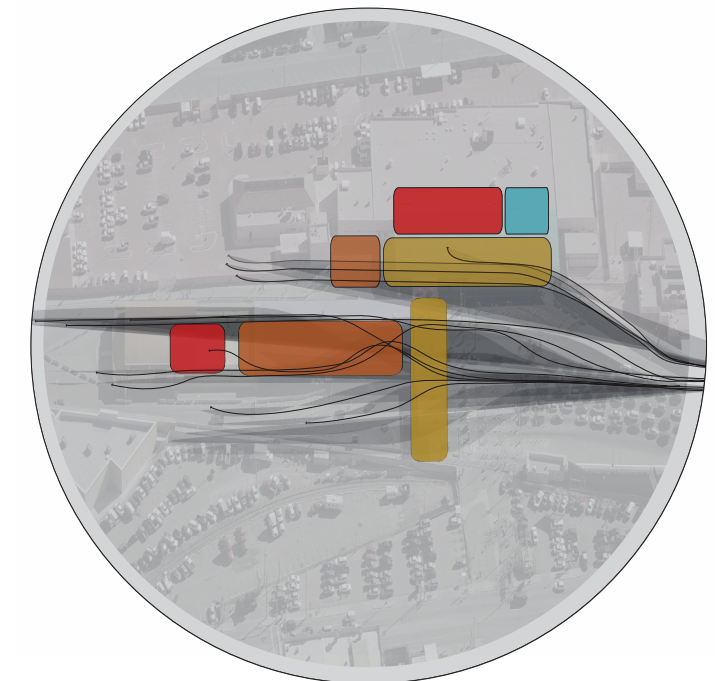


Figure22:( Santa Fe Elements)

## Architecture of Crossing

The border crossing can be classified as a strictly utilitarian form of architecture that represents the interest of the Country for which it controls the flow of people and goods. The International border crossings along the U.S. - Mexico and U.S.- Canada borders each uniquely solve their goals of securing the border, through a different type of organization that symbolically or physically represents a border crossing. The international border can be described as a nexus of two colliding cultures that despite the economic disparity have learned to live with the separation of a political boundary running between it.

The architectural presence of a border crossing is composed of more than its anatomy or the core elements discussed earlier. The presence it creates with these core elements is the true test of its efficiency. This investigation moves away from the single and double connection methods of creating a border crossing (figure 23 & 24), all the border crossings of El Paso and Juarez use this approach. The design of this light rail- border crossing tries to transform the border to a level of elasticity and uses it as a form of infrastructure(figure 25).

The border crossing must act as a barrier and a gateway of traffic at the same time. Its function to filter cars and pedestrians drives its organization of core elements, and its place on its regional infrastructure. The

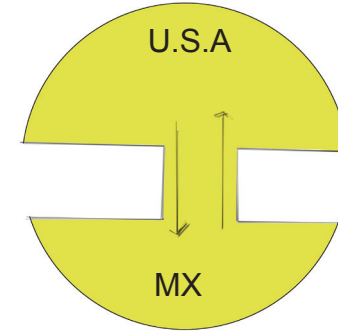


Figure23:( Single land connection over border)

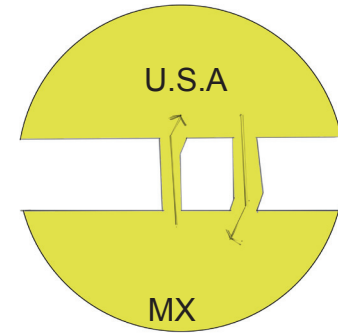


Figure24:( Double land connection over border)

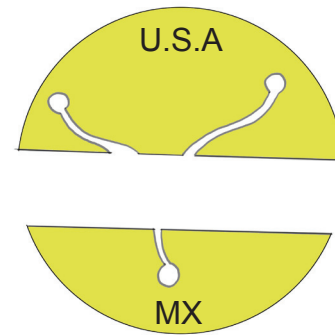


Figure25:( Elasticity of the Border)

border crossing must act as both a barrier and gateway and while doing so the design guidelines for each of these borders will very likely overlook the need to engage the user or provide program outside its need to secure and check people and cars as fast as possible. The architectural envelope that contains the American border crossing is composed of a balanced integration of transparent and shelter like elements. It is important to maintain a sense of transparency throughout the border crossing as a security measure that allows the agents to visually communicate across the border stations. The solid elements enclose essential areas of private nature like the interrogation rooms or holding cells.

Recently the U.S. General Service Administration, in charge of administering the construction of governmental and public facilities, has reinstated design principles that will result in public buildings that accurately engage its users and establish sustainable methods of construction that set an example in energy usage ("Policy Statement"). The border crossings have only recently begun to incorporate socio-cultural elements like regional art and waiting areas as part of its program. The cultural role of the American and Mexican border crossing in the American-Mexican border has

neglected to play their cultural role as a piece of land, which both countries share.

Programs like Operation Hold the Line of El Paso and Operation Gatekeeper of San Diego have only used the element of time as a security measure, by making waiting lines anywhere between 45 minutes to 2 hours (“Southwest Border Security Operations”). This inefficient use of time could be dealt by new methods of checking vehicles and pedestrians in a timely fashion and could eliminate the smuggling of drugs if methods used in airport security could be implemented in the border crossing.

In 2013 the first un-manned border crossing was opened at the U.S. Border crossing of Big Bend National Park (Lonely Conservative). A security method of this type could be implemented to the decentralized border crossing of the light rail system, but would need to be incorporated to a document verification process like it was in the San Ysidro fast pedestrian lane (figure 26). The new border crossing is making progress towards more secure and efficient methods that do not rely on the use of time, as a tactic to physiologically affect the drivers or pedestrians crossing illegal substances (Perkins). This type of cross-border station can be

described as a hybrid system composed of a satellite airport station of the highest level of security, and train station, to control a high level of flow (figure 27). This hybrid design will reduce the number of agents that are needed in the border stations due to the division of users into a series of decentralized border stations.



Figure26:(Fox, Fast Lane)



Figure27:( Research: New X-Ray may better airport security )

## The Light Rail

In the late nineteenth century, during the Porfirio Diaz Administration, Mexico introduced the first form of infrastructure over the Northern Mexican states creating an efficient form of communication, and for the first time Mexico City recognized the importance of the northern Mexican states in trade and commerce (“Economic History of Mexico”). The border became a point of interest for investors and essential in the establishment of foreign trade. Before the railroad was introduced, some of the largest cities in Mexico were centrally located near the capital, Mexico D.F. or near the ocean to control the import and export of goods. After the railroad was established the border towns grew in population and developed economies of their own. This shift happened between the 1870’s and 1920’s, Lawrence Herzog calls this shift an infrastructure for regional change (43), which also changed the spatial organization of the American city from one that connected by train to one that revolved around the car.

This spatial de-concentration of the American and Northern Mexican city (El Paso- Juarez) makes the light rail

an efficient response to connect the commuters of El Paso and Juarez across the border. There are 14,000 pedestrians that cross every morning through the Santa Fe Bridge to go to work, to school or buy American goods that could benefit from a light rail system (Borunda). The following studies compare the sky train, the ground and underground light rail systems to assess the benefits that each type of light rail could bring to the city (figure 28).

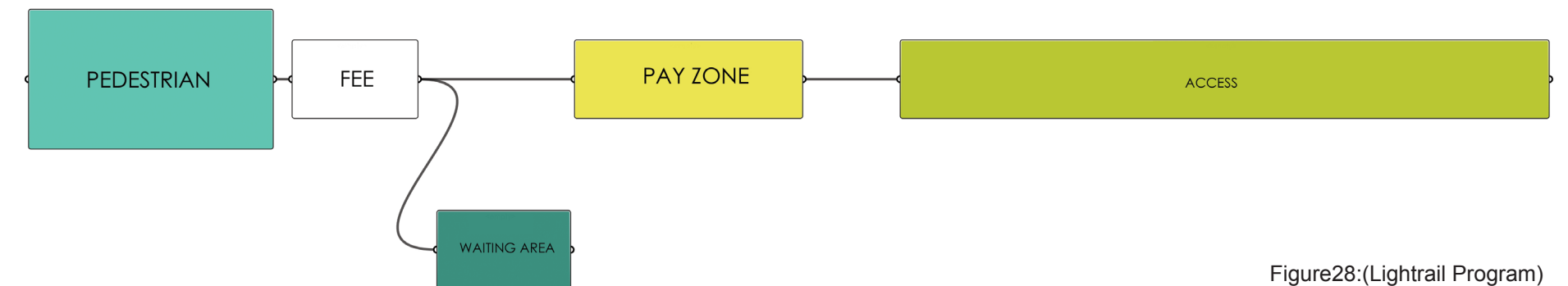


Figure28:(Lightrail Program)

### Underground Light Rail System

The underground light rail system is the most expensive of the three types of light rails due to the high costs of tunneling equipment and lengthy construction process. Some of the benefits of an underground light rail system are its minimal effects on existing infrastructure and the high speeds that are reached due to little or no stopping in between stations. The city of Seattle is currently in the process of extending its light rail system from Capitol Hill to the University of Washington where it is predicted to serve about 14,000 riders by 2030. The University of Washington underground rail station will bring some relief to the high volume of vehicular traffic that congests Montlake Bridge and Pacific Street. The tunnels for this underground station were started in 2009 and scheduled to be complete in 2016 (figure 29) (University of Washington).

This type of light rail station would prove beneficial to connect to the exact location of interests, like the University of Texas at El Paso and the El Paso Community College, which are presently near, but not directly adjacent to the existing railroads. The noise level of the underground light rail is minimal compared to that of a ground or elevated system, and the speed of the underground light rail is much higher than one at ground level. Despite the benefit of potentially connecting directly to these educational facilities, the high cost of the underground rails, the unperceived problems of the high water table of the region, and the long periods of time that it would take to complete these tunnels make it the least viable option for the El Paso-Juarez region.

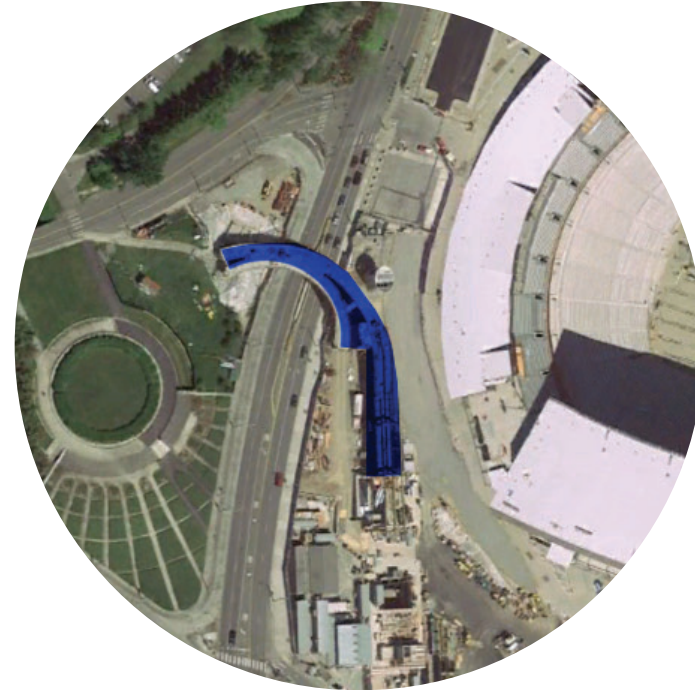
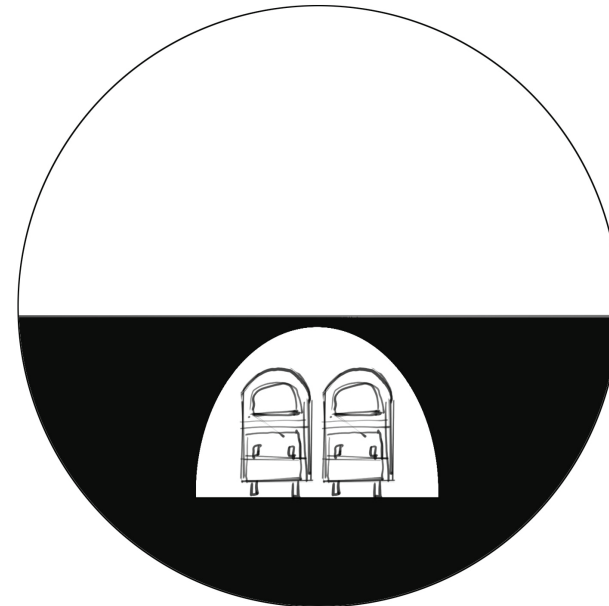


Figure29:(Sound Transit, University of Washington Station)



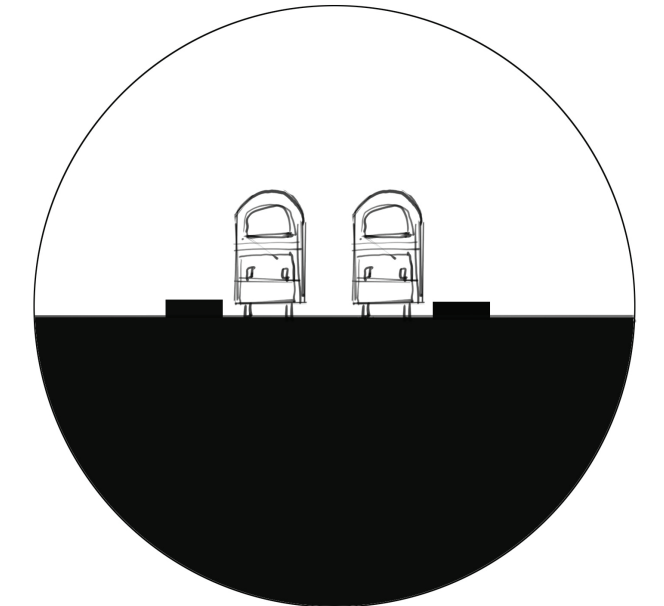
### Ground Light Rail System

The San Diego light rail system was established in 1981 (“San Diego Trolley”) and has expanded to three lines connecting downtown San Diego to the area of Santee, Mission Valley, Imperial Beach and San Ysidro (figure 30). This mixed level light rail serves a total of 87,700 riders every day, through a line that stretches 53.5 miles across San Diego and its neighboring counties. The blue line is an all ground level rail connecting down town San Diego to San Ysidro. The light rail station down in San Ysidro is located next to the town’s border crossing, transporting the high volume of workers that travel to the larger San Diego area every day. The light rail is presented with a small group of benches and canopies on both sides of the rail, the favorable weather of the region does not require much to accommodate its passengers while they wait.

