CINCINNATI STREETCAR
FEASIBILITY STUDY

Cincinnati Streetcar Uptown Connector

Feasible Alternatives Study

November 2009

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INTRODUCTION

Cincinnati is one of a number of cities pursuing the construction of a modern streetcar system to enhance mobility and connectivity as well as to catalyze development and redevelopment. The modern streetcar is intended to connect existing and future destinations, promoting "walkable urbanism" and creating a more livable environment. The City of Cincinnati completed an initial feasibility study in July 2007 that illustrated conceptual streetcar routes, and is now conducting more detailed analyses regarding specific alignment options.

The initial focus area for modern streetcar in Cincinnati is Downtown and Over-the-Rhine, with a connection to the Uptown area. Downtown is the city's Central Business District (CBD), and serves as the business and government center of the region. In addition, Downtown is home to numerous hotels, restaurants, arts venues, and sports facilities. Just north of the Central Business District, the historic neighborhood of Over-the-Rhine is home to an emerging arts district, the historic Brewery District and the venerable Findlay Market. Although the neighborhood has struggled in recent years, its proximity to both the CBD and Uptown makes it primed for redevelopment. Indeed, some redevelopment has already begun to take place, and the streetcar can provide the additional spark needed to generate additional investment.

Cincinnatians gather at Over-the-Rhine's Findlay Market

"Uptown", which takes its name from its location at the top of steep hill separating the district from Downtown, is home to many of the city's medical centers, the University of Cincinnati, the Cincinnati Zoo, and the surrounding vibrant, mixed-use neighborhoods. In fact, four of Cincinnati's six largest employers are located in Uptown. Recognizing the significant concentration of population and employment in Uptown, the City of Cincinnati amended the initial modern streetcar alignment to include a connection to Uptown.

The initial feasibility study illustrated several potential Uptown connections, but did not evaluate the merits of specific routing options. Thus, the focus of this assessment is on the technical evaluation of alternative routes connecting Downtown and Uptown. Several alternative routes are available for consideration, and must be assessed with regard to numerous planning and design-related issues. This report describes the various alignment options that are available, the evaluation methodology and specific technical and economic criteria for comparing the options, and the resulting analysis. The next step in this process will be to thoroughly review the options through a public process and reach consensus on the priorities to be used to arrive at an ultimate recommendation. Additionally, this report will serve as a framework for further examination as part of the federally-required Alternatives Analysis (AA) and Environmental Assessment (EA) studies.

UPTOWN CONNECTOR OPTIONS

HISTORICAL ROUTES

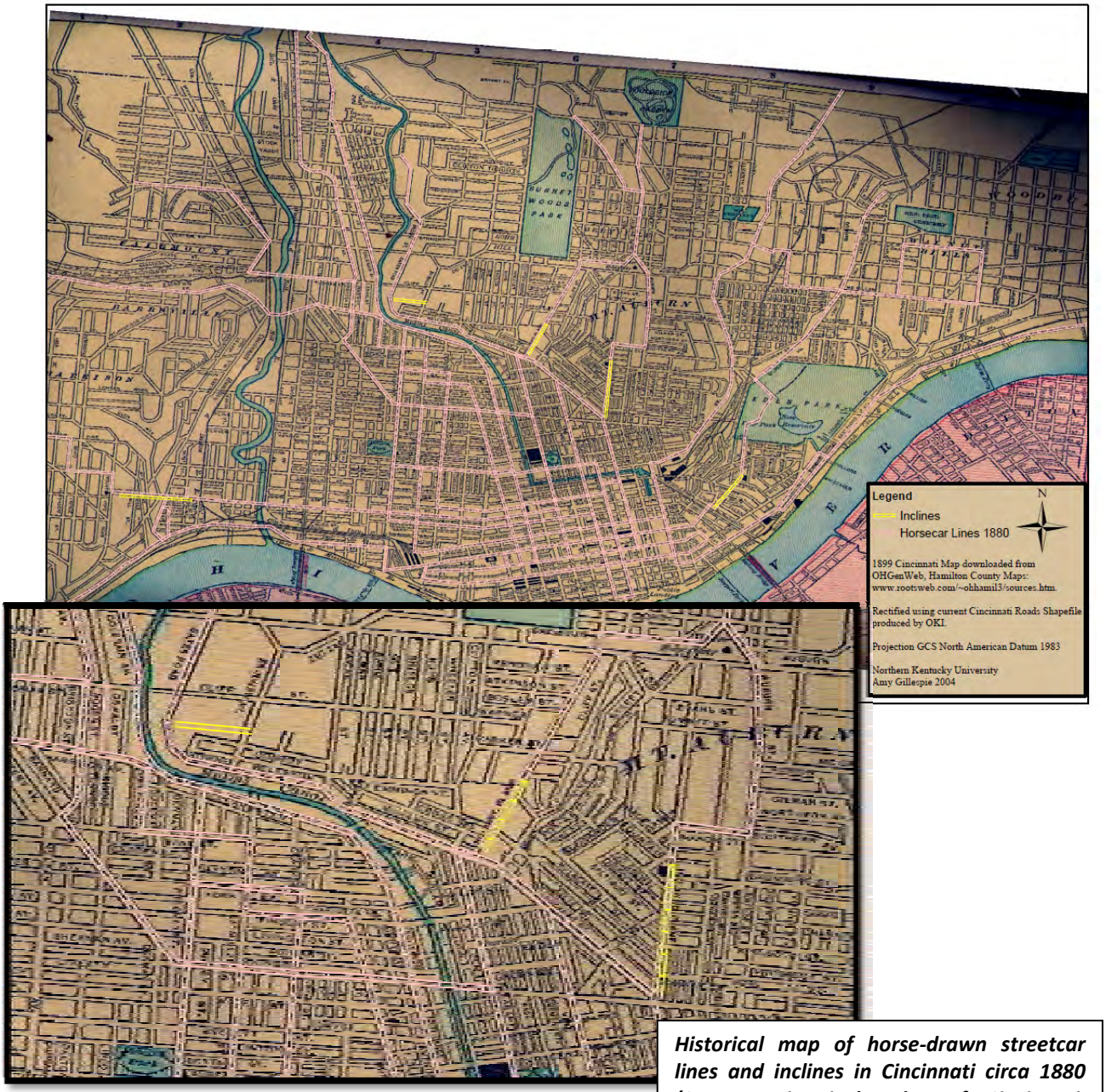
Streetcars played a major role in the growth of Cincinnati beginning 150 years ago, allowing the expansion of Cincinnati beyond the basin that defines present-day Downtown, Over-the-Rhine, and surrounding neighborhoods. Horse-drawn streetcars began serving the downtown area in 1859, but rapid population growth led to the construction of several inclined railways to enable expansion beyond the basin. Five inclines were ultimately constructed between 1872 and 1892, and three of these – Mt. Auburn, Bellevue, and Fairview - were built in the 1870's to connect the basin to the neighborhoods that today comprise "Uptown". Upon reaching the inclines, streetcars in the basin would disengage from the track, be driven onto the incline platform, ride the incline up the hill, and at the top of the hill, would reengage to continuations of the lines extending into the new suburbs. At first, horse-drawn streetcars used this technique; later, electric streetcars would follow the same protocol.

The Bellevue incline transports an electric streetcar up the hill, passing over streetcar track on Clifton Avenue. (Source: Historical Atlas of Cincinnati; http://www.nku.edu/~hisgeo/AtlasProject /index.htm)

The accompanying map and inset illustrates the horse-drawn streetcar lines (shown in rose color) and inclines (shown in yellow) that served Cincinnati in 1880. With regard to present-day Uptown, the following connections were available:

- The Bellevue incline connected Elm Street (downtown) to present-day Ohio Ave. (uptown). The route then continued to the zoo.
- The Mount Auburn incline linked Main Street (downtown) to what is now Jackson Hill Park on Eleanor Place.
- The Fairview incline connected what is now McMicken Avenue in the basin to Fairview Avenue.

Cable cars represented a vast improvement over horse-drawn cars on some routes, particularly those with steep grades. A continuously-running cable ran in a narrow slot in the street. A "gripper" from the streetcar would extend under the car into the slot and latch on to the moving cable to propel the car forward. The gripper would then release from the cable to slow down and stop. This is the same method of propulsion that is still used today by San Francisco's famous cable cars. In Cincinnati, three cable car routes were opened between 1885 and 1887, including lines on Vine Street and Sycamore Street.



Historical map of horse-drawn streetcar lines and inclines in Cincinnati circa 1880 (Source: Historical Atlas of Cincinnati; http://www.nku.edu/~hisgeo/AtlasProject/index.htm)

Around the turn of the century, cable cars and horse-drawn streetcars quickly became obsolete due to the emergence of electricity as a viable power source for transportation. Electric streetcars were extended to new areas previously beyond the reach of horse-drawn cars, and development quickly followed. The streetcar network grew to include 222 miles of track in Cincinnati and Northern Kentucky, and for decades consistently transported more than 100 million passengers per year.

Between the areas now known as Downtown and Uptown, a large number of streetcar connections were in place over the years:

- Vine Street (originally cable car; then converted to electric streetcar);
- Clifton Avenue (electric streetcar);
- Bellevue incline, connecting to streetcar routes on Elm Street and Ohio Avenue;
- Mount Auburn incline, connecting to streetcar routes on Main Street and Eleanor Avenue;
- Mount Auburn cable car, running on Sycamore Street to Dorchester and Highland;
- Highland Avenue (electric streetcar, connecting to Liberty Street downtown);
- McMillan Avenue (electric streetcar);
- Fairview Avenue incline; and
- Reading Road (electric streetcar).

The bold lines on the map at right illustrate the various streetcar, incline, and cable car connections between Downtown and Uptown throughout Cincinnati's street railway history.

Map illustrating former streetcar, cable car, and incline routes. (Source: http://homepage.mac.com/jjakucyk/Transit1/map.html)

The popularity of streetcars began to wane with the rising popularity of the automobile, and the focus of transit shifted to buses and trolley buses. The last streetcar route in Cincinnati was discontinued in 1951.

This overview is intended to illustrate the extent of former streetcar operations in Cincinnati and the significant impact that streetcars had on the city's development. The fact that streetcars formerly operated on specific streets should not by itself be interpreted to indicate that modern streetcars can also effectively and efficiently operate on the same streets. Modern streetcars are subject to rigid technological constraints to ensure that not only can they operate, but they can operate in a safe, reliable, and efficient manner.

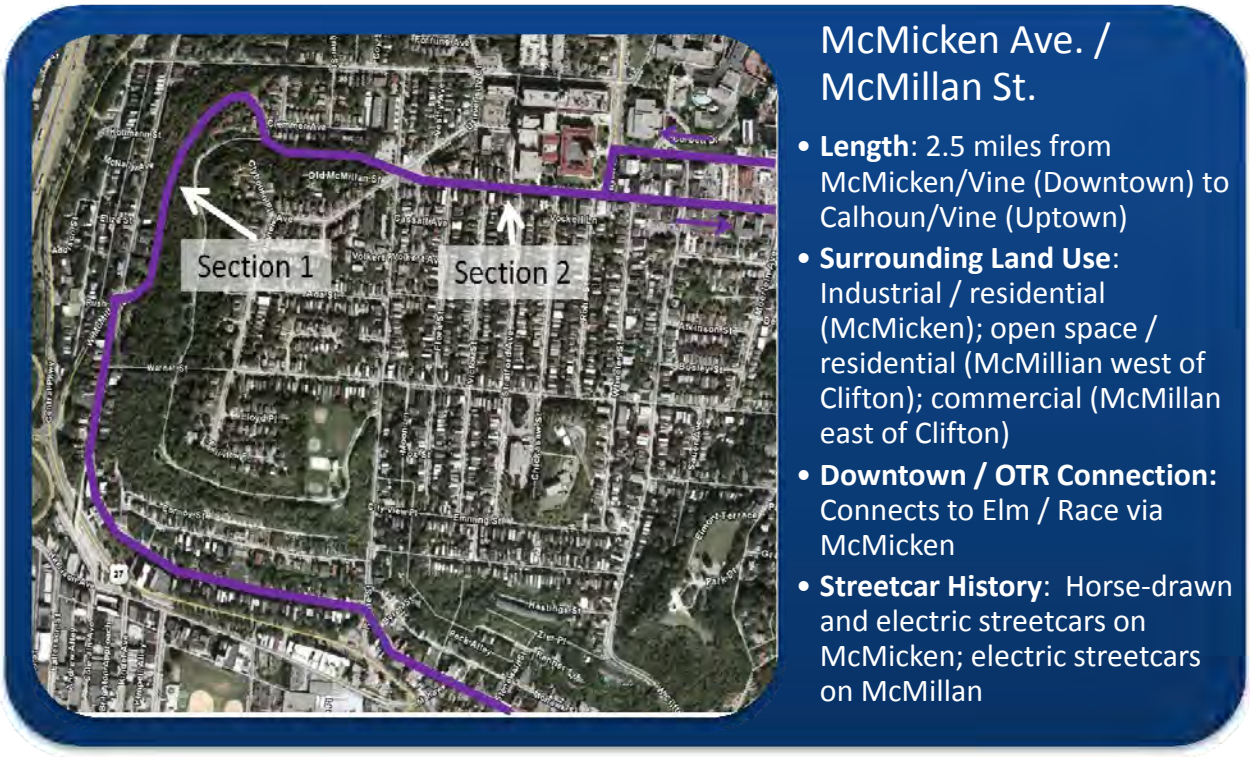
ALIGNMENTS CONSIDERED FOR MODERN STREETCAR

The historical streetcar routes provide some perspective for the consideration of potential alignments between Downtown and Uptown, and variations on several of these historic routes merit strong consideration for use by the modern streetcar. In general terms, the goal of this study is to identify the "best" option for connecting the Central Business District and Over-the-Rhine ("OTR") to Clifton Heights, Corryville, the University of Cincinnati (UC) campus, the hospital superblock, and other Uptown neighborhoods and destinations. To fully consider all potential routing options, a broad area was defined for evaluation, including all existing thoroughfares between Central Parkway and I-71. For this

analysis, it is assumed that only existing streets could be used by modern streetcar; no consideration is given to other modes such as inclines or cable cars.

Without regard to specific evaluation criteria other than the geographic constraints noted above, eight alternative routes were identified as shown below.

Each of these potential routes would terminate at a “transit hub” in the vicinity of the existing University Plaza shopping center, where connections could be made to future streetcar extensions circulating through Uptown. A brief overview description of each of the candidate alignments is provided on the following pages.



McMicken Ave. / McMillan St.

- **Length**: 2.5 miles from McMicken/Vine (Downtown) to Calhoun/Vine (Uptown)
- **Surrounding Land Use**: Industrial / residential (McMicken); open space / residential (McMillian west of Clifton); commercial (McMillan east of Clifton)
- **Downtown / OTR Connection:** Connects to Elm / Race via McMicken
- **Streetcar History**: Horse-drawn and electric streetcars on McMicken; electric streetcars on McMillan

Section 1

- Four travel lanes; generally 40' cross-section
- No on-street parking
- Approx. 1500' of 6.6 - 6.7% grade

Section 2

- Four travel lanes; generally 40' cross-section
- On-street parking in curb lane
- Relatively flat

McMicken Ave. / Ravine St.

- **Length**: 1.9 miles from McMicken/Vine (Downtown) to Calhoun/Vine (Uptown)
- **Surrounding Land Use**: Industrial / residential (McMicken); residential / park land (Ravine); residential / commercial (McMillan)
- **Downtown / OTR Connection:** Connects to Elm / Race via McMicken
- **Streetcar History**: Horse-drawn and electric streetcars on McMicken; no streetcars on Ravine; electric streetcars on McMillan

Section 1

- Two travel lanes; on-street parking allowed on both sides
- Approx. 1300' of 10-12% grade

Section 2

- Two travel lanes; on-street parking allowed on one side only
- 3-9% grade

West Clifton Ave.

