5.0 ENVIRONMENTAL RESOURCES, IMPACTS, AND MITIGATION

The potential social, environmental, and economic impacts of the Cincinnati Streetcar project have been assessed in relation to identified impact categories. The resources included are: transportation and traffic, land use and zoning, community and neighborhoods, economics, environmental justice, air quality, noise, ecological resources, hazardous materials, energy, cultural resources, Section 4(f) resources, visual quality, safety and security, secondary and cumulative effects, and construction.

Following the environmental considerations and impacts analysis of the No Build and both Build Alternatives (as described in this section), Build Alternative 1 is the recommended preferred alternative. Reasons for recommending this alternative as the preferred are discussed in Section 8.0. Based on a comparative analysis of the three maintenance and storage facility (MSF) sites, Location 1 on the south side of Henry Street at 120 Henry Street is recommended as the preferred MSF site.

5.1 Traffic

The potential impacts of a streetcar on Downtown traffic were assessed. A review of the roadway network, street classifications, traffic volumes, and traffic control was conducted.

The traffic analysis provides the approach and methodologies used to develop traffic-volumes and perform operational analysis of opening year traffic conditions for the proposed streetcar. The full traffic analysis is located in Appendix E. The following is a summary of the traffic analysis.

5.1.1 Study Scenarios

The following scenarios were analyzed to study the impact of the streetcar on the local roadway system for the opening year during the PM peak hour (4:00 p.m. – 6:00 p.m.).

- 2009 Existing Conditions - The roadway network includes existing roadway conditions.

- 2012 No Build - The roadway network would remain the same as the existing 2009 roadway conditions with the addition of The Banks street grid.

- 2012 Build Alternative 1 - The roadway geometry, traffic control and roadway capacity would remain the same as the No Build scenario. The proposed streetcar would share one lane and require on-street parking adjustments as noted in the conceptual engineering plans. Six streetcar trips per hour were included in the Build scenario. Both Build Alternatives would have the same impacts between Freedom Way and Henry Street. This alternative includes an analysis of Vine Street.

- 2012 Build Alternative 2 – This scenario would be the same as 2012 Build Alternative 1 except that it also includes an analysis of West Clifton Avenue instead of Vine Street.

5.1.2 Existing Conditions

The existing roadway facilities in the study area are shown in Figure 1. North-south routes in the study area include Elm, Race, Walnut, and Main streets within Downtown and Vine Street and West Clifton Avenue connecting to Uptown. East-west routes include 12th Street, Central Parkway, Henry Street, Findlay Street, and Freedom Way. In Downtown Cincinnati, the majority of the streets that the streetcar would use experience low to moderate traffic volumes. Low to moderate traffic volumes are defined as an average daily traffic (ADT) of less than 15,000 vehicles per day. High traffic volumes are defined as exceeding 15,000 vehicles per day. Central Parkway is the only roadway in the study area with high traffic volume intersections.

There are 44 traffic signals along the streetcar route that were included in this traffic analysis. Most of these signals are part of the Downtown signal system. The signals operate by a master control system that adjusts cycle lengths by time of day. The list of existing traffic signals is shown in Appendix E.

The study intersections were analyzed for AM and PM peak hour conditions for current traffic. The current level of service (LOS) is "C" or better for all intersections in the study area. A table showing the existing AM and PM LOS for intersections is in Appendix E, Table 3.

5.1.3 Potential Impacts

The existing roadways along and adjacent to the proposed streetcar alignment would not change under either Build Alternative 1 or 2. Both Build Alternatives 1 and 2 yield similar results related to traffic impacts and intersection performance. Table 4 outlines the traffic impacts of adding a modern streetcar to the vehicle mix on the existing streets. Suggestions to mitigate the impacts are also included in Table 4 and Section 5.1.3.2 for both Build Alternatives 1 and 2.