This type of light rail station is the most economical option for the El Paso – Juarez region considering that most of the rail infrastructure is existent and passes within a mile of each of the El Paso proposed destinations. The noise level would not be an issue for the existing neighborhoods since the proposed light rail stations are located within industrial areas, but the fact that the stations would be close to industrial areas could pose a safety issue for passengers riding the light rail at night. The stations would have to provide a clear visual connection to their responding destinations in the form of a designed ground path, or bridge over I-10 at the UTEP connection.



Figure30:(Google,San Ysidro Station)



## Above Ground Light rail System

The Aberdeen Skytrain Station of Richmond, British Columbia, is a great example of a Skytrain system that efficiently connects the Metro Vancouver area. This above ground infrastructure station was completed in 2009 (“Detailed Design Consultation for Canada Line Stations”), and connects less than 12 miles of rail and serves 6,999 daily passengers at this station (figure 31). This translucent glass box light rail station connects the ground with the elevated rails through a main concrete staircase and wooden canopies.

The benefit of a Skytrain system running through El Paso and Juarez would be that the rails could cut through different types of infrastructure with minimal disruption of traffic and fast construction. The Skytrain could be an opportunity to help El Paso establish an iconic form of infrastructure that would have the most visual impact on the city, compared to the underground light rail, or the ground light rail which would be forced to run through industrial areas, out of sight of the major roads or heavy pedestrian areas.

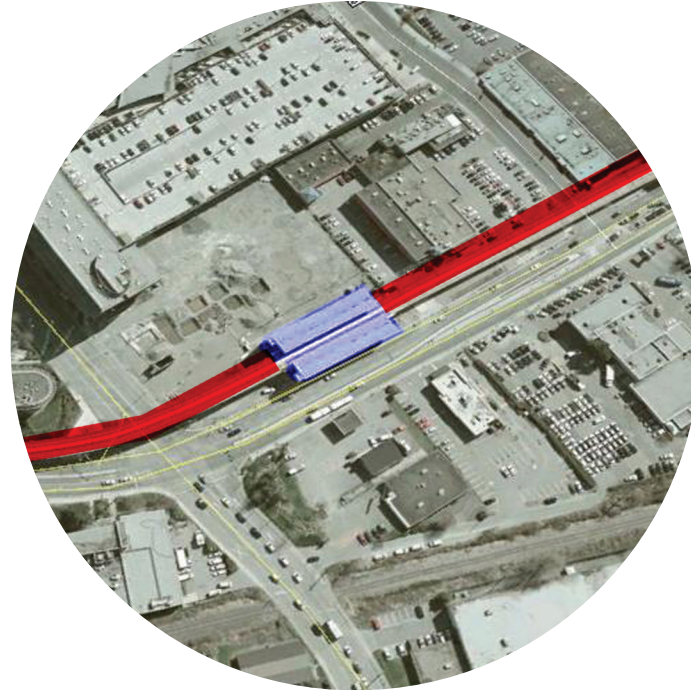
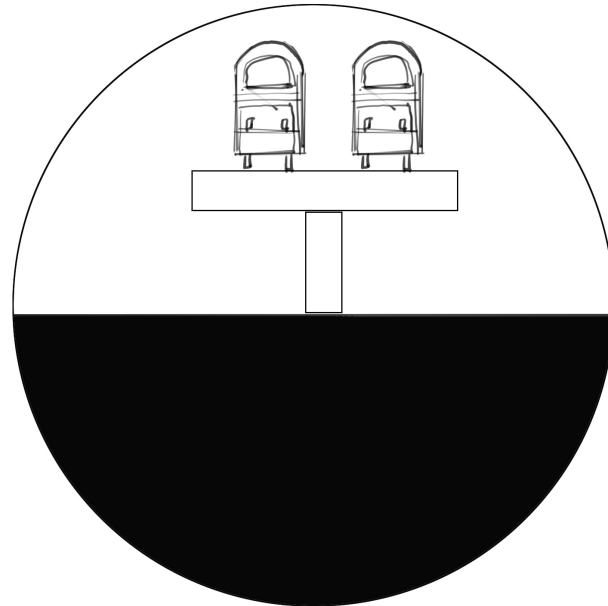


Figure31:(Google maps, Aberdeen Skytrain Station)



## Program-User

The border crossing serves a diverse, mobile population drawn from both sides of its boundaries that can be categorized as workers, merchants, and students all of which have unique needs and reasons why they cross the border of El Paso and Juarez.

### The Workers

The commuters can then be further classified into a series of subcategories based on their flexibility of destination and frequency of travel. The commuter that lives in Ciudad Juarez and works across the border, or vice versa, has the most distinct needs when it comes to independent destinations (figure 32). The commuting worker travels an average of five days a week across the border and makes use of highway I-10, highway 54 and the border-highway, which are all efficient traffic arteries. When we consider the high level of flexibility that each individual needs to reach his or her unique destination, the car is considered the ideal method of transportation for the working commuter.



Figure32:(Chaparrito, The Worker)

## The Merchants

The merchants compose the second category of commuters that cross this border regularly (figure 33). The Mexican border community relies heavily on the American importation of Chinese goods and American products since they are manufactured and sold at a much lower cost than those produced in Mexico. Many of the neighborhoods of Ciudad Juarez rely on their local grocery store, better known as the abarrotes, for goods and produce. The abarrotes is a type of family owned store of the “colonias” or neighborhoods of Ciudad Juarez that can be compared to a local gas station in American suburbia. The merchant that supplies these types of abarrotes plays an important role in the everyday life of Mexican families, which depend on these grocery stores for food and home supplies (figure 34). The proximity of the Asian stores to the Mexican border shortens the distance traveled by the merchant and dictates the merchant to use personal vehicular transportation to supply a large sum of goods to their grocery stores. The short distance that the merchant travels when in El Paso could be satisfied by a public bus system, because most of the stores that they regulate are near the border, but the transportation of products requires the use of truck or car.



Figure33:(Gamboa, Merchant)



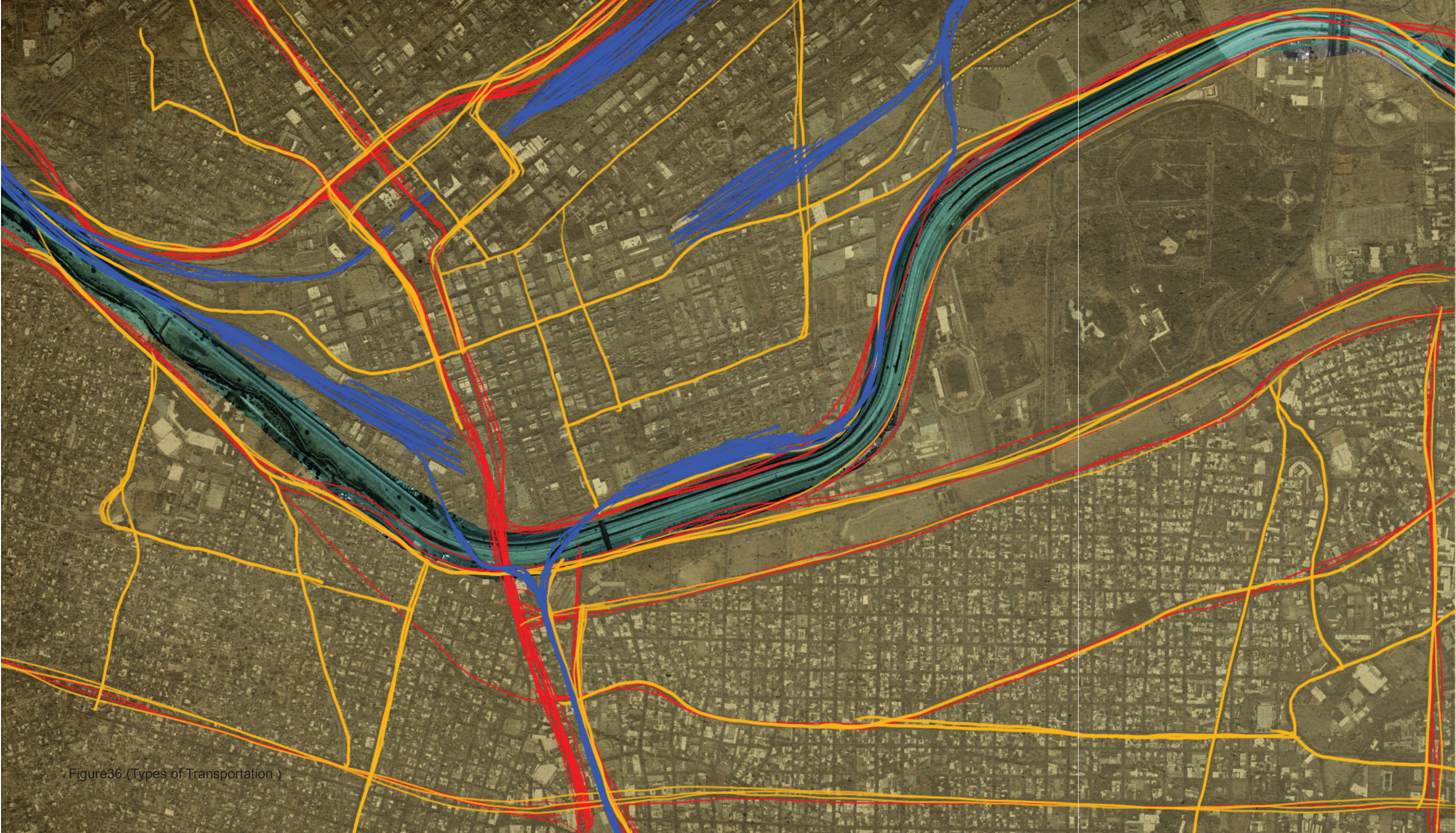
Figure34:(Calderon, Abarrotes)

## The Students

The third types of commuters for this border crossing are the students, who commonly travel across the border to go to high school or college (figure 35). These students (ranging from kinder garden to college seniors), commute from different areas of Ciudad Juarez and cross the Rio Grande everyday because they believe that the education they receive in the United States is superior to that of the Mexican schools. 86 percent of the University of Texas at El Paso is composed of Hispanic college students (“2013-2014 UTEP Facts”) and nine percent of those students cross the border every day to go to school (UTEP). The second destination for many students is the El Paso Community College. EPCC is composed of five different campuses in the city of El Paso and is attended by over 30,000 students of the El Paso- Juarez region (Jacobs). The relation between commuter and one common destination is the strongest with the students, than with the worker or the merchant. With this in mind, it made sense to allocate the border-crossing stations near destinations that could benefit the student due to their common destinations.



Figure35:(NBC, Students of all ages)



**Transportation**

The map to the left shows the main traffic routes used by public transportation in yellow, the train in blue, and the private car in red (figure 36). The introduction of a trans-border light rail system will prove to be a faster method of transporting commuters whose destination surpasses that of downtown El Paso and Juarez. Each of these types of transportation plays an important role in the movement of people and goods throughout El Paso and Juarez.

- CAR
- PUBLIC BUS TRANSIT
- FREIGHT TRAIN

Figure36: (Types of Transportation )

## The Train

The sites explored are woven through a diverse collection of methods of transportation, each city (El Paso and Juarez) manages to connect these sites through its own public and private forms of public transportation but lack a common form of public transportation to efficiently transport commuters across the El Paso- Juarez border. The forms of transportation explored as methods of transporting people and goods to the respective sites are the car, the public bus, and the freight train. Each of these forms of transportation is inherently present at each site at very different levels of integration and proximity.

Throughout stages of industrialization and regional development the El Paso- Juarez border has adapted various forms of transportation since it became a border-town. The simple wood bridge that initially connected El Paso and Juarez in 1882 (Dawson 12) soon became a railroad connection for the trains transporting mined metals and goods. The rails were the first form of infrastructure that established the northern Mexican states as a point of interest for commerce (figure 37). The freight trains were used to transport goods, crops, and mined minerals from Mexico to the United States. These rails were not only the means of transportation

for goods but helped connect people to California and New Mexico while making the border an important point of trade. The railroad yards can still cross through Juarez and be traced across the border into the U.S.. These rails that once helped travelers and immigrants cross the border lay like fossils in the harsh Chihuahuan desert, occasionally used by commercial freight trains crossing the border. These trains cross through two bridges, which are strictly utilitarian and assigned to the usage of freight. These steel and concrete bridges open for incoming trains like the gates of a castle which are inspected by the border patrol for smugglers, before being allowed to continue on their journey north. In a way these railroad bridge-gates are the purest form of the border, as both gateway and valve.

The re-purpose of these bridges from freight trains to trains with passengers can soon become possible. Union Pacific (UP) has recently proposed a relocation of the large railroad yards of the El Paso area to Santa Teresa, forty five minutes outside of El Paso, which means that the existing freight train bridges will no longer be needed for commercial freight (Crowder). What this means for the city of El Paso is that a large part of the downtown area will be vacant and many of the lines that today cross near the El Paso- Juarez border will no longer be used for freight cargo loads. This relocation means the Union Pacific railroad yards can open the opportunity of using some of the existing rails as a viable method of public transportation beyond the already proposed cross-border stations as introduced in this thesis.

## The Automobile

The El Paso street car line (trolley) that transported commuters across the border ran until the 1970's when the car became the preferred mode of transportation for commuters crossing the border every day. The Santa Fe Bridge transformed to accommodate the car at the same time that the Texas highway system completed Interstate I-10, in 1969 connecting East and West El Paso with a twenty-minute car drive. The car continues to be the most widely used method of transportation to cross the border, creating the 2-hour waiting lines during peak hours. The perception of the individual flexibility that the car seems to bring to the commuter is counteracted by the time spent waiting at the border crossing.

Figure37:( The Train Track Routes )

The car is not only the most environmentally destructive method of transportation to cross the El Paso-Juarez border (due to the 2 hour waiting time of the thousands of cars waiting in line every day), but also the method of transportation most commonly used by drug cartels. The car itself has become the method of transportation that the drug trade primarily targets due to the high number of cars that cross the border every day. The local Juarenze would have no need to drive across the border if there were an efficient method of transportation and security checkpoints to transport him/her to their destination in a faster safer way.