- **Length**: 1.3 miles from McMicken/Vine (Downtown) to Calhoun/Vine (Uptown)
- **Surrounding Land Use**: Residential / open space (W. Clifton); commercial (McMillan)
- **Downtown / OTR Connection:** Connects to Elm / Race via Findlay St. near Findlay Market
- **Streetcar History**: Electric streetcars on W. Clifton; electric streetcars on McMillan

Section 1

- Two travel lanes; on-street parking allowed on both sides
- Generally 40' cross-section
- Approx. 1200' of 8-9% grade

Section 2

- Two travel lanes; on-street parking allowed on both sides
- Generally 40' cross-section
- 6-8% grade

West Clifton Ave. / Vine St. Loop

- **Length**: 1.3 miles from McMicken/Vine (Downtown) to Calhoun/Vine (Uptown) via West Clifton; 0.9 miles via Vine
- **Surrounding Land Use**: Residential / open space (W. Clifton); commercial (McMillan); residential / open space (Vine)
- **Downtown / OTR Connection:** Connects to Elm / Race via Findlay St. near Findlay Market
- **Streetcar History**: Electric streetcars on W. Clifton, McMillian, and Vine (cable cars previously operated on Vine)

Section 1

- Two travel lanes; on-street parking allowed on both sides
- Generally 40' cross-section
- Approx. 1200' of 8-9% grade

Section 2

- Four travel lanes; 36' cross-section
- On-street parking allowed in curb lane (except during peak periods)
- Continuous 6.5-7% grade

Vine St.

- **Length**: 0.9 miles from McMicken/Vine (Downtown) to Calhoun/Vine (Uptown)
- **Surrounding Land Use**: Residential / open space
- **Downtown / OTR Connection:** Connects to Elm / Race via Findlay St. near Findlay Market
- **Streetcar History**: Cable cars originally operated on Vine Street; the line was later electrified

Section 1

- Four travel lanes; 36' cross-section
- On-street parking allowed in curb lane (except during peak periods)
- Continuous 6.5-7% grade

Section 2

- Four travel lanes; 36' cross-section
- On-street parking allowed in curb lane (except during peak periods)
- Continuous 6.5-7% grade

Sycamore St. / Auburn Ave.

- **Length**: 1.2 miles from Sycamore/Liberty (Downtown) to Calhoun/Vine (Uptown)
- **Surrounding Land Use**: Residential / open space (Sycamore); office / institutional (Auburn)
- **Downtown / OTR Connection:** Connects to Main/Walnut via Liberty St.
- **Streetcar History**: Cable cars operated on Sycamore Street; horse-drawn and electric streetcars operated on Auburn Avenue

Section 1

- Two travel lanes; on-street parking allowed on both sides
- Approx. 2400' of 9-11% grade

Section 2

- Two to four travel lanes (varies)
- Intermittent on-street parking (except during peak periods)
- 0-5% grade

Highland/Dorchester/ Auburn Ave.

- **Length**: 1.8 miles from Sycamore/Liberty (Downtown) to Calhoun/Vine (Uptown)
- **Surrounding Land Use**: Residential / open space (Highland and Dorchester); office / institutional (Auburn)
- **Downtown / OTR Connection:** Connects to Main/Walnut via Liberty St.
- **Streetcar History**: Electric streetcars operated on Liberty and Highland; cable cars operated on Dorchester Ave.; horse-drawn and electric streetcars operated on Auburn

Section 1

- Two travel lanes; on-street parking allowed on both sides
- Approx. 500' of 9.6% grade; additional 1000' of 8+% grade

Section 2

- Two travel lanes; on-street parking allowed on one side of street only
- Approx. 5.5% grade

Reading Rd./McGregor Ave./Auburn Ave.

- **Length**: 1.6 miles from Reading/Liberty (Downtown) to Calhoun/Vine (Uptown)
- **Surrounding Land Use**: Industrial / commercial (Reading); residential (McGregor); office (Auburn)
- **Downtown / OTR Connection:** Connects to Main/Walnut via Central Parkway
- **Streetcar History**: Horse-drawn and electric streetcars operated on Reading Road and Auburn Ave.; no streetcars operated on McGregor Ave.

Section 1

- Six travel lanes; on-street parking allowed in curb lane in places
- Reading Road splits near I-71
- Relatively flat

Section 2

- Two travel lanes; on-street parking allowed on both sides
- Approx. 1000' of 9.0-9.5% grade

EVALUATION METHODOLOGY

The eight alignment options were examined using a two-tiered evaluation process:

- **Tier 1** is a "fatal flaw" analysis that identifies options that are not technically feasible due to design constraints.
- **Tier 2** is a comparison of the attributes of each option in reference to specific planning and design criteria; in this case, the goals and objectives from the earlier *Feasibility Study* served as the evaluation criteria.

TIER 1 ("FATAL FLAW") EVALUATION METHODOLOGY

The Tier 1 ("fatal flaw") analysis was based on engineering constraints as defined by roadway grade. Modern streetcars are generally limited to a maximum grade of 9%. For this reason, alignment options with grades exceeding 9% are eliminated from further consideration where the grade cannot be reduced without major roadway profile retrofits that would heavily impact adjacent properties. An important caveat is that the specified maximum grade criterion is based on information provided by United Streetcar, LLC, who is currently the only manufacturer of modern streetcars in the United States. This vehicle technology is based on the design originated by the European manufacturer SKODA, who built the modern streetcars currently operating in Portland, Seattle, and Tacoma. The maximum grade criterion is based on a general guideline, and the actual maximum grade varies depending on local conditions such as length of grade, climatic conditions, vehicle loading, and other factors.

For purposes of this fatal flaw analysis, routes with grades exceeding 9% were eliminated from further consideration.

As part of this comparison of options, it is premature to request detailed analyses from streetcar manufacturers to fully verify the ability of their vehicle to negotiate each candidate alignment. However, at the conclusion of this evaluation process, a formal *Request for Information* should be issued to prospective streetcar manufacturers to obtain duty cycle simulations, thermal simulations, and other information to confirm the capability of their vehicle(s) to navigate the locally-preferred alignment based on the specific characteristics of the alignment and conditions specific to Cincinnati.

For purposes of this fatal flaw analysis, routes with grades exceeding 9% were eliminated from further consideration. However, **this criterion should not be interpreted as confirmation that all routes with grades less than 9% are automatically viable**. Several alignment options have grades that are just under 9%. While these options are considered "technically feasible" for the purposes of this analysis, the detailed analyses that would be conducted later by prospective vehicle manufacturers as part of a formal *Request for Information* may indicate that the preferred alignment is in fact too steep for modern streetcar operations.

TIER 2 EVALUATION METHODOLOGY

Candidate alignments with grades that do not exceed nine percent were then evaluated in relation to the specific goals and objectives that were established in the *Cincinnati Streetcar Feasibility Study*, published in July 2007. By using the same criteria, consistency is maintained between the guiding principles used to select the Downtown / Over-the-Rhine alignment and those used to identify the preferred Uptown Connector route. The specific data sources examined with regard to each goal and objective are summarized in the following table.

Adopted Goals from *Cincinnati Streetcar Feasibility Study*	Data Examined for Assessment
1. Improve mobility and connectivity within downtown Cincinnati	
• Provide convenient access and local circulation for major employment, commercial, recreational, and cultural activity centers	• Number / size of major activity centers on / within close proximity to route
• Provide better connectivity between neighborhoods and activity centers	• Penetration into residential neighborhoods (population density)
• Provide an attractive means of transportation for residents, workers, customers, and visitors	• "Cleanliness" of connection to downtown alignment and potential maintenance facility locations • Ability to accommodate future extensions • Ability to create a rational operating plan
• Improve access and opportunities for transit-dependent populations	• Service to transit-dependent populations
2. Support existing and proposed development in downtown and surrounding neighborhoods in the City of Cincinnati, creating a more livable and more walk-able environment	
• Consider transit investment that supports the existing and planned built environment and which minimizes adverse impacts	• Consistency with proposed development projects • Assessment of overall consistency with current built environment
• Consider transit investment to help shape urban form through reinvestment along selected corridors and neighborhoods	• Assessment of physical characteristics of corridors that impact the ability of streetcar to shape urban form
• Encourage neighborhood revitalization and livable and walk-able communities through development of good streetscapes and pedestrian environment	• Consistency with neighborhood plans
• Link key destinations in the corridor	• Number / size of major activity centers on / within close proximity to route
• Capture the economic benefit resulting from improved transit service and mobility in these areas	• Assessment of economic development potential for each option

Adopted Goals from *Cincinnati Streetcar Feasibility Study*	Data Examined for Assessment
• Maximize energy efficiency of the transit operation and minimize negative impacts on historic, archaeological, traditional cultural places, parklands, and other public recreation areas	• Identification of any potential negative impacts on historic, archaeological, traditional cultural places, parklands, and other public recreation areas
3. **Maximize the efficiency and effectiveness of the local and regional transit system**	
• Attract new riders to the local and regional transit system by providing a convenient, frequent, reliable, and attractive streetcar transit service	• Comparison of travel time between Uptown and Downtown / Over-the-Rhine for various alternatives • Potential ridership changes considering positive impacts from new markets served as well as potential negative impacts from higher travel times.
• Integrate the planned streetcar line or lines with the overall transportation system, complementing and ensuring compatibility with the existing and planned street and roadway network and transit system	• Design considerations including maximum grade, lane widths, on-street parking impacts, restrictive turns, high-traffic areas, potential utilities conflicts • Other engineering challenges that affect cost
• Provide convenient access to the transit system using various modes and means of travel (e.g. pedestrian, bicycle, bus, automobile)	• Level of duplication with existing bus service
• Develop safe, comfortable, and convenient transit facilities, including stations and stops	• Ability to incorporate stops in available right-of-way
• Provide viable mobility options to discourage increased single occupancy vehicle use in the CBD and already congested roadway network	• Comparison of travel time between Uptown and Downtown / Over-the-Rhine for various alternatives • Potential ridership changes considering positive impacts from new markets served as well as potential negative impacts from higher travel times.
• Complement previous planning studies and planned multimodal operations	• Subjective assessment of how each option supports previous planning efforts
• Identify suitable sites for a streetcar maintenance facility	• Subjective assessment of potential additional maintenance facility sites adjacent to alignment options
4. Provide a transit investment that is affordable, in terms of capital and operating expenses, and is implemented on a fast track	
• Select and implement the most effective streetcar starter line that is affordable and manageable while yielding significant transportation and development benefits	• Relative capital costs of options • Benefits of options as discussed with reference to Goals 1, 2, and 3

Adopted Goals from *Cincinnati Streetcar Feasibility Study*	Data Examined for Assessment
• Minimize capital costs (e.g. not design elaborate stations and systems, generally street running operation, no grade separations, no park and ride lots)	• Relative capital costs of options
• Develop sustainable systems which maximize revenues and minimize net operating and maintenance costs	• Relative operating costs of options
• Fast track the planning and design period	• Subjective assessment of unique planning or design challenges that may impact the project implementation schedule
• Leverage other public and private funding whenever possible	• Relationship of routes to TIF areas
• Maximize public-private partnership opportunities	• Relationship of routes to potential private funding partners

PROCESS TO IDENTIFY A PREFERRED ALIGNMENT

The options advanced to Tier 2 analysis were examined with reference to each specific goal and objective. These assessments were conducted using the supporting data noted in the table above, and the results and summary descriptions are presented on the following pages.

Based on these assessments, a grade was assigned to each alternative for each goal, using the following rating scale:

- A = Significantly exceeds goal
- B = Exceeds goal
- C = Meets goal
- D = Does not meet goal
- F = Detrimental to goal

This rating scale serves two purposes - first, an absolute grade provides an overall assessment of how each option addresses the specific goals and objectives defined by the City and its stakeholders; second, by comparing the grades for each option, aspects in which there are major and minor differences among the alternatives are clearly illustrated. For example, under one criterion, all options may have a rating of "A" or "B", indicating little difference among them. Under another performance measure, one option may receive an "A" rating, and others may be uniformly split between "C", "D", and "F" grades. In this case, one option is clearly superior.

No attempt has been made to apply any weighting to the various goals and objectives; thus, no composite "score" has been calculated to produce a final ranking of alternatives. As the options are considered, the relative level of emphasis placed on specific goals will play a major role in helping to select a preferred alignment. For example, if one goal receives heavy emphasis, one alignment option

may be deemed to be the best; if another goal is stressed, a different alternative may emerge. Ultimately, it is the responsibility of the City, in partnership with its stakeholders and the public at large, to identify the relative importance of each goal and use the information provided herein to select a preferred alignment. Additionally, as a requirement for federal Small Starts funding, these options must be further considered in a formal Alternatives Analysis study. To aid in this decision-making, this report presents a series of summary tables with compilations of the various ratings for each option, as well as the key advantages and disadvantages of each alignment.

ANALYSIS AND RESULTS

This section describes the evaluation of each alignment option using the two-tiered process described above.

TIER 1 ("FATAL FLAW") ANALYSIS

An initial examination was conducted on all eight candidate alignments to identify grades in comparison to the maximum of 9%. Grades were calculated by comparing the ground elevations at intersections along the alignment. Because the grades were calculated over distances of several hundred feet, there may be short segments within each alignment with a slightly different grade than those shown here. The following alternatives had grades in excess of 9%, and thus were eliminated from further analysis:

- McMicken Ave. / Ravine St. (up to 11.9% grade);
- Sycamore St. / Auburn Ave. (up to 10.6% grade);
- Highland Ave. / Dorchester Ave. / Auburn Ave. (up to 9.6% grade);
- Reading Rd. / McGregor Ave. / Auburn Ave. (up to 9.4% grade).

For each of these options, the grades exceeding 9% are sustained over a distance of approximately 500' or greater.

In addition, several other alternatives have grades that approach the maximum of 9%, and **should be treated with caution** as the planning process continues. If one of these options is ultimately selected as the preferred alignment, final verification of its viability can only be achieved after one or more prospective vehicle manufacturers confirm that their vehicle can negotiate the subject alignment. The alternatives that should be treated with particular prudence include the following:

- West Clifton Ave. (up to 8.9% grade); and
- West Clifton Ave. / Vine St. Loop (up to 8.9% grade).

The table on the following page illustrates the calculated grades for various segments of each option.