As shown in Table 4, the streetcar would have minimal impacts to traffic on the roadway network. To minimize traffic impacts, streetcars would travel in the same lane along the route and only change lanes to make turns. Travel lane changes would occur at seven locations along the alignment. At three of the lane change locations, sidewalks and curbs will be reconfigured to accommodate the streetcar (Table 4).

The streetcar would move with the flow of traffic on the roadways and would only impact traffic flow for an average dwell time of 30 seconds at stops. Stops were strategically located to access traffic generators such as Findlay Market, Fountain Square, Government Square, and the Riverfront. In some locations, existing bus stops would need to be moved, while others could be shared with the streetcar as described in Table 4.

Intersections and bus stops in the study area were analyzed for AM and PM peak hour conditions projected for 2012 No Build and Build Alternatives. The intersections with traffic signals were optimized for all future scenarios. Under the No Build Alternative, all study area intersections would function at LOS C or better. Under the Build Alternatives, all study area intersections would function at LOS B or better with delay of less than 25 seconds. The LOS improves with the Build Alternatives because of the optimized signal timing and coordination utilized in the Synchro traffic signal program. A table showing the 2012 No Build Alternative and 2012 Build Alternatives AM and PM LOS for intersections is provided in Appendix E. This table provides detailed information on intersection impacts and LOS.

Table 4. Streetcar Impacts on the Local Street Network

Streetcar Stop or Road Intersection	Street	Issue	Impact[1] (Build Alternatives 1 and 2)	Mitigation (Build Alternatives 1 and 2) (See Section 5.1.5.3 for details)
Stop #1	Midblock – South side of Freedom Way	Occupies west side of recessed drop off/pick up area. The right turn lane on Main Street prohibits use of Main Street for the stop location.	Full width stop on walk may extend past right of way on south side of Freedom Way.	None
Intersection	Freedom Way at Main Street	Left turn from Freedom Way to Main Street.	No traffic impact.	None
Intersection	Main Street at Second Street	None	No traffic impact.	None
Intersection	Main Street at 3rd Street	None	No traffic impact.	None
Intersection	Main Street Between 3rd and 4th Street	Alignment switches from far right lane to far left lane. This switch results from recommendations by City planning.	No traffic impact.	Mid-block signal required.
Intersection	Main Street at 4th Street	None	No traffic impact.	None
Stop #2	SW Corner of Main Street at 5th Street	The steep grade prohibits a stop south of 4th Street. The thru curb lane between 4th and 6th streets prohibits a bump out.	Loss of three peak hour metered spaces.	Stop constructed in existing walk in lieu of "bump out".
Intersection	Main Street at 5th Street	None	No traffic impact.	None
Main Street between 5th and 6th Streets	Main Street	Alignment switches from far left lane to center left lane. This switch results from recommendations by City planning.	No traffic impact.	Mid-block signal required.
Intersection	Main Street at 6th Street	None	No traffic impact.	None
Stop #3	NW Corner of Main Street at 6th Street	None	Loss of one metered space.	Stop placed north of 6th Street due to left turn lane onto 6th, utilizing an existing bump out and avoiding the curb thru lane at 7th Street.
Intersection	Main Street at 7th Street	None	No traffic impact.	None