### Public Transportation

The public transportation of Ciudad Juarez is not a publicly run entity as it is in most American cities. The buses are independently owned and run by an association of bus drivers, "Ruteros" drive their own buses around the city much like taxi drivers on their own schedule. The drivers work for different series of bus lines and pay a duty at the end of their shift to the company. The intense competition between the bus drivers and lack of order has created a disorganized and unsafe method of transportation, which has forced the city of Juarez to find an affordable and reliable alternative (Lara). It is only recently that the city of Juarez decided to adopt a Bus Rapid Transit System (BRT), connecting a large section of the city through efficiently designating BRT lanes through areas of high traffic volume to reduce driving time and a pay before you ride system reduces wait-

ing time at the bus stops (figure 38). El Paso was one of ten approved cities to received funding by DOT (Department of Transportation) for its Mesa BRT Corridor, which could be adapted to a light rail system like the one proposed in this thesis (Schmitt).



Figure38: (Schmitt, BRT Station)

## Design Goals

### Site

This thesis will explore the El Paso and Juarez region for trails of rail road tracks that could potentially be re-used from a strictly private-commercial use to one of public benefit, while locating the best locations for the border crossing stations at the end of these lines. The process of locating these border-cross stations will analyze the needs and destinations of the commuters that cross the border every day (worker, merchant and student). The process of establishing border-crossing stations at the ends of this light-rail system will help dissolve the borderline tensions that exist along the border. It will also implement a faster method of crossing the border through the re-use of the railroad and increase security through the de-centralization of the border crossing.

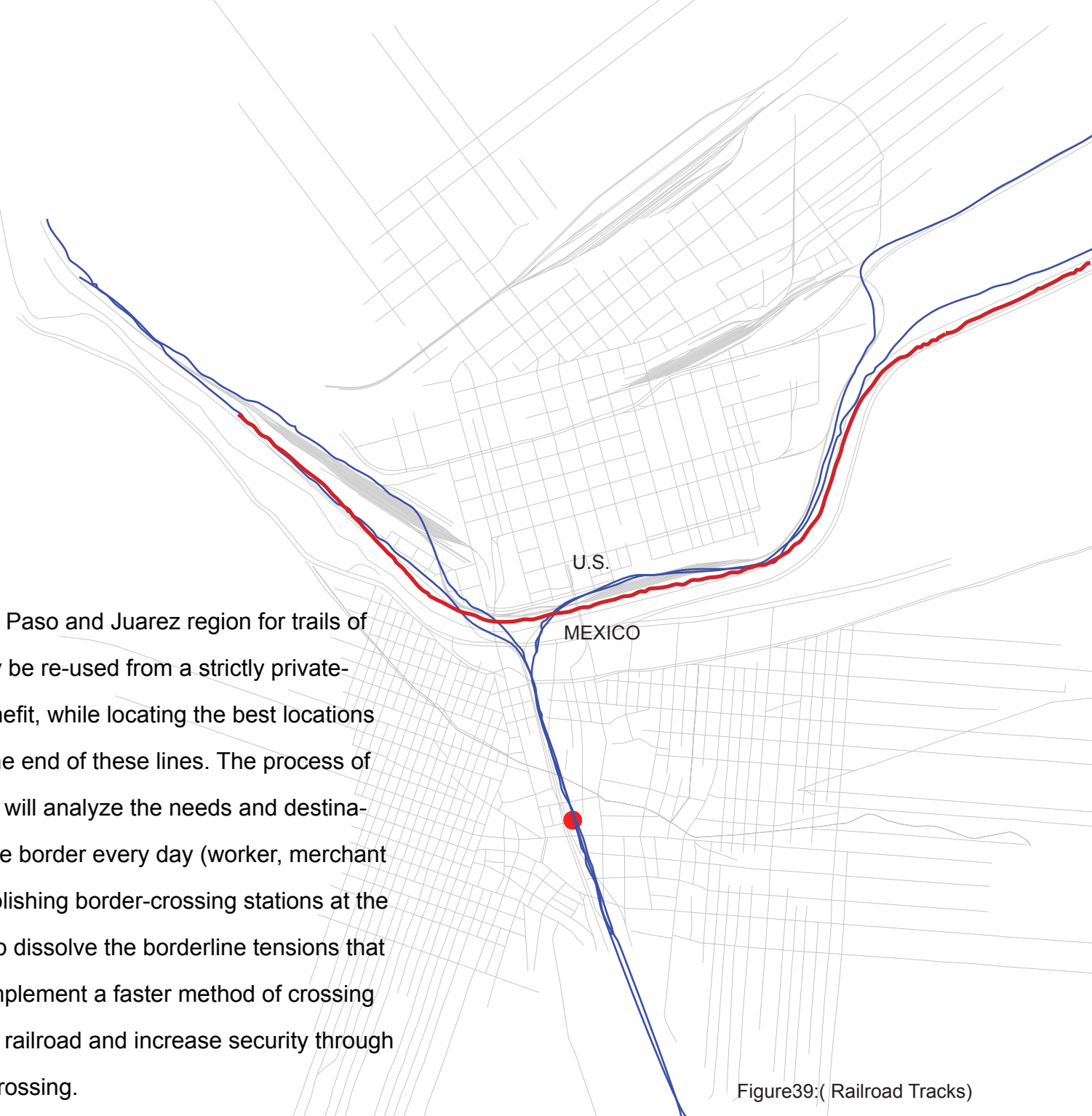


Figure39:( Railroad Tracks)

The design of this thesis will engage each of the sites through factors of efficiency, in their use of existing forms of infrastructure and proximity to the decided destinations. After choosing three sites, this thesis will explore the third site, located in Juarez to design a light rail station. The goal of each of the destinations and the light-rail system itself should be to:

1. Not intrude or overlap on other existing forms of public transportation
2. Keep the addition of railroad infrastructure to a minimum
3. Maximize the use of existing lines (figure 39)
4. Maintain a clear connection to the existing urban context.

### Station

The Light Rail Station will strive to:

1. Engage the street level by incorporating program of social significance
2. Help reduce pollution through the diminished use of the automobile
3. Reduce waiting times at the other border crossing bridges
4. De-centralize the border crossing by efficiently detaching itself from the border as shown in the Elasticity diagram of the border (figure 25)
5. Create a sense of unity between the city of EL Paso and Juarez through a common form of public transportation.

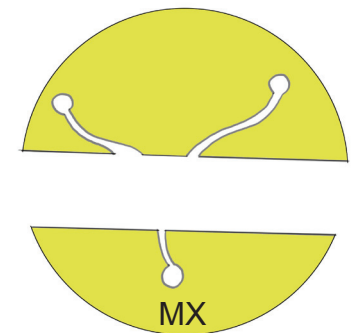


Figure 25: (Elasticity of the Border)

## Sites

The solution that this light-rail system is trying to implement is composed of a network of stations that connect El Paso and Juarez. The site location of these stations was driven by the destination of the student user and proximity to the existing railroad system. Choosing to locate the de-centralized border crossing stations around the needs of the students also guided the vicinity and direct location in which these stations were to be placed. As was previously discussed, the goal of re-purposing the railroad into an efficient form of transportation across the border should not disturb the existing layers of public and private transportation. Site A and B are located in El Paso Texas while site C is located in Ciudad Juarez, Mexico as shown in figure 40. The new light-rail system should only use existing railroads, to reduce or completely remove the need to build new rails while connecting Juarez to El Paso.

### PROPOSED LIGHT RAIL STATIONS

- A- The University of Texas at El Paso Light-Rail Station
- B- The El Paso Community College Light-Rail Station
- C- The Juarez Light-Rail Station



Figure40: Sites

**Site A:**

The first decentralized border crossings will be located in El Paso Texas at the Western end of the light-rail lines, it will connect the Juarez station to the University of Texas at El Paso (UTEP) border crossing station. The Western border crossing site (yellow) sits on a desolate site of the railroads tracks within an industrial area across Interstate 10 (white) from UTEP (A) (figure 41). The site can be described as an industrial island surrounded by Highway 10 and railroads (red). The proposed design thus becomes an opportunity to revitalize an industrial area (B) while providing a direct connection to existing transportation networks through a no-stop zone of the light-rail system.

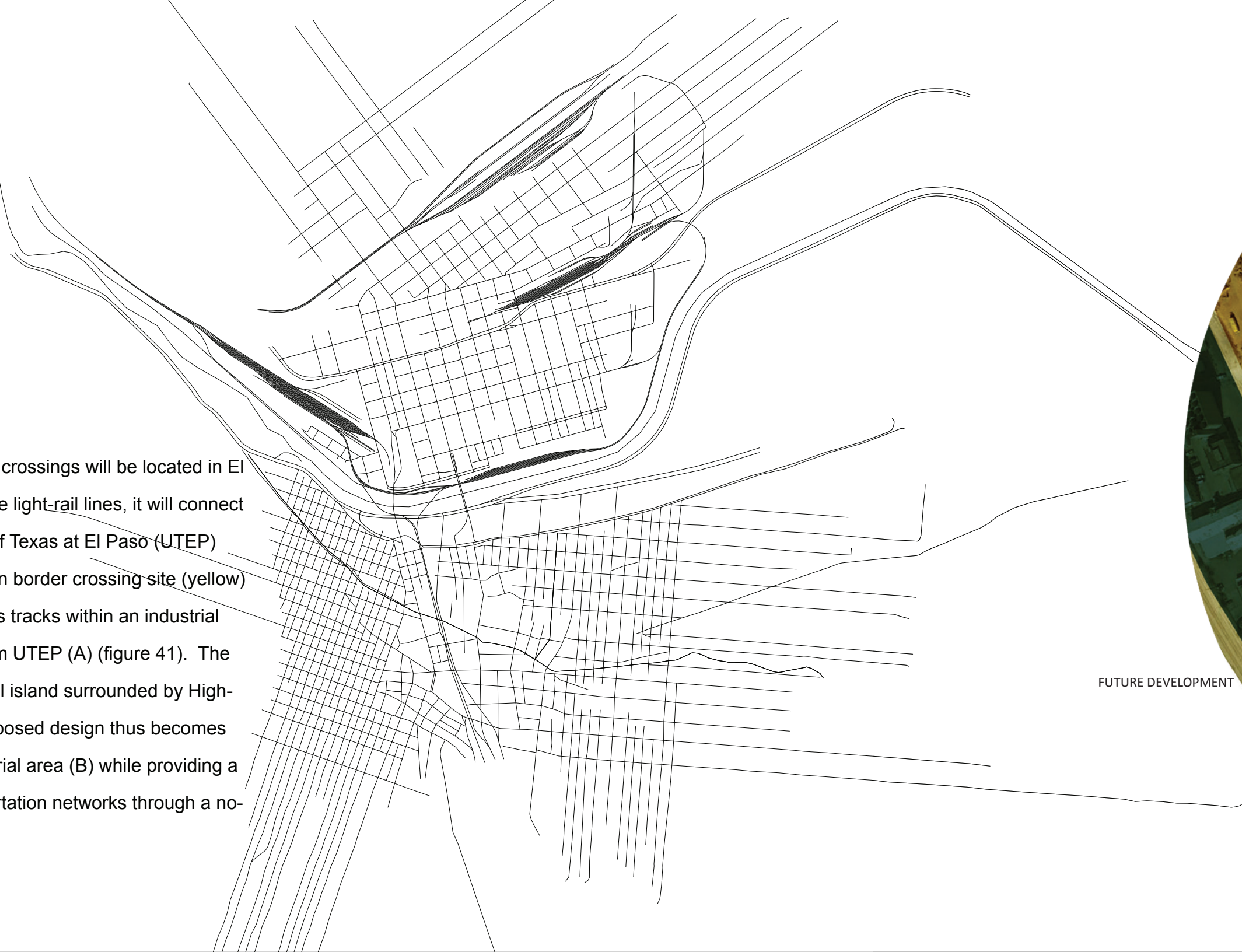


Figure41: UTEPSite

**Site B:**

The final light-rail system is located near the El Paso Community College on the Eastern side of El Paso (figure 42). This third site (yellow), very much like the UTEP location, is located in an industrial area within a mile of EPCC (A) that will not require any additional rails, but does lack the social and public interest that is commonly sought after to introduce a program of this type. The site sits on the edge of a medium to low-income residential area better known as the Lower Valley of El Paso, a large park area (C) and an industrial railroad yard with a set of terminating tracks (red), which are used by freight trains on their way to the United States. The East side cross-border station is intended to connect Juarez to an area of El Paso located between the Bridge of the Americas and the Zaragoza bridge that is not widely routed by Sun Metro. The proposed station will sit half a mile away from EPCC, a mile and a half away from one of El Paso's biggest shopping areas near I-10, and a block away from bus route 7, 67, and 66. Bus route 7 is an express route that connects the lower valley to the north-east area of El Paso, where a satellite campus of EPCC is located.



