

# TRANSITIONAL INFRASTRUCTURE

A non-degree-required thesis submitted to the Master of Architecture Program

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advised by  
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May, 2025  
University of Virginia  
School of Architecture





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I would like to sincerely thank my thesis advisor, Peter Stec, as well as my Thesis I and II instructors, Nana Last, Matthew Jull, and Sasson Rafailov for their knowledge, guidance, and support throughout the fall and spring semesters. I am beyond grateful for the opportunity to work with and learn from them.

I would also like to thank my friends and family for their constant support and positivity throughout both this process and my entire architectural education.

Lastly, I would like to dedicate this project to my beautiful hometown city, Louisville, KY and its community members who make it so special to me. I hope this thesis can inspire the city and others like it to take on projects which greatly serve its communities in the future.



# ABSTRACT

The current momentum towards higher-speed rail in the U.S. poses a future where passenger rail service begins to quickly sprawl into regions which have only seen freight trains move through cities for decades. This future towards increasing intercity connectivity poses an opportunity to act as a spoke for urban revitalization in cities that have been affected by decentralization and failed attempts at urban renewal over the past century, such as seen in Louisville, KY. With Louisville's six freight rail lines owned and operated by CSX Transportation, the city demonstrates tremendous underutilization of rail corridors in urban areas. Private rail companies who own these spaces lack incentive to create development beneficial to the city they're located in, however, as more new rail services become funded by federal, state, and local governments, cities begin to see incentive for this new development to act as a catalyst for re-densifying urban cores through city-specific approaches.

This project zooms into an elevated stretch of one of Louisville's rail lines near the city's urban core and proposes a phased approach to redeveloping the spaces along the line into community and transit-oriented developments. The design phases take place over the next several decades - the first being in the present as the line remains privately owned, the second during the transition period from freight to higher-speed passenger transit, and the final focusing on surrounding urban growth and densification once passenger rail is fully implemented. Increased traffic and use of various programmatic spaces along, beneath, and above the track will encourage and necessitate mixed-use growth and pedestrian development in the surrounding areas, setting up a future of a redensified urban core which successfully generates public activity and acts as a case study for cities across the U.S.

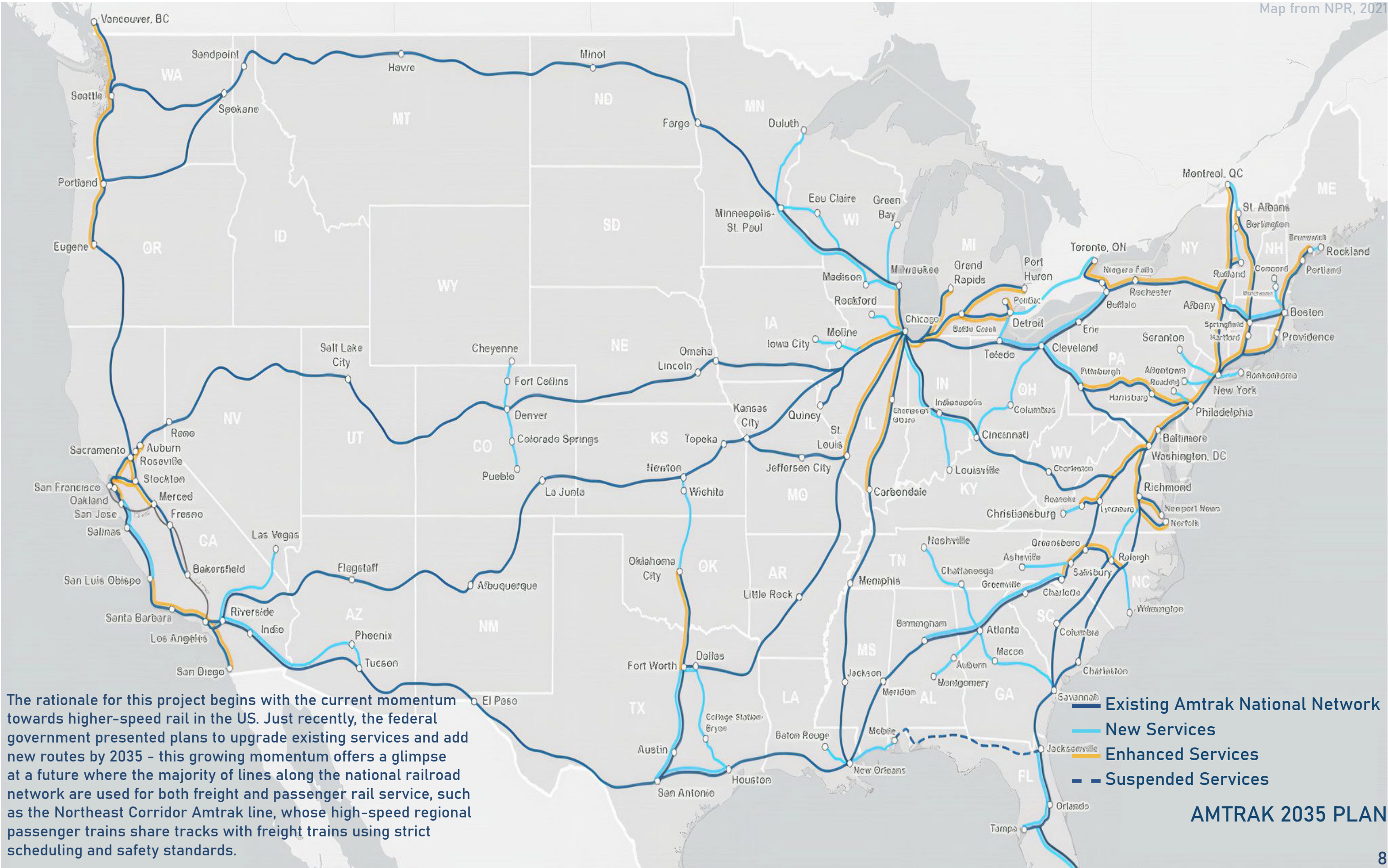


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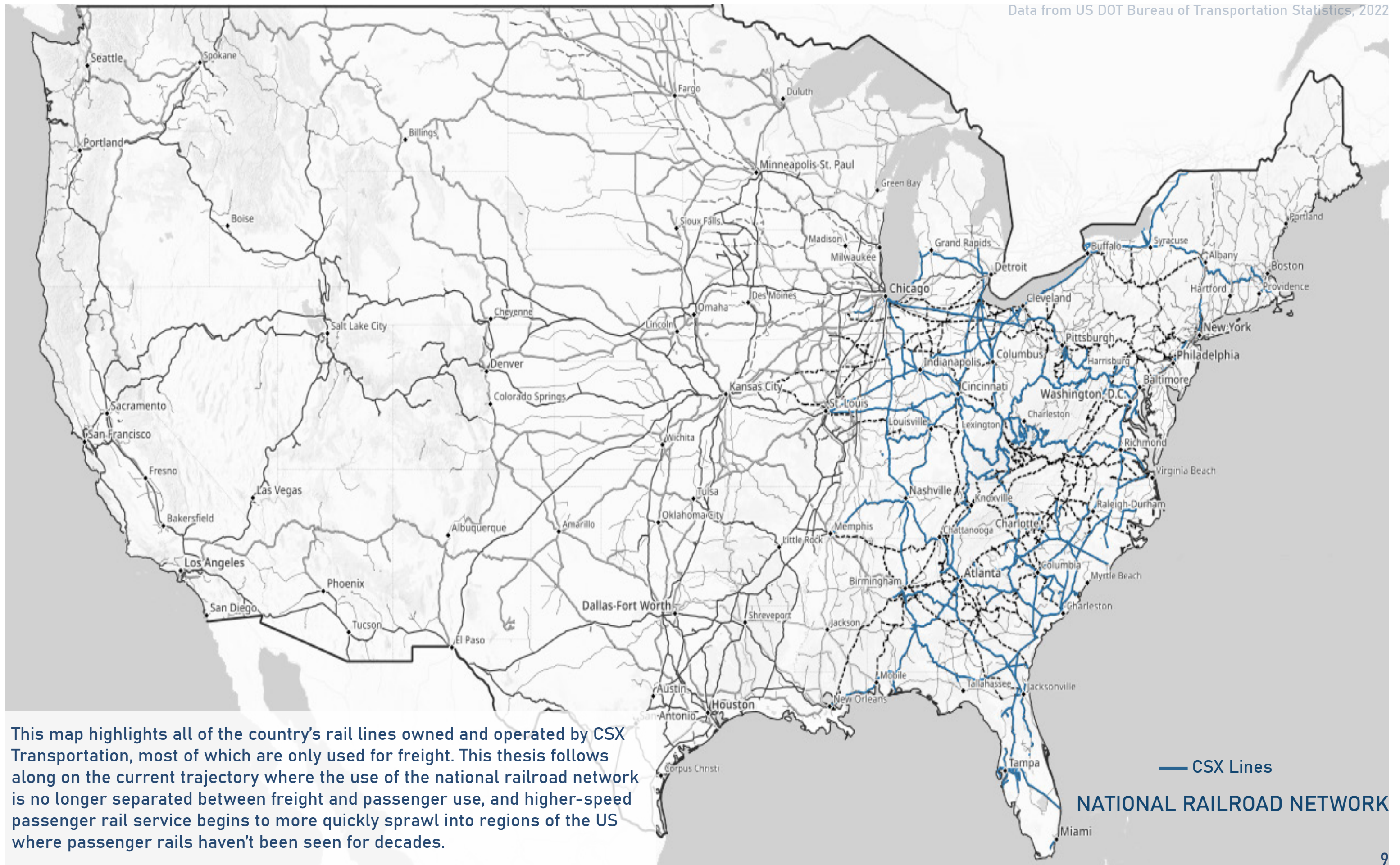
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# THE CURRENT STATE OF RAILS IN THE U.S.



