



CORRIDOR CONCEPTS

Options for Focused Growth and Mobility

Study Report

April 2019



This project was funded through a combination of public and private contributions. Partners include the Mid-Ohio Regional Planning Commission (MORPC), Central Ohio Transit Authority (COTA), The Columbus Foundation, The Columbus Partnership, Urban Land Institute Columbus, and the cities of Bexley, Columbus, Dublin, Grandview Heights with Clinton Township, Groveport, Reynoldsburg, Westerville, and Whitehall. Through their active involvement in the project steering committee and working groups, the project's funding partners have provided input and guidance in all stages of the project, and worked closely with developers, businesses, residents, government planners, and elected officials along each study corridor to create thoughtful policy and planning recommendations to preserve and enhance existing communities.

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April 30th, 2019

Dear Central Ohio Community,

Having served as the co-chairs of this initiative for the past year, it is our pleasure to present to you the insight2050 Corridor Concepts report. The Corridor Concepts report is designed to help our region answer a set of pressing questions that will guide how our region grows. We know our region could grow significantly to 3 million people over the next 30 years. But where will our future neighbors live, work, and raise their families? How can we leverage transit infrastructure and development patterns to benefit our public health and our individual wallets? This is what insight2050 Corridor Concepts sets out to answer.

In the following pages, you will find data and research from national experts that the Central Ohio community can use to inform our future growth. This report lays out what focusing future growth around transit corridors could mean for this region and examines the impact of various transit investment strategies. The lessons learned from this report will inform how we guide hundreds of millions of dollars in future investment. Change is coming. Our region will grow. We have the opportunity to grow so everyone in our community shares in our collective success. We would like to challenge you to not only dive into this report, but to consider what this means for our community. Based on the information in this report, how can you play a part in advocating and actualizing a vision for the Columbus Region of the future?

Best,



Shannon Hardin

Columbus City Council, President
& insight2050 Co-chair



Yaromir Steiner

ULI Columbus, District Council Chairman
& insight2050 Co-chair



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Introduction

Central Ohio is one of the country's most dynamic and forward-looking regions. Since 2010, the region has experienced four record-breaking growth years and the highest average annual growth rate of any decade. With its intellectual and economic resources, it is well positioned to continue attracting national and regional growth in the years ahead. Insight2050 Corridor Concepts is a critical next step in the region's commitment to thoughtful urban planning to improve livability and keep the region competitive. By evaluating the role of "mobility corridors" in structuring growth, the study explores how best the region could support a broad projection of one million more residents.

The regional insight2050 study completed in 2014 helped achieve consensus around a vision for compact, focused development throughout Central Ohio — an approach that comprehensively addresses the land use, housing, and transportation challenges ahead. Taking the direction of the "Focused Growth" scenario as a starting point, insight2050 Corridor Concepts builds on the momentum of that initial study, and outcomes of other recent planning efforts in the region, to better ground the vision. It explores in detail where growth can occur and how to make it happen. With Central Ohio considering investment of substantial resources in new transit options, the study evaluates the potential of coordinated transit and development to serve existing communities and new growth.

Like other major metropolitan areas across the nation, Central Ohio is at the precipice of a new generation of mobility options that must be carefully considered and weighed. The age of autonomous vehicles is around the corner. How will emerging technologies impact larger goals to address housing needs and affordability, promote equitable access to opportunity, foster complete communities, and grow in more compact and fiscally efficient ways?

Well-informed discussions of these impacts are critical. A complete approach to mobility will be required — one that addresses walking, biking, transit, and automobile use, and balances impacts on land use, community health, and economic and environmental sustainability.

Project Leadership

Insight2050 Corridor Concepts has been co-chaired by Columbus City Council President Shannon G. Hardin and Yaromir Steiner, Founder and CEO of Steiner + Associates. Together, they have driven the effort forward, convening

the project's funding partners and facilitating active involvement among the project steering committee and project working group.

The project co-chairs and partners, along with members of the project working group and five corridor working groups, provided guidance and input throughout all stages of the effort. Partners include the Mid-Ohio Regional Planning Commission (MORPC), Central Ohio Transit Authority (COTA), The Columbus Foundation, The Columbus Partnership, Urban Land Institute Columbus, and the cities of Bexley, Columbus, Dublin, Grandview Heights with Clinton Township, Groveport, Reynoldsburg, Westerville, and Whitehall. The co-chairs and partners have worked closely with developers, businesses, community organizations, residents, government planners, and elected officials along each study corridor to create thoughtful policy and planning recommendations to preserve and enhance existing communities.

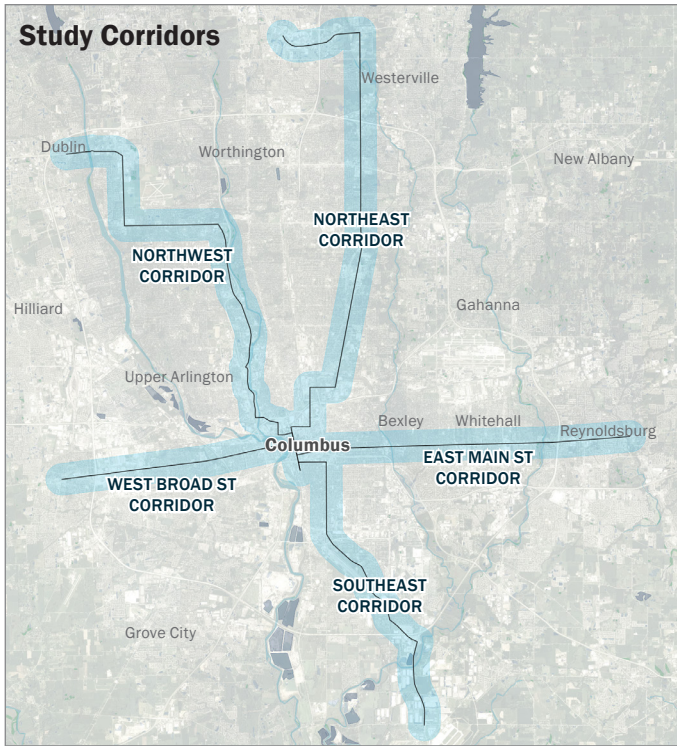
Study Approach

Insight2050 Corridor Concepts brings new tools and modeling capacity to decisions about where and how to grow, where to invest valuable transit resources, and how to balance community goals. It has engaged key stakeholders across Central Ohio to produce scenarios that measure the impact of varying approaches of accommodating expected growth, paired with an implementation framework that identifies strategies for how the region and its many jurisdictions can advance transit and corridor development to best serve our communities.

Study Corridors and Scenarios

In the context of projected regional growth, the study explores development and mobility options in and around five corridors. **These corridors were selected to represent a range of diverse growth opportunities. It is important to note that they are not the only ones that could be considered for future transit service and redevelopment.** They include:

- **East Main Street:** SR 256 to Downtown Columbus
- **Northeast:** Polaris Parkway to Downtown Columbus
- **Northwest:** US 33 at Post Rd./Frantz Rd. to Downtown Columbus
- **Southeast:** Rickenbacker International Airport to Downtown Columbus
- **West Broad Street:** Norton Rd. to Downtown Columbus



The study corridors, as shown in blue, were selected to represent a diverse range of growth opportunities.

All are potentially suitable for major dedicated right-of-way (ROW) transit and mobility investments in the coming years. These five corridors were selected from among those previously examined by recent planning efforts in the region, including the Metropolitan Transportation Plan, the COTA NextGen study, and the Connect Columbus study. All are in need of improved infrastructure and offer great opportunity for economic development and new housing choices. The analysis and lessons learned with this study can be applied for other corridors.

Corridor Concepts

The study has yielded concepts for focused growth along each corridor, developed through extensive input over the course of the study. Working groups comprised of over 80 local representatives participated in a series of project-wide and corridor-specific workshop sessions from March to September 2018 to provide input on local and regional priorities, highlighting community needs and visions for new development. Through discussions and map exercises, project and corridor working group members guided the creation of detailed growth options

for each of the study corridors, where new high-capacity transit would be planned.

For every corridor, two general patterns emerged — a “Nodal” concept featuring higher-intensity centers, and higher growth overall; and a “Distributed” concept featuring more even development intensities and lower growth overall. These initial concepts and their results were then modeled and presented for comparison. Most preferred the Nodal concepts, and envisioned substantial growth in Downtown Columbus. With some further adjustments based on discussion and detailed review by local partners, the preferred concepts were established and brought together into a regional “Focused Corridor Concept.”

Regional Scenarios

Two regional scenarios put corridor growth in the context of a projection for one million more residents in Central Ohio, varying the amounts of growth around the corridors as compared to elsewhere in the region. The Focused Corridor Concept scenario is composed of the individual preferred concepts, which altogether account for 260,000 homes and 370,000 jobs, or 55% and 60%, respectively, of the regional projection for housing and job growth. The balance of the projection is located in predominantly compact patterns in other locations in the region.

For comparison, a “Current Trajectory” approach assumes existing transit and growth along the study corridors in line with existing plans; this leads to an 18% share of regional growth within the corridor areas. Instead, the

New mobility options for the corridors could include bus rapid transit (BRT) such as the Cleveland HealthLine (shown below), light rail, autonomous rapid transit (ART), or other emerging technologies.



majority of new development is located in auto-oriented patterns elsewhere in the region. Modeling these two scenarios has yielded results that demonstrate the wide-ranging benefits of focused corridor development, including lower auto use, land savings, lower costs for local infrastructure, higher revenues, and lower household costs.

Planning Tools

The study scenarios were modeled and analyzed using the UrbanFootprint model, which through the Corridor Concepts effort was localized for the Central Ohio region to include new travel and fiscal impact modeling capacities. Moving beyond the study, planners throughout the region will be able to benefit from locally grounded estimates of future household auto and transit travel, local infrastructure and emergency services costs, and local tax revenues associated with different forms of new development.

Looking Ahead

Realizing visions for transit corridor development will take coordinated effort, and yet must be unique to each of the 10+ communities through which the corridors run. The products of the study include new local modeling capacity via the UrbanFootprint planning platform, as well as guidance for implementing corridor development as envisioned. This report provides an overview of strategies for implementation; the full Implementation Toolkit is available separately at getinsight2050.org.



At corridor and regionwide workshops, working group members engaged in map-based activities to provide input on the location and form of new housing and jobs.

Corridor Concepts Scenarios

The insight2050 Corridor Concepts scenarios represent different visions for Central Ohio. They vary in the shape and share of new development occurring along the five study corridors and throughout the region, serving to explore how growth could occur with or without high-capacity dedicated right-of-way transit.

Growth Projections

Central Ohio is already attracting growth faster than the rest of the state. The Corridor Concepts scenarios were developed to accommodate an additional one million people within Delaware, Fairfield, Franklin, Licking, Madison, Pickaway, and Union Counties. This projection follows the trajectory of the region's growth since 2010. By addressing this growth allocation — which amounts to about 450,000 new homes and 600,000 new jobs over the next few decades — the study looks ahead to understand the implications of continued growth to inform both near- and long-term planning for sustainable land use decisions and transportation investments.

Corridor Capacity

The Corridor Concepts scenarios were developed using rich data from the region to assess redevelopment opportunities and growth capacity. All corridors host a range of areas suitable for reinvestment and redevelopment now or into the future, including large suburban retail centers, underutilized corridor commercial sites, surface parking lots, large industrial sites, and vacant residential parcels in neighborhoods in and around the corridors. Likewise, some areas were not considered suitable for new growth, such as areas with environmental constraints, existing parks, historic areas or those otherwise identified for preservation, or residential parcels unless directly on the corridors or already planned for redevelopment. While existing residential neighborhoods could receive some infill, they were otherwise unchanged.

Project partners and working group members identified community goals, areas in need of reinvestment, places with plans already underway or ready for near-term development, and locations with important regional connections. With these priorities in mind, they guided concepts for the uses, forms, and intensities of development that could serve existing communities and attract new residents and employment.

High-Capacity Transit and New Mobility

Land use as featured in the corridor concepts supports fast, reliable, high-capacity transit service along the corridors. Likewise, development of sufficient intensity supports such premium transit services. While agnostic to the specific type of new mobility — whether it be light rail transit (LRT), bus rapid transit (BRT), autonomous rapid transit (ART), or pools (platoons) of autonomous cars or smaller vehicles — the study assumes a system on dedicated rights-of-way (ROW) that can support significant investment and prioritized development. It is assumed that any system has frequent headways for short passenger wait times and competitive travel speeds to move large numbers of people quickly and efficiently. (For modeling purposes, the study assumed BRT service characteristics as a minimum standard.)



Expanded mobility options along the corridors could include bus rapid transit (BRT), light rail, as shown in Salt Lake City, or a leap to autonomous rapid transit (ART) using buses or other emerging technologies.

Regional Corridor Concepts Scenarios

Evolving over seven workshops and driven by stakeholder input via the corridor concepts, two regional scenarios examine detailed growth options along the study corridors and throughout the region. The scenarios vary in the share of future housing and job growth that occur in the corridor areas, and the different forms that new development can take.

The **Current Trajectory** scenario represents how the region could grow without new dedicated right-of-way corridor transit or new mobility options along with a coordinated approach to more efficient development patterns. It casts forward from current plans with largely suburban development trends to meet housing and employment growth projections.

Growth continues downtown and as compact, mixed use development in some locations; however, the extent and densities of new compact development are limited by a lack of new transit investments that would otherwise serve to focus investment. The resulting urban structure is dispersed and generally auto-oriented.

In line with residential development trends since 2010, the Current Trajectory scenario increases the combined proportion of multifamily homes and townhomes in the region, raising it from the current 35% to 45% by 2050. Diversifying the range of available housing types in the market provides a better fit for the smaller projected household sizes into the future, and more affordable options for rental and ownership. However, with most multifamily and townhomes in this scenario developed as lower-density building types in suburban locations, savings on housing costs are counteracted by limitations on mobility and accessibility, and associated household costs for transportation.

The **Focused Corridor Concept** puts forth a vision for enhanced mobility and more compact communities across the region. It focuses new housing and job growth around the five dedicated ROW transportation corridors according to the “Nodal” concepts developed through extensive input for each corridor.

Altogether, the corridors take on the majority of the region’s anticipated growth (55% of housing and 60% of jobs) in compact, mixed-use areas of varying intensities and with a mix of housing types including multifamily units in low-, mid-, and high-rise buildings, townhomes, and small-lot single family homes. Beyond the corridors, the regional growth structure favors compact

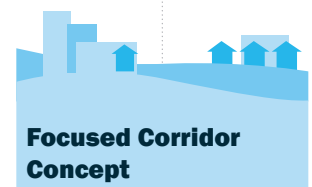
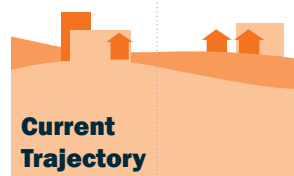
development in strategic locations — including along other major thoroughfares or potential transit corridors, and in redevelopment opportunity sites.

The Focused Corridor Concept increases the combined proportion of multifamily homes and townhomes in the region from the current 35% to 53% by 2050. While the Current Trajectory scenario locates most new housing of all types in suburban locations, the Focused Corridor Concept locates a large proportion along the corridors, where residents will have greater mobility and access to local and regional destinations. The reduced transportation costs associated with location efficiency are an important facet of housing affordability that extends to new and existing housing of all types.

The characteristics of the scenarios and their results — at the regional level and for each corridor — are summarized on pages 8-9.

Scenario Growth within Corridor Areas (% of total regional growth)

Within corridors		Outside corridors		Within corridors		Outside corridors	
18%	homes	82%	55%	homes	45%	40%	jobs
40%	jobs	60%	60%	jobs	40%		



Building and Place Types

The insight2050 Corridor Concepts scenarios were developed using the UrbanFootprint planning platform, which represents new and existing development using a range of land uses via the software's Building Types and Place Types. The library of types was localized to include examples of development in the region.

Building Types

Building Types are applied to parcels to depict the characteristics of buildings and their resulting housing and employment densities. A range of low-, mid-, and high-rise mixed use, residential, and commercial building types are used to represent corridor development. Compact residential building types, including townhomes, multifamily buildings, and small-lot home types, are featured within the place types representing mixed use centers and neighborhoods. A few examples of common types are shown at right. Suburban building types include low-density multifamily complexes and single-family homes across a range of lot sizes, and standalone commercial types such as retail centers and office parks. Building types are also incorporated as elements of Place Types.