Figure42: EPCC Site

**Site C:**

The final de-centralized border crossing proposed in this design proposal is strategically located in Ciudad Juarez. The site is not only centrally located but in direct proximity to a bull fighting stadium (A), an un-used parking garage (B), a once popular business district (C), and adjacent vacant areas for future housing development (D) shown in figure 43. The site is heavily used due to a bus route lane that runs through the site, a bike lane and an

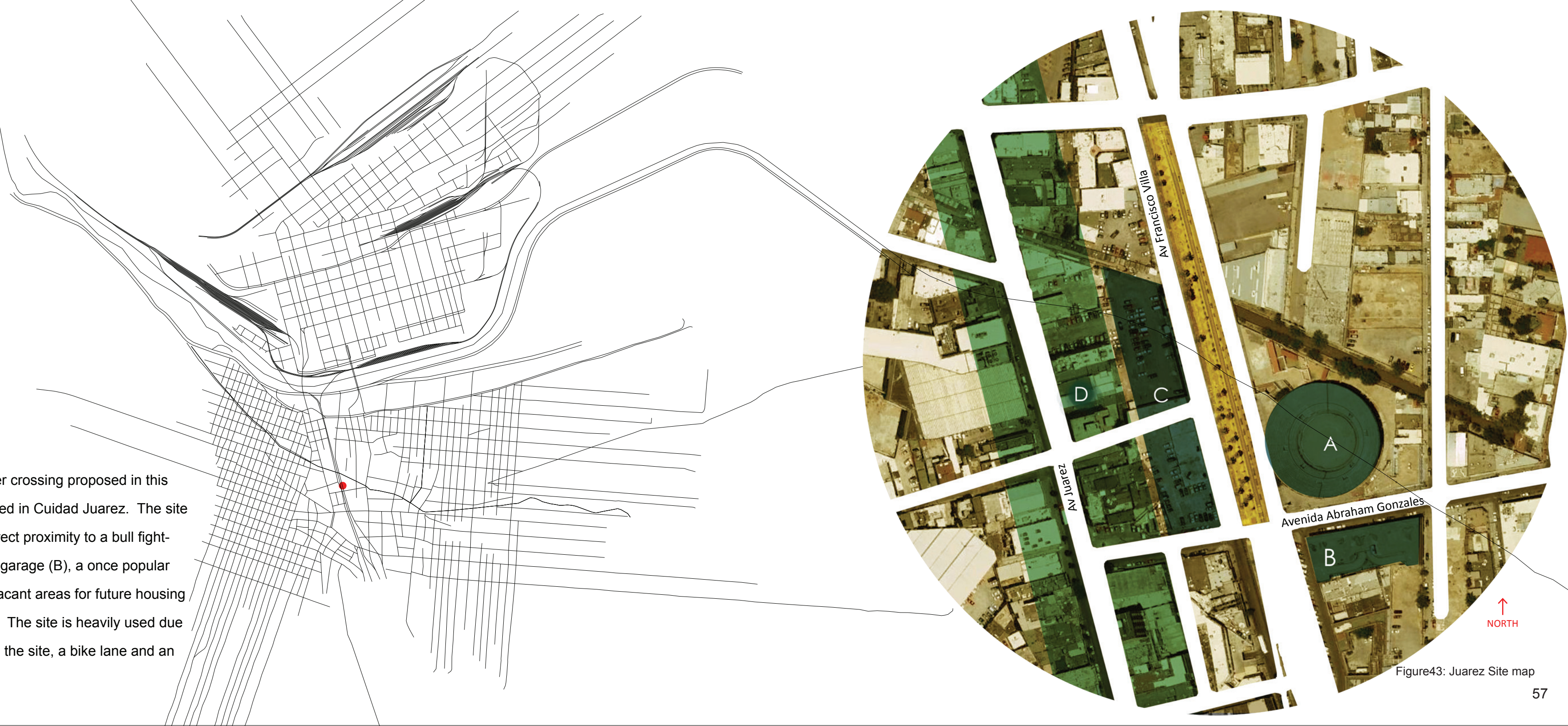


Figure43: Juarez Site map

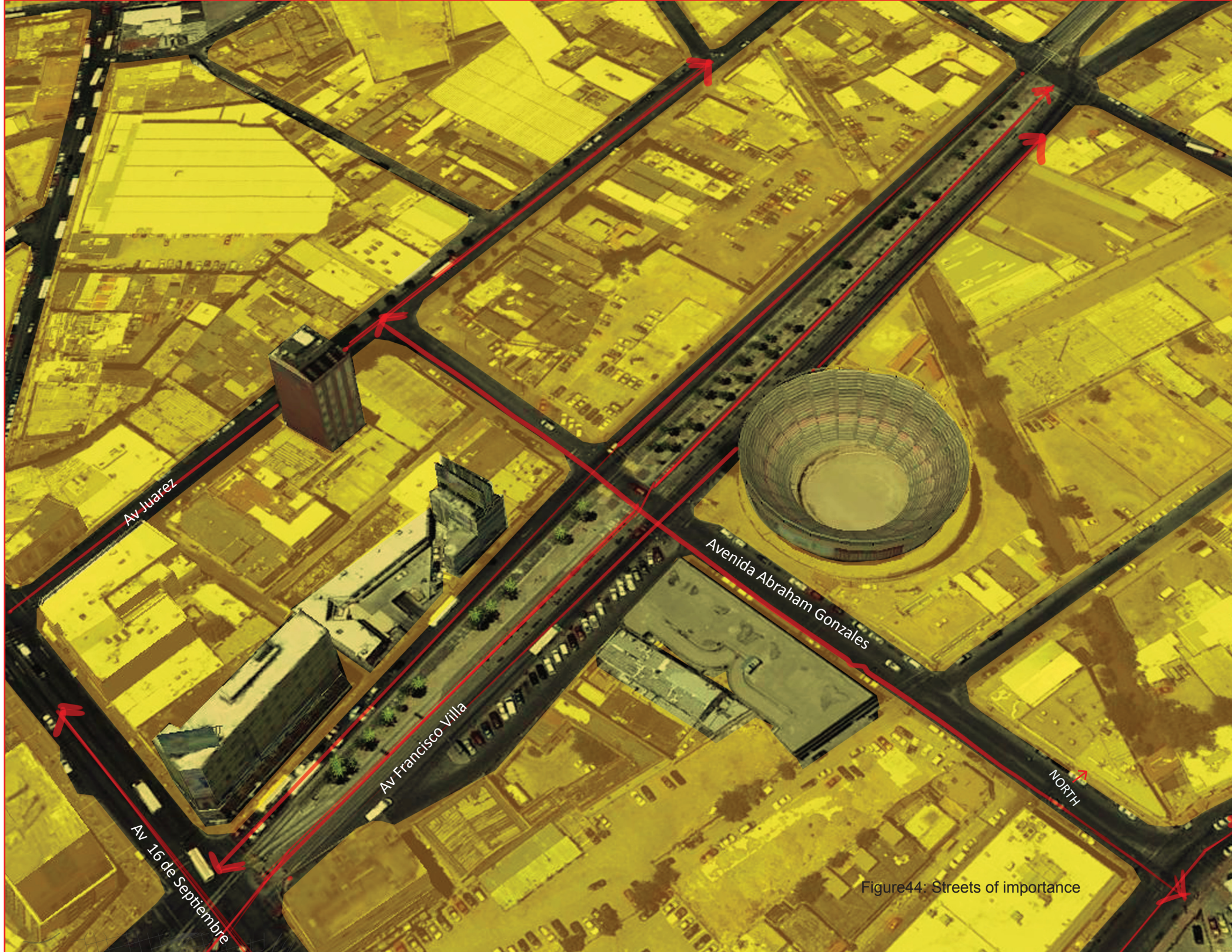
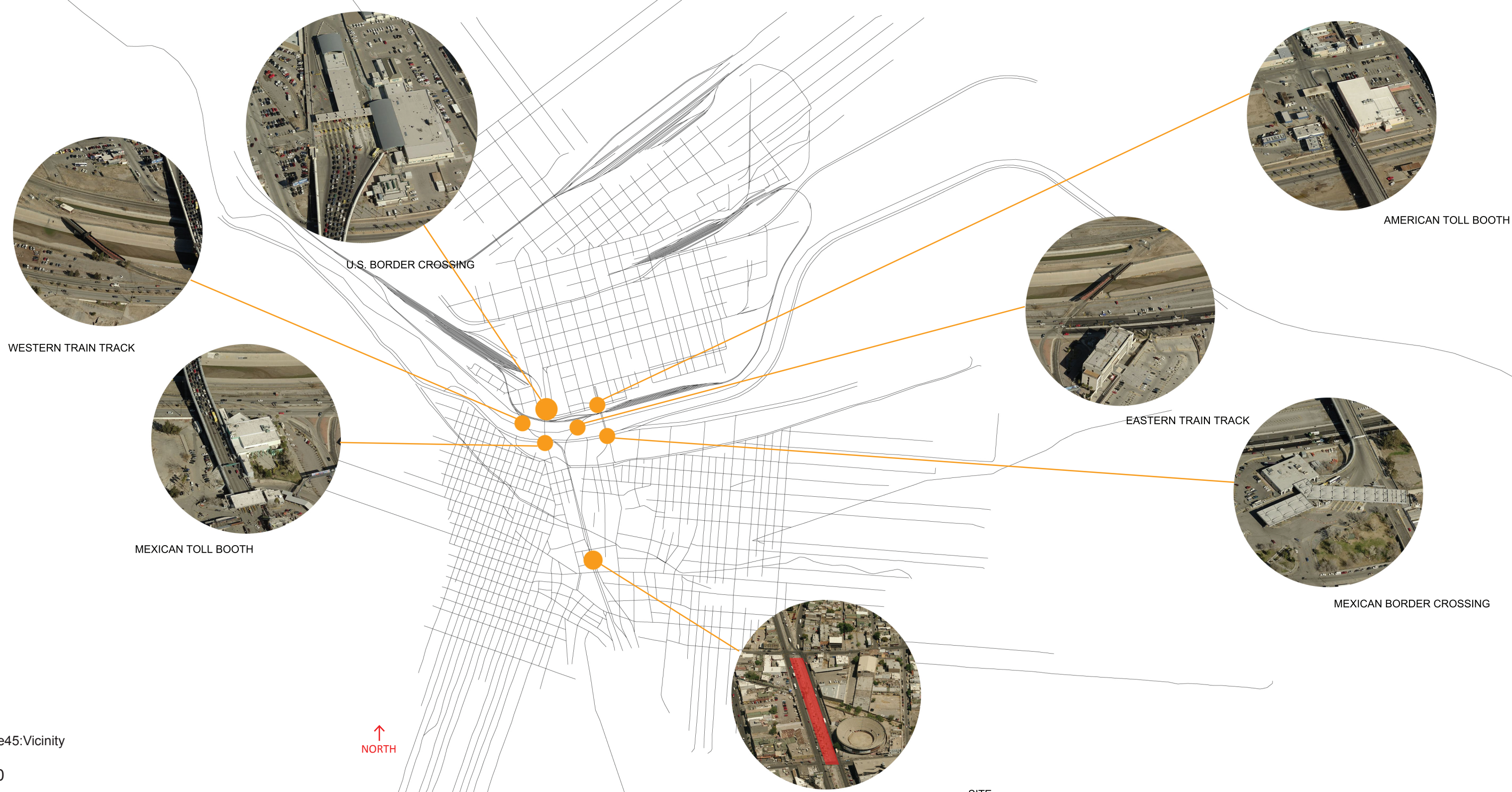


Figure44: Streets of importance

existing railroad, that sits between two vehicular traffic lanes on each side that are used by drivers on the way to the Santa Fe Bridge border crossing. The site of the Juarez Border-crossing station is 60 feet wide and 800 feet long, strategically located on the intersection of Avenida Francisco Villa and Calle Abraham Gonzales. Avenida Francisco Villa runs perpendicular to the American border and is a direct path to the El Paso border from the southern area of Juarez. This highly trafficked route is part of the “Rutas” or public bus system, a two way bicycle lane, pedestrians walk ways, trains and vehicular traffic, all in the matter of 120 feet. This unique road has created a highway of multiple forms of transportation, allowing them to coexist despite the proximity of one to the other. Avenida Abraham Gonzales was chosen as the intersection road because of its proximity to Avenida 16 de Septiembre (figure 44), which is one of the fastest ways to connect the eastern rural areas of Ciudad Juarez to its downtown area.

This site will provide a unique opportunity to explore the architecture of border crossings, as a filtering system through which different types of transportation pass and help commuters pass through borders efficiently. The challenges of this site will lie in its linear nature, which has little ground to spare without interrupting the bicycle and bus lanes. A challenge of this site will be to maintain the flow of different forms of vehicular movement, while imposing various levels of control. A third and final challenge of this site will be in its ability to securely and quickly transfer passengers without interrupting the traffic flow of pedestrians, cyclists, and buses.



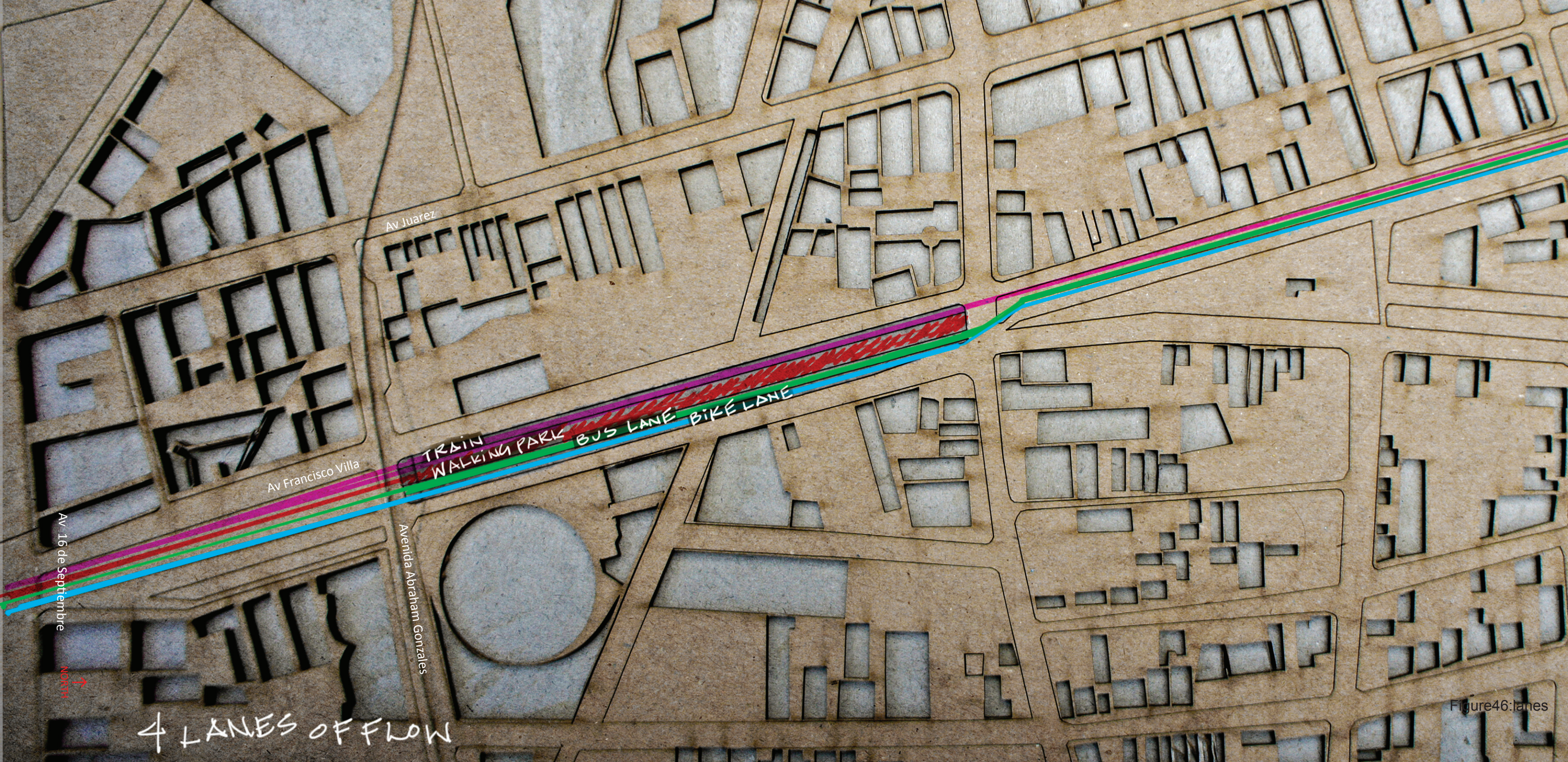
**Vicinity**

The site of the light rail station- border crossing was chosen to work in a system of four elements:

1. Its proximity to the El Paso border.
2. Its proximity to the American and Mexican border crossings (figure 45).
3. Its location directly on existing railroad tracks.
4. Its ability to provide a home to the light rail-border crossing with minimum disturbance to existing traffic.

