Transit Oriented Development Study

For the CORTEX DISTRICT

prepared by H3 Studio

for the Saint Louis Development Corporation

Final Report

October 2012

Acknowledgements

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A METROLINK TRAIN APPROACHING BOYLE AVENUE

STUDY OBJECTIVE

Many years in the making and located in the heart of the City of Saint Louis' central corridor, the CORTEX district is nestled between the Central West End, Forest Park Southeast, Midtown, and the bustling BJC Kingshighway Campus. CORTEX is bounded on the south by I-64 and bisected by the MetroLink Red/Blue Line, making it ideally-located for a life-sciences research park from the standpoint of visibility, accessibility, and adjacency to significant medical centers and universities. These assets are supported by great amenities including residential neighborhoods and commercial main streets. However, the district as a whole is ill-defined in terms of identity, character, and perceptible boundaries. Originally developed as a light-industrial enclave, the CORTEX district faces major challenges moving forward to make itself feel welcoming, pedestrian-friendly, and fundamentally connected to its surrounding neighborhoods and amenities.

Market research has demonstrated that the knowledge-worker of the 21st century places a high premium on issues of livability, sustainability, and access to a vibrant public life after work. Adjacency to great neighborhoods and main streets; dense mixed-use development supporting a variety of uses and activities; vibrant walk-able and bike-able streets; and access to transit all provide a competitive edge that can be most fully realized in both great neighborhoods and urban research parks. In order to capitalize on years of public and private investment and attract and retain the best and the brightest, it is imperative that development in the CORTEX district unlocks the latent potential present in the district's enviable location in the heart of Saint Louis. A key component of this development is the proposed construction of a new MetroLink station at Boyle Avenue.

The City of Saint Louis, CORTEX & Metro possess a significant opportunity to reimagine the district **as a key link between its surounding neighbors.**

The Transit Oriented Development Study (TOD) for the CORTEX District (the Study) seeks to establish projections for net new riders on the MetroLink light rail system over a 20-year planning horizon resulting from the construction of a new MetroLink station in the CORTEX District. This Study is focused on proposed ridership projections based on planned investments in CORTEX and the surrounding areas. Metro Saint Louis Transit and the Bi-State Development Agency (Metro), owners and operators of the MetroLink and MetroBus transit systems, have established target thresholds as goals for proposed stations.

This station will be an invaluable asset in the future development potential of both the CORTEX district and the region-wide MetroLink system. The proposed station has the potential to function both as a

Context Map

transit option for current and future area residents and employees, as well as a major amenity and connective element for the surrounding neighborhoods and residents. In order to capitalize on years of public and private investment and attract and retain the best and the brightest, it is imperative that development in the CORTEX district unlocks the latent potential present in the district's enviable location in the heart of Saint Louis. The City of Saint Louis, Metro, and CORTEX possess a significant opportunity to recreate the district as a key link between surrounding neighborhoods, with the ability to tie these neighborhoods together with public spaces, great pedestrian streets, mixed-use development, and multi-modal transit access.

PLANNING PROCESS SCHEDULE

Project Kick-Off Meeting
February 3, 2012

Stakeholder Interviews
February - May 2012

Client Group Meeting 01
April 2, 2012

Advisory Committee Meeting 01
April 4, 2012

Client Group Meeting 02
April 27, 2012

Public Workshop
May 15, 2012

Advisory Committee Meeting 02
May 17, 2012

Citizens for Modern Transit Presentation
May 18, 2012

STUDY DEVELOPMENT & FUNDING

As noted above, the Study is funded with a portion of the $4.7 million Sustainable Communities Regional Planning Grant from the U.S. Department of Housing and Urban Development through the East-West Gateway Council of Governments. Additional funding for the Study was provided by three partners: the Saint Louis Development Corporation (SLDC), CORTEX, and the Missouri Botanical Garden. The Missouri Botanical Garden's interest was specifically focused on improving the connectivity between its facility and MetroLink, which led to the Study's emphasis on the Tower Grove Avenue corridor.

The Transit Oriented Development Study for the CORTEX District is closely aligned with the goals of the HUD-DOT-EPA Partnership for Sustainable Communities Livability Principles and is comprised of the following components: 1) a projection of MetroLink system net new riders over a 20 year planning horizon based on CORTEX district and surrounding area development plans; 2) planning Scenarios to increase net new ridership projections; 3) a Street-Level Connectivity Plan to enhance pedestrian and bike access to the proposed station from surrounding neighborhoods and institutions; and 4) TOD and Sustainable Development Strategies for the CORTEX District.

Connecting existing residents to existing and planned modes of transit is a major component of sustainable neighborhood development and a stated requirement of the Study. The project Study Area incorporates the existing Central West End MetroLink station and extends from approximately one quarter mile west of Kingshighway Boulevard (west) to one half block east of Compton Avenue (east) and from one half block north of Olive Boulevard (north) to one half block south of Hartford Avenue (south). This study area contains approximately 25,000 existing residents and 50,000 existing employees, a significant opportunity for enhancing connectivity, mobility, and access to transit.

The Saint Louis Development Corporation (SLDC) is responsible for the project administration. Karin Hagaman, Major Project Manager, is in charge as project coordinator. The Client Group team consists of Karin Hagaman, Dennis Lower (CORTEX), Mike Sullivan (CORTEX), Bob Herleth (Missouri Botanical Garden), Catherine Werner (City of Saint Louis Director of Sustainability), and Don Roe (City of Saint Louis Planning and Urban Design Agency. The Project Team lead is H3 Studio, with partners Bernardin, Lochmueller & Associates (BLA); Innis Consulting; David Mason & Associates (DMA); and Vector Communications Corporation.

PROJECT ASSUMPTIONS & EXISTING CONDITIONS

The TOD Study for the CORTEX District is predicated on a number of assumptions based on the existing CORTEX development plans and other information provided to the Project Team. The CORTEX plan is based around the concept of the CORTEX Commons, a plaza-like central square located along Boyle Avenue between Duncan Avenue and Clayton Avenue. It is also the general location of the proposed new MetroLink Station. In addition, CORTEX's current plans call for the re-creation of Duncan Avenue as a major east-west bicycle and pedestrian street. These are the public space amenities around which the first phase of planned redevelopment projects are located.

In the context of regional connectivity, both Tower Grove Avenue and Clayton Avenue are identified in the Regional Bike Plan as important shared bike facilities. Clayton Avenue is a key east-west connector through the CORTEX district and Forest Park but provides limited access to the east. Tower Grove Avenue is an essential north-south connection between the proposed MetroLink station, the Missouri Botanical Garden, and neighborhoods to the south; it is the only neighborhood street that continues south of Vandeventer Avenue. However, the proposed MoDOT interchange improvements at Tower Grove and Boyle Avenues and I-64 will significant inhibit north-south bicycle and pedestrian connectivity across the highway; vehicular access will be enhanced but I-64 will remain a major pedestrian barrier.

Finally, the proposed redevelopment plans for the CORTEX district will generate a net increase of 11,500 jobs over twenty (20) years. This increase is based on: 1) current CORTEX development plans provided to the Project Team and 2) the assumption that employment in the BJC/ Washington University Medical Center Kingshighway Campus will remain at current levels or increase over the same timeframe. Please note that this Study was completed between February and June 2012. Subsequent to completion of this Study, CORTEX amended their Master Plan and thereby revised the district development program and employment projections. Despite these revisions, overall ridership forecasts for the proposed MetroLink station remain valid.

In addition to the project assumptions and existing conditions outlined previously, the Project Team identified and compiled a number of Consensus Issues and Consensus Ideas for the Study Area, CORTEX district, and proposed MetroLink station. These Consensus Issues and Ideas were developed from on-site analysis, stakeholder interviews, and feedback from the Client Group and Advisory Committee.

CONSENSUS ISSUES
CORTEX DISTRICT

1. In order to justify a new MetroLink station, it must be demonstrated that the new station will result in a net increase of new riders over 20 years.

2. The new interchange at Boyle and Clayton Avenues results in complex movement patterns, difficult connections for pedestrians/bikes and facilitates greater volumes of vehicular traffic into the district.

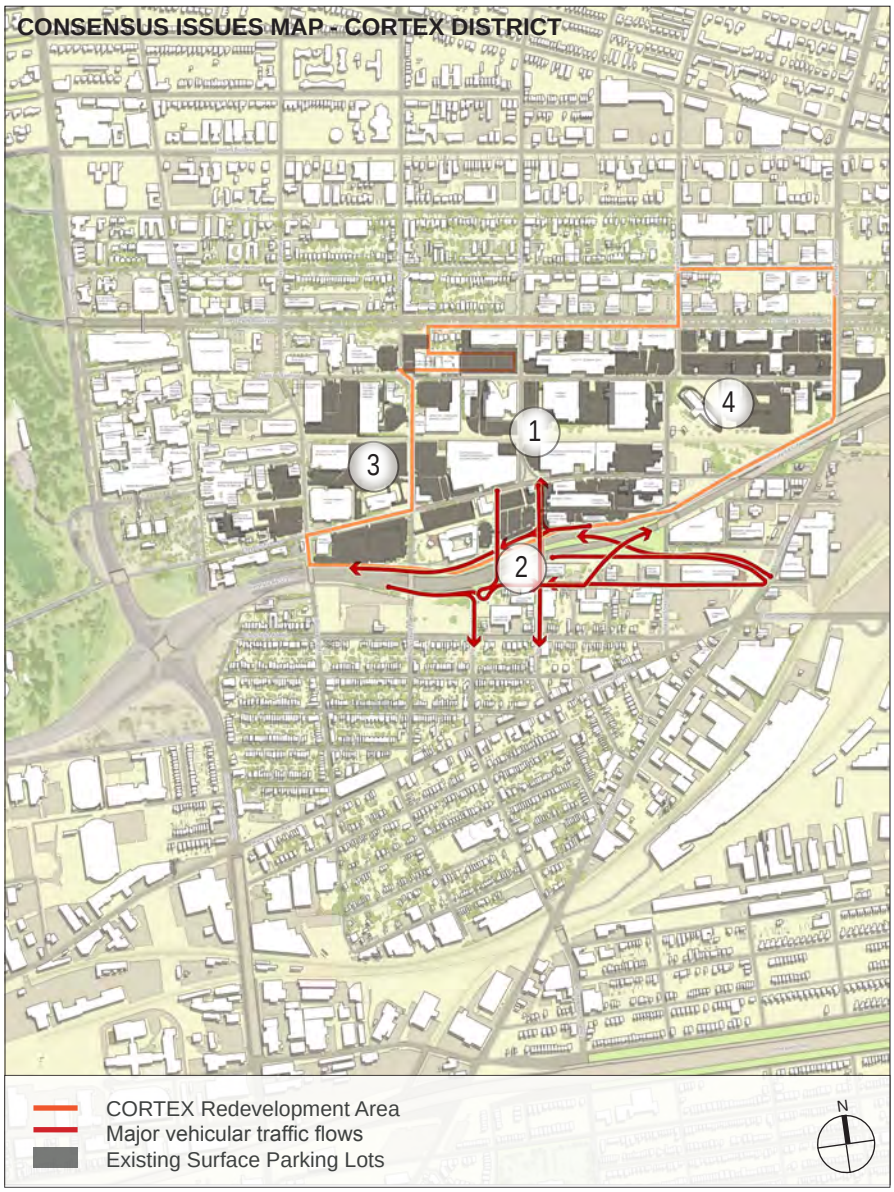
3. Large quantities of free surface parking are prohibitive to developing a dense, urban district.

4. The lack of a district-wide parking strategy puts pressure on the adjacent Central West End and Forest Park Southeast residential neighborhoods as CORTEX users turn to these areas for free parking.

5. In order to achieve necessary densities, ridership, walkability & vibrancy, mixed-use development is required for the CORTEX/BJC-WUMC district.

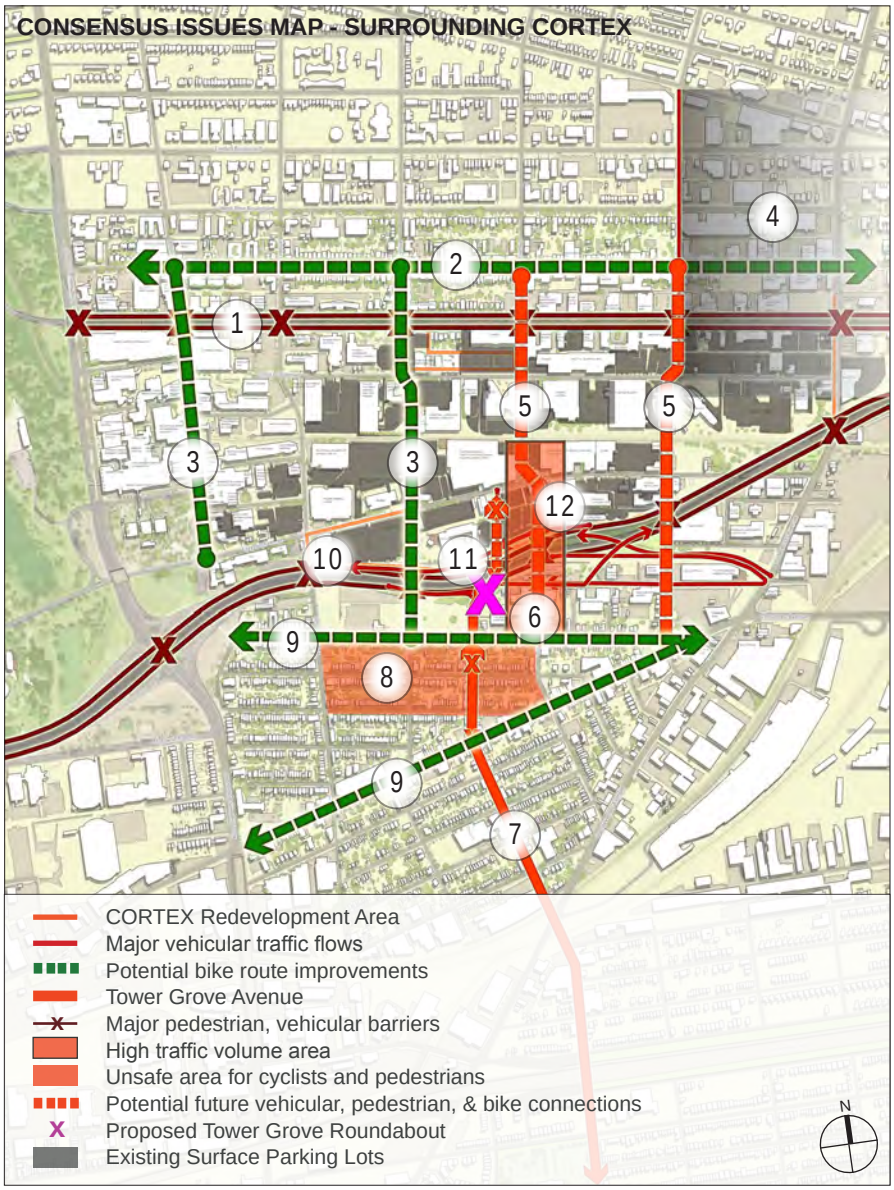
6. The ability of the new MetroLink station to attract riders is heavily dependent on the surrounding uses, amenities and connectivity.

7. CORTEX MetroLink station needs to be integrated into a larger transit and transportation strategy for the CORTEX/BJC-WUMC district.



CONSENSUS ISSUES SURROUNDING CORTEX

1. Forest Park Avenue is perceived as unfriendly to bikes and pedestrians for east-west travel and crossing.
2. Laclede Avenue is the major east/ west pedestrian connector north of Forest Park Avenue.
3. Euclid and Newstead Avenues are the primary pedestrian north/ south crossing points of Forest Park Avenue.
4. Walkability from the east and St. Louis University is inhibited by adjacent land uses and streetscape conditions, although people do walk to the CWE station.
5. Boyle Avenue and Sarah Street are perceived as unfriendly to pedestrians due to streetscape conditions and adjacent land uses.
6. Boyle Avenue is perceived as unsafe and unfriendly for cyclists due to poor streetscape quality and pavement condition.
7. Tower Grove Avenue is perceived as unsafe and unfriendly for bikes due to poor streetscape quality, pavement condition, and the Vandeventer intersection.
8. The area of the Forest Park Southeast neighborhood bounded by Chouteau (north), Arco (south), Boyle (east), and Taylor (west) is perceived as very unsafe for cyclists and pedestrians.
9. Major opportunities for east/west pedestrian/bike connectivity exist on Chouteau and Manchester Avenues.
10. The I-64 corridor and proposed interchange is a significant barrier to major pedestrian and bicycle connectivity.
11. The roundabout as proposed at the new Tower Grove/I-64 interchange is unfriendly to pedestrians and provides little support for cyclists.
12. North of I-64, Boyle Avenue as proposed will carry higher volumes of vehicular traffic.



CYCLING ON TOWER GROVE AVENUE

MetroLink system ridership projections based on planned CORTEX redevelopments are **600 to 700 net new riders** on opening day, **and 1,250 to 1,350 net new riders** per day by year 20.

SYSTEM RIDERSHIP STRATEGIES

The planning target for net new MetroLink riders, established by Metro, is 1,900 net new boardings per day. Baseline ridership projections for the proposed stations indicate an increase of approximately 600 to 700 net new boardings on opening year, and increase of approximately 1,250 to 1,350 net new boardings on year 20. These numbers would be achieved based solely on planned development in the area with no other actions to attract riders. To increase ridership to meet the Metro target, the Planning Team has identified a number of connectivity, development, and operational strategies that can be employed to increase ridership.

IMPROVE CONNECTIVITY: Stronger connections to the Central West End and Forest Park Southeast would yield additional boardings above the 1,250-1,350 range previously cited. These boardings are still limited, however, by continued usage of the Central West End MetroLink station at Euclid Avenue by portions of both neighborhoods. Strategies to improve connectivity are listed on the facing page.

INCREASE RESIDENTIAL DEVELOPMENT: Based upon additional research, TOD-style development will yield a higher ridership capture than employment. These capture rates are highly dependent on proximity to the MetroLink station (as outlined below) and to the provision of mixed-use amenties. Capture rates in TOD-style development are listed on the facing page.

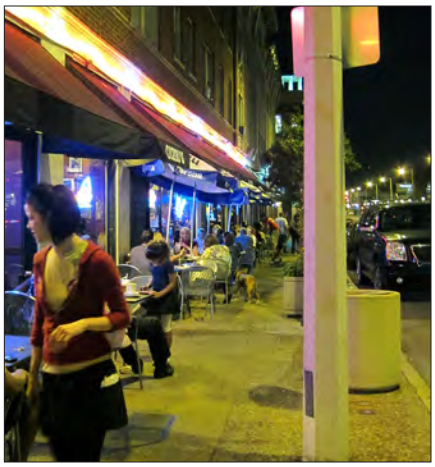
A special capture rate of 15 percent for TOD directly adjacent to stations (1/4 mile or less) was developed by Robert Cervero (UC-Berkeley) as part of the MetroLink MetroSouth Study in the mid-2000s. The rate is predicated on developments attracting residents who are predisposed to riding transit; this rate cannot be applied to typical residential uses.

MANAGEMENT & OPERATIONS: There are a variety of management and operational initiatives that can implemented to incentivize transit use or make transit a more attractive option to district employees and residents who currently commute by car. Management and operations strategies are presented on the facing page.

By utilizing some or all of these strategies, net new system ridership can be increased to achieve Metro planning threshold. The following alternative scenarios illustrate the combined effects of employing these strategies in various ways.

IMPROVE AREA CONNECTIVITY

- Develop pedestrian first streets
- Increase bike accessibility & facilities
- Improve Streetscape, Visibility & Imageability
- Provide Active Ground Floor Uses on Key Streets
- Install Security Lighting and Monitoring System
- Install Blue Light Safety Call system
- Increase safety patrols



INCREASE RESIDENTIAL DEVELOPMENT

- ¼ Mile Radius from MetroLink: *8-10% Capture Rate*
- ½ Mile Radius from MetroLink: *3-5% Capture Rate*
- Greater than ½ Mile Radius: *<2% Capture Rate*

MANAGEMENT & OPERATIONS

- Increase Bus Connectivity
- Neighborhood Shuttle Services
- Park-And-Ride Facilities
- Bike Transfer Facilities
- District-wide Parking Management Plan
- Subsidized- or No-Cost MetroLink Fares or Passes

SCENARIOS TO INCREASE RIDERSHIP: SCENARIO 1

If all Scenario 1 recommendations are implemented and mutually leveraged toward the purpose of enhancing transit ridership, it will result in **a total of 1,800 to 2,000 net new daily riders by year 20.**

Scenario 1 is designed to achieve Metro's planning threshold of 1,900 net new riders if that target is understood as the year 20 ridership goal. Scenario 1 involves moderate modifications to existing proposals and planning initiatives to enhance north and south connectivity, initiate new mixed-use, transit oriented development near the proposed station, and incentivize current and planned district employees to use MetroLink as their means of commuting to work.

CONNECTIVITY

1. Provide shared lanes on Tower Grove Avenue and widen Boyle Avenue overpass with widened sidewalks and dedicated bike lanes.
2. Provide dedicated bike lanes on Tower Grove Avenue south of Vandeventer Avenue to the Missouri Botanical Garden.
3. Extend CORTEX Commons north to Forest Park Avenue and create a "front door" to the CORTEX district at Forest Park Avenue.

DEVELOPMENT

4. Meet baseline CORTEX development projections.
5. IN ADDITION provide 650 to 750 units of new, TOD residential development and mixed-use development in the CORTEX district (975 to 1,125 new residents.)
6. Focus TOD residential and mixed-use development between Sarah Avenue and Vandeventer Avenue and extend planned Duncan Avenue streetscape improvements east to Vandeventer.

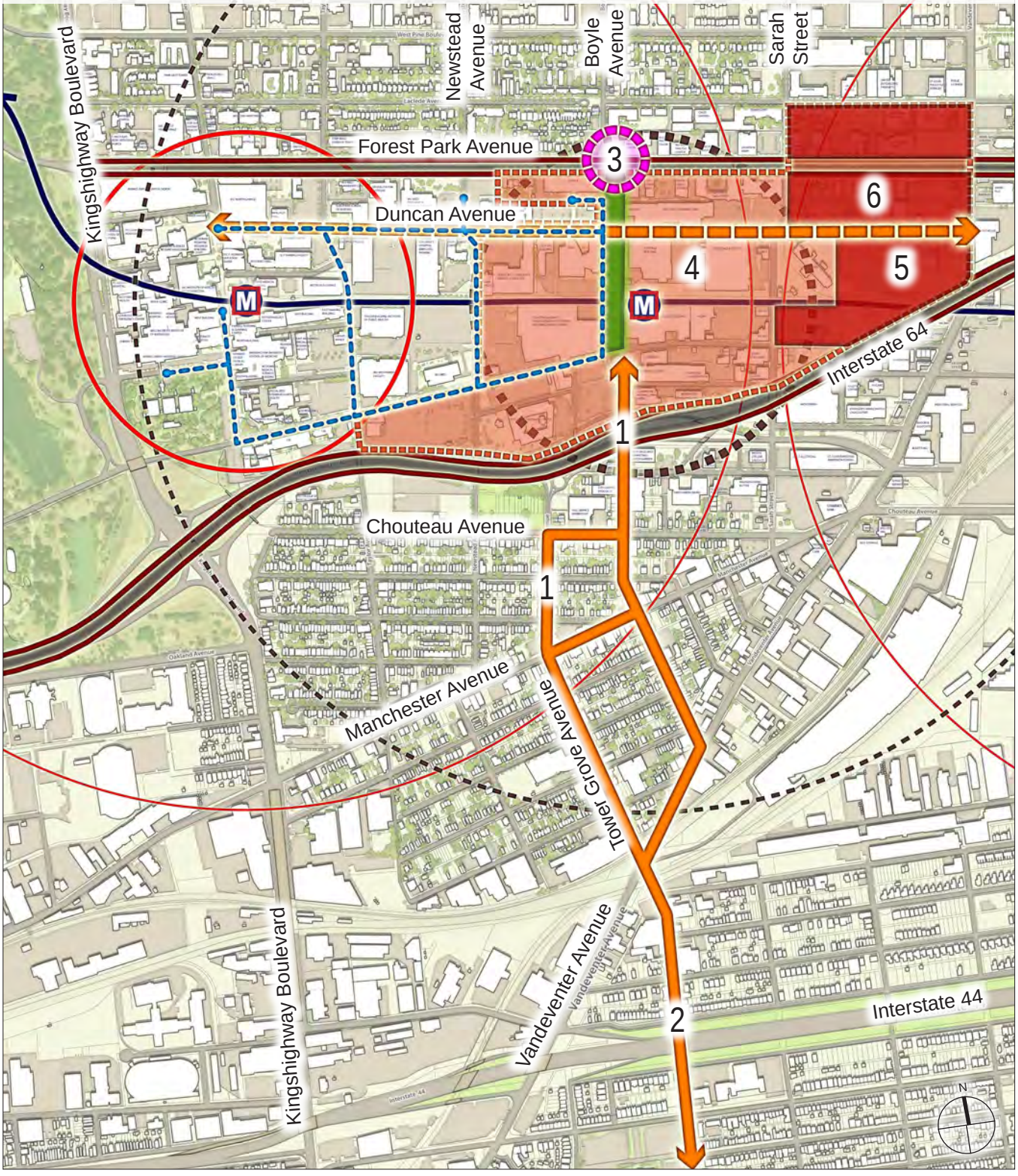
MANAGEMENT & OPERATIONS

7. Provide bike storage, lockers, and shower facilities at the CORTEX MetroLink Station.
8. Provide subsidized transit passes to CORTEX district employees (BJC model; approximately $20 per month subsidy or pass discount.)

If all of these recommendations are implemented and mutually leveraged towards the purpose of enhancing transit ridership, it will result in an additional 550 to 650 net new riders at year 20. In addition to the base level ridership of 1,250 to 1,350 in year 20, this would result in a total of 1,800 to 2,000 net new riders.

FIGURE 3.1: SCENARIO 1 PLAN

- CORTEX Redevelopment Area
- Small Circles: 1/4 Mile (5 Minute Walking) Radius from existing or proposed MetroLink station
- Large Cricles: 3/4 Mile (5 Minute Bike Ride) Radius from existing or proposed MetroLink station
- MetroLink Route
- MetroLink Stop
- Major Street-Level Connectivity Routes
- District Shuttle



SCENARIOS TO INCREASE RIDERSHIP: SCENARIO 2

If all Scenario 2 recommendations are implemented and mutually leveraged toward the purpose of enhancing transit ridership, it will result in **a total of 2,350 to 2,550 net new daily riders by year 20.**

Scenario 2 is designed to achieve Metro's planning threshold of 1,900 net new riders if that target is understood as the opening year goal. Accounting for a projected 16% growth in overall system ridership, an opening year goal of 1,900 would translate into a year 20 ridership goal of 2,200 net new riders. Scenario 2 involves more aggressive actions and all recommendations of Scenario 1 are included.

CONNECTIVITY

1. Make the CORTEX Station double-sided, with entrances from both Boyle Avenue & Sarah Avenue.
2. Extend CORTEX Commons north to Forest Park Avenue and south to I-64, creating two "front doors" to the CORTEX district.
3. Provide dedicated bike lanes on Boyle Avenue and Vandeventer Avenue; widen Boyle Avenue overpass with widened sidewalks and dedicated bike lanes.
4. Provide a dedicated "cycle track" on Tower Grove Avenue south of Vandeventer to the Missouri Botanical Garden.

DEVELOPMENT

5. Focus TOD residential and mixed-use development between Sarah Street and Vandeventer Avenue and improve Duncan Avenue, Sarah Street, and Vandeventer Avenue streetscapes.

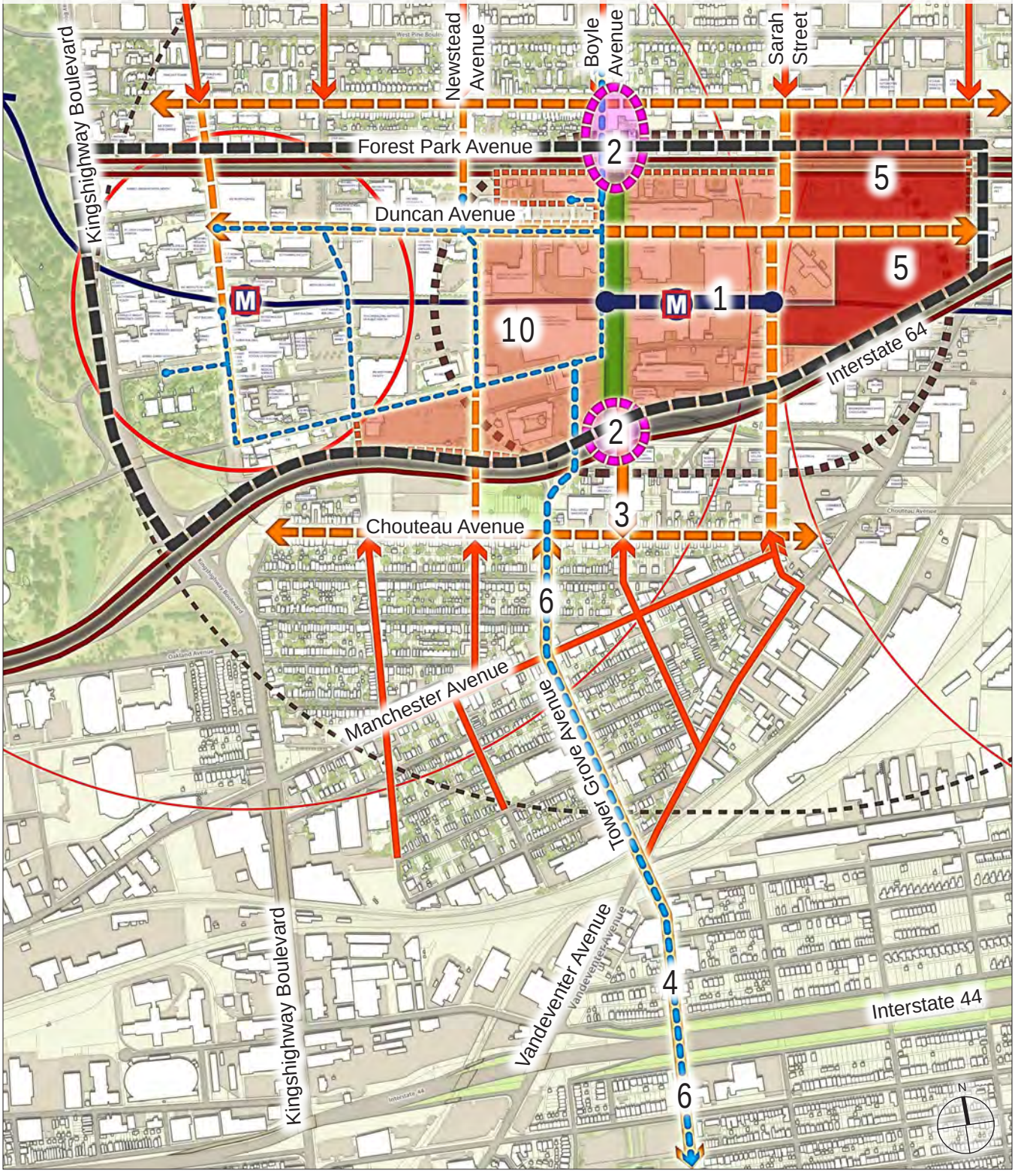
MANAGEMENT & OPERATIONS

6. Extend shuttle service and/or provide neighborhood circulator to surrounding neighborhoods and south to the Missouri Botanical Garden.
7. Provide subsidized transit passes to CORTEX district employees (enhanced model; $50 per month subsidy or discount.)
8. Implement a district-wide access, circulation and parking strategy that balances accessibility, convenience and transit ridership.
9. Implement a neighborhood parking management strategy.
10. Consider creating a Transportation Management District to facilitate ALL forms of transportation.

If all of these recommendations are implemented and mutually leveraged towards the purpose of enhancing transit ridership, it will result in an additional 1,250 to 1,350 net new riders at year 20. In addition to the base level ridership of 1,250 to 1,350 in year 20, this would result in a total of 2,350 to 2,550 net new riders.