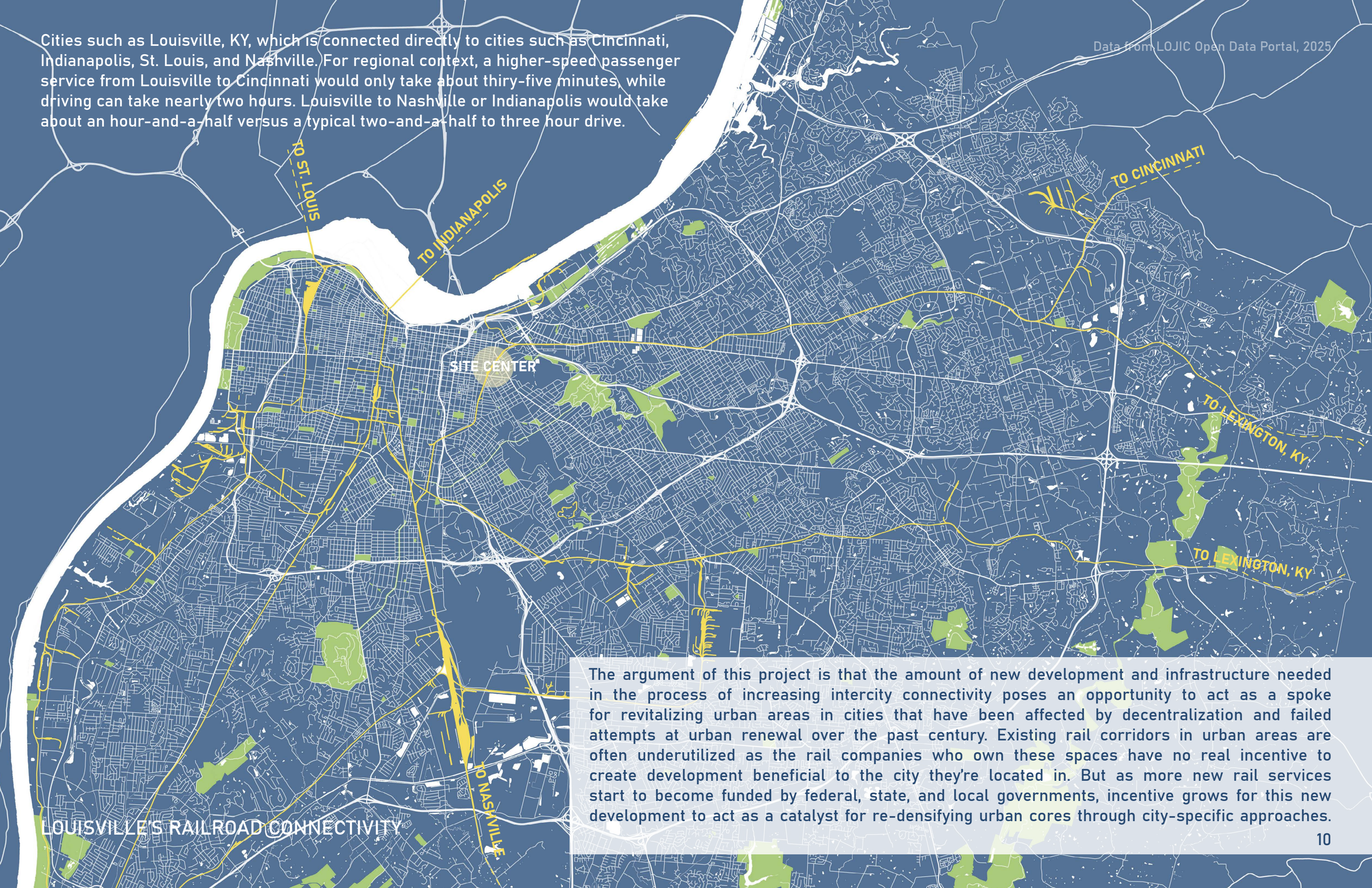






Cities such as Louisville, KY, which is connected directly to cities such as Cincinnati, Indianapolis, St. Louis, and Nashville. For regional context, a higher-speed passenger service from Louisville to Cincinnati would only take about thirty-five minutes, while driving can take nearly two hours. Louisville to Nashville or Indianapolis would take about an hour-and-a-half versus a typical two-and-a-half to three hour drive.

Data from LOJIC Open Data Portal, 2025



The argument of this project is that the amount of new development and infrastructure needed in the process of increasing intercity connectivity poses an opportunity to act as a spoke for revitalizing urban areas in cities that have been affected by decentralization and failed attempts at urban renewal over the past century. Existing rail corridors in urban areas are often underutilized as the rail companies who own these spaces have no real incentive to create development beneficial to the city they're located in. But as more new rail services start to become funded by federal, state, and local governments, incentive grows for this new development to act as a catalyst for re-densifying urban cores through city-specific approaches.



# **LOUISVILLE'S CURRENT URBAN CONDITIONS**





VIEW OF WALNUT STREET IN LOUISVILLE, KY: 1940s VS. TODAY

Like many downtown areas across the U.S., Downtown Louisville's historic fabric has been severely decimated over the last century, and today is packed with blankets of parking lots, poorly rebuilt buildings, and urban spaces which fail to generate public activity.





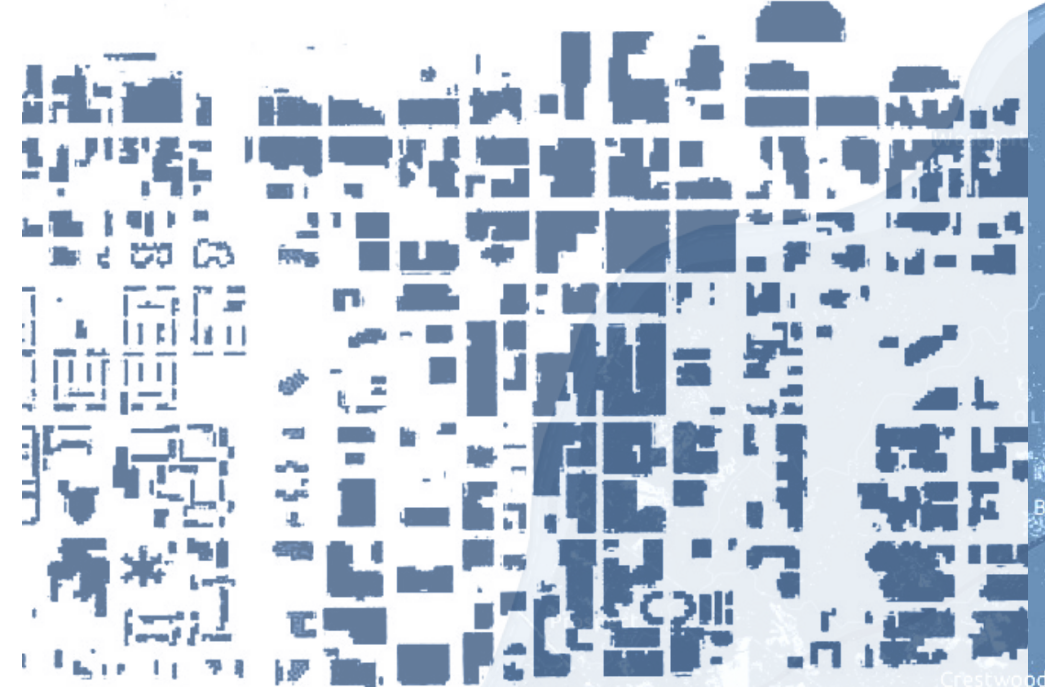
DOWNTOWN LOUISVILLE: 1952 VS. TODAY

The most rapid change occurred during the mid-century urban renewal period that cleared large tracts of urban land for new highways, parking, and public facilities or housing projects, transforming fine-grained networks of streets and buildings on small lots into superblocks and megastructures.





DOWNTOWN LOUISVILLE FIGURE-GROUND: 1900



DOWNTOWN LOUISVILLE FIGURE-GROUND: 1990

# LOUISVILLE'S URBAN SPRAWL: 2001 - 2019

Many of these scars are still unhealed, and have led to an increased continuation of sprawl to the outer edges of the city to this day, despite most of the city's major employers being located in and around the downtown area.