Place Types

Place Types are applied to broader areas, such as large parcels, blocks, and districts. Place Types depict prototypical combinations of buildings, along with streets, parks, and other civic areas. Most growth in the Focused Corridor Concept is allocated via types that represent mixed use transit-oriented development (TOD) centers and adjoining residential neighborhoods at varying densities. Most growth in the Current Trajectory scenario, by contrast, is allocated via lower-density suburban residential and commercial types.

Urban, Compact Walkable, and Suburban Development Patterns

The Building and Place Types nest within broader land use patterns, which are used to conceptualize the distribution of growth among scenarios as well as delineate selected analysis assumptions. The land use patterns include Urban, Compact Walkable, and Suburban. These patterns represent a range from the most intense and mixed parts of Downtown Columbus; to compact walkable neighborhoods as you would see along the corridors, and in towns such as Granville and Grandview Heights; to suburban areas that are common across the 7-county region. The scenarios are described in terms of their distribution of growth among these patterns.

**"Net" density refers to density measured over developable parcel area, not inclusive of streets or other "gross" area components.*



Mid-Rise Mixed Use Building Type
200 homes and 190 jobs per acre (net*)



Low-Rise Residential Building Type
120 homes and 7 jobs per acre (net)



Townhome and Attached Residential Building Types
25+ homes per acre (net)

OVERVIEW

Regional Scenarios

The Corridor Concepts regional scenarios represent two distinct growth patterns for the region. Both scenarios accommodate the same amount of housing and job growth in Central Ohio to the year 2050 or beyond,

but vary in where and how they are located across the region. They also vary in their mixes of housing types, and the extent to which they can meet the demands of Central Ohio's current and future residents.

Current Trajectory

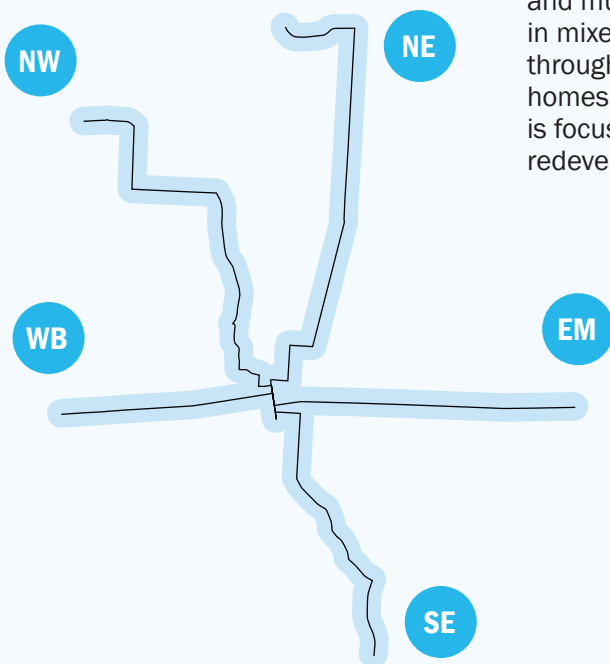
This scenario casts forward from existing plans and largely suburban development trends to meet the study projection. Some growth continues in Downtown Columbus and as compact, mixed use development, but without high-capacity transit — bus rapid transit (BRT), light rail transit (LRT), autonomous rapid transit (ART), or another system that can quickly and reliably move large numbers of people — to structure and serve growth, most occurs in low density, auto-oriented development patterns.

Reflecting relatively recent trends, new housing growth occurs as 41% single family and 59% townhome and multifamily. Much of the townhome and multifamily growth occurs within suburban areas. New employment growth also occurs at lower densities than in the Focused Corridor Concept, with most located in suburban office parks and commercial centers.

Focused Corridor Concept

This scenario locates the majority of the region's projected growth — 55% of homes and 60% of jobs — along the five study corridors and in Downtown Columbus. New growth occurs primarily as compact, walkable, mixed use development, with moderate to high densities along the corridors. At key nodes building height can vary up to 12 stories (or higher in or near Downtown Columbus); in between, buildings range from three to six stories.

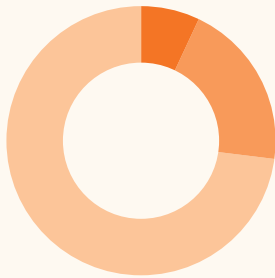
New housing growth occurs as 20% single family and 80% townhome and multifamily. Townhome and multifamily growth takes place in mixed use centers and neighborhoods along the corridors and throughout the region, answering to market demand for smaller homes with walkable access to amenities. New employment growth is focused in mixed use centers along the corridors, and in infill and redevelopment locations in and around existing cities and towns.



Corridor Area	Existing Housing	Housing Growth	Existing Jobs	Job Growth	Area Redeveloped
East Main	23,600	44,300	29,900	43,300	900 ac
Northeast	25,700	70,600	61,500	79,300	2,120 ac
Northwest	30,300	50,500	56,500	93,900	1,830 ac
Southeast	11,800	23,200	18,600	47,900	1,990 ac
West Broad	15,100	38,800	22,600	46,200	1,200 ac
Downtown	7,700	31,600	92,500	60,100	330 ac

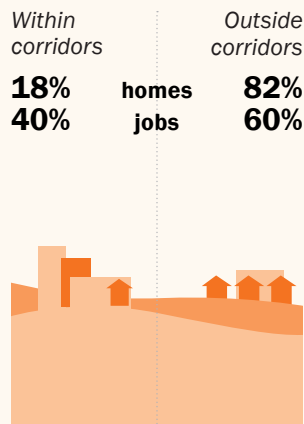
For more details, see Appendix A.

Place Type Proportions

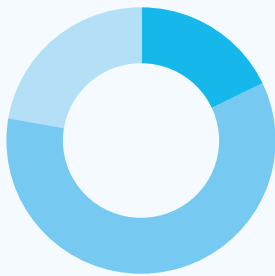
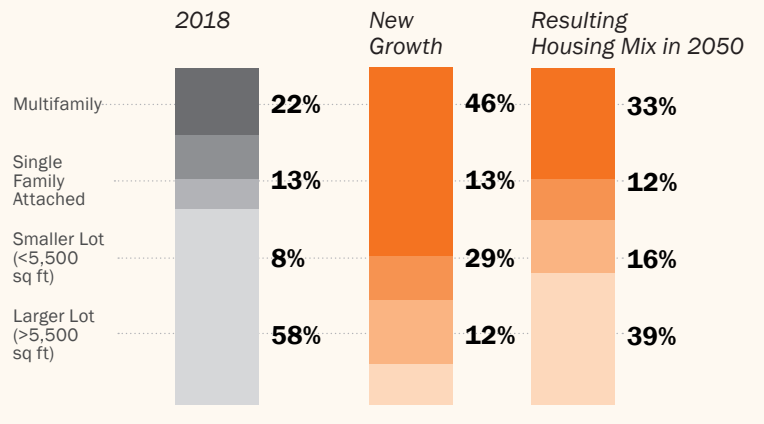


- Standard Suburban **73%**
- Compact **20%**
- Urban **7%**

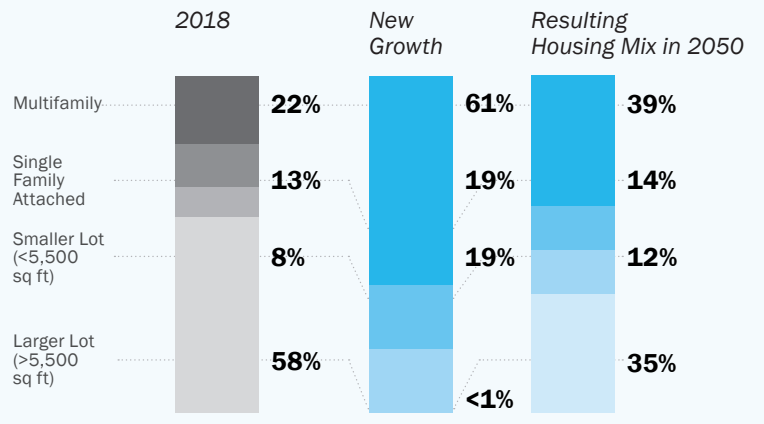
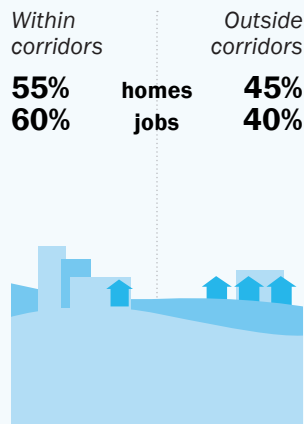
Growth Concentration



Housing Unit Mix*



- Standard Suburban **22%**
- Compact **60%**
- Urban **18%**



*Component figures may not add up to totals due to rounding.

METRICS SUMMARY

Regional Scenario Metrics

The comparative scenario metrics summarized here include projected annual results in 2050, and cumulative results from 2018-2050. For clarity, values are rounded*. All costs are expressed in year-2018 dollars.

The metrics are described in further detail on pages 26 to 36 of the report.



Land Consumption

Amount of all previously undeveloped land that is newly developed from 2018-2050. See page 27 for more.



Local Infrastructure & Services

Capital and operations and maintenance (O&M) costs for new local roads, sewer, water, wastewater, and emergency services (2018-2050). See page 28 for more.



Local Tax Revenues

Local tax revenues associated with new development, including income, property, and sales taxes (2018-2050). See page 29 for more.

Current Trajectory

Follows the trajectory of existing plans and mostly suburban development trends to meet a high regional growth projection. Lacks new high-capacity transit to structure growth.

	Capital	O&M	Residential	Commercial
135 sq mi	19.6	10.6	7.3	14.0
	\$30.1 BIL cumulative total, 2018-2050		\$21.3 BIL cumulative total, 2018-2050	
	\$941 MIL average annual costs		\$14,000 annual per acre	

Focused Corridor Concept

Focuses the majority of new housing and region-wide job growth in compact, walkable, mixed-use development in the corridors defined by new high-capacity transit infrastructure.

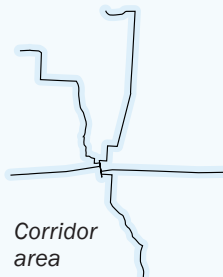
The full scenario metrics describe region-wide impacts, while the Corridor Area Average metrics below highlight impacts specifically for development along the corridors.

	Capital	O&M	Residential	Commercial
23 sq mi	10.2	9.1	6.5	15.8
	\$19.3 BIL cumulative total, 2018-2050		\$22.3 BIL cumulative total, 2018-2050	
	\$603 MIL average annual costs		\$40,000 annual per acre	

Corridor Area Average

The “corridor area” of the Focused Corridor Concept is defined as all area within half a mile of the corridors. It includes new development as well as existing neighborhoods and preserved areas.

For comparison, results are shown for metrics that can be expressed as averages (e.g., per acre or per household).



(A corridor area average metric is not applicable)

\$134,000
annual per acre



Transportation: Accessibility

Regional jobs accessible within 45 minutes by walk and transit, in 2050. See page 30 for more.



Transportation: Mode Share

Share of household transportation trips by mode: transit, auto, and walk or bike, in 2050. See page 31 for more.



Transportation: VMT

Vehicle miles traveled (VMT) in passenger vehicles, cumulatively (2018-2050) and annually per household. See page 31 for more.



Greenhouse Gas Emissions

Annual CO₂e emissions from passenger vehicles and residential and commercial buildings, in 2050. See page 36 for more.



Household Auto and Utility Costs

Annual automobile transportation (fuel, insurance, ownership, and maintenance) and home energy and water costs, in 2050. See page 36 for more.



4%
Share of homes with access to 25% of regional jobs within 45 min by walk/transit
74,000
Average number of jobs accessible by walk/transit



1.5% transit
16% total non-auto
Transit and total non-auto (transit/walk/bike) share of total trips



489 BIL
cumulative miles
16,800
annual miles per household



29.4 MMT**
annual
17.1 MT*
annual per household



\$20.3 BIL
annual
\$18,600
annual per household



11%
Share of homes with access to 25% of regional jobs within 45 min by walk/transit
125,000
Average number of jobs accessible by walk/transit



3.2% transit
20% total non-auto
Transit and total non-auto (transit/walk/bike) share of total trips



441 BIL
cumulative miles
14,200
annual miles per household



27.4 MMT
annual
15.8 MT
annual per household



\$17.4 BIL
annual
\$15,900
annual per household

29%
Share of homes with access to 25% of regional jobs within 45 min by walk/transit
262,000
Average number of jobs accessible by walk/transit

8.0% transit
29% total non-auto
Transit and total non-auto (transit/walk/bike) share of total trips

8,500
annual miles per household

11.9 MT
annual per household

\$10,100
annual per household

*Component figures may not add up to totals due to rounding.

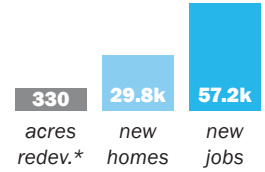
**MMT = million metric tons, MT = metric tons

Focused Corridor Concept Metrics

The varied amounts of growth and development characteristics along the study corridors lead to different outcomes for transportation, fiscal, and environmental impacts in the year 2050. Metrics are also shown for Downtown Columbus, which as the hub for all corridors is considered apart from the individual corridor areas to isolate the impacts for each. Refer to Appendix A for base-year metrics.

Current Trajectory Regional Average Metrics (for comparison)

Downtown



74,000

jobs

528,000

jobs

Walk and Transit Accessibility

Average number of regional jobs accessible within 45 minutes by walking and transit (via the existing system plus new high-capacity corridor transit) from homes in the area

Transit & Active Mode Share

Share of all household trips taken by non-auto modes, including transit and walk or bike trips. Walk or bike trips include those that can be taken close to home.

1.5% **16%**
transit total non-auto
transit, walk, and bike trips

24% **51%**
transit total non-auto
transit, walk, and bike trips

Vehicle Miles Traveled

Annual vehicle miles traveled (VMT) per household

16,800 mi
annual per household

6,200 mi
annual per household

Greenhouse Gas Emissions

Annual GHG emissions from passenger vehicle travel and residential building energy use per household

17.1 MT
annual per household

10.3 MT
annual per household

Infrastructure Costs per Acre

Average costs per acre of new development to build, operate, and maintain local roads, water, wastewater, and sewer infrastructure

\$249,000
cumulative per acre

\$690,000
cumulative per acre

Tax Revenues per Acre

Average annual revenues from local income taxes, property taxes, and sales taxes per acre of new development

\$14,000
annual per acre

\$422,000
annual per acre

Household Costs

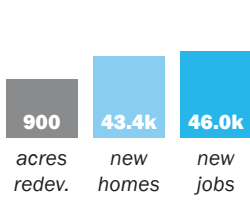
Annual auto and utility costs per household