FIGURE 3.2: SCENARIO 2 PLAN

- CORTEX Redevelopment Area
- Small Circles: 1/4 Mile (5 Minute Walking) Radius from existing or proposed MetroLink station
- Large Cricles: 3/4 Mile (5 Minute Bike Ride) Radius from existing or proposed MetroLink station
- MetroLink Route
- MetroLink Stop
- Major Street-Level Connectivity Routes
- District Shuttle
- Proposed Parking District Boundary



TOWER GROVE AVENUE AT THE MISSOURI BOTANICAL GARDENS

TRANSIT-ORIENTED DEVELOPMENT & SUSTAINABLE DESIGN STRATEGIES

Today, the CORTEX district is segregated from its neighbors, surrounded by significant barriers, and provides few incentives to cross these barriers. In order to ensure both the success of the proposed MetroLink station and continuing success for the CORTEX district as a whole, the future CORTEX development must work to tie the district to existing residential populations, commercial centers, and surrounding institutional amenities, making the CORTEX district an integral part of its surrounding neighborhoods. While the recommendations and scenarios put forth in this study address particular technical issues, the sum total of these recommendations can and should be leveraged together in order to create a vibrant, mixed-use, transit-oriented district that is well connected to adjacent neighborhoods and amenities and overcomes the fundamental barrier of I-64 to the south.

Equally important is the role that a MetroLink station within the CORTEX district would play in providing a direct connection to regional assets such as the airport, colleges, downtown St. Louis, Clayton, and other job centers. Making the MetroLink system more accessible to CORTEX and its adjacent neighborhoods will lead to increased ridership throughout the system.

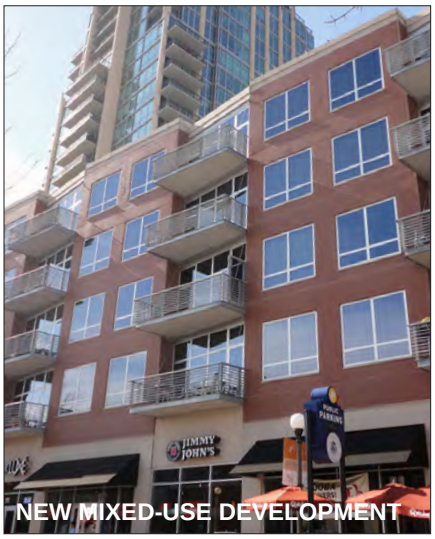
The Transit Oriented Development Study for the CORTEX district proposes **eight TOD and Sustainable Design Strategies** to advance this goal. The first four TOD and Sustainable Design Strategies are **necessary to facilitate transit-oriented development in the district.** The remaining four strategies represent best practice opportunities that **should be utilized to maximize development investment.** These TOD and Sustainable Design Strategies address new development, creating vibrant places for social and professional interaction, district parking, pedestrian and bike connectivity, high-performance infrastructure, building and site performance requirements, district water and energy strategies, and district wide branding and imaging. It is recommended that these strategies be incorporated into all future master planning efforts for the CORTEX district, in order to capitalize on new development opportunity.

1. REQUIRE HIGH-DENSITY, MIXED-USE & RESIDENTIAL DEVELOPMENT

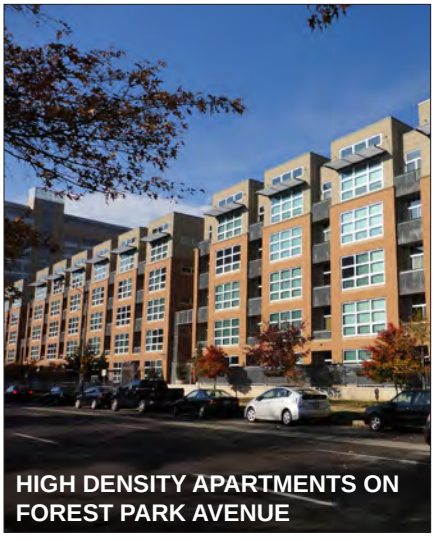
In order to ensure the future financial and operational sustainability of transit, development must be high-density and provide a mix of uses and amenities. Transit-oriented development is typically defined as 1) 20-unit per acre residential density or greater or 2) 0.75 floor area ratio (FAR) or greater within a one-quarter mile radius of transit; and 3) 15-unit per acre residential density or greater or 4) 0.5 FAR or greater within one-quarter to one-half mile radius of transit. These density levels yield the ridership necessary for mass-transit to operate economically, and the presence of transit can induce greater market demands for high density development. Primary residential and office uses should be supplemented with commercial, retail, and entertainment mixed-use. Actions to achieve this strategy include:

- **Develop a district regulatory plan that establishes building minimum and maximum heights and massing requirements throughout the district.**
- **Develop a district building use plan that dictates ground-floor and upper-floor building programs throughout the district that promote social interaction and provide for the community's and users' needs.**
- **Establish a primary mixed-use corridor through the district**
- **Establish district-wide mixed-use guidelines to ensure the proper proportions of development types and programs.**
- **Establish location-based development density thresholds (units per acre and/or FAR) and require or incentivize new buildings to achieve these thresholds.**
- **Implement a greater fine-grain mixing of residential and research buildings.**
- **Develop a form-based code and overlay district so that development meeting these requirements is allowed by right and not by variance.**

NEW MIXED-USE DEVELOPMENT



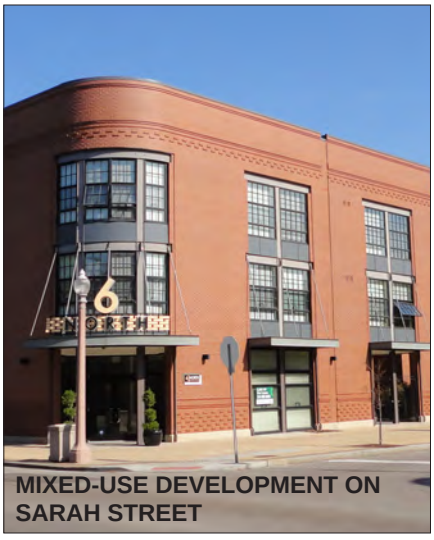
NEW MIXED-USE DEVELOPMENT



HIGH DENSITY APARTMENTS ON FOREST PARK AVENUE

EUCLID AVENUE AT FOREST PARK AVENUE

LACLEDE AVENUE IN THE CENTRAL WEST END



MIXED-USE DEVELOPMENT ON SARAH STREET

2. CONNECT TO SURROUNDING ASSETS, NEIGHBORHOODS & AMENITIES

The CORTEX district is ideally-positioned in the heart of the Saint Louis central corridor to deliver on the promise of urban, life-sciences research parks. **In order to realize this potential, provide the kind of livable, sustainable, and vibrant mixed-use urban neighborhoods that the 21st century knowledge-based worker desires, and increase access to regional transit**, CORTEX must leverage and capitalize on its surrounding neighborhoods and amenities. To the north, the Central West End remains one of Saint Louis' premier residential neighborhoods and the Euclid Avenue corridor continues to be the region's most successful mixed-use main street. To the south, The Grove commercial and entertainment district has made great strides and the Forest Park Southeast neighborhood possesses huge latent value because of it's location, historic building stock, and potential for reinvestment. In addition, the Sarah Street corridor and areas adjacent to SLU represent a future redevelopment opportunity. Actions to achieve this strategy include:

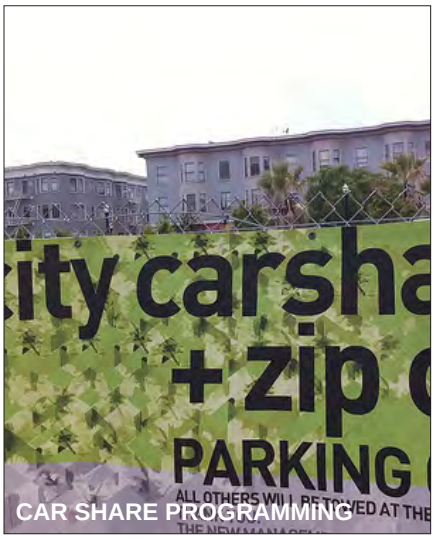
- **Create a double-ended MetroLink station with entrances at both Boyle Avenue and Sarah Street.**
- **Create two front doors to the district at Forest Park Avenue and I-64.**
- **Develop Sarah Street as a key neighborhood main street**
- **Provide high quality pedestrian and bike connections south across the I-64 barrier.**
- **Connect to existing and planned adjacent greenways and bike routes including Chouteau Avenue and Tower Grove Avenue.**
- **Require ground-floor mixed-use and commercial uses with street frontages and storefronts.**
- **Design and implement public spaces that support and encourage social and professional interaction.**
- **Connect to existing business and commercial centers, main streets, and amenities in surrounding neighborhoods.**
- **Encourage and support new development and redevelopment in surrounding neighborhoods and districts.**

3. REDUCE PARKING REQUIREMENTS, ENHANCE ACCESSIBILITY & DEVELOP A CORTEX PARKING DISTRICT

In order to facilitate necessary TOD densities and help incentivize transit ridership, typical municipal parking requirements must be reduced. On average, modern parking codes require 500 to 600 hundred square feet of parking per 1000 square feet of residential or office development. In order to achieve necessary densities, parking must be accommodated in garages, which cost about 10 times more than surface parking. The costs of structured parking make residential and office developments infeasible in most development markets; high levels of provided parking also disincentivize transit ridership. The CORTEX district should reduce parking requirements and establish a Parking District that meets the needs of park and ride users while at the same time supporting and incentivizing transit ridership with the ultimate goal of creating a car-optional district. Actions to achieve this strategy include:

- **Develop location-based alternative parking requirements for development in the CORTEX district.**
- **Establish maximum parking ratios for all development within one-quarter mile of MetroLink stations.**
- **Allow market-based parking ratios for all development in the CORTEX district.**
- **Require or incentivize distributed, shared-use parking garages located adjacent to other development.**
- **Implement a system of shuttles to link surrounding neighborhoods to the CORTEX district and new MetroLink station through CORTEX Commons.**
- **Establish a Parking Management District for the CORTEX district to provide a coordinated approach to parking.**
- **Implement reduced-fare or free parking for transit riders based on paid transit tickets to provide free park-and-ride parking while still incentivizing transit use.**

DISTRICT PARKING LOT WITH SOLAR PANEL SHADES



CAR SHARE PROGRAMMING

MIXED-USE URBAN PARKING STRUCTURE

ADA-ACCESSIBLE CROSSWALK

BIKE LANES AND DISTRICT BICYCLE PARKING

ADA-ACCESSIBLE CROSSWALK

4. ENSURE PEDESTRIAN AND BIKE CONNECTIVITY, SAFETY, AND COMFORT

Transit-oriented developments and districts rely on safe, comfortable, walk-able and bike-able streets and public spaces to provide access to transit. In the CORTEX district, streets are currently designed to give preference to vehicular traffic; most streets have only a 36-foot curb-to-curb width, which accommodates only two travel lanes and two parallel parking lanes. In addition, sidewalks are only 4- to 5-feet wide, pedestrian right-of-ways are often obstructed by utility poles and other infrastructure, and there are few street trees or other pedestrian amenities. Given limited right-of-way width and vehicular traffic restrictions, enhancing bike and pedestrian connectivity, safety, and comfort will need to occur on some streets while vehicular service requirements are accommodated on others. Actions to achieve this strategy include:

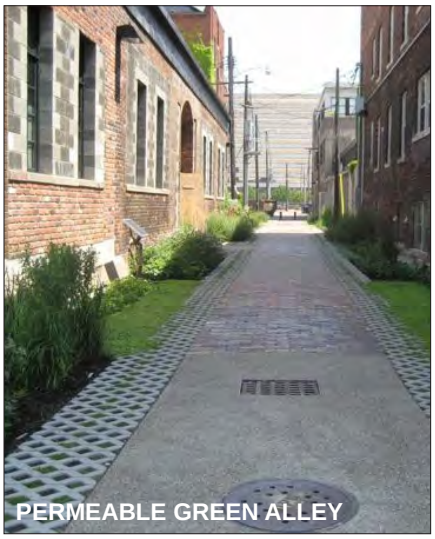
- **Create "pedestrian first" streets and vehicular-centric streets through the district.**
- **Repair all sidewalks and maximize sidewalk width in all locations.**
- **Provide planting strips and/or tree lawns on all streets.**
- **Relocate utility poles and other infrastructure out of pedestrian right-of-ways.**
- **Provide lane-width, shared lane markings ("Super Sharrows") on all streets.**
- **Provide parallel parking on all streets.**
- **Provide street trees on all streets with a maximum spacing of 40-feet on-center.**
- **Provide pedestrian-scaled street lights with a maximum spacing of 80-feet on center.**
- **Provide trash receptacles, benches, bike racks, safety call boxes, and other street furniture.**
- **Provide ADA-accessible curb cuts, oriented perpendicular to the street, at all intersections and crosswalks.**
- **Provide pavement changes at all crosswalks.**

5. CONSTRUCT HIGH-PERFORMANCE BLUE & GREEN INFRASTRUCTURE

Streets, sidewalks, parking lots, driveways, and turf grass all contribute to runoff due to their low rainwater absorption coefficients—the amount of water that a given material or surface can absorb. This contributes to increased stormwater discharge, which stresses on aging, combined stormwater/sanitary sewage systems such as those found throughout the City of Saint Louis. In heavily urbanized areas, this runoff contributes to poor water quality from oil and other hydrocarbon pollution resulting from car and truck traffic. **The CORTEX district will undergo a wholesale improvement of street and sidewalk infrastructure over the next 20 years; this is an opportunity to construct high-performance blue and green infrastructure.** High-performance blue and green infrastructure comprises permeable pavement, bioswales, rain gardens, native hydrophytic plantings, and other infrastructure elements to reduce stormwater runoff and increase water detention, filtering, and recharge. Actions to achieve this strategy include:

- **Utilize tree lawns and planting strips as bioswales and rain gardens.**
- **Construct crosswalks out of permeable unit pavers.**
- **Construct parallel parking lanes out of permeable unit pavers or permeable concrete.**
- **Construct bike lanes out of permeable concrete.**
- **Construct parking lots and service drives out of permeable materials (“green parking lots” and “green alleys”).**
- **Establish native plant lists for district landscaping.**
- **Establish tree canopy coverage ratios for parking lots and street right-of-ways.**
- **Establish run-off abatement targets and benchmarks for the district.**

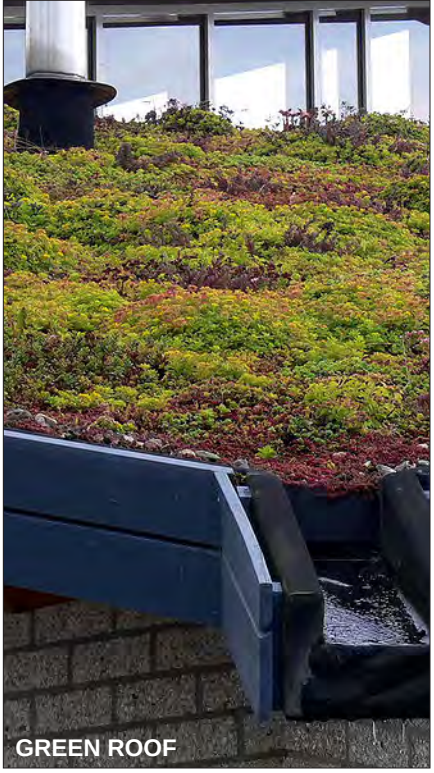
ENHANCED STREETSCAPE WITH BIOSWALE



PERMEABLE GREEN ALLEY

CURB BUMP-OUT WITH BIOSWALE

Portland Bureau of Environment



GREEN ROOF

LOW-ALBEDO WHITE ROOF

ROOF PHOTOVOLTAIC PANEL ARRAY

6. ESTABLISH BUILDING & SITE DESIGN & PERFORMANCE STANDARDS

Buildings are the largest consumers of energy; increasing design and performance standards for buildings not only helps to minimize environmental impacts but also improves operational and life-cycle costs and economic performance. **CORTEX, its partners, and investors will be constructing numerous new buildings in the district over the next 20 years, providing an opportunity to implement sustainable site and building standards.** The U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) program provides an industry-standard evaluation and benchmarking programming for new buildings, existing buildings, operations, and neighborhoods. The Sustainable Sites Initiative (SITES) provides a comparable program for sites and landscapes. The CORTEX district is ideally positioned to take advantage of these programs due to its proximity to existing mixed-use development, residential neighborhoods, and transit. Actions to achieve this strategy include:

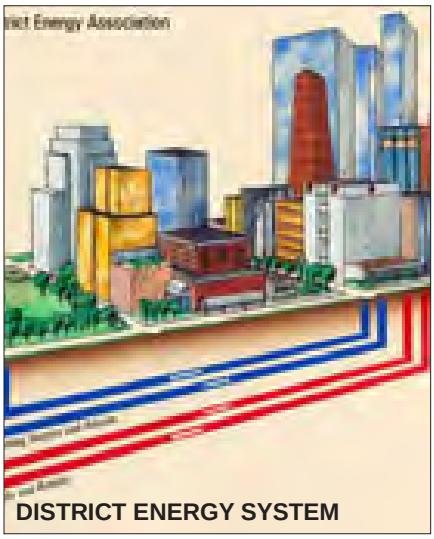
- **Establish and incentivize compliance with minimum LEED Operations & Maintenance (OM) standards for existing buildings.**
- **Establish minimum LEED New Construction (NC) and LEED Neighborhood Development (ND) standards for new buildings.**
- **Establish minimum Sustainable Sites Initiative (SITES) standards for landscapes, sites, and public space.**
- **Establish maximum greenhouse gas emission targets and benchmarks for the CORTEX district.**
- **Establish energy use targets and benchmarks for the CORTEX district.**

7. IMPLEMENT DISTRICT AND ALTERNATIVE ENERGY FOR NEW DEVELOPMENT

CORTEX, its partners, and investors will be constructing numerous new buildings and renovating existing buildings in the district over the next 20 years, providing an opportunity to implement district energy. Centralized district heating, cooling, and energy generation strategies offer a number of benefits over building-by-building energy and air conditioning solutions. District energy can realize greater levels of efficiency over distributed building systems; a typical district heating and cooling plant can achieve 80-percent efficiency, versus only 40- to 50-percent efficiency for distributed building systems. In addition, district energy plants can more feasibly use alternative energy sources—including solar, geothermal, and biomass—than individual building systems and a centralized systems can lead to increased efficiency in operations and maintenance costs. One of the major difficulties with district energy is that it cannot easily be retrofitted to existing buildings. In cases of new development and significant rehabs, however, district energy can be a cost-effective and sustainable solution. Actions to achieve this strategy include:

- **Construct a district heating and cooling plant and distribution system.**
- **Construct alternative energy supplemental power generation for the district.**
- **Incentivize individual building alternative energy supplemental power generation.**
- **Utilize natural gas and alternative energy for district shuttle service vehicles.**
- **Provide charging stations for plug-in hybrid vehicles.**
- **Utilize district-created waste for biomass energy generation.**
- **Establish self-generated energy ratio targets and benchmarks.**

CAMPUS DISTRICT HEATING PLANT



DISTRICT ENERGY SYSTEM

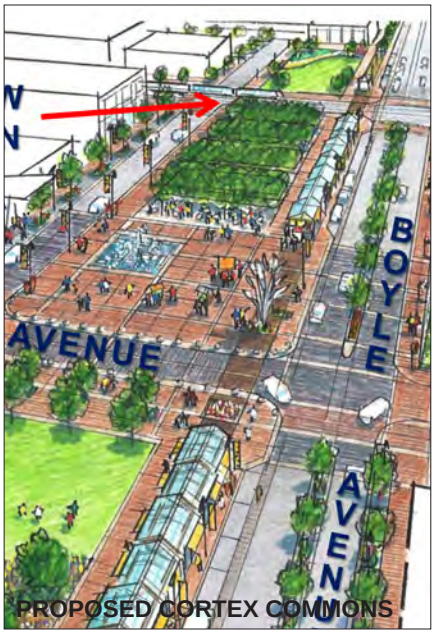
BUILDING WIND TURBINE

CORTEX DISTRICT HEADQUARTERS

8. CREATE A COHERENT CORTEX DISTRICT BRANDING IMAGE

One of the major challenges faced by the CORTEX district is a lack of an easily-recognized identity. Today, the district is largely inhabited by transitioning and underutilized light industrial buildings and administrative back office and utility functions. It does not possess the character exhibited in the Central West End or the Grove and Forest Park Southeast. As a result, the district is perceived as a kind of "no man's land" between an established neighborhood to the north and an emerging neighborhood and commercial district to the south, limiting the connectivity potential through the district. **As part of district development and in order to elevate the CORTEX district as distinct and recognizable district or neighborhood in the area, CORTEX should engage in a strategy to create new image or brand for the district.** Actions to achieve this strategy include:

- **Establish new and recognizable gateways into the CORTEX district.**
- **Reconceive of I-64 as a front door to the CORTEX district and create two front doors by extending CORTEX Commons north to Forest Park Avenue and south to I-64.**
- **Establish design standards for street lighting, street trees, and street furniture.**
- **Establish landscape standards for streetscapes and building sites and "green" the district with new trees and landscape.**
- **Create a primary east-west link through the district utilizing green infrastructure, signature landscaping, design elements, and street furnishings.**
- **Establish material and design standards for sidewalks and crosswalks.**
- **Establish a district color palette for public space fixtures and equipment.**
- **Create district branding and signage standards.**
- **Create district imagery, advertisements, and banners.**
- **Establish partnerships for district art and public art installations.**



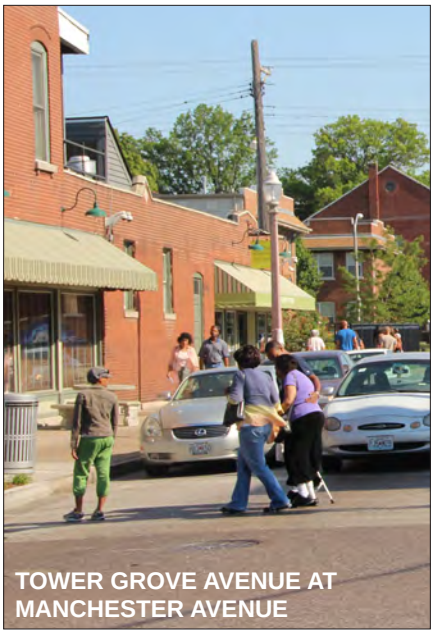
PROPOSED CORTEX COMMONS

CONCLUSION

The proposed MetroLink station at Boyle Avenue in the CORTEX district should be a key development initiative for the City of Saint Louis, CORTEX, and Metro and will be an invaluable asset in the future development potential of both the CORTEX district and the region-wide MetroLink system. While the opening year projections for the station falls short of the Metro planning ridership threshold, the location of the proposed station has some of the greatest and most high-value development potential in the St. Louis metro area. As this Study demonstrates, appropriate residential densities, transit-oriented development strategies, and programming & operations will allow the proposed CORTEX station to operate in the top 20 percent of stations system-wide.

For the future of the CORTEX district, construction of this station is essential. Market research has demonstrated that the knowledge-worker of the 21st century places a high premium on issues of livability, sustainability, and access to a vibrant public life after work. Adjacency to great neighborhoods and main streets; dense mixed-use development supporting a variety of uses and activities; vibrant walk-able and bike-able streets; and access to transit all provide a competitive edge that can be most fully realized in urban research parks. In order to capitalize on years of public and private investment and attract and retain the best and the brightest, it is imperative that development in the CORTEX district unlocks the latent potential present in the district's enviable location in the heart of Saint Louis. A key component of this development is the proposed construction of a new MetroLink station at Boyle Avenue.

Finally, construction of this station and implementation of the Street-Level Connectivity Plan and TOD & Sustainable Design Strategies will broad-reaching effects on neighborhoods and institutions surrounding the district. The MetroLink station will provide a transit amenity that is strongly desired by residents of the Central West End, Forest Park Southeast, Botanical Heights, and Shaw neighborhoods. Combined with high-quality pedestrian and bike crossings at I-64, streetscape and public realm improvements, and new commercial development and neighborhood service amenities, it will ensure that the CORTEX district becomes an integral and important linkage interconnecting these neighborhoods, their workers, and their residents.



TOWER GROVE AVENUE AT MANCHESTER AVENUE

1 | Introduction

A METROLINK TRAIN APPROACHING BOYLE AVENUE

INTRODUCTION

Many years in the making and located in the heart of City of Saint Louis' central corridor, the CORTEX district is nestled between the Central West End, Forest Park Southeast, Midtown, and the bustling BJC Kingshighway Campus. CORTEX is a life sciences research district in the City of Saint Louis bordered by its five founding sponsors —BJC Healthcare, Missouri Botanical Garden, Saint Louis University, University of Missouri-St. Louis, and Washington University. In addition, CORTEX is bounded on the south by I-64 and bisected by the MetroLink Red/Blue Line, making it ideally-located for a life-sciences research park from the standpoint of visibility, accessibility, and adjacency to significant medical centers and universities. These assets are supported by great amenities including residential neighborhoods and commercial main streets. However, the district as a whole is ill-defined in terms of identity, character, and perceptible boundaries. Originally developed as a light-industrial enclave, the CORTEX district faces major challenges moving forward to make itself feel welcoming, pedestrian-friendly, and fundamentally connected to its surrounding neighborhoods and amenities.

Market research has demonstrated that the knowledge-worker of the 21st century places a high premium on issues of livability, sustainability, and access to a vibrant public life after work. Adjacency to great neighborhoods and main streets; dense mixed-use development supporting a variety of uses and activities; vibrant walk-able and bike-able streets; and access to transit all provide a competitive edge that can be most fully realized in both great neighborhoods and urban research parks. In order to capitalize on years of public and private investment and attract and retain the best and the brightest, it is imperative that development in the CORTEX district unlocks the latent potential present in the district's enviable location in the heart of Saint Louis. A key component of this development is the proposed construction of a new MetroLink station at Boyle Avenue.

This station will be an invaluable asset in the future development potential of both the CORTEX district and the region-wide MetroLink system. The location of the proposed station has some of the greatest and most high-value development potential in the St. Louis metro area. Residential density surrounding the new station is over 30 people per acre, and employment density exceeds 75 people per acre; this population represents a significant benefit to Metro as a source of new MetroLink riders. The proposed station has the potential to function both as a transit option for current and future area

Context Map

CORTEX Redevelopment Area
Small Circles: 1/4 Mile (5 Minute Walking) Radius from existing or proposed MetroLink station
Large Cricles: 3/4 Mile (5 Minute Bike Ride) Radius from existing or proposed MetroLink station
MetroLink Route
MetroLink Stop

TOWER GROVE AVENUE AT THE MISSOURI BOTANICAL GARDENS

residents and employees, as well as a major amenity and connective element for the surrounding neighborhoods and residents. The City of Saint Louis, Metro, and CORTEX possess a significant opportunity to recreate the district as a key link between surrounding neighborhoods, with the ability to tie these neighborhoods together with public spaces, great pedestrian streets, mixed-use development, and transit access.

STUDY OBJECTIVE

The Transit Oriented Development Study (TOD) for the CORTEX District (the Study) seeks to establish projections for net new riders on the MetroLink light rail system over a 20-year planning horizon resulting from the construction of a new MetroLink station in the CORTEX District. The Scope of this Study is focused primarily on proposed ridership projections based on planned investments in CORTEX and the surrounding areas. Metro Saint Louis Transit and the Bi-State Development Agency (Metro), owners and operators of the MetroLink and MetroBus transit systems, have established target thresholds as goals for proposed stations. Additionally, CORTEX has retained separate firms to establish the district economic development plan and create the district master plan. This Study encompasses the analysis required by Metro, provides proposals to increase ridership by improving connectivity, enhancing programming and operations, and provides strategies for increased development density.

The City of Saint Louis, CORTEX & Metro possess a significant opportunity to reimagine the district **as a key link between its surounding neighbors.**

STUDY DEVELOPMENT & FUNDING

As noted above, the Study is funded with a portion of the $4.7 million Sustainable Communities Regional Planning Grant from the U.S. Department of Housing and Urban Development through the East-West Gateway Council of Governments. Additional funding for the Study was provided by three partners: the Saint Louis Development Corporation (SLDC), CORTEX, and the Missouri Botanical Garden. The Missouri Botanical Garden's interest was specifically focused on improving the connectivity between its facility and MetroLink, which led to the Study's emphasis on the Tower Grove Avenue corridor.

The Transit Oriented Development Study for the CORTEX District is closely aligned with the goals of the HUD-DOT-EPA Partnership for Sustainable Communities Livability Principles and is comprised of the following components: 1) a projection of MetroLink system net new

riders over a 20 year planning horizon based on CORTEX district and surrounding area development plans; 2) planning Scenarios to increase net new ridership projections; 3) a Street-Level Connectivity Plan to enhance pedestrian and bike access to the proposed station from surrounding neighborhoods and institutions; and 4) TOD and Sustainable Development Strategies for the CORTEX District.

Connecting existing residents to existing and planned modes of transit is a major component of sustainable neighborhood development and a stated requirement of the Study. The project Study Area incorporates the existing Central West End MetroLink station and extends from approximately one quarter mile west of Kingshighway Boulevard (west) to one half block east of Compton Avenue (east) and from one half block north of Olive Boulevard (north) to one half block south of Hartford Avenue (south). This study area contains approximately 25,000 existing residents and 50,000 existing employees, a significant opportunity for enhancing connectivity, mobility, and access to transit.

PARTNERS & ADMINISTRATION

The Study is administered by the Saint Louis Development Corporation (SLDC). SLDC, in partnership with CORTEX, the Missouri Botanical Garden, and the City of Saint Louis Planning and Urban Design Agency forms the Client Group (Client) for the Study. The Project Team lead is H3 Studio, performing project direction, planning, and project management. Project Team partners Bernardin, Lochmueller & Associates (BLA) perform transit planning and ridership scenario modeling; Innis Consulting assists BLA with transit policy and operations recommendations; David Mason & Associates (DMA) develops the street-level connectivity plan; and Vector Communications leads public outreach and communication efforts.

The Saint Louis Development Corporation (SLDC) is responsible for the project administration. Karin Hagaman, Major Project Manager, is in charge as project coordinator. The Client Group team consists of Karin Hagaman, Dennis Lower (CORTEX), Mike Sullivan (CORTEX), Bob Herleth (Missouri Botanical Garden), Catherine Werner (City of Saint Louis Director of Sustainability), and Don Roe (City of Saint Louis Planning and Urban Design Agency. The project team held four (4) coordination and review meetings with the Client Group team throughout the course of the Study for regular guidance and review of materials and work products.

PLANNING PROCESS SCHEDULE

Project Kick-Off Meeting
February 3, 2012

Stakeholder Interviews
February - May 2012

Client Group Meeting 01
April 2, 2012

Advisory Committee Meeting 01
April 4, 2012

Client Group Meeting 02
April 27, 2012

Public Workshop
May 15, 2012

Advisory Committee Meeting 02
May 17, 2012

Citizens for Modern Transit Presentation
May 18, 2012

PLANNING PROCESS

This Study took place over the course of four-and-a-half months and involved regular interface between the Client Group and the Project Team. In addition, the Project Team met with an assembled Advisory Committee and conducted extensive public and stakeholder outreach. These efforts allowed the Project Team to collect a large amount of data and feedback from a wide cross-section of neighborhood residents, institutional and governmental staff, and community members. The public and stakeholder outreach initiatives have helped to enrich the recommendations of the study and have helped to build a broad base of consensus and support for the project.

ADVISORY COMMITTEE

The purpose of the Advisory Committee was to provide directed guidance to the Planning Team and review of in-progress work, public engagement materials and initiatives, and public work products. The Advisory Committee was comprised of representatives from key agencies and institutions involved in the Study, including CORTEX, the Missouri Botanical Garden, BJC Healthcare, Washington University in St. Louis and the Washington University Medical Center, Metro, the East-West Gateway Council of Governments, Citizens for Modern Transit, Great Rivers Greenway District, the Saint Louis Development Corporation, and the City of Saint Louis. Refer to the *Acknowledgements* section on page 2 for a complete list. The Advisory Committee was identified by the Client Group, with assistance from the Project Team, to serve as a representative cross-section of project partners and stakeholders for decision-making and feedback.

STAKEHOLDER INTERVIEWS

Additionally, the Client Group and the Project Team identified over 60 project Stakeholders to be interviewed as part of the planning process. Stakeholders included residents of the Central West End and Forest Park Southeast neighborhoods; business and property owners; developers; City staff; Alderpersons; institutional representatives; non-governmental organizations; and other interested parties. These Stakeholders were organized into sixteen (16) small focus groups and invited to speak with the Project Team in one-on-one, confidential work sessions. These Stakeholder Interviews were critical in shaping the Project Teams' understanding of the CORTEX district, surrounding neighborhoods, and transit use and accessibility. While comments provided by the Stakeholders are confidential and not attributed to

any particular individual, information collected is compiled in the Consensus Issues and Consensus Ideas. A full list of all Stakeholder Interviewees is provided in the Appendix of this document.