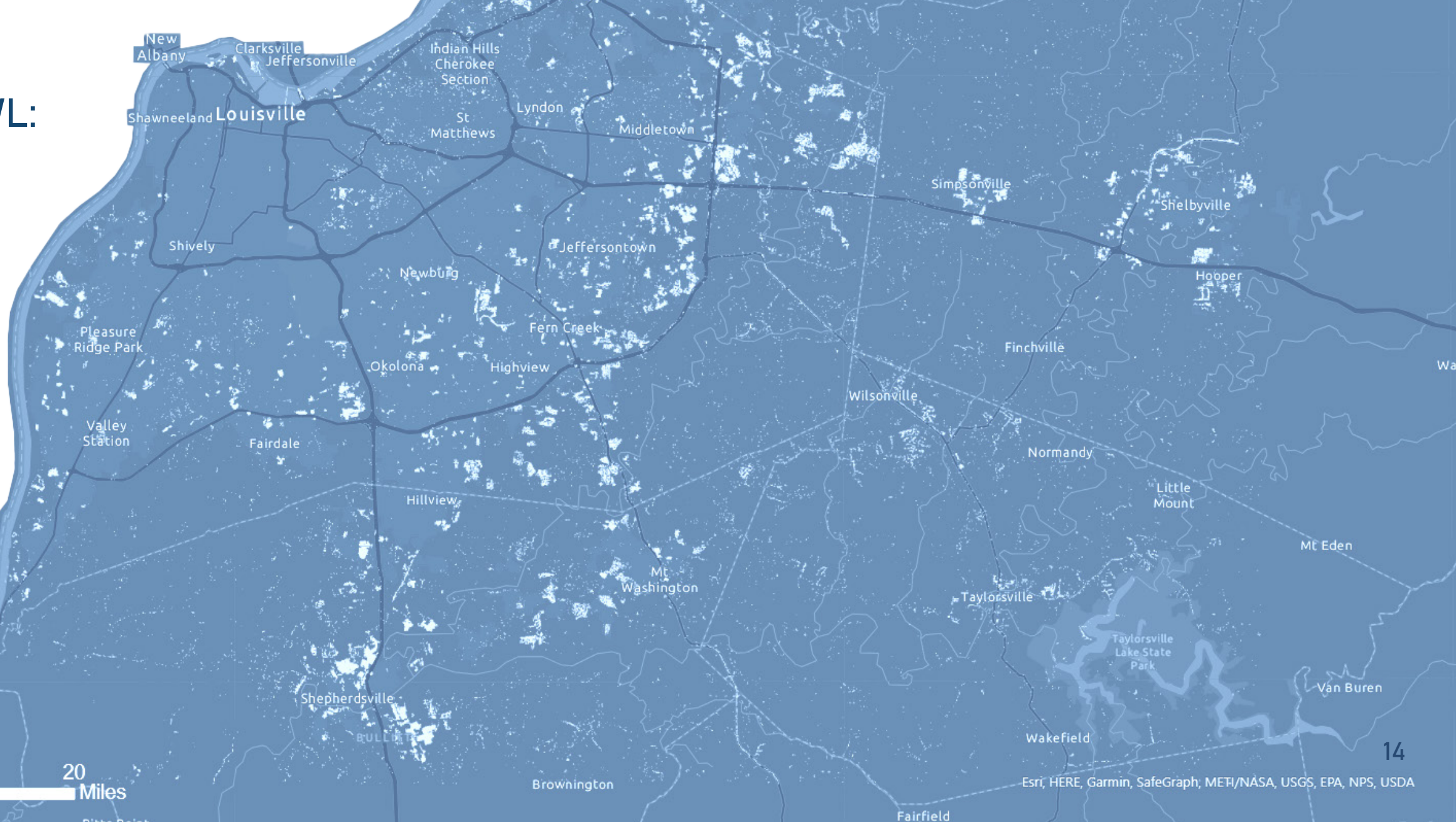


Figure-ground maps by Broken Sidewalk  
Urban sprawl data from NLCD





Source: louisvilleky.gov

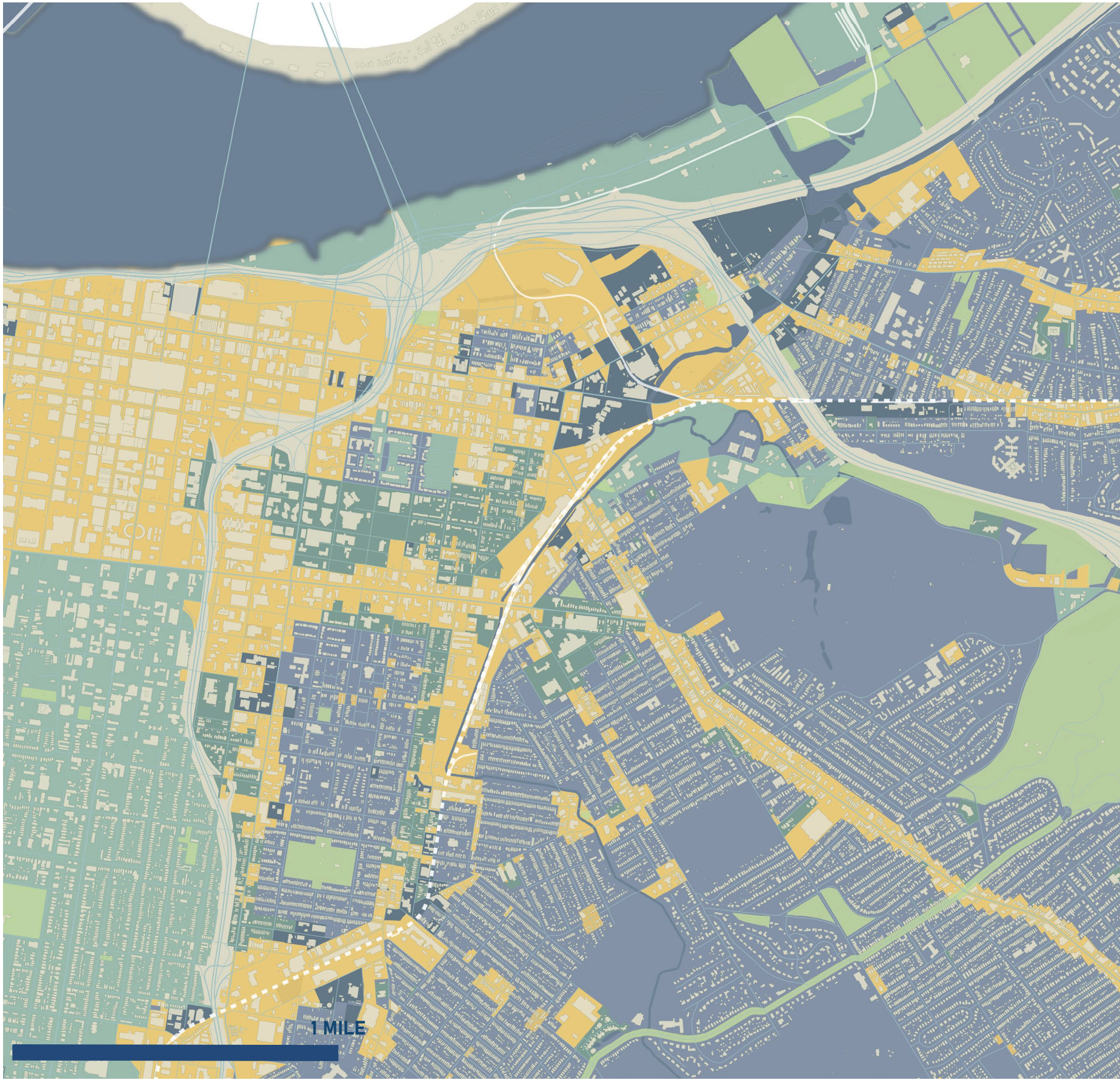


# GROWING LOUISVILLE TOGETHER



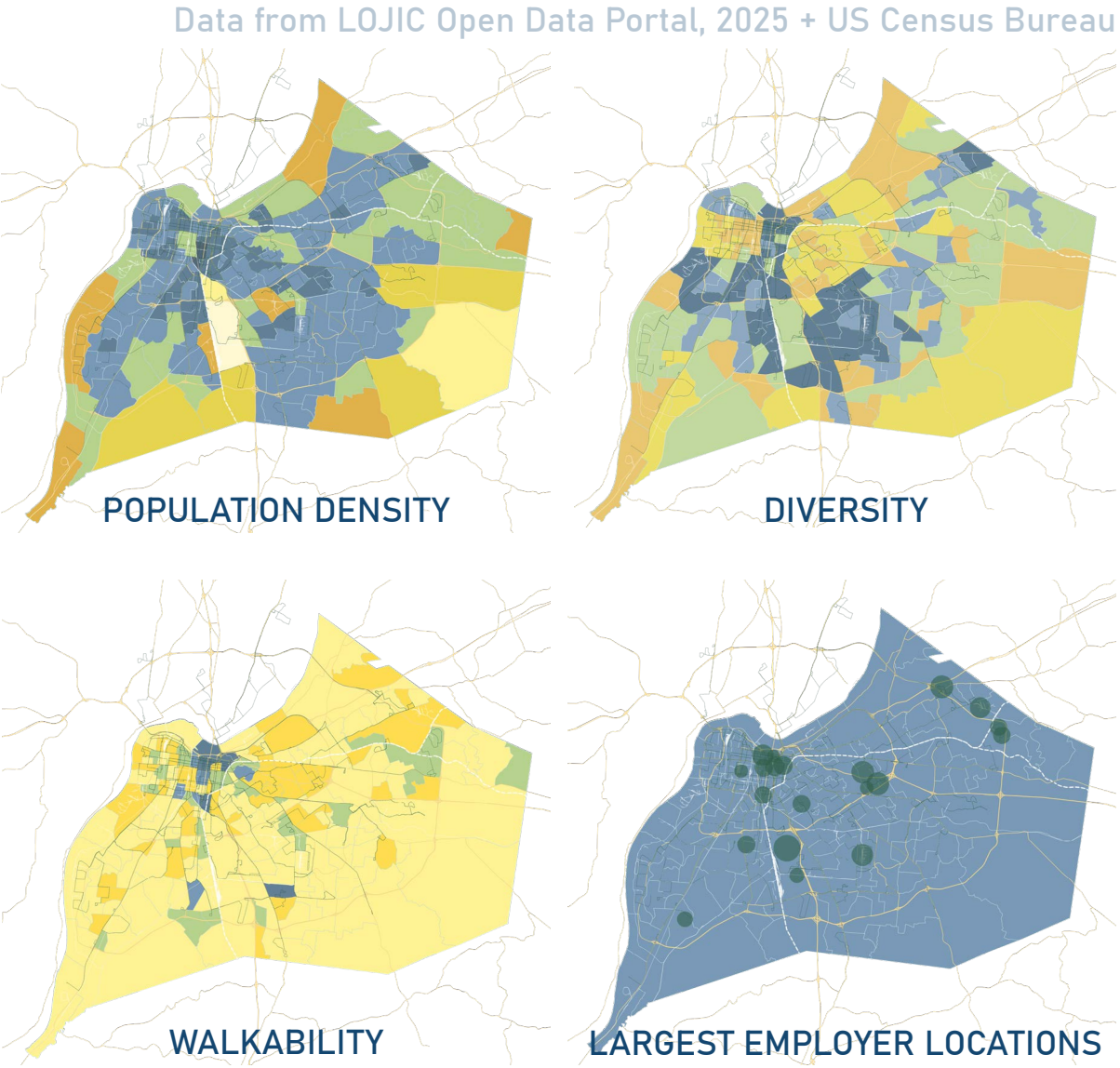
Like many cities, Louisville Metro Government has plans to pursue opportunities for passenger rail service to and within the Louisville Metro region within the next 15 years, as stated in its plan for 2040. The plan encourages land use and transportation patterns that connect Louisville Metro and support future growth, and also includes plans for improving the downtown and adjacent areas. This entails improving walkability, connecting different modes of travel, providing walking and bicycling opportunities to enable activity centers, encouraging higher-density mixed use developments, etc. This, in addition to the city's Growing Louisville Together Initiative, created last year, offers some insight into how this railroad corridor could help serve the needs of the city beyond intercity travel. The Growing Louisville Together Initiative outlines an extensive long-term vision for developing the city in a comprehensive, sustainable, and equitable way. Just a few of these goals include creating 300 new black-owned small businesses by 2027, creating activity generators in the downtown area and adjacent areas such as by investing in infrastructure improvements and redeveloping underutilized city owned properties (like surface parking lots), and prioritizing redevelopment of vacant and abandoned properties into various programmatic spaces, creating spaces where local events can be celebrated within each neighborhood.





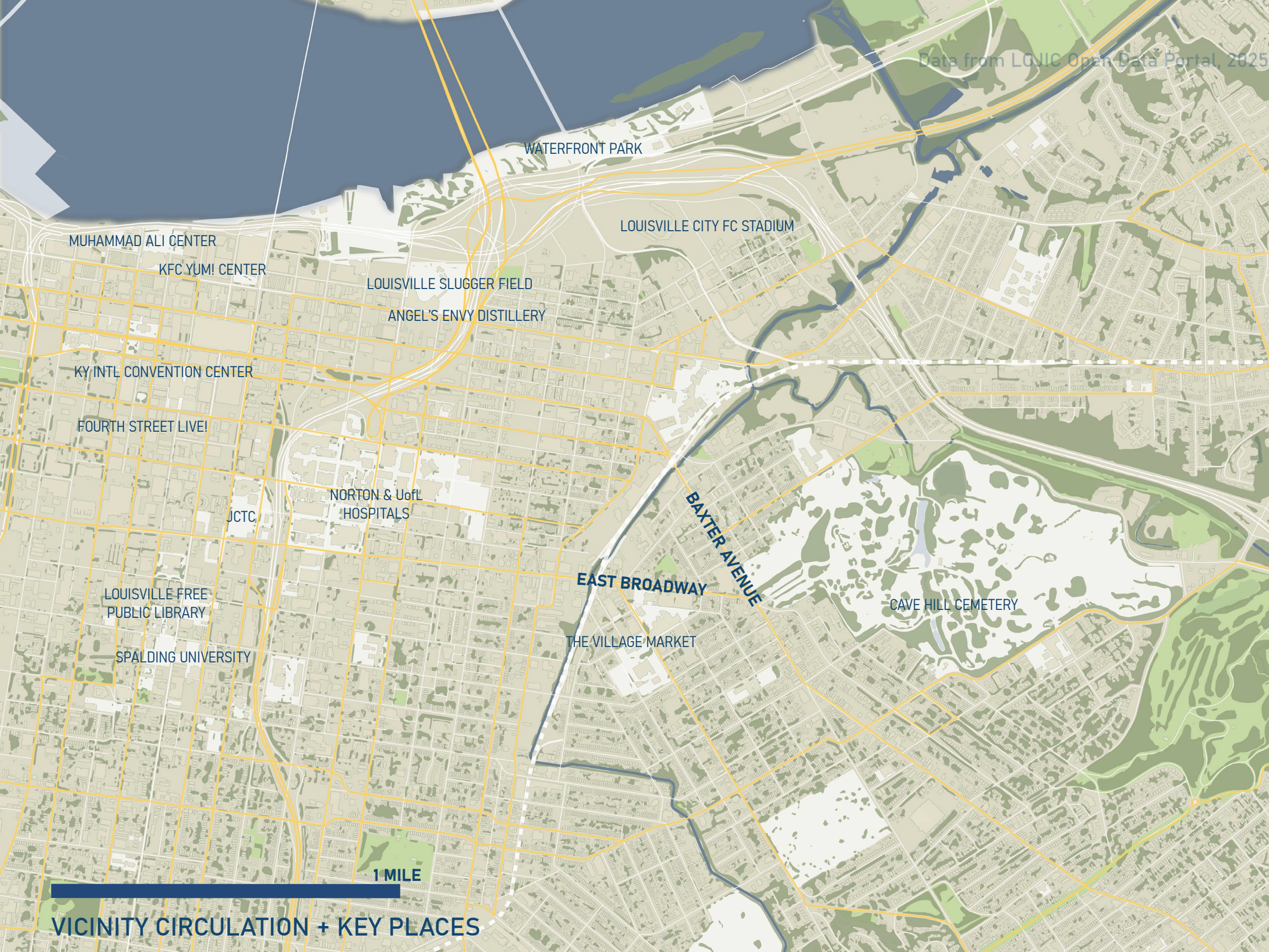
VICINITY ZONING

INDUSTRIAL RESIDENTIAL COMMERCIAL OFFICE PUBLIC PARK PLANNED DEVELOPMENT



The selected site for this project is located along one of Louisville’s roll-through freight lines which is currently owned by CSX Transportation. This site is the closest point to the downtown area along any of the railroads through the city (6-7 blocks away), and contains a wide array of zoning/programmatic conditions including single-family and multi-unit residential, a variety of commercial and office spaces, some industrial zones, public parks, and some special planned development. Several of Louisville’s largest employers and major attractions are within walking distance, and the site sits at a unique intersection of various diverse neighborhoods, several of which are listed under the national register of historic places.