Table 4. Streetcar Impacts on the Local Street Network

Streetcar Stop or Road Intersection	Street	Issue	Impact[1] (Build Alternatives 1 and 2)	Mitigation (Build Alternatives 1 and 2) (See Section 5.1.5.3 for details)
Intersection	Main Street at 8th Street	None	No traffic impact.	None
Intersection	Main Street at 9th Street	None	No traffic impact.	None
Stop #4	Near northwest corner of Main and 8th streets	No traffic impact, majority of stops constructed in existing "Bump out"	No traffic impact.	Placed to avoid the loading zone between 8th and 9th streets.
Intersection	Main Street at Court Street (south)	None	No traffic impact.	None
Intersection	Main Street at Court Street (north)	None	No traffic impact.	None
Stop #5	Midblock – West side of Main Street, between Central Parkway and Court Street	None	Loss of three peak hour metered spaces.	Bump out. Placed south of Central Parkway to avoid impacts to the taxi zone. Allows left turn onto 12th Street without a queue jump.
Intersection	Main Street at Central Parkway	None	No traffic impact.	None
Stop #5A	Midblock – West side of Main Street, between Reading Road and 12th Street	None	Loss of four miscellaneous metered spaces. Closure of Wilkymacky Alley.	Bump out. Placed north of Reading Road to avoid midblock pedestrian crossing.
Intersection	Main Street at 12th Street	Left turn from Main Street to 12th Street. Reconfigure sidewalk and curb at southwest corner of intersection. Decrease sidewalk width from 13 feet to 11 feet.	Loss of one miscellaneous metered space.	Shorten length of off hour limo stand on 12th Street by 5 feet.

Table 4. Streetcar Impacts on the Local Street Network

Streetcar Stop or Road Intersection	Street	Issue	Impact[1] (Build Alternatives 1 and 2)	Mitigation (Build Alternatives 1 and 2) (See Section 5.1.5.3 for details)
12th Street from Main Street to Elm Street	12th Street	Streetcar moved out of the curb lane and into the adjacent lane (alignment modification from Feasibility Study).	No traffic impact.	Avoid eliminating on-street parking and conflicts with loading zones
Intersection	12th Street at Walnut Street	None	No traffic impact.	None
Stop #6	NE Corner of 12th Street at Vine Street	None	Loss of four non-metered spaces.	Bump out. Coordination with Duke Vault in area required.
Intersection	12th Street at Vine Street	None	No traffic impact.	None
Intersection	12th Street at Race Street	None	No traffic impact.	None
Intersection	12th Street at Elm Street	Right turn from 12th Street to Elm Street.	Reconfigure walk and curb at northeast corner of intersection (southwest corner of Washington Park).	Relocate Metro Stop to the east.
Stop #7	SE corner Elm Street and 14th Street	None	Loss of two metered spaces. Combine with bus stop.	Stop located north of new parking garage entrance as recommended by City planning.
Intersection	Elm Street at 14th Street	None	No traffic impact.	None
Intersection	Elm Street at 15th Street	None	No traffic impact.	None
Stop #8	SE corner on Elm Street at Liberty Street	None	Loss of four non-metered spaces. Combines with bus stop.	Bump out.
Intersection	Elm Street at Liberty Street	None	No traffic impact.	None
Intersection	Elm Street at Green Street	None	No traffic impact.	None
Stop #9	East side of Elm Street, north of Findlay Market	No traffic impact. (Alignment modification from Feasibility Study)	Loss of one metered space. Impacts loading zone.	Bump out. Provides access to Findlay Market.
Intersection	Elm Street at Findlay Street	None	No traffic impact.	None

Table 4. Streetcar Impacts on the Local Street Network

Streetcar Stop or Road Intersection	Street	Issue	Impact[1] (Build Alternatives 1 and 2)	Mitigation (Build Alternatives 1 and 2) (See Section 5.1.5.3 for details)
Stop #10	Southeast corner of Elm and Henry Street	Stop at same location of existing Metro stop.	Combine with bus stop.	Bump out.
Henry Street	Henry Street	Streetcar alignment moved from McMicken Avenue to Henry Street due to the severity of the horizontal and vertical alignment at the intersection of Elm Street and McMicken Avenue (Alignment modification from Feasibility Study).	No traffic impact.	None
Intersection	Elm Street at Henry Street	Right turn from Elm Street to Henry Street. Streetcar uses northern most lane of Henry Street.	Loss of twelve non-metered spaces. Henry becomes one way eastbound with Henry becoming one lane through to Race Street and a portion of Henry Street dedicated to truck maneuvering to serve the existing driveways on the north side of the street.	Change Henry Street from two-way to one-way.
Intersection	Henry Street at Race Street	Right turn from Henry Street to Race Street.	Reconfigure curb and walk at southwest corner of intersection. Loss of one non-metered space. The 10-foot wide walk remains. Prohibit left turn from northbound McMicken Street to southbound Race Street.	Construct bump out to direct traffic turning right onto Race Street from McMicken into the left two southbound lanes of Race Street.
Intersection	Race Street at Findlay Street	None	No traffic impact.	None
Stop #11	West side of Race Street, north of Findlay Market	None	Loss of four metered spaces.	Provides access to Findlay Market, while missing one bus stop.
Lane Change	Race Street between West Elder Street and Green Street.	Alignment switches from far center right lane to center left lane. This switch results from recommendations by City planning.	No traffic impact.	Mid-block signal required.