PUBLIC ENGAGEMENT

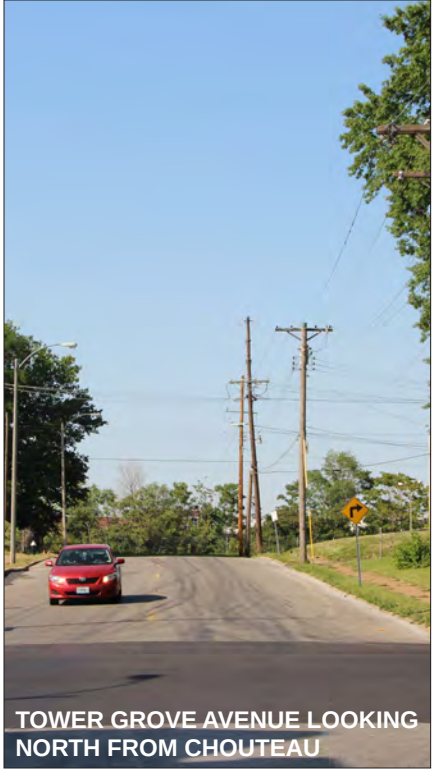
In addition to the regular meetings with the Client Group team and Advisory Committee, the Project Team and Client also conducted a Public Workshop. The purpose of this Workshop was to present the Study results to date and collect input and feedback from the attendees. The Public Workshop was held on Tuesday, May 15, 2012 in the lobby of the CORTEX Building at 4230 Forest Park Avenue. The Workshop began with introductions from the Client Team and a presentation by the Project Team outlining the current development of the Study. This presentation lasted approximately 45 minutes. Following the presentation, attendees broke up into small groups to work hands-on with Work Boards prepared by the Project Team that summarized the content of the presentation. Attendees were encouraged to write and draw their ideas on the Work Boards, which were collected by the Project Team for review and summation. This small group work session about lasted thirty-minutes and concluded with a public "report out" of key ideas from each of the small groups. Following the Public Workshop, the Project Team reviewed the comments selected and prepared summary documents for submission to the Client.

To maximize community participation at the Work Session, Vector Communications conducted a public awareness and outreach campaign. The approach involved a comprehensive campaign that aimed to touch target audiences at least seven times. These exposures occurred through: social media marketing, direct mail, posters, phone calls, media relations, email marketing, online calendar posts and personal stakeholder invitations during interviews. The public outreach campaign resulted in 850 people directly touched, with 62 people attending the Public Workshop. This translates into an attendance conversion rate 7.3 percent invitees to attendees. The average attendance conversion is usually only two- to three-percent, making the public outreach efforts for the Study extremely successful. A full report on the public outreach process is provided in the Appendix of this document.

THE MAY 15 PUBLIC WORKSHOP IN THE CORTEX LOBBY

THE MAY 15 PUBLIC WORKSHOP IN THE CORTEX LOBBY

THE MAY 15 PUBLIC WORKSHOP IN THE CORTEX LOBBY



TOWER GROVE AVENUE LOOKING NORTH FROM CHOUTEAU

PROJECT ASSUMPTIONS & EXISTING CONDITIONS

The TOD Study for the CORTEX District is predicated on a number of assumptions based on the existing CORTEX development plans and other information provided to the Project Team. The CORTEX plan is based around the concept of the CORTEX Commons, a plaza-like central square located along Boyle Avenue between Duncan Avenue and Clayton Avenue. It is also the general location of the proposed new MetroLink Station. In addition, CORTEX's current plans call for the re-creation of Duncan Avenue as a major east-west bicycle and pedestrian street. These are the public space amenity around which the first phase of planned redevelopment projects are located.

In the context of regional connectivity, both Tower Grove Avenue and Clayton Avenue are identified in the Regional Bike Plan as important shared bike facilities. Clayton Avenue is a key east-west connector through the CORTEX district and Forest Park but provides limited access to the east. Tower Grove Avenue is an essential north-south connection between the proposed MetroLink station, the Missouri Botanical Garden, and neighborhoods to the south; it is the only neighborhood street that continues south of Vandeventer Avenue. However, the proposed MoDOT interchange improvements at Tower Grove and Boyle Avenues and I-64 will significant inhibit north-south bicycle and pedestrian connectivity across the highway; vehicular access will be enhanced but I-64 will remain a major pedestrian barrier.

Redevelopment plans for the CORTEX District are projected to generate **11,500 new jobs** over the next 20 years.

Finally, the proposed redevelopment plans for the CORTEX district will generate a net increase of 11,500 jobs over twenty (20) years. This increase is based on: 1) current CORTEX development plans provided to the Project Team and 2) the assumption that employment in the BJC/ Washington University Medical Center Kingshighway Campus will remain at current levels or increase over the same timeframe. Please note that this Study was completed between February and June 2012. Subsequent to completion of this Study, CORTEX amended their Master Plan and thereby revised the district development program and employment projections. Despite these revisions, overall ridership forecasts for the proposed MetroLink station remain valid.

In addition to the project assumptions and existing conditions outlined previously, the Project Team identified and compiled a number of Consensus Issues and Consensus Ideas for the Study Area, CORTEX district, and proposed MetroLink station. These Consensus Issues and Ideas were developed from on-site analysis, stakeholder interviews, and feedback from the Client Group and Advisory Committee.

CONSENSUS ISSUES
CORTEX DISTRICT

1. In order to justify a new MetroLink station, it must be demonstrated that the new station will result in a net increase of new riders over 20 years.

2. The new interchange at Boyle and Clayton Avenues results in complex movement patterns, difficult connections for pedestrians/bikes and facilitates greater volumes of vehicular traffic into the district.

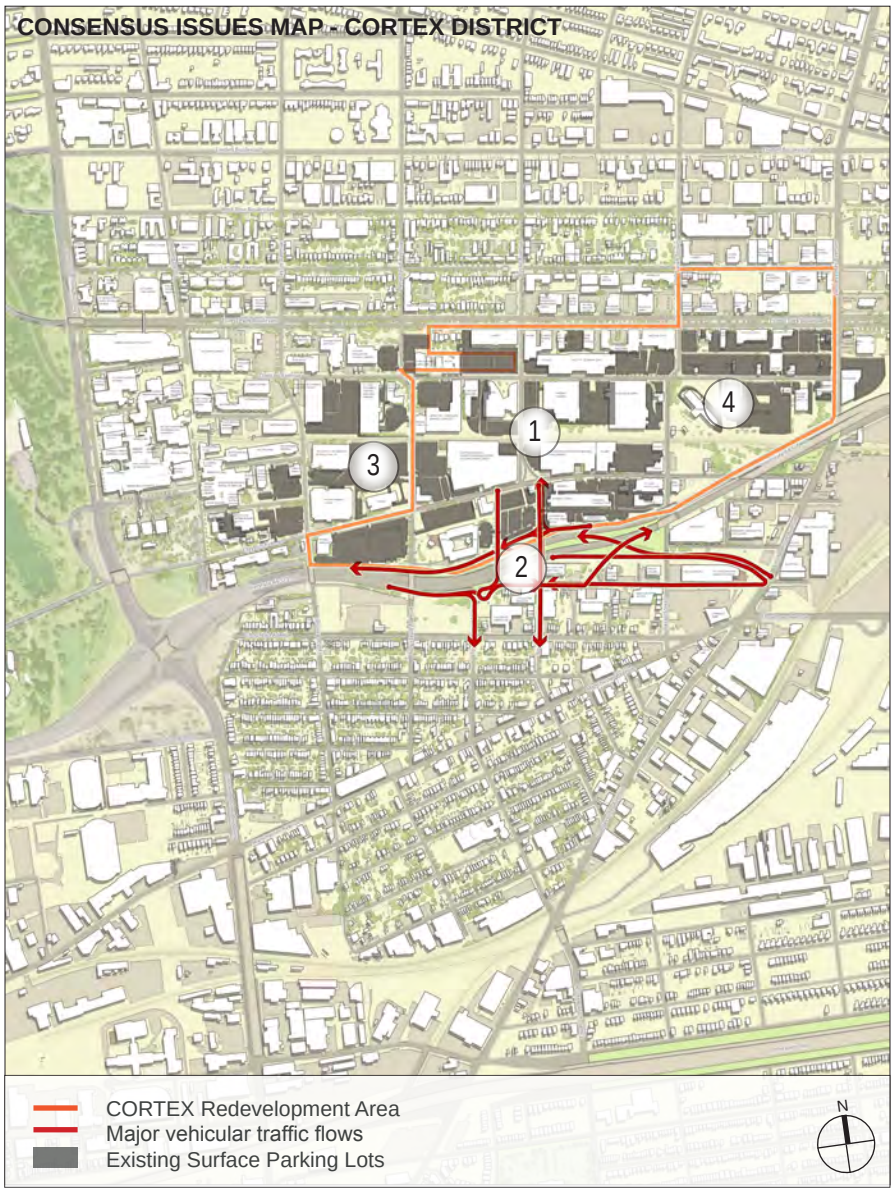
3. Large quantities of free surface parking are prohibitive to developing a dense, urban district.

4. The lack of a district-wide parking strategy puts pressure on the adjacent Central West End and Forest Park Southeast residential neighborhoods as CORTEX users turn to these areas for free parking.

5. In order to achieve necessary densities, ridership, walkability & vibrancy, mixed-use development is required for the CORTEX/BJC-WUMC district.

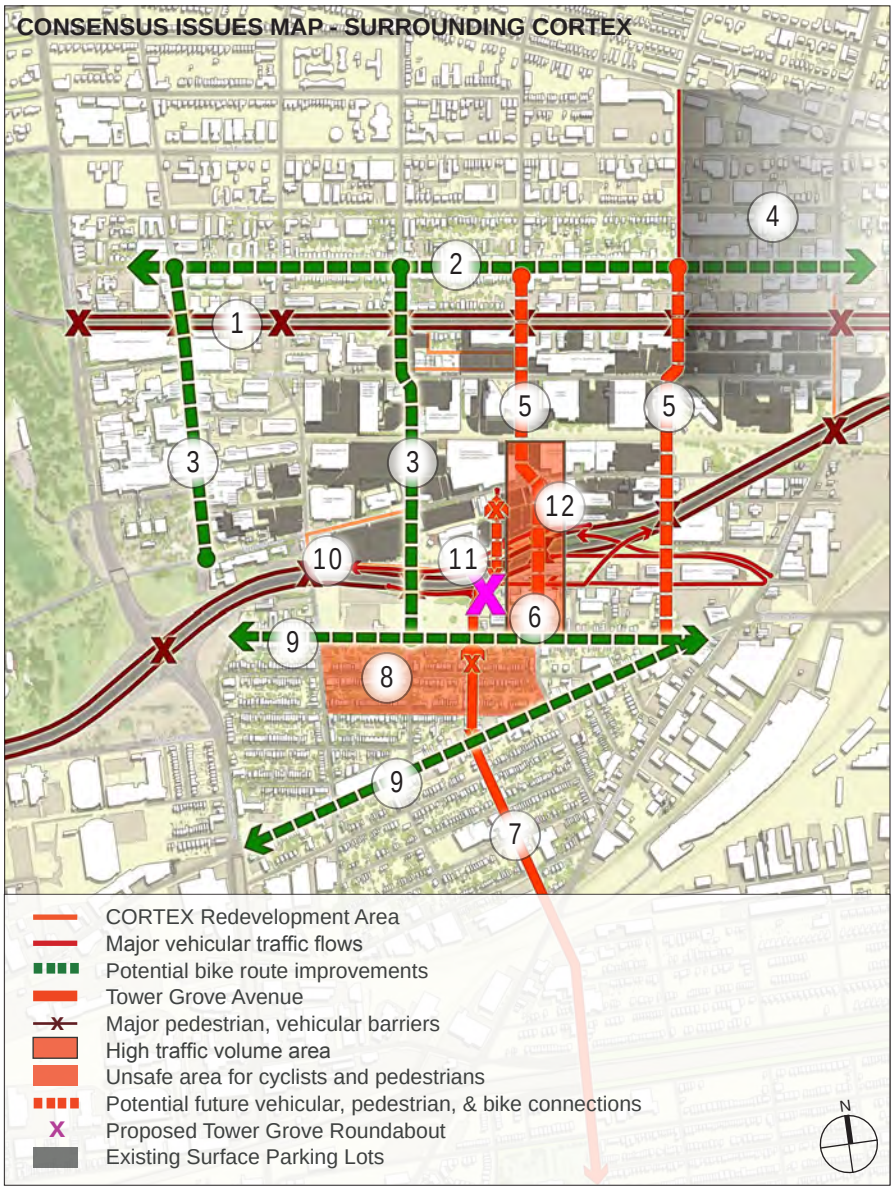
6. The ability of the new MetroLink station to attract riders is heavily dependent on the surrounding uses, amenities and connectivity.

7. CORTEX MetroLink station needs to be integrated into a larger transit and transportation strategy for the CORTEX/BJC-WUMC district.



CONSENSUS ISSUES SURROUNDING CORTEX

1. Forest Park Avenue is perceived as unfriendly to bikes and pedestrians for east-west travel and crossing.
2. Laclede Avenue is the major east/ west pedestrian connector north of Forest Park Avenue.
3. Euclid and Newstead Avenues are the primary pedestrian north/ south crossing points of Forest Park Avenue.
4. Walkability from the east and St. Louis University is inhibited by adjacent land uses and streetscape conditions, although people do walk to the CWE station.
5. Boyle Avenue and Sarah Street are perceived as unfriendly to pedestrians due to streetscape conditions and adjacent land uses.
6. Boyle Avenue is perceived as unsafe and unfriendly for cyclists due to poor streetscape quality and pavement condition.
7. Tower Grove Avenue is perceived as unsafe and unfriendly for bikes due to poor streetscape quality, pavement condition, and the Vandeventer intersection.
8. The area of the Forest Park Southeast neighborhood bounded by Chouteau (north), Arco (south), Boyle (east), and Taylor (west) is perceived as very unsafe for cyclists and pedestrians.
9. Major opportunities for east/west pedestrian/bike connectivity exist on Chouteau and Manchester Avenues.
10. The I-64 corridor and proposed interchange is a significant barrier to major pedestrian and bicycle connectivity.
11. The roundabout as proposed at the new Tower Grove/I-64 interchange is unfriendly to pedestrians and provides little support for cyclists.
12. North of I-64, Boyle Avenue as proposed will carry higher volumes of vehicular traffic.

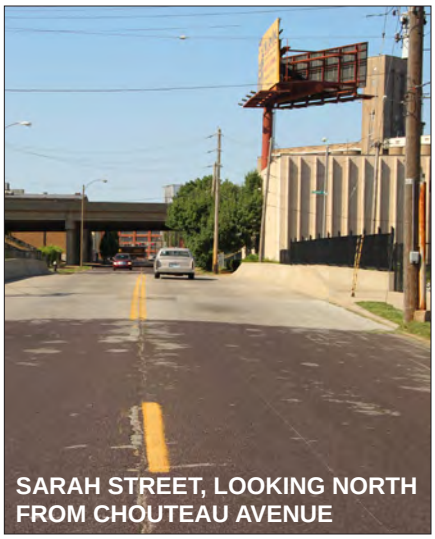


CONSENSUS IDEAS

1. Develop the CORTEX district as a mixed-use, urban district.
2. Develop alternate and/or dedicated bicycle and pedestrian connections to Tower Grove Avenue across the I-64/U.S. 40 corridor.
3. Create an east/west pedestrian connector through the CORTEX district.
4. Develop a CORTEX circulator bus system to connect surrounding neighborhoods to the Central West End and new CORTEX MetroLink stations.
5. Develop a rubber-wheel trolley express transit system along Tower Grove Avenue.
6. Connect the Missouri Botanical Garden to the CORTEX MetroLink station via the Garden bus line.
7. Develop Sarah Street and Vandeventer Avenue as a mixed-use commercial district.
8. Implement a district-wide, paid parking strategy to reduce automobiles in the district.
9. Create the CORTEX MetroLink station as a bicycle transfer station with showers, changing rooms, and bike storage.
10. The community is overwhelmingly supportive of the proposed CORTEX MetroLink station.

LACLEDE AVENUE IS A MAJOR EAST-WEST PEDESTRIAN ROUTE

TOWER GROVE AVENUE AT VANDEVENTER AVENUE



SARAH STREET, LOOKING NORTH FROM CHOUTEAU AVENUE

2 | Baseline Ridership **Projections**

TOWER GROVE AVENUE AT MANCHESTER AVENUE

DEFINING EXISTING MARKETS & CAPTURE RATES

Market areas that would contribute potential ridership to the proposed station were defined based on information from a compilation of sources, including typical rules-of-thumb and national research.

A GIS database of the study area was obtained from the City's Planning and Urban Design Agency. This database included parcel and zoning information and was appended with population data from the 2010 Census and employment data from a proprietary source shared by East-West Gateway. This information was supplemented by data from the Longitudinal Employer-Household Dynamics (LEHD) dataset, which is a source of more detailed data regarding the characteristics of employment trips.

The scale of the market areas for potential ridership capture was established using specific radial distances from the proposed station. Distance from the station has a significant influence on the decision to use transit, and the distance thresholds vary depending upon the mode of travel to/from the station (walk, bike, drive). Generally, walk-to-transit trips occur within a small radius around the station, whereas bike-to-transit and drive-to-transit trips occur within a larger area. These radial distances define areas of transit capture.

Capture rates are primarily a function of distance from the proposed station, but they are also influenced by **connectivity, safety & quality of the walking environment.**

Population and employment were then quantified within each of the capture areas to identify potential markets from which to capture transit ridership, with population serving as a source of potential transit trip origins and employment serving as a source of potential transit trip destinations.

Only portions of the population and employees residing within the market (capture) areas surrounding the proposed station would become transit riders. These portions are defined as capture rates, which are percentages applied to the population and employment totals within the capture areas.

While capture rates are primarily a function of distance from the proposed station, they are also influenced by other factors, such as connectivity, quality of the walking environment, safety, etc. Moreover, different capture rates are usually applied depending on the mode of travel to/from the station (walk, bike, drive). Note that walking was the only mode assumed for transit trips ending at the proposed station.

WALK TO / FROM TRANSIT

The quality of the walking environment near the proposed station was quantified using Walk Score, a professional and consumer service that measures walk-ability based on distances to amenities in various categories (http://www.walkscore.com). The intersection of Boyle and Duncan Avenues has a Walk Score of 80 out of 100, which indicates the area is very walkable. A pedestrian friendliness measure, which considers the number of intersections and block lengths, was also applied. The same location received a score of 71 out of 100, which reflects above average pedestrian friendliness. Refer to http://www.walkscore.com/ for additional information.

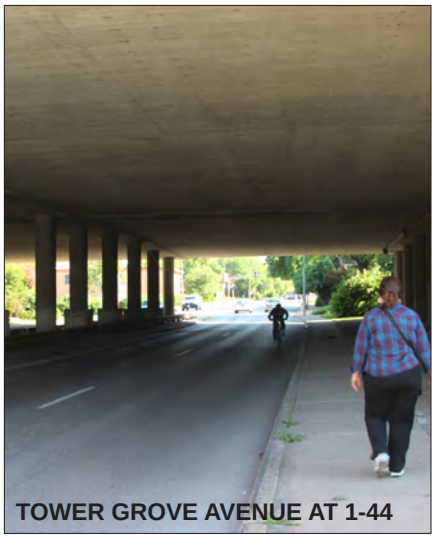
Observations of pedestrian conditions in the area revealed numerous locations of dilapidated pedestrian infrastructure and inadequate pedestrian treatments at intersections. Moreover, Interstate 64 and Forest Park Avenue are major transportation arteries that define the northern and southern boundaries of CORTEX, and they tend to be inhibitors of pedestrian connectivity to the adjacent neighborhoods.

Traditionally, ½ mile from a station or a 10-minute walk has been used as the typical walking distance from which to capture ridership, although it is now recognized that some riders walk distances in excess of ½ mile, particularly those walking to the station at the origin end of their transit trip. For purposes of this analysis, a walk capture threshold of ½ mile was applied in an effort to be conservative. This same distance was assumed for walking to the station at the origin end of the transit trip as well as walking from the station at the destination end.

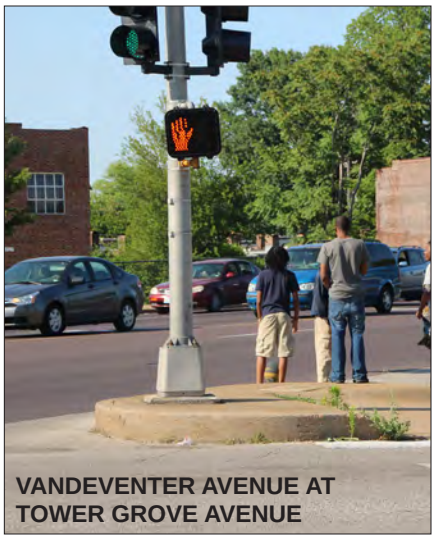
Population and employment within the ½ mile capture area were calculated using GIS. Note that the existing Central West End MetroLink Station is located approximately ½ mile west of the proposed station. Therefore, the two stations would have overlapping walk catchment areas. A procedure was employed to avoid counting residents and employees that are closer to the Central West End Station.

First, population and employment totals within the proposed station's ½ mile capture area were calculated. Then, the amount of population and employment within an area represented by overlapping ½ mile capture areas around both stations was calculated. This reflects riders located within ½ mile of both stations. A portion of the residents and employees within this combined area (assumed to be 75 percent) are closer to the Central West End Station and were not considered within the proposed station's walk capture area.

TOWER GROVE AVENUE
LOOKING NORTH FROM I-44



TOWER GROVE AVENUE AT 1-44



VANDEVENTER AVENUE AT
TOWER GROVE AVENUE

PEDESTRIAN CROSSNG AT VANDEVENTER AVENUE

The resulting population total within the proposed station's walkable market area is 2,773, and the resulting employment total is 4,842. Figure 2.1 illustrates the employment density within ½ mile of the proposed station based on the LEHD dataset. That source shows 15,351 primary jobs within that radius, which is higher than our calculations because it does not discount overlap with the Central West End Station and so employment on the Barnes-Jewish Hospital Complex is included.

55 percent of these employees live within 10 miles, and the majority resides to the west of the study area as depicted in Figure 2.2.

An inflow/outflow analysis of the ½ mile walking threshold indicates that only 105 people are both employed and reside within the area as shown in Figure 2.3.

Based on a review of national literature, it was determined that 10 percent would be a reasonable walk to/from transit capture rate for both population and employment within ¼ mile of the proposed station. Likewise, 5 percent would be an appropriate capture rate between ¼ mile and ½ mile. Outside ½ mile, the amount of capture would be nominal.

A capture rate specific to Transit Oriented Development was estimated in the mid-2000s as part of the MetroLink Metro South Study. An elasticity of 0.145 per TOD dwelling unit was calculated, which indicates a capture rate closer to 15 percent for TOD within ¼ mile of a station.

There are 2,773 residents and 4,842 employees living within a **1/2 mile walking radius of the proposed CORTEX MetroLink station.**

FIGURE 2.1: WALKING MARKET DENSITY

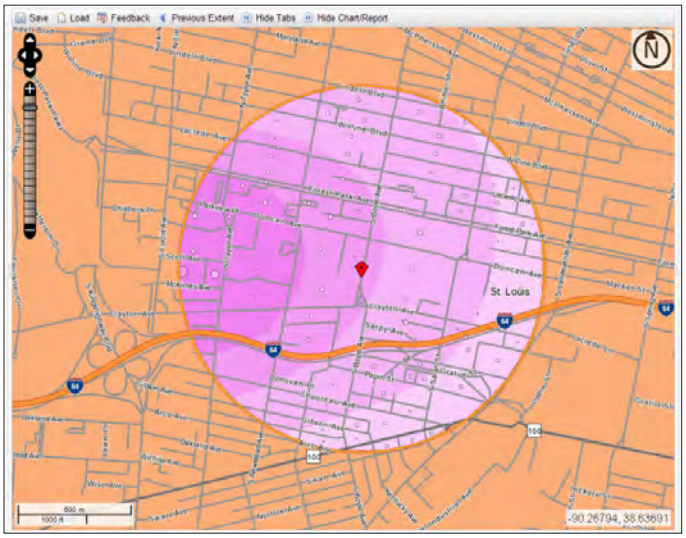


FIGURE 2.2: WALKING EMPLOYMENT TRAVEL

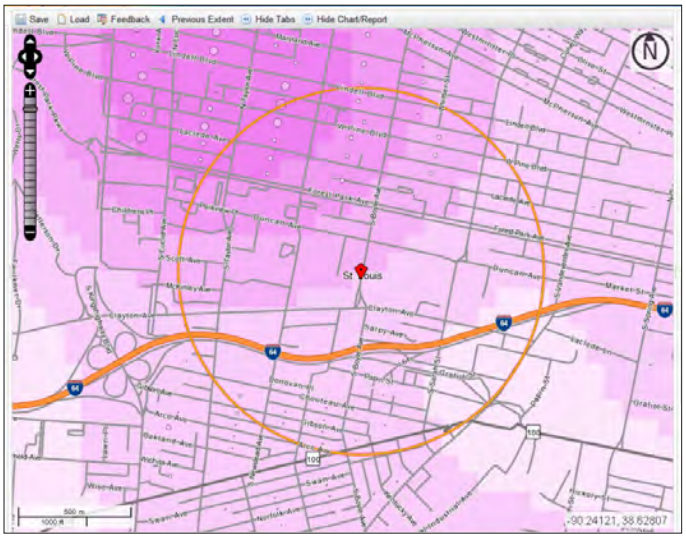
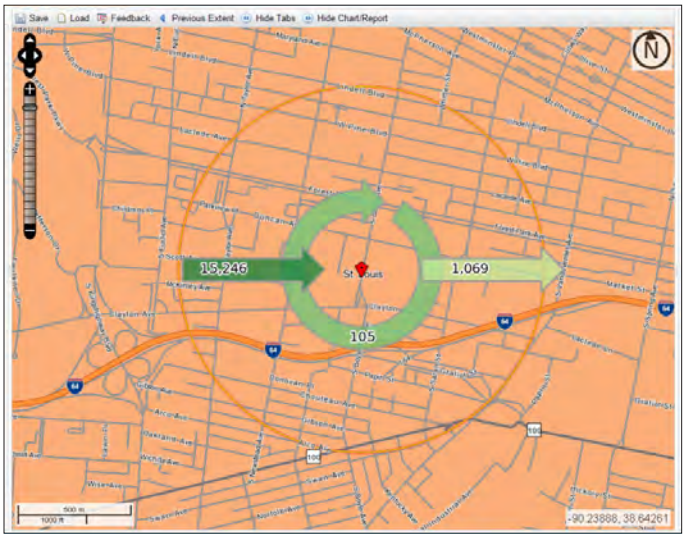


FIGURE 2.3: WALKING INFLOW/OUTFLOW ANALYSIS



CYCLISTS CROSSNG VANDEVENTER AVENUE AT TOWER GROVE AVENUE

BIKE TO TRANSIT

Bicycling speeds are much higher than walking speeds, which creates a larger market from which to capture bicyclists to transit. Aside from being larger than walk capture areas, bike capture areas are not well defined. Using the 10-minute standard of walk time to or from a station, a bicyclist could travel 1.5 to 2 miles during that same timeframe. To be conservative, a 1.5 mile radius for biking to transit was assumed for this analysis. This distance represents a significant increase in capture area as compared to walk to transit.

At that distance threshold, the residential capture is 34,733. Figure 2.4 illustrates the employment density within 1.5 miles of the proposed station based on the LEHD dataset. There are a total of 57,550 primary jobs within that radius.

56 percent of employees live within 10 miles, and the majority resides to the west and southwest of the study area as depicted by in Figure 2.5.

An inflow/outflow analysis of the 1.5 mile biking threshold indicates that about 5 percent of employees also reside within the area as shown in Figure 2.6.

Our research did not reveal definitive bike to transit capture rates since these rates vary significantly by region and are heavily dependent upon climate, whether the surrounding roadway infrastructure is bicycle-friendly, etc. Other information was solicited to help identify the potential capture of bicyclists.

A bicyclist can travel approximately **one-and-a-half to two miles** in 10 minutes.

It was discovered that the overall bicycle mode share in the St. Louis Metropolitan Stastical Area (MSA) is about 1 percent per the 2010 Census. Note that this figure should include only those trips where biking was the primary mode of travel. Transit trips that included travel by bicycle are likely excluded. However, Metro's 2008 Customer Service Survey indicated that about 1 percent of MetroLink riders arrive by bike. Based on that information, it was assumed that bicycle ridership could be conservatively estimated as approximately 1 percent of the proposed station's boardings as calculated for walk and drive access.

FIGURE 2.4: BIKING MARKET DENSITY

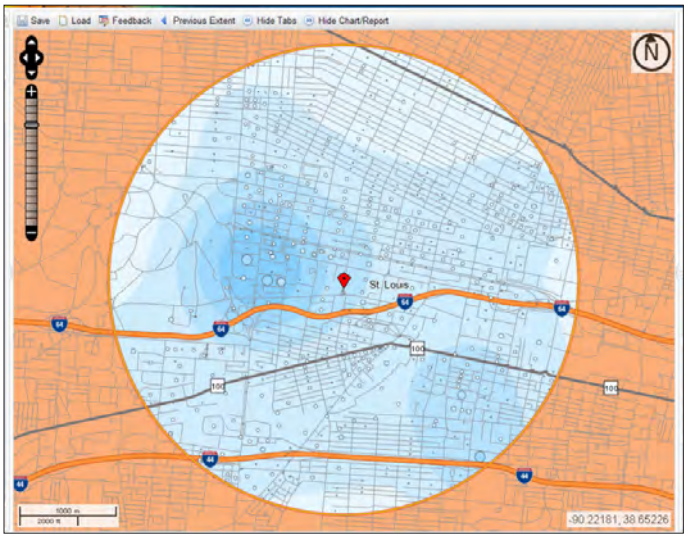


FIGURE 2.5: BIKING EMPLOYMENT TRAVEL

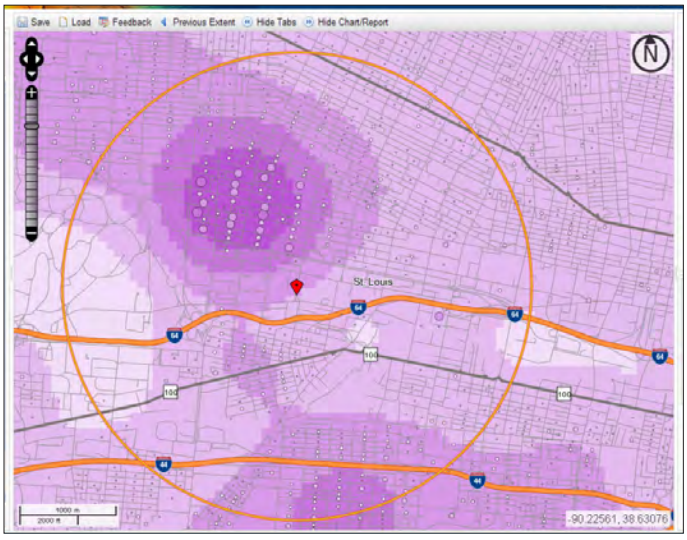
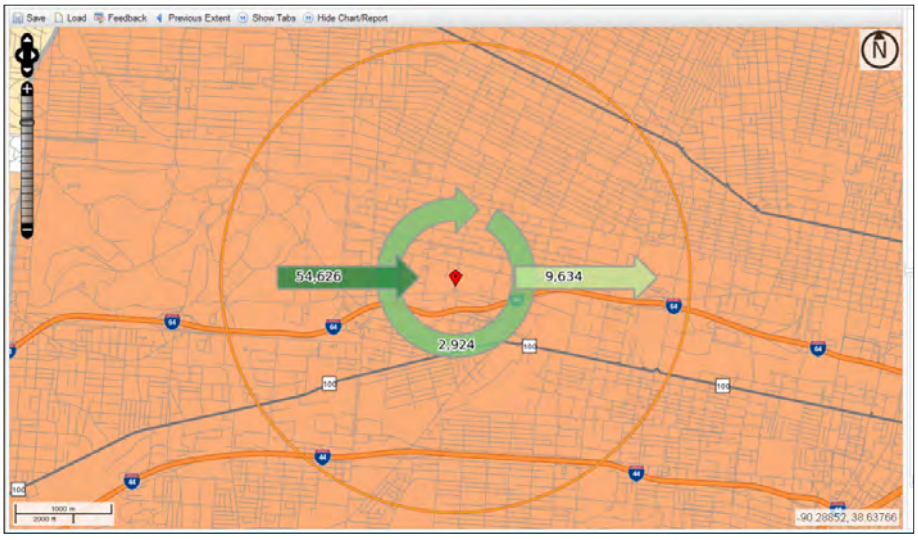
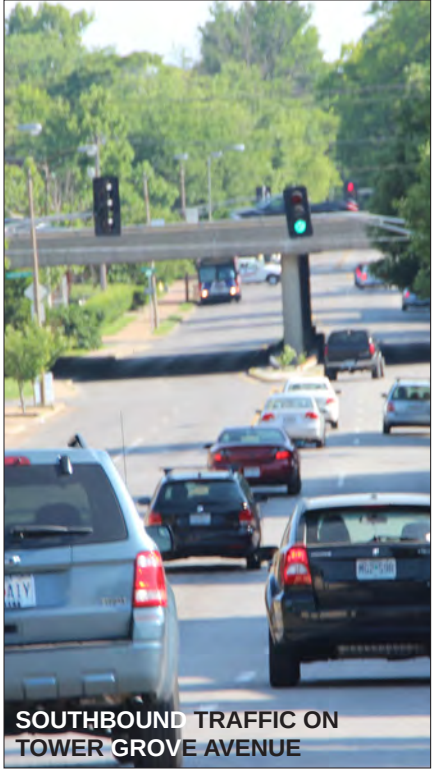


FIGURE 2.6: WALKING INFLOW/OUTFLOW ANALYSIS





SOUTHBOUND TRAFFIC ON TOWER GROVE AVENUE

DRIVE TO TRANSIT

The market area for driving to transit is difficult to define as it is influenced by many variables, including parking availability, parking costs, traffic congestion, etc. Park-and-ride habits also vary significantly from region to region. National research suggests about half of park-and-ride users drive less than 3 miles to their station, but some riders, particularly those driving to terminal stations with large park-and-ride facilities, may travel much further.