\$18,600
annual per household

\$7,700
annual per household

Focused Corridor Concept: Corridor Area Averages

East Main



253,000

jobs

3.8% transit
24% total non-auto
transit, walk, and bike trips

9,100 mi
annual per household

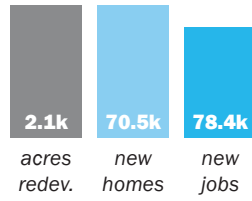
12.5 MT
annual per household

\$460,000
cumulative per acre

\$162,000
annual per acre

\$10,700
annual per household

Northeast



218,000

jobs

3.9% transit
23% total non-auto
transit, walk, and bike trips

9,000 mi
annual per household

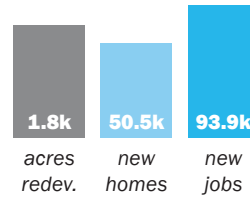
12.2 MT
annual per household

\$499,000
cumulative per acre

\$117,000
annual per acre

\$10,500
annual per household

Northwest



189,000

jobs

4.1% transit
21% total non-auto
transit, walk, and bike trips

8,800 mi
annual per household

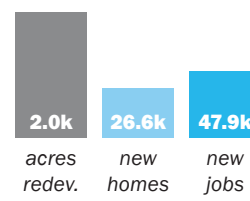
11.9 MT
annual per household

\$466,000
cumulative per acre

\$158,000
annual per acre

\$10,300
annual per household

Southeast



211,000

jobs

4.0% transit
23% total non-auto
transit, walk, and bike trips

9,200 mi
annual per household

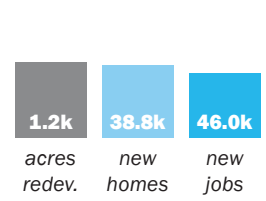
12.6 MT
annual per household

\$331,000
cumulative per acre

\$61,000
annual per acre

\$10,800
annual per household

West Broad



312,000

jobs

9.1% transit
32% total non-auto
transit, walk, and bike trips

7,800 mi
annual per household

11.6 MT
annual per household

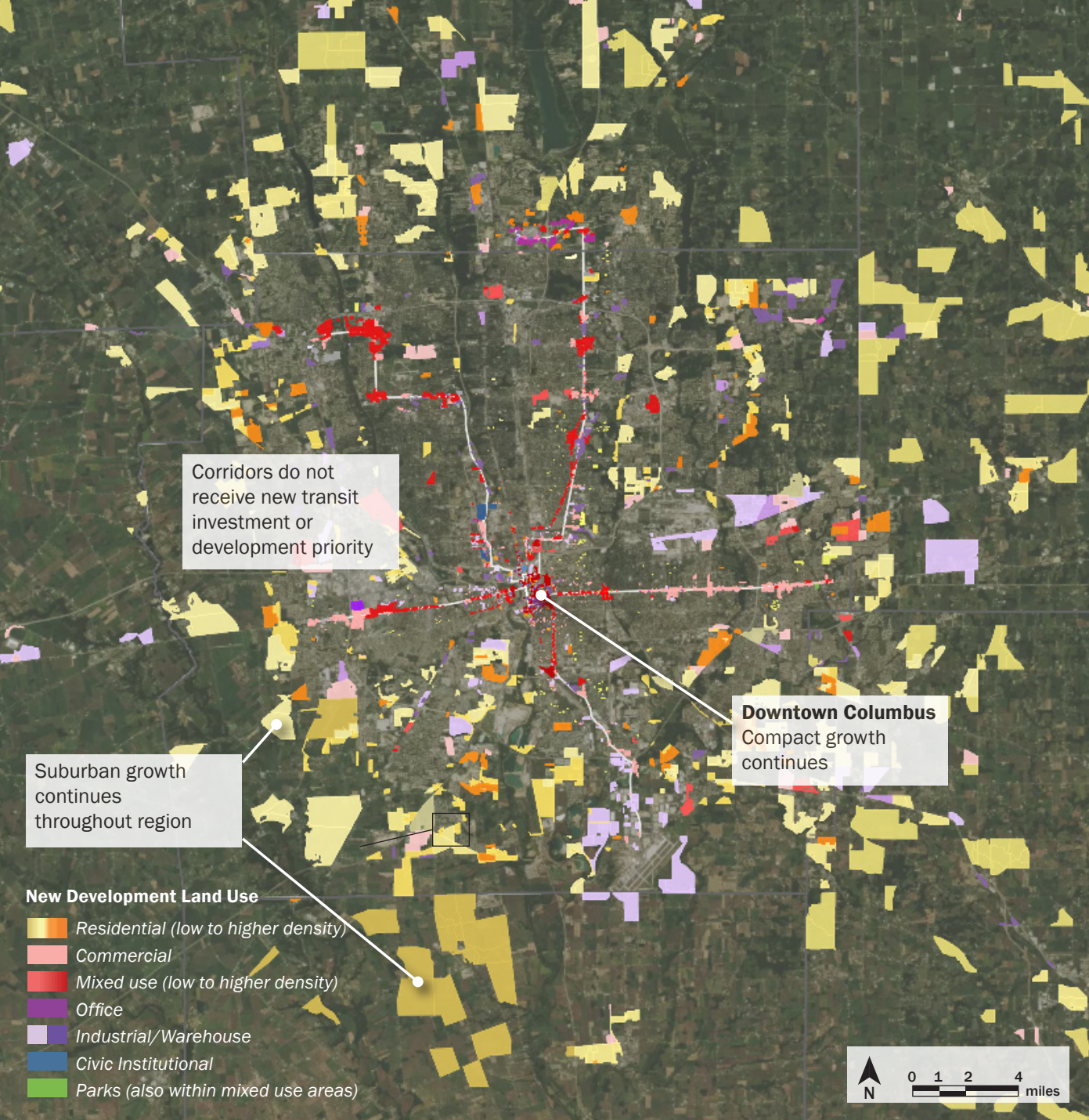
\$364,000
cumulative per acre

\$124,000
annual per acre

\$9,400
annual per household

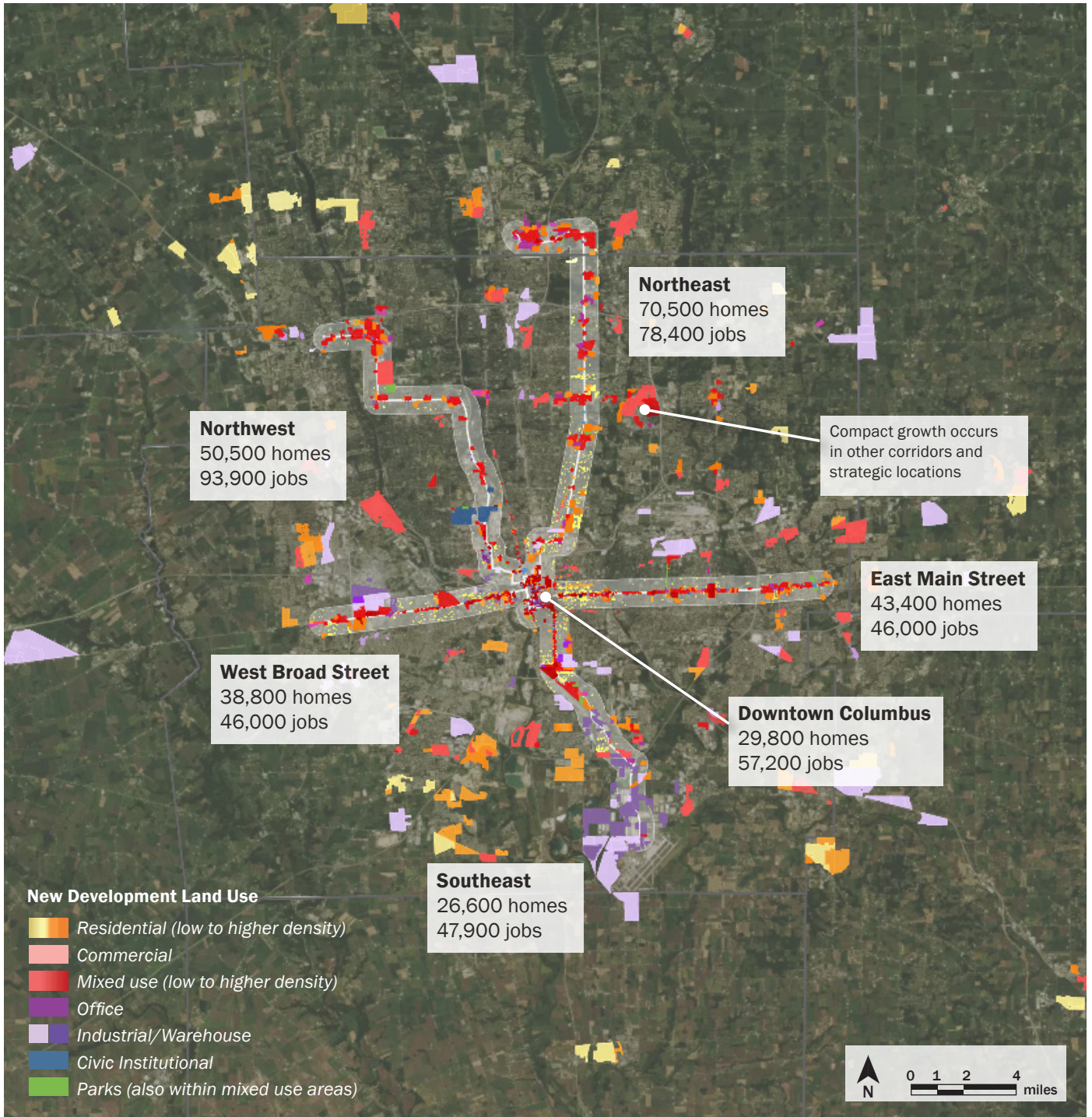
*acres redev = net parcel acreage developed as infill or redevelopment to accommodate new growth

Current Trajectory Regional Scenario



This view of the Current Trajectory scenario shows suburban growth continuing within Franklin County and beyond. Limited compact growth occurs in Downtown Columbus, and in locations throughout the region that have been planned for mixed-use development.

Focused Corridor Concept Regional Scenario



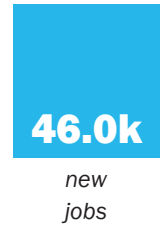
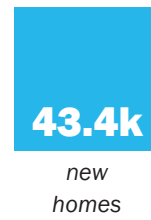
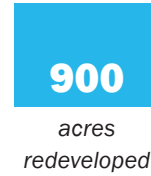
This view of the Focused Corridor Concept scenario shows infill and redevelopment within the half-mile corridor areas. Mixed use, compact growth also occurs along other corridors and in strategic locations throughout the region. Since growth is prioritized around the corridors, Franklin County sees a relatively higher proportion of growth than in the Current Trajectory scenario.



CONCEPT AND METRICS SUMMARY

East Main Street Corridor

Locates substantial amounts of growth at major nodes along the corridor, with intensification on infill opportunity sites close to downtown and moderate density redevelopment of commercial areas.



Transportation - Walk and Transit Accessibility

Average number of regional jobs accessible within 45 minutes by walking and transit

253,000

average number of jobs accessible by walk/transit

Compared to Current Trajectory regional average

+ 240%

Transportation - Transit & Active Mode Share

Share of all household trips taken by transit, walk, or bike

3.8%

transit

24%

total non-auto

Transit, walk, and bike trips

+ 150%
transit

Transportation - Vehicle Miles Traveled

Annual vehicle miles traveled (VMT) per household

9,100 mi

annual per household

- 46%

Greenhouse Gas Emissions

Annual GHG emissions from passenger vehicle travel and residential energy use per household

12.5 MT

annual per household

- 16%

Infrastructure Costs per Acre

Average costs per acre of new development to build, operate, and maintain local roads, water, wastewater, and sewer infrastructure.

\$460,000

cumulative per acre

+ 85%

Tax Revenues per Acre

Average annual revenues from local income taxes, property taxes, and sales taxes per acre of new development

\$162,600

annual per acre

+ 1060%

Household Costs

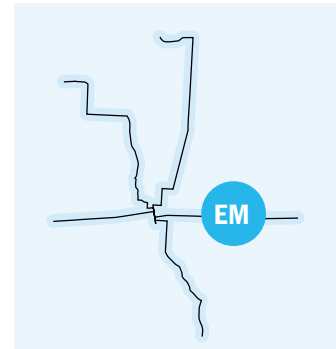
Annual auto and utility costs per household

\$10,700

annual per household

savings of \$7,900

DOWNTOWN
COLUMBUS



Existing land use
New development

- Residential
- Commercial
- Industrial
- Mixed Use
- Civic Institutional
- Transportation Utilities
- Open Space

Note: Large parcels depicted with new development may involve redevelopment and/or accommodate infill that maintains existing buildings or open space.

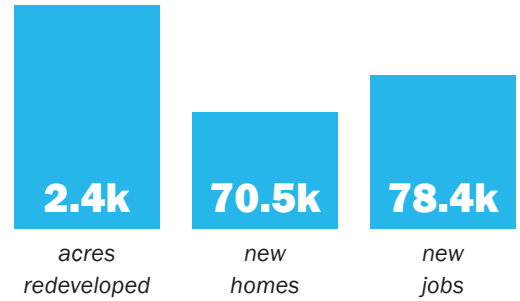




CONCEPT AND METRICS SUMMARY

Northeast Corridor

Prioritizes high growth in major nodes at the northern end, and in high density infill approaching Downtown Columbus. Moderate density growth along corridor is focused around key transportation connections and in large opportunity sites.



Transportation - Walk and Transit Accessibility

Average number of regional jobs accessible within 45 minutes by walking and transit

218,000

average number of jobs accessible by walk/transit

Compared to Current Trajectory regional average

+ 195%

Transportation - Transit & Active Mode Share

Share of all household trips taken by transit, walk, or bike

3.9%

transit

23%

total non-auto

Transit, walk, and bike trips

+ 160% transit

Transportation - Vehicle Miles Traveled

Annual vehicle miles traveled (VMT) per household

9,000 mi

annual per household

- 45%

Greenhouse Gas Emissions

Annual GHG emissions from passenger vehicle travel and residential energy use per household

12.2 MT

annual per household

- 18%

Infrastructure Costs per Acre

Average costs per acre of new development to build, operate, and maintain local roads, water, wastewater, and sewer infrastructure.

\$499,000

cumulative per acre

+ 100%

Tax Revenues per Acre

Average annual revenues from local income taxes, property taxes, and sales taxes per acre of new development

\$117,000

annual per acre

+ 735%

Household Costs

Annual auto and utility costs per household

\$10,500

annual per household

savings of \$8,100

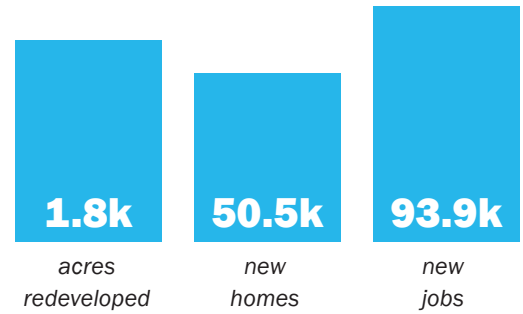




CONCEPT AND METRICS SUMMARY

Northwest Corridor

Prioritizes high growth in major nodes at the northern end and near Downtown Columbus. Moderate intensity growth along rest of corridor, including the Ohio State West Campus and near the OSU airport.



Transportation - Walk and Transit Accessibility

Average number of regional jobs accessible within 45 minutes by walking and transit

189,000

average number of jobs accessible by walk/transit

Compared to Current Trajectory regional average

+ 155%

Transportation - Transit & Active Mode Share

Share of all household trips taken by transit, walk, or bike

4.1%

transit

21%

total non-auto

Transit, walk, and bike trips

+ 165% transit

Transportation - Vehicle Miles Traveled

Annual vehicle miles traveled (VMT) per household

8,800 mi

annual per household

- 47%

Greenhouse Gas Emissions

Annual GHG emissions from passenger vehicle travel and residential energy use per household

11.9 MT

annual per household

- 20%

Infrastructure Costs per Acre

Average costs per acre of new development to build, operate, and maintain local roads, water, wastewater, and sewer infrastructure.