The site includes a 1.5 mile stretch of elevated railroad which stretches above two major intersections: Baxter Ave at the north tip and East Broadway - both of which connect directly to the outer extents of the downtown district and act as some of the city's most prevalent commercial thoroughfares. These are also on two of the most locally used bus routes with major connectivity to crucial locations around the city, and are significant micro mobility routes.



EXISTING BAXTER STATION



VIEW OF ELEVATED RAIL TOWARDS DOWNTOWN



THE VILLAGE MARKET



ABANDONED OFFICE BUILDING ALONG RAIL



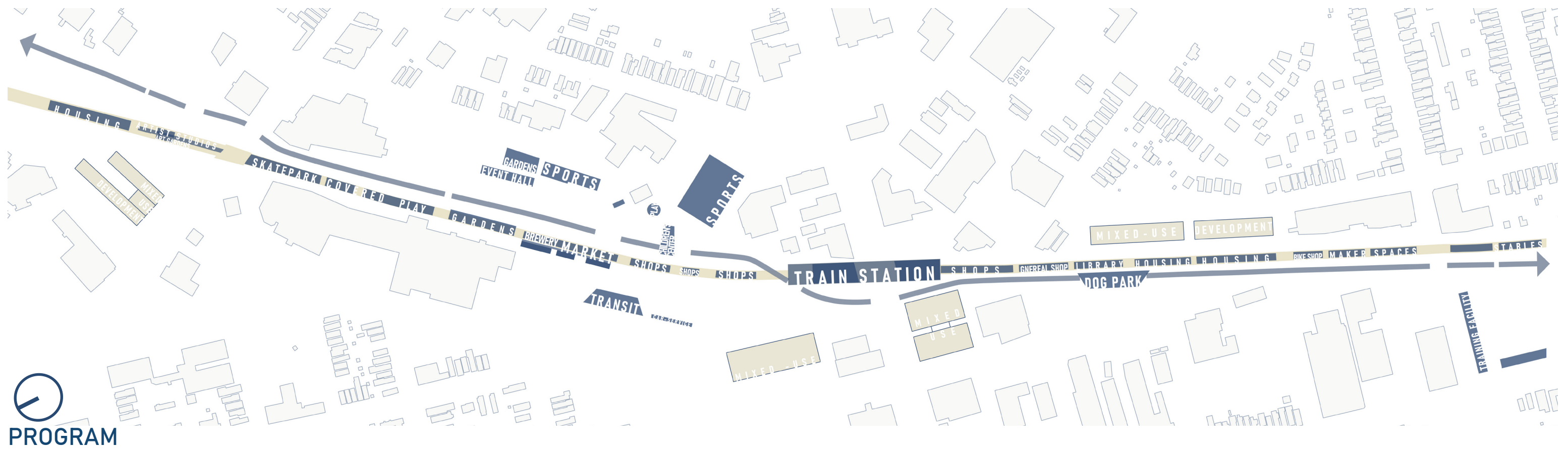


SELECTED SITE



# **PROPOSAL FOR RE-DENSIFICATION: PROPOSED SITE PLAN**





The dividing nature of the site brought on by the tracks and current 14' embankments on either side of Beargrass Creek form the basis of this project's proposal - to create a phased approach to re-stitch this area of the city. In order to serve purposes both for community-oriented and transit-oriented development, this approach includes a wide variety of programs designed in the spaces around, beneath, and above the tracks in accordance with existing zoning and urban conditions, and with city goals for the future.

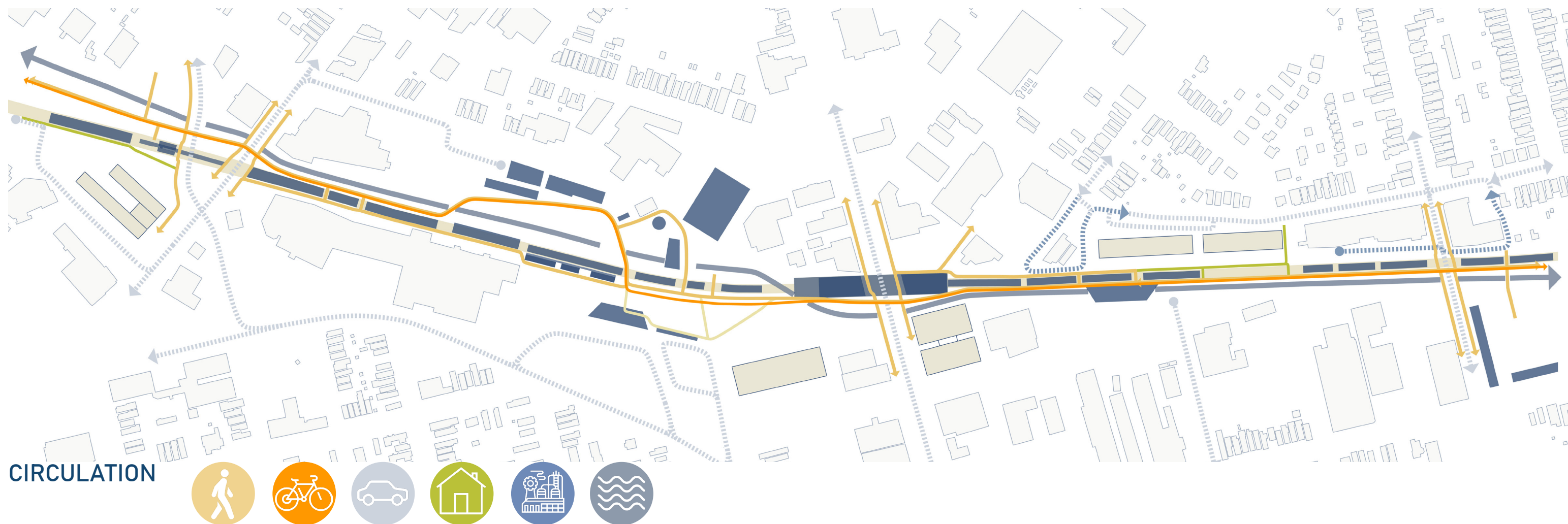




# SITE PLAN

- |                  |                                  |                                 |                             |
|------------------|----------------------------------|---------------------------------|-----------------------------|
| 1 HOUSING        | 8 COMMUNITY GREENHOUSE + GARDENS | 15 BUS + MICROMOBILITY STATIONS | 22 DOG PARK                 |
| 2 ART GARDENS    | 9 EVENT SPACE                    | 16 CAR PICK-UP/DROP-OFF         | 23 BIKE REPAIR SHOP         |
| 3 ART STUDIOS    | 10 NATIVE WATERSHED              | 17 CHILDREN'S CENTER + PLAY     | 24 MAKER SPACES / WORKSHOPS |
| 4 SKATE PARK     | 11 BREWERY/RESTAURANT            | 18 SHOPS                        | 25 STABLES                  |
| 5 BOULDERING     | 12 OUTDOOR SPORTS                | 19 TRAIN STATION                | 26 TRAINING FACILITY        |
| 6 TRACK          | 13 MARKET                        | 20 GENERAL STORE                |                             |
| 7 NATURE GARDENS | 14 PUBLIC RESTROOMS              | 21 LIBRARY                      |                             |





This intense level of program variation calls for an intricate network of circulation routes which are able to serve pedestrians, cyclists, commuters, passengers, industry workers, and residents of the site safely and efficiently. The new corridor aims to act as a literal and metaphorical stitch to its surrounding fairly low-density contexts, even with the existing highly autocentric traffic conditions, but momentum towards autonomous vehicles and increased pedestrian traffic in the area brought on by this development creates an opportunity to transform the site's main thoroughfares into more pedestrian friendly corridors that better serve commercial and urban growth in the future.





SITE PLAN

# **STEPS TOWARDS RE-DENSIFICATION: PROPOSAL FOR PHASING**



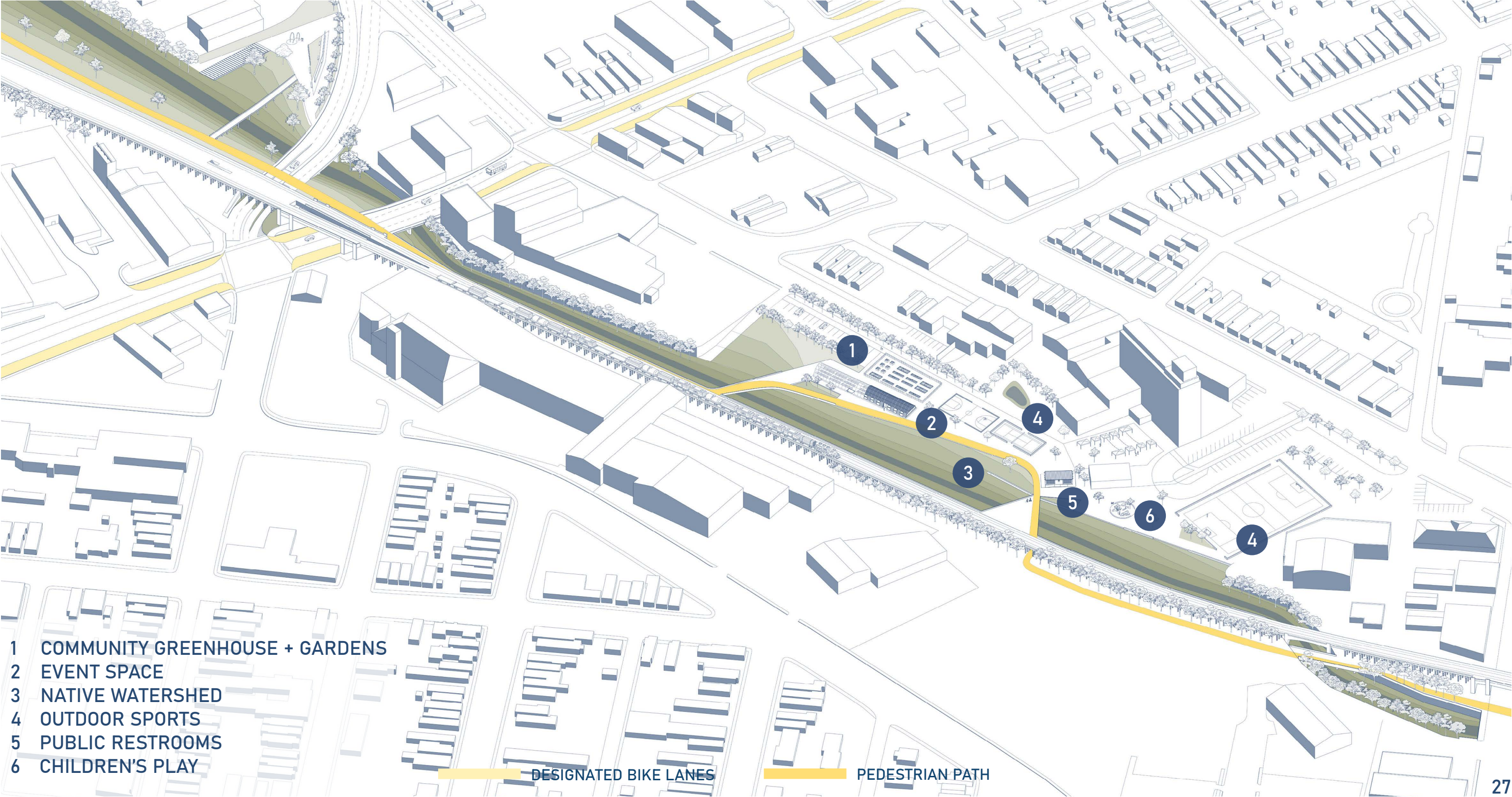
This project should represent phasing rather than a complete, all-at-once development as not only should the revitalization of urban centers begin immediately, but the amount of time it will take for higher-speed rail to reach more cities in the US gives cities time to intentionally develop infrastructure around rail corridors to prepare for increased traffic and density.