It is important to recognize that the proposed station would be urban in nature and park-and-ride would not be expected to be a major contributor of ridership. In that light, the proposed station would attract park-and-ride users from within a concentrated area consisting of surrounding neighborhoods within the City of St. Louis. A threshold of 2.5 miles was deemed appropriate and incorporates the City limits to the west, while stretching to Jefferson Avenue to the east, Arsenal Street to the south, and St. Louis Avenue to the north. The proposed station also has a greater likelihood of attracting more residents from neighborhoods in South St. Louis because there is no good atlernative for regional light rail.

Population and employment within this area amounts to 99,339 residents and 123,425 employees; as with market areas, transit capture rates are also not well defined for park-and-ride. Instead of applying capture rates to the market area, it would be more useful to compare park-and-ride usage at existing MetroLink stations with urban characteristics (i.e., Delmar, Forest Park, and Fifth & Missouri) in an effort to benchmark the park-and-ride ridership potential of the proposed station.

EXISTING TRANSIT SERVICE

Metro has nine local fixed MetroBus routes that provide regular service in and around the study area. Routes include the #01 Gold Line, #10 Gravois-Lindell, #13 Union, #18 Taylor, #42 Sarah, #59 Dogtown, #80 Park-Shaw, and #95 Kingshighway. The #70 Grand, operating just east of the study area, is the most utilized route in the system.

Metro has transitioned from the more traditional, radial configuration of fixed route MetroBus service to a transit-center-based system. This was driven, in part, by the need to better serve changes in regional travel patterns resulting from region wide shifts in population and

FIGURE 2.7: EXISTING TRANSIT SERVICE

employment. The purpose of these transit centers is to facilitate intermodal transfers between MetroBus and MetroLink riders as well as MetroBus-to-MetroBus transfers.

The MetroLink Light Rail system consists of approximately 46 miles of double-track, operated as two lines (red and blue). The Red Line runs from a western terminus at Lambert Airport to the Shiloh-Scott station in Illinois. The portion of the Red Line between the North Hanley and Fifth & Missouri stations was the original MetroLink segment, which opened in 1993. The original line was extended to Belleville in 2001 and eventually to Shiloh in 2003.

The Cross-County Extension opened in 2006, branching from the existing line at the Forest Park station. The extension runs west into Clayton before turning south towards the terminal station at Shrewsbury and I-44. Blue Line trains operate between Shrewsbury and Fairview Heights, overlapping with Red Line trains along the 14-station segment between Forest Park and Fairview Heights within the region's central corridor.

Existing MetroBus ridership is heaviest on north-south routes, and the **highest-volume MetroLink stations are located in the central corridor or at major park-and-ride facilities.**

Trains on each line operate at 12 minute headways during weekday peak hours and at 20 minute headways during off-peak hours and on weekends. MetroLink in the study area has peak headways of 6 minutes and off-peak headways of 10 minutes, reflecting combined Red Line-Blue Line service. The study area is served by the Central West End MetroLink Station, located between Euclid and Taylor Avenues on the campus of Barnes-Jewish Hospital.

Observed boardings by MetroLink station and MetroBus line were obtained from Metro for purposes of understanding existing ridership. Data was obtained from the 3 most recent fiscal years available. However, the focus was on the period between August 2010 and March 2011, which reflected ridership after the last major service restoration but before the closure of the Grand MetroLink station for construction. Seasonal adjustment factors were developed and applied to convert ridership during this period into annual equivalent values.

Existing MetroBus ridership is heaviest on north-south routes, including Grand (#70) and Kingshighway (#95). The highest volume MetroLink stations are located in the central corridor or at major park-and-ride facilities. The Central West End station in the study area is the busiest. Ridership at that location is aided by the density of the Barnes-Jewish Hospital complex and associated parking constraints, coupled with MetroBus transfer opportunities and the walkable proximity of adjacent neighborhoods, namely the Central West End. Refer to Figure 2.7 for existing boardings.

The Central West End MetroLink station is a major bus transfer center that serves the #01 Gold Line, #10 Gravois-Lindell, #13 Union, #18 Taylor, #42 Sarah, #59 Dogtown, #80 Park-Shaw and #95 Kingshighway.

FIGURE 2.7: CURRENT METROLINK BOARDINGS

Station	Average Weekday Boardings	Station	Average Weekday Boardings
CENTRAL WEST END	5,403	EMERSON PARK	877
FOREST PARK	3,940	CLAYTON	851
NORTH HANLEY	3,217	SHILOH-SCOTT	771
GRAND	3,075	UMSL SOUTH	750
CIVIC CENTER	3,014	SKINKER	746
DELMAR	1,915	UMSL NORTH	693
8TH AND PINE	1,873	MAPLEWOOD	693
FAIRVIEW HEIGHTS	1,864	BELLEVILLE	674
5TH & MISSOURI	1,819	EAST RIVERFRONT	672
SHREWSBURY	1,815	RICHMOND HEIGHTS	660
CONVENTION CENTER	1,653	WASHINGTON PARK	557
ROCK ROAD	1,628	U CITY BIG BEND	495
UNION STATION	1,568	JJK CENTER	480
LAMBERT TERMINAL 1	1,481	SWANSEA	458
ARCH LACLEDES	954	LAMBERT TERMINAL 2	423
WELLSTON	934	MEMORIAL HOSPITAL	402
BRENTWOOD	893	FORSYTH	392
STADIUM	891	SUNNEN	226
COLLEGE	889	**SYSTEM**	**49,646**

BOYLE AVENUE LOOKING TOWARD FOREST PARK AVENUE

Several MetroLink stations provide park-and-ride accommodations for riders. Space capacities at park-and-ride stations vary from 57 to over 1,700. Observations of park-and-ride space utilization from 2011 were obtained from Metro. Most stations have ample park-and-ride capacity, although the Richmond Heights and Forest Park surface lots were effectively full. Note that 58 parking spaces will be introduced at Grand as part of that station's reconstruction. Refer to Figure 2.8 for park-and-ride capacities

The study area's transit score was computed to quantify the sufficiency of public transit service. Transit Score, which is part of the Walk Score professional and consumer service referenced earlier in this document (http://www.walkscore.com/transit/), is based on data released in a standard format by public transit agencies. To calculate a Transit Score, the Walk Score service utilizes an algorithm that assigns a "usefulness" value to nearby transit routes based on their frequency, type of route (rail, bus, etc.), and distance to the nearest stop on the route. The "usefulness" of all nearby routes is summed and normalized to a score between 0 - 100. Measured from the intersection of Boyle Avenue and Duncan Avenue, the study area received a score of 62 which reflects good transit coverage. Refer to http://www.walkscore.com/transit/ for additional information.

Measured from the intersection of Boyle Avenue and Duncan Avenue, the CORTEX district recieves a **Transit Score of 62 out of 100,** indicating good transit coverage.

FIGURE 2.8: METRO PARK-AND-RIDE FACILITIES

Parking Lot Location	Parking Spaces	Spaces Occupied	% Full
East Riverfront	295	114	39%
5th & Missouri	328	159	49%
Emerson Park	816	201	25%
Washington Park	681	97	14%
Fairview Heights	853	552	65%
Memorial Hospital	431	129	30%
Swansea	716	244	34%
Belleville	287	195	68%
College	598	227	38%
Shiloh-Scott (Shiloh side*)	645	175	27%
Shiloh-Scott (Scott side*)	421	89	21%
Forest Park	118	113	96%
Richmond Heights	57	57	100%
Brentwood	914	178	20%
Shrewsbury	800	438	55%
Delmar Loop	362	187	52%
Wellston	242	43	18%
Rock Road	191	75	39%
UMSL South	130	97	75%
North Hanley	1,705	884	52%

TRAVEL DEMAND MODEL CALIBRATION

Ridership forecasts were generated using both the **regional transit demand model** maintained by East-West Gateway and **manual methods.**

Ridership forecasts for the proposed station were generated using both the regional travel demand model, maintained by East-West Gateway, and manual methods. Prior to applying the regional model, it was first necessary to determine its level of calibration relative to existing transit trips. If the model accurately predicts existing transit usage, it stands to reason that it would sufficiently estimate changes in ridership due to system enhancements (i.e., a new station).

Our calibration assessment initially focused on the version of the regional travel demand model that was available in March 2012. Several issues with that model's prediction of transit usage were uncovered. In particular, it substantially overestimated existing transit trips in the region. It was believed that this stemmed from inaccurate transit ridership counts. As a result, the model was likely calibrated to unrealistically high transit boardings.

East-West Gateway released an updated model version (TransEVAL v2.0) in mid-April 2012, and their representatives requested that the changes applied in the updated version be incorporated into this analysis moving forward. Upon initial inspection, the v2.0 model appeared to accurately predict existing transit trips in the region. However, several significant errors were discovered which, upon correction, reduced the model's accuracy. The corrections and associated transit ridership predictions are summarized in Figure 2.8. The adjustments lowered light rail boardings but significantly increased bus boardings.

Output from the final adjusted and calibrated regional travel demand model was compared to targets established for this project based on observed transit ridership data and customer survey information. The comparison is illustrated in Figure 2.9.

From the model, existing light rail boardings and trips were about 10 percent higher than observed amounts. Conversely, bus boardings and trips from the model were significantly higher. Combined with a high light rail transfer rate, this result suggests that the model overstated transit trips that begin by bus followed by a transfer to light rail. In actuality, many of these trips utilize only light rail.

It is our understanding that an abundance of bus to light rail transfers has been an issue dating back to the model's original calibration. This is a fundamental issue inherent to the model's existing structure and configuration, which could not be addressed by this project;

FIGURE 2.8: TRANSIT DEMAND MODEL CALIBRATIONS

Iteration	Model Adjustments	Daily Bus Boardings	Daily Light Rail Boardings
-	V2 Model as Provided by East-West Gateway	102,339	57,898
1	Enabled Bus/Light Rail Transfers Restricted Mode 36 Lot Links to 1-Way	100,457	50,434
2	Corrected Peak/Offpeak Bus Schedules	128,234	55,081
3	Prevented Bus Trips from Using Mode 36	131,134	55,459
4	Extended Blue Line Service to Fairview Heights Relocated Conv Ctr Station Off Road Network	131,610	53,549
5	Enabled Bus Park-N-Ride at Light Rail Stations	136,485	51,839
6	Modified Impedances on Park-N-Ride Lot Links	137,432	52,442

FIGURE 2.9: TRANSIT DEMAND MODEL & ESTABLISHED TARGETS

Transit Ridership Parameters	V2 Model Adjusted	Targets
Daily Bus Boardings	137,432	92,000
Daily Light Rail Boardings	52,442	47,500
Bus Transfer Rates	1.33	1.45
Light Rail Transfer Rates	1.6	1.35
Daily Bus Trips	81,531	53,855
Daily Light Trail Trips	51,280	43,885
Percent Access Light Rail by Driving	48%	50%
Percent Access Light Rail by Walking	52%	50%
Percent Access Bus by Driving	14%	10%
Percent Access Bus by Walking	86%	90%

nevertheless, the model's overall calibration with respect to light rail trips and boardings is sufficient to generate reasonably accurate forecasts for the proposed station. In fact, a snapshot comparison of modeled versus observed daily boardings at existing MetroLink stations in the central corridor nearest the study area is summarized below in Figure 2.10.

FIGURE 2.10: COMPARISON OF OBSERVED AND MODELED BOARDINGS FOR SELECTED METROLINK STATIONS

MetroLink Station	Modeled Boardings	Observed Boardings
Rock Road	1,714	1,628
Wellston	876	934
Delmar	2,636	1,915
Skinker	944	746
Forest Park	3,028	3,940
Central West End	3,589	5,430
Grand	2,998	3,075
Union Station	1,210	1,568
Civic Center	2,178	3,014
Stadium	1,206	819
Eighth & Pine	2,360	1,873
Convention Center	2,844	1,653

ESTIMATING FUTURE GROWTH

Master plan documents illustrating employment and population projections at build-out of the CORTEX district were obtained for purposes of estimating future growth. Projections were developed for both near-term and long-term planning horizons. The near-term horizon reflects development in the district at opening year of the proposed station, assumed to occur in 2017. The long-term horizon reflects build-out of the CORTEX district, assumed to occur by 2030. The developments within CORTEX that would occur by the near-term horizon are summarized in the table below. These projects are committed, and so there is a reasonable degree of certainty that they would be in place by 2017. In total, they would bring 3,110 jobs to CORTEX. While most of the developments would replace vacant structures, there would be minor displacement of existing employment, resulting in 327 jobs leaving the district. As a result, the net employment increase in the near-term would be 2,783 jobs, as shown in Figure 2.11. No changes in population are anticipated by 2017.

FIGURE 2.11: NEAR-TERM CORTEX EMPLOYMENT ESTIMATES

Development	Location	Employment Added
CORTEX I Expansion	4320 Forest Park Avenue	135
Crescent	West of Solae	150
WU Research	SE Quadrant Newstead & Duncan	1,200
BJC CBO	SE Quadrant Boyle & MetroLink	1,000
Heritage	NE Quadrant Boyle & MetroLink	625
Near-Term Total		**3,110**

The changes in employment are allocated to 1 of 3 zones representing the CORTEX district, as follows:

- **Zone 910 is bounded by Forest Park Avenue, Vandeventer Avenue, Sarah Street, and Lindell Boulevard;**
- **Zone 1031 is bounded by Interstate 64, Vandeventer Avenue, Forest Park Avenue, and Boyle Avenue; and**
- **Zone 969 is bounded by Interstate 64, Boyle Avenue, Forest Park Avenue, and Taylor Avenue.**

These same zones are employed by the regional travel demand model, maintained by East-West Gateway. Their limits are graphically illustrated in Figure 2.12 below. Figure 2.13 on the facing page provides near-term employment projections by zone.

FIGURE 2.12: RIDERSHIP CAPTURE ZONES FOR THE CORTEX DISTRICT

FIGURE 2.13: NEAR-TERM EMPLOYMENT PROJECTIONS BY ZONE

Zone	2010 EWG	Existing To Be Removed	CORTEX Added	2017 Projected
910	1,263	0	0	1,263
969	2,314	10	1,485	3,789
1031	1.285	317	1,625	2,593
TOTAL	**4,862**	**327**	**3,110**	**7,645**

A portion of the employment added in the near-term horizon would be existing jobs relocated from the Barnes-Jewish Hospital campus west of Newstead Avenue. Another portion would represent existing jobs relocated from elsewhere in the region. A third portion would consist of newly created jobs. An approximate breakdown of these job categories is provided in Figure 2.14 below, based on information provided by CORTEX. It should be emphasized that all of these jobs would be new to CORTEX. It is assumed that employees relocated from Barnes-Jewish Hospital Complex would be replaced, either by backfilling existing building space or expanding or adding new buildings to the Barnes-Jewish Hospital complex.

FIGURE 2.14: NEAR-TERM EMPLOYMENT PROJECTIONS BY ZONE

Category	Jobs
Relocated from BJC	1,675
Relocated from elsewhere	860
New	575
Total	**3,110**

The long-term employment projection for CORTEX assumes a full build-out of the district and is consistent with a typical 20 year future planning horizon. By 2030, the CORTEX district should contain a total of 16,431 jobs, based on the current development projections provided by CORTEX. When compared to the 4,862 jobs present in the area today, this amounts to a net increase of 11,569 jobs, as shown in Figure 2.15.

FIGURE 2.15: LONG-TERM EMPLOYMENT PROJECTIONS BY ZONE

Zone	2017 Projected	Existing To Be Removed	CORTEX Added	2030 Projected
910	1,263	180	1,230	2,313
969	3,789	6	4,485	8,268
1031	2,593	563	3,820	5,850
TOTAL	**7,645**	**749**	**9,535**	**16,431**

The travel demand model predicts that transit ridership will increase by **16 percent between 2010 and 2030.**

FIGURE 2.16: LONG-TERM RESIDENTIAL PROJECTIONS BY ZONE

Zone	2010 Existing	Existing To Be Removed	CORTEX Added	2030 Projected
910	498	97	0	401
969	57	46	0	11
1031	140	0	700	840
TOTAL	**695**	**143**	**700**	**1252**

A similar projection was prepared for population reflecting the addition of residential units in the CORTEX district by 2030. These projections are summarized in Figure 2.16 above. Based on the current development plan as provided by CORTEX, CORTEX is expected to add 700 residents, although 143 existing residents would be displaced as a result. Therefore, the net increase in population would amount to 557 residents.

The work of this Study was completed between February and June 2012. Subsequent to completion of this Study, CORTEX amended their Master Plan and thereby revised the district development program and employment projections. Despite these revisions, overall ridership forecasts for the proposed MetroLink station remain valid.

Growth in the existing MetroLink system was projected to provide an indication of future ridership reflecting maturation of the system and future changes in land use. This projection was generated using the regional travel demand model. Utilizing East-West Gateway's 2030 land use and demographic assumptions for the region, the travel demand model predicts that transit ridership would increase by 16 percent between 2010 and 2030.

For purposes of comparison, the model's predicted rate of growth between 2010 and 2030 was compared to the rate of growth exhibited by the original 18-station system, which partially opened in 1993 and was completed in 1994. Note that the East Terminal station did not open until 1998 but this did not have a discernible effect on ridership. According to data maintained by the Federal Transit Administration, the original system averaged 42,400 daily boardings between 1997 and 2001 when the St. Clair extension opened. Those same stations averaged just 34,100 daily boardings in 2011, exhibiting a negative rate of growth since the opening of the system.

RIDERSHIP FORECASTS

Several key project assumptions and project requirements were defined to guide the development of ridership forecasts, as follows:

- **According to Metro, the target ridership for the proposed station is 1,900 net new daily boardings. This figure reflects new riders to the system boarding at the proposed station. New riders boarding at other stations or existing riders relocating from the Central West End station cannot be credited toward the target.**
- **It was not specified if this ridership target pertains to an opening year target or a 20-year planning horizon. If 1,900 boardings is an opening year target, it would be reasonable to assume the 20-year target is equal to the opening year number plus the percentage increase in system ridership anticipated over the next 20 years. East-West Gateway forecasts a 16 percent increase. Therefore, the 20-year target could be as high as 2,200 daily boardings.**
- **As described previously, some employees that are presently located on the Barnes-Jewish Hospital complex would be relocated to CORTEX to populate future developments. However, it was assumed that these employees would be replaced, either by backfilling existing building space or expanding or adding new buildings on the Barnes-Jewish Hospital complex. Therefore, no employment reductions were assumed.**
- **Relocating the existing MetroBus transfer facility located next to the Central West End MetroLink station to CORTEX has been suggested. However, this would not contribute to a net increase in ridership because moving the facility would simply relocate existing riders from one MetroLink station to another. Moving the transfer station was not reflected in any of the ridership forecasts.**
- **There is interest in providing park-and-ride spaces for MetroLink riders that would like to drive to the proposed station. However, because of the study area's location proximate to many transit-oriented destinations and its urban characteristics, the proposed station would not constitute a major park-and-ride facility. It was assumed that parking must be free to attract meaningful park-and-ride users to the station.**

Three different scenarios were modeled to identify the amount of

ridership that would be attracted to the proposed station given various levels of connectivity, development, and management and operational strategies, as summarized below. Criteria and assumptions for each scenario are outlined below in Figure 2.17. Scenario 1 and Scenario 2 will be described in greater detail in the following chapter.

FIGURE 2.17: RIDERSHIP SCENARIO CRITERIA

	BASELINE	SCENARIO 1	SCENARIO 2
Connectivity & Ridership Capture	Limited Ridership Capture from North of Forest Park Ave	Improved Connectivity Across Forest Park Ave & Across I-64	Double-Sided Station – Entrances on Boyle & Sarah
	No Ridership Capture from South of I-64	Expanded Ridership Capture from North	Extend Commons to I-64
		Limited Ridership Capture from South	Expanded Ridership Capture from East & South
Development	Baseline CORTEX Development Plan	Additional 650 to 750 Residential Units of TOD	Same as Scenario 1
Management & Operations		Bike Storage, Lockers, & Shower Facility at Station	Bike Storage, Lockers, & Shower Facility at Station
	None	Subsidized Transit Passes for CORTEX District Employees	Expanded Shuttle Service to Neighborhoods
		(~$20 subsidy per pass)	Increased Subsidy for CORTEX District Employees
			Implement Parking Management Plan

Ridership forecasts for the proposed station were prepared using two

different methodologies, as follows:

- The regional travel demand model was applied because it represents the most technically robust means of generating forecasts and is best able to withstand scrutiny and garner acceptance of Metro and the Federal Transit Administration. It contains an imbedded mode choice model – essentially local capture rates – that reflects the mode preferences and travel behaviors exhibited by people in the St. Louis region.
- A manual method of ridership forecasting was employed to both augment and validate the projections from the regional travel demand model. This was done to estimate ridership components not well represented by the model but also to obtain a duplicate projection to provide greater confidence in the results and broaden support for the proposed station. The primary method consisted of estimating ridership by applying transit capture percentages to population and employment totals within defined capture areas around the proposed station.

BASELINE FORECASTS

Baseline ridership forecasts reflect the CORTEX Master Plan as defined by CORTEX and its other master planning and economic development consultants. No additional connectivity improvements, development, or management/operational strategies were assumed. Forecasts were developed for an assumed 2017 opening year of the station. The 20-year planning horizon was based on 2030. The Baseline forecasts were based almost entirely from output from the regional travel demand model. However, forecasts for park-and-ride ridership demand were developed manually because the regional travel demand model tends to produce unreliable estimates of park-and-ride ridership. It generally overstates demand for stations in the region's core by assuming riders will drive further for a shorter transit trip. In actuality, this is rarely the case.

In consultation with Metro, it was determined that the proposed station should include no more than 200 park-and-ride spaces, which were assumed to attract 200 daily boardings. National research indicates that park-and-ride stations typically average 2 boardings per space, so this estimate should be deemed conservative. Furthermore, 200 park-and-ride boardings would be consistent with existing space utilization

counts at similar stations. The park-and-ride lot occupancy at Forest Park, Delmar, East Riverfront, 5th & Missouri, and Emerson Park averaged 150 spaces based on a 2011 count. Since park-and-ride ridership was estimated manually, the regional travel demand model identified riders that would walk to and from the station. No bus or shuttle connections were considered, although it should be noted that the Barnes Hospital complex shuttle does serve the CORTEX district.

One advantage of the regional travel demand model for ridership based on walking to/from the station is that it identified the reduction in boardings at the Central West End station that would occur due to the proposed station. Boardings at the proposed station were then reduced accordingly so that the resulting ridership forecasts reflected net new riders to the system, excluding existing riders that would divert from the Central West End station.

Forecasts of net new daily boardings at the proposed station are summarized in Figure 2.17. Ridership associated with biking to and from the station was not explicitly presented, since ridership was summarized as a range and the biking component would comprise a nominal percentage of the overall ridership and wouldn't affect the ranges presented.

MetroLink system ridership projections based on planned CORTEX redevelopments are **600 to 700 net new riders** on opening day, **and 1,250 to 1,350 net new riders** per day by year 20.

FIGURE 2.17: PROPOSED STATION NET NEW BOARDING FORECAST

Time Horizon	Walk Boardings	Park-And-Ride Boardings	Reduction Due to CWE Diversions	Net New Daily Boardings
Opening Year	525-625	200	-125	600-700
20-Year	1200-1300	200	-150	1250-1350

Ridership estimates based wholly on manual techniques were prepared for comparison purposes as a means of validating the above projections. This methodology was based on applying capture rate percentages to the amount of employees and residents within defined capture zones around the proposed station to determine ridership based on walking to/from the station. The determination of appropriate capture zones and rates was described in detail in a previous section of this report. Manual estimates are presented in Figures 2.18 and 2.19 on the facing page.

FIGURE 2.18: MANUAL ESTIMATE OF OPENING YEAR RIDERSHIP

Time Horizon	Capture Zone Radius	Residents in Zone	Jobs in Zone	Capture Rate	Daily Boardings
Opening Year	Within ¼ Mile	250	934	10%	118
Opening Year	Between ¼ Mile and ½ Mile	2,523	3,908	5%	322
Net New Daily Boardings					**440**

FIGURE 2.19: MANUAL ESTIMATE OF 20-YEAR RIDERSHIP

Time Horizon	Capture Zone Radius	Residents in Zone	Jobs in Zone	Capture Rate	Daily Boardings
20-Year	Within ¼ Mile	392	9,510	10%	990
20-Year	Between ¼ Mile and ½ Mile	2,939	4,207	5%	357
Net New Daily Boardings					**1,347**

The above estimates, which address ridership based on walking to/from the station only, are very similar to the estimates generated by the regional travel demand model, as follows:

- The opening year model walk ridership estimate amounted to 400 to 500 daily boardings when deducting for diverted riders from the Central West End Station. The manual estimate projected 440 boardings.
- The 20-year model walk ridership estimate amounted to 1,050 to 1,150 daily boardings when deducting for diverted riders from the Central West End Station. The manual estimate projected 1,347 boardings, suggesting that the model may be underestimating ridership.
- It can be concluded that the manual estimates support those ridership numbers generated using the regional travel demand model, thereby lending confidence to the ridership projections.

As the baseline ridership projections did not meet the threshold of 1,900 net new system riders as established by Metro, two scenarios to increase system ridership were developed. These scenarios are presented in detail in the following chapter.

3 | Scenarios to **Increase Station Ridership**

CYCLING ON TOWER GROVE AVENUE

RIDERSHIP STRATEGIES

The planning target for net new MetroLink riders, established by Metro, is 1,900 net new boardings per day. Baseline ridership projections for the proposed stations indicate an increase of approximately 600 to 700 net new boardings on opening year, and increase of approximately 1,250 to 1,350 net new boardings on year 20. These numbers would be achieved based solely on planned development in the area with no other actions to attract riders. To increase ridership to meet the Metro target, the Planning Team has identified a number of connectivity, development, and operational strategies that can be employed to increase ridership.

IMPROVE CONNECTIVITY: Stronger connections to the Central West End and Forest Park Southeast would yield additional boardings above the 1,250-1,350 range previously cited. These boardings are still limited, however, by continued usage of the Central West End MetroLink station at Euclid Avenue by portions of both neighborhoods. Strategies to improve connectivity are listed on the facing page.

INCREASE RESIDENTIAL DEVELOPMENT: Based upon additional research, TOD-style development will yield a higher ridership capture than employment. These capture rates are highly dependent on proximity to the MetroLink station (as outlined below) and to the provision of mixed-use amenties. Capture rates in TOD-style development are listed on the facing page.

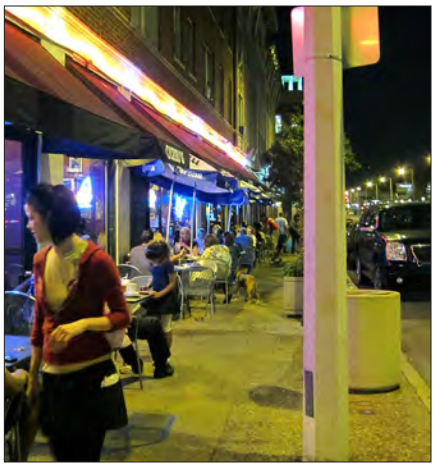
A special capture rate of 15 percent for TOD directly adjacent to stations (1/4 mile or less) was developed by Robert Cervero (UC-Berkeley) as part of the MetroLink MetroSouth Study in the mid-2000s. The rate is predicated on developments attracting residents who are predisposed to riding transit; this rate cannot be applied to typical residential uses.

MANAGEMENT & OPERATIONS: There are a variety of management and operational initiatives that can implemented to incentivize transit use or make transit a more attractive option to district employees and residents who currently commute by car. Management and operations strategies are presented on the facing page.

By utilizing some or all of these strategies, net new system ridership can be increased to achieve Metro planning threshold. The following alternative scenarios illustrate the combined effects of employing these strategies in various ways.

IMPROVE AREA CONNECTIVITY

- Develop pedestrian first streets
- Increase bike accessibility & facilities
- Improve Streetscape, Visibility & Imageability
- Provide Active Ground Floor Uses on Key Streets
- Install Security Lighting and Monitoring System
- Install Blue Light Safety Call system
- Increase safety patrols

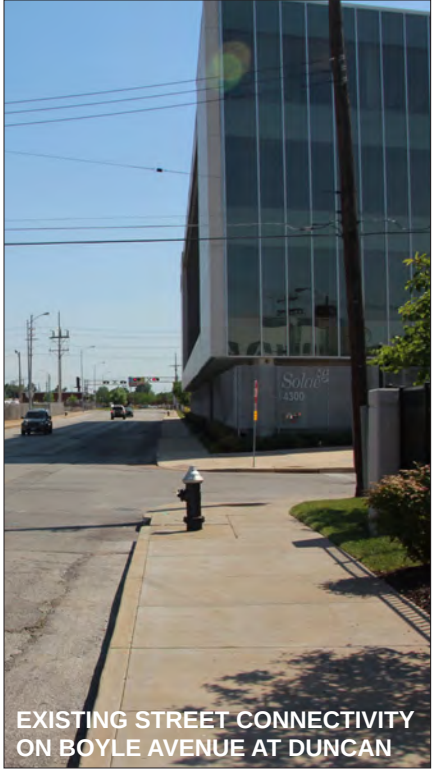


INCREASE RESIDENTIAL DEVELOPMENT

- ¼ Mile Radius from MetroLink: *8-10% Capture Rate*
- ½ Mile Radius from MetroLink: *3-5% Capture Rate*
- Greater than ½ Mile Radius: *<2% Capture Rate*

MANAGEMENT & OPERATIONS

- Increase Bus Connectivity
- Neighborhood Shuttle Services
- Park-And-Ride Facilities
- Bike Transfer Facilities
- District-wide Parking Management Plan
- Subsidized- or No-Cost MetroLink Fares or Passes



EXISTING STREET CONNECTIVITY ON BOYLE AVENUE AT DUNCAN

URBAN DESIGN CONSIDERATIONS & STRATEGIES FOR THE DISTRICT

While the scope of the Study did not include specific urban designs or master plans for the CORTEX district, a number of urban design considerations and strategies were evaluated. These considerations and strategies are necessary to address specific scope items relating to MetroLink system ridership, street-level connectivity, and transit-oriented development and sustainability initiatives and are represented generally in the scenarios to increase ridership. Urban design considerations and strategies for the CORTEX district include:

CREATE A DOUBLE-SIDED METROLINK STATION: When calculating ridership capture potential, the greatest factor is proximity to the station entrance; residents within 1/4 mile of the station entrance are captured at a rate twice that of those who are between 1/4 and 1/2 mile of the station entrance. The proposed MetroLink station therefore should be double-sided, with **entrances from both Boyle Avenue and Sarah Street**, and the platform located somewhere between the two. This follows the model of the Central West End Station, which is accessible from both Euclid Avenue and Taylor Avenue, and significantly expands the capture radius of the station for both pedestrians and cyclists.

CREATE TWO FRONT DOORS TO THE DISTRICT AT FOREST PARK AVENUE AND I-64: The CORTEX District has historically viewed Forest Park Avenue as its front door; however, its I-64 frontage is more visible and perhaps more important from the perspective of vehicular access. By extending the CORTEX Commons north to Forest Park Avenue and south to I-64, CORTEX can leverage investments in the new Tower Grove Avenue/Boyle Avenue interchange and **provide a signature entrance for visitors arriving from the Interstate**. In addition, this will allow the Commons to function as a key connective element **crossing the I-64 barrier** and linking the Central West End to Forest Park Southeast.