Alignment Option	Intersection	Elevation (ft)	Change in Elevation (ft)	Distance (ft)	Grade
McMicken Ave. / McMillian St.	McMicken/Ravine	571			
	McMicken/McMillan	613	42	3120	1.3%
	McMillan/Clemmer	730	117	1780	6.6%
	McMillan/Ravine	796	66	980	6.7%
	McMillan/W Clifton	863	67	1770	3.8%
	University Plaza Shopping Center	843	-20	2800	-0.7%
McMicken Ave. / Ravine St.	McMicken/Ravine	571			
	Ravine/Warner	730	159	1340	**11.9%**
	McMillan/Ravine	796	66	1170	5.6%
	McMillan/W Clifton	863	67	1770	3.8%
	University Plaza Shopping Center	843	-20	2800	-0.7%
West Clifton Ave. (also applies to West Clifton / Vine St. Loop)	Findlay/McMicken	547			
	Vine/W Clifton	574	27	600	4.5%
	W Clifton/Ohio	602	28	373	7.5%
	W Clifton/East end of residential parking lot	656	54	613	8.8%
	W Clifton/Zier	683	27	304	8.9%
	W Clifton/Hastings	705	22	270	8.1%
	W Clifton/Emming	740	35	478	7.3%
	W Clifton/Warner	782	42	752	5.6%
	McMillan/W Clifton	863	81	1130	7.2%
	University Plaza Shopping Center	843	-20	2800	-0.7%
Vine St.	Findlay/McMicken	547			
	Vine/W Clifton	574	27	600	4.5%
	Vine/St Joe	654	80	1230	6.5%
	Vine/Thill	718	64	910	7.0%
	Vine/E Hollister	794	76	1130	6.7%
	University Plaza Shopping Center	843	49	1170	4.2%
Sycamore St. / Auburn Ave.	E Liberty/Sycamore	563			
	Sycamore/Mulberry	654	91	920	**9.9%**
	Sycamore/Excelsior	747	93	880	**10.6%**
	Dorchester/Auburn	803	56	570	**9.8%**
	Auburn/McGregor	877	74	1900	3.9%
	University Plaza Shopping Center	843	-34	2070	-1.6%
Highland Ave. / Dorchester Ave. / Auburn Ave.	E Liberty/Sycamore	563			
	Liberty Hill/Cumber St	606	43	857	5.0%
	Liberty Hill/Decker Alley	651	45	532	8.5%
	Liberty Hill/Highland	699	48	500	**9.6%**
	Highland/Boal	738	39	466	8.4%
	Highland/Ringgold	754	16	518	3.1%
	Highland/Dorchester	729	-25	1014	-2.5%
	Dorchester/Auburn	803	74	1380	5.4%
	Auburn/McGregor	876	73	1900	3.8%
	University Plaza Shopping Center	843	-33	2070	-1.6%
Reading Rd. / McGregor Ave. / Auburn Ave.	E Liberty/Reading	602			
	Reading/Dorchester	640	38	2750	1.4%
	Reading/McGregor	712	72	1720	4.2%
	McGregor/Highland	752	40	610	6.6%
	McGregor/Maplewood	772	20	286	7.0%
	McGregor/Auburncrest	833	61	681	9.0%
	Auburn/McGregor	876	43	458	**9.4%**
	University Plaza Shopping Center	843	-33	2070	-1.6%

TIER 2 ANALYSIS

At the conclusion of the Tier 1 examination, four options met the criteria for further analysis:

- McMicken Ave. / McMillan St.
- West Clifton Ave.
- West Clifton Ave. / Vine St. Loop
- Vine St.

The characteristics of these options were then studied with regard to the stated goals and objectives.

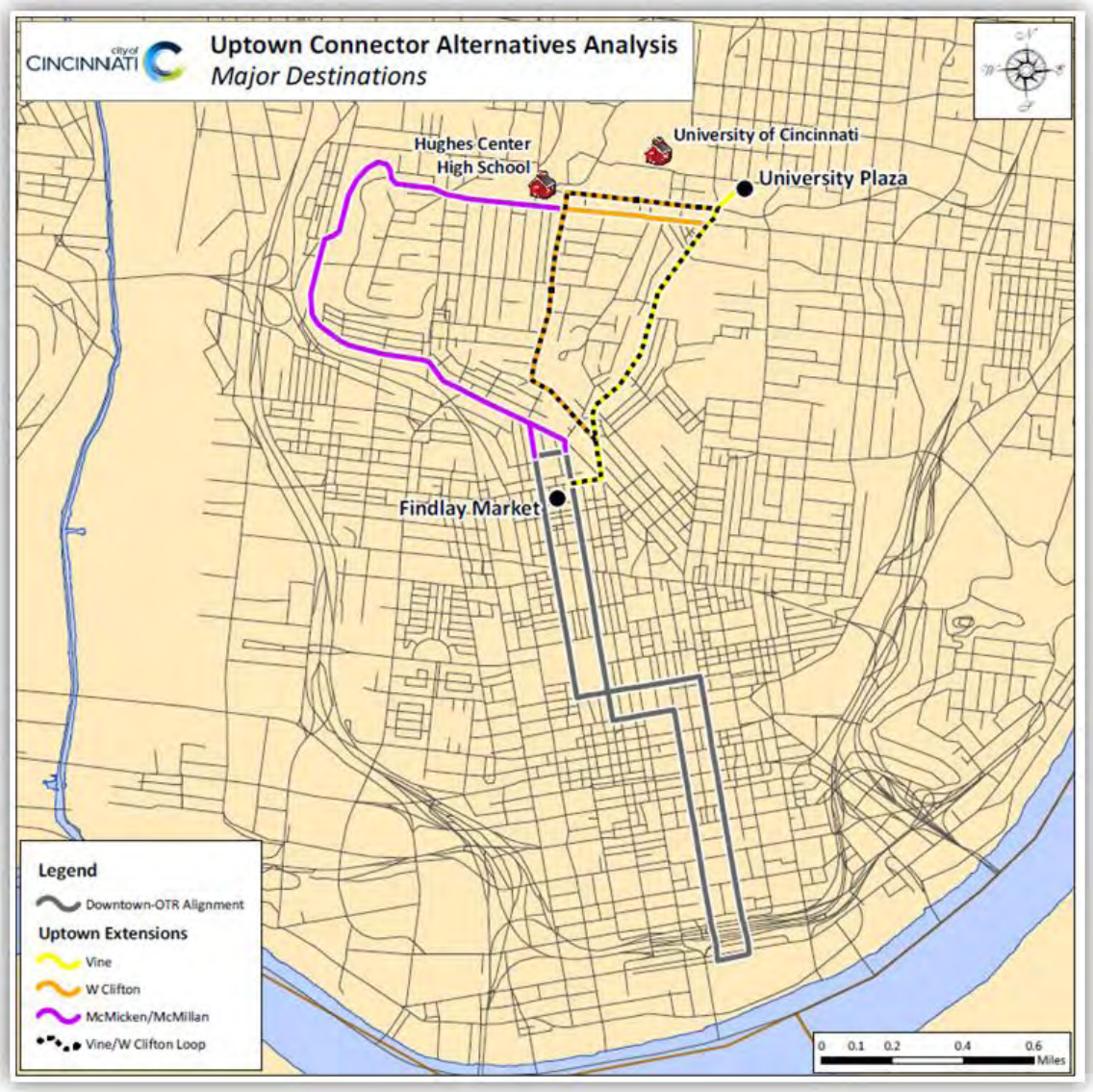
Goal #1: Improve mobility and connectivity within downtown (and uptown) Cincinnati

In general, the West Clifton Ave. and McMicken Ave. / McMillan St. options offer enhanced mobility to a greater number of local residents and employees than the alternatives using Vine Street. Additionally, these two options provide better connections between residential areas, business districts, and other activity centers in Uptown. Key attributes of each option are summarized below:

Alignment Option	*Analysis*
McMicken Ave. / McMillan St.	• Along with West Clifton Ave., serves the most Uptown residents (including transit-dependent residents). • Provides good access to UC campus and Clifton Heights business district.
West Clifton Ave.	• Along with McMicken Ave./McMillan St., serves the most Uptown residents (including transit-dependent residents). • Provides good access to UC campus and Clifton Heights business district. • Most efficient operationally.
West Clifton Ave. / Vine St. Loop	• Serves a large number of residents, but level of access is limited due to loop route structure. • Loop structure becomes even more problematic operationally as future extensions are built.
Vine St.	• Direct routing to University Plaza forces longer walks to the UC campus and CUF neighborhood. • Not as many residents are within walking distance of Vine Street, limiting the effectiveness of service in this area.

<u>Objective</u>: Provide convenient access and local circulation for major employment, commercial, recreational, and cultural activity centers

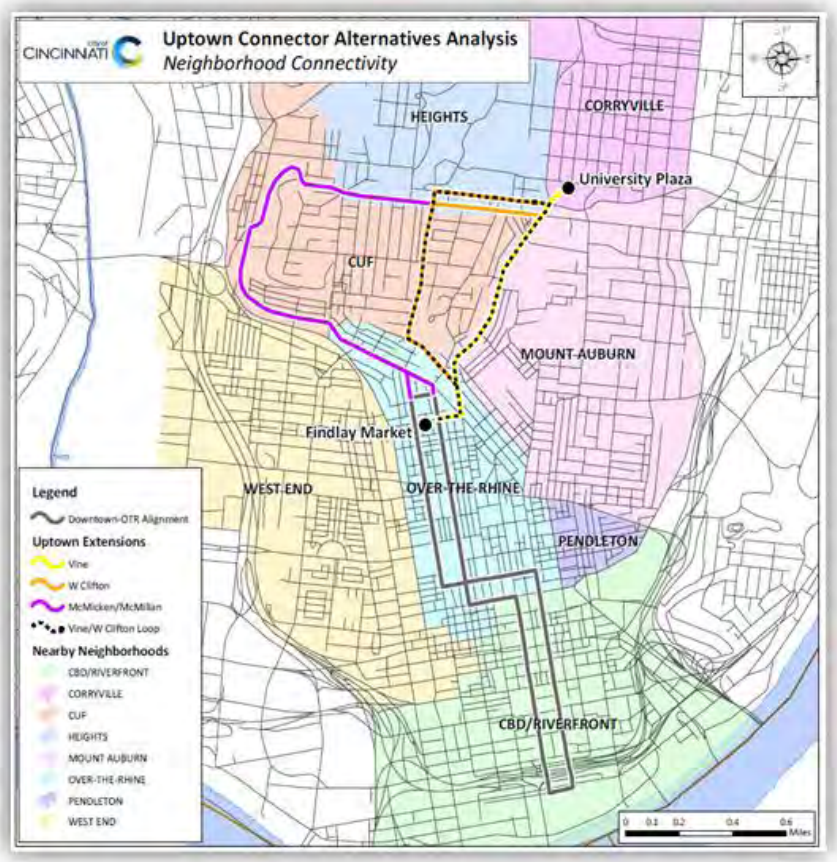
The land use between Findlay Market and Uptown is primarily residential in nature, with a strip of commercial development on McMillan and Calhoun Streets in the Uptown district. A primary destination for streetcar service to Uptown is the University of Cincinnati, with an annual enrollment of approximately 35,000 students and over 15,000 faculty and staff. Additional destinations include University Plaza and the surrounding commercial and residential area, and Hughes Center High School, a magnet school with an enrollment of over 1,400 students. Future extensions are envisioned to serve more Uptown destinations, including the massive medical center area and the Cincinnati Zoo. The McMicken/McMillan and West Clifton alternatives provide the most direct access to both the University of Cincinnati campus and the Hughes Center High School. The Vine Street alternative provides some access to the University of Cincinnati, but only at the southeastern corner of the campus.



Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	A	Provides connectivity with the entire frontage of the University of Cincinnati along Calhoun Street.
West Clifton Ave.	A	Provides connectivity with the entire frontage of the University of Cincinnati along Calhoun Street.
West Clifton Ave. / Vine St. Loop	B	Provides connectivity with the entire frontage of the University of Cincinnati along Calhoun Street, but because the alternative is a loop, the destinations are only accessible in one direction.
Vine St.	C	Requires longer walks (1/4-mi or further) to access most of the University of Cincinnati campus.

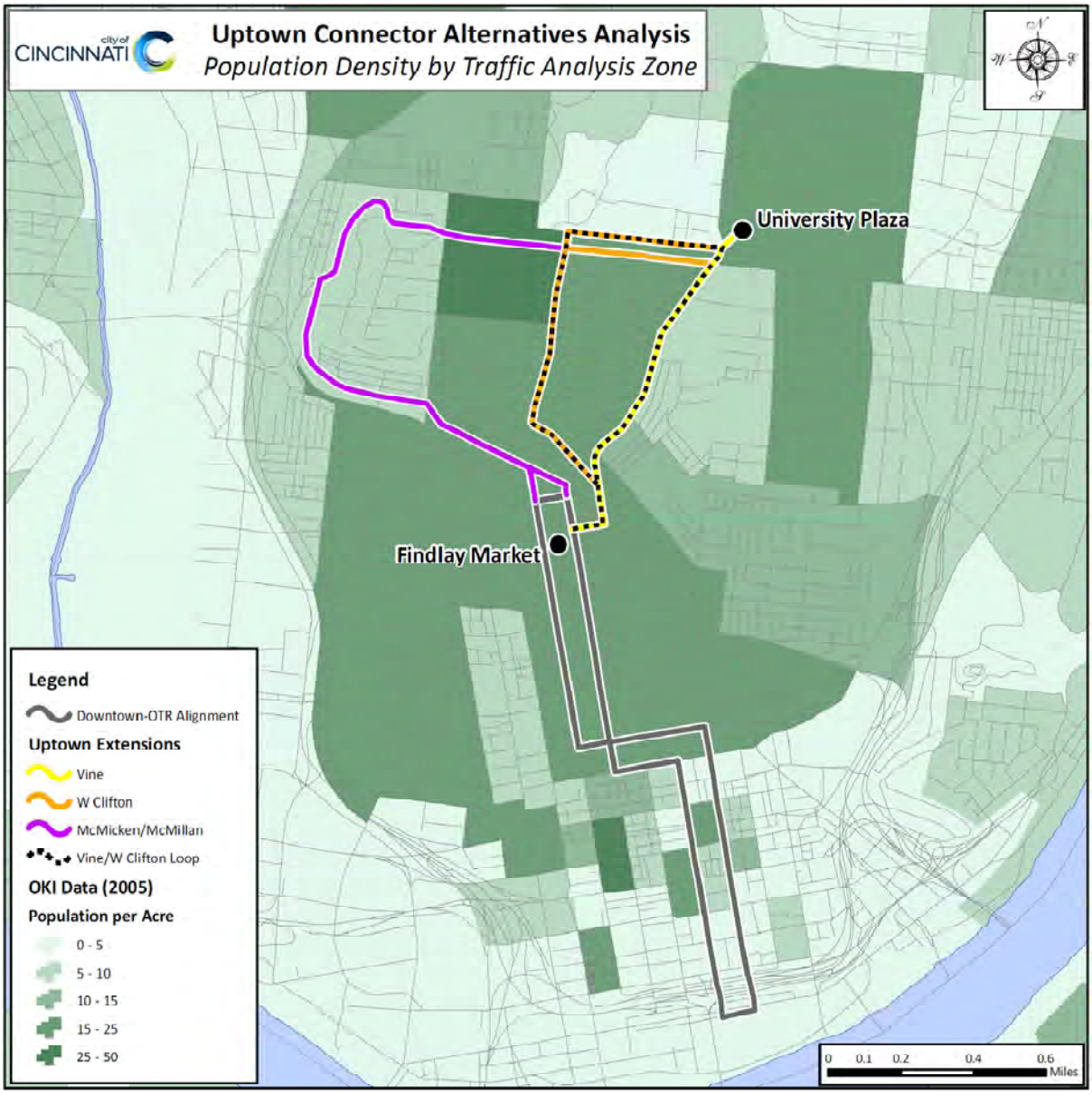
Objective: Provide better connectivity between neighborhoods and activity centers

The McMicken/McMillan and West Clifton alternatives almost exclusively serve the CUF neighborhood, a grouping of the Clifton Heights, University Heights and Fairview communities. These communities are predominantly populated with University of Cincinnati students and employees. The McMicken/McMillan alignment provides coverage along both the bottom and the top of the hill, including the northern area of Over-the-Rhine. The West Clifton alternative also serves the CUF neighborhood with expanded penetration into the residential areas along West Clifton Ave. The Vine Street alignment runs between the CUF and Mount Auburn neighborhoods, but due to the topography on the northern side of Vine Street, residences in CUF are largely inaccessible. The Mount Auburn neighborhood is accessible from Vine Street via a few east/west streets (Mulberry St., St. Joe St. and Thill St.), but access beyond these areas is limited.