\$466,000

cumulative per acre

+ 85%

Tax Revenues per Acre

Average annual revenues from local income taxes, property taxes, and sales taxes per acre of new development

\$158,000

annual per acre

+ 1035%

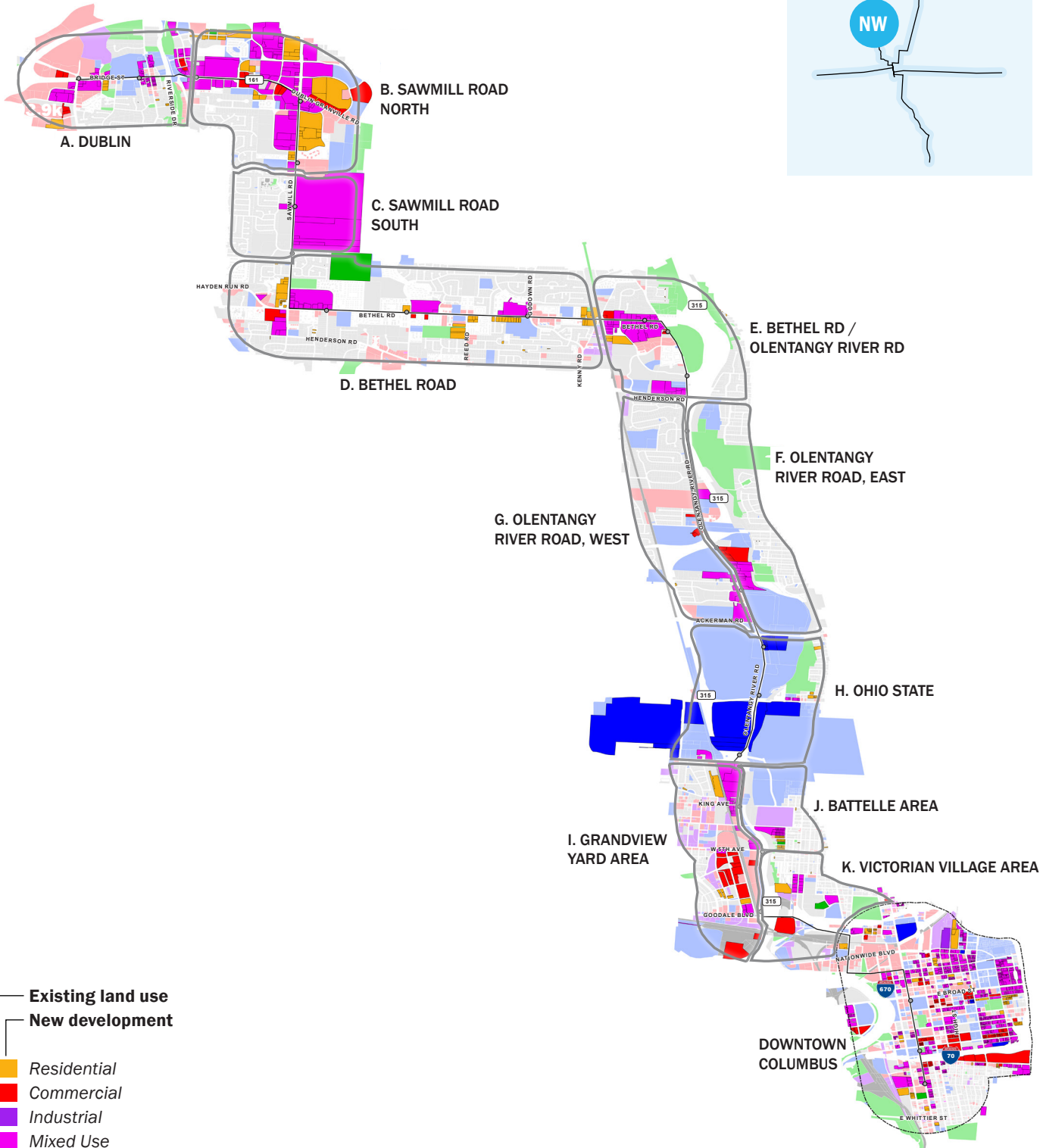
Household Costs

Annual auto and utility costs per household

\$10,300

annual per household

savings of \$8,200



- Existing land use**
- New development**
- Residential
- Commercial
- Industrial
- Mixed Use
- Civic Institutional
- Transportation Utilities
- Open Space

- Potential corridor
 - Potential transit stops
- N
- 0 1/2 1 mile

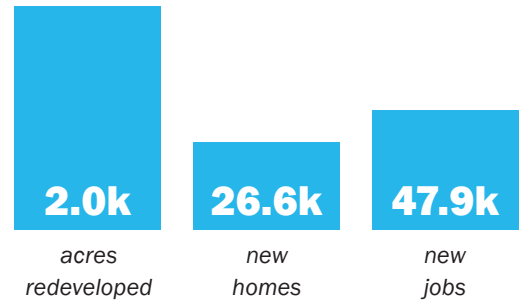
Note: Large parcels depicted with new development may involve redevelopment and/or accommodate infill that maintains existing buildings or open space.



CONCEPT AND METRICS SUMMARY

Southeast Corridor

Distributes mixed use growth in moderate density areas along corridor. Logistics and industrial job growth is located throughout the broader Rickenbacker area. Includes major housing and job growth in mixed use redevelopment of the Columbus Castings site and in the area nearby. Density peaks along the corridor near downtown.



Transportation - Walk and Transit Accessibility

Average number of regional jobs accessible within 45 minutes by walking and transit

211,000

average number of jobs accessible by walk/transit

Compared to Current Trajectory regional average

+ 185%

Transportation - Transit & Active Mode Share

Share of all household trips taken by transit, walk, or bike

4.0%

transit

23%

total non-auto

Transit, walk, and bike trips

+ 160% transit

Transportation - Vehicle Miles Traveled

Annual vehicle miles traveled (VMT) per household

9,200 mi

annual per household

- 45%

Greenhouse Gas Emissions

Annual GHG emissions from passenger vehicle travel and residential energy use per household

12.6 MT

annual per household

- 15%

Infrastructure Costs per Acre

Average costs per acre of new development to build, operate, and maintain local roads, water, wastewater, and sewer infrastructure.

\$331,000

cumulative per acre

+ 52%

Tax Revenues per Acre

Average annual revenues from local income taxes, property taxes, and sales taxes per acre of new development

\$61,600

annual per acre

+ 335%

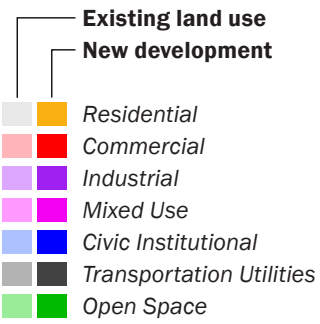
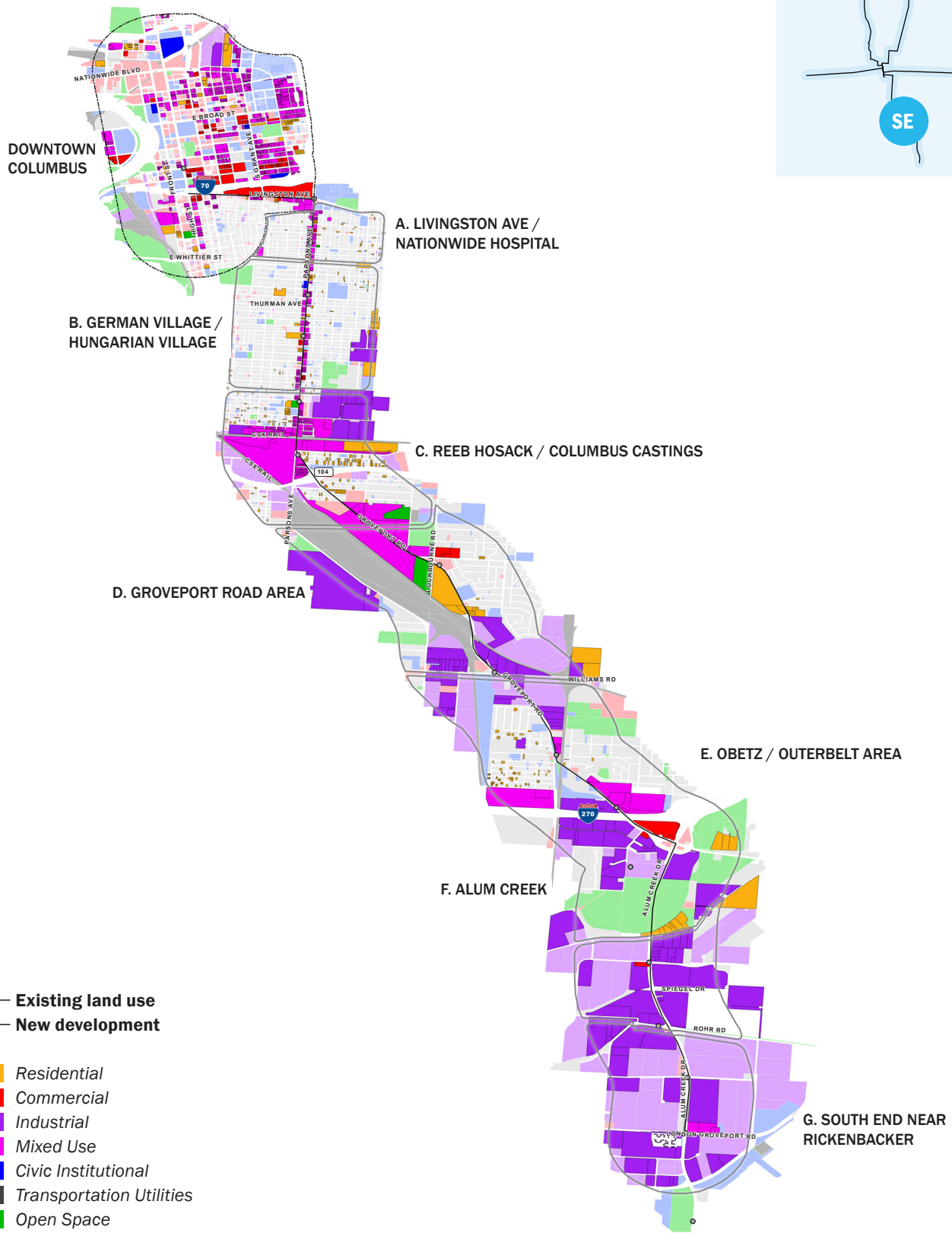
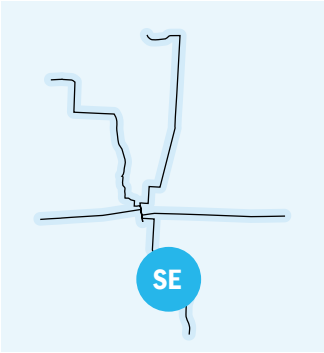
Household Costs

Annual auto and utility costs per household

\$10,800

annual per household

savings of \$7,800

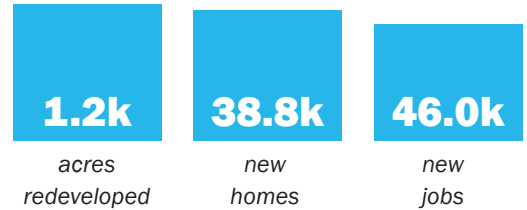


Note: Large parcels depicted with new development may involve redevelopment and/or accommodate infill that maintains existing buildings or open space.



West Broad Street Corridor

Prioritizes growth in higher density infill approaching downtown, in Franklinton, and on the Scioto Peninsula. Also locates development at moderate densities in large-scale mixed-use areas, including major growth at the former Westland Mall site.



Transportation - Walk and Transit Accessibility

Average number of regional jobs accessible within 45 minutes by walking and transit

312,000

average number of jobs accessible by walk/transit

Compared to Current Trajectory regional average

+ 320%

Transportation - Transit & Active Mode Share

Share of all household trips taken by transit, walk, or bike

9.1%

transit

32%

total non-auto

Transit, walk, and bike trips

+ 500% transit

Transportation - Vehicle Miles Traveled

Annual vehicle miles traveled (VMT) per household

7,800 mi

annual per household

- 54%

Greenhouse Gas Emissions

Annual GHG emissions from passenger vehicle travel and residential energy use per household

11.6 MT

annual per household

- 19%

Infrastructure Costs per Acre

Average costs per acre of new development to build, operate, and maintain local roads, water, wastewater, and sewer infrastructure.

\$364,000

cumulative per acre

+ 47%

Tax Revenues per Acre

Average annual revenues from local income taxes, property taxes, and sales taxes per acre of new development

\$124,000

annual per acre

+ 790%

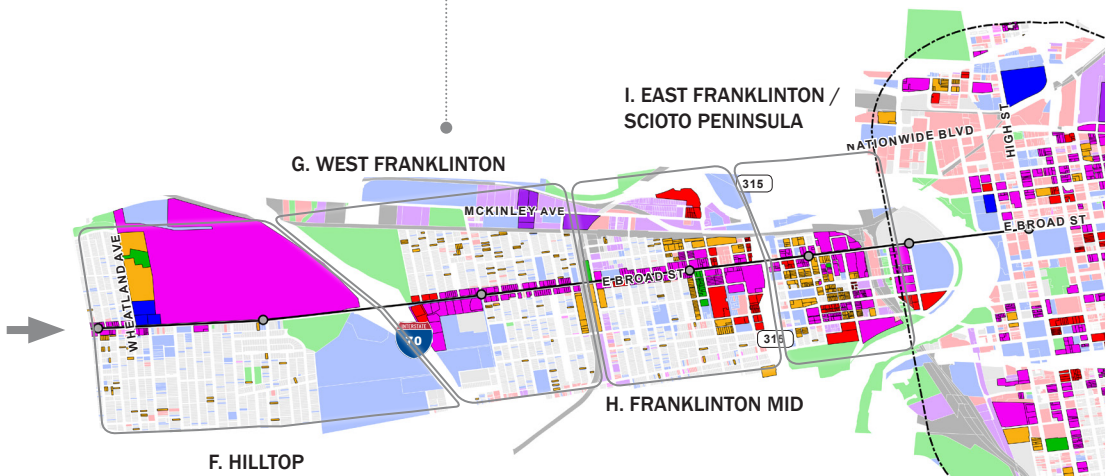
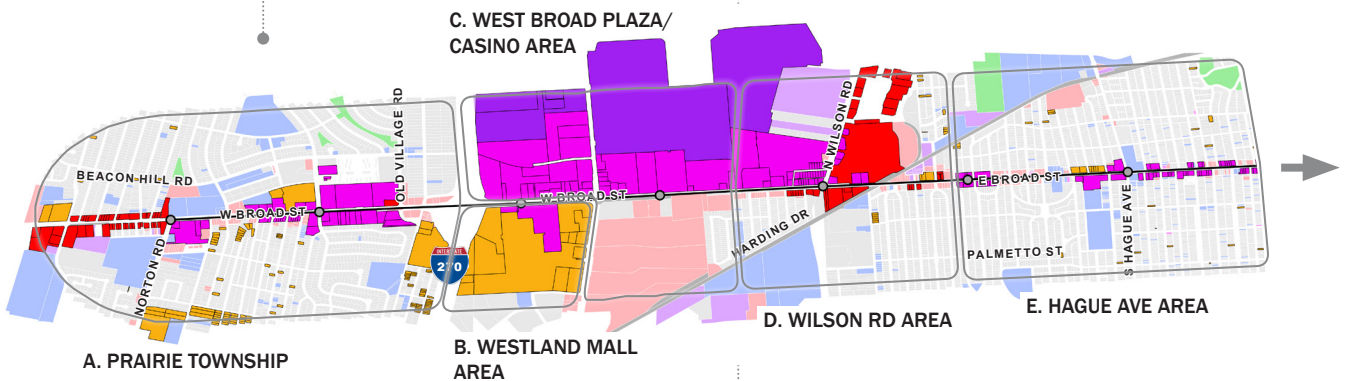
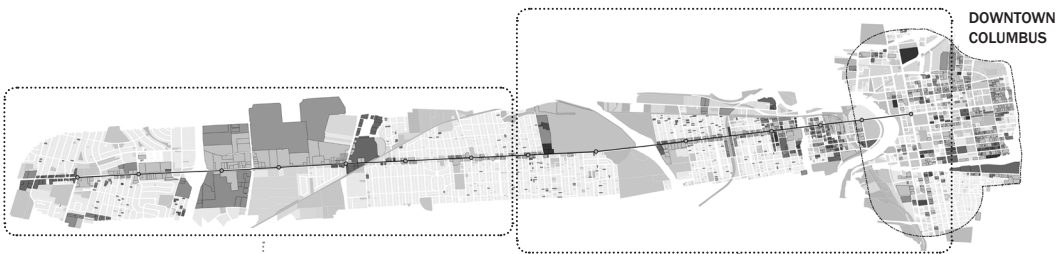
Household Costs

Annual auto and utility costs per household

\$9,400

annual per household

savings of \$9,200



- Existing land use**
- New development**
- Residential
- Commercial
- Industrial
- Mixed Use
- Civic Institutional
- Transportation Utilities
- Open Space

Potential corridor
 Potential transit stops

0 1/2 1 mile

Note: Large parcels depicted with new development may involve redevelopment and/or accommodate infill that maintains existing buildings or open space.