Its proximity to the Mexican-American border and the border crossings will help relieve these downtown border crossing stations from some of the volume of pedestrian traffic, and its location on Avenida Francisco Villa will work strategically to use the existing railroad tracks by placing the station directly on it and reduce obstructions on the adjacent vehicular lanes of traffic.

Figure45:Vicinity



## Site Analysis

The Site Analysis of the site explores its unique shape and its eroded position as a piece of land in the middle of the existing paths of transportation (figure 46). The traffic lanes which surround it have created a long narrow site that hosts four types of infrastructures:

1. A train track commonly used for freight moving north into the United States (pink).
2. A pedestrian park 24' wide that was guided with landscape to shelter from the train (red).
3. A designated bus lane 12' wide which has recently been transformed to a Bus Rapid transit lane (green).
4. A bike lane, 12' wide that runs north to south along the three previously mentioned lanes (blue).

The following maps show how each of these forms of infrastructure are implemented into the site and the location of the program that anchors each of these to the station.

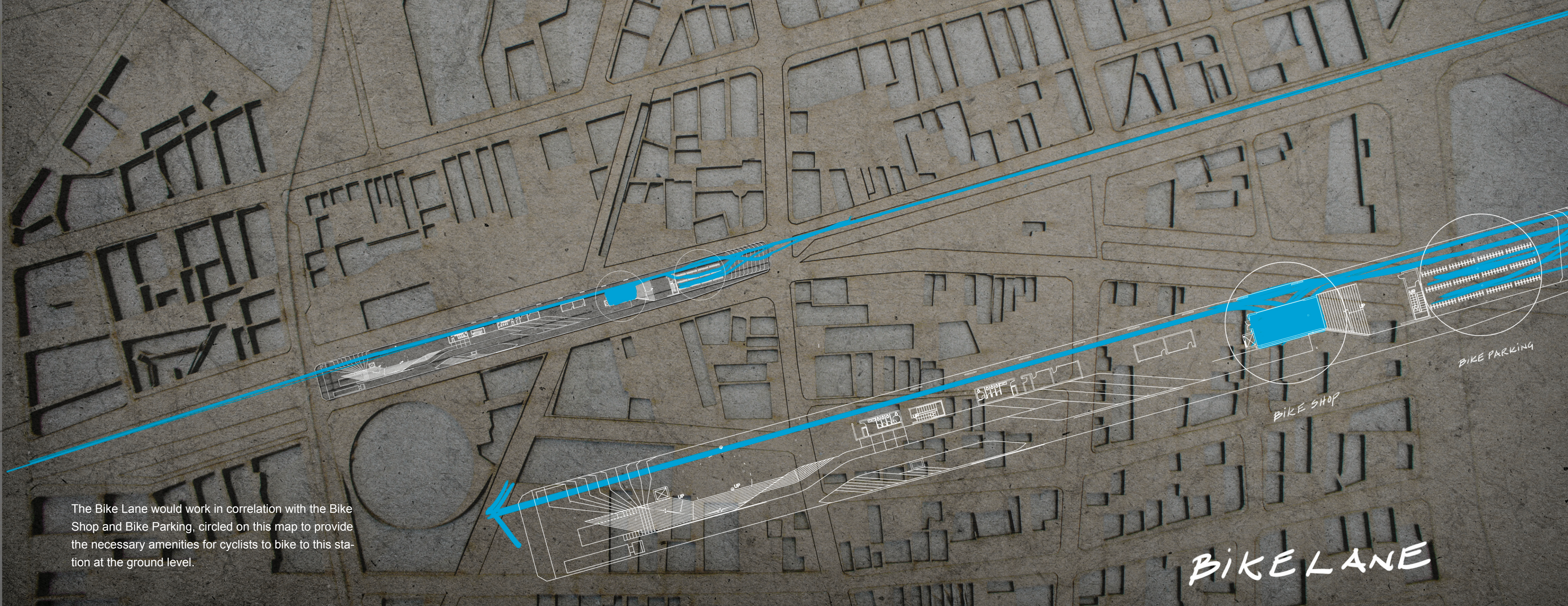


The BRT lane would work in correlation with the Bus Stop circled on this map to load and unload passengers at the ground level.

BUS STOP

BUS RAPID TRANSIT LANE

The Bike Lane would work in correlation with the Bike Shop and Bike Parking, circled on this map to provide the necessary amenities for cyclists to bike to this station at the ground level.



BIKE LANE

BIKE SHOP

BIKE PARKING

The Walking Lanes represent those areas used to help direct flow of pedestrian traffic or provide an area to help gather people on the ground floor. The ground level provides an outdoor theater area for performers and spectators, sitting stairs by the bus station, a small market area with its own seating area, and a seating ramp by the bike parking.



STAGE

OUTDOOR THEATER

SITING STAIRS

MARKET/SITING SLOPE

SEATING RAMP

WALKING PARK

This site model was produced to analyze the scale of the station to its respective neighborhood.

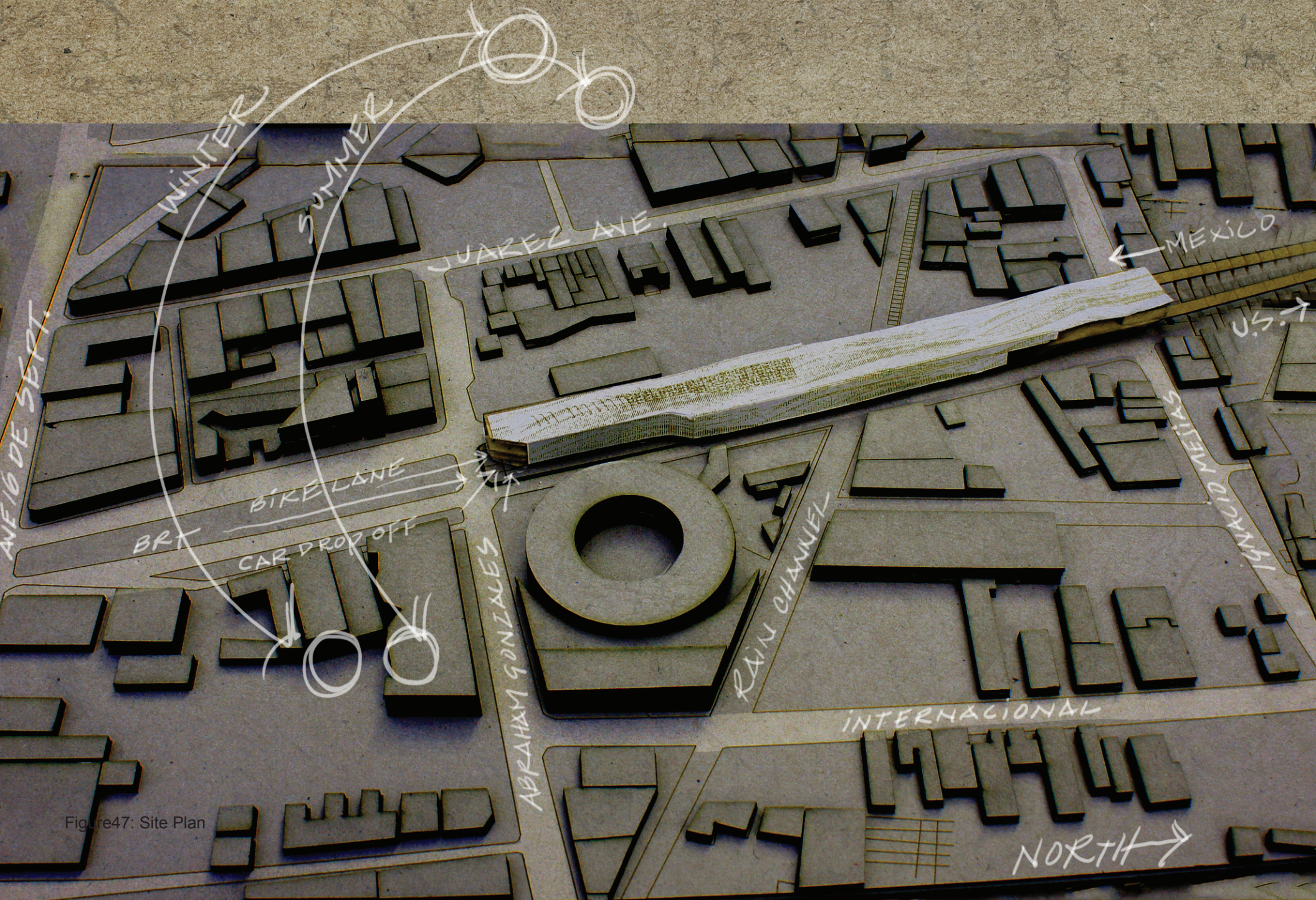


Figure 47: Site Plan

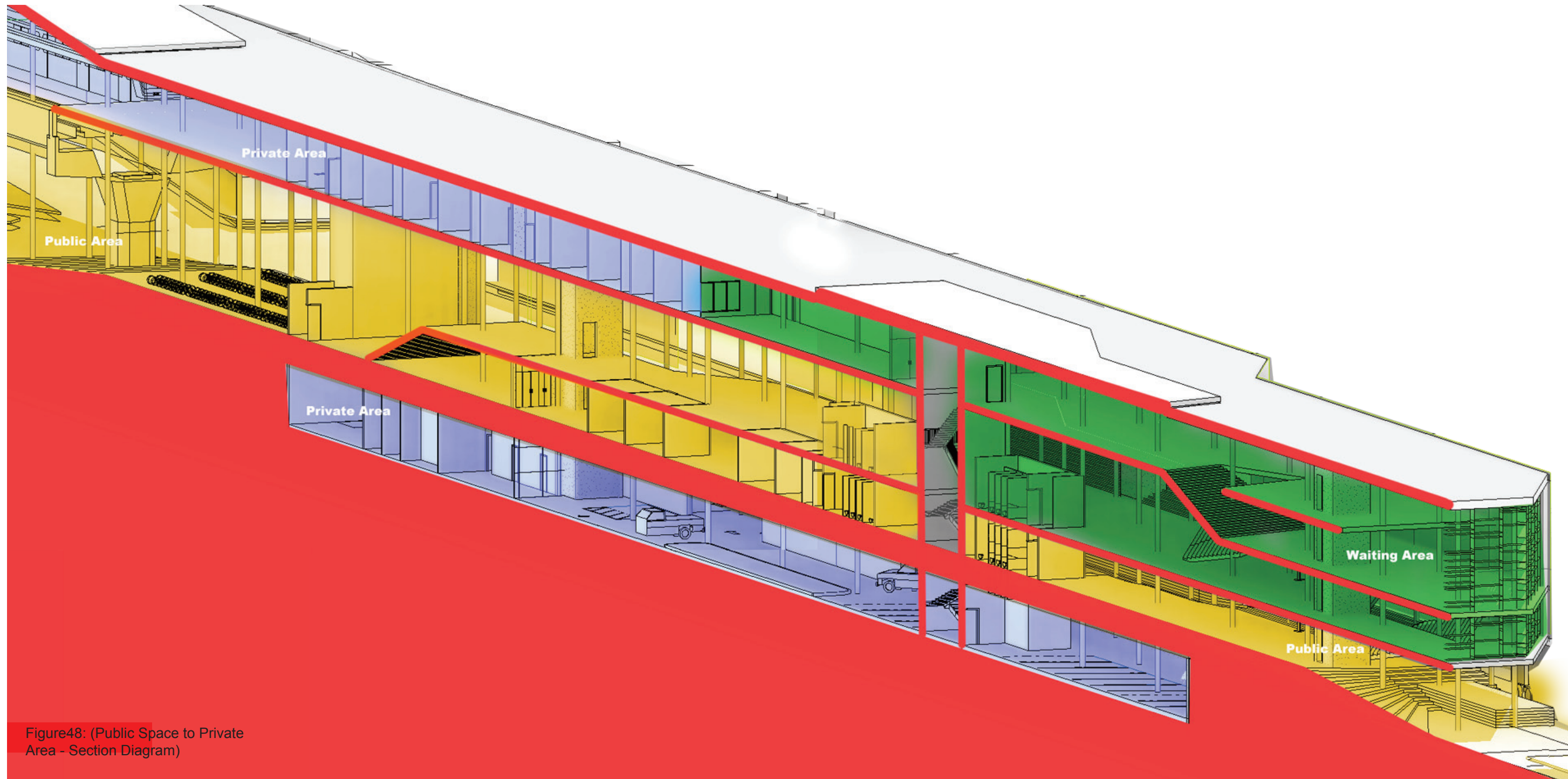


Figure48: (Public Space to Private Area - Section Diagram)

## The Program

The Juarez light rail station will have to play many roles within its envelope to create a sense of community among its users. The elements of this light rail- border crossing that would prove vital to its integration in this neighborhood of Ciudad Juarez would be a:

1. Bus Rapid Transit Station
2. Bike Shop - Bike Parking Area
3. Market
4. Place for Public Performances
5. Grand Stair Case
6. Lobby/ Waiting Area
7. Border Crossing
8. Light Rail Platform

Each of these programs have been organized to create a gradual transition from a space of an open and public program (yellow) to one of private and high level of security as the user ascends to the top level of the border crossing, blue (figure 48). This transition would allow the lower levels to remain open to the air and with minimum security and reduce interruption to the flow of pedestrian traffic. By isolating the areas of high security to the top floor and to the basement, the station will need minimum security between the ground level and border crossing level.