All alignment options serve University Plaza, but as noted earlier, the McMicken/McMillan and West Clifton alternatives also provide direct service to the Clifton Heights business district and afford closer access to the UC campus. The West Clifton / Vine loop serves these areas as well, but in one direction only.

The CUF neighborhood is one of the more densely populated areas in Cincinnati, with the area between Ravine and West Clifton Streets approaching a density of 25 persons per acre. The area west of Ravine Street is less dense, primarily due to a large neighborhood park, Fairview Park. The Mount Auburn neighborhood along Vine Street tends to be less dense than CUF, due to some difficult terrain and two parks, Jackson Hill Park and Inwood Park. Because of the number of stops on their alignments, the McMicken/McMillan and West Clifton alternatives serve a much larger population base than the Vine Street alternative.

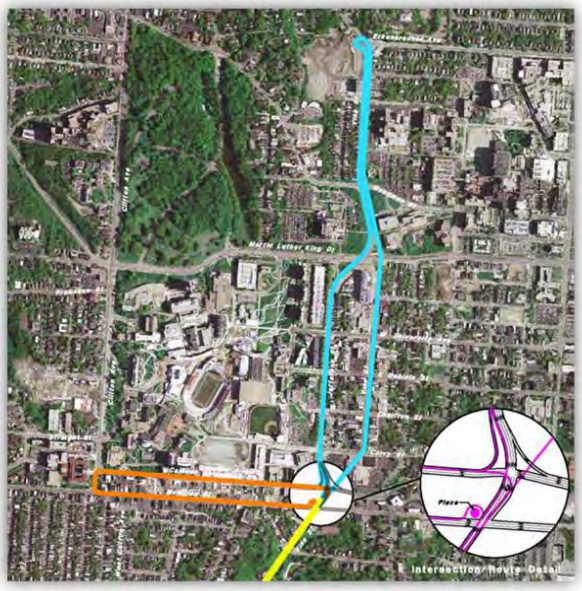


Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	A	Provides good connectivity between CUF neighborhood and other activity centers in Uptown/Downtown.
West Clifton Ave.	A	Provides good connectivity between the CUF neighborhood and other activity centers in Uptown/Downtown.
West Clifton Ave. / Vine St. Loop	B	Provides connectivity between the CUF neighborhood and Uptown/Downtown, but because the alternative is a loop, the Uptown neighborhoods and destinations are only accessible in one direction.
Vine St.	C	Provides no direct connection to the CUF neighborhood and limited connections to the Mount Auburn neighborhood.

Objective: Provide an attractive means of transportation for residents, workers, customers, and visitors

"Attractiveness" is typically defined to include convenience, efficiency, safety, cost-effectiveness, and other characteristics. Many of these traits are discussed elsewhere in this analysis in conjunction with other performance objectives. For this objective, the "cleanliness" of the alignment and opportunities to incorporate future extensions are addressed.

All of the primary alignments have a workable connection to the base Downtown-to-OTR alignment and potential maintenance facility location on Henry Street. The McMicken/McMillan Alternative is slightly "cleaner" than the West Clifton and Vine alternatives because it extends the Elm St. and Race St. loop through Over-the-Rhine up to McMicken Ave. For the West Clifton and Vine options, northbound passengers must "backtrack" slightly on Race St. when traveling past the maintenance facility from Henry St. to Findlay St. (a tight turning radius prohibits a direct turn from northbound Elm St. onto eastbound Findlay St.). This out-of-direction travel is short (1 block), but will require clear signage to indicate where patrons should board to travel in a particular direction.



Future Uptown extensions were conceptualized during the previous *Feasibility Study* and include potential service on the Calhoun Street/McMillan Street couplet as well as service on Jefferson Avenue and Vine Street north to the hospitals and the Cincinnati Zoo. If implemented as such, the Vine Street alternative (illustrated here) would require that service extend in one direction only or operate with alternating trips between the two extensions.

The West Clifton Ave. / Vine St. Loop restricts access to Uptown attractions to one direction only, which limits the effectiveness of service to this area. This issue becomes more pronounced when future extensions are constructed, because more out-of-direction travel will be required for some patrons. For example, with an extension to the Cincinnati Zoo, passengers originating downtown and destined for West Clifton Ave. would be forced to travel all the way to the Zoo and back before the route reaches West Clifton Ave.

The Downtown-to-OTR streetcar service plan assumed a 10-minute peak-period service frequency and a 20-minute off-peak period service frequency. These same service frequencies were carried over to the Uptown Connector service plan. Based on preliminary run time estimates for the four alternatives, the West Clifton alternative provides the most efficient service, with a manageable layover during both the peak and off-peak periods. The layover is a scheduled period of time where the vehicle is at the end of its route and the time is used to prepare the vehicle for its return trip and give the operator an opportunity to rest. If a vehicle is early or late coming into the end-of-line stop, the layover time also enables the vehicle to stay on schedule. A safe estimate of layover is typically 15 percent of the round-trip running time.

Based on the Downtown-to-OTR service frequencies, the West Clifton Ave. / Vine St. Loop was the most inefficient service during the peak period, with approximately five extra minutes of time built into the layover period. During the off-peak periods, the Vine and McMicken/McMillan alternatives were the most inefficient, with nine and seven extra minutes of layover, respectively.

Peak Period Service *(10-min frequencies)*

Alternative	Run-Time (Round Trip)	Cycle Time	Layover Target (15% of Run-Time)	Actual Layover
Vine	0:44:34	0:50:00	0:06:41	0:05:26
West Clifton	0:51:16	1:00:00	0:07:41	0:08:44
Vine/W Clifton Loop	0:46:51	1:00:00	0:07:02	0:13:09
McMicken/McMillan	1:03:39	1:10:00	0:09:33	0:06:21

Off-Peak Period Service *(20-min frequencies)*

Alternative	Run-Time (Round Trip)	Cycle Time	Layover Target (15% of Run-Time)	Actual Layover
Vine	0:44:34	1:00:00	0:06:41	0:15:26
West Clifton	0:51:16	1:00:00	0:07:41	0:08:44
Vine/W Clifton Loop	0:46:51	1:00:00	0:07:02	0:13:09
McMicken/McMillan	1:03:39	1:20:00	0:09:33	0:16:21

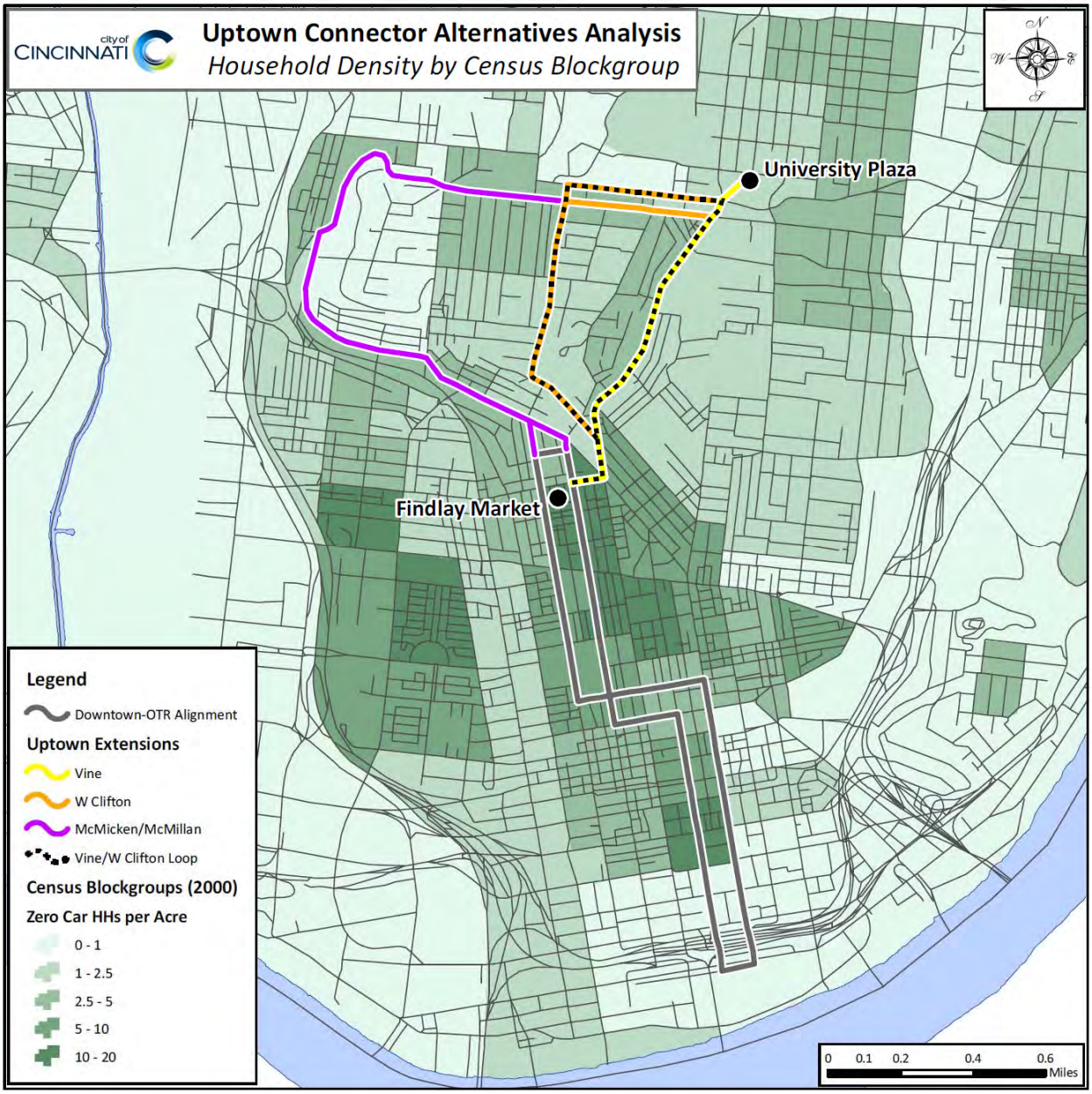
Alignment Option	*Rating*	*Comments*
McMicken Ave. / McMillan St.	*B*	Provides opportunities for northern expansion to hospitals and Cincinnati Zoo. Operating plan is less efficient in the off-peak periods.
West Clifton Ave.	*A*	Provides opportunities for northern expansion to hospitals and Cincinnati Zoo. Operating plan is the most efficient of the four alternatives.
West Clifton Ave. / Vine St. Loop	*D*	Provides opportunities for northern expansion to hospitals and Cincinnati Zoo, but because the alternative is a loop, direct trips from Calhoun Street to the hospitals or Cincinnati Zoo would not be possible. Operating plan is the least efficient in the peak periods.
Vine St.	*C*	Provides an opportunity for either a western expansion on Calhoun St./McMillan St or a northern expansion to hospitals and the Cincinnati Zoo. However, the operating plan is less efficient in the off-peak periods.

Objective: Improve access and opportunities for transit-dependent populations

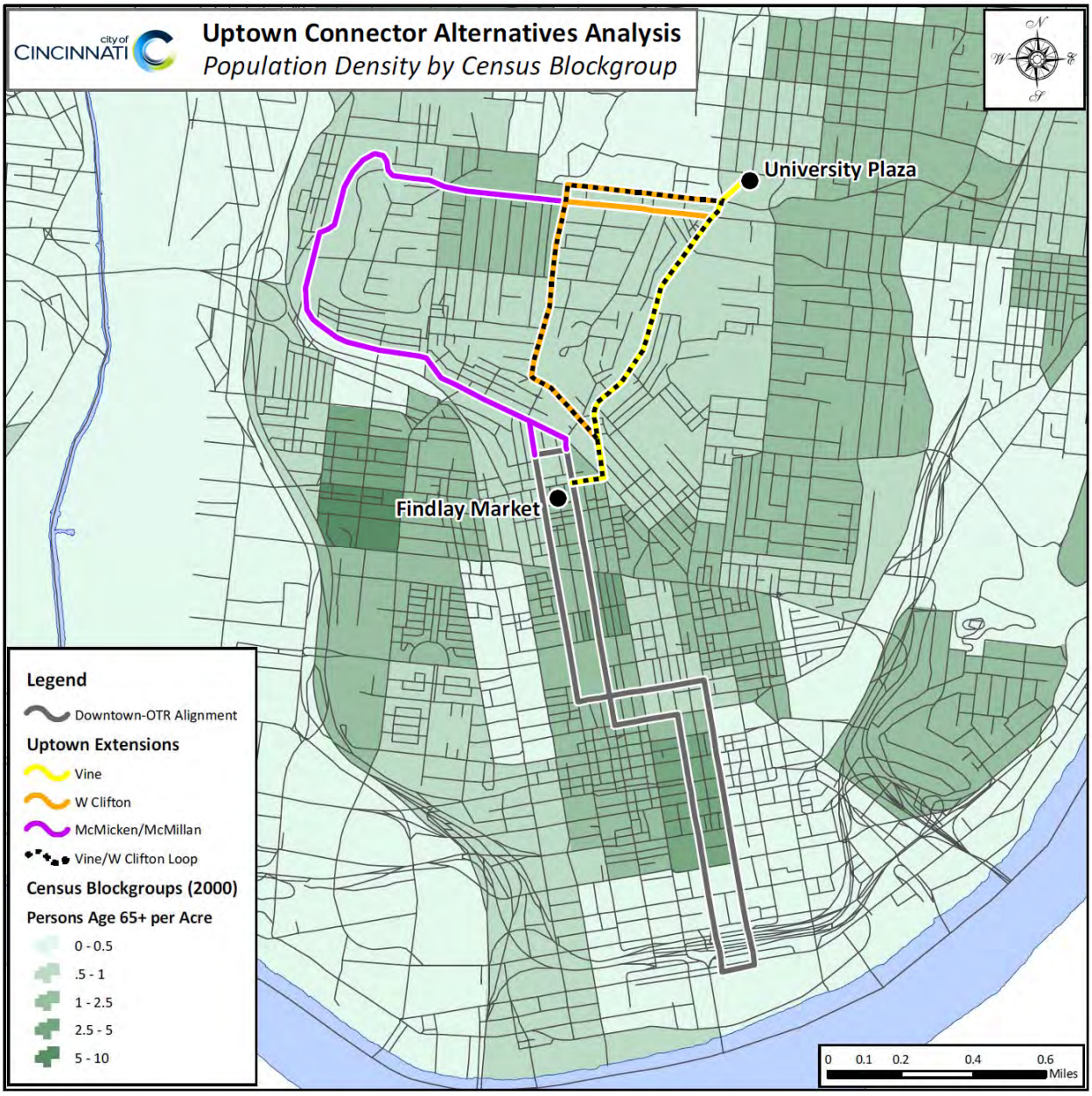
Using 2000 U.S. Census data, the following socioeconomic factors were mapped to identify potential transit-dependent markets:

- Zero-car households
- Persons age 65 or older
- Population with incomes at or below poverty level
- Persons with disabilities
- Minority population

Zero-car Households: While the highest densities of zero-car households are in OTR and West End neighborhoods, several block groups in CUF have moderate densities of zero-car households (2.5 to 5 per acre), giving the McMicken/McMillan and West Clifton alternatives the opportunity to improve mobility for these households in their respective corridors. Portions of the Vine Street corridor also have moderate zero-car household densities, with higher concentrations near the Vine Street / Findlay Street intersection in Over-the-Rhine.