Scenario Metrics

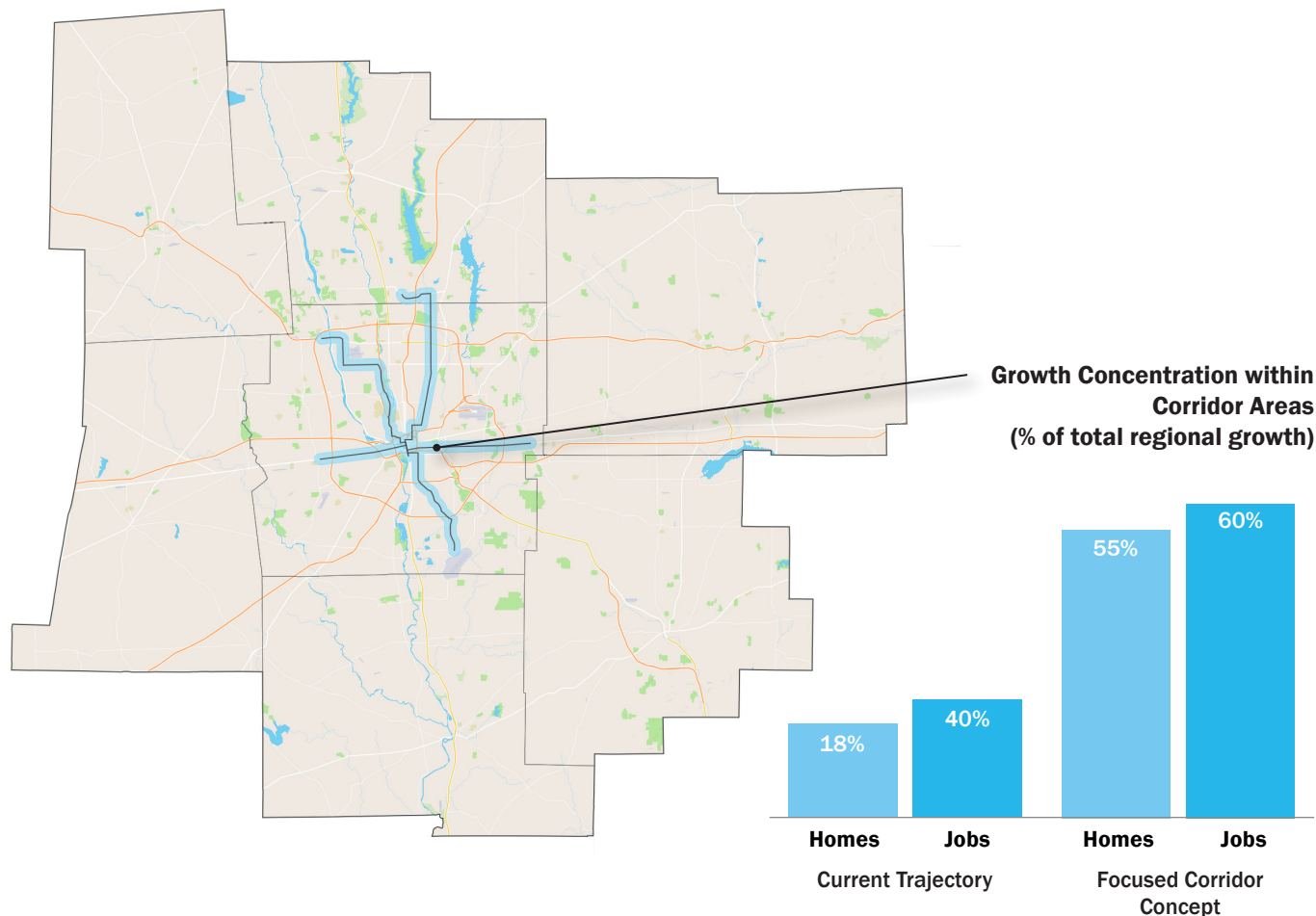
The insight2050 Corridor Concept scenarios were analyzed for their performance across a range of metrics, including fiscal, environmental, transportation, and other impacts for the region and its residents. From land consumption to walk and transit accessibility, and local infrastructure costs and revenues to household costs, the analysis comprehensively demonstrates the impacts of the region’s land use and transportation decisions.

The study has involved localizing the UrbanFootprint model to ground the analysis with data and assumptions specific to Central Ohio. Scenario analysis was used to compare performance at the regional scale, as well as along individual study corridors.

The summary of results for the Current Trajectory and Focused Corridor Concept scenarios as presented here highlight the large-scale implications of high-capacity corridor transit and focused land use in the seven-county region. Where applicable, “in corridor” results for the Focused Corridor Concept are given for areas within half a mile of the corridor alignments. These corridor-area average metrics demonstrate the impacts specifically associated with compact development in proximity to new high-capacity transit.

“Cumulative” results reflect sum totals over the time frame of the study (2018 to 2050), while “annual” results reflect values in 2050, the scenario end year. Costs are described in year-2018 constant dollars. Input assumptions for the model and metrics are summarized in Appendix B.

Corridor Areas within the Central Ohio Region

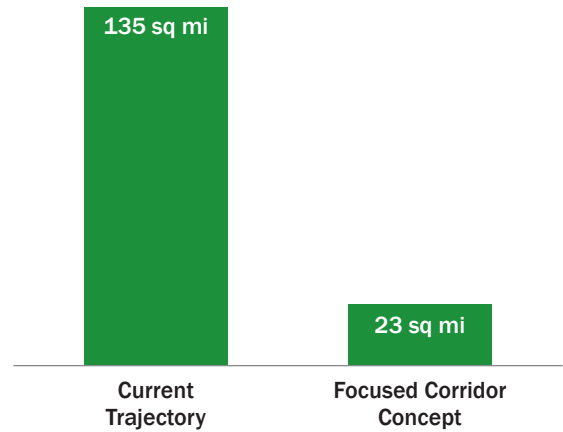


Land Consumption

New land consumption includes all land that will be newly developed for residential and employment areas, roadways, and other uses. This is land that today includes open space, agricultural, and public lands. The amount of land consumption needed to accommodate new growth depends on the location and intensity of development and the use of infill land for redevelopment.

With most housing and employment growth taking place in moderate to higher densities in currently underutilized areas along the study transit corridors, the Focused Corridor Concept uses much less land for new growth, as compared to the Current Trajectory scenario. While the Focused Corridor Concept consumes 23 square miles to accommodate growth, the Current Trajectory scenario spreads out over 135 square miles to accommodate the same number of new homes and jobs. Of the 112 square miles preserved by the Focused Corridor Concept, nearly 100 square miles is currently agricultural land.

Cumulative New Land Consumption to 2050



Infrastructure and Service Costs

The costs of local infrastructure and emergency services to serve new development vary substantially according to the extent and location of new growth. Capital costs for roads, sewers, and stormwater infrastructure increase proportionally with new land developed, as do the ongoing costs to operate and maintain them. The costs for new fire stations and ongoing costs to provide emergency services also vary with the reach of new growth. Note that the analysis accounts for these components of local infrastructure and services only. Other significant costs include those for transit and local fiber provision. Transit costs will depend on transit type, while public costs for fiber will vary according to the extent of private investment. For a discussion of financing considerations for transit and fiber, refer to the Implementation Toolkit.

The Focused Corridor Concept, which includes more infill development and less new land consumption, saves \$10 billion in cumulative costs for infrastructure capital, operations, and maintenance to 2050 as compared to the Current Trajectory scenario. Capital and operations costs for emergency services over the same timeframe are lower by \$500 million in the Focused Corridor Concept. Combined capital costs for infrastructure and emergency services are lower by \$9.4 billion for the Focused Corridor Concept, while those for combined operations and maintenance are lower by \$1.1 billion.

Localized cost assumptions were developed to estimate the relative cost impacts of the scenarios. While maintenance costs for new growth and infill growth are similar, infill growth does not incur capital costs for new infrastructure. However, infill is not cost-free — significant increases in density increase the use of existing infrastructure. This in turn shortens its effective lifetime, demanding reconstruction sooner than would have been required if there were little to no increase in density. Reconstruction, which entails the replacement of road, water, and sewer infrastructure, can cost upwards of 60% of the costs of initial construction.

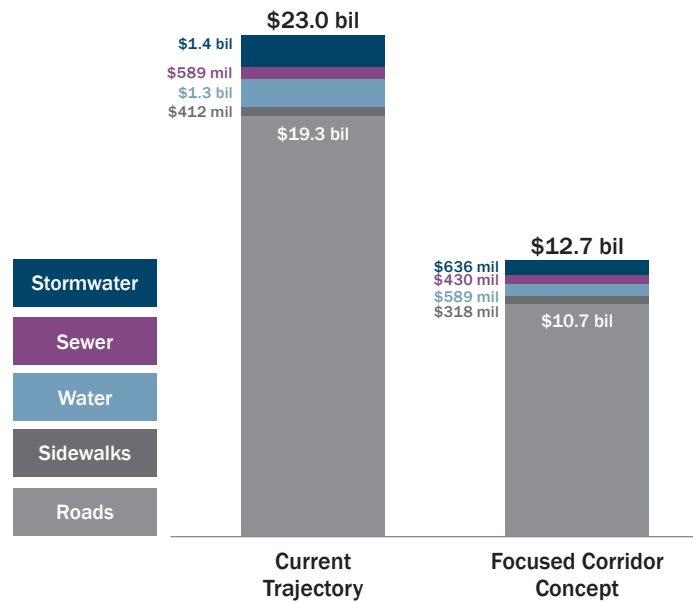
Capital and ongoing maintenance costs are included for:

Right-of-way: New roads; new sidewalks (non-rural areas only); and snow removal on new roads (maintenance only).

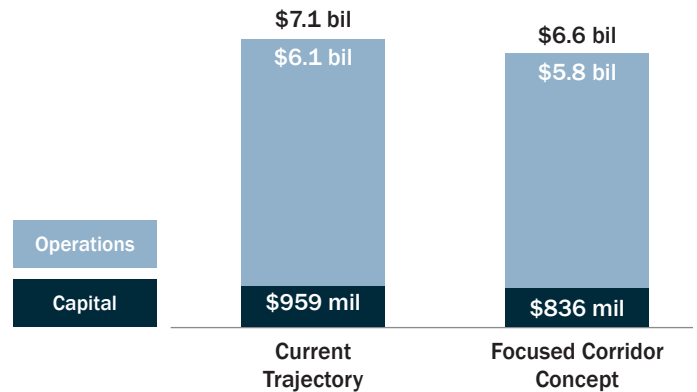
Utilities: Water mains; sanitary sewers (non-rural areas only); and storm drains.

Emergency services: New stations; new vehicles – fire engines, ladder trucks, EMS ambulances; and operations costs for new vehicles.

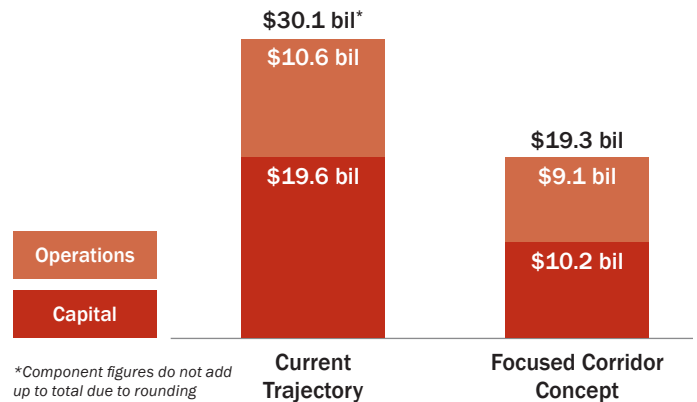
Local Infrastructure Costs to 2050



Emergency Services Costs to 2050



Combined Local Infrastructure and Emergency Services Costs to 2050



*Component figures do not add up to total due to rounding

Fiscal Revenues

Walkable, compact, mixed use development yields greater local tax revenues than typical suburban development patterns. Higher densities, and the property value premiums that come with transit proximity and the desirability of walkable neighborhoods, bring higher revenues per acre of development, and for the region overall. According to the National Association of Realtors 2017 *Community & Transportation Preference Survey*, six in ten respondents across all age groups would pay more to live in a walkable community.

With more growth overall in transit-oriented development along the corridors, the Focused Corridor Concept generates \$1 billion more in local tax revenues to 2050 than the Current Trajectory scenario. On a per-acre basis, the differences are substantial. Across the region, the Focused Corridor Concept generates \$40,000 per acre annually – three times the Current Trajectory scenario average of \$14,000. The value difference is most pronounced in corridor areas, where average revenues amount to \$134,000 per acre.

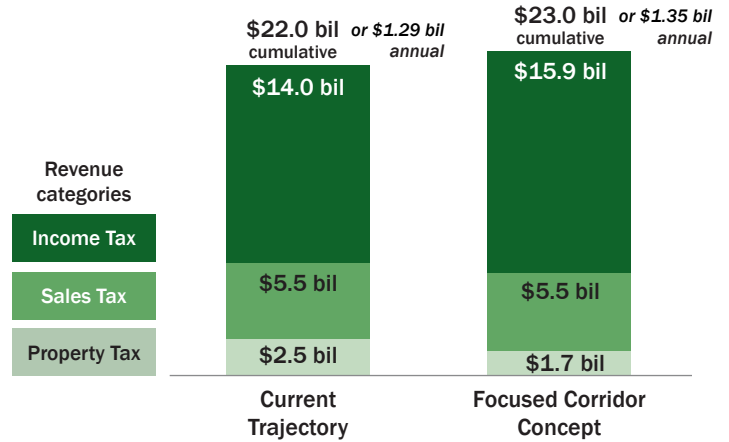
The study estimates revenues from the following sources:

- Annual income tax revenue associated with new commercial development, as levied for general fund and public safety uses.
- Annual property tax revenues from new residential and commercial development, as levied for general fund and public safety uses. The analysis does not account for property tax revenues levied to fund school districts.
- Annual county sales tax revenue generated from households in new residential development.

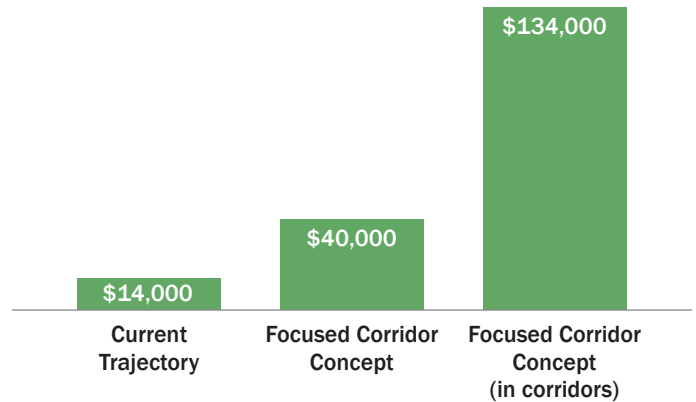
Income tax is tied to commercial square feet, type of space, employment mix, and employment location, and accounts for the majority of local revenues. Higher employment densities, wages, and income tax rates in compact corridor areas as compared to suburban locations lead to higher income tax revenues per square foot.

Property tax revenues also increase along with development densities and higher property values and rents in compact, walkable areas, and in proximity to transit. Premium corridor transit will attract varying levels of investment depending on location. Corridor development differs in value depending on relative market strength, with applied values ranging from “medium” to “high” based on a sample of places in the region today. “High” market strength is assumed at major nodes and with greater development intensities. Proximity to robust transit – whether within ¼ or ½ mile – brings additional value premiums for residential, office, and retail

Local Tax Revenues, Cumulative to 2050 and Annual in 2050



Local Tax Revenues per Acre, Annual in 2050



buildings due to the additional desirability associated with convenient regional access via transit.

The projections for higher property values and resulting property tax revenues associated with compact development must be considered in balance with the implementation of local strategies to provide housing for all income levels. More affordable housing may lead to relatively lower property taxes while yielding greater equity and livability.

Note that the fiscal impacts estimated by the study – including revenues and local infrastructure and service costs as outlined – do not present a complete picture of all costs and revenues. Nor can the timing of infrastructure investments and expected revenues be expected to coincide. For these reasons, the results cannot be used to project return on investments.

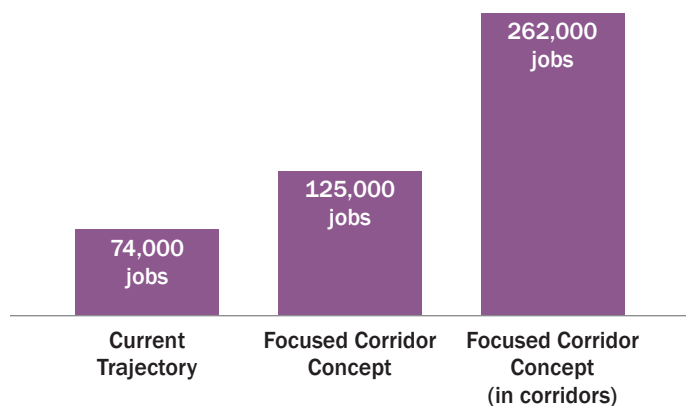
Walk and Transit Accessibility

Most people in Central Ohio today rely on cars to get to where they need to go, using them for nearly 85% of all trips. The Focused Corridor Concept reflects a vision for enhanced mobility — one where more people can get to school, work, shops, services, parks, and other destinations via transit, walking, or biking.