**PHASE 1:**  
**2025 - PRIVATELY-OWNED RAILS**



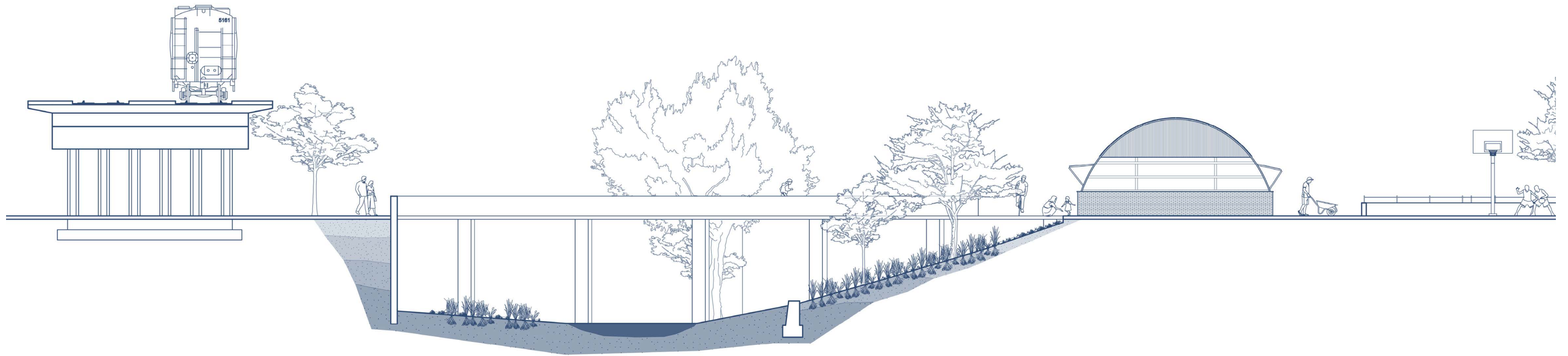
Phase 1 begins in the present as the rail is still privately owned and operated for freight. The design starts by using the rail's adjacent underutilized spaces connected by a designated pedestrian path that stretches across Baxter Avenue and Broadway. This phase also begins the redesign of Baxter Avenue using a more temporary tactic of painting the streets towards the development of a new traffic system. The programs of Phase 1 are largely community-focused, including a public art park and gardens, towards the northeast tip of the elevated rail, which can serve as an outdoor gallery for the city's arts district that this part of the site is located in, as well as a large activity park with sports fields, a designated children's play area, and an event space connected to community gardens. This zone connects directly to Beargrass creek by lifting the existing 14' embankment on one side, reintroducing the natural watershed and promoting increased ecological activity.



- 1 COMMUNITY GREENHOUSE + GARDENS
- 2 EVENT SPACE
- 3 NATIVE WATERSHED
- 4 OUTDOOR SPORTS
- 5 PUBLIC RESTROOMS
- 6 CHILDREN'S PLAY

DESIGNATED BIKE LANES PEDESTRIAN PATH





## WATERSHED + EVENT SPACE SECTION

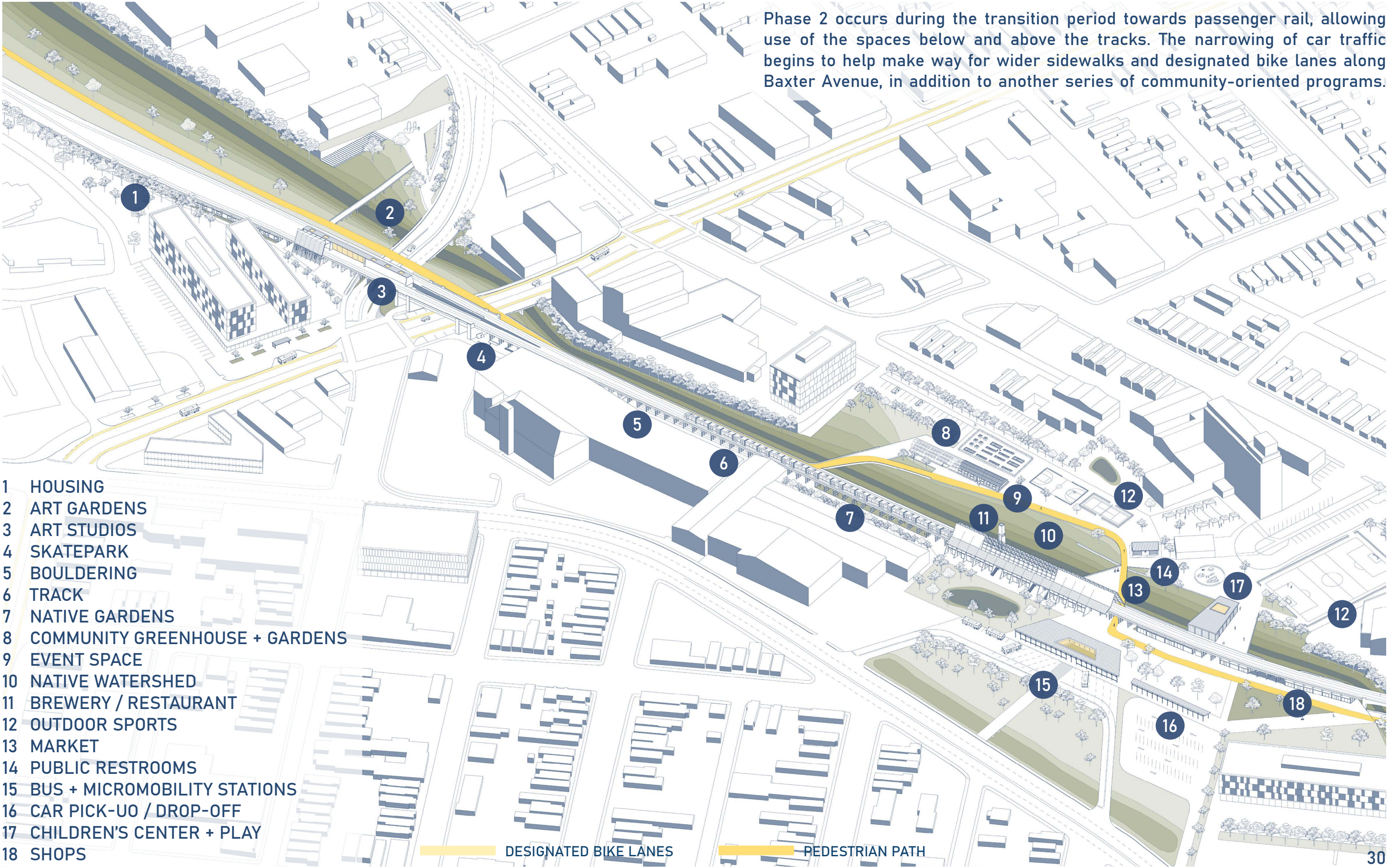
This section drawing showcases the existing conditions of the elevated rail and demonstrates the re-design of the 14' embankment on one edge of Beargrass Creek. This allows a reintroduction of the natural watershed, while leaving one edge of the embankment untouched as to prevent structural issues with the existing railroad.



**PHASE 2:**  
**2035 - TRANSITION FROM FREIGHT TO PASSENGER RAIL**



Phase 2 occurs during the transition period towards passenger rail, allowing use of the spaces below and above the tracks. The narrowing of car traffic begins to help make way for wider sidewalks and designated bike lanes along Baxter Avenue, in addition to another series of community-oriented programs.



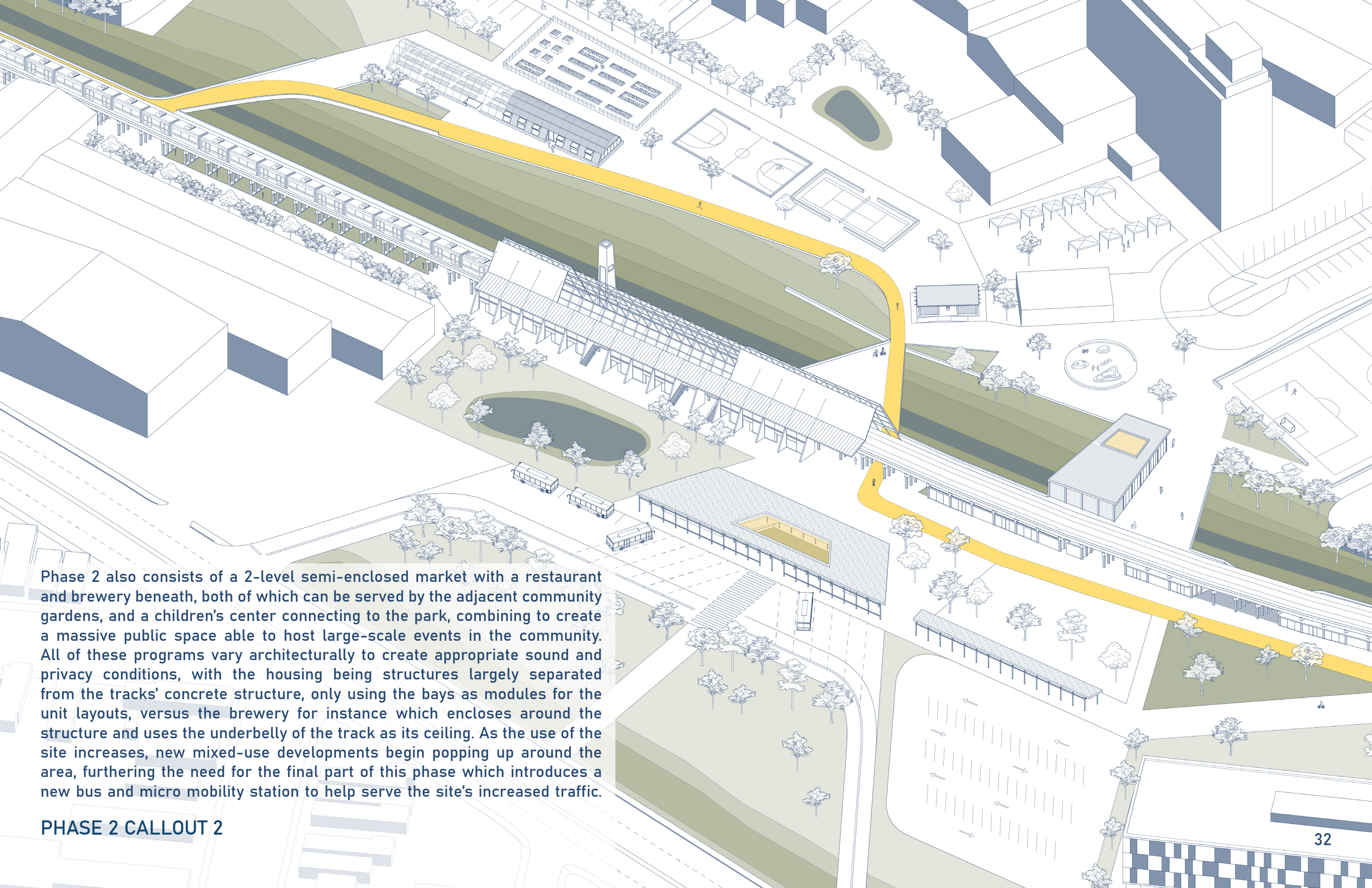
- 1 HOUSING
- 2 ART GARDENS
- 3 ART STUDIOS
- 4 SKATEPARK
- 5 BOULDERING
- 6 TRACK
- 7 NATIVE GARDENS
- 8 COMMUNITY GREENHOUSE + GARDENS
- 9 EVENT SPACE
- 10 NATIVE WATERSHED
- 11 BREWERY / RESTAURANT
- 12 OUTDOOR SPORTS
- 13 MARKET
- 14 PUBLIC RESTROOMS
- 15 BUS + MICROMOBILITY STATIONS
- 16 CAR PICK-UP / DROP-OFF
- 17 CHILDREN'S CENTER + PLAY
- 18 SHOPS