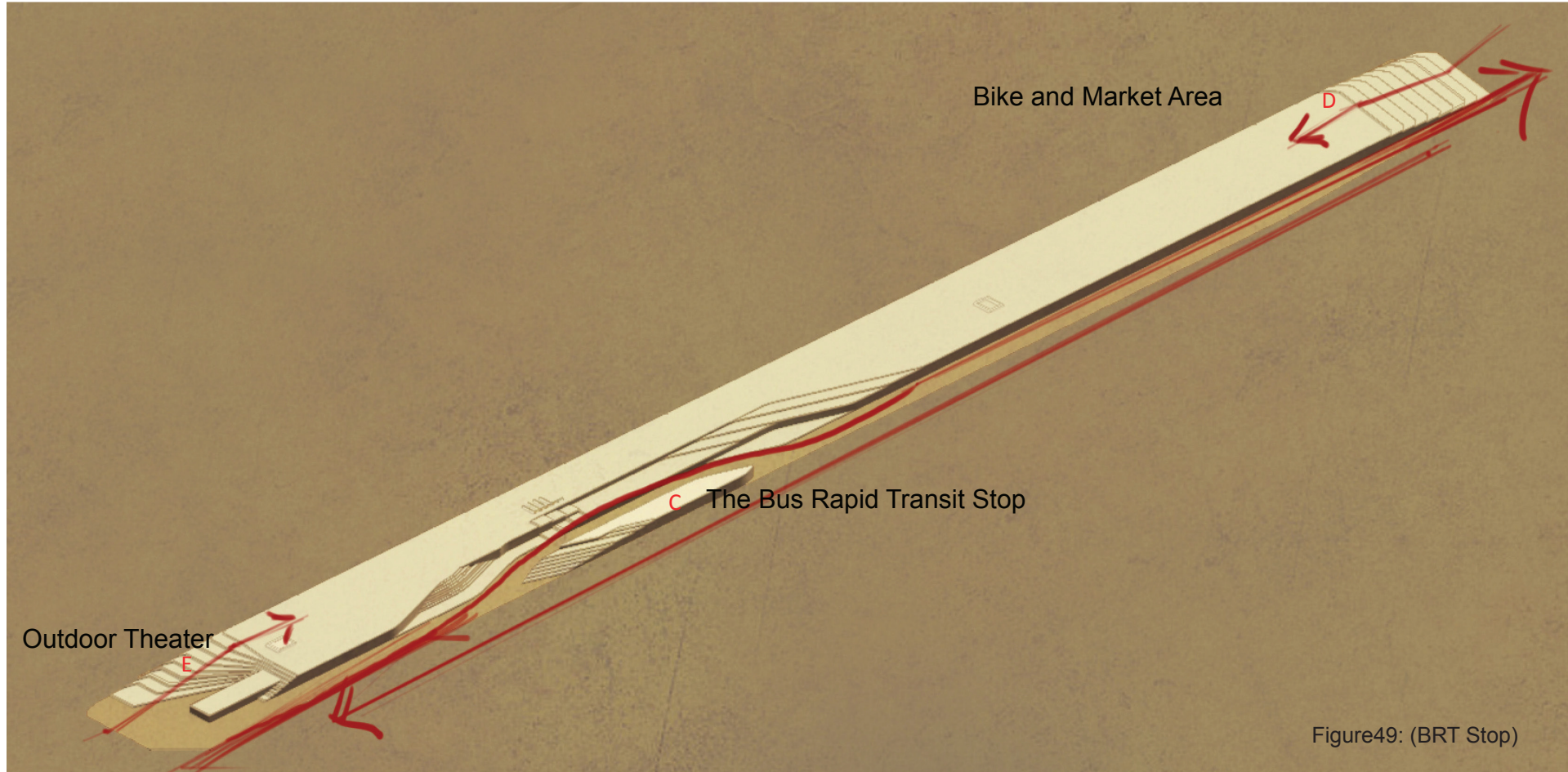


Figure49: (BRT Stop)

Ground Level



Figure50: (BRT Stop)

### The Bus Rapid Transit Stop

The creation of a Bus Rapid Transit Stop was essential due to the high levels of traffic that the BRT would bring to the area. By placing the BRT within the site would reduce the BRT stop was an important factor in the shape of the ground floor and its interaction with the hub's and its context. The Bus lane cut into the site creating an island for buses going in the opposite directions allowing them to board and drop off passengers on either side. The ramps and stairs that welcome pedestrians and cyclists align to this same level, creating a platform that engages the site and its surrounding context by creating a gradual threshold over the span of the site. The transgression from ground to platform became a guide to the form, which would guide the flow of people across the site in a horizontal fashion and in a vertical one across platforms of program.



Figure51: Bike Parking and Market Area

### Bike Area & Market

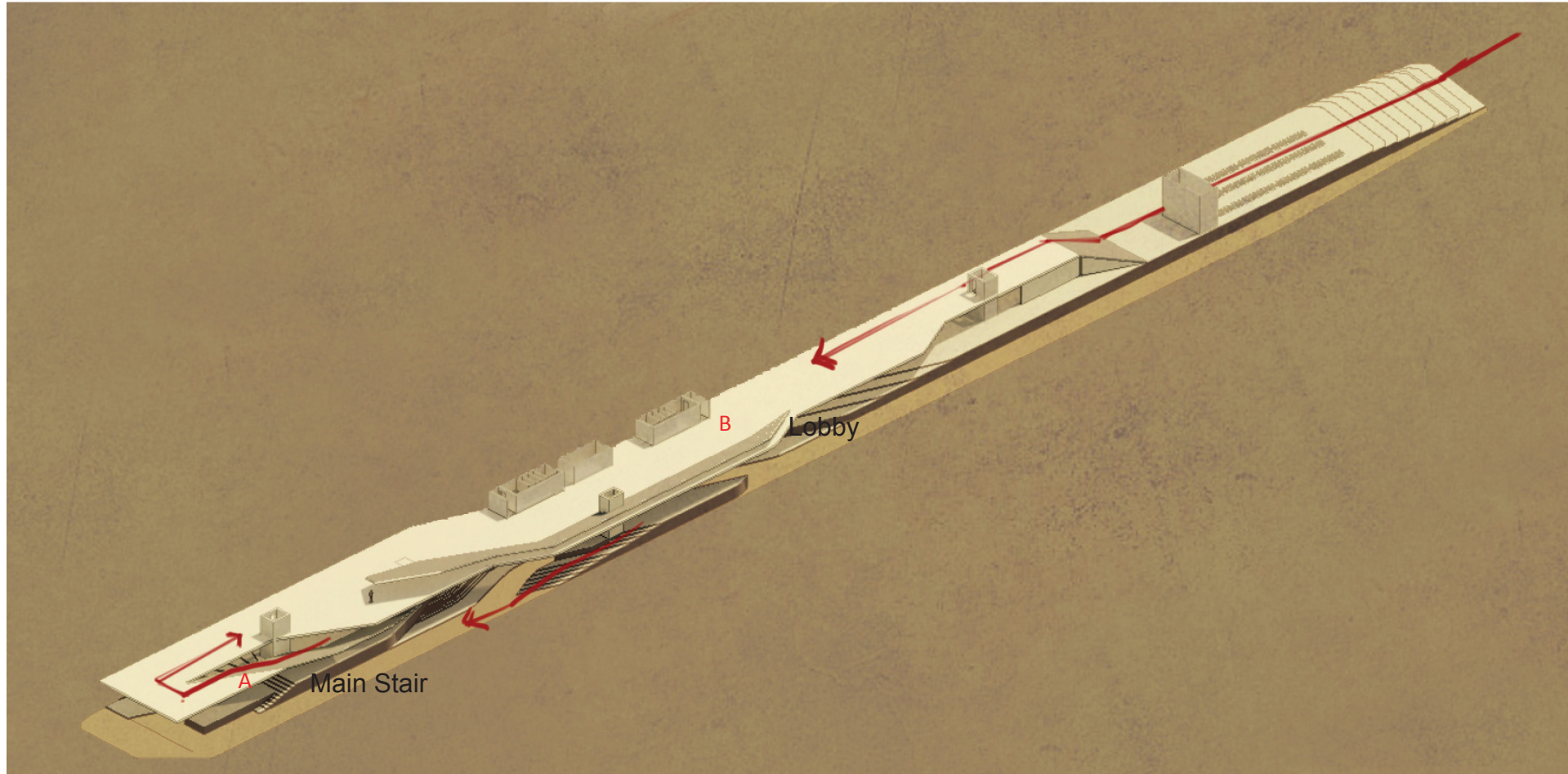
The presence of a bike area and bike shop will establish the Juarez Light Rail Station as a bike friendly establishment which promotes the use of bikes as a method of urban transportation, and facilitates it through the residing bike lane which runs directly through the station. The bike parking area will serve 200 bikes and provide a repair area. The Food Market will be located on the ground level next to the bike area and provide 5 spaces for food establishments. These two programs will help activate the northern region of the ground level at all times of the day.



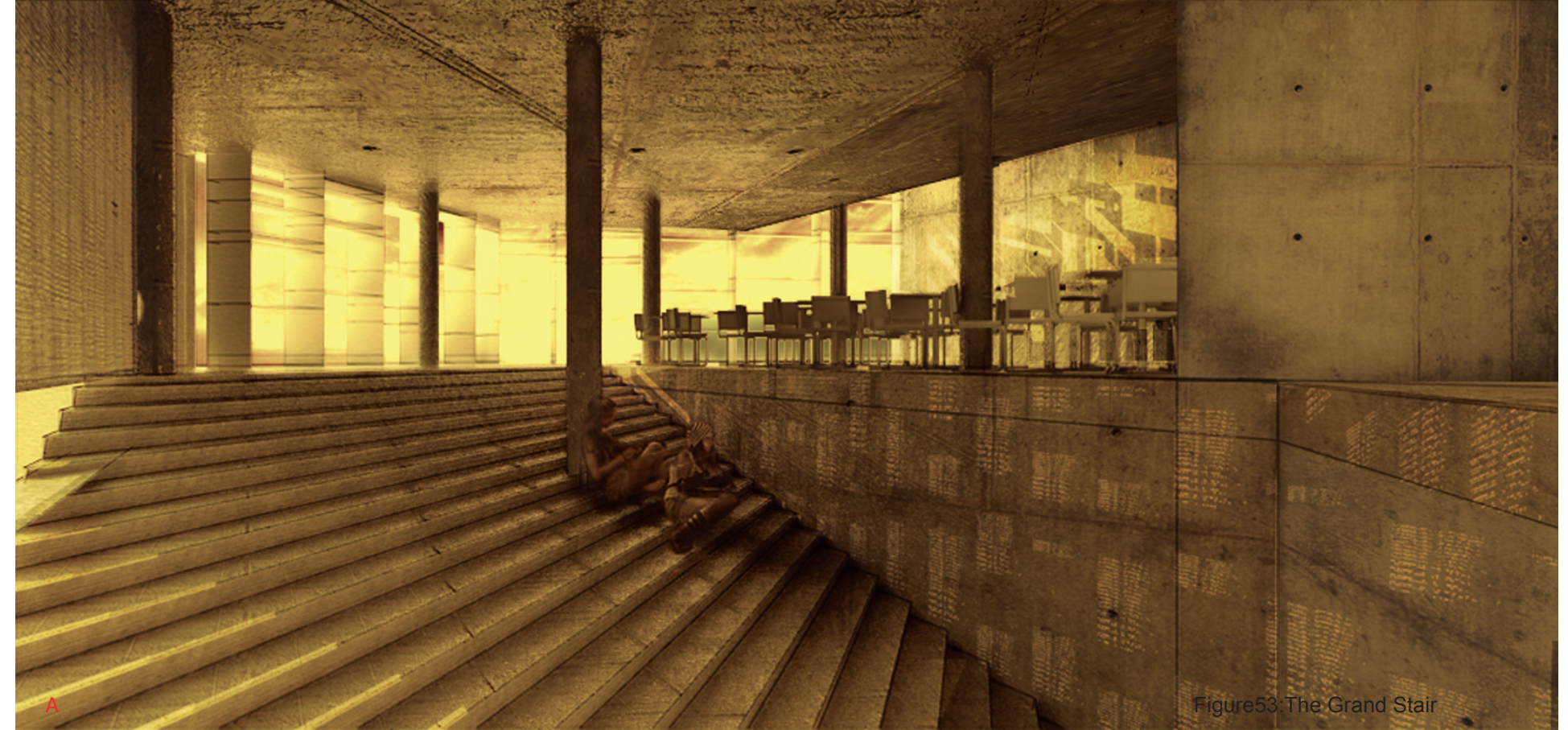
Figure52: (Place for Public Performances)

### Outdoor Theater

The street level at the intersection of Avenida Abraham Gonzales and Avenida Francisco Villa welcomes the cyclists and pedestrians with a ramp that allows the users to cross through the station without disrupting the other lobby or Rapid Bus Stop. To the right of the ramp is a stair that becomes the seating for an outdoor theater. This area will provide a space for artists and performers to engage people walking in the street level.



Lobby Level



The Grand Stair

The grand stair is an element of the light rail station that repeats itself on every floor of the station to create a slow transition from one floor to the next. The stairs become a place to sit, to move, to perform all while maintaining its ability to move people from floor to floor (figure 53). Much like the Spanish steps of Rome these stairs begin to turn and take an invasive approach to every floor uniquely to create spaces where people can sit.