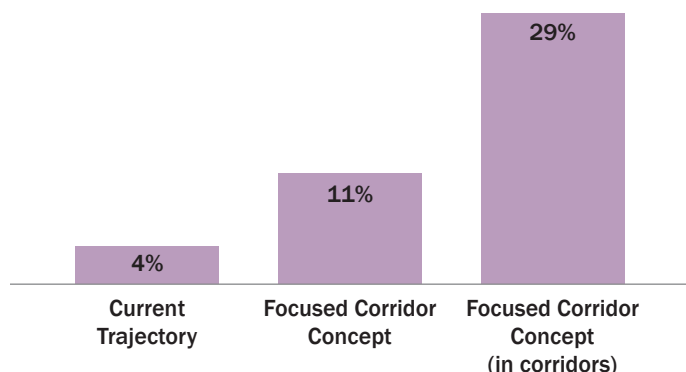
The Focused Corridor Concept coordinates new growth with transit, locating new homes and employment in compact, walkable, mixed-use centers and neighborhoods within walking distance of stations. Maximizing development opportunities along corridors to bring more homes and jobs within proximity of high-capacity corridor transit improves accessibility not only for those living along the corridors, but also for commuters working along the corridors. Greater walk and transit accessibility leads to lower auto use and more non-auto trips, as described with the transportation mode share results on the next page.

The UrbanFootprint model measures walk and combined walk/transit access to employment and other destinations using a network-based analysis that accounts for street patterns and walkable intersections.

Average Number of Jobs Accessible within 45 min by Walk/Transit



% of Homes with Access to 25% of Regional Jobs within 45 minutes by Walk/Transit



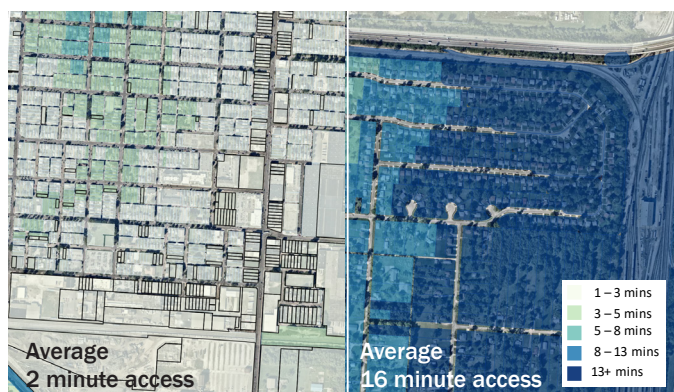
Access to Employment

Currently, the average resident in the region can access 48,000 jobs within 45 minutes by some combination of walking and transit. With substantial growth in both new homes and jobs, the Current Trajectory scenario sees that increase to 74,000 jobs. By contrast, the Focused Corridor Concept puts 125,000 jobs within reach — an increase of 69% over the Current Trajectory scenario. Within the corridor areas, where most residents are within half a mile of a high-capacity transit stop, the number of jobs accessible by the average resident rises to 262,000 — an increase of 250% over the Current Trajectory scenario.

Walk Access to Local Destinations

The ability to reach local services and amenities via a short walk is, for many, a measure of livability. With most new growth occurring in compact, mixed-use neighborhoods, far more residents in the Focused Corridor Concept can meet their daily needs without a car, an option that can be healthier, less expensive, and more environmentally sustainable. The maps below illustrate how accessibility varies according to development pattern. In contrast to a compact development pattern featuring interconnected streets and a mix of uses within close proximity, suburban development limits mobility and destination accessibility with low densities, separate residential and commercial areas, and inefficient street patterns that increase walking distances.

Compact development patterns at the neighborhood scale are best complemented by broader networks of pedestrian- and bike-friendly infrastructure. Designing and developing street facilities in the corridor areas in line with MORPC's Complete Streets policy will support safe mobility and efficient connections, encouraging walking, biking, and transit use.



Area average walk access to retail destinations. Compact development along a corridor is shown at left; a suburban pattern is shown at right.

Travel Mode and Vehicle Miles Traveled

How people choose to get around — whether by transit, auto, rideshare (e.g., Lyft and Uber), walking, biking, or even electric scooter — depends on their mobility options and the accessibility of local and regional destinations by various transportation modes. Compact development and high-capacity transit along corridors, coupled with improved pedestrian facilities and bike infrastructure, allow residents and commuters in the area to drive less or not at all.

The Focused Corridor Concept scenario assumes that the corridors are served by some form of high-capacity transit along dedicated rights-of-way. To ground the vision for the corridors, transit must move people quickly, efficiently, equitably, and reliably. Many forms of transit or new mobility options could satisfy these criteria, whether they exist today or will emerge as technology evolves. Potential options include:

- Bus rapid transit (BRT) or light rail transit (LRT), which require varying amounts of fixed physical infrastructure
- Autonomous rapid transit (ART), which could look similar to BRT but use driverless technology
- Microtransit in the form of autonomous shuttles, which could operate according to demand along fixed corridor routes, with flexible stop locations
- High-occupancy vehicle (HOV) lanes for smaller shared autonomous vehicles, which could use smart vehicle technologies (such as platooning) to transport passengers efficiently and at optimal speeds

These options and others to come may vary significantly with respect to infrastructure requirements, implementation and cost considerations, scalability, and interaction with other travel modes. Quality of service, passenger experience, and close coordination with land use to



Along with transit, bike lanes and other active transportation infrastructure are vital components of an interconnected, multimodal transportation system that supports non-auto mobility.

maintain a corridor focus are also important given the rising pressures presented by new auto mobility options — from ride-hailing and ridesharing today to private autonomous passenger vehicles into the future (as discussed on pages 33-34). This study is a step in gauging impacts to define a vision for focused corridor growth. Further evaluation will determine what forms of corridor and regional transit/mobility systems can best serve that vision.

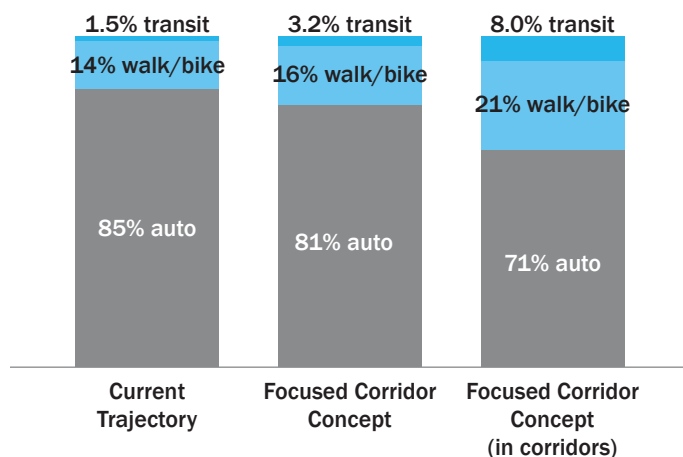
Transportation Mode Share

Mode share refers to the distribution of transportation trips by primary travel mode. The modes include transit, auto (including solo and shared trips), and walk and bike trips (referred to collectively as “active transportation,” and inclusive of options such as mobility scooters). Walk and bike share includes “internal capture” trips, whereby vehicle trips are avoided because mixed use development brings more destinations within walking distance.

Transit use is limited in the Current Trajectory scenario, which does not include the new high-capacity corridor transit around which the Focused Corridor Concept scenario is organized. Regionwide, the Current Trajectory scenario results in 1.5% mode share for transit and 14% for active transportation. These non-auto mode shares are significantly higher in the Focused Corridor Concept, which results in 3.2% and 16%, respectively, and 4% fewer auto trips. While regional average transit mode share is not easily comparable among different regions or cities due to their varying sizes and transit systems, the over three-fold increase in transit share compared to existing Central Ohio transit mode share (less than 1%) represents a substantial increase.

Looking to the corridor areas within the Focused Corridor Concept, where most residents are within half a mile

Transportation Mode Share



(around a 10-minute walk) from major transit, we see even higher average shares of 8% for transit and 21% for active transportation. The active transportation share increases largely due to greater accessibility of nearby local destinations in more mixed and walkable environments, as illustrated with the walk accessibility analysis.

Household Vehicle Miles Traveled

Household driving, or VMT, increases with auto mode share and the lengths of average trips. With the majority of new housing and employment growth occurring along the corridors, the Focused Corridor Concept results in 16% lower regionwide annual VMT in 2050 than the Current Trajectory scenario. As compared to current regionwide VMT, the Focused Corridor Concept sees VMT increase by only 35% while accommodating approximately 60% more people.

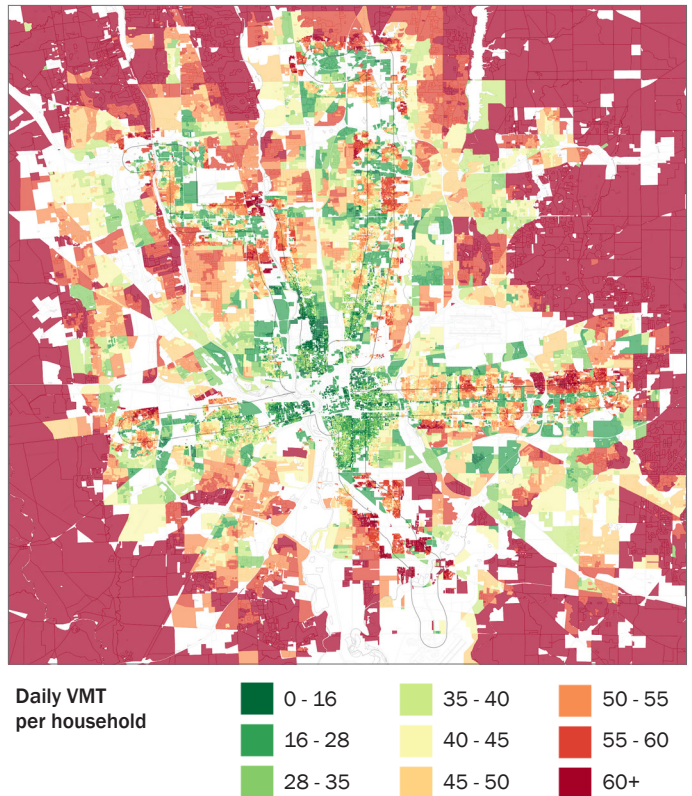
While the average household in the Current Trajectory scenario drives 16,800 miles, households in the Focused Corridor Concept drive 14,200 miles — a savings of 2,600 miles. Households along the corridors in the Focused Corridor Concept drive even less. With more people using transit and walking or biking, households are estimated to travel 8,500 miles, or about half the Current Trajectory scenario average.

The cumulative VMT savings for the region are substantial. In total to 2050, the Focused Corridor Concept would see 48 billion fewer VMT — **the equivalent of taking all cars off the roads for four years**. The VMT savings have considerable implications for household transportation costs and vehicle emissions throughout the region, as shown on page 36.

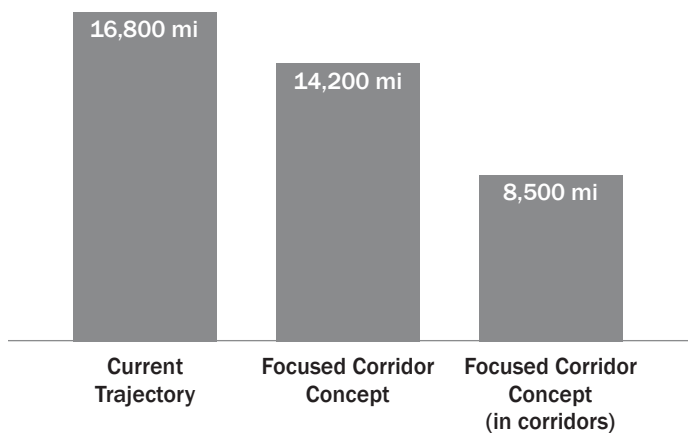
Projected daily VMT per household in the Focused Corridor Concept is shown in the map below. VMT is lowest along the corridors and in compact, walkable locations with access to transit, including local systems that connect to the corridors. VMT is highest in suburban and rural locations. In the corridor areas, VMT for households in existing residential neighborhoods that feature larger suburban lots will be higher than for households in more compact neighborhoods. The areas that are not shaded are purely commercial.

It should be noted that the projected transportation results for the scenarios can be considered relatively conservative with respect to potential transit mode share and VMT savings for the Focused Corridor Concept. Modeling assumes bus rapid transit along the corridors. Further enhancements to service characteristics, such as upgrades to rail service, new autonomous technologies, or additional stations, could substantially increase ridership and reduce VMT accordingly.

Daily Vehicle Miles Traveled (VMT) per Household in Focused Corridor Concept



Vehicle Miles Traveled per Household, Annual in 2050



Transportation into the Future

Emerging autonomous vehicle (AV) technologies will alter the transportation and mobility landscape, and in turn exert influence on the shape of our urban environment. While much is yet to be determined, it is generally considered that the convenience of travel by autonomous vehicles will make people more inclined to use them. Thoughtful planning will be necessary to maximize the benefits of new systems and mitigate potential negative impacts.

Autonomous Vehicle Adoption Scenarios

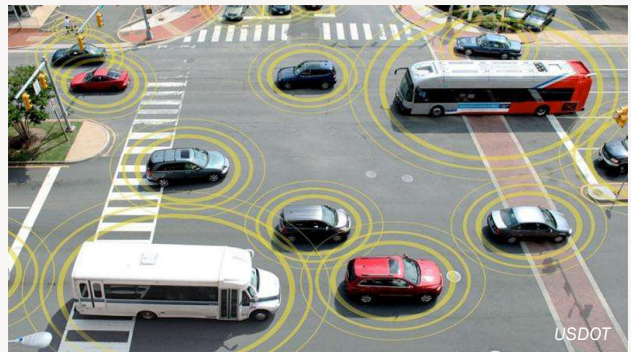
As part of the insight2050 Corridor Concepts study, project consultant Fehr & Peers led a group of over 30 local representatives, including project partners and interested working group members, in a workshop to discuss and provide input on trends likely to impact future travel patterns in Central Ohio.

Expected trends include evolving transportation options, such as the adoption of AVs and new electric non-auto modes; demographic shifts; changing locational preferences for suburban or urban living; social trends around driving; employment trends such as telework and virtual reality; variable gas prices; and macro-economic factors. In a workshop poll, over 90% of participants indicated that AV use, whether operating with a driver on board or unoccupied, would trend upward, reflecting a prediction of strong AV adoption to 2040.

Guided by the group’s prediction, the study explored two future scenarios for AV adoption to understand the extent to which they could affect auto and transit use. A “moderate” scenario assumes 80% AV adoption, while an “aggressive” scenario assumes 100% AV adoption.

The scenarios were modeled with varying assumptions about the value of travel time, auto operating costs, and transit travel times and fares recommended by a national panel of experts. Fehr & Peers then tested the effects in ten regional travel models from urban areas across to country to determine the resulting range of impacts on vehicle trips, transit trips, and vehicle miles traveled (VMT). The results shed light on the pressures posed by AVs.

The potential impacts on vehicle trips, transit trips, and VMT, based on the average of the ten regional models, are summarized in the table as follows. Vehicle trips would increase by as much as 21% and VMT by as much as 33%, while transit trips would decrease by as much as 30%.



The emergence of autonomous vehicle technology of all types, from personal vehicles to transit systems, will invariably change how we travel and how our cities are shaped.

Autonomous Vehicle Adoption Scenario Impacts

Scenario	Vehicle Trips Change	VMT Change	Transit Trips Change
Moderate AV Adoption	+13%	+21%	-12%
Aggressive AV Adoption	+21%	+33%	-30%

The projected increases for vehicle trips and VMT are substantial, and demonstrate the potential of AVs to induce auto travel demand. It may follow that reduced friction to auto travel can reinforce or encourage dispersed development patterns. At the same time, AVs could allow for positive changes in urban form, from reduced requirements for parking to narrower auto travel lanes that allow more room for bike lanes, wider sidewalks, and features that enhance walkability. Further study and planning will be necessary, for Central Ohio and regions across the country, to examine the far-reaching impacts of AVs and interactions with urban design and development.

The region is taking a proactive approach to countering the potential adverse impacts of AVs by putting land use at the forefront of strategies to address mobility.

Corridor Development in Context

In a future with AVs, transit and mobility infrastructure and coordinated land use planning become more of an imperative for establishing a structure for compact, walkable communities in the region. With the Corridor Concepts study, the region is



An array of autonomous vehicle technologies are being designed to suit various purposes. Smart Columbus is exploring Connected Electric Autonomous Vehicles (CEAVs) with the Smart Circuit shuttle by May Mobility along the Scioto Mile loop (shown at left). The Olli shuttle (below) was another option explored for local circulation and first-mile/last-mile connections to transit. Driverless taxis such as the Waymo vehicle provide on-demand services (above).

taking a proactive approach to countering the potential adverse impacts of AVs by putting land use at the forefront of strategies to address mobility. A comprehensive approach to planning land use and transportation investments, as represented by the Focused Corridor Concept, will be necessary to bring about the full range of benefits — mobility, health, fiscal, and others — that can come with compact development.