DESIGNATED BIKE LANES PEDESTRIAN PATH



Phase 2's community-oriented programs include affordable housing units at the northeastern tip of the elevated track, art studios above the tracks which take place of the unused pavilions where there was once a passenger rail station from the 30s to late 60s, as well as an activity zone with a skatepark, outdoor bouldering, and a track beneath the rail.





Phase 2 also consists of a 2-level semi-enclosed market with a restaurant and brewery beneath, both of which can be served by the adjacent community gardens, and a children's center connecting to the park, combining to create a massive public space able to host large-scale events in the community. All of these programs vary architecturally to create appropriate sound and privacy conditions, with the housing being structures largely separated from the tracks' concrete structure, only using the bays as modules for the unit layouts, versus the brewery for instance which encloses around the structure and uses the underbelly of the track as its ceiling. As the use of the site increases, new mixed-use developments begin popping up around the area, furthering the need for the final part of this phase which introduces a new bus and micro mobility station to help serve the site's increased traffic.

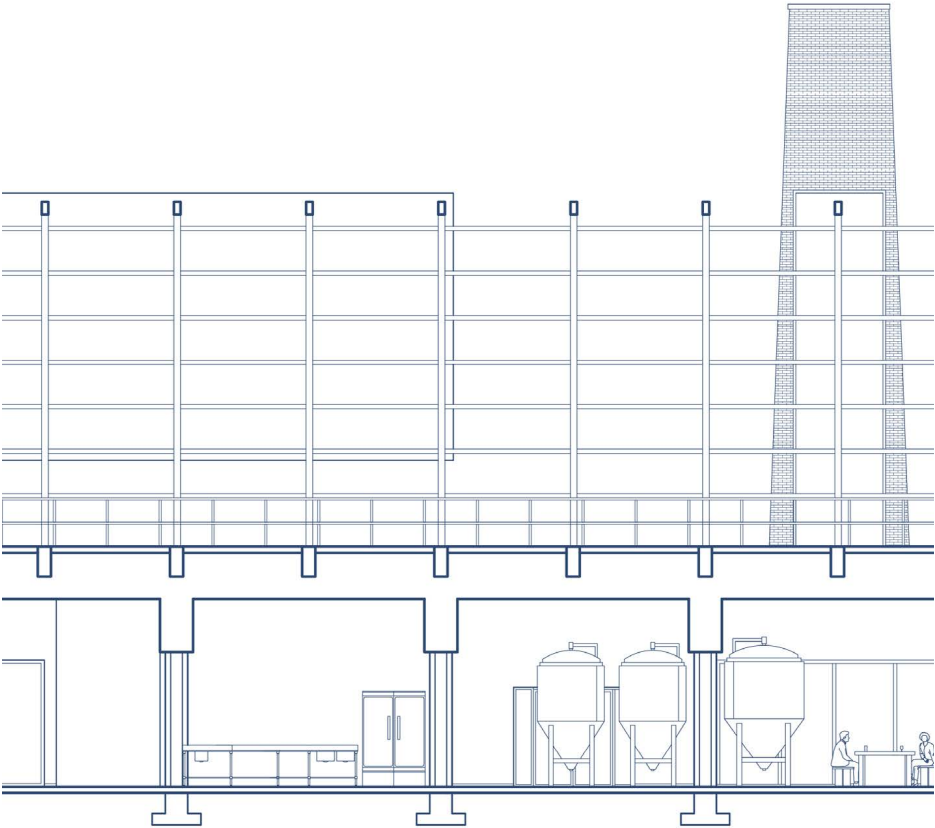
## PHASE 2 CALLOUT 2



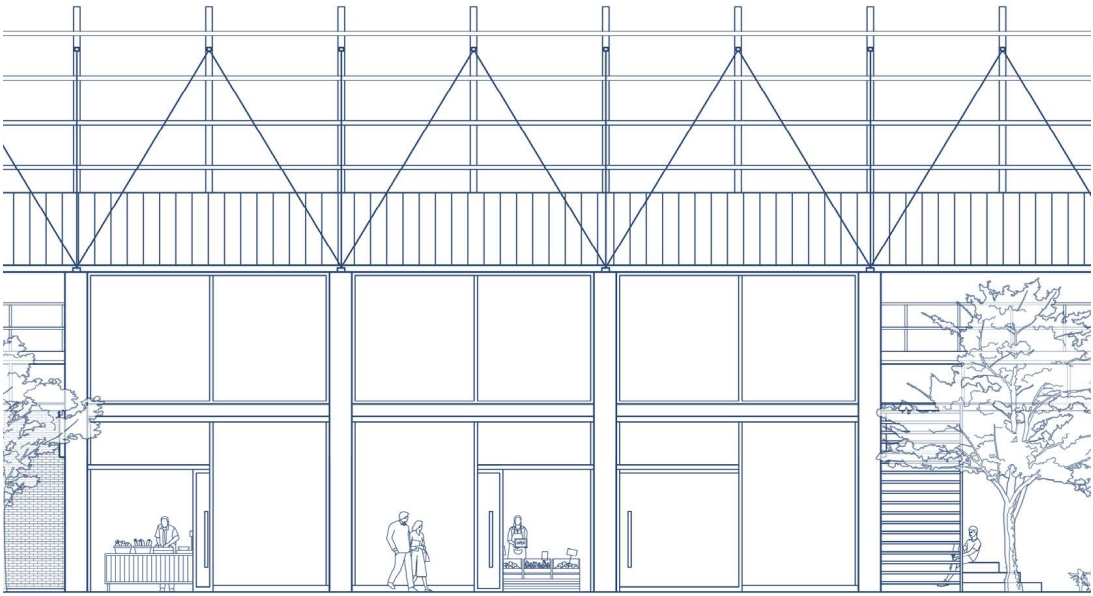


## BREWERY, MARKET, + SHOPS SECTION

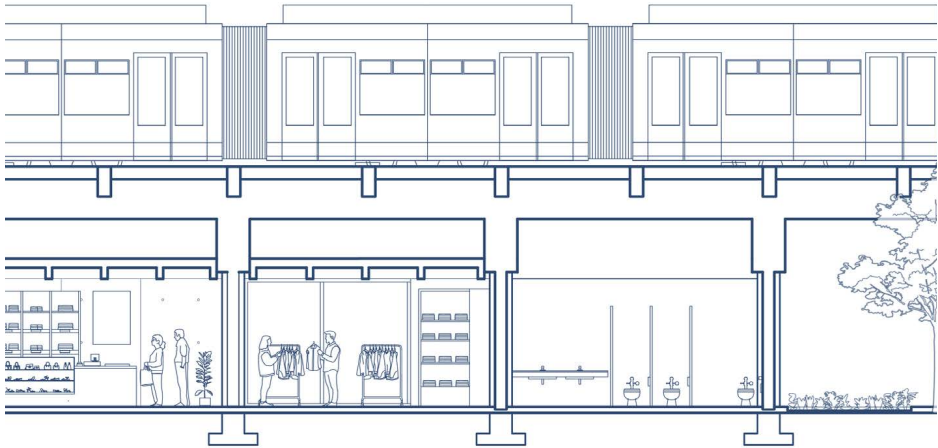
The section drawing above shows 750' of programmed space along and beneath the existing elevated railroad, including the semi-enclosed market with individual stalls and open covered space, a brewery and restaurant, and several retail shops. These programs aim to provide ample space for various sellers and small local businesses in a busy, yet affordable, location.