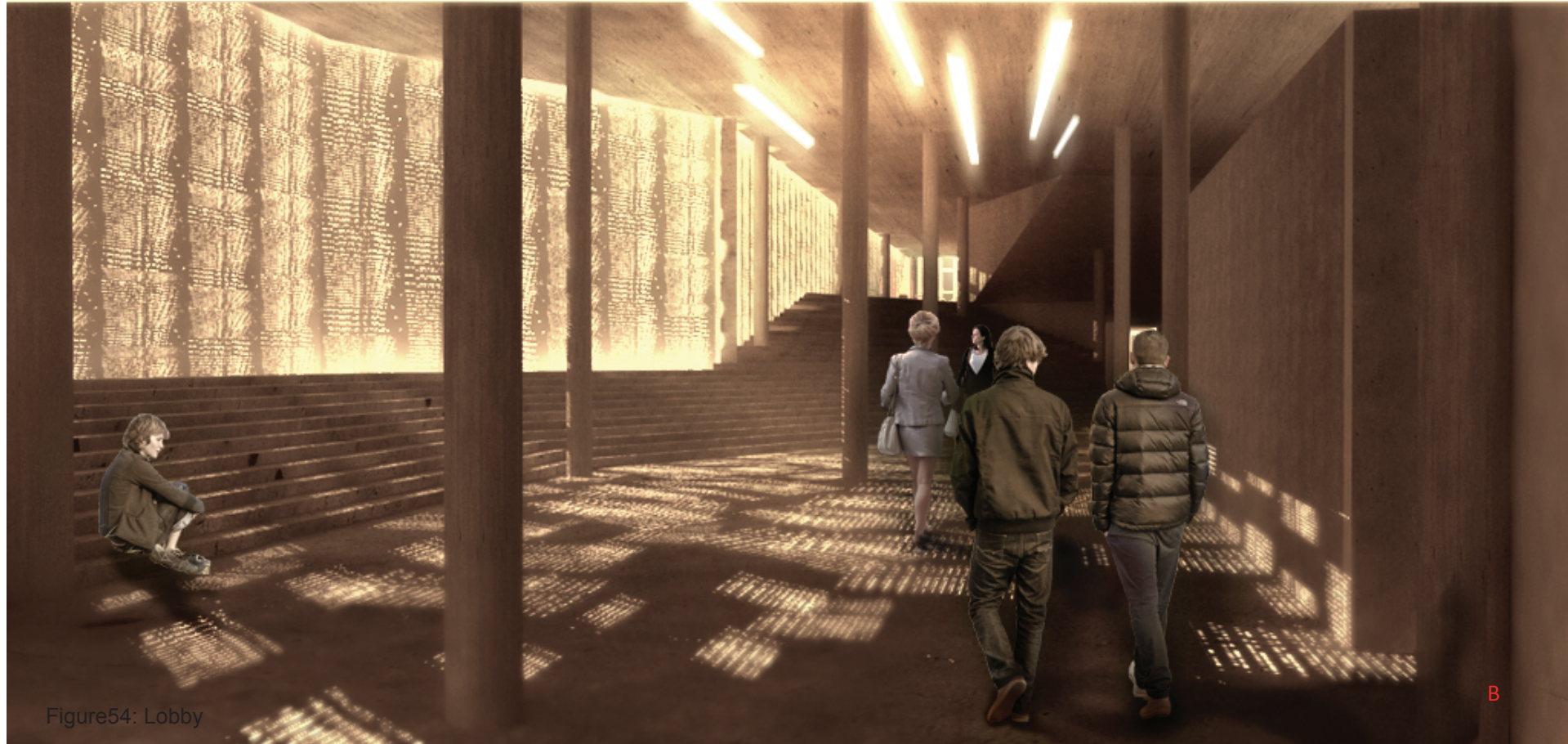


Figure54: Lobby

### The Lobby

The lobby in figure 54 above shows an elongated stair case that can act like seating for a performance or large public gathering. The seating area in the lobby runs along the circulation of the pedestrian traffic and becomes a stair that takes people up to the waiting area at the end of the lobby. The seamless transition of the grand stair case between seating and stair tries to combine these floors, and guide the high volumes of pedestrians through the station while accommodating the people who are waiting. Please note the red letter labeling located on the floor plans (figure 59) for orientation.

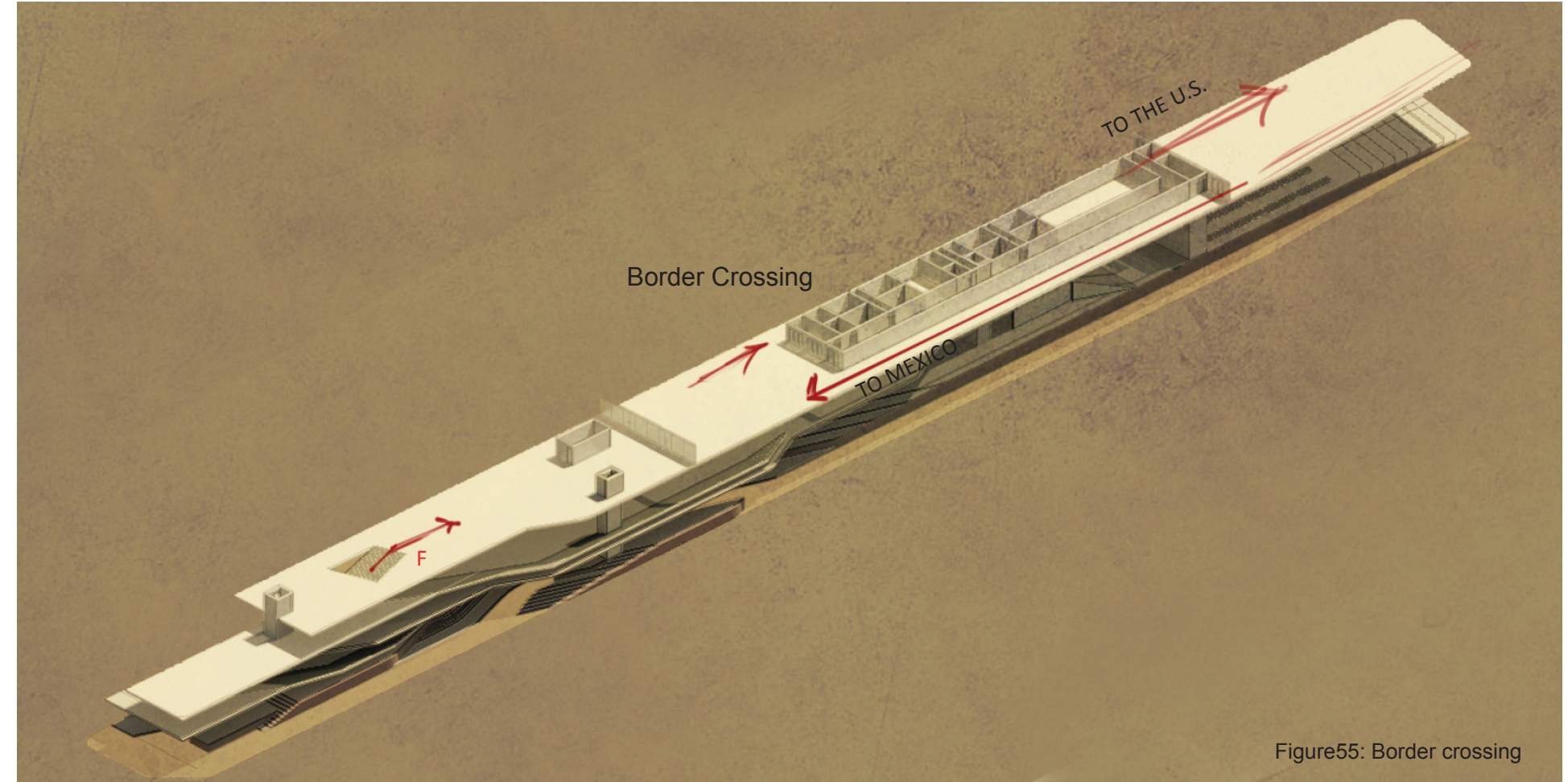


Figure55: Border crossing

### Border Crossing Level

**The Border Crossing & Light Rail**

The border crossing and the light rail platform are located at the top floor to reduce the amount of security personnel in the station. The border crossing is centrally located on the top floor (figure 55) to accommodate the traffic of people coming from and going to the United States. The flows of traffic were separated and directed to maximize flow, and provide faster and more direct inspections. The top floor is enclosed with a metal mesh that allows air to ventilate the waiting area while providing shelter from the sun (figure 56).

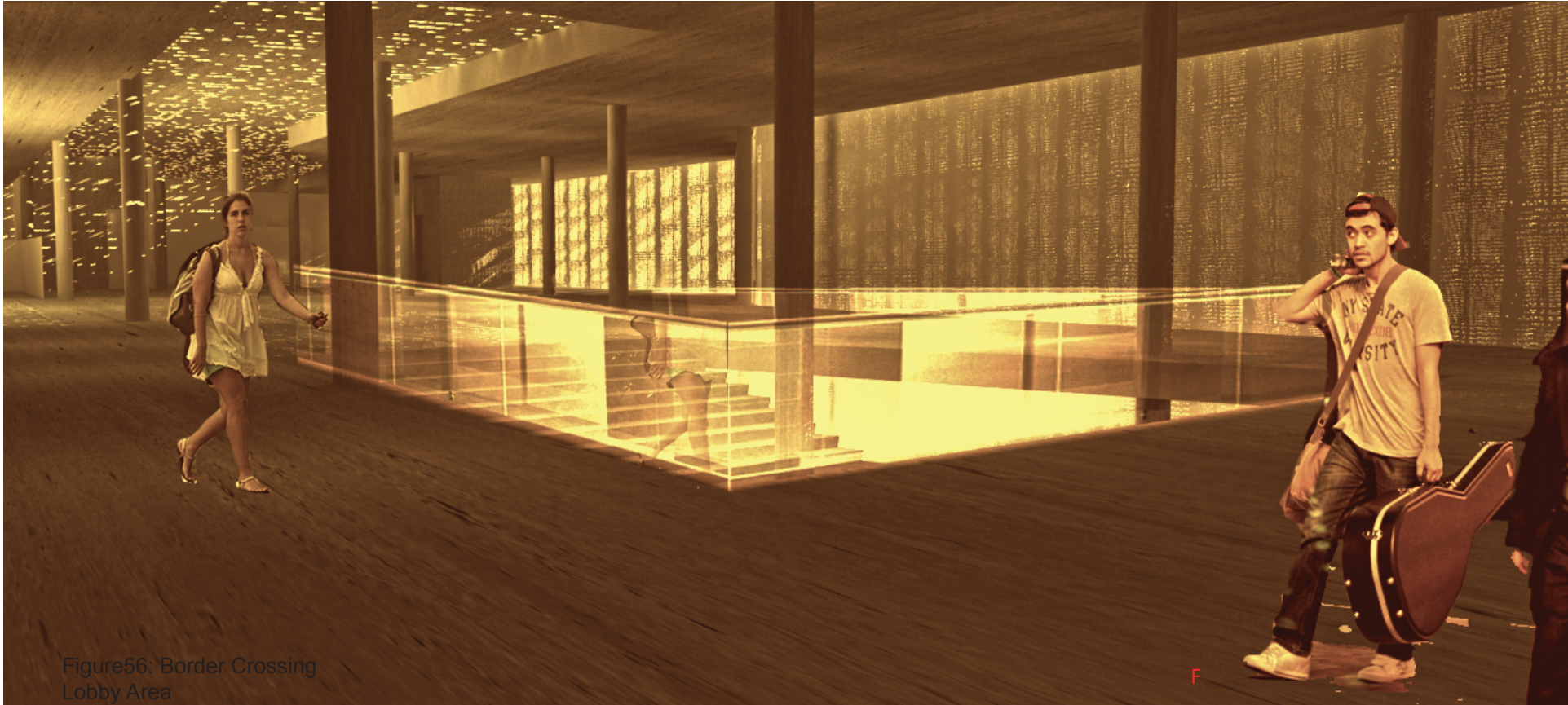


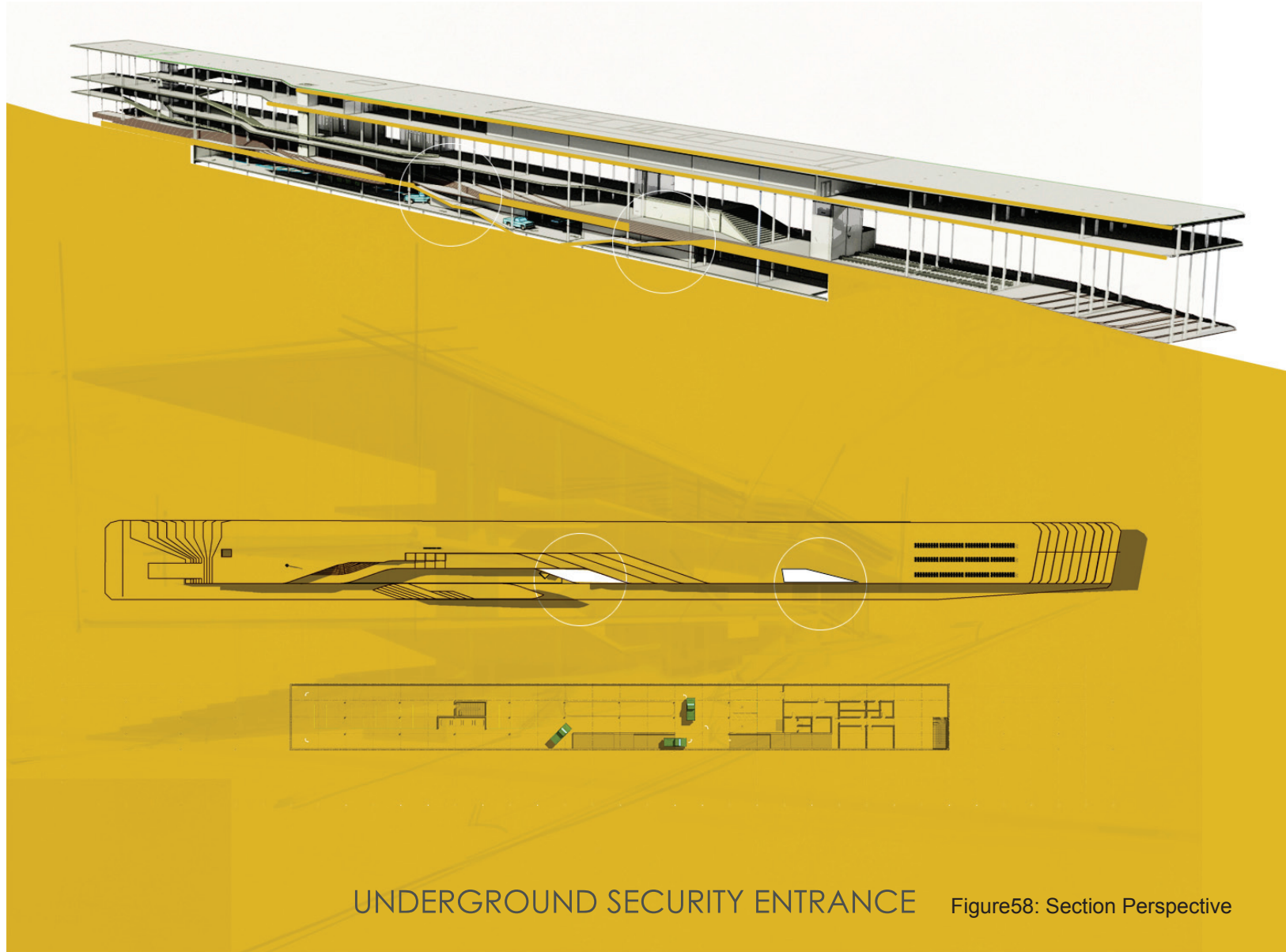
Figure56: Border Crossing Lobby Area

**Circulation Paths**

Roof  
 Border Crossing/ Light Rail Platform Level  
 Waiting Area Level  
 Lobby Level  
 Ground Level