Rather than allow the functional characteristics and user demands for AV transportation to dictate changes in land use and development, the future

The future of AV use must be guided by a vision for urban development that makes the most of the opportunities it presents.

of AV use must be guided by a vision for urban development that makes the most of the opportunities it presents. As various autonomous technologies, including transit options, evolve, new zoning requirements, urban design guidelines, and complementary policies will be vital to supporting sustainable, equitable development and mobility as envisioned.

Early action is also needed to address right-of-way allocation, traffic management, and transportation demand management. Without comprehensive, cohesive plans and policies throughout the region, there is potential for single-occupant AV adoption to constrain the use of transit and alternative modes.

Smart Columbus

As the winner of the U.S. Department of Transportation’s Smart City Challenge, the City of Columbus and its partners in the Smart Columbus initiative are implementing projects to demonstrate the application of innovative technologies to meet goals for safe, efficient, and equitable mobility throughout Columbus. Among others, the projects include the development of data infrastructure to support connected vehicle applications; deployments of connected electric autonomous vehicles (CEAVs); and a range of services to enhance mobility by easing transit use.

The application of these projects and other evolving systems, in coordination with land use planning for compact, focused growth, transportation policy, and considered implementation strategies, can put Central Ohio at the frontier in a new era of sustainable development and mobility.



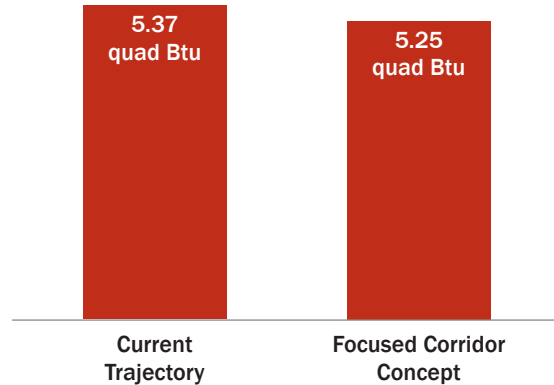
Building Energy Use

Compact development accommodates a higher proportion of growth in more energy-efficient building types such as apartments, townhomes, and smaller single family homes, as well as more compact commercial building types. The scenarios vary substantially in their building energy use profiles due to their different mixes of housing and commercial buildings.

With a greater proportion of attached home types and smaller single family homes, and more space-efficient commercial buildings, the Focused Corridor Concept uses 7 trillion Btu* less energy annually in 2050 than the Current Trajectory scenario, a savings of 3.6%, or **enough to power over 40,000 homes for a year**. Lower energy use also translates to lower energy costs for households and businesses – on the order of \$193 million in total, assuming today’s costs – and reduces greenhouse gas emissions by 0.8 million metric tons (MMT). Cumulatively to 2050, the savings amount to 118 trillion Btu.

Energy use will also change into the future depending on improvements in energy efficiency. For the purposes of comparison, the study scenarios assume current average energy use rates.

Cumulative Residential and Commercial Building Energy Use to 2050



**British thermal units, a measure of energy. The energy metrics expressed in Btu incorporate electricity and natural gas use, which are modeled separately.*

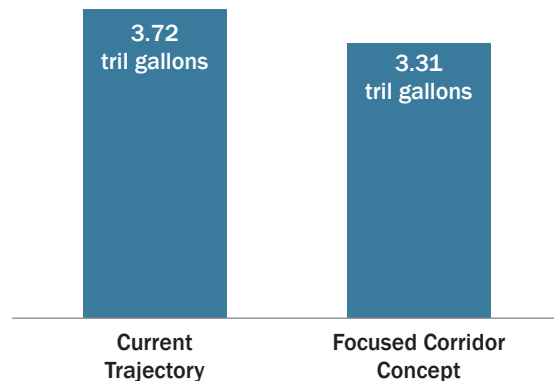
Water Use

Compact development can substantially lower water demand by virtue of a smaller footprint and reduced area for irrigated lawns and landscaping. Townhomes, multifamily buildings, and small lot single family lots require less water than large lot single family homes, while commercial building types in compact and urban areas require less than their suburban counterparts.

With its greater proportion of compact development, the Focused Corridor Concept uses 24 billion gallons less water annually in 2050 than the Current Trajectory scenario, a savings of 19% – **enough to serve nearly 300,000 homes for a year and save households and businesses a combined \$275 million**. Cumulatively to 2050, the savings amount to over 400 billion gallons.

Water use will also change into the future depending on improvements in water use efficiency and conservation measures. For the purposes of comparison, the study scenarios assume current average water use rates.

Cumulative Residential and Commercial Water Use to 2050



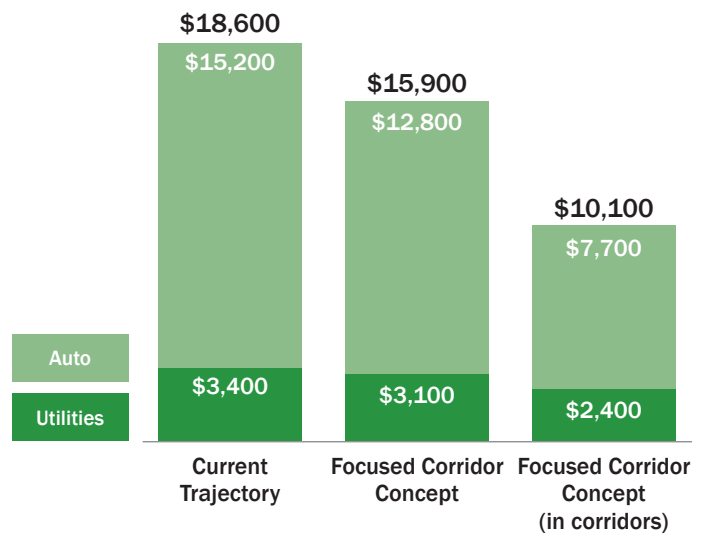
Household Auto and Utility Costs

For many Central Ohio households, auto and utility expenses can be an outsize financial burden. While the study does not project mortgage or rental costs into the future, household expenditures for transportation, energy, and water make up a significant share of the basic costs of living, and are tied to the availability of location- and resource-efficient housing options. Examining average costs to households in the scenarios highlights the significant impacts that land use and policy choices have on affordability for residents of the region.

The Current Trajectory scenario would cost the average household \$18,600 annually (in 2050) for household energy and water use, and automobile ownership, maintenance, and operation. With lower average household vehicle miles traveled (VMT) and resource demand, the Focused Corridor Concept scenario would cost households \$15,900 annually in 2050, about \$2,700 less per household than the Current Trajectory scenario region-wide. Along the study corridors, the savings are even higher, with average annual household costs of \$10,100, or **\$8,500 less than the Current Trajectory scenario**.

Over time, the differences in annual expenditures would amount to a significant sum for each household — money that could instead be applied to a home mortgage or other living expenses. Cumulatively to 2050, household

Annual Household Auto and Utility Costs in 2050



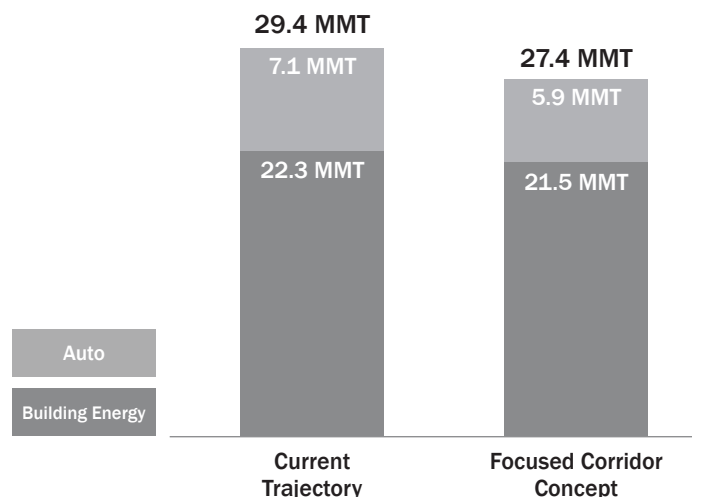
costs amount to \$549 billion in the Current Trajectory scenario. The Focused Corridor Concept would cost households across the region \$500 billion in total, a savings of \$49 billion.

Greenhouse Gas Emissions

Passenger vehicle transportation, along with residential and commercial building energy use, accounts for over half of total greenhouse gas (GHG) emissions in Central Ohio. Land use patterns have enduring impacts on GHG emissions by shaping demand for auto travel and building energy. While improvements in vehicle technology, transportation fuels, and energy portfolio changes will all contribute in reducing emissions, compact land use plays a foundational role in reducing energy demand and related emissions.

With its compact development patterns yielding lower vehicle miles traveled (VMT) and building energy use, the Focused Corridor Concept reduces GHG emissions by 7% annually in 2050 as compared to the Current Trajectory scenario. Assuming current transportation and building energy use and emissions assumptions, this reduction would amount to 1.9 million metric tons (MMT) of carbon dioxide equivalent (CO₂e) — **a quantity equivalent to taking nearly 500,000 cars off the roads for a year**.

Annual Greenhouse Gas Emissions from Building Energy and Passenger Autos in 2050



*MMT = Million metric tons

Implementation Toolkit

The Implementation Toolkit is a separate report that provides a market-sensitive strategy and options for consideration by local partners in developing codes, policies and incentives to implement the development patterns as envisioned by the Focused Corridor Concept. The report includes guidance on jurisdictional collaboration, general policies for corridor areas, specific policies for corridor segments, and considerations for near-term prioritization.

The following provides an overview of the toolkit components. The full report is available separately at getinsight2050.org.

Options for Jurisdictional Collaboration and Implementation

The Implementation Toolkit describes a number of options for collaborative governance and mechanisms to implement corridor development in a consistent, cohesive manner. Options include:

- **A Transportation Improvement District (TID) approach.** A TID (or TIDs), such as the one recently created by Franklin County, could serve as a main body for coordinating transportation resources and investments, or serve as a complement to other collaborative governance structures.
- **A Regional Transit Authority (RTA) approach.** COTA, the RTA for Central Ohio, could expand its capacity as an RTA, working closely with MORPC, Franklin County, the City of Columbus, and the Franklin County TID to construct, acquire, equip and operate a transportation mode within each corridor.
- **A Council of Governments (COG) approach.** A COG for each corridor, or all corridors, could serve as an administrative body and operating entity on behalf of member counties, municipal corporations, townships, special districts, school districts, and other political subdivisions.
- **Corridor-Specific Economic Development Agreements.** A cooperative economic development agreement (a “CEDA”) for each corridor could be considered to cultivate a cohesive implementation strategy.
- **Revenue Capture Mechanisms.** Understanding each corridor will have a set of transportation improvements and may undertake a large transportation investment, revenue capture by corridor-specific or county-wide TIDs, will enhance financing.
- **Project Oversight.** Mid-Ohio Planning Commission (MORPC) and project partner.



The full Implementation Toolkit is available separately for regional and local partners and stakeholders.

- **Policy Guide.** A corridor-wide Development Agreement can memorialize common policy approaches.

Corridor-Wide Policies

Dedicated Right-of-Way

A right-of-way strategy enables a mass transportation solution to accommodate and enhance value from higher densities. Approaches should address three property ownership types:

- **Public.** Right-of-way dedication addressed through Development Agreement and governance entity.
- **Private: Planned Development.** Development Agreement requires property owners developing along corridor to dedicate right-of-way through a number of methods.
- **Private: No Planned Development.** Request property owners dedicate right-of-way or utilize power of COG to appropriate right-of-way real property for a public purpose.

Large-Scale Transportation Finance Strategy

Local revenue capture programs should be coupled with grants, bonds, and other funds for a federal Transportation Infrastructure Finance and Innovation Act (TIFIA) loan structure, one typically used in public transit projects. This can be structured with a tax revenue pledge utilizing bonds and grant proceeds, or a public-private partnership model that focuses around availability payments and bonds. Revenues to be pledged can include sales taxes, availability payments, state & local appropriations, farebox revenues/user charges, fuel taxes, project revenues, facility rents, or tax increments.

Zoning Recommendations

Current corridor zoning categories across Central Ohio do not allow, or encourage, the type of development prescribed by the Focused Corridor Concept. The report identifies key zoning recommendations for implementation to occur immediately (within a year), in the near-term (one to two years), and for the next-term (two to four years).

Immediate (under one year). Expand existing zoning tools in place in cities, counties and townships to encourage compact development in the corridors within the half-mile buffer area. This might include overlays, design guidelines, or special planning areas. By adjusting the boundaries to which these apply, immediate impacts could be accomplished with development review for new projects.

Near-term (one to two years). Consider changes to existing zoning districts as possible based on impacts throughout the cities/townships, including:

- Overall development standards to create denser, compact development patterns.
- Transitions to established neighborhoods along corridors.
- Reduced parking ratios.
- Affordable housing strategy, which may involve location-based tax abatement incentives.

Next-term (two to four years). Develop mixed-use zoning districts for all corridors that allow compact development at the scale prescribed, including:

- **Urban Mixed Use (UMU) and Compact Mixed Use (CMU) districts.** Urban Mixed Use, modeled after Columbus' existing Downtown District, would apply in areas adjacent to existing urban districts. Compact Mixed Use districts would represent a step down in density and height from UMU, and apply in areas between nodes of higher density UMU zones, where lot depths may pose a development constraint, or where the transition from suburban zoning would be extreme. Both would include:
 - Less limitation on height and massing, and other issues of scale.
 - Specific requirements added to detail the public realm (streetscape, open space, interface with transit/transportation networks).

- Standards to address the transition area where each corridor abuts adjoining neighborhoods. (Historically, this has been addressed in a largely ad hoc manner through individual development site reviews.)
- A completely new approach to parking requirements based on changes in mobility and access to high-capacity transit.
- **Sub-district types.** These could define standards for different intensities of nodes and neighborhoods along the corridors, including:
 - *High-intensity nodes.* Areas that have very low current developed value, are large in size, and well served by the regional transportation network (e.g., Westland Mall area).
 - *Medium-intensity nodes.* Areas that have low to moderate current development value, potential for some land assembly, adequate size, and are well served by the regional transportation network (e.g., at the intersection of key roadways).
 - *Neighborhood corridors.* Areas along traditional neighborhood corridors, often delineated by area between the corridor and the parallel alley (e.g., Parsons Avenue).

Corridor Segment Policies

Existing Conditions

In order to help inform the needs and challenges of the district, an in-depth existing conditions study was performed for each segment that mapped current zoning and land use, distress and economic data, anchor institutions, smart mobility and additional characteristics. A matrix was developed for each study corridor.

Segment Recommendations

Recommendations were provided and coded specifically to each segment within the study corridors. These include:

Development and Land Use

- Undertake zoning changes under an immediate, near-term and next-term phase by political subdivision. This includes specific recommendations for subdivisions. This approach for specific subdivisions should be included in the corridor-wide Development Agreements.

- Create a Development Agreement for unincorporated areas — this is in the event a corridor-wide Development Agreement is not created to serve as a Plan B for townships.
- Enhance historic districts and historic structures by creating “innovation districts.”

Workforce and Market Rate Housing

- Work with the affordable housing trust to create scalable policies for funding.
- Utilize public finance tools to control rents for affordable, workforce, and market-rate housing.

Budgets and Incentives

- Utilize the provided “Incentives Matrix” for considerations to fund expected development activities along the corridors.
- Consider the replication or expansion of existing City of Columbus tax abatement and incentive policies to create desired housing stock.

Smart Mobility Recommendations

- To provide connectivity to the wireless infrastructure needed to enable smart mobility initiatives, ensure that a complete fiber path along each proposed corridor is available through one or more public and/or private providers.
- In accordance with MORPC’s Smart Streets Policy, encourage installation of digital infrastructure in any dedicated right-of-way along the Corridors as construction projects take place (“dig once”) to streamline construction, reduce costs, and enhance efficiencies.
- Attract more data centers within the corridors (outside of downtown) — necessary if the fiber network is not interconnected as recommended.
- Supplement cellular towers to ensure wireless connectivity in certain segments, and also explore small cell facilities. Cities should ensure that right-of-way ordinances and design guidelines are in place to guide the private deployment of small cell facilities and wireless support structures.
- Consider smart mobility and technology implementation in “smart mobility investment ready” segments, which have been identified on the basis of existing wired and wireless infrastructure.