DEVELOP SARAH STREET AS A KEY NEIGHBORHOOD MAIN STREET: In order to capitalize on its development potential, CORTEX must invest in mixed-use development, create key connectors between neighboring amenities, and help catalyze new development in surrounding neighborhoods. Sarah Street presents an unrivaled opportunity to create **a new, mixed-use, neighborhood main street for the CORTEX district** that serves as a spine for new mixed-use and residential development and connects Saint Louis University and Midtown to The Grove commercial district.

SCENARIO FORECAST METHODOLOGY

Ridership forecasts were prepared for the two alternative scenarios described previously. A combination of the regional travel demand model and manual methods were employed, as the modeling platform was not able to estimate the ridership ramifications of every scenario element. The purpose of these scenarios was to identify strategies that would increase ridership to more closely match or exceed the threshold established by Metro.

The ridership implications of the various scenario elements were addressed as follows:

- Connectivity improvements were accounted for using the regional travel demand model by extending pedestrian access links to additional zones and improving some existing connections. In particular, evaluating the double-sided station in Scenario 2 required extending pedestrian access links to additional zones and shortening existing connections.
- Additional development was accounted for by increasing the number of residents in the regional travel demand model for those zones designated for development.
- The fare subsidy for CORTEX district employees was introduced into the regional travel demand model by lowering the MetroLink fare for all trips destined to zones representing CORTEX.
- The ridership implications of a bike transfer station and bike lane on Tower Grove Avenue could not be addressed using the regional travel demand model. Instead, it was assumed that these facilities would generate a net increase of 50 daily boardings.
- Expanded shuttle service was envisioned as an expansion of the existing Barnes-Jewish Hospital shuttle into adjacent areas, enabling portions of the Central West End and Forest Park Southeast neighborhoods to receive high frequency transit service. The impact upon ridership at the proposed station would vary depending upon routing, headways, fares, etc. These details go beyond the scope of this effort, and so it was conservatively assumed that a shuttle service expansion would contribute at least 100 new riders to the proposed station daily. This is reflected in the Scenario 2 projection below.
- The impact of a comprehensive area-wide parking management plan upon ridership could not be readily identified. While it is believed that such a plan would contribute to increased ridership, the Scenario 2 projection summarized below does not assume ridership credits for the parking management plan.

SCENARIO 1

If all Scenario 1 recommendations are implemented and mutually leveraged toward the purpose of enhancing transit ridership, it will result in **a total of 1,800 to 2,000 net new daily riders by year 20.**

Scenario 1 is designed to achieve Metro's planning threshold of 1,900 net new riders if that target is understood as the year 20 ridership goal. Scenario 1 involves moderate modifications to existing proposals and planning initiatives to enhance north and south connectivity, initiate new mixed-use, transit oriented development near the proposed station, and incentivize current and planned district employees to use MetroLink as their means of commuting to work.

CONNECTIVITY

1. Provide shared lanes on Tower Grove Avenue and widen Boyle Avenue overpass with widened sidewalks and dedicated bike lanes.
2. Provide dedicated bike lanes on Tower Grove Avenue south of Vandeventer Avenue to the Missouri Botanical Garden.
3. Extend CORTEX Commons north to Forest Park Avenue and create a "front door" to the CORTEX district at Forest Park Avenue.

DEVELOPMENT

4. Meet baseline CORTEX development projections.
5. IN ADDITION provide 650 to 750 units of new, TOD residential development and mixed-use development in the CORTEX district (975 to 1,125 new residents.)
6. Focus TOD residential and mixed-use development between Sarah Avenue and Vandeventer Avenue and extend planned Duncan Avenue streetscape improvements east to Vandeventer.

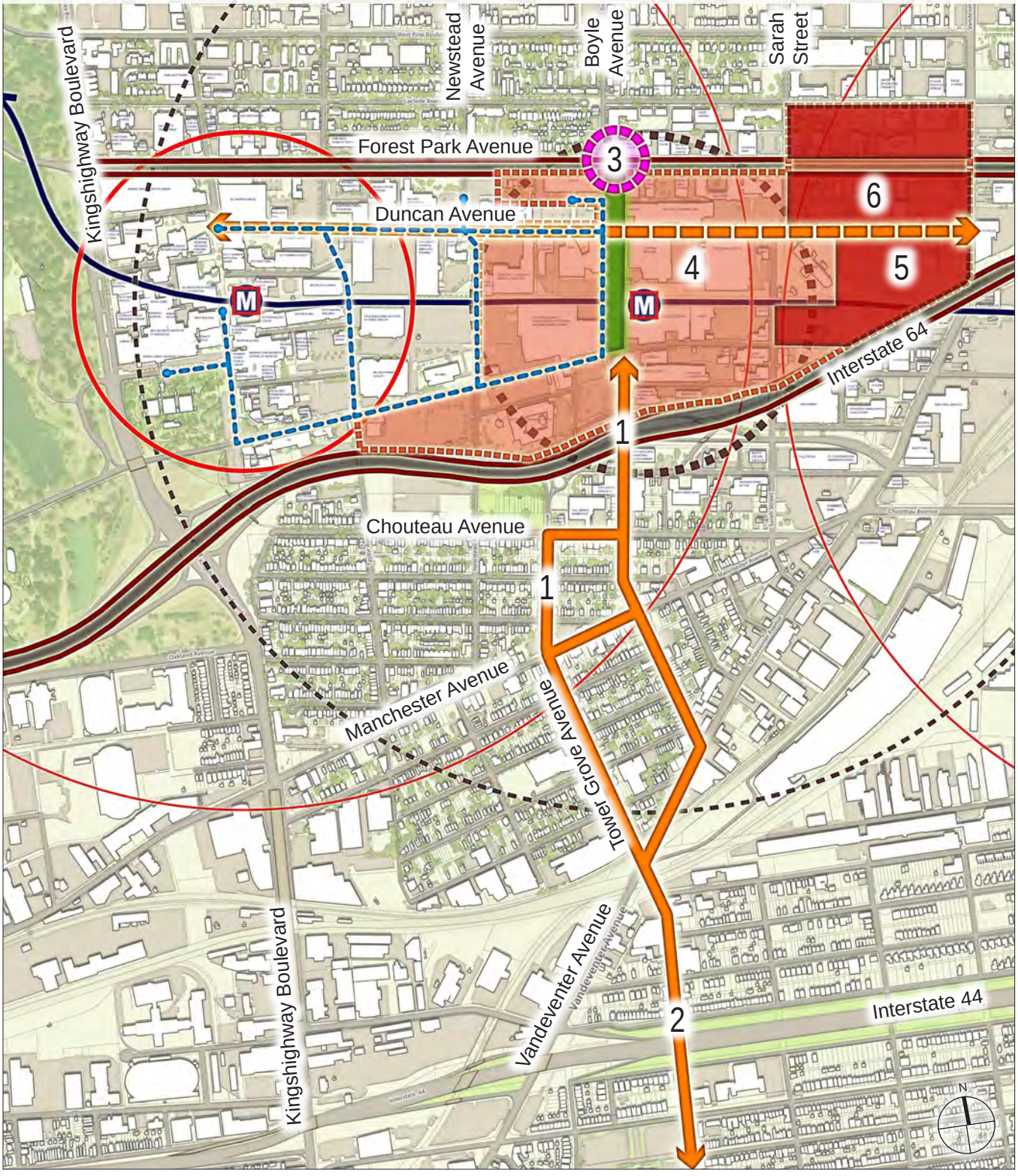
MANAGEMENT & OPERATIONS

7. Provide bike storage, lockers, and shower facilities at the CORTEX MetroLink Station.
8. Provide subsidized transit passes to CORTEX district employees (BJC model; approximately $20 per month subsidy or pass discount.)

If all of these recommendations are implemented and mutually leveraged towards the purpose of enhancing transit ridership, it will result in an additional 550 to 650 net new riders at year 20. In addition to the base level ridership of 1,250 to 1,350 in year 20, this would result in a total of 1,800 to 2,000 net new riders.

FIGURE 3.1: SCENARIO 1 PLAN

- CORTEX Redevelopment Area
- Small Circles: 1/4 Mile (5 Minute Walking) Radius from existing or proposed MetroLink station
- Large Cricles: 3/4 Mile (5 Minute Bike Ride) Radius from existing or proposed MetroLink station
- MetroLink Route
- MetroLink Stop
- Major Street-Level Connectivity Routes
- District Shuttle



SCENARIO 2

If all Scenario 2 recommendations are implemented and mutually leveraged toward the purpose of enhancing transit ridership, it will result in **a total of 2,350 to 2,550 net new daily riders by year 20.**

Scenario 2 is designed to achieve Metro's planning threshold of 1,900 net new riders if that target is understood as the opening year goal. Accounting for a projected 16% growth in overall system ridership, an opening year goal of 1,900 would translate into a year 20 ridership goal of 2,200 net new riders. Scenario 2 involves more aggressive actions and all recommendations of Scenario 1 are included.

CONNECTIVITY

1. Make the CORTEX Station double-sided, with entrances from both Boyle Avenue & Sarah Avenue.
2. Extend CORTEX Commons north to Forest Park Avenue and south to I-64, creating two "front doors" to the CORTEX district.
3. Provide dedicated bike lanes on Boyle Avenue and Vandeventer Avenue; widen Boyle Avenue overpass with widened sidewalks and dedicated bike lanes.
4. Provide a dedicated "cycle track" on Tower Grove Avenue south of Vandeventer to the Missouri Botanical Garden.

DEVELOPMENT

5. Focus TOD residential and mixed-use development between Sarah Street and Vandeventer Avenue and improve Duncan Avenue, Sarah Street, and Vandeventer Avenue streetscapes.

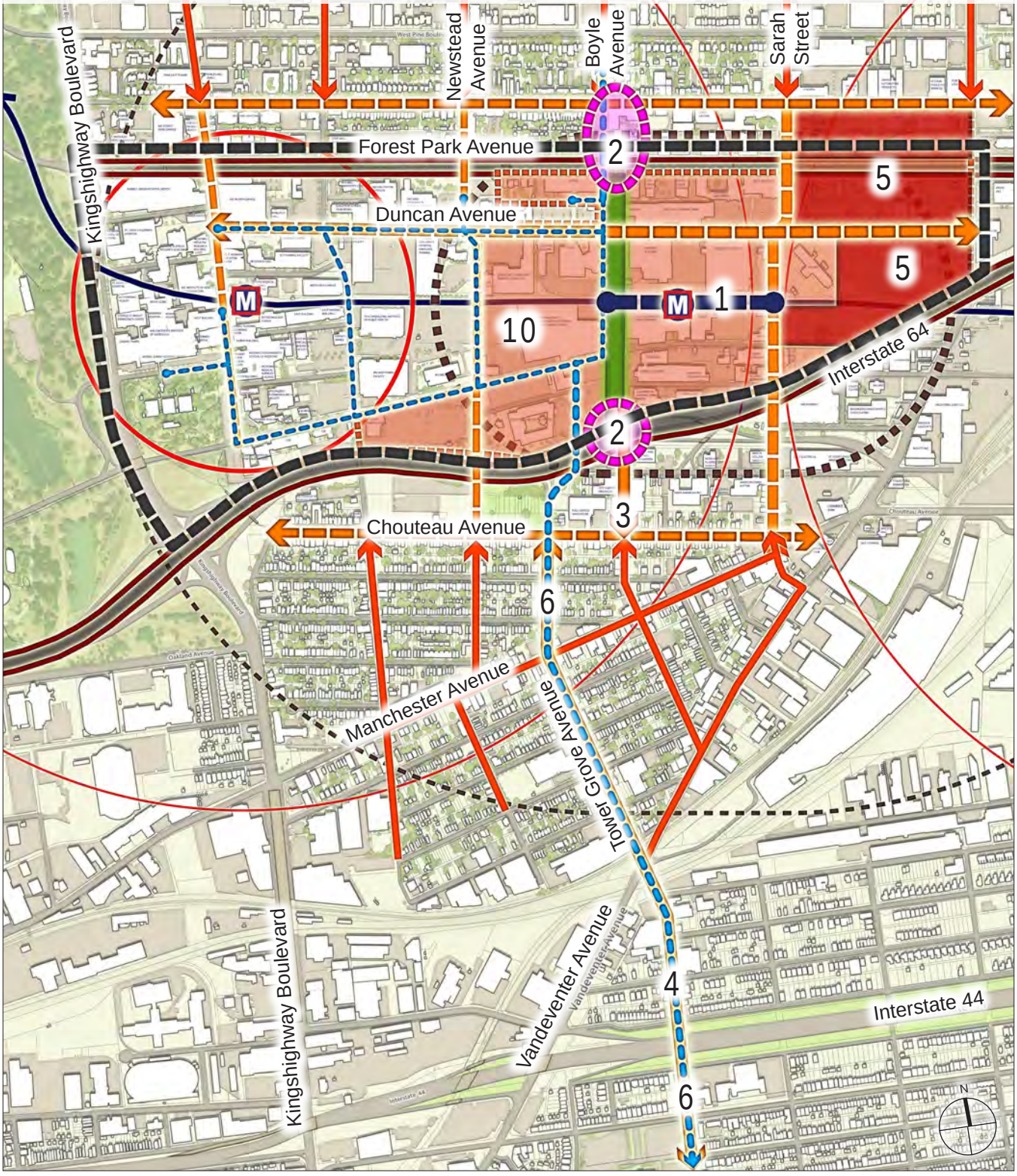
MANAGEMENT & OPERATIONS

6. Extend shuttle service and/or provide neighborhood circulator to surrounding neighborhoods and south to the Missouri Botanical Garden.
7. Provide subsidized transit passes to CORTEX district employees (enhanced model; $50 per month subsidy or discount.)
8. Implement a district-wide access, circulation and parking strategy that balances accessibility, convenience and transit ridership.
9. Implement a neighborhood parking management strategy.
10. Consider creating a Transportation Management District to facilitate ALL forms of transportation.

If all of these recommendations are implemented and mutually leveraged towards the purpose of enhancing transit ridership, it will result in an additional 1,250 to 1,350 net new riders at year 20. In addition to the base level ridership of 1,250 to 1,350 in year 20, this would result in a total of 2,350 to 2,550 net new riders.

FIGURE 3.2: SCENARIO 2 PLAN

- CORTEX Redevelopment Area
- Small Circles: 1/4 Mile (5 Minute Walking) Radius from existing or proposed MetroLink station
- Large Cricles: 3/4 Mile (5 Minute Bike Ride) Radius from existing or proposed MetroLink station
- MetroLink Route
- MetroLink Stop
- Major Street-Level Connectivity Routes
- District Shuttle
- Proposed Parking District Boundary



4 | Street Level **Connectivity Plan**

BOYLE AVENUE OVERPASS AT INTERSTATE 64

STREET CONNECTIVITY OPPORTUNITIES & CONSTRAINTS

One of the stated goals of the Study is to improve pedestrian and bicycle connectivity along major corridors between the CORTEX District, proposed CORTEX MetroLink Station, within the district, and to surrounding local neighborhoods and destinations. Developing a street level connectivity plan required an assessment of the existing street facilities to identify opportunities and constraints for new pedestrian and bicycle facilities. The analysis of the existing street facilities focused on major corridors that link neighborhoods and local destinations both north and south of the CORTEX District as well as potential corridor(s) from the east and west. Tower Grove Avenue is the major corridor connecting the Missouri Botanical Gardens and Tower Grove Park to the south. North of Vandeventer Avenue, Tower Grove Avenue is paralleled to the east by Boyle Avenue. These two streets intersect Clayton Avenue just north of Interstate 64 at which point Tower Grove Avenue terminates and Boyle Avenue continues on to connect with the CORTEX District and neighborhoods north of Forest Park Avenue. See Figure 3.1.

A potential major east-west corridor within the CORTEX District is Duncan Avenue, which runs from Sarah Street and Vandeventer Avenue to the east and the Central West End MetroLink Station and Barnes Jewish/Washington University Medical Campuses to the west. Where Duncan Avenue intersects with Boyle Avenue is the heart of the CORTEX District with the CORTEX building to the north and the Solae building to the south. Refer to Figure 3.1.

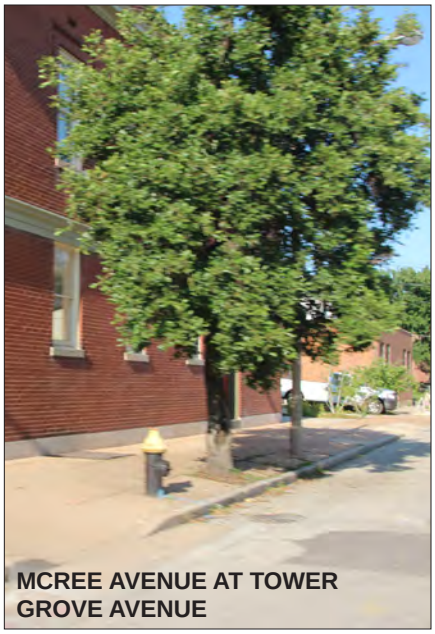
When the analysis of existing street facilities on major corridors between the CORTEX District and local destinations was completed, the study turned its focus to ways to further enhance and strengthen existing pedestrian and bicycle facilities to improve street-level connectivity. Opportunities and constraints will arise from the decisions made on these types of street improvements and will need to be addressed.

Note that while this report presents and analysis of existing conditions and potential approaches to improving connectivity, it does not recommend a specific course of action. Any decision regarding improvements will need to be made in close partnership with the City of St. Louis and others.

EXISTING STREET FACILITIES

The survey of existing street facilities for the identified major corridors that link neighborhoods and local destinations from north, south, east, and west of the CORTEX District was performed through collection of data, i.e., existing maps, planned transportation improvements, studies and master plans for the existing conditions, and On-the-Ground Walkthroughs of the major corridors. Stakeholder Interviews were performed concurrently with this task, which resulted in identification of several additional street corridors utilized by pedestrians and bicyclists not previously defined in the study area that required survey investigation. These newly identified street corridors were Newstead Avenue and Chouteau Avenue. It should be noted that Laclede Avenue and Euclid Avenue were also identified by Stakeholders as pedestrian and bicycle street corridors. These corridors were not surveyed because they fell outside the immediate study area.

In general, the typical cross-section or general make-up of a street is divided into specific pieces or components. These components include, but are not limited to, the following: sidewalks, bike lanes with or without buffers, vehicle parking lanes, vehicle travel lanes, curbs and tree lawns. Refer to Figure 3.2. The assessment of the existing street facilities focused on identifying and quantifying the above mentioned street components to help understand what can be done to improve street-level connectivity along the corridors in the study area. Other items affecting street connectivity that were surveyed include: ADA accessibility along the street as well as intersections, signalized or signed intersections, signage and wayfinding for local destinations and ADA and bike designated routes, types of pavement markings (i.e. designated bike lanes), vehicle lanes, cross-walks at intersections), and the utilities present in the public right-of-way that are overhead and underground.



MCREE AVENUE AT TOWER GROVE AVENUE

SARAH STREET AT I-64

BOYLE AVENUE AT CHOUTEAU

96% of connectivity routes consist of a 36 foot wide street with a 60 foot right-of-way.

1% of connectivity routes consist of 50 foot to 64 foot wide streets with an 80 foot right-of-way, which primarily occurs along Tower Grove Avenue south of Vandeventer Avenue to Magnolia Avenue adjacent to the Missouri Botanical Gardens/Tower Grove Park.

1% of connectivity routes consist of a 46 foot wide street with a 64 foot Right-of-way located along Boyle Avenue between Forest Park Parkway and Clayton Avenue.

1% of connectivity routes consist of a 46 foot wide street with a 70 foot right-of-way located along Manchester Avenue between Kingshighway and Vandeventer Avenue.

1% of connectivity routes consist of a 50 foot wide street with a 75 foot right-of-way located along Chouteau Avenue between Taylor Avenue and Manchester.

ASSESSMENT OF EXISTING STREET FACILITIES

The assessment of existing street facilities was categorized by street width from face of curb to face of curb and width of public right-of-way. Refer to Figure 3.3. The 5 typical sections were delineated into the following components:

1. Existing 36 ft. wide streets with a 60 ft. right-of-way:
   Existing Condition 1:
   - **(2) 10 ft. Vehicle Travel Lanes ("Sharrow" or Share-the-Road Arrow stencil for Bikes)**
   - **(2) 8 ft. Parking Lanes**
   - **(2) 12 ft. Pedestrian zones**

   Existing Condition 2:
   - **(2) 9 ft. Vehicle Travel Lanes**
   - **(2) 9 ft. Shared Lanes (Bikes and Vehicles)**
   - **(2) 12 ft. Pedestrian zones**

2. Existing 50 ft. to 64 ft. wide streets with an 80 ft. right-of-way (Tower Grove Avenue from Vandeventer to Magnolia):
   Existing Condition 1:
   - **(2) 11 ft. Vehicle Travel Lanes**
   - **(2) 14 ft. to 21 ft. Shared Lanes (Bikes and Street Parking)**
   - **(2) 8 ft. to 15 ft. Pedestrian zones**

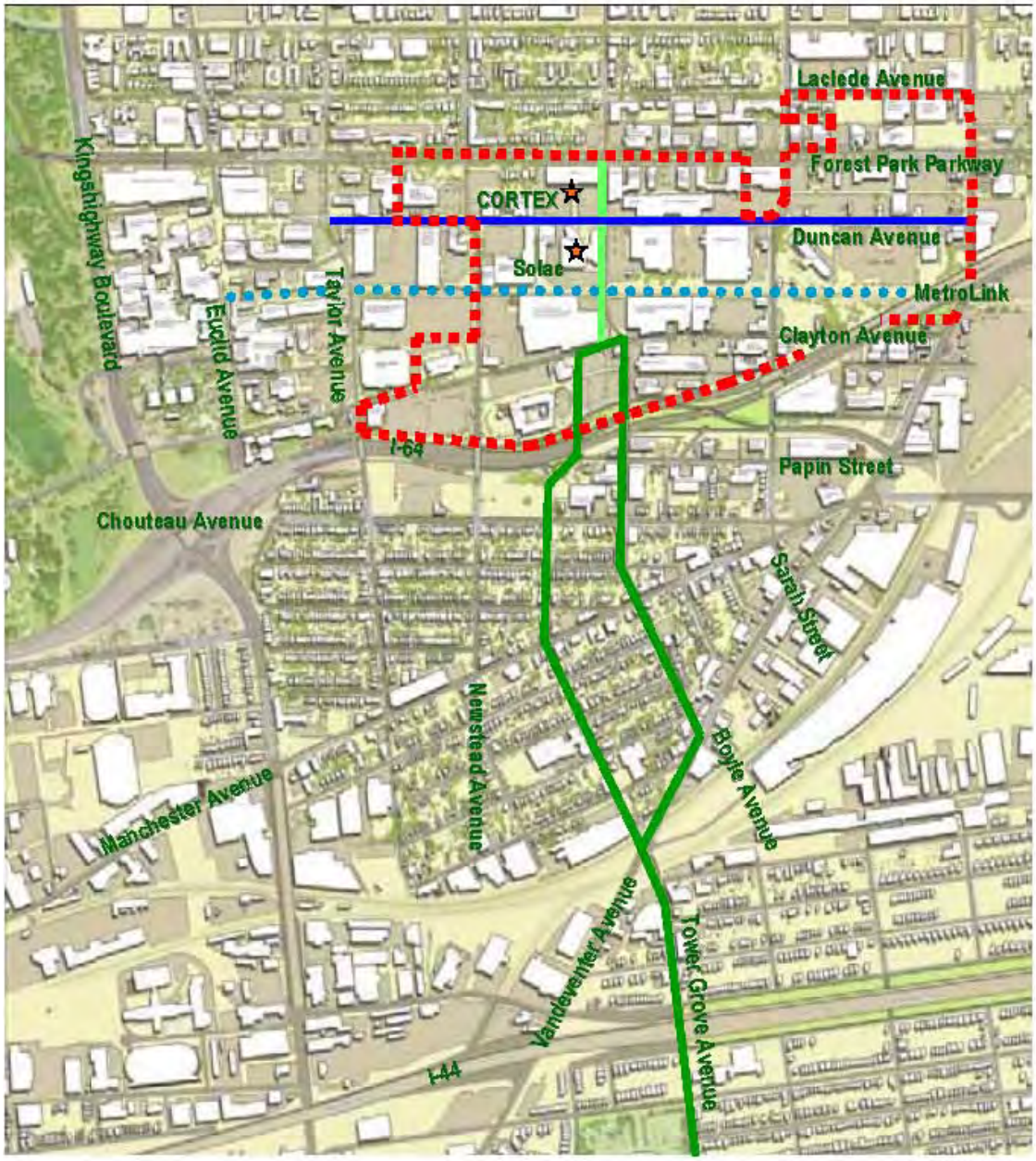
   Existing Condition 2:
   - **(2) 11 ft. Vehicle Travel Lanes**
   - **(2) 14 ft. to 21 ft. Shared Lanes (Bikes and Vehicles)**
   - **(2) 8 ft. to 15 ft. Pedestrian zones**

3. Existing 46 ft. wide street with a 64 ft. right-of-way (Boyle Avenue from Forest Park Parkway to Clayton Avenue):
   - **(2) 11 ft. Vehicle Travel Lanes**
   - **(2) 12 ft. Shared Lanes (Bikes and Vehicles)**
   - **(2) 9 ft. Pedestrian zones**

4. Existing 46 ft. wide street with a 70 ft. right-of-way (Manchester Avenue from Kingshighway to Sarah Street):
   - **(2) 11 ft. Vehicle Travel Lanes (Shared with Bikes)**
   - **(2) 12 ft. Parking Lanes**
   - **(2) 12 ft. Pedestrian zones**

5. Existing 50 ft. wide street with a 75 ft. right-of-way (Chouteau Avenue from East of Kingshighway to Sarah Street):
   - **(2) 15 ft. Vehicle Travel Lanes (Shared with Bikes)**
   - **(2) 10 ft. Parking Lanes**
   - **(2) 12.5 ft. Pedestrian zones**

FIGURE 4.1: EXISTING STREET FACILITIES ASSESSMENT



CORTEX Redevelopment District and Major Pedestrian/Bike Connectors

- CORTEX Redevelopment District
- Major North-South Corridor - North of Clayton Avenue
- Major North - South Corridor South of Clayton Avenue to Magnolia Avenue (Missouri Botanical Gardens
- Potential Major East-West Corridor

PAVEMENT CONDITION ALONG TOWER GROVE AVENUE

ASSESSMENT OF EXISTING SIDEWALK AND STREET PAVEMENT CONDITIONS

BOYLE AVENUE CORRIDOR

- Overall, the street pavement is in poor to fair condition with alligator cracking, sections where base pavement is exposed, and numerous patches of pavement.
- Curb material varies with either granite or concrete curb. Concrete curb is usually in sections where sidewalk has been replaced.
- The standard curb height of six inches occurs mainly in sections where sidewalk has been replaced. Remaining sections of curb are less than six inches due to overlaying of street pavement.
- The sidewalks are mainly in poor to fair condition with broken and uneven pavement. Numerous patches occur in the sidewalk pavement due to underground utility improvements. In areas where new construction or street improvements have occurred at street intersections, the sidewalks are in good condition.

TOWER GROVE AVENUE CORRIDOR

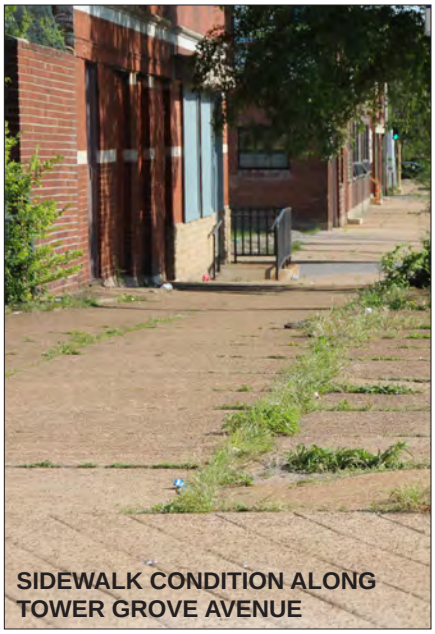
- Some sections of Tower Grove Avenue have been newly overlaid with asphalt leaving them in good condition. Most other areas of the street pavement have alligator cracking, sections where base pavement is exposed and numerous patches of pavement and should be considered in fair to poor condition.
- Overall the sidewalks are in poor to fair condition with prevalent pavement cracking and uneven areas. Some sections of sidewalk have been replaced at intersections with road improvements. Where new building has occurred, new sidewalk has been installed.
- Curbing in this section of Tower Grove Avenue is mainly granite curb with concrete curb occurring at street intersections. Overlaying of the street pavement has reduced the height of the curb to less than six inches.

NEWSTEAD AVENUE CORRIDOR: FOREST PARK PARKWAY TO CLAYTON AVENUE

- The street pavement is in fair to poor condition with numerous patches, large amounts of alligator cracking, and sections of exposed base pavement.
- The sidewalks are in fair to good condition. Decorative medallions have been added to the sidewalk. A short section north of the MetroLink tracks has uneven and cracked pavement, and the east sidewalk from Forest Park Parkway to Duncan Avenue has some remnants of a sidewalk in places.
- Curbing material overall is composed of granite, but some areas closer to Forest Park Parkway are concrete.

DUNCAN AVENUE CORRIDOR:
NEWSTEAD AVENUE TO SARAH STREET

- The street pavement is in poor condition with numerous patches, large amounts of alligator cracking, and sections of exposed base pavement from raveling top mat of asphalt and potholes.
- The sidewalks are in fair to poor condition. There are several sections of sidewalk which have been replaced, and those are located on the north and south sides of Duncan Avenue at the CORTEX and Solae Buildings and parking lots as well as the West End Lofts parking lot near the intersection of Sarah Street and Duncan Avenue.
- Curbing material mainly is composed of granite except in the sections of the CORTEX and Solae buildings.



SIDEWALK CONDITION ALONG TOWER GROVE AVENUE

ASSESSMENT OF EXISTING UTILITIES

BOYLE AVENUE CORRIDOR

- Underground sewer, water, electric and gas lines located in the street.
- Fiber optic lines located in the east and west sidewalks and street.
- Street lighting located in the east sidewalk.
- Fire hydrants located in the east and west sidewalks.
- Overhead power lines located primarily in the west sidewalk.

TOWER GROVE AVENUE CORRIDOR

- Underground sewer, water and miscellaneous utilities located in the street.
- Street lighting locations vary between the east and west sidewalks at the curb.
- Fire hydrants located in the east and west sidewalks.
- Overhead power lines in west sidewalk from Clayton Ave. to Papin Ave., then in the east sidewalk from Papin Ave. to Manchester Ave. No overhead lines further south on Tower Grove Avenue to Magnolia Avenue intersection.

TOWER GROVE AVENUE AT VANDEVENTER AVENUE

DUNCAN AVENUE CORRIDOR:
FROM SARAH AVENUE TO NEWSTEAD AVENUE

- Overhead power lines located along the sidewalk on the north side of the street which serve the BJC power plant located at Duncan Avenue and Newstead Avenue.
- Underground sewer and water lines located in the street.
- Fire hydrants located in the north sidewalk.
- Fiber optic lines located in the south sidewalk and street.
- Street lighting located in the south sidewalk.

HIERARCHY OF STREET USAGE BY PEDESTRIANS AND BIKES

From Stakeholder meetings with neighborhood committees and residents, City agencies and other concerned parties a hierarchy of primary pedestrian and bike routes were determined to help aid in the development of a Street-Level Connectivity Plan.