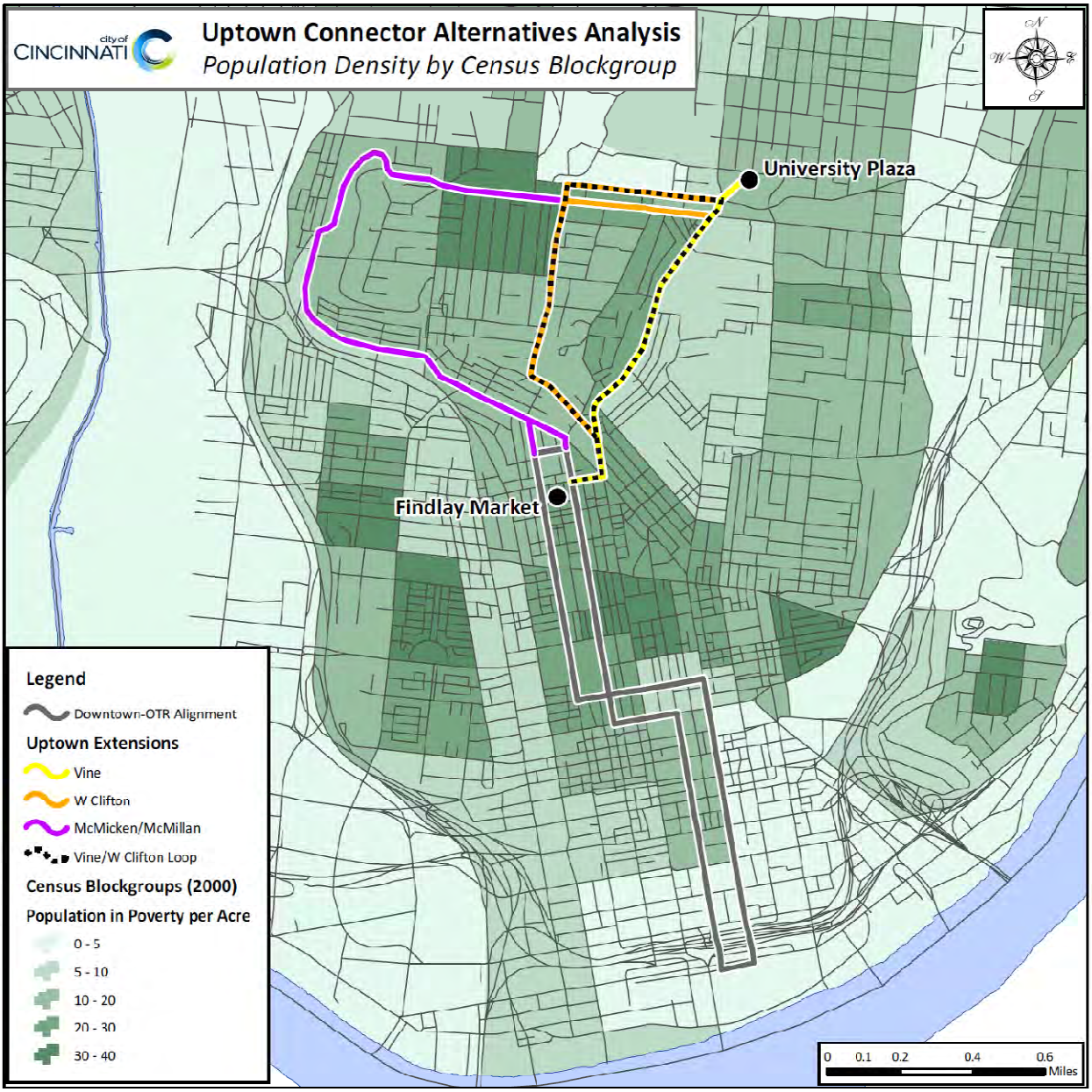

city of CINCINNATI
Uptown Connector Alternatives Analysis
Household Density by Census Blockgroup
N
W
E
S
University Plaza
Findlay Market
Legend
Downtown-OTR Alignment
Uptown Extensions
Vine
W Clifton
McMicken/McMillan
Vine/W Clifton Loop
Census Blockgroups (2000)
Zero Car HHs per Acre
0 - 1
1 - 2.5
2.5 - 5
5 - 10
10 - 20
0 0.1 0.2 0.4 0.6
Miles

Persons Age 65 or Older: Because much of the CUF neighborhood is oriented around University of Cincinnati student and staff housing, most block groups in the area do not have high densities of elderly population. One block group between Ravine Street and West Clifton Avenue did have densities exceeding 1 elderly person per acre. Comparatively, the Vine Street corridor has low elderly residential densities (less than 1 elderly person per acre).

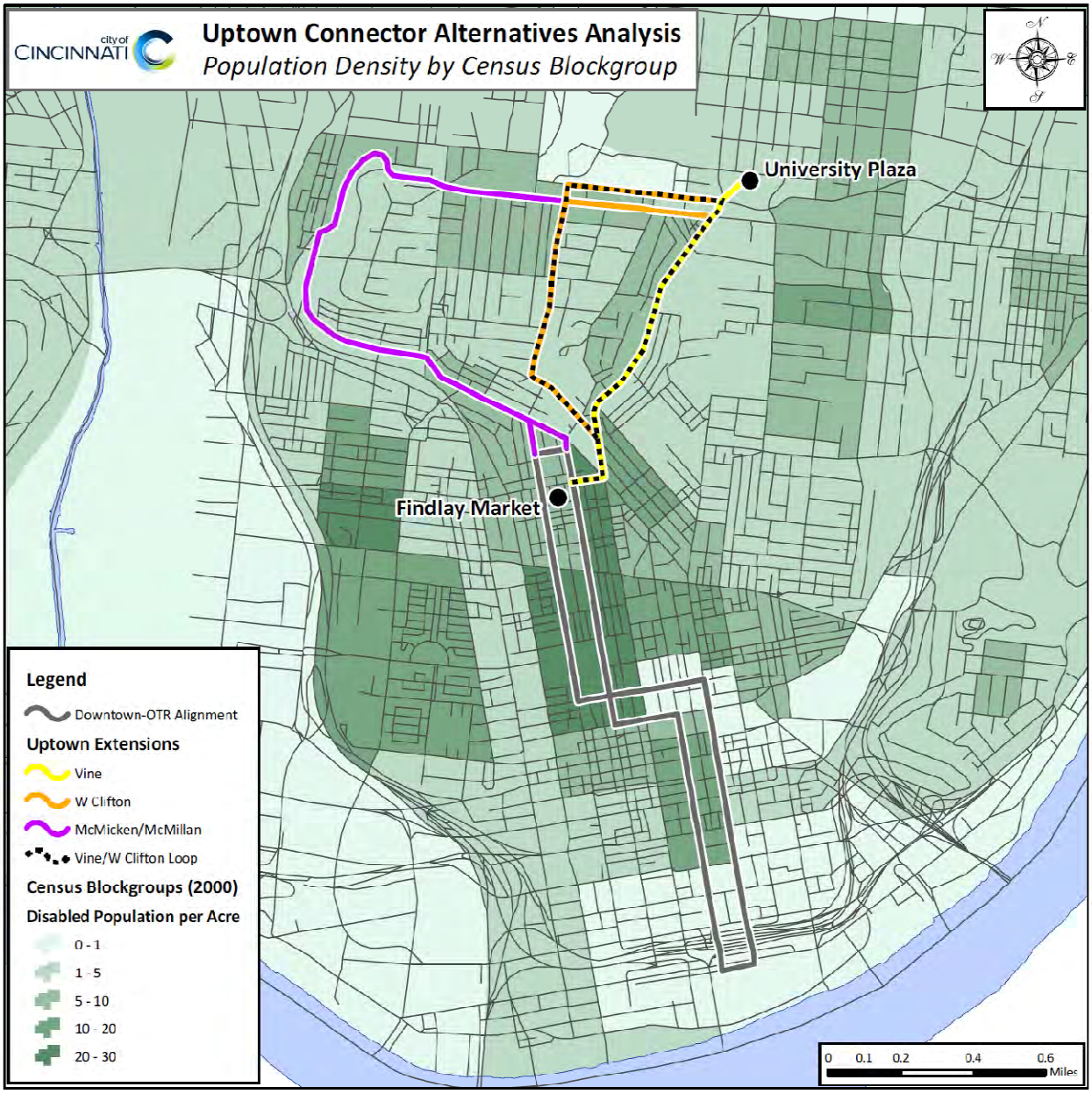


Persons At or Below the Poverty Level: Several block groups in CUF have relatively high densities of impoverished persons (10 to 20 persons per acre) with one block group exceeding 30 persons per acre. The neighborhood's impoverished persons are primarily students, as most likely reported little to no income.

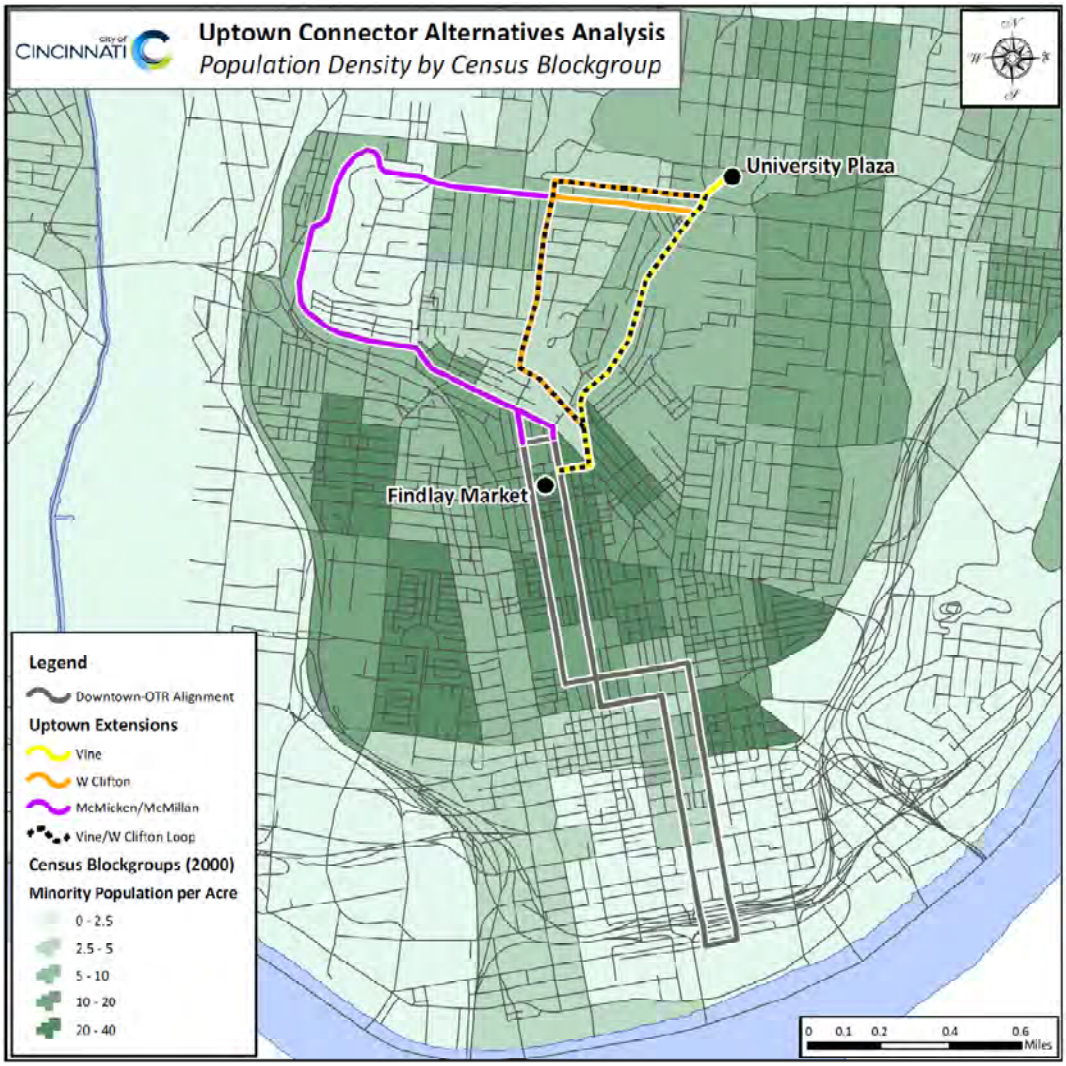
The Vine Street corridor also has significant densities of impoverished persons in the blocks between Mulberry Street and McMicken Avenue; however, fewer students live in this area.



Persons with Disabilities: Only a few block groups in the CUF neighborhood report significant densities of disabled persons. However, higher densities of disabled persons are located in Over-the-Rhine.



Minority Populations: Minority populations are centered heavily in the Over-the-Rhine and West End neighborhoods. Of the four alignment alternatives, the Vine Street option has the highest concentrations of minorities in the blocks between Mulberry Street and McMicken Avenue.



Alignment Option	*Rating*	*Comments*
McMicken Ave. / McMillan St.	A	Provides good access to elderly, minority, low-income, and disabled residents of CUF.
West Clifton Ave.	A	Provides good access to elderly, minority, low-income, and disabled residents of CUF.
West Clifton Ave. / Vine St. Loop	B	Provides access to transit-dependent residents along both Vine and West Clifton, but the loop restricts access to one direction only.
Vine St.	B	Provides good access to elderly, minority, low-income, and disabled residents along Vine Street, but the overall population base is smaller than the CUF neighborhood.

Goal #2: Support existing and proposed development in downtown and surrounding neighborhoods in the City of Cincinnati, creating a more livable and more walk-able environment

The objectives under this goal focus on the connection between streetcar and development. Alignment options in which streetcar has a better opportunity to support and catalyze redevelopment and new development receive higher ratings. Key attributes of each option are summarized in the table below:

Alignment Option	***Analysis***
McMicken Ave. / McMillan St.	• Provides good access to development projects on UC campus and in Clifton Heights business district, helping to reshape urban form and encourage revitalization and a more pedestrian-friendly environment in this area.
West Clifton Ave.	• Provides good access to development projects on UC campus and in Clifton Heights business district, helping to reshape urban form and encourage revitalization and a more pedestrian-friendly environment in this area.
■ ■ ■ West Clifton Ave. / Vine St. Loop	• Encourages revitalization and enhances pedestrian environment in the Clifton Heights business district, but service is provided in one direction only through his area.
Vine St.	• Encourages revitalization in the University Plaza area, but this alignment option does not reach the heart of the Clifton Heights business district and requires a longer walk from the UC campus.

<u>Objective</u>: Consider transit investment that supports the existing and planned built environment and which minimizes adverse impacts

Design compatibility with existing transportation infrastructure is discussed under Goal #3. All alignment options are in-street, which minimizes impacts to adjacent properties. However, as discussed later, changes to the existing cross-section are needed in some cases to accommodate streetcar. The most significant cross-section change required is on Vine Street, where the number of travel lanes would need to be reduced to create sufficient lane width for streetcar.

Development projects are concentrated at the top of the hill along the Calhoun St. / McMillan St. corridor and Jefferson Ave., with significant projects planned or underway for the UC campus and the medical center area. All options serve the University Plaza area, but the McMicken/McMillan, West Clifton, and West Clifton Ave. /Vine St. Loop provide additional coverage to the Clifton Heights business district and the development projects there.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	A	Provides good access to development projects on UC campus and in Clifton Heights business district; minimal changes required to existing roadway.
West Clifton Ave.	A	Provides good access to development projects on UC campus and in Clifton Heights business district; minimal changes required to existing roadway.
West Clifton Ave. / Vine St. Loop	B	Provides some access to development projects on UC campus and in Clifton Heights business district; significant cross-section changes required to Vine Street.
Vine St.	C	Terminus location limits access to UC campus and Clifton Heights business district; significant cross-section changes required to Vine Street.