Table 4. Streetcar Impacts on the Local Street Network

Streetcar Stop or Road Intersection	Street	Issue	Impact[1] (Build Alternatives 1 and 2)	Mitigation (Build Alternatives 1 and 2) (See Section 5.1.5.3 for details)
Intersection	Race Street at Green Street	None	No traffic impact.	None
Intersection	Race Street at Liberty Street	None	No traffic impact.	None
Stop #12	Southeast corner of Race at Liberty Street	None	Loss of one metered space. Impacts loading zone.	Bump out. Located to miss the two bus stops.
Intersection	Race Street at 15th Street	None	No traffic impact.	None
Intersection	Race Street at 14th Street	None	No traffic impact.	None
Intersection	Race Street at 13th Street	None	No traffic impact.	None
Stop #13	East side of Race Street near the south end of Washington Park	None	Loss of two non-metered spaces.	Bump out. Changed from west to east side of Race Street.
Intersection	Race Street at 12th Street	None	No traffic impact.	None
Intersection	Race Street at Central Parkway	None	Shorten median island five feet to the east.	None
Central Parkway from Race Street to Walnut Street	Central Parkway	Alignment modification from Feasibility Study.	Streetcar moved out of the curb lane and into the adjacent lane; conflicts with loading zones.	Avoid eliminating on-street parking.
Intersection	Central Parkway at Vine Street	None	No traffic impact.	None
Stop #14	Northeast corner of Central Parkway and Vine Street	Stop at location of existing parking spaces.	No traffic impact.	Existing parking options available.

Table 4. Streetcar Impacts on the Local Street Network

Streetcar Stop or Road Intersection	Street	Issue	Impact[1] (Build Alternatives 1 and 2)	Mitigation (Build Alternatives 1 and 2) (See Section 5.1.5.3 for details)
Intersection	Central Parkway at Walnut Street	Right turn only lane.	Elimination of right turn only lane required with loss of one metered space on Walnut Street.	Alternate would be to reconfigure curb, walk and existing private parking at southwest corner of intersection to allow both right turn movements with loss of one metered space. Signal preemption required.
Walnut Street from Central Parkway to 7th Street	Walnut Street	Alignment modification from Feasibility Study.	Conflicts with loading zones.	Streetcar moved out of the curb lane and into the adjacent lane to avoid eliminating on-street parking.
Intersection	Walnut Street at Court Street	None	No traffic impact.	None
Intersection	Walnut Street at 9th Street	None	No traffic impact.	None
Stop # 15	Near the Southwest corner of Walnut and Ninth streets	Stop near loading zone and curb thru lane and existing parking spaces.	Loss of three metered spaces.	Bump out. Designed to miss the loading zone and curb thru lane that becomes a left turn lane at 7th Street.
Intersection	Walnut Street at 8th Street	None	No traffic impact.	None
Intersection	Walnut Street at 7th Street	None	No traffic impact.	None
Stop # 16	Near northeast corner of Walnut Street and 7th Street	Originally designed to miss the parking areas in front of the Aronoff Center. City Planning recommends putting stop where the parking occurs in order to get the streetcar out of the traffic flow.	Combine with bus stop.	Queue jump can occur at 6th Street instead of at 5th Street.
Intersection	Walnut Street at 6th Street	Alignment switches from far left. Stop near Fountain Square.	No traffic impact.	Signal preemption required.
Intersection	Walnut Street at 5th Street	None	No traffic impact.	None