East-West Pedestrian Corridor:

Laclede Avenue and Chouteau Avenue	Most Preferred
Forest Park Parkway	Least Preferred

North-South Pedestrian Corridor:

Newstead Avenue and Euclid Avenue	Most Preferred
Boyle Avenue and Taylor Avenue	Least Preferred

East-West Bike Corridor:

Chouteau Avenue	Most Preferred
Duncan Avenue	Least Preferred

North-South Bike Routes:

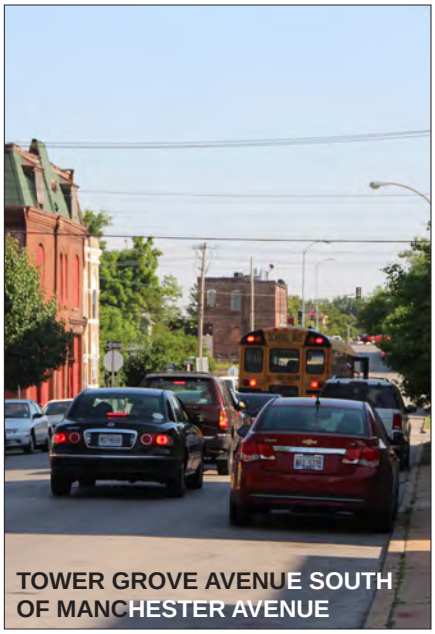
Newstead Avenue	Most Preferred
Vandeventer Avenue	Least Preferred

OPPORTUNITIES AND CONSTRAINTS FOR SCENARIOS 1 & 2

Opportunities are conditions that support a new MetroLink Station in the CORTEX District by building street-level connectivity within the district, adjacent neighborhoods and local attractions. Constraints are conditions that can impede the development of a new MetroLink station by impeding street-level connectivity. Some items can be cost based (i.e., widening streets, relocating existing utilities), or negatively affect existing street facilities (i.e. removal of on-street parking).

SCENARIO 1: FIRST LEVEL OF IMPROVEMENTS TO EXISTING ROUTES AND FACILITIES. Scenario 1 utilizes the existing Tower Grove Avenue bike route from the Missouri Botanical Gardens to the CORTEX District. South of Vandeventer Avenue, Tower Grove Avenue can be reconfigured to allow for bike lanes in both directions. Tower Grove Avenue north of Vandeventer Avenue is much narrower, which would require bikes to share travel lanes with vehicles. At the intersection of Chouteau Avenue and Tower Grove Avenue, bikes and pedestrians could head east to Boyle Avenue to avoid the proposed roundabout and ramp improvements at Tower Grove Avenue and Interstate 64. Once on Boyle Avenue, bikes and pedestrians could head north to the CORTEX District and a proposed MetroLink station. Duncan Avenue would be the major east-west connector from CORTEX to the BJC/WUMC campuses to the west. Additionally, enhancements to the Boyle Avenue and Forest Park Parkway intersection are recommended to improve pedestrian and bike traffic from neighborhoods to the north of the CORTEX District.

SCENARIO 2: MODIFY EXISTING STREET FACILITIES AND ROUTES. Scenario 2 alters the existing connectivity route from the Missouri Botanical Gardens to the CORTEX District. The existing route south of Vandeventer Avenue will remain as Tower Grove Avenue, but north of Vandeventer Avenue, the route will be shifted to Boyle Avenue. Boyle Avenue will then directly connect to the CORTEX District and a new MetroLink station. A proposed MetroLink station would be mid-block south of Duncan Avenue between Boyle Avenue and Sarah Street, which would help increase the number of riders at this station. Tower Grove Avenue south of Vandeventer Avenue would be reconfigured to provide a buffered bike lane and different types of pavement to help motorists differentiate between vehicle parking zones and buffered bike lanes. As in Scenario 1, Duncan Avenue would be the major east-west connector; enhancements to the Boyle Avenue and Forest Park Avenue intersection can improve pedestrian and bike traffic from neighborhoods to the north of the CORTEX District.



TOWER GROVE AVENUE SOUTH OF MANCHESTER AVENUE

TOWER GROVE AVENUE AT VANDEVENTER AVENUE

TOWER GROVE AVENUE AT VANDEVENTER AVENUE

SCENARIO 1:
FIRST LEVEL OF IMPROVEMENTS TO EXISTING ROUTES AND FACILITIES

OPPORTUNITIES

1. Tower Grove Avenue has a much wider street profile south of Vandeventer Avenue to the Missouri Botanical Gardens, which would allow the street to be configured to add dedicated bike lanes.

2. Utilizing Chouteau Avenue as a connector between Tower Grove Avenue and Boyle Avenue would provide an alternate route to avoid the proposed roundabout at Tower Grove Avenue and Interstate 64.

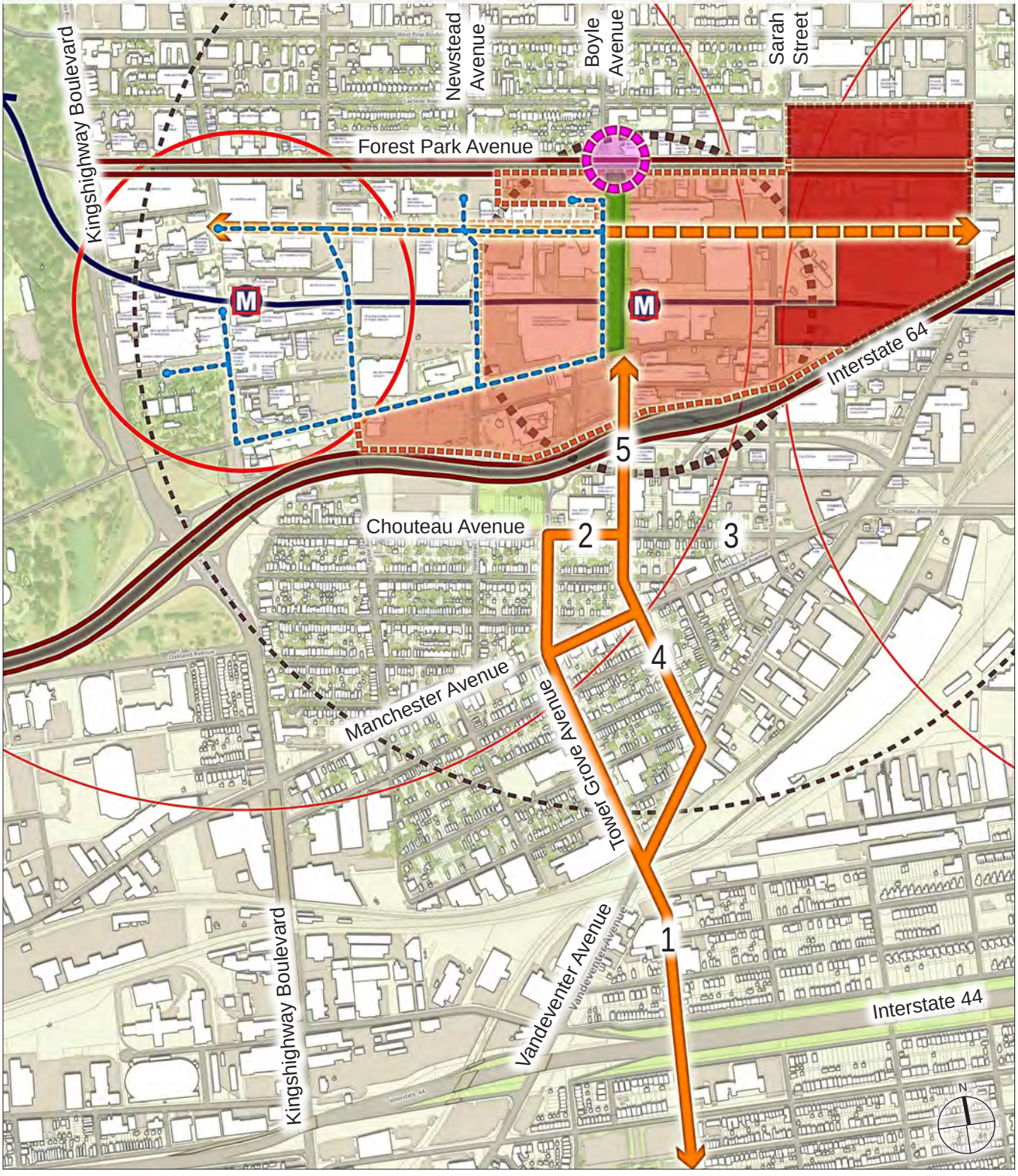
3. Chouteau Avenue has a street width of 50 ft. that allows for development of separate pedestrian and bike facilities making its use more appealing to pedestrians and bicyclists.

4. Boyle Avenue has lower vehicular traffic volume than Tower Grove Avenue which is appealing to pedestrians and bicyclists looking for an alternate safer route to CORTEX and BJC/WU campuses.

5. Pedestrians and bicyclists can avoid the proposed roundabout at Tower Grove Avenue and Interstate 64 for the more comfortable routes of Boyle Avenue.

FIGURE 4.2: SCENARIO 1 OPPORTUNITES

- CORTEX Redevelopment Area
- Small Circles: 1/4 Mile (5 Minute Walking) Radius from existing or proposed MetroLink station
- Large Cricles: 3/4 Mile (5 Minute Bike Ride) Radius from existing or proposed MetroLink station
- MetroLink Route
- MetroLink Stop
- Major Street-Level Connectivity Routes
- District Shuttle



SCENARIO 1:
FIRST LEVEL OF IMPROVEMENTS TO EXISTING ROUTES AND FACILITIES

CONSTRAINTS

1. Tower Grove Avenue has a vehicular traffic volume which is even more pronounced when the street narrows to 36 feet wide north of Vandeventer Avenue. Bikes much share the narrow travel lanes with vehicles while maneuvering around opening doors from parked vehicles.

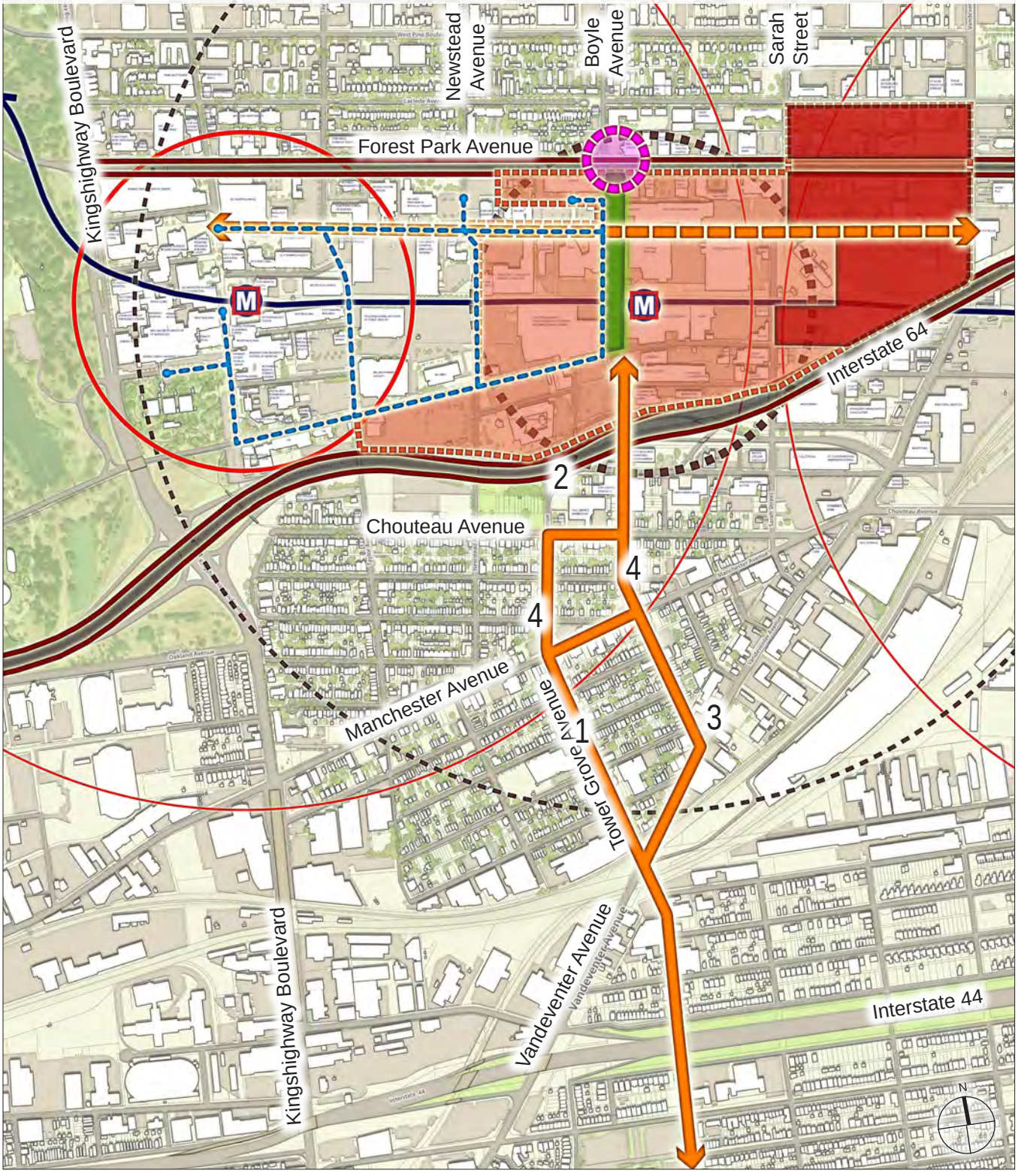
2. The proposed roundabout and ramp modifications to the Tower Grove and Boyle Avenue connections at Interstate 64 can cause pedestrians and bicyclists to avoid these areas and revert back to their present routes on Newstead and Euclid Avenue.

3. Vandeventer Avenue is a very high volume route which is comprised of a large percentage of semi-truck traffic in addition to cars. A cross over point from Boyle Avenue to Tower Grove Avenue via Vandeventer Avenue would put pedestrians and bicyclists at risk crossing three lanes of traffic to turn on to Boyle north or Tower Grove south.

4. Reconfiguring streets to allow for dedicated bike lanes would require restriping of the bike and pedestrian routes on Tower Grove Avenue south of Vandeventer Avenue, Chouteau Avenue and Boyle Avenue.

FIGURE 4.3: SCENARIO 1 CONSTRAINTS

- CORTEX Redevelopment Area
- Small Circles: 1/4 Mile (5 Minute Walking) Radius from existing or proposed MetroLink station
- Large Cricles: 3/4 Mile (5 Minute Bike Ride) Radius from existing or proposed MetroLink station
- MetroLink Route
- MetroLink Stop
- Major Street-Level Connectivity Routes
- District Shuttle



SCENARIO 2: MODIFY EXISTING STREET FACILITIES AND ROUTES

OPPORTUNITIES

1. Tower Grove Avenue has a much wider street profile south of Vandeventer Avenue that allows the street to be configured to add buffered bike lanes and on-street parking.

2. Pedestrians and bicyclists can avoid the proposed roundabout at Tower Grove Avenue and I-64 for the more comfortable routes of Boyle Avenue and Newstead Avenue.

3. Boyle Avenue north of Vandeventer Avenue allows for a direct connection by bicyclists and pedestrians to the district.

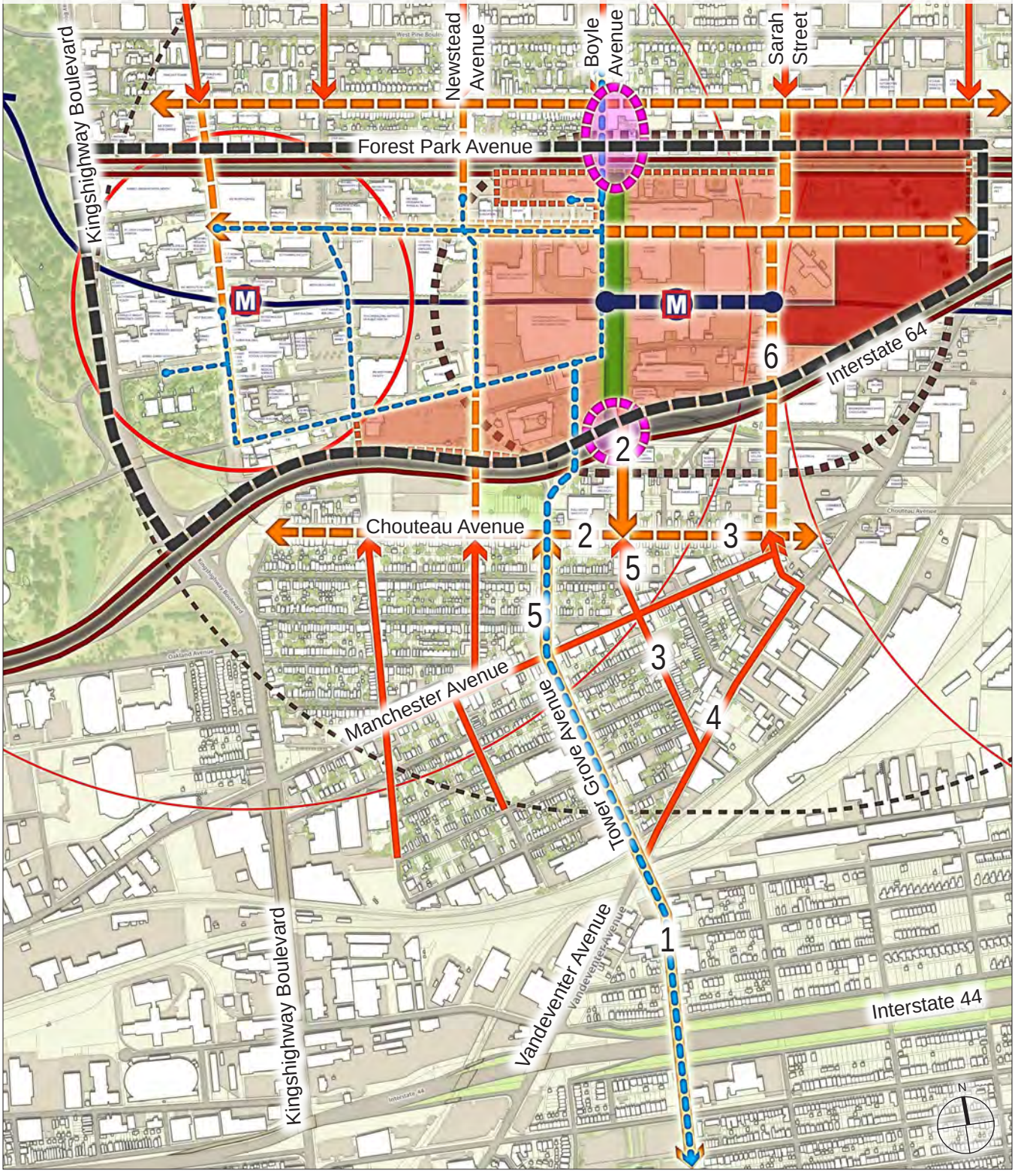
4. Vandeventer Avenue has ample width to reconfigure lanes to provide dedicated or buffered bike lanes on each side of the street.

5. Restriping, new signage and modifying of traffic signals at the Boyle Avenue and Tower Grove Avenue intersections with Vandeventer Avenue would allow for safe passage through these intersections by pedestrians and bicyclists.

6. Sarah Avenue is underutilized and could provide additional access into the CORTEX District and a new MetroLink Station.

FIGURE 4.4: SCENARIO 2 OPPORTUNITIES

- CORTEX Redevelopment Area
- Small Circles: 1/4 Mile (5 Minute Walking) Radius from existing or proposed MetroLink station
- Large Cricles: 3/4 Mile (5 Minute Bike Ride) Radius from existing or proposed MetroLink station
- MetroLink Route
- MetroLink Stop
- Major Street-Level Connectivity Routes
- District Shuttle
- Proposed Parking District Boundary



SCENARIO 2: MODIFY EXISTING STREET FACILITIES AND ROUTES

CONSTRAINTS

1. Vandeventer Avenue is a very high volume route which is comprised of a large percentage of semi-truck traffic in addition to cars. A cross over point from Boyle Avenue to Tower Grove Avenue via Vandeventer Avenue would put pedestrians and bicyclists at risk crossing three lanes of traffic to turn on to Boyle north or Tower Grove south. Pedestrian crossing signals or in pavement detector loops in the bike lane pavement would be required.

2. Modifications to the traffic signals at the intersections of Boyle Avenue/Vandeventer Avenue and Tower Grove Avenue/ Vandeventer Avenue would be an additional construction cost.

3. All streets and intersections along the route would need to be restriped to allow for new bike lanes.

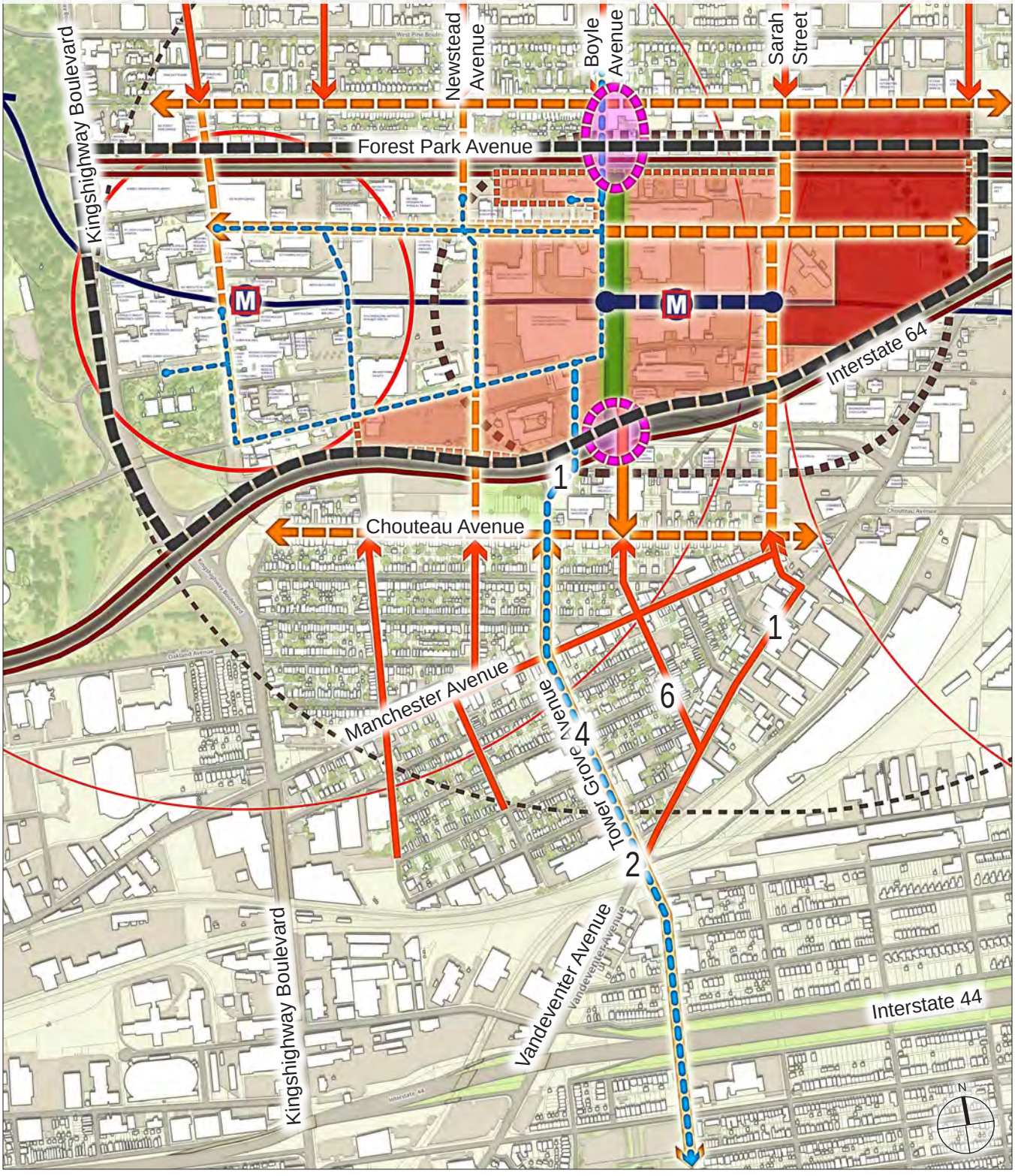
4. Providing a different type of paving material in the parking lanes on the connectivity route south of Vandeventer Avenue on Tower Grove Avenue would be added cost for removal and replacement of existing pavement.

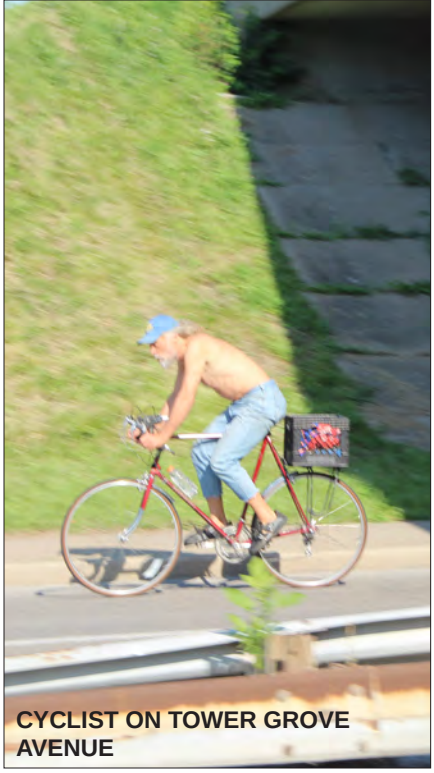
5. New signage for the bike and pedestrian route would be needed.

6. Removing parking lanes on the Boyle Avenue section of the route will have resistance from the residents and businesses in the community. On-street parking would not allow for dedicated bike

FIGURE 4.5: SCENARIO 2 CONSTRAINTS

- CORTEX Redevelopment Area
- Small Circles: 1/4 Mile (5 Minute Walking) Radius from existing or proposed MetroLink station
- Large Cricles: 3/4 Mile (5 Minute Bike Ride) Radius from existing or proposed MetroLink station
- MetroLink Route
- MetroLink Stop
- Major Street-Level Connectivity Routes
- District Shuttle
- Proposed Parking District Boundary





CYCLIST ON TOWER GROVE AVENUE

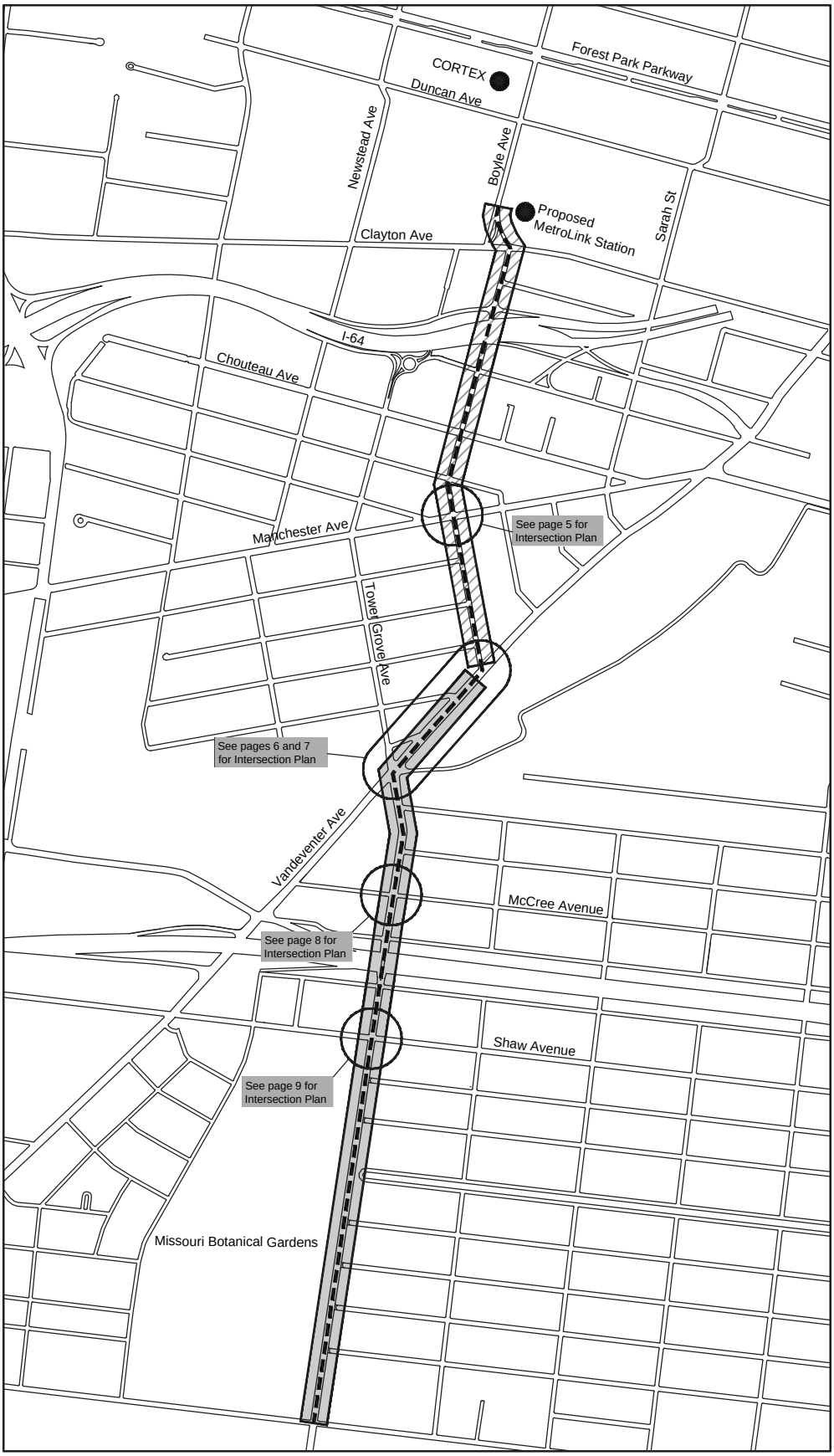
COMMONALITIES BETWEEN BOTH SCENARIOS

OPPORTUNITIES

- Revitalizing the intersection of Forest Park Parkway and Boyle Avenue can create a welcoming entrance into the district and draw pedestrian/bike traffic from the neighborhoods north of Forest Park Parkway.
- Duncan Avenue can become a vital east-west connection point between the CORTEX District and Barnes Jewish Children's (BJC)/Washington University (WU) campuses.
- Developing a Metro Transit Hub at Boyle Avenue just south of Duncan Avenue would bring more pedestrian/bike/vehicular/bus traffic into the district to help build a strong multi-modal facility.

CONSTRAINTS

- Duncan Avenue between Sarah Avenue and Newstead Avenue is limited to a 36 ft. wide street with a 60 ft. right-of-way. Reconfiguring the facilities into a wider street to accommodate separated bike and pedestrian facilities would require the removal or underground bury of overhead power lines located in the north sidewalk that could be an expensive proposition.
- Pedestrians and bicyclists heading down to the Garden area have limited street routes south of Vandeventer Avenue and must utilize Tower Grove Avenue, which has a high vehicular traffic volume.
- Tower Grove Avenue and Boyle Avenue are only 36 ft. wide with a 60 ft. right-of-way from Clayton Avenue to Vandeventer Avenue. It would be necesary to reconfigure the present street section and possibly eliminate street parking in areas where parking spots can be quite scarce.
- Providing off-street parking in the Forest Park Southeast area would be needed if street parking is eliminated along Tower Grove Avenue and Boyle Avenue. This is especially true where Tower Grove Avenue and Boyle Avenue enter the Grove business district located along Manchester Avenue.
- Numerous underground utilities can pose unforeseen issues and costs during design and construction.
- The overall existing condition of street pavement, sidewalks and rail crossings is fair to poor and needs to be improved greatly to promote connectivity and safety for pedestrians and bicyclists.