Objective: Consider transit investment to help shape urban form through reinvestment along selected corridors and neighborhoods

Streetcar can clearly help to shape urban form in Downtown and Over-the-Rhine, and can also do so in Uptown. However, reshaping opportunities are somewhat limited for the connection between Over-the-Rhine and Uptown. Vine Street is in need of reinvestment, but the opportunities for additional new development are constrained by the small area of developable land along the corridor, due to the steep hillsides and shallow lot depths. West Clifton Ave. also can benefit from reinvestment along the segments that have already been developed, near the bottom and top of the hill. There are some redevelopment opportunities along McMillan St., but a significant portion of this alignment passes through Fairview Park, where no development will occur. Conversely, at the bottom of the hill, McMicken Ave. affords opportunities for redevelopment. The Clifton Heights business district continues to emerge as a significant activity hub, and streetcar will continue to help shape urban form in this area.

All alignment options offer some opportunity to help shape urban form, but the extent of these opportunities is limited primarily by the geography of the hillside between Downtown and Uptown.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	A	Creates opportunities to reshape urban form in Clifton Heights and in the northern portion of Over-the-Rhine.
West Clifton Ave.	B	Creates opportunities to reshape urban form in Clifton Heights.
West Clifton Ave. / Vine St. Loop	B	Expanded coverage area promotes redevelopment on West Clifton Ave. and Vine St.
Vine St.	C	Redevelopment opportunities are available along Vine St., but new development sites are limited.

Objective: Encourage neighborhood revitalization and livable and walk-able communities through development of good streetscapes and pedestrian environment

The Clifton Heights Community Urban Redevelopment Corporation is working to redevelop the Calhoun / McMillan Street corridor into a vibrant, pedestrian-friendly, mixed use business district. A number of new projects have already been completed in this corridor, and more are planned. These projects will transform the Clifton Heights business district into a major activity center. Efforts to revitalize this corridor appear to be well ahead of redevelopment plans for other corridors in the area, including Vine Street.

The streetcar has the ability to catalyze additional revitalization efforts, and supports the goal of enhancing the streetscape to create a more pedestrian-oriented focus. Because of the revitalization emphasis in the Clifton Heights business district, the streetcar alignment options that serve this area have a better opportunity to meet this objective, and ratings were assigned accordingly. The Vine Street option also creates the opportunity to reshape this corridor into a more pedestrian-friendly environment, if a new cross-section with a reduced number of travel lanes is identified.

Alignment Option	*Rating*	*Comments*
McMicken Ave. / McMillan St.	A	Encourages revitalization and enhances pedestrian environment in the Clifton Heights business district.
West Clifton Ave.	A	Encourages revitalization and enhances pedestrian environment in the Clifton Heights business district.
West Clifton Ave. / Vine St. Loop	B	Encourages revitalization and enhances pedestrian environment in the Clifton Heights business district, but service is provided in one direction only through his area.
Vine St.	C	Encourages revitalization in the University Plaza area, but this alignment option does not reach the heart of the Clifton Heights business district. Streetscape opportunities are available on Vine Street with a modified cross-section.

Objective: Link key destinations in the corridor

This objective is very similar to the objective included in Goal #1 to "provide convenient access and local circulation for major employment, commercial, recreational, and cultural activity centers". For consistency, the same ratings are applied to this objective.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	A	Provides connectivity with the entire frontage of the University of Cincinnati along Calhoun Street.
West Clifton Ave.	A	Provides connectivity with the entire frontage of the University of Cincinnati along Calhoun Street.
West Clifton Ave. / Vine St. Loop	B	Provides connectivity with the entire frontage of the University of Cincinnati along Calhoun Street, but because the alternative is a loop, the destinations are only accessible in one direction.
Vine St.	C	Requires longer walks (1/4-mi or further) to access most of the University of Cincinnati campus.

Objective: Capture the economic benefit resulting from improved transit service and mobility in these areas

The economic benefit of improved mobility is directly linked to the objective above to "encourage neighborhood revitalization and livable and walk-able communities through development of good streetscapes and pedestrian environment". For consistency, the same ratings are applied to this objective.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	A	Encourages revitalization and enhances pedestrian environment in the Clifton Heights business district.
West Clifton Ave.	A	Encourages revitalization and enhances pedestrian environment in the Clifton Heights business district.
West Clifton Ave. / Vine St. Loop	B	Encourages revitalization and enhances pedestrian environment in the Clifton Heights business district, but service is provided in one direction only through his area.
Vine St.	C	Encourages revitalization in the University Plaza area, but this alignment option does not reach the heart of the Clifton Heights business district.

<u>Objective</u>: Maximize energy efficiency of the transit operation and minimize negative impacts on historic, archaeological, traditional cultural places, parklands, and other public recreation areas

Because all options consist of alignments that are completely in-street, very few impacts on any adjacent historic, archaeological, or cultural resources or parklands can be expected, with the possible exception of areas located around streetcar stops. No major historic or cultural sites are adjacent to the candidate options. The McMicken/McMillan alternative runs through Fairview Park, but few (if any) streetcar stops are anticipated along the hillside. However, the visual impacts of the overhead catenary infrastructure (while fairly minimal) should be considered. The Vine Street alternative passes next to Inwood Park, but impacts of any streetcar stops serving the park are anticipated to be minimal. Rather, the streetcar would provide a benefit to the park by providing a new means of access to this activity center.

Alignment Option	***Rating***	***Comments***
McMicken Ave. / McMillan St.	*C*	Alignment passes through Fairview Park. Streetcar stop and overhead catenary impacts should be minimal, but should be considered.
West Clifton Ave.	*B*	Alignment does not pass any significant historic facilities or parklands.
West Clifton Ave. / Vine St. Loop	*B*	Alignment passes Inwood Park on Vine St. Streetcar stop impacts should be minimal, and improved access is provided.
Vine St.	*B*	Alignment passes Inwood Park on Vine St. Streetcar stop impacts should be minimal, and improved access is provided.

Goal #3: Maximize the efficiency and effectiveness of the local and regional transit system

Many objectives under this goal focus on compatibility with the existing transportation system, particularly in terms of design constraints associated with the candidate alternatives. The steepness of grades remains a concern for all options, and narrow lane widths provide additional challenges. Travel time, and its associated impact on the attractiveness of streetcar service, is a primary differentiator among the alternatives. Key attributes of each option are summarized in the table below:

Alignment Option	*Analysis*
McMicken Ave. / McMillan St.	• Longest option results in highest travel time. • Comparatively gentle grade, though it is sustained over a significant distance.
West Clifton Ave.	• Grades closely approach the theoretical maximum of 9%, and are sustained over a significant distance.
West Clifton Ave. / Vine St. Loop	• Grades closely approach the theoretical maximum of 9% on West Clifton, and are sustained over a significant distance. • The existing 36’ cross-section on Vine Street, using four 9’ travel lanes, will not safely accommodate streetcar. An alternative cross-section with a wider lane for streetcar (at least 10.5’ – 11’) is required. If widening is not a viable option, a reduction in the number of travel lanes will be required.
Vine St.	• Shortest option results in quickest travel time. • Comparatively gentle grade, though it is sustained over a significant distance. • The existing 36’ cross-section on Vine Street, using four 9’ travel lanes, will not safely accommodate streetcar. An alternative cross-section with a wider lane for streetcar (at least 10.5’ – 11’) is required. If widening is not a viable option, a reduction in the number of travel lanes will be required.

<u>Objective</u>: Attract new riders to the local and regional transit system by providing a convenient, frequent, reliable, and attractive streetcar transit service

When deciding whether to use streetcar for a particular trip, potential patrons will consider the convenience of the trip, how long it takes, and if streetcar takes them where they want to go. It is assumed that each of the alignment options would operate at the same frequency and during the same hours of operation. For planning purposes, a 10-minute peak period frequency and 20-minute off-peak frequency was assumed, to be consistent with the level of service proposed for the Downtown-to-OTR segment.

A key differentiator among the alternatives is the travel time between Uptown and Downtown / OTR. It is envisioned that the streetcar would operate as a single route, with all trips serving Downtown, OTR, and Uptown. The Vine Street option is the most direct, and thus has the shortest travel time. Using West Clifton Ave. would add about three minutes in each direction to the trip time, and using McMicken Ave./McMillan St. would add another 6-7 minutes in each direction. Conceptual round trip running times are summarized below.

Alignment Option	Round Trip Running Time	One-Way Trip Time (from University Plaza to the Great American Ball Park)
McMicken Ave./McMillan St.	64 minutes	32 minutes
West Clifton Ave.	51 minutes	26 minutes
West Clifton Ave./Vine St. Loop	49 minutes	23-26 minutes
Vine St.	45 minutes	23 minutes

Although the Vine Street option has the shortest travel time, the destinations served must also be considered. As currently envisioned, the Vine Street option would terminate at a redeveloped University Plaza shopping center. This is certainly a hub of activity, but it is removed from the heart of the University of Cincinnati campus and adjacent residential neighborhoods, and would require many patrons to walk, bicycle, or drive to University Plaza. Conversely, by serving the Calhoun / McMillan corridor, the other three alignment options provide a higher level of direct access to the UC campus, the Clifton Heights business district, and surrounding communities. Thus, when considering total travel time, including time needed to access the streetcar, the options serving the Calhoun / McMillan corridor are likely to be more attractive to many patrons. The Vine Street option has the shortest in-vehicle travel time, but because it stops short of the activity centers west of University Plaza, it may not attract as much ridership as the other options. An additional consideration is that although all routes are currently envisioned to terminate at University Plaza, the Vine Street option could be extended to serve the Calhoun / McMillan corridor as part of the initial phase of implementation. Also the viability of this option could increase if considered from the perspective of its connections to future extensions elsewhere in Uptown.

The West Clifton Ave./Vine St. Loop is the least attractive option from this perspective because stops are not provided in both directions along the same alignment. This route design increases the travel time for many trips. For example, patrons destined for residences in the CUF neighborhood must travel from Downtown to University Plaza and through the Calhoun St. business corridor before returning to West Clifton Ave. This routing functions differently than the proposed couplets downtown. Because the paired streets on the Downtown / OTR segment are only a block apart, pedestrians can easily walk to access the streetcar traveling in either direction. There is no access between West Clifton and Vine in the Uptown area, so this routing option functions as a loop rather than a couplet.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	C	Provides good access to Uptown destinations, but travel time between Uptown and Downtown is significantly higher than Vine or West Clifton.
West Clifton Ave.	A	Provides good balance of reasonable travel time and access to Clifton Heights and UC campus.
West Clifton Ave. / Vine St. Loop	C	Loop system, while providing a balance in service coverage, results in inefficient service for both Vine and West Clifton.
Vine St.	B	Not as attractive as West Clifton due to lack of penetration in the Clifton Heights business area and significant distance from the heart of the UC campus.

Objective: Integrate the planned streetcar line or lines with the overall transportation system, complementing and ensuring compatibility with the existing and planned street and roadway network and transit system

Decisions related to the preferred streetcar alignment must be made not only within the context of planning issues, but also in consideration of specific design challenges that impact how (and if) the streetcar infrastructure physically fits into its surroundings. As compared to other rail-based modes, streetcar is quite flexible; however, there are design challenges and limitations that must be considered:

- **Grade** – As discussed earlier, streetcars can typically operate on a grade up to 9%. The McMicken Ave./McMillan St. and Vine St. options both have long (approximately 3000 feet) sustained grades of 6.5%-7%. This gradient is well within the general technical capabilities of modern streetcar, but the long length of the grade presents a unique challenge. The two options that use West Clifton Ave. are even steeper, with nearly 1000 feet of 8.8-8.9% grade, and 2000 feet continuous of grades higher than 7%. Any of these options will require verification from prospective vehicle manufacturers regarding their ability to handle the grade, but the options that use West Clifton have a higher risk of not being able to negotiate the hill.

Streetcar lines can accommodate existing on-street parking

- **Lane width** – Modern streetcars are just over 9 feet wide (including mirrors), and the lanes identified for streetcar use must be wide enough to safely accommodate

the vehicle. Accounting for the dynamic envelope of the vehicle and a factor of safety, 11-12 feet is the preferred width of a lane used by streetcar. In restricted situations, it may be possible to reduce this lane width to 10.5 feet. Additionally, intersection width is critical where the streetcar will be turning, and must accommodate the vehicle's turning radius.

The lane widths on the streets included in the Tier 2 analysis, and the impacts of these widths, are summarized below. The most significant impact is on Vine Street, where the number of travel lanes will need to be reduced to provide adequate width for safe streetcar operations. This is a significant impact for both the Vine St. and West Clifton Ave. / Vine St. Loop options.

Street / Alignment Option	Existing Lane Widths	Impacts on Streetcar Compatibility
McMicken Ave.	Cross-section of 36' – 42' includes one travel lane in each direction plus on-street parking on both sides	Streetcar should be able to be accommodated; some on-street parking may need to be removed in most narrow places
McMillan St.	Cross-section is generally 40' (four 10' travel lanes with parking allowed in places)	Lane widths will need to be adjusted to allow an 11' lane for streetcar use (9' for the second lane). On-street parking may need to be removed in some areas.
West Clifton Ave.	Cross-section is generally 40' (includes one travel lane in each direction plus parking on both sides)	Streetcar can be accommodated, with an 11' lane for streetcar use (9' for on-street parking)
Vine St.	Cross-section is 36' – 38' (four 9' travel lanes with parking allowed during off-peak hours)	Streetcar can not be safely accommodated within the existing cross-section. An alternative cross-section with a reduced number of travel lanes will be necessary to provide the adequate width for streetcar.

With regard to turning movements, there are no turns on any of the Tier 2 options that present a significant design challenge. Some traffic changes or curb extensions may be required, but the minimum turning radius appears to be achievable at all intersections where the alignment changes direction.

- **Utilities** – Consideration of impacts on underground utilities is paramount. Although design elements will minimize stray current leakage, the ability to access underground utilities for maintenance is a concern. The streetcar track slab placement and design should enable maintenance access to underground utilities without negatively impacting the streetcar infrastructure and operations.

All Tier 2 alignment options are on major roadways, and thus have various utilities underneath the surface. The utility relocation impacts are determined largely by the proximity of the underground lines to the streetcar track slabs, as well as the level of mitigation that will ultimately be employed by the City of Cincinnati. At this point, extensive utility location analysis has not been performed. As design work proceeds, extensive work to identify utility conflicts will be required.

- **On-street parking** – Depending on the location of the track within the street and the associated streetcar stops, existing on-street parking spaces may be impacted. Each of the streets included in the Tier 2 alignment options allows on-street parking to some extent. The notable exception is on Vine Street, where on-street parking is allowed only during off-peak periods.

  Where parking is allowed on street, some spaces will need to be removed to permit an extended curb for streetcar stops. Depending on stop design and location-specific conditions, 4-6 parking spaces may be impacted at streetcar stop locations. Additionally, parking spaces may be impacted near intersections where the streetcars proceed around a corner.

  Since on-street parking is allowed on McMicken, McMillan, and West Clifton, the parking impacts will be similar across the three alternatives that use these streets. Vine Street parking impacts would need to be determined in conjunction with the consideration of alternative cross-section designs, since the streetcar will not safely fit within the existing cross-section anyway.