BREWERY



MARKET STALLS

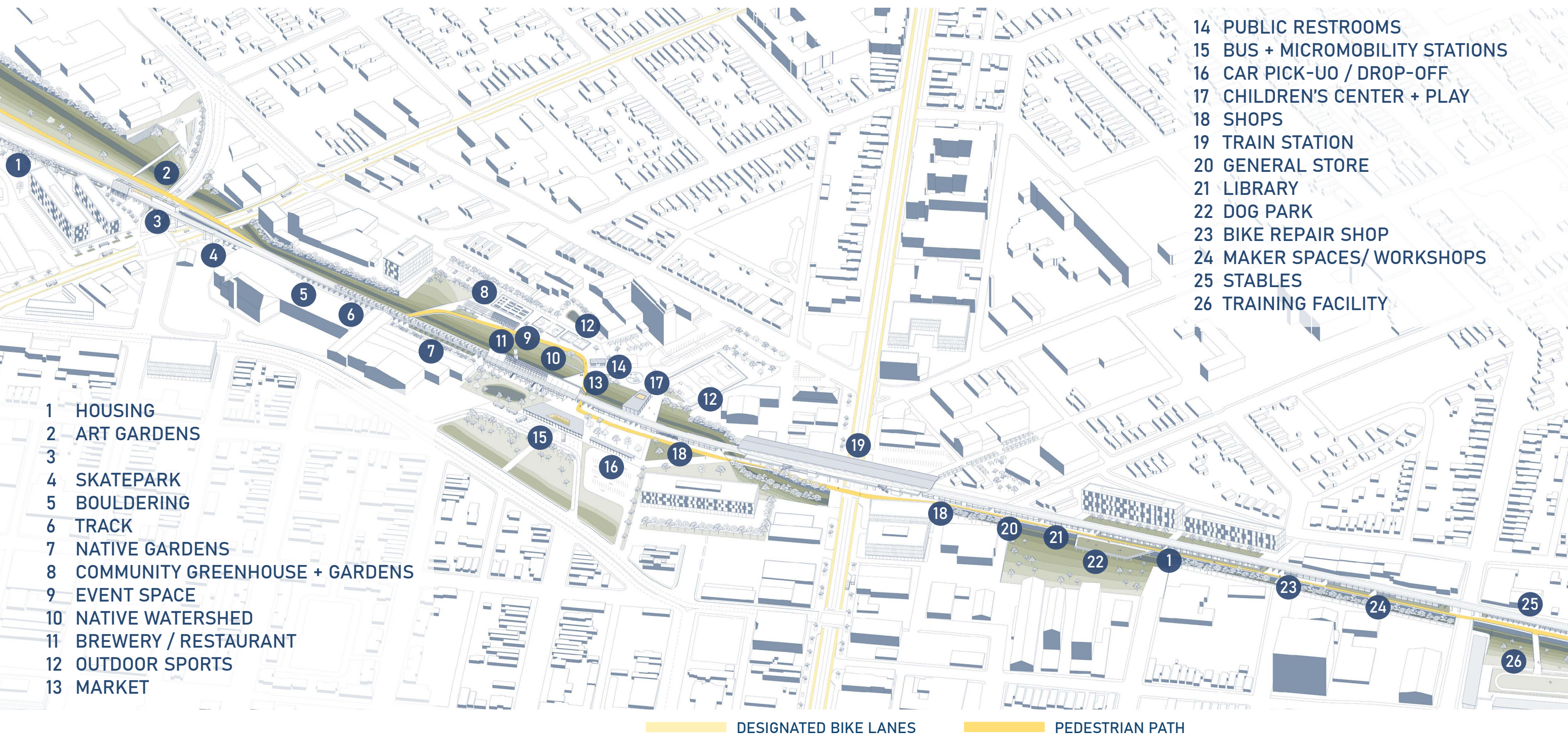


RETAIL SHOPS



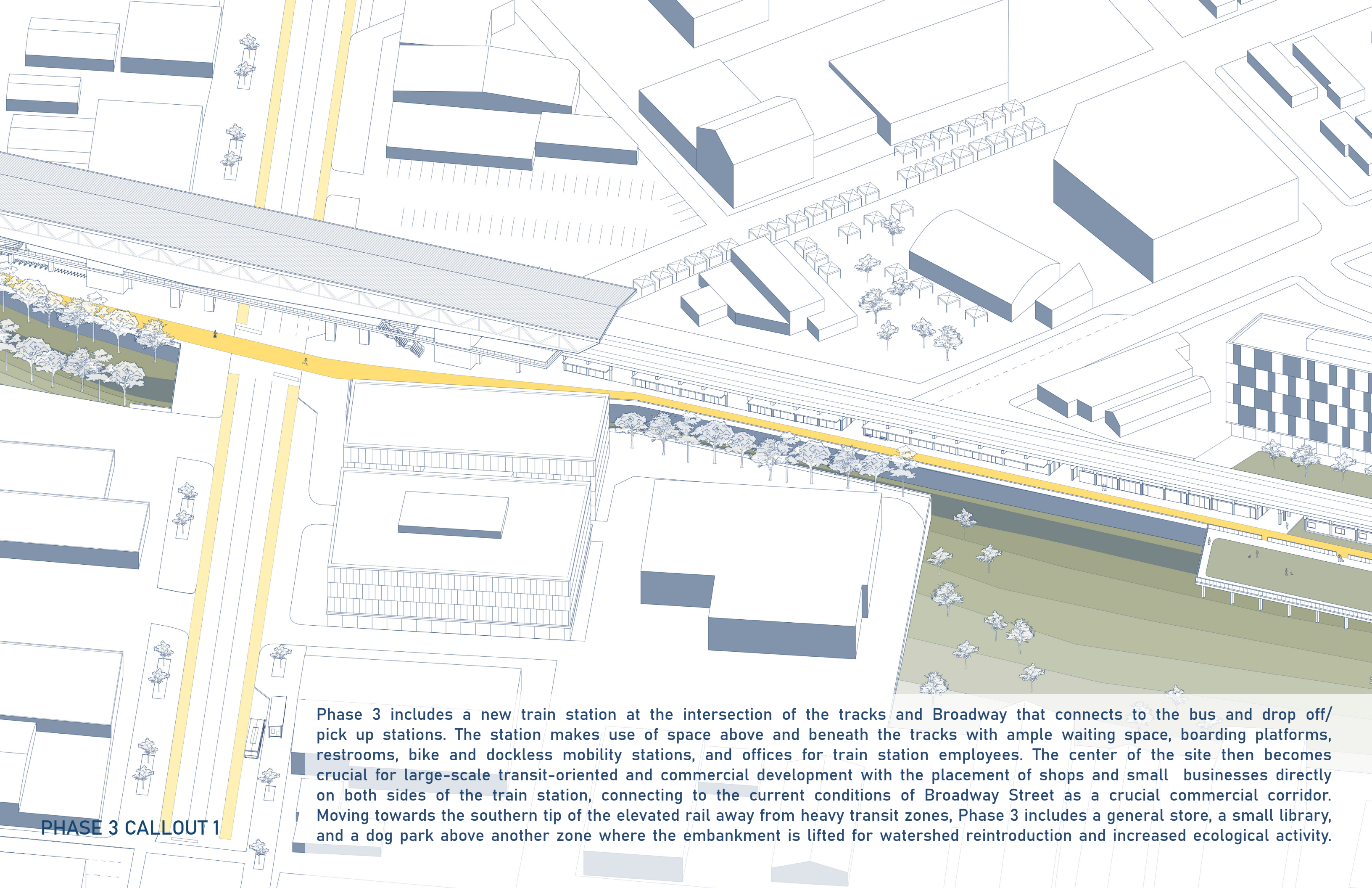
**PHASE 3:**  
**2045 - URBAN GROWTH POST-PASSENGER RAIL**





The final phase takes place once passenger rail is fully introduced, creating a need for additional transit-oriented development on and around the site. Phase 3 implements this in addition to more selective community-oriented programming.

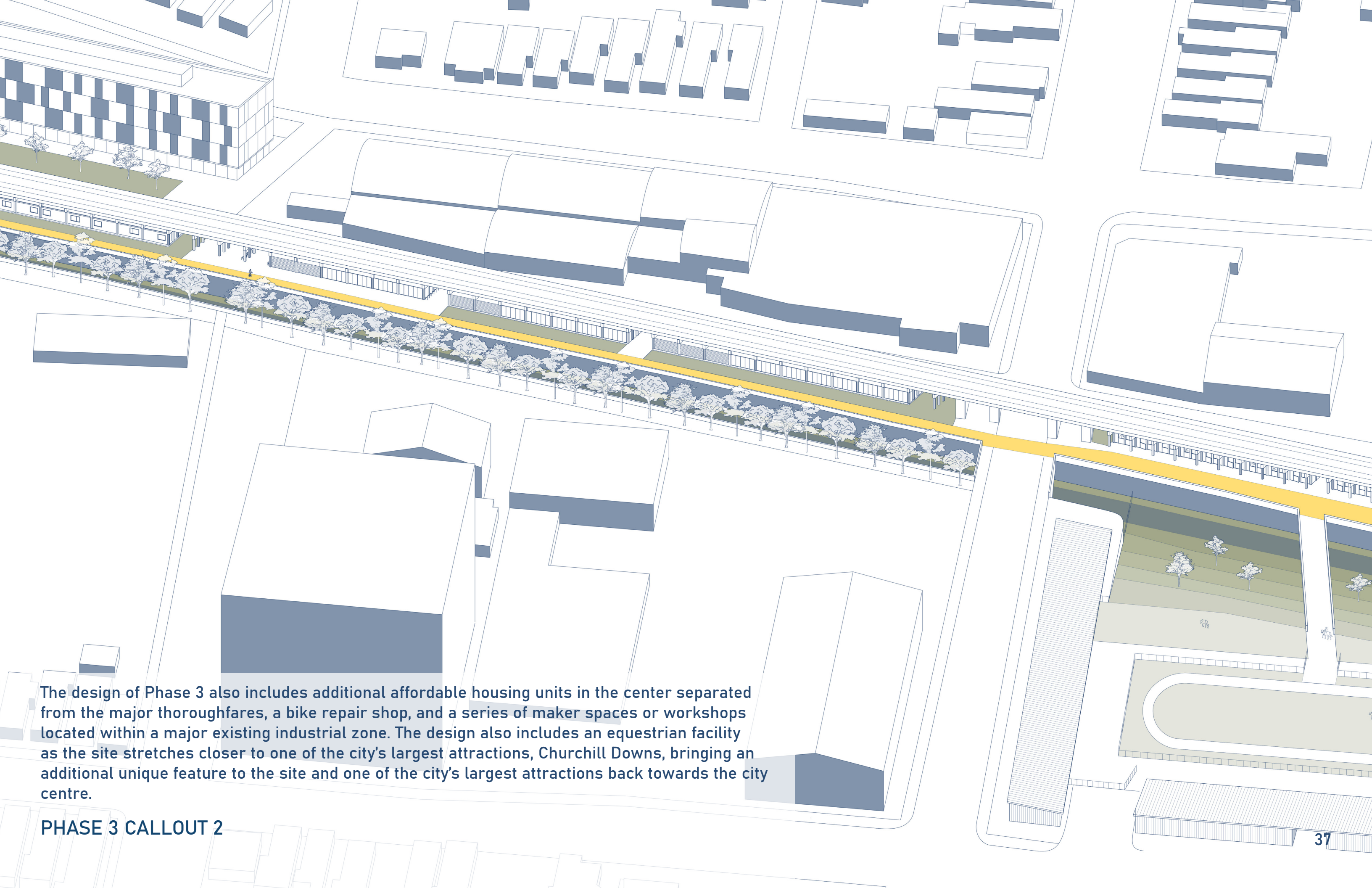




### PHASE 3 CALLOUT 1

Phase 3 includes a new train station at the intersection of the tracks and Broadway that connects to the bus and drop off/pick up stations. The station makes use of space above and beneath the tracks with ample waiting space, boarding platforms, restrooms, bike and dockless mobility stations, and offices for train station employees. The center of the site then becomes crucial for large-scale transit-oriented and commercial development with the placement of shops and small businesses directly on both sides of the train station, connecting to the current conditions of Broadway Street as a crucial commercial corridor. Moving towards the southern tip of the elevated rail away from heavy transit zones, Phase 3 includes a general store, a small library, and a dog park above another zone where the embankment is lifted for watershed reintroduction and increased ecological activity.

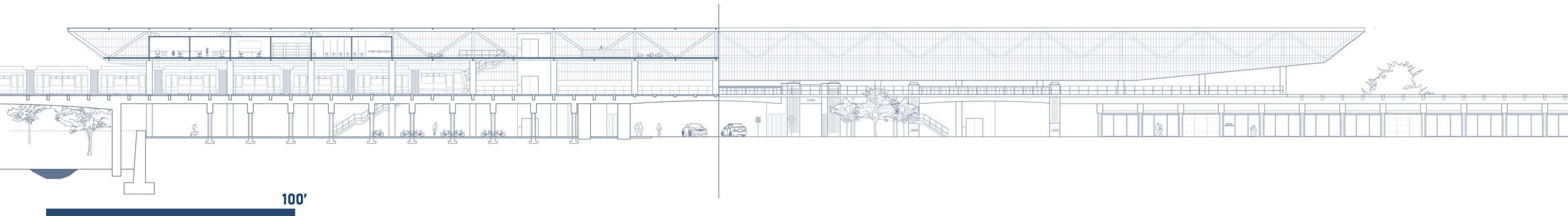




The design of Phase 3 also includes additional affordable housing units in the center separated from the major thoroughfares, a bike repair shop, and a series of maker spaces or workshops located within a major existing industrial zone. The design also includes an equestrian facility as the site stretches closer to one of the city's largest attractions, Churchill Downs, bringing an additional unique feature to the site and one of the city's largest attractions back towards the city centre.