Prioritization of Corridors and Segments

The study delineated each corridor into six to eleven “segments” (as shown in the corridor maps on pages 16–25 of this report) to focus on their unique development characteristics. In prioritizing the undertaking of recommendations, it is important to address the challenges of the individual corridor segments through land use policies, while placing a high priority on the investment preferences of an entire corridor.

To create a better understanding of investment priority preferences, the project working group (PWG), consisting of regional development and transportation professionals and key stakeholders, participated in a survey. Using response cards, working group members chose their key investment priorities and top priority segments, along with the reasons for their selections. Of the responses, “High Capacity Transit Potential” was the highest ranked preference, representing 18% of the total share. That reason was also the highest ranked preference for each corridor, with the exception of the Southeast Corridor, for which “Job Creation” was ranked highest.

The reasoning behind the selection of top individual segments was varied. PWG members prioritized segments for availability of land, economic weakness, job creation, and housing needs. This illustrates that while transit enablement and implementation should be a point of emphasis, specific segments with other challenges should be targeted in lockstep. In consideration of these outcomes, select strategies may be to:

- Pilot recommendations in a single corridor that possesses the following characteristics:
 - Includes segments of economic distress
 - Includes high job access potential
 - Has existing land availability and limited property ownership, creating opportunities to acquire a dedicated right-of-way
- Prioritize segments that are economically weak, and have high job creation potential, housing needs, and availability of land.
- In the near and immediate terms, foster collaboration among political subdivisions to establish a cohesive development and regulatory approach that allows for speed and certainty of development along the corridors.

Full results of the prioritization survey are included in the Implementation Report, which will be made available to all regional and local partners and stakeholders.

UrbanFootprint

UrbanFootprint is a cloud-based software platform built to give planners, designers, analysts, and advocates the tools they need to support robust planning at all scales, build and test development and policy options, and facilitate meaningful community engagement. Founded on 30 years of leadership in urban planning and design, UrbanFootprint allows communities and practitioners to map and evaluate existing conditions in minutes with access to hundreds of cleaned and curated datasets, compare and contrast the impacts of future land use and policy scenarios, and support transparent communication and community education with clear, easy-to-use reporting.

UrbanFootprint is used by a growing number of private sector urban planning and environmental analysis companies, as well as cities across the United States, non-profit organizations, and companies in the new mobility and real estate sectors. Many of the nation's top urban planning schools have begun to use UrbanFootprint as part of teaching and research activities.

Insight2050 Corridor Concepts supported the localization of UrbanFootprint for the Central Ohio region, yielding new travel and fiscal impact modeling capacities that were put to use in analyzing the study scenarios. Moving beyond the study, planners throughout the region will be able to benefit from locally grounded estimates of future household auto and transit travel, local infrastructure and emergency services costs, and local tax revenues associated with different forms of new development.

UrbanFootprint features provide access to comprehensive data, interactive scenario development, and advanced analytics.

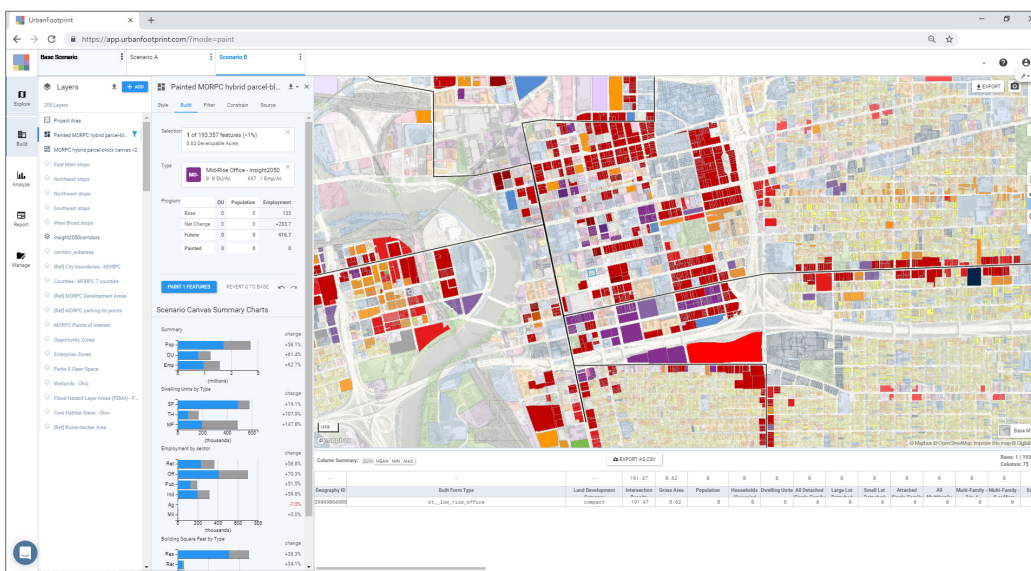
Streamlined Data

Easy access to comprehensive data supports informed, innovative, and sustainable planning. UrbanFootprint provides a core set of existing conditions data as well as a broader set of reference layers to uncover additional insights.

Base Canvas – UrbanFootprint's Base Canvas gives planners the data they need to evaluate existing conditions, including current land use at the block and parcel scales. The Base Canvas lays the foundation for alternative scenario development and reporting.

Reference Layers – UrbanFootprint comes pre-loaded with dozens of cleaned and curated data sets detailing key factors like transportation accessibility, opportunities and constraints, environmental features, socio-demographic conditions, economic context, public health quality, infrastructure impacts, land use patterns, and more. These expansive data sets are translated into clear, actionable insights with UrbanFootprint's scenario comparisons and reporting.

In its capacity as a regional resource for data, the Mid-Ohio Regional Planning Commission (MORPC) collaborates with communities throughout the region to provide current, accurate, and comprehensive information. Providing access to data via UrbanFootprint will expand



UrbanFootprint enables data access and exploration, scenario development, and analysis.

access and use, particularly for communities with limited technical capacity.

Interactive Scenarios

Scenario development tools allow users to readily sketch alternative growth plans, policies, or investments at multiple scales: site, corridor, district, city, or region. The costs and benefits of scenarios can be weighed to find the best possible solution and mitigate the risk of unintended consequences. Significantly reducing the time and cost associated with data curation for each individual scenario serves to improve the planning process.

Advanced Analytics

UrbanFootprint analyzes scenarios for a range of social, environmental, and fiscal metrics. As for the Corridor Concepts study, analysis reveals tradeoffs regarding climate change, travel behavior and mobility, fiscal impacts, and more. UrbanFootprint’s analysis modules include:

- Emissions
- Land Consumption
- Water Use
- Energy Use
- Transportation
- Household Costs
- Walk Accessibility
- Transit Accessibility
- Fiscal Impacts
- Conservation (*currently in California only*)
- Public Health (*pending data and model availability*)

Next Steps: UrbanFootprint in Central Ohio

UrbanFootprint can help to forward sustainable planning throughout the region. Future efforts can build on the analytical foundations of the Corridor Concepts study, making use of the expanded modeling capabilities and localized assumptions. With MORPC playing a role in coordination and support, the platform will be able to form a common basis for sharing data among local and regional agencies and jurisdictions.

UrbanFootprint supports planning with streamlined scenario development features and analysis modules.



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Appendix A: Additional Scenario Data

Table A-1. Focused Corridor Concept Summary by Corridor: Housing Growth, Job Growth, Developed Acreage, and Floor Area Ratio (FAR)

Corridor Area	Existing Homes	New Homes in Focused Corridor Concept	Total Homes in 2050	Existing Jobs	New Jobs in Focused Corridor Concept	Total Jobs in 2050	Existing Acreage	Redeveloped Acreage	Existing FAR ¹	New Growth FAR	Average FAR in 2050
DOWNTOWN	7,700	31,600	39,300	92,500	60,100	152,600	1,130	330	1.2	3.0	2.1
East Main	23,600	44,300	67,900	29,900	43,300	73,200	5,530	900	0.23	1.6	0.48
Northeast	25,700	70,600	96,300	61,500	79,300	140,800	9,710	2,120	0.16	1.2	0.41
Northwest	30,300	50,500	80,800	56,500	93,900	150,400	8,120	1,830	0.23	1.1	0.46
Southeast	11,800	23,200	35,000	18,600	47,900	66,500	6,360	1,990	0.11	0.7	0.33
West Broad	15,100	38,800	53,900	22,600	46,200	68,800	4,040	1,200	0.21	1.1	0.53
Corridor Area total	114,200	259,000	373,200	281,600	370,700	652,300	34,900	8,370	0.22	1.1	0.49

¹Floor area ratio (FAR) is the ratio of total building floor area to the area of the land that it occupies (i.e., the area of developed parcels).

Table A-2. Scenario Metrics

	Base Year (2018) ¹	Current Trajectory	Focused Corridor Concept							
	Regional Average	Regional Average	Regional Average	Corridor Area Average	Downtown	East Main	Northeast	Northwest	Southeast	West Broad
Walk & Transit Accessibility²	46,000	74,000	125,000	262,000	528,000	253,000	218,000	189,000	211,000	312,000
Transit Mode Share	0.6%	1.5%	3.2%	8.0%	43%	3.8%	3.9%	4.1%	4.0%	9.1%
Total Non-Auto Mode Share	16%	16%	20%	29%	51%	24%	23%	21%	23%	32%
Vehicle Miles Traveled per Household	17,500	16,800	14,200	8,500	6,200	9,100	9,000	8,800	9,200	7,800
Greenhouse Gas Emissions per Household	18.1 MT	17.1 MT	15.8 MT	11.9 MT	10.3 MT	12.5 MT	12.2 MT	11.9 MT	12.6 MT	11.6 MT
Infrastructure Costs per Acre³	N/A	\$249,000	\$378,000	\$440,000	\$690,000	\$460,000	\$499,000	\$466,000	\$331,000	\$364,000
Tax Revenues per Acre⁴	N/A	\$14,000	\$40,000	\$134,000	\$422,000	\$162,000	\$117,000	\$158,000	\$61,000	\$124,000
Household Costs	\$19,600 ⁵	\$18,600	\$15,900	\$10,100	\$7,700	\$10,700	\$10,500	\$10,300	\$10,800	\$9,400

¹ Base-year metrics are modeled for comparative purposes; outputs may differ from estimates produced by other means.

² Average number of jobs accessible by a household in the region.

³ Infrastructure costs are estimated for new development only.

⁴ Tax revenues are estimated for new development only.

⁵ Household costs for existing development assume same utility and fuel costs as future-year scenarios.

Appendix B: Technical Assumptions

Technical Assumptions

Transportation	
Fuel economy	On-road passenger vehicle average, including cars and light trucks: 23 mpg
Fuel price	\$6 per gallon (2018 dollars)
Auto operating cost	\$0.643 per mile (2018 dollars), including ownership and maintenance. AAA Your Driving Costs 2018 data, including depreciation, insurance, finance charges, maintenance, and tires.
Transportation fuel emissions	19.9 lbs carbon dioxide equivalent (CO ₂ e) per gallon, statewide average
Buildings	
Energy use	<p>Energy Information Administration (EIA) Residential Energy Consumption Survey 2009 average annual energy use per housing unit by type for East North Central Region.</p> <ul style="list-style-type: none"> • Larger lot single family: 11,980 kWh; 873 therms • Smaller lot single family: 10,400 kWh; 697 therms • Townhome: 8,035 kWh; 622 therms • Multifamily: 6,550 kWh; 543 therms. <p>Commercial energy use: baseline averages by sector estimated based on EIA Commercial Buildings Energy Consumption Survey data, 2012 (published 2016) and job sector/floorspace distribution among categories.</p> <ul style="list-style-type: none"> • Retail: 21.9 kWh/sf; 0.86 therms • Office: 18.2 kWh/sf; 0.43 therms • Warehouse: 10.9 kWh/sf; 0.30 therms • Civic/Institutional: 20.3 kWh/sf; 0.68 therms
Electricity price	\$0.16 per kWh, from EIA state average base.
Natural gas price	\$1.06 per therm, from EIA state average base.
Water use	Use estimated on per-capita indoor averages, and outdoor needs estimated based on irrigated area and reference evapotranspiration assumptions.
Water price	\$3,677 per AF (2018 dollars) from Ohio EPA 2016 Sewer + Water Rate survey for Columbus. Rates cover drinking water and wastewater.
Energy Emissions	
Electricity emissions	Estimated year-2018 carbon dioxide equivalent (CO ₂ e) output emission rate based on EIA eGRID 2016 data for Ohio: 1,475 lbs/MWh.
Natural gas emissions	Static rate based on carbon content: 11.7 lbs/therm.

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Appendix C: Working Group Members

Steering Committee

Mike Bradley	COTA
Jennifer Gallagher	City of Columbus
Shannon Hardin	Columbus City Council
Patty Huddle	Columbus Partnership
William Murdock	MORPC
Vince Papsidero	City of Dublin
Steve Schoeny	City of Columbus
Kimberly Sharp	City of Westerville
Yaromir Steiner	ULI Columbus

Project Working Group

Robert Bitzenhofer	Columbus Metropolitan Housing Authority
Stacey Boumis	Village of Obetz
Pat Bowman	City of Grandview Heights
Mike Bradley	COTA
Brandi Braun	City of Columbus
Steve Farst	City of Groveport
Jennifer Gallagher	City of Columbus
Bobbie Garber	Affordable Housing Alliance of Central Ohio
Chad Gibson	City of Upper Arlington
Tom Goodney	Educational Service Center of Central Ohio
Shannon Hardin	City of Columbus
Patty Huddle	Columbus Partnership
Ben Kessler	City of Bexley
Jung Kim	Columbus 2020
Tim Moloney	MetroParks
William Murdock	MORPC
Vince Papsidero	City of Dublin
Don Plank	ULI Columbus, Plank Law Firm
Erin Prosser	Ohio State University
Jason Reece	Ohio State University
Cornell Robertson	Franklin County Engineer's Office
Joe Ryan	City of Whitehall
Bill Sampson	City of Reynoldsburg
Jim Schimmer	Franklin County Economic Development & Planning
Kimberly Sharp	City of Westerville
Yaromir Steiner	ULI Columbus
Greg Stype	ULI Columbus, Barnes & Thornburg
Alex Trevino	Columbus City Schools
Aaron Underhill	ULI Columbus, Underhill & Hodge
Robert Vogt	Vogt Strategic Insights
Mark Wagenbrenner	ULI Columbus, Wagenbrenner Development
Kevin Wheeler	City of Columbus

Corridor Working Groups

Jonathan Alexander	Nationwide Children's, Near East Area Commission	Bob Leighty	Parsons Ave Merchants Association
Jen Alford	City of Westerville	Christopher Lohr	City of Columbus
Jason Bechtold	City of Westerville	Carolyn Markling	Columbus Regional Airport Authority-LCK
Ted Beidler	Franklin County Engineer	Jay McCallister	Greater Hilltop Area Commission
Alex Beim	City of Columbus	Mike McCann	COTA
Stacey Boumis	Village of Obetz	Jacquelin Mile	Franklinton Area Commission
Patrik Bowman	City of Grandview	Andrew Neutzling	COTA
Jennifer Chamberlain	Far East Area Commission	Tammy Noble	City of Dublin
Joy Chivers	Gladden	Jennifer Noll	MORPC
Nick Cipiti	Northwest Civic Assoc.	Beth Paul	Capital University
Erin Crilly	Unispace	Devayani Puranik	City of Dublin
Bob Dowler	Groveport Rickenbacker Employee Access Transit	Kate Reagan	Otterbein University
Kristin Easterday	Columbus Regional Airport Authority	Chris Reed	Reynoldsburg City Schools
Pauline Edwards	Resident (45 years)	Kerry Reeds	Neighborhood Design Center
Steve Farst	City of Groveport	Al Rodack	Ohio Dominican
Terri Flora	MORPC	Joe Ryan	City of Whitehall
Franz Geiger	Polaris Centers of Commerce/ NP Limited	Alex Sauersmith	City of Columbus
Chad Gibson	City of Upper Arlington	Maria Schaper	MORPC
Nick Gill	MORPC	Kim Sharp	City of Westerville
Jeff Green	City of Groveport	Trent Smith	Franklinton Board of Trade
Ashley Hofmaster	Fifth by Northwest Commission, Franklinton Urban Empowerment Lab (FUEL)	Jim Sweeney	Sweeney & Associates
Will Huffman	Friends of the Hilltop	Herb Talabere	E. Main St. Special Improvement District
Betty Jaynes	Westgate Neighbors Association	Vincent Valentino	Land Grant Brewing Co.
Jason Koma	Mount Carmel	Christie Ward	Village of Lockbourne
		Lori Wilson	Hayden Run Civic Association
		Jackie Yeoman	City of Columbus

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