- **Other engineering issues –** In addition to the design challenges described above, several additional engineering considerations are apparent, and other issues may emerge as the planning and design process proceeds. Most notably, the connection to the Downtown-to-OTR segment for the alternatives using West Clifton and Vine Streets is proposed to be made via Findlay St. between Vine St. and Race St. / Elm St. This connection will require Findlay St. between Race and Vine to be converted to two-way operation, rather than the current one-way westbound operation. Streetcars can not travel against the flow of traffic in a shared lane; thus, this block will need to be converted to two-way operation, or an alternate connection will need to be identified.

  Also, several areas in which roadway reconstruction may be needed have been identified. The complex intersection of Vine/McMicken/Findlay may need to be reconstructed to provide the proper cross-slopes for streetcar slabs. Additionally, the large curve on West Clifton at Zier Place may need to be reconstructed to remove the crown on the roadway and provide the proper cross slopes. These issues do not necessarily impact the selection of a preferred alignment to any great extent, but represent costs that will be incurred during construction.

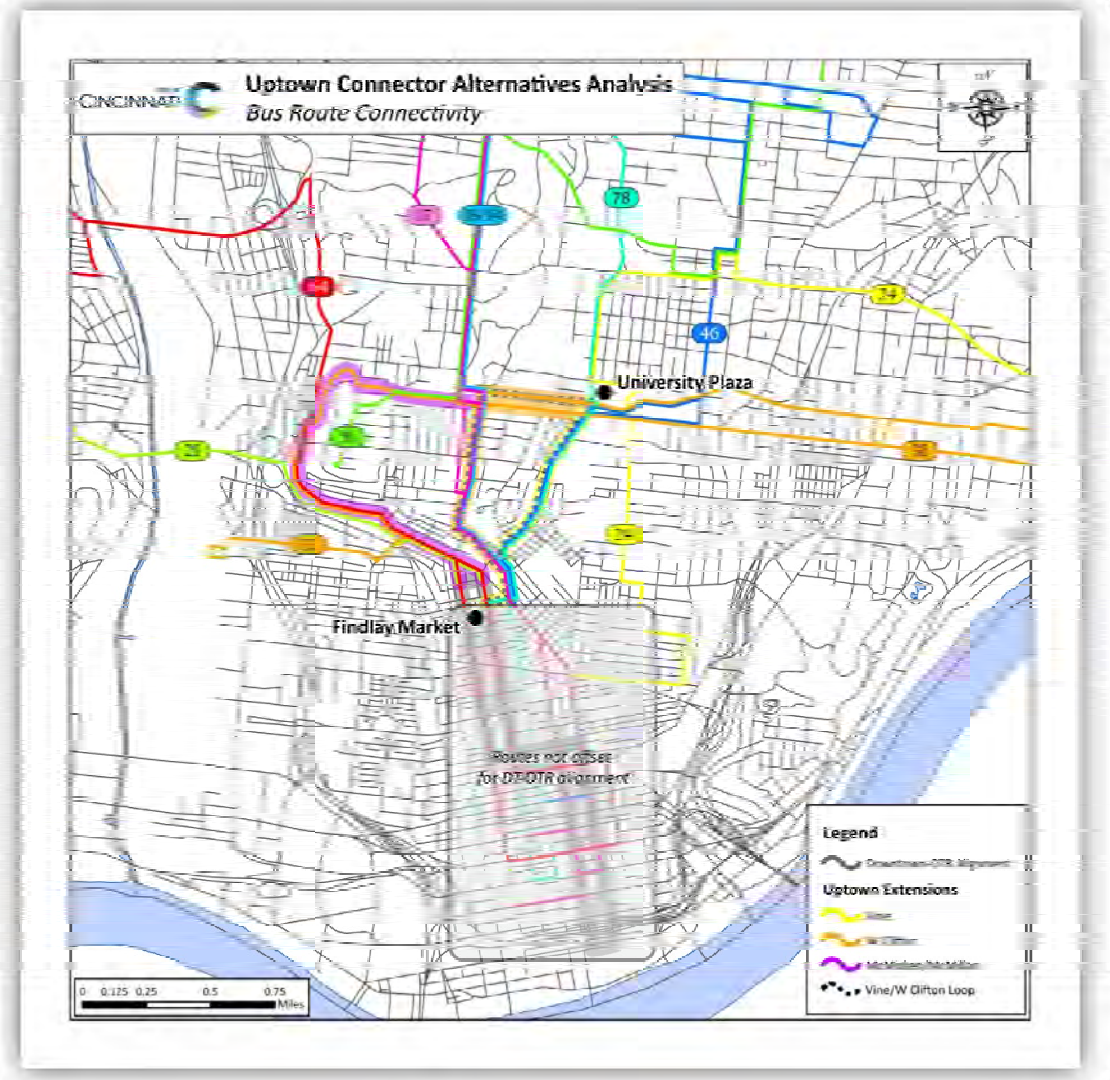
Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	B	The grade is comparatively gentle and the lane width is adequate (though some restriping is required).
West Clifton Ave.	C	The steepness of the grade is a risk for the ability of modern streetcar to navigate West Clifton. Confirmation from vehicle manufacturers will be necessary.
West Clifton Ave. / Vine St. Loop	D	The steepness of the grade on West Clifton is a concern, and the inadequate lane width on Vine requires a reduction in the number of through lanes.
Vine St.	D	The inadequate lane width on Vine requires a reduction in the number of through lanes

Objective: Provide convenient access to the transit system using various modes and means of travel (e.g. pedestrian, bicycle, bus, automobile)

Streetcar passengers typically walk to and from the streetcar route. As such, pedestrian accessibility of a route is an important feature. Although sidewalks are present along all the candidate alignments, Vine St. is not as pedestrian-friendly at the other options, due to its narrow sidewalks, narrow cross-section that places sidewalks at the back of curb adjacent to travel lanes, and the lack of penetration of pedestrian connections into the surrounding neighborhoods. On the other hand, West Clifton Ave. has good pedestrian and vehicular connections into the surrounding neighborhood, and the on-street parking helps to slow traffic and provide a buffer between vehicular traffic and pedestrians. The McMicken St. / McMillan Ave. option also has good connections into the adjacent neighborhoods, particularly those above Fairview Park, and the on-street parking benefits pedestrians. The West Clifton Ave. / Vine St. Loop enjoys good pedestrian access along the West Clifton Ave. portion of the alignment, but not along the Vine St. section.

While each of the alignment alternatives duplicates some of SORTA's local bus service, the overlapping segments are relatively short, when compared to the overall lengths of the local bus routes. The streetcar service would not replace the local bus service, but rather supplement it, providing additional connectivity between the streetcar service area and the region.

The McMicken/McMillan alternative provides the highest level of connectivity with SORTA's local bus network, as it would overlap Routes 21 and 64 on McMicken Ave., Route 31 on McMillan St. and Routes 17, 18, 19 and 51 on the Calhoun St./McMillan St. couplet. It would also provide transfer opportunities at University Plaza to Routes 24, 46 and 78. The West Clifton alternative would overlap Routes 17, 18 and 19 on West Clifton as well as Route 31 on the Calhoun St./McMillan St. couplet and provide transfer connections at University Plaza to Routes 24, 46 and 78. The Vine St. option would overlap Routes 46 and 78, and provide transfer connections to Routes 31 and 46 at University Plaza.



Alignment Option	*Rating*	*Comments*
McMicken Ave. / McMillan St.	A	Regular blocks enable good connections from surrounding neighborhoods, and on-street parking provides a pedestrian buffer from traffic. Good bus connectivity.
West Clifton Ave.	B	Regular blocks enable good connections from surrounding neighborhoods, and on-street parking provides a pedestrian buffer from traffic.
West Clifton Ave. / Vine St. Loop	C	Good access is provided from neighborhoods surrounding West Clifton Ave., but access to and from areas along Vine Street is limited.
Vine St.	D	Vine St. has narrow sidewalks located adjacent to the back of curb, along with few connections into surrounding neighborhoods due to topographic constraints.

Objective: Develop safe, comfortable, and convenient transit facilities, including stations and stops

As illustrated earlier, streetcar stops are typically accommodated through a curb extension ("bulb out") into a parking lane. This design eliminates on-street parking at the stop location, but does not intrude onto the existing sidewalk. If a parking lane is not available for a curb extension, then the stop must be placed on the sidewalk (with the streetcar running adjacent to the curb). In many cases, the sidewalk can be rerouted behind the streetcar stop, but this approach may not be viable in areas where the sidewalk can not be modified due to proximity of buildings or geographic issues.

The McMicken/McMillan and West Clifton corridors typically have on-street parking that can be removed to provide safe and comfortable station stops. However, stops are not as conducive along the Vine Street corridor, at least in its existing cross-section. Because two lanes of traffic in each direction are maintained during peak periods, the streetcar would be required to operate in the curb lane to stop at any station stops. These stops would be difficult to construct given the existing narrow sidewalks, steep slopes, and close building faces in some areas.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	B	Streetcar stops can be adequately provided by removing on-street parking.
West Clifton Ave.	B	Streetcar stops can be adequately provided by removing on-street parking.
West Clifton Ave. / Vine St. Loop	C	Streetcar stops would be difficult to implement on Vine Street given the need for streetcar to operate in the curb lane if four lanes of traffic are maintained during peak periods.
Vine St.	D	Streetcar stops would be difficult to implement on Vine Street given the need for streetcar to operate in the curb lane if four lanes of traffic are maintained during peak periods.

Objective: Provide viable mobility options to discourage increased single occupancy vehicle use in the CBD and already congested roadway network

As discussed with regard to the earlier objective of attracting new riders to the transit system, the streetcar must be convenient, efficient, and reliable to encourage people to shift from single-occupant vehicles to transit. The same considerations as discussed earlier also apply to this objective, and for consistency, the same ratings are applied to this objective.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	C	Provides good access to Uptown destinations, but travel time between Uptown and Downtown is significantly higher than Vine or West Clifton.
West Clifton Ave.	A	Provides good balance of reasonable travel time and access to Clifton Heights and UC campus.
West Clifton Ave. / Vine St. Loop	C	Loop system, while providing a balance in service coverage, results in inefficient service for both Vine and West Clifton.
Vine St.	B	Not as attractive as West Clifton due to lack of penetration in the Clifton Heights business area and significant distance from UC campus.

Objective: Complement previous planning studies and planned multimodal operations

The original *Cincinnati Streetcar Feasibility Study* (2007) mentioned only Vine Street as an alignment to connect Uptown with Downtown / OTR. However, Uptown alignment options were not studied to any appreciable level of detail in the initial feasibility studies. A circulator route in Uptown was shown on the Calhoun / McMillan couplet.

The 2006 *Uptown Transportation Study*, conducted by the Ohio-Kentucky-Indiana Regional Council of Governments, was a comprehensive assessment of transportation needs in and around the neighborhoods comprising the Uptown district, and although it did not specifically mention streetcar, included among the goals of the study was the desire to "Identify transportation system improvements to enhance accessibility of existing institutions" and "support new economic development". Transit recommendations included the development of "Rapid Bus" service between Uptown and Downtown, using the West Clifton Ave. and/or Vine St. corridors. Although streetcar does not necessarily serve the same purpose as the "Rapid Bus" concept, it will certainly enhance the connection between Uptown and Downtown.

The City of Cincinnati completed a "University Village Urban Renewal Plan" in 2005, but there is no mention of transit other than some discussion about the potential for a transit hub in the area.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	C	This option has not been mentioned previously as a primary connector between Uptown and Downtown.
West Clifton Ave.	B	West Clifton and Vine have been acknowledged as the potential corridors for implementation of a "Rapid Bus" service.
West Clifton Ave. / Vine St. Loop	B	West Clifton and Vine have been acknowledged as the potential corridors for implementation of a "Rapid Bus" service.
Vine St.	B	West Clifton and Vine have been acknowledged as the potential corridors for implementation of a "Rapid Bus" service.

Objective: Identify suitable sites for a maintenance facility

Several maintenance facility sites are being evaluated along the base Downtown-to-OTR segment, and it is highly likely that a suitable site will be identified along this portion of the alignment. However, the Uptown extension potentially provides additional site options for a maintenance facility. No in-depth site analysis has been undertaken for these alignments, but a general review of the candidate options was undertaken to assess the likelihood of identifying suitable maintenance facility sites.

It is unlikely that a suitable maintenance facility site can be identified along any of the streets studied in the Tier 2 analysis, due to the steep grades, limited depth of building lots, and existing viable development. Efforts should continue to focus on identifying a maintenance facility location within the Downtown / OTR area.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	D	Steep grades, limited depth of building lots, and existing viable development limit opportunities for maintenance facilities.
West Clifton Ave.	D	Steep grades, limited depth of building lots, and existing viable development limit opportunities for maintenance facilities.
West Clifton Ave. / Vine St. Loop	D	Steep grades, limited depth of building lots, and existing viable development limit opportunities for maintenance facilities.
Vine St.	D	Steep grades, limited depth of building lots, and existing viable development limit opportunities for maintenance facilities.

Goal #4: Provide a transit investment that is affordable, in terms of capital and operating expenses, and is implemented on a fast track

The objectives supporting this goal are based primarily on the capital and operating costs of each option, in comparison to the transportation and development benefits generated. Key attributes of each option are summarized in the table below:

Alignment Option	*Analysis*
McMicken Ave. / McMillan St.	• Longest option results in highest capital and operating cost (approximately $40 million more than lowest cost option). • Serves more neighborhoods and activity centers than other options, but significant additional cost may not justify the transportation and development impacts.
West Clifton Ave.	• Capital cost estimated at $18 million higher than the lowest cost option. • Provides key transportation and development benefits by serving the Clifton Heights business district.
West Clifton Ave. / Vine St. Loop	• Capital cost estimated at $14 million higher than the lowest cost option. • Provides key transportation and development benefits by serving the Clifton Heights business district, but service would be provided in one direction only.
Vine St.	• Shortest option results in lowest capital and operating cost. • Comparatively low cost must be weighed against the impact of not serving the heart of the Clifton Heights business district.

<u>Objective</u>: Select and implement the most effective streetcar starter line that is affordable and manageable while yielding significant transportation and development benefits

As discussed with regard to Goal #2, the alternatives serving the Calhoun / McMillan corridor clearly have a greater potential impact on transportation and development, due to the greater proximity to major activity centers that is afforded by these options. However, these benefits must be considered in conjunction with the cost of extending streetcar service to this area.

The estimated capital cost of each option is shown in the following table. These figures represent incremental costs beyond the current estimated cost of the base system in Downtown and Over-the-Rhine. These costs are preliminary estimates only, and will be refined as the design process continues.

Alignment Option	Preliminary Capital Cost Estimate
McMicken Ave./McMillan St.	$69 million
West Clifton Ave.	$46 million
West Clifton Ave./Vine St. Loop	$42 million
Vine St.	$28 million

As the shortest alternative, the Vine Street alignment has the lowest cost. At the other end of the spectrum, the McMicken Ave. / McMillan St. option has a cost that is approximately $40 million greater than the Vine Street option. While the McMicken/McMillan alignment offers access to more activity centers and greater neighborhood penetration, the added value may not be commensurate with the additional cost of $40 million. However, the West Clifton Ave. and West Clifton Ave. / Vine Street Loop options also offer access to the Clifton Heights business district, but the incremental cost as compared to the Vine Street option is approximately $14-18 million. This additional cost may be more palatable in comparison to the development and mobility benefits generated.