Legend

- Street-Level Connectivity Route
- See pages 2 and 3 for Typical Section and Street Plan
- See page 4 for Typical Section and Street Plan

Key Plan

Typical Sections/Street Plans and Intersection Plans

N

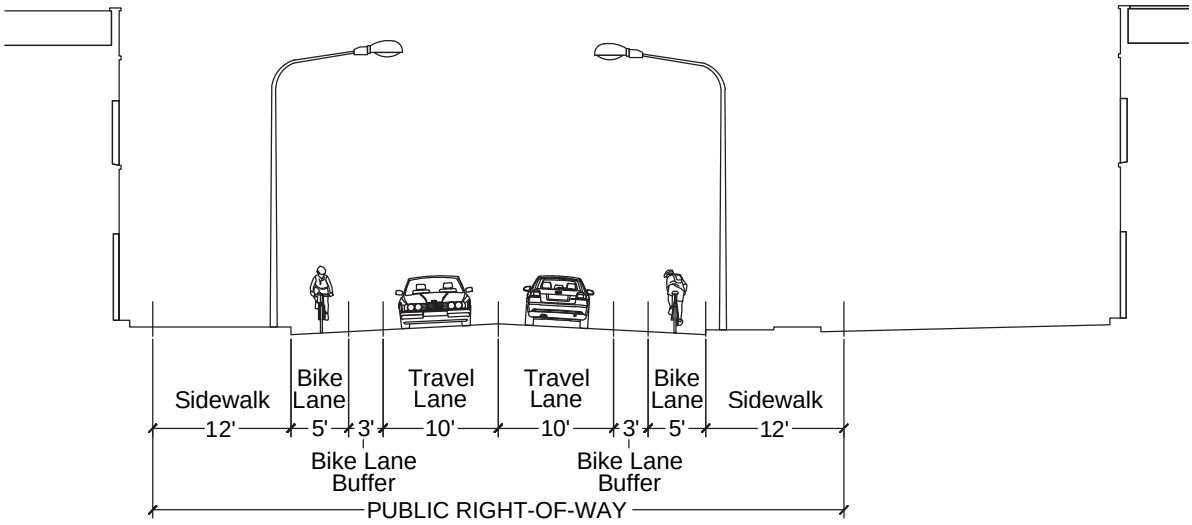
BOYLE AVENUE, LOOKING SOUTH

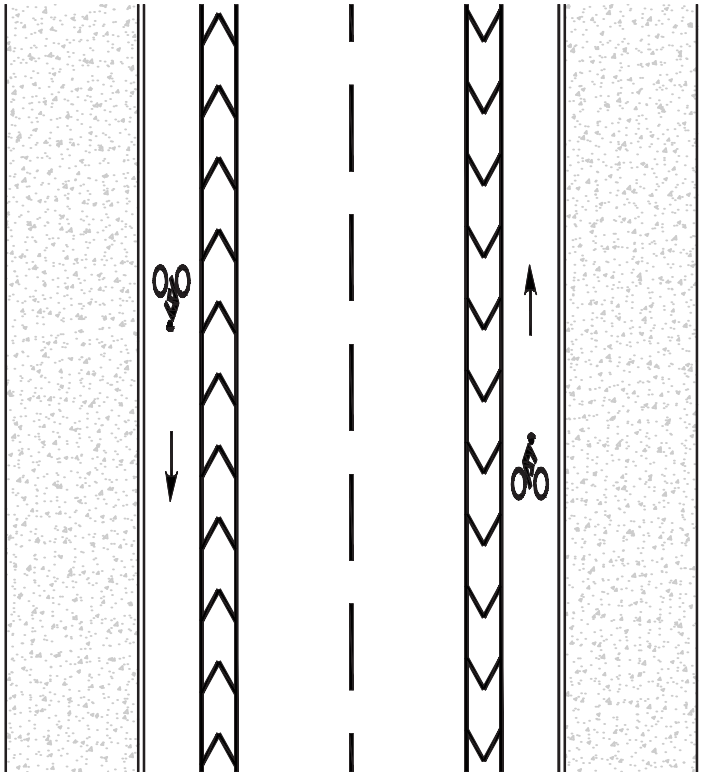
TYPICAL SECTIONS & STREET PLANS

Boyle Avenue from Vandeventer Avenue to Clayton Avenue
OPTION A

- Curb face to curb face width is 36 ft.
- Right-of-way is 60 ft.
- Buffered bike lanes
- No street parking

BOYLE AVENUE, LOOKING NORTH





Typical Section and Street Plan

Option A - Boyle Avenue from Vandeventer Avenue to Clayton Avenue

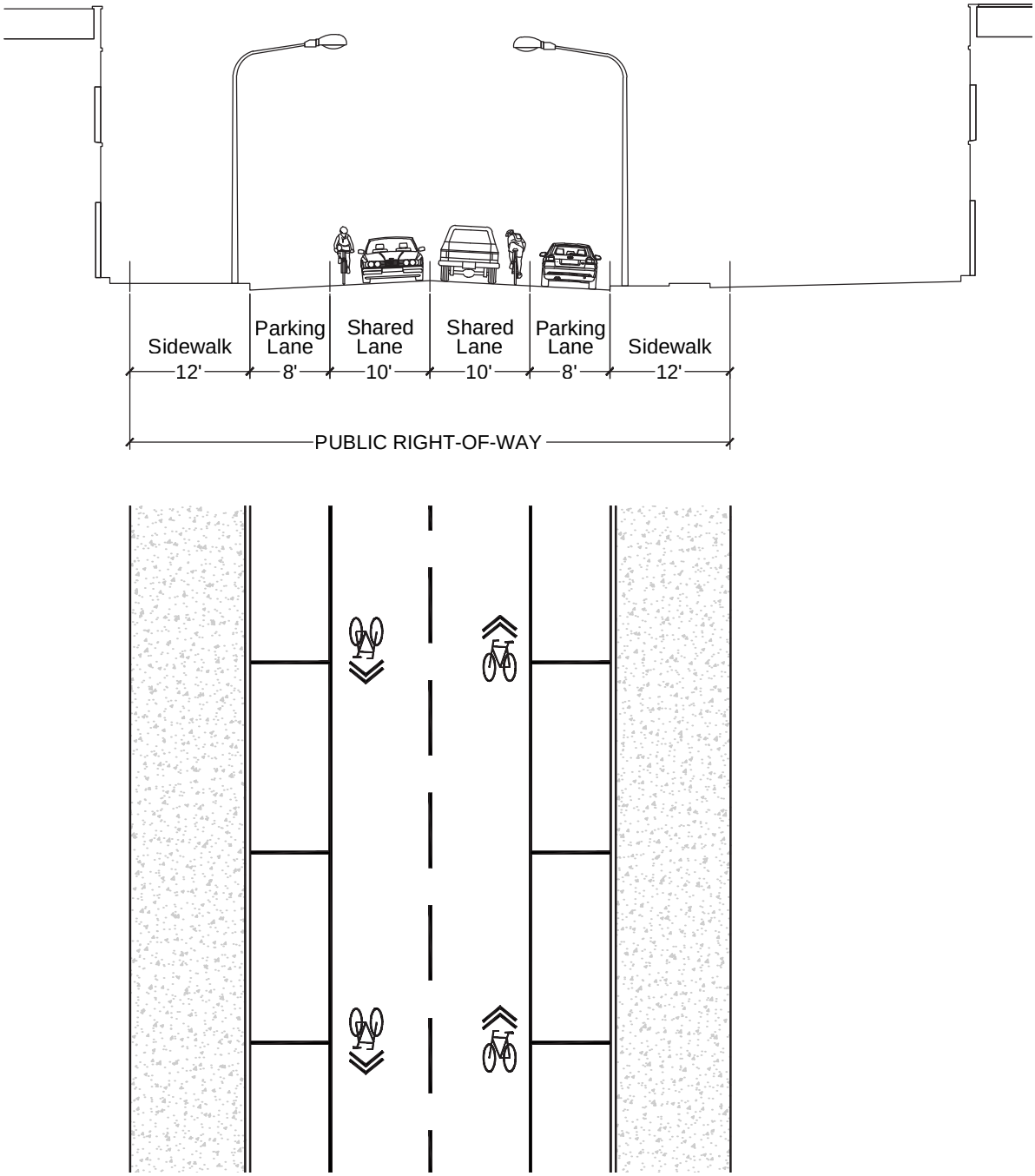
BOYLE AVENUE AT CHOUTEAU AVENUE

TYPICAL SECTIONS & STREET PLANS

Boyle Avenue from Vandeventer Avenue to Clayton Avenue
OPTION B

- Curb face to curb face width is 36 ft.
- Right-of-way is 60 ft.
- Shared lanes with vehicles and bikes
- Street parking both sides

BOYLE AVENUE AT VANDEVENTER AVENUE



Typical Section and Street Plan

Option B - Boyle Avenue from Vandeventer Avenue to Clayton Avenue

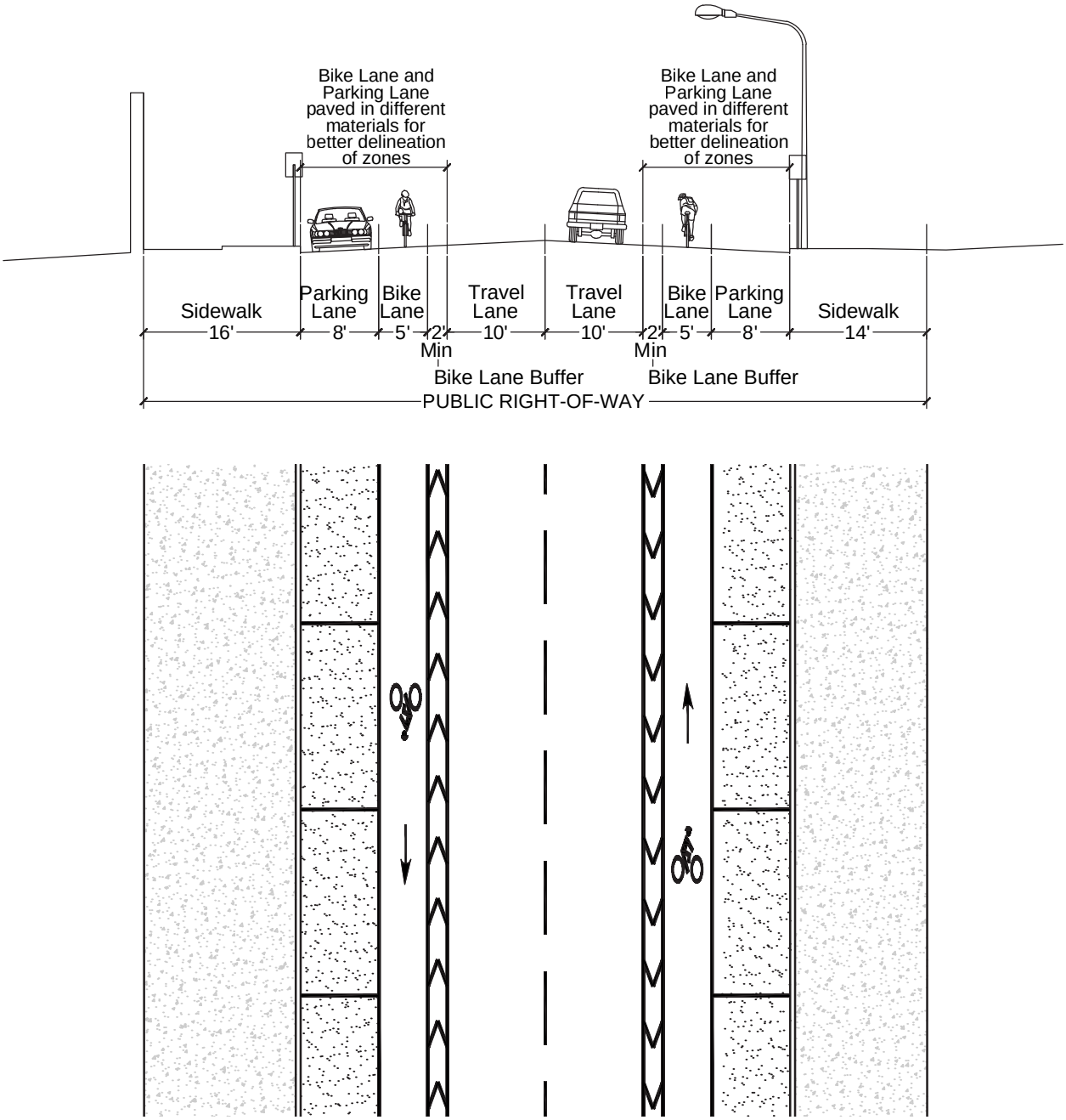
TOWER GROVE AVENUE AT MCREE AVENUE

TYPICAL SECTIONS & STREET PLANS

Tower Grove Avenue from Magnolia Avenue to Vandeventer Avenue

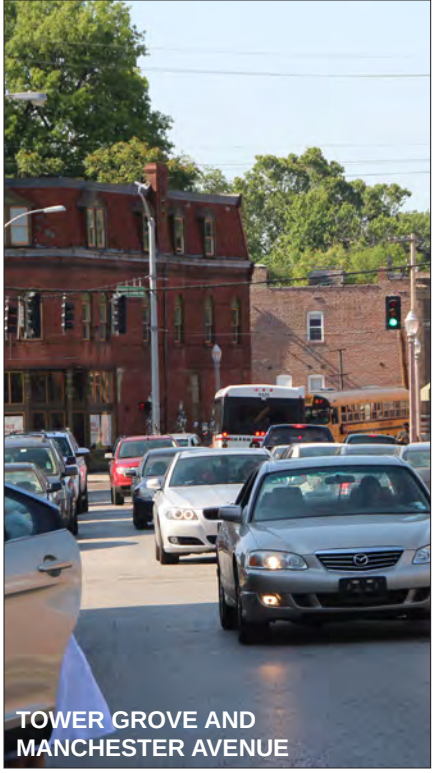
- Curb face to curb face width varies from 52 ft. to 62 ft.
- Right-of-way is 80 ft.
- Buffered bike lanes
- Street parking both sides

TOWER GROVE AVENUE LOOKING SOUTH TOWARD MAGNOLIA AVENUE



Typical Section and Street Plan

Tower Grove Avenue from Magnolia Avenue to Vandeventer Avenue



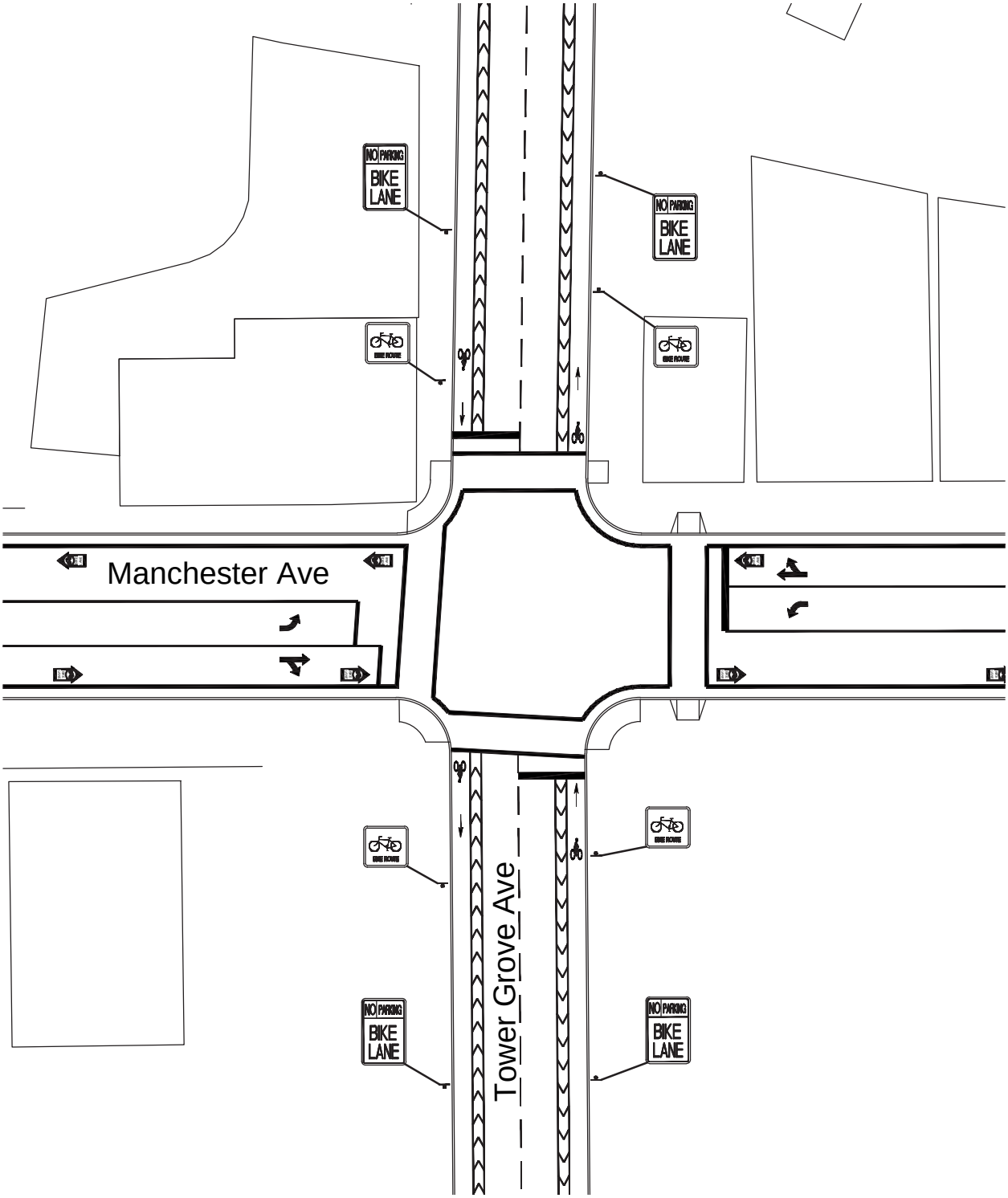
TOWER GROVE AND MANCHESTER AVENUE

INTERSECTION PLANS

Tower Grove Avenue and Manchester Avenue

- Boyle Avenue is 36 ft. wide from face of curb to face of curb
- Signs denoting “No Parking in Bike Lane” and “Bike Route”
- Buffered bike lanes
- No street parking on Boyle Avenue
- No dedicated right turn lanes onto Manchester in either direction
- Manchester Avenue has dedicated left turn lanes onto Boyle in both directions and shared vehicle and bike lanes
- Boyle Avenue will be restriped.
- Bike signage will be added along Boyle Avenue and at the intersection on Manchester Avenue

TOWER GROVE AND MANCHESTER AVENUE



Intersection Plan

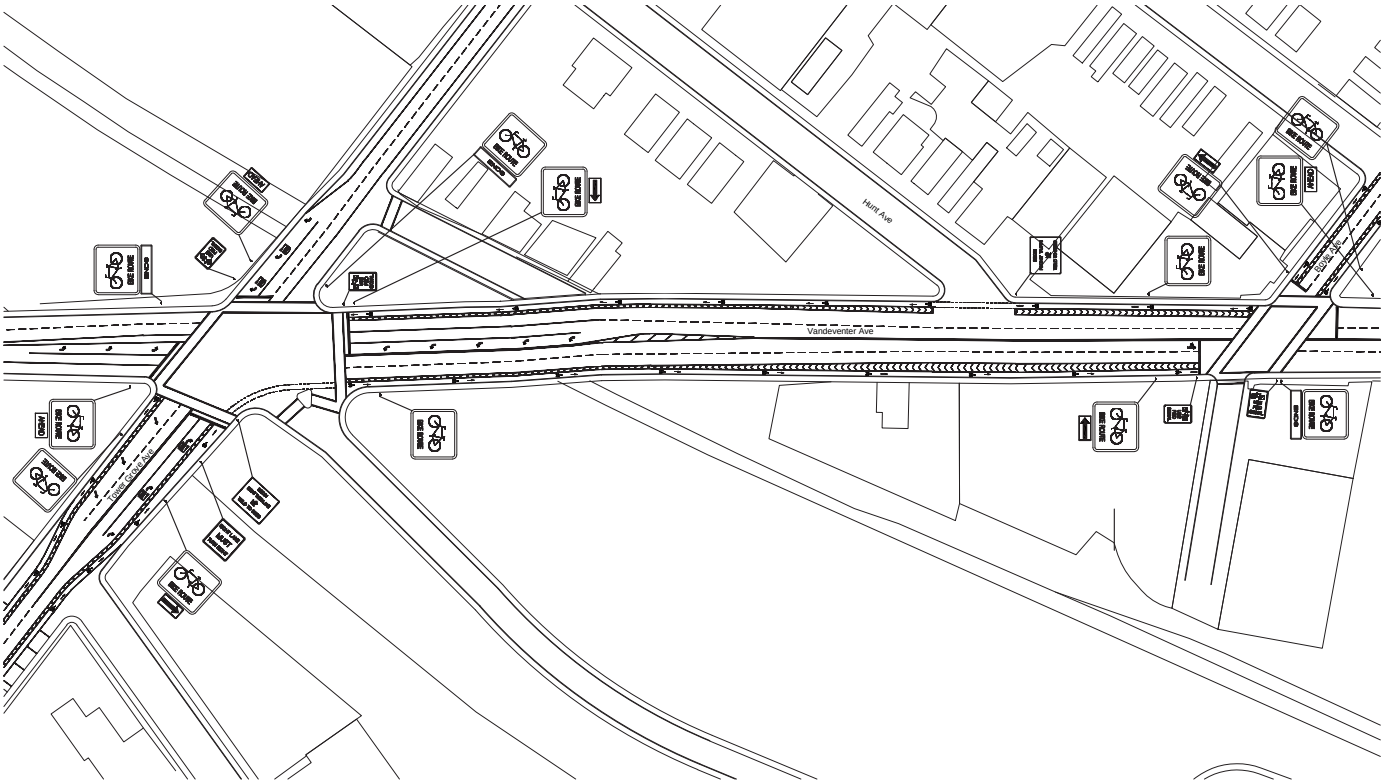
Tower Grove Avenue and Manchester Avenue

TOWER GROVE AND
VANDEVENTER AVENUE

INTERSECTION PLANS

Vandeventer Avenue/Tower Grove Avenue and
Vandeventer Avenue/Boyle Avenue
OPTION 1

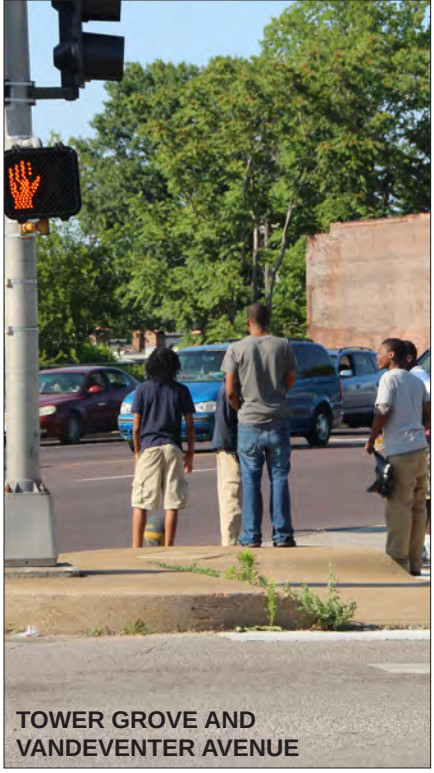
- Bike route from Tower Grove Avenue south of Vandeventer is routed along east along Vandeventer Avenue to Boyle Avenue.
- At the Boyle Avenue and Vandeventer Avenue intersection, the dedicated left-turn lane and arrow is replaced with a combined left-thru arrow to help reduce the amount of vehicular traffic on Boyle Avenue north. This will require traffic signal modification to remove the left turn signal head.
- Traffic headed south of Vandeventer Avenue on Tower Grove Avenue is merged into a single lane south of the intersection.
- Traffic headed north on Tower Grove Avenue at the intersection of Vandeventer Avenue have a dedicated right turn lane as well as bikes.
- Buffered bikes lanes are separated on each side Vandeventer Avenue between the two intersections.
- Signs denote the bike route and direction bikes must turn.
- Bikes headed to the Boyle Avenue intersection on Vandeventer Avenue are directed to use the Pedestrian Signal Buttons to cross Vandeventer Avenue onto Boyle. This will require some modifications to the present traffic signal system to accommodate pedestrian buttons for bikes.
- Bikes headed to the Tower Grove Avenue intersection on Vandeventer Avenue are directed to use the Pedestrian Signal Buttons to cross Vandeventer Avenue south onto Tower Grove Avenue. This will require some modifications to the present traffic signal system to accommodate pedestrian buttons for bikes.
- Boyle Avenue, Tower Grove Avenue and Vandeventer Avenue at and between the Boyle Avenue and Tower Grove Avenue intersections will require restriping and new bike signage.



Intersection Plan

Option 1 - Vandeventer Avenue/Tower Grove Avenue and Vandeventer Avenue/Boyle Avenue

VANDEVENTER AVENUE AT TOWER GROVE AVENUE

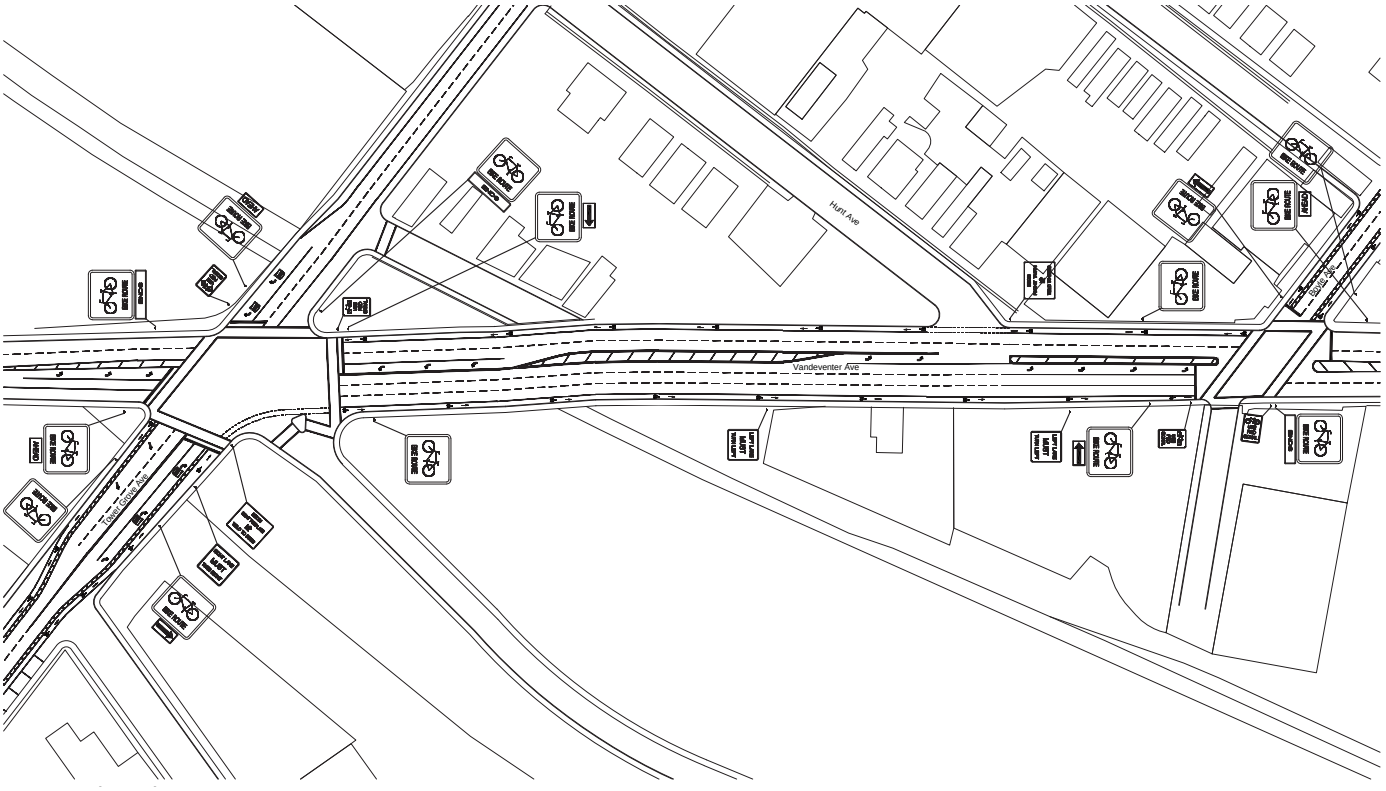


TOWER GROVE AND
VANDEVENTER AVENUE

INTERSECTION PLANS

Vandeventer Avenue/Tower Grove Avenue and
Vandeventer Avenue/Boyle Avenue
OPTION 2

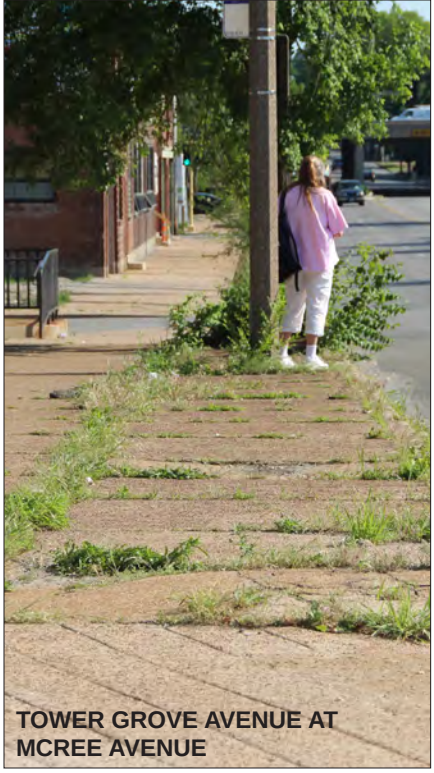
- Bike route from Tower Grove Avenue south of Vandeventer is routed along east along Vandeventer Avenue to Boyle Avenue.
- Along Vandeventer Avenue there is a dedicated left turn lane onto Boyle Avenue north and Hunt Avenue.
- Traffic headed south of Vandeventer Avenue on Tower Grove Avenue is merged into a single lane south of the intersection.
- Car and bike traffic headed north on Tower Grove Avenue at the intersection of Vandeventer Avenue has a dedicated right turn lane.
- Dedicated bike lanes are on each side Vandeventer Avenue between the two intersections.
- Signs denote the bike route and direction bikes must turn.
- Bikes headed to the Boyle Avenue intersection on Vandeventer Avenue are directed to use the Pedestrian Signal Buttons to cross Vandeventer Avenue onto Boyle. This will require some modifications to the present traffic signal system to accommodate pedestrian buttons for bikes.
- Bikes headed to the Tower Grove Avenue intersection on Vandeventer Avenue are directed to use the Pedestrian Signal Buttons to cross Vandeventer Avenue south onto Tower Grove Avenue. This will require some modifications to the present traffic signal system to accommodate pedestrian buttons for bikes.
- Boyle Avenue, Tower Grove Avenue and Vandeventer Avenue at and between the Boyle Avenue and Tower Grove Avenue intersections will require restriping and new bike signage.



Intersection Plan

Option 2 - Vandeventer Avenue/Tower Grove Avenue and Vandeventer Avenue/Boyle Avenue

VANDEVENTER AVENUE AT
TOWER GROVE AVENUE



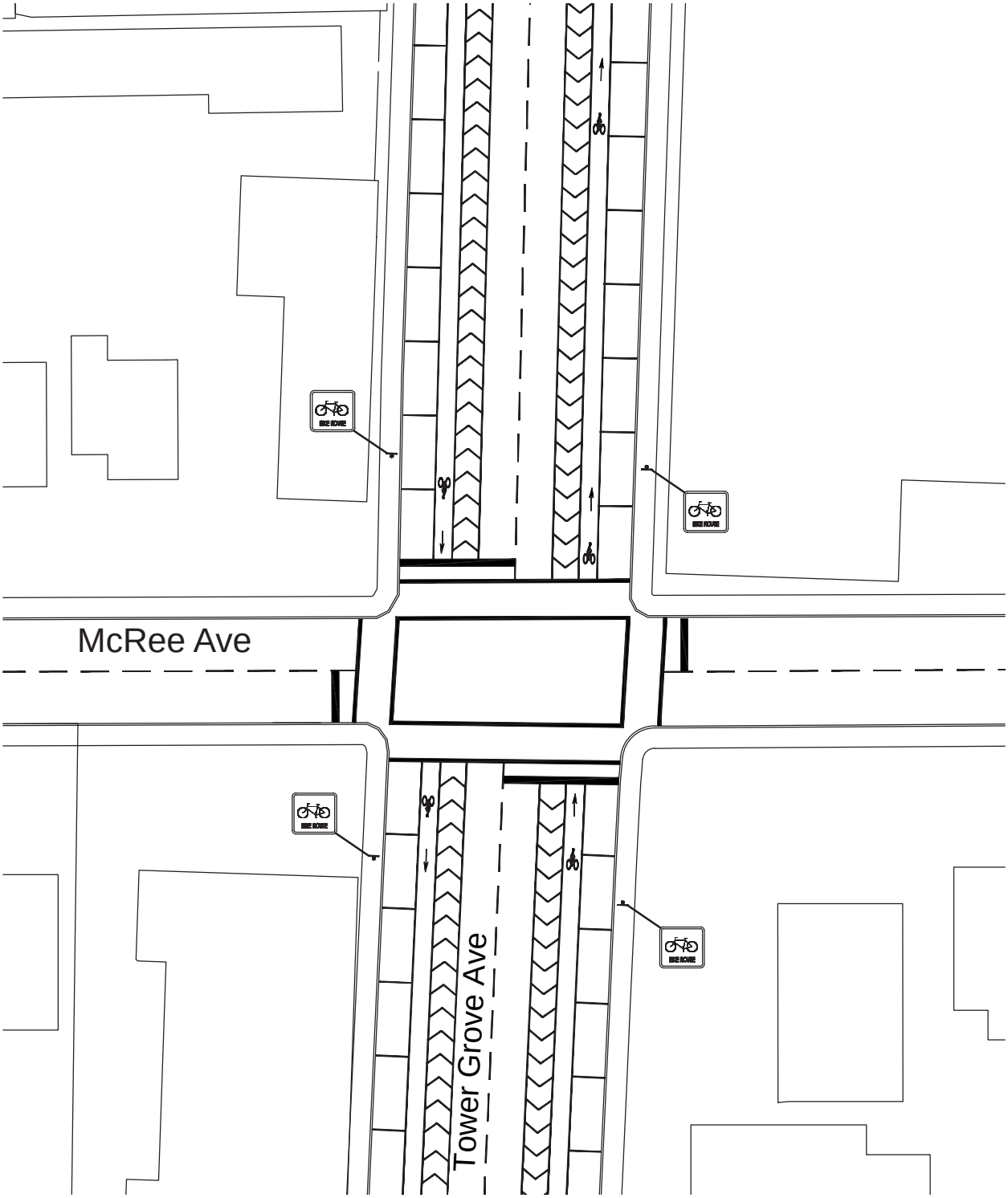
TOWER GROVE AVENUE AT MCREE AVENUE

INTERSECTION PLANS

Tower Grove Avenue and McRee Avenue

- Tower Grove is 62 ft. wide from face of curb to face of curb.
- Signs denoting “No Parking in Bike Lane”.
- Buffered bike banes.
- Street parking on Tower Grove Avenue both sides.
- No dedicated right turn lanes onto McRee Avenue in either direction.
- Tower Grove Avenue will be restriped to accommodate the new buffered bike lane and street parking.
- Bike signage will be required along Tower Grove Avenue and at the intersection with McRee Avenue.
- No modifications to the traffic signals are needed.