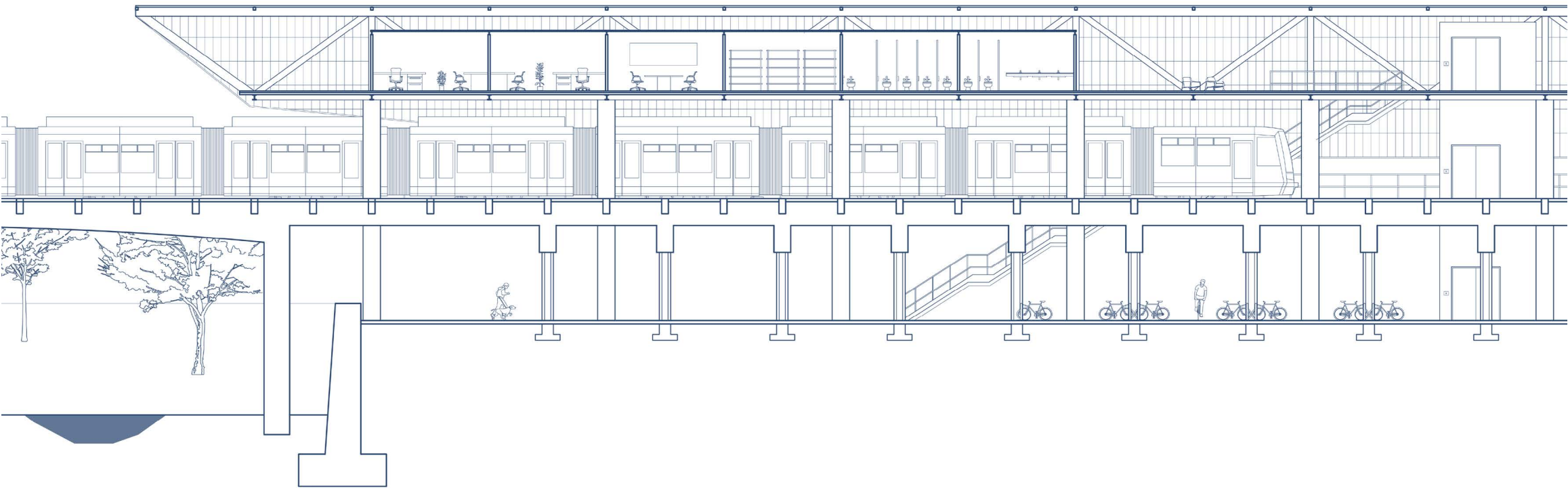
PHASE 3 CALLOUT 2



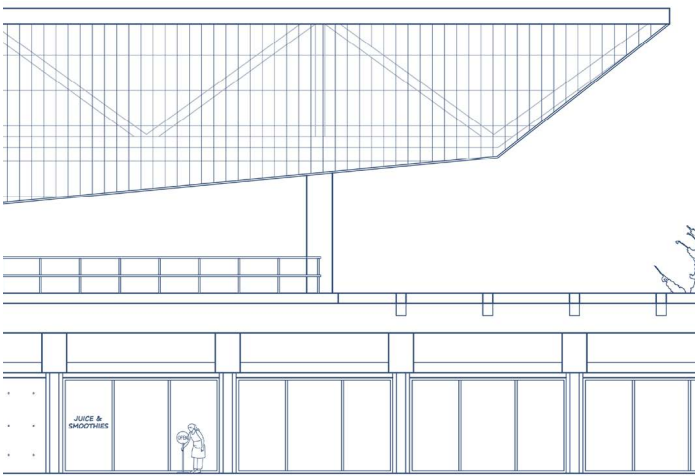


## TRAIN STATION + SHOPS SECTION

The section shows 700' of programmed space along, above, and beneath the existing elevated railroad, including the 3-level train station with micromobility zones, waiting spaces, loading zones, restrooms, and office spaces for employees. To the left of the train station is a bridge over Beargrass Creek leading to the bus and car stations, and to the right are various retail stores which connect to the existing Village Market which houses several local shops and restaurants.



## TRAIN STATION

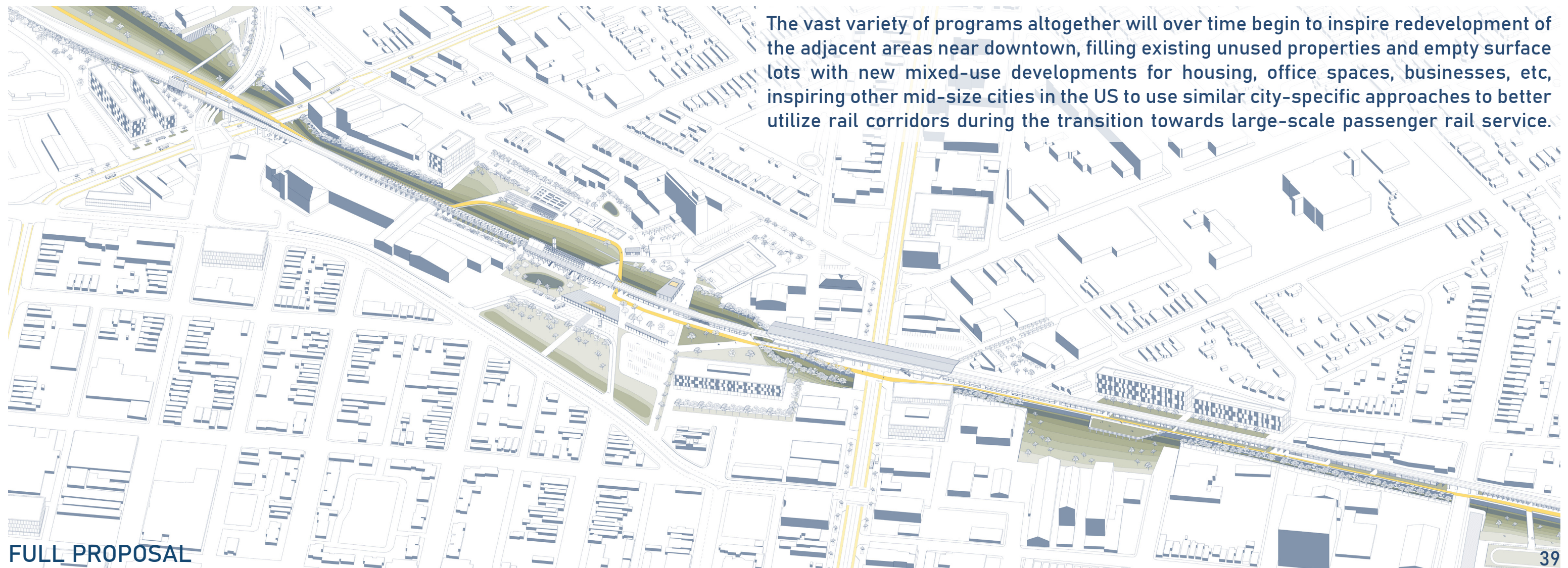


## RETAIL SHOPS BELOW





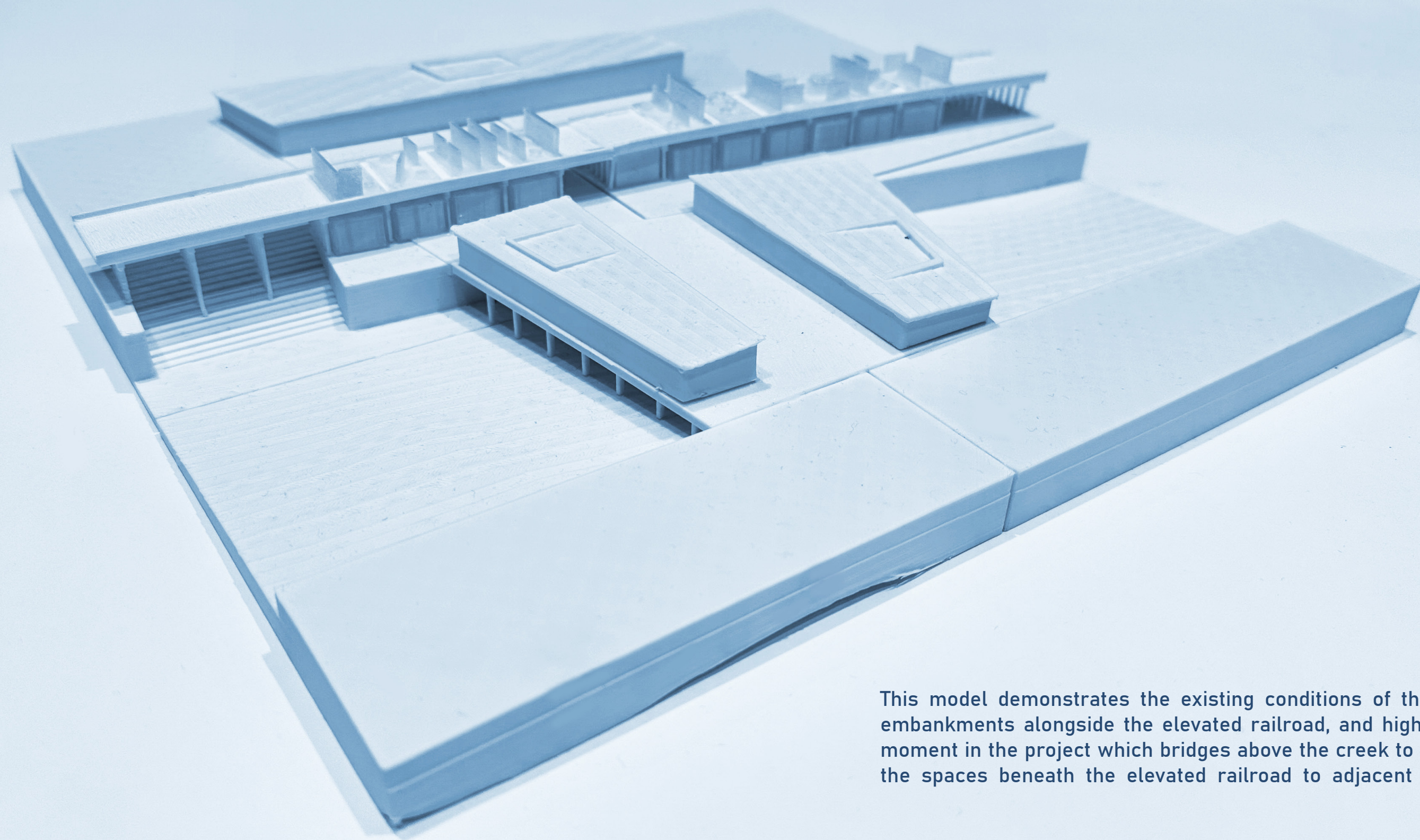
PROPOSAL WITH EXISTING ROAD CONDITIONS



The vast variety of programs altogether will over time begin to inspire redevelopment of the adjacent areas near downtown, filling existing unused properties and empty surface lots with new mixed-use developments for housing, office spaces, businesses, etc, inspiring other mid-size cities in the US to use similar city-specific approaches to better utilize rail corridors during the transition towards large-scale passenger rail service.

FULL PROPOSAL





This model demonstrates the existing conditions of the creek embankments alongside the elevated railroad, and highlights a moment in the project which bridges above the creek to connect the spaces beneath the elevated railroad to adjacent spaces.





# TRANSITIONAL INFRASTRUCTURE



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