Alignment Option	*Rating*	*Comments*
McMicken Ave. / McMillan St.	C	This option serves additional areas, but the added cost of approximately $40 million more than the Vine Street option may not justify the benefits received.
West Clifton Ave.	A	This alignment serves the Clifton Heights business district at a more manageable incremental cost of approximately $18 million more than the Vine Street option.
West Clifton Ave. / Vine St. Loop	A	This alignment serves the Clifton Heights business district at a reasonable cost of $14 million more than the Vine Street option, but the loop service is not as effective and efficient as bi-directional service.
Vine St.	B	This option has the lowest cost of implementation, but does not produce the transportation and development benefits of the other options.

Objective: Minimize capital costs (e.g. not design elaborate stations and systems, generally street running operation, no grade separations, no park and ride lots)

This objective ranks the options strictly by capital cost, based on the figures illustrated above.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	C	The long distance of this option results in the highest capital cost.
West Clifton Ave.	B	This option, while more expensive than the Vine Street option, is within an acceptable range.
West Clifton Ave. / Vine St. Loop	B	This option, while more expensive than the Vine Street option, is within an acceptable range.
Vine St.	A	This option has the lowest cost of implementation.

Objective: Develop sustainable systems which maximize revenues and minimize net operating and maintenance costs

Unique operating plans were developed for each of the Uptown Connector alternatives to evaluate the overall cost to operate and maintain the service extension. The inputs and cost estimates are shown below.

System Characteristic	Base	McMicken / McMillan	West Clifton	West Clifton / Vine Loop	Vine
Peak Cars	4	7	6	6	5
Fleet Cars	5	9	8	8	6
Rev. Car-Miles	90,300	215,600	171,600	160,300	149,500
Rev. Car-Hours	16,190	30,850	24,280	24,280	22,760
Directional Route Miles	3.72	8.88	7.07	6.62	6.16

System Cost	**$2,640,000**	**$4,830,000**	**$3,840,000**	**$3,900,000**	**$3,590,000**
Incremental Cost	**n/a**	**$2,190,000**	**$1,200,000**	**$1,260,000**	**$950,000**

The McMicken/McMillan alternative was nearly one million dollars annually more expensive to operate and maintain than any of the other alternatives. The West Clifton and Vine/West Clifton loop alternatives were in the middle range, with an incremental annual cost of approximately $1.2 million. The Vine Street alternative would be the least expensive, with an additional cost of just under $1.0 million per year.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	C	Most expensive to operate and maintain.
West Clifton Ave.	B	Moderately more expensive to operate and maintain than the Vine Street alternative.
West Clifton Ave. / Vine St. Loop	B	Moderately more expensive to operate and maintain than the Vine Street alternative.
Vine St.	A	Least expensive to operate and maintain.

Objective: Fast track the planning and design period

Minimizing the length of the project will enable the implementation to proceed as quickly as possible. As the shortest option, the Vine Street alignment will have the shortest construction time. Conversely, the McMicken Ave. / McMillan St. alignment will take the longest time to construct. The planning and design issues appear to be fairly consistent between alternatives, although the options serving the Calhoun / McMillan St. corridor through the Clifton Heights business district may have additional considerations in terms of coordination for streetscape elements and streetcar stop locations. Likewise, consensus would need to be reached on an alternative cross-section for the Vine Street alignment, since streetcar is not workable within the existing configuration of four 9' lanes.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	C	Planning and design issues are concentrated in the Clifton Heights business district. Special considerations may also be necessary in the portion passing through Fairview Park.
West Clifton Ave.	B	Planning and design issues are concentrated in the Clifton Heights business district.
West Clifton Ave. / Vine St. Loop	C	Relatively short alignment, but an alternative cross-section for Vine Street must be identified.
Vine St.	C	Shortest alignment option, but requires consensus on an alternative cross-section.

Objective: Leverage other public and private funding whenever possible

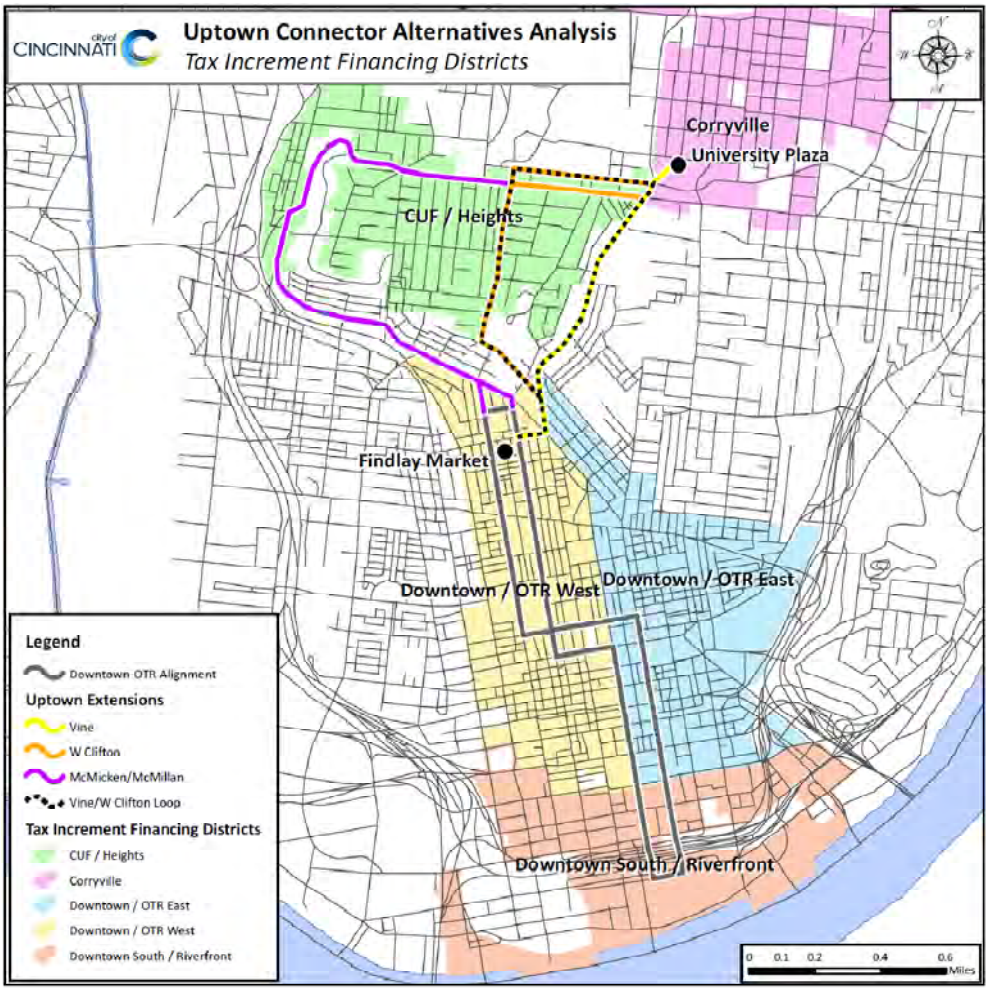
One potential financing strategy for the streetcar has been the use of Tax Increment Financing (TIF) districts, of which there are several in and around Downtown and Uptown Cincinnati.

The McMicken/McMillan alternative has segments in both the Downtown/OTR West and the CUF/Heights TIF districts. Approximately 0.5 miles along McMicken Avenue between Linn Street and Colerain Avenue and another 0.2 miles along McMillan Street on the hill-climb would fall outside of the TIF boundaries. The guideway on Vine Street to the end-of-line at University Plaza would be in the southwestern corner of a third TIF district, Corryville.

The West Clifton alternative is primarily in the CUF/Heights TIF district, with approximately 0.35 miles between Findlay Street and Zier Place falling outside of the TIF boundary. A short one-block segment on Findlay Street between Vine and Race Street is in the Downtown/OTR West TIF district. The guideway on Vine Street to the end-of-line at University Plaza would be in the Corryville TIF district.

The Vine St. alternative falls primarily outside of the existing TIF districts. A short one-block segment on Findlay Street between Vine and Race Street is in the Downtown/OTR West TIF district. The guideway on Vine Street north of McMillan Street would be in the Corryville TIF district.

It should be noted that current TIF funding obligations for each district have not been examined. The presence of a TIF district does not necessarily indicate that funding is available to support the streetcar project.



Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	B	Potential to leverage TIF financing from several TIF districts. Most of the guideway falls within existing TIF boundaries.
West Clifton Ave.	B	Potential to leverage TIF financing from several TIF districts. Most of the guideway falls within existing TIF boundaries.
West Clifton Ave. / Vine St. Loop	C	Potential to receive TIF financing along the West Clifton Avenue segment of the loop. Limited potential to receive financing along Vine Street.
Vine St.	D	Limited potential to receive TIF financing without the establishment of a new TIF district.

Objective: Maximize public-private partnership opportunities

Public-private partnership opportunities are defined largely by the destinations to be served by the streetcar. Major employers, institutions, or other activity centers that directly benefit from streetcar service are more apt to participate financially or otherwise in the development and on-going operation of the system. With regard to the Uptown Connector, the largest institution that would be directly impacted is the University of Cincinnati. The three options that serve the Clifton Heights business district also operate along the southern edge of the UC campus, and provide better service to UC than the Vine Street option. Thus, there is a greater opportunity to engage UC regarding potential partnership opportunities if one of the three options serving the Calhoun / McMillan corridor is selected.

Additionally, all options terminate at the site of the existing University Plaza sopping center, which is slated for possible redevelopment. As planning for redevelopment proceeds, a partnership with the private developers of the property will need to be established. As future Uptown extensions are planned, additional partnership opportunities may emerge. The medical centers and Cincinnati Zoo are prime examples of potential partners in the streetcar effort.

Alignment Option	Rating	Comments
McMicken Ave. / McMillan St.	B	Potential to engage UC stakeholders.
West Clifton Ave.	B	Potential to engage UC stakeholders.
West Clifton Ave. / Vine St. Loop	B	Potential to engage UC stakeholders.
Vine St.	C	More limited potential to engage UC stakeholders.

TIER 2 SUMMARY OF ADVANTAGES AND DISADVANTAGES

Key advantages and disadvantage of each option are summarized in the following table. These points are compiled from the detailed Tier 2 analysis.

Alignment Option	*Key Advantages*	*Key Disadvantages*
McMicken Ave. / McMillan St.	• Strong coverage in the CUF neighborhood as well as the northern portion of Over-the-Rhine. • Provides good access to major activity centers near the UC campus and Clifton Heights business district. • Comparatively gentle grade, though it is sustained over a significant distance.	• Longest travel time between Uptown and Downtown (nine minutes longer than Vine St.) negatively impacts attractiveness of service. • Highest capital and operating cost ($40 million more than lowest cost option). • Serves more neighborhoods and activity centers than other options, but significant additional cost may not justify the transportation and development impacts.
West Clifton Ave.	• Strong coverage in the CUF neighborhood. • Provides good access to major activity centers near the UC campus and Clifton Heights business district. • Most efficient operationally; travel time between Downtown and Uptown is only three minutes longer than shortest option (Vine St.).	• Grades closely approach the theoretical maximum of 9%, and are sustained over a significant distance. • Capital cost estimated at $14 million higher than the lowest cost option (Vine St.).

Alignment Option	*Key Advantages*	*Key Disadvantages*
■ ■ ■ West Clifton Ave. / Vine St. Loop	• Provides key transportation and development benefits by serving the Clifton Heights business district, but service would be provided in one direction only.	• Serves a large number of residents, but level of access is limited due to loop route structure. • Loop structure becomes more problematic operationally and less attractive to some riders as future extensions are built. • Grades closely approach the theoretical maximum of 9% on West Clifton, and are sustained over a significant distance. • Capital cost estimated at $10 million higher than the lowest cost option (Vine St.).
Vine St.	• Quickest travel time between Uptown and Downtown. • Comparatively gentle grade, though it is sustained over a significant distance. • Lowest capital and operating cost.	• Direct routing to University Plaza does not directly serve the Clifton Heights business district and forces longer walks to the UC campus and CUF neighborhood. • Not as many residents are within walking distance of Vine Street, limiting the effectiveness of service in this area. • The existing 36’ cross-section on Vine Street, using four 9’ travel lanes, will not safely accommodate streetcar. An alternative cross-section with a wider lane for streetcar (at least 10.5’ – 11’) is required. If widening is not a viable option, a reduction in the number of travel lanes will be required.

TIER 2 SUMMARY OF RATINGS

The ratings for each objective are summarized below. As noted earlier, no attempt has been made to weight individual objectives or assign a composite "score". Ultimately, this process will be driven by the priorities established by the City of Cincinnati and its stakeholders.

Goal 1: Improve mobility and connectivity within downtown (and uptown) Cincinnati

Objective	McMicken Ave./ McMillan St.	West Clifton Ave.	West Clifton Ave. / Vine St. Loop	Vine St.
Provide convenient access and local circulation for major employment, commercial, recreational, and cultural activity centers	A	A	B	C
Provide better connectivity between neighborhoods and activity centers	A	A	B	C
Provide an attractive means of transportation for residents, workers, customers, and visitors	B	A	D	C
Improve access and opportunities for transit-dependent populations	A	A	B	B

Goal 2: Support existing and proposed development in downtown and surrounding neighborhoods in the City of Cincinnati, creating a more livable and more walk-able environment

Objective	McMicken Ave./ McMillan St.	West Clifton Ave.	West Clifton Ave. / Vine St. Loop	Vine St.
Consider transit investment that supports the existing and planned built environment and which minimizes adverse impacts	A	A	B	C
Consider transit investment to help shape urban form through reinvestment along selected corridors and neighborhoods	A	B	B	C
Encourage neighborhood revitalization and livable and walk-able communities through development of good streetscapes and pedestrian environment	A	A	B	C
Link key destinations in the corridor	A	A	B	C

Objective	McMicken Ave./ McMillan St.	West Clifton Ave.	West Clifton Ave. / Vine St. Loop	Vine St.
Capture the economic benefit resulting from improved transit service and mobility in these areas	A	A	B	C
Maximize energy efficiency of the transit operation and minimize negative impacts on historic, archaeological, traditional cultural places, parklands, and other public recreation areas	C	B	B	B

Goal 3: Maximize the efficiency and effectiveness of the local and regional transit system

Objective	McMicken Ave. / McMillan St.	West Clifton Ave.	West Clifton Ave. / Vine St. Loop	Vine St.
Attract new riders to the local and regional transit system by providing a convenient, frequent, reliable, and attractive streetcar transit service	C	A	C	B
Integrate the planned streetcar line or lines with the overall transportation system, complementing and ensuring compatibility with the existing and planned street and roadway network and transit system	B	C	D	D
Provide convenient access to the transit system using various modes and means of travel (e.g. pedestrian, bicycle, bus, automobile)	A	B	C	D
Develop safe, comfortable, and convenient transit facilities, including stations and stops	B	B	C	D
Provide viable mobility options to discourage increased single occupancy vehicle use in the CBD and already congested roadway network	C	A	C	B
Complement previous planning studies and planned multimodal operations	C	B	B	B
Identify suitable sites for a maintenance facility	D	D	D	D

Goal 4: Provide a transit investment that is affordable, in terms of capital and operating expenses, and is implemented on a fast track

Objective	McMicken Ave. / McMillan St.	West Clifton Ave.	West Clifton Ave. / Vine St. Loop	Vine St.
Select and implement the most effective streetcar starter line that is affordable and manageable while yielding significant transportation and development benefits	C	A	A	B
Minimize capital costs (e.g. not design elaborate stations and systems, generally street running operation, no grade separations, no park and ride lots)	C	B	B	A
Develop sustainable systems which maximize revenues and minimize net operating and maintenance costs	C	B	B	A
Fast track the planning and design period	C	B	C	C
Leverage other public and private funding whenever possible	B	B	C	D
Maximize public-private partnership opportunities	B	B	B	C