TOWER GROVE AVENUE AT MCREE AVENUE



Intersection Plan

Tower Grove Avenue and McCree Avenue

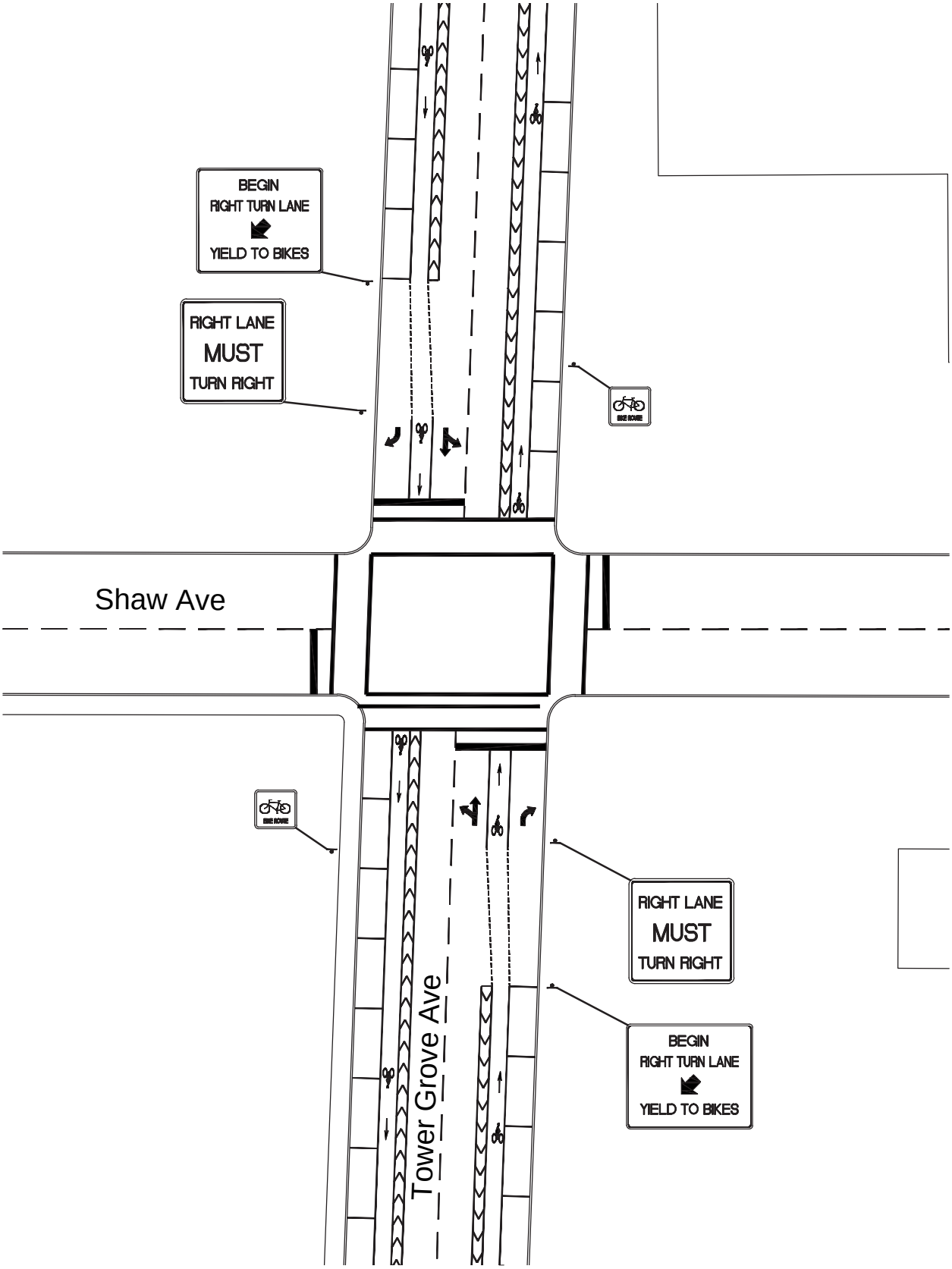
TOWER GROVE AVENUE AT SHAW BOULEVARD

INTERSECTION PLANS

Tower Grove Avenue and Shaw Avenue

- Tower Grove is 52 ft. wide from face of curb to face of curb.
- Signs denoting “No Parking in Bike Lane”.
- Buffered bike lanes.
- Street parking on Tower Grove Avenue on both sides. Parking lanes will be permeable pavement to help delineate the bike lane from parking lane.
- Dedicated right turn lanes onto Shaw Avenue in either direction with special striping of the bike in those sections.
- Tower Grove Avenue will be restriped to accommodate the new buffered bike lane and street parking.
- Bike signage will be required along Tower Grove Avenue and at the intersection with Shaw Avenue.
- No modifications to the traffic signals is needed.

TOWER GROVE AVENUE AT SHAW BOULEVARD



Intersection Plan

Tower Grove Avenue and Shaw Avenue

5 | TOD Opportunities & **Sustainable Design Strategies**

TOWER GROVE AVENUE AT THE MISSOURI BOTANICAL GARDENS

DEFINING SUSTAINABILITY

Sustainable communities are cities and towns that prosper because their citizens work together to produce a high quality of life that they strive to sustain and constantly improve. Sustainable communities flourish because their residents and stakeholders build a mutually-supportive, dynamic balance between social well-being, economic opportunity, and environmental quality. The most sustainable communities are characterized by increased density; easy access to transportation and an equity of mobility; a balance of housing and local jobs; a range of housing types and household income levels; availability of services and amenities; and great public spaces where residents have access to employment, shopping, recreational, cultural arts, housing, and transportation opportunities regardless of their age, ability, and income level. With an appropriate density of residential units and employment, this pattern also ideally facilitates transit-oriented development (TOD). This requires meeting a threshold at which mass transit is economically- and operationally sustainable, and at which transit options can create a car-optional district.

The triple-bottom-line approach acknowledges the three pillars of sustainability—environmental stewardship, social equity, and economic development—as equal and capitalizes on the fact that they can be leveraged to increase the positive outcomes of each beyond what would be possible if each pillar were addressed separately. This is due to the fact that most sustainability initiatives that occur in the sphere of cities require some investment of city funds. If the effects of the initiatives increase property values or stimulate economic activity, the tax base may increase to fully offset the cost of the initiative or more. In addition, an increase in property value improves the investment of individual residents, makes the community more desirable, and may lead to an increase in other investments, both public and private. This increases social equity by improving each individual resident's "investment" in their community and its "return."

Public transit serves as a textbook example. Through increased efficiency, mass transit lowers the per-capita carbon emissions of each user, when compared to transportation by car. This can have a measurable impact on environmental sustainability. Proximity and access to public transit also has the effect of raising property values, which can provide a positive economic impact to both the city (through an increased tax base) and individuals (through an increase of value in their real estate.) Regular use of public transit also reduces annual transportation costs to households, which increases an individual's

real wealth. This increase in wealth can have a positive effect on both individual economic impact as well as an increase in social equity, because it enhances individual empowerment within a community.

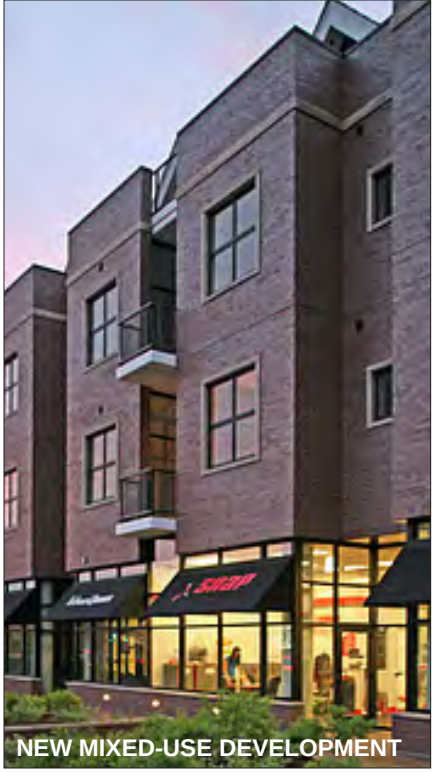
HIGH DENSITY APARTMENTS ON FOREST PARK AVENUE

DESIGN STRATEGIES & ACTIONS

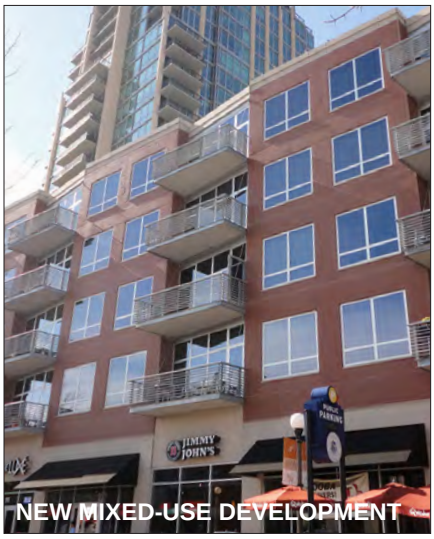
Today, the CORTEX district is segregated from its neighbors, surrounded by significant barriers, and provides few incentives to cross these barriers. In order to ensure both the success of the proposed MetroLink station and continuing success for the CORTEX district as a whole, the future CORTEX development must work to tie the district to existing residential populations, commercial centers, and surrounding institutional amenities, making the CORTEX district an integral part of its surrounding neighborhoods. While the recommendations and scenarios put forth in this study address particular technical issues, the sum total of these recommendations can and should be leveraged together in order to create a vibrant, mixed-use, transit-oriented district that is well connected to adjacent neighborhoods and amenities and overcomes the fundamental barrier of I-64 to the south.

Equally important is the role that a MetroLink station within the CORTEX district would play in providing a direct connection to regional assets such as the airport, colleges, downtown St. Louis, Clayton, and other job centers. Making the MetroLink system more accessible to CORTEX and its adjacent neighborhoods will lead to increased ridership throughout the system.

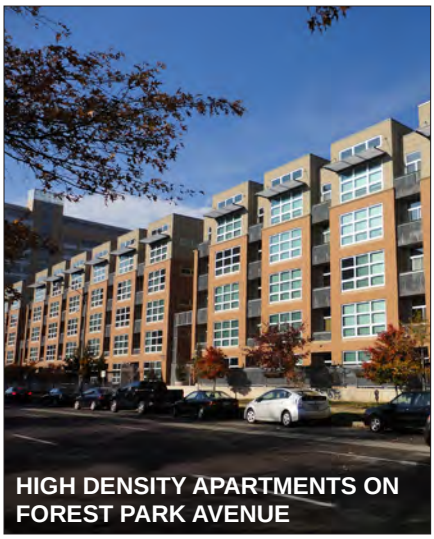
The Transit Oriented Development Study for the CORTEX district proposes **eight TOD and Sustainable Design Strategies** to advance this goal. The first four TOD and Sustainable Design Strategies are **necessary to facilitate transit-oriented development in the district.** The remaining four strategies represent best practice opportunities that **should be utilized to maximize development investment.** These TOD and Sustainable Design Strategies address new development, creating vibrant places for social and professional interaction, district parking, pedestrian and bike connectivity, high-performance infrastructure, building and site performance requirements, district water and energy strategies, and district wide branding and imaging. It is recommended that these strategies be incorporated into all future master planning efforts for the CORTEX district, in order to capitalize on new development opportunity.



NEW MIXED-USE DEVELOPMENT



NEW MIXED-USE DEVELOPMENT



HIGH DENSITY APARTMENTS ON FOREST PARK AVENUE

1. REQUIRE HIGH-DENSITY, MIXED-USE & RESIDENTIAL DEVELOPMENT

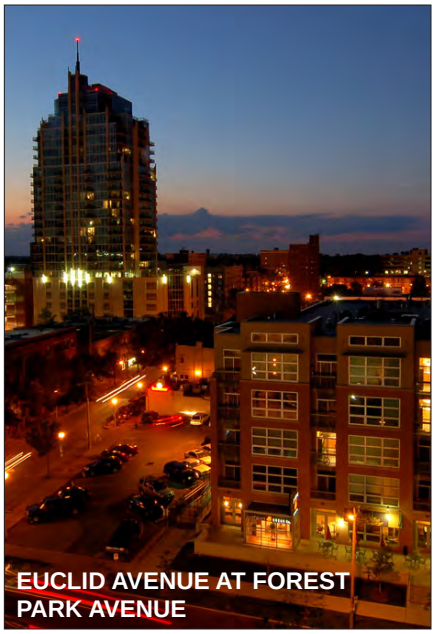
In order to ensure the future financial and operational sustainability of transit, development must be high-density and provide a mix of uses and amenities. Transit-oriented development is typically defined as 1) 20-unit per acre residential density or greater or 2) 0.75 floor area ratio (FAR) or greater within a one-quarter mile radius of transit; and 3) 15-unit per acre residential density or greater or 4) 0.5 FAR or greater within one-quarter to one-half mile radius of transit. These density levels yield the ridership necessary for mass-transit to operate economically, and the presence of transit can induce greater market demands for high density development. Primary residential and office uses should be supplemented with commercial, retail, and entertainment mixed-use. Actions to achieve this strategy include:

- **Develop a district regulatory plan that establishes building minimum and maximum heights and massing requirements throughout the district.**
- **Develop a district building use plan that dictates ground-floor and upper-floor building programs throughout the district that promote social interaction and provide for the community's and users' needs.**
- **Establish a primary mixed-use corridor through the district**
- **Establish district-wide mixed-use guidelines to ensure the proper proportions of development types and programs.**
- **Establish location-based development density thresholds (units per acre and/or FAR) and require or incentivize new buildings to achieve these thresholds.**
- **Implement a greater fine-grain mixing of residential and research buildings.**
- **Develop a form-based code and overlay district so that development meeting these requirements is allowed by right and not by variance.**

2. CONNECT TO SURROUNDING ASSETS, NEIGHBORHOODS & AMENITIES

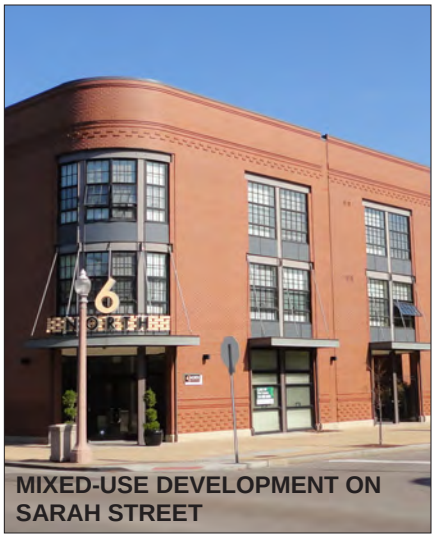
The CORTEX district is ideally-positioned in the heart of the Saint Louis central corridor to deliver on the promise of urban, life-sciences research parks. **In order to realize this potential, provide the kind of livable, sustainable, and vibrant mixed-use urban neighborhoods that the 21st century knowledge-based worker desires, and increase access to regional transit**, CORTEX must leverage and capitalize on its surrounding neighborhoods and amenities. To the north, the Central West End remains one of Saint Louis' premier residential neighborhoods and the Euclid Avenue corridor continues to be the region's most successful mixed-use main street. To the south, The Grove commercial and entertainment district has made great strides and the Forest Park Southeast neighborhood possesses huge latent value because of it's location, historic building stock, and potential for reinvestment. In addition, the Sarah Street corridor and areas adjacent to SLU represent a future redevelopment opportunity. Actions to achieve this strategy include:

- **Create a double-ended MetroLink station with entrances at both Boyle Avenue and Sarah Street.**
- **Create two front doors to the district at Forest Park Avenue and I-64.**
- **Develop Sarah Street as a key neighborhood main street**
- **Provide high quality pedestrian and bike connections south across the I-64 barrier.**
- **Connect to existing and planned adjacent greenways and bike routes including Chouteau Avenue and Tower Grove Avenue.**
- **Require ground-floor mixed-use and commercial uses with street frontages and storefronts.**
- **Design and implement public spaces that support and encourage social and professional interaction.**
- **Connect to existing business and commercial centers, main streets, and amenities in surrounding neighborhoods.**
- **Encourage and support new development and redevelopment in surrounding neighborhoods and districts.**



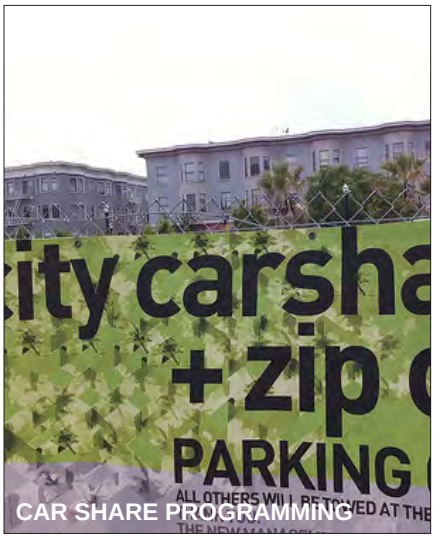
EUCLID AVENUE AT FOREST PARK AVENUE

LACLEDE AVENUE IN THE CENTRAL WEST END



MIXED-USE DEVELOPMENT ON SARAH STREET

DISTRICT PARKING LOT WITH SOLAR PANEL SHADES



CAR SHARE PROGRAMMING

MIXED-USE URBAN PARKING STRUCTURE

3. REDUCE PARKING REQUIREMENTS, ENHANCE ACCESSIBILITY & DEVELOP A CORTEX PARKING DISTRICT

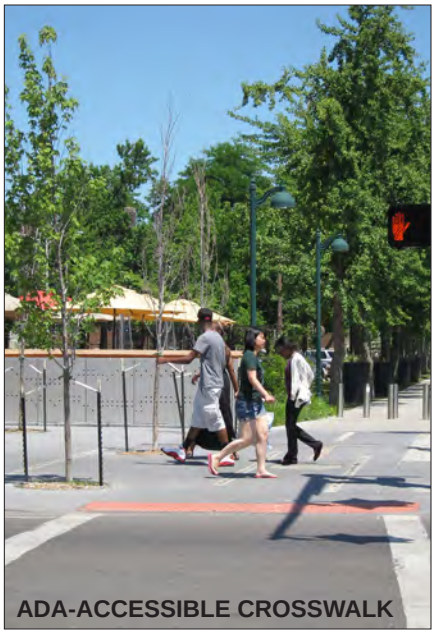
In order to facilitate necessary TOD densities and help incentivize transit ridership, typical municipal parking requirements must be reduced. On average, modern parking codes require 500 to 600 hundred square feet of parking per 1000 square feet of residential or office development. In order to achieve necessary densities, parking must be accommodated in garages, which cost about 10 times more than surface parking. The costs of structured parking make residential and office developments infeasible in most development markets; high levels of provided parking also disincentivize transit ridership. The CORTEX district should reduce parking requirements and establish a Parking District that meets the needs of park and ride users while at the same time supporting and incentivizing transit ridership with the ultimate goal of creating a car-optional district. Actions to achieve this strategy include:

- **Develop location-based alternative parking requirements for development in the CORTEX district.**
- **Establish maximum parking ratios for all development within one-quarter mile of MetroLink stations.**
- **Allow market-based parking ratios for all development in the CORTEX district.**
- **Require or incentivize distributed, shared-use parking garages located adjacent to other development.**
- **Implement a system of shuttles to link surrounding neighborhoods to the CORTEX district and new MetroLink station through CORTEX Commons.**
- **Establish a Parking Management District for the CORTEX district to provide a coordinated approach to parking.**
- **Implement reduced-fare or free parking for transit riders based on paid transit tickets to provide free park-and-ride parking while still incentivizing transit use.**

4. ENSURE PEDESTRIAN AND BIKE CONNECTIVITY, SAFETY, AND COMFORT

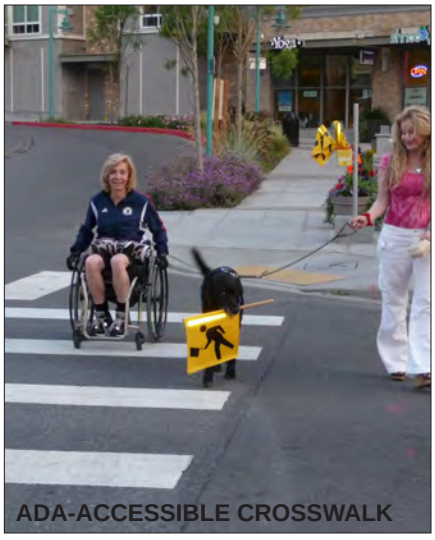
Transit-oriented developments and districts rely on safe, comfortable, walk-able and bike-able streets and public spaces to provide access to transit. In the CORTEX district, streets are currently designed to give preference to vehicular traffic; most streets have only a 36-foot curb-to-curb width, which accommodates only two travel lanes and two parallel parking lanes. In addition, sidewalks are only 4- to 5-feet wide, pedestrian right-of-ways are often obstructed by utility poles and other infrastructure, and there are few street trees or other pedestrian amenities. Given limited right-of-way width and vehicular traffic restrictions, enhancing bike and pedestrian connectivity, safety, and comfort will need to occur on some streets while vehicular service requirements are accommodated on others. Actions to achieve this strategy include:

- **Create "pedestrian first" streets and vehicular-centric streets through the district.**
- **Repair all sidewalks and maximize sidewalk width in all locations.**
- **Provide planting strips and/or tree lawns on all streets.**
- **Relocate utility poles and other infrastructure out of pedestrian right-of-ways.**
- **Provide lane-width, shared lane markings ("Super Sharrows") on all streets.**
- **Provide parallel parking on all streets.**
- **Provide street trees on all streets with a maximum spacing of 40-feet on-center.**
- **Provide pedestrian-scaled street lights with a maximum spacing of 80-feet on center.**
- **Provide trash receptacles, benches, bike racks, safety call boxes, and other street furniture.**
- **Provide ADA-accessible curb cuts, oriented perpendicular to the street, at all intersections and crosswalks.**
- **Provide pavement changes at all crosswalks.**



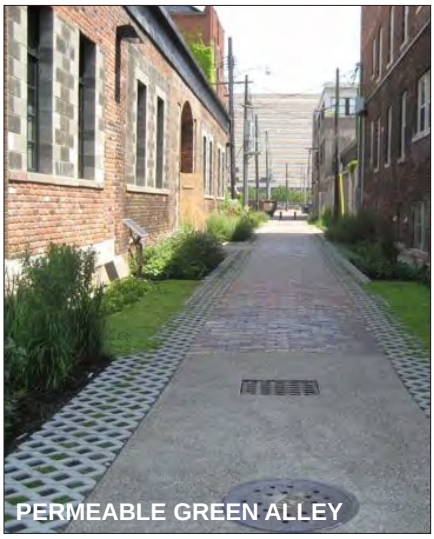
ADA-ACCESSIBLE CROSSWALK

BIKE LANES AND DISTRICT BICYCLE PARKING



ADA-ACCESSIBLE CROSSWALK

ENHANCED STREETSCAPE WITH BIOSWALE



PERMEABLE GREEN ALLEY

CURB BUMP-OUT WITH BIOSWALE Portland Bureau of Environment

5. CONSTRUCT HIGH-PERFORMANCE BLUE & GREEN INFRASTRUCTURE

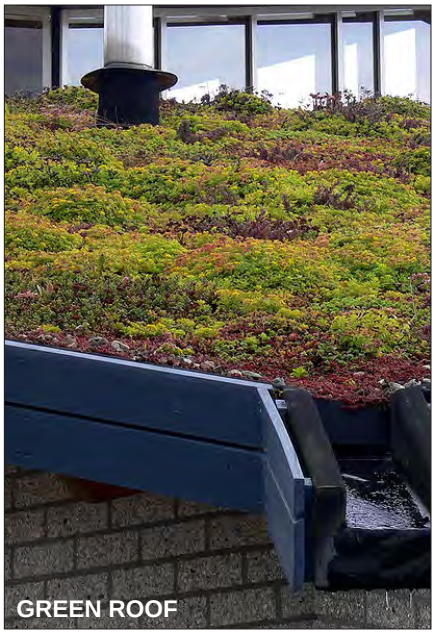
Streets, sidewalks, parking lots, driveways, and turf grass all contribute to runoff due to their low rainwater absorption coefficients—the amount of water that a given material or surface can absorb. This contributes to increased stormwater discharge, which stresses on aging, combined stormwater/sanitary sewage systems such as those found throughout the City of Saint Louis. In heavily urbanized areas, this runoff contributes to poor water quality from oil and other hydrocarbon pollution resulting from car and truck traffic. **The CORTEX district will undergo a wholesale improvement of street and sidewalk infrastructure over the next 20 years; this is an opportunity to construct high-performance blue and green infrastructure.** High-performance blue and green infrastructure comprises permeable pavement, bioswales, rain gardens, native hydrophytic plantings, and other infrastructure elements to reduce stormwater runoff and increase water detention, filtering, and recharge. Actions to achieve this strategy include:

- **Utilize tree lawns and planting strips as bioswales and rain gardens.**
- **Construct crosswalks out of permeable unit pavers.**
- **Construct parallel parking lanes out of permeable unit pavers or permeable concrete.**
- **Construct bike lanes out of permeable concrete.**
- **Construct parking lots and service drives out of permeable materials (“green parking lots” and “green alleys”).**
- **Establish native plant lists for district landscaping.**
- **Establish tree canopy coverage ratios for parking lots and street right-of-ways.**
- **Establish run-off abatement targets and benchmarks for the district.**

6. ESTABLISH BUILDING & SITE DESIGN & PERFORMANCE STANDARDS

Buildings are the largest consumers of energy; increasing design and performance standards for buildings not only helps to minimize environmental impacts but also improves operational and life-cycle costs and economic performance. **CORTEX, its partners, and investors will be constructing numerous new buildings in the district over the next 20 years, providing an opportunity to implement sustainable site and building standards.** The U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) program provides an industry-standard evaluation and benchmarking programming for new buildings, existing buildings, operations, and neighborhoods. The Sustainable Sites Initiative (SITES) provides a comparable program for sites and landscapes. The CORTEX district is ideally positioned to take advantage of these programs due to its proximity to existing mixed-use development, residential neighborhoods, and transit. Actions to achieve this strategy include:

- **Establish and incentivize compliance with minimum LEED Operations & Maintenance (OM) standards for existing buildings.**
- **Establish minimum LEED New Construction (NC) and LEED Neighborhood Development (ND) standards for new buildings.**
- **Establish minimum Sustainable Sites Initiative (SITES) standards for landscapes, sites, and public space.**
- **Establish maximum greenhouse gas emission targets and benchmarks for the CORTEX district.**
- **Establish energy use targets and benchmarks for the CORTEX district.**

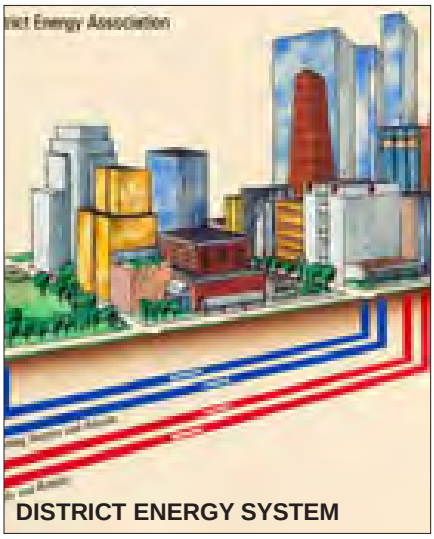


GREEN ROOF

LOW-ALBEDO WHITE ROOF

ROOF PHOTOVOLTAIC PANEL ARRAY

CAMPUS DISTRICT HEATING PLANT



DISTRICT ENERGY SYSTEM

BUILDING WIND TURBINE

7. IMPLEMENT DISTRICT AND ALTERNATIVE ENERGY FOR NEW DEVELOPMENT

CORTEX, its partners, and investors will be constructing numerous new buildings and renovating existing buildings in the district over the next 20 years, providing an opportunity to implement district energy. Centralized district heating, cooling, and energy generation strategies offer a number of benefits over building-by-building energy and air conditioning solutions. District energy can realize greater levels of efficiency over distributed building systems; a typical district heating and cooling plant can achieve 80-percent efficiency, versus only 40- to 50-percent efficiency for distributed building systems. In addition, district energy plants can more feasibly use alternative energy sources—including solar, geothermal, and biomass—than individual building systems and a centralized systems can lead to increased efficiency in operations and maintenance costs. One of the major difficulties with district energy is that it cannot easily be retrofitted to existing buildings. In cases of new development and significant rehabs, however, district energy can be a cost-effective and sustainable solution. Actions to achieve this strategy include:

- **Construct a district heating and cooling plant and distribution system.**
- **Construct alternative energy supplemental power generation for the district.**
- **Incentivize individual building alternative energy supplemental power generation.**
- **Utilize natural gas and alternative energy for district shuttle service vehicles.**
- **Provide charging stations for plug-in hybrid vehicles.**
- **Utilize district-created waste for biomass energy generation.**
- **Establish self-generated energy ratio targets and benchmarks.**

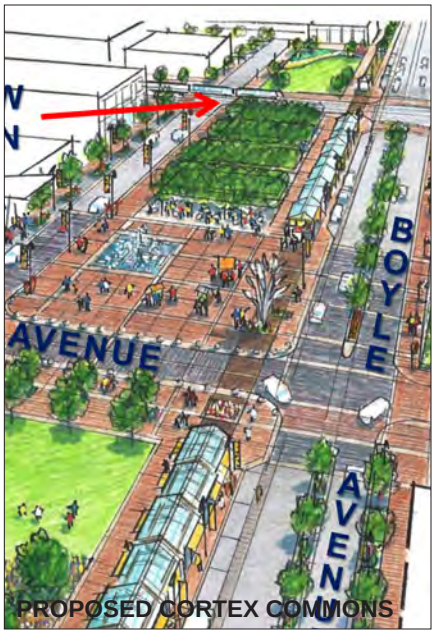
8. CREATE A COHERENT CORTEX DISTRICT BRANDING IMAGE

One of the major challenges faced by the CORTEX district is a lack of an easily-recognized identity. Today, the district is largely inhabited by transitioning and underutilized light industrial buildings and administrative back office and utility functions. It does not possess the character exhibited in the Central West End or the Grove and Forest Park Southeast. As a result, the district is perceived as a kind of "no man's land" between an established neighborhood to the north and an emerging neighborhood and commercial district to the south, limiting the connectivity potential through the district. **As part of district development and in order to elevate the CORTEX district as distinct and recognizable district or neighborhood in the area, CORTEX should engage in a strategy to create new image or brand for the district.** Actions to achieve this strategy include:

- **Establish new and recognizable gateways into the CORTEX district.**
- **Reconceive of I-64 as a front door to the CORTEX district and create two front doors by extending CORTEX Commons north to Forest Park Avenue and south to I-64.**
- **Establish design standards for street lighting, street trees, and street furniture.**
- **Establish landscape standards for streetscapes and building sites and "green" the district with new trees and landscape.**
- **Create a primary east-west link through the district utilizing green infrastructure, signature landscaping, design elements, and street furnishings.**
- **Establish material and design standards for sidewalks and crosswalks.**
- **Establish a district color palette for public space fixtures and equipment.**
- **Create district branding and signage standards.**
- **Create district imagery, advertisements, and banners.**
- **Establish partnerships for district art and public art installations.**

CORTEX DISTRICT HEADQUARTERS

cortex



PROPOSED CORTEX COMMONS