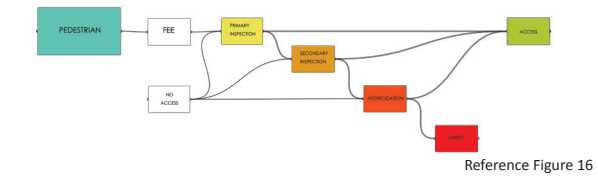
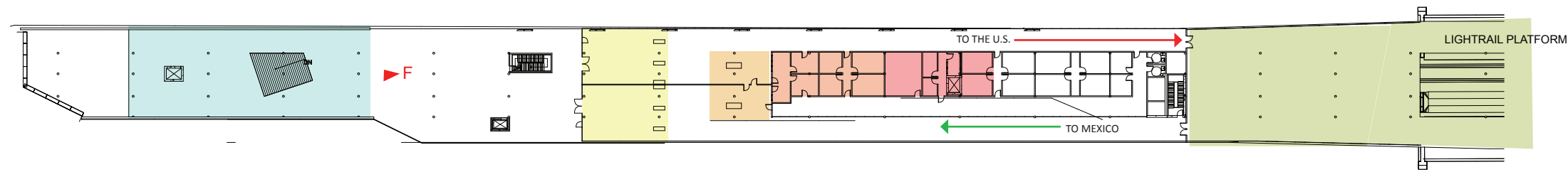


Figure57: Perspective Plans

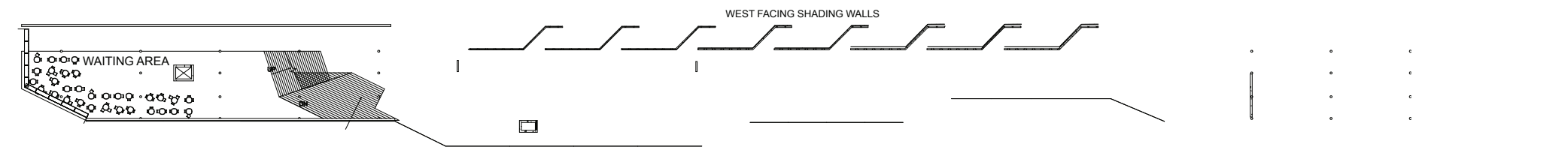


UNDERGROUND SECURITY ENTRANCE Figure58: Section Perspective

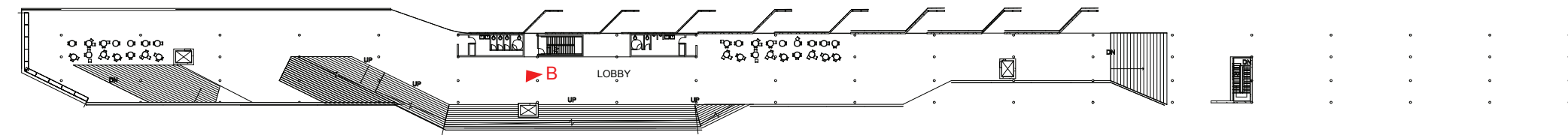
This section shows the entrance ramps for the Border Crossing Parking Level and the grand stair element as it winds itself through the different floors.



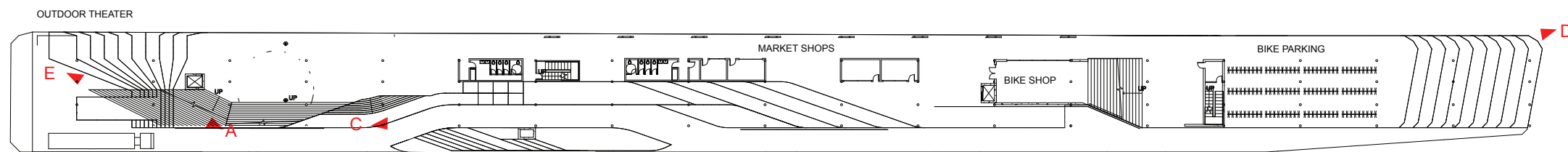
BORDER CROSSING LEVEL



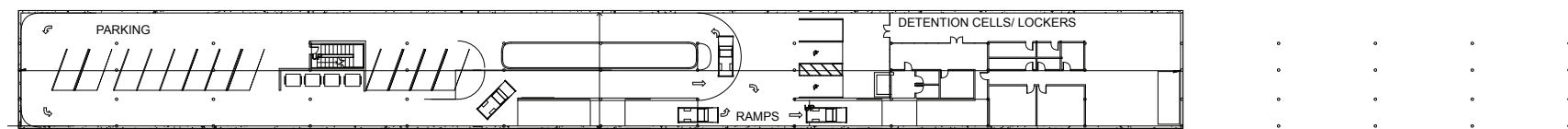
WAITING AREA LEVEL



LOBBY LEVEL



GROUND LEVEL



PARKING LEVEL

Figure59:Floor Plans



Figure60:The Grand Stair A

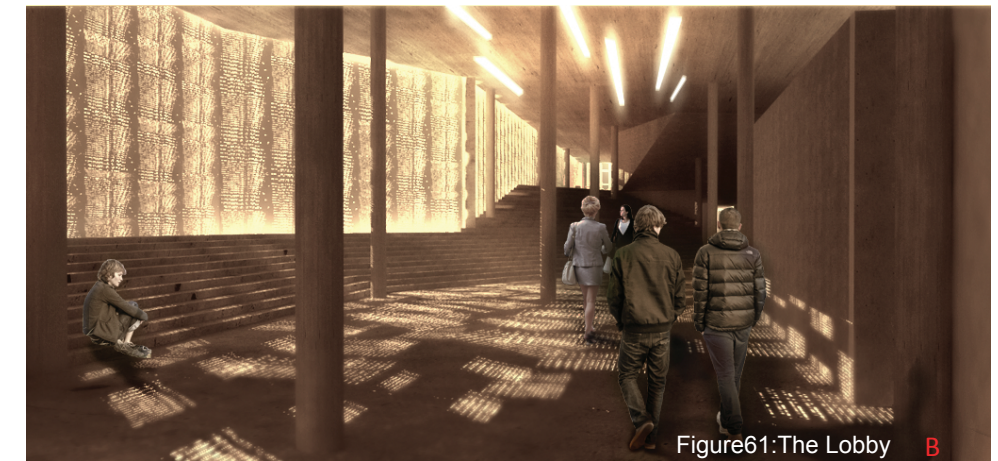
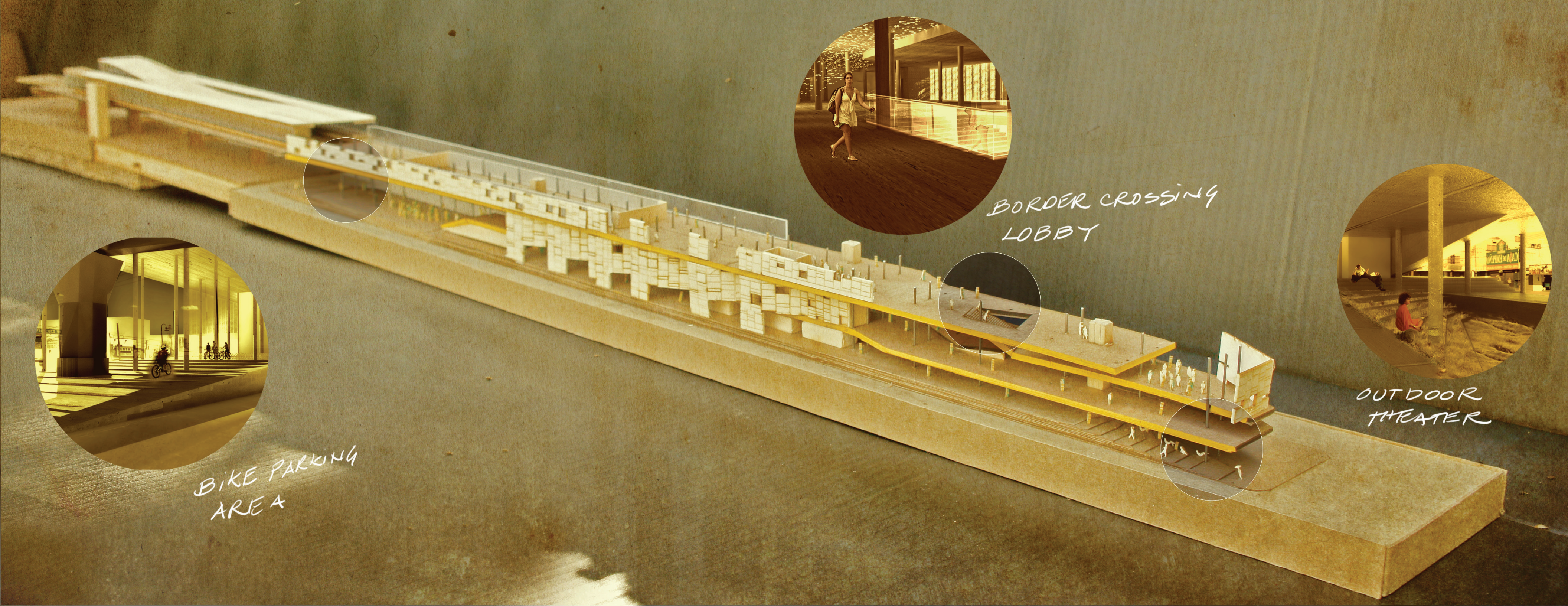


Figure61:The Lobby B



Figure62:Rapid Bus Transit C



BIKE PARKING  
AREA



BORDER CROSSING  
LOBBY



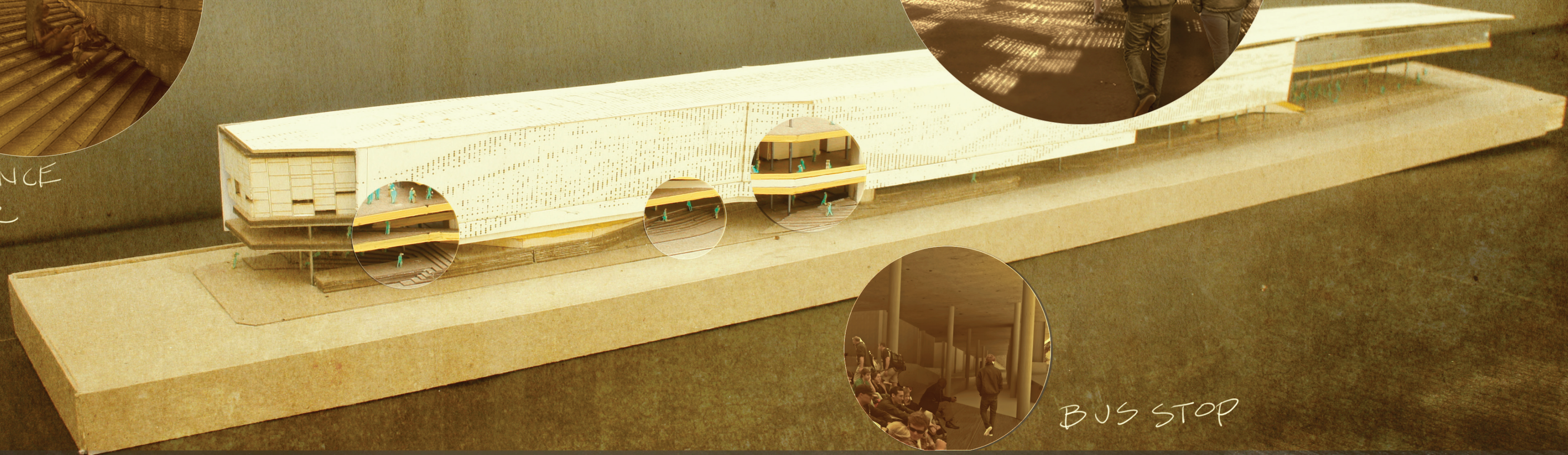
OUTDOOR  
THEATER



ENTRANCE  
STAIR



LOBBY



BUS STOP



Figure63: NW perspective



Figure64: NE perspective

## Conclusion

The border crossing and light rail station along the Mexican-American border once played an important role in their respective communities; they welcomed diverse social activities and provided gathering spaces for their users. These roles gradually changed in order to create higher levels of security within the border crossings and light rail stations. The need for better security diminished the amount of public space that border crossings and associated light rail stations included in their list of amenities. It also redirected their design priorities to filtering and transporting higher volumes of people despite the loss of community within the space. This shift in design centralized the border crossings along the Mexican-American border and created a void between cities like El Paso and Juarez. The Santa Fe Bridge of El Paso and Juarez is one of those border crossings, and like many others along the border, this bridge is located directly on the border over the Rio Grande with little or no space for people to congregate. The border crossing and light rail station have the opportunity to create a place for people to gather, interact, move, or sit. It is in the movement and interaction of its users that the light rail station truly comes alive.

This thesis analyzes the border from a commuter's point of view and begins by proposing the design of a light rail system that transforms the border into a usable form of infrastructure. The integration of a light-rail system at the border between El Paso and Juarez requires a de-centralized border crossing, which challenges the notion that a border crossing must exist only and directly at the border. By transforming and stretching the border, we can lessen the geographical barrier it represents to remind us that it

is only a line demarcated by a law, and created by man to protect his or her land. This design also restores the loss of public space in the light rail station and border crossing through the organization of five key elements. The five elements that will help activate the light rail station are a bus rapid transit station, a bike shop, a market area, an outdoor performance space, and a grand staircase. Each of these elements will prove vital to the engagement of the users and to the integration of the light rail station within its urban context.

The people of El Paso and Juarez are in need of a form of public transportation that does not end at the border and improves the commute over the Rio Grande. This light rail system will be a sign of the commitment that El Paso and Juarez have to each other and to their citizens. This border crossing has the potential to bring vitality not only to the light rail station, but life to its surroundings through a simple dialogue that can unite the people and the cities of El Paso and Juarez.

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