Table 4. Streetcar Impacts on the Local Street Network

Streetcar Stop or Road Intersection	Street	Issue	Impact[1] (Build Alternatives 1 and 2)	Mitigation (Build Alternatives 1 and 2) (See Section 5.1.5.3 for details)
Stop # 17	Southwest corner of Walnut and 5th streets	Designed to avoid the large bus station at Fountain Square, the garage entrance from Walnut Street, the bus turning movement into Government Square and the street frontage at the Federal Building on the east side of Walnut Street.	Loss of three peak hour metered spaces.	Bump out.
Intersection	Walnut Street at 4th Street	None	No traffic impact.	None
Intersection	Walnut Street at 3rd Street	None	No traffic impact.	None
Stop #18	Walnut Street between 3rd and 2nd streets	Grade change on Walnut Street.	No traffic impact.	Engineering design for grade mitigation likely required at this location.
Intersection	Walnut Street at 2nd Street	None	No traffic impact.	Queue jump required.
Intersection	Walnut Street at Freedom Way	No traffic impact if eastern most curb lane on Walnut Street is parking.	No traffic impact.	None
Intersection	Freedom Way	None	No traffic impact.	None
Stop #19	Vine Street (east side) North of Mulberry Avenue	Stop at same location as existing Metro bus stop. Streetcar temporarily blocks thru traffic for short periods.	Combine with bus stop. (Impact by Build Alternative 1 only)	Bump out. Add appropriate warning signs.
Stop #20	Corry Street East of Vine Street	Streetcar will need to reverse directions because it is at end of the line.	Intersection may become congested at times. Potential loss of 11 metered parking spaces. (Impact by Build Alternative 1 only).	Install new traffic signal. Install parking control and related signs.
Stop #21	Vine Street (west side) North of Mulberry Avenue	Streetcar temporarily blocks thru traffic for short periods.	Loss of four unmetered parking spaces. Congestion may occur during peak hours. (Impact by Build Alternative 1 only).	Bump out. Add appropriate warning signs.

1. Impacts highlighted in yellow may be adverse.

The MSF would result in changes to existing streets. Locations 1 and 2 would require Henry Street to be converted from a two-way to a one-way street going eastbound (Table 4). Traffic volumes on Henry Street are low and only minor inconvenience would result. For Location 3, a dedicated center lane would be required on Broadway Street for the streetcar and new traffic signals on the adjacent block of Broadway Street.

Construction related impacts to traffic operations are discussed in Section 5.22.3.

5.1.3.1 Parking Impacts

Build Alternative 1 would require the removal of approximately 61 on-street parking spaces. Build Alternative 2 would require the removal of approximately 46 on-street parking spaces. Fourteen stop locations and four intersections would necessitate removal of these parking spaces (Table 4). This is nine percent of the total number of on-street parking spaces currently available along the route. Locations of existing on-street parking are shown in Appendix C. Of the eliminated on-street parking spaces:

- 24 are metered parking spaces (no restrictions);
- 11 are peak hour metered spaces (pay from 9:00 a.m. – 5:00 p.m.); and
- 22 are unmetered on-street spaces.

There are on-street parking spaces adjacent to or in the immediate vicinity of those spaces removed that are available on a first-come, first-served basis. The replacement spaces are similarly or comparably priced and have the same or similar provisions and time restrictions.

In all cases there are available and comparably priced on-street parking spaces immediately adjacent to the removed spaces, directly across the street or right around the corner. In the downtown area, between Freedom Way and Central Parkway, all of the metered spaces affected are currently priced at $2.00/hour with a two hour limit. This rate is designed to encourage frequent turnover of these spaces and all day parking is not allowed. All of the available adjacent parking spaces are identically priced. There are also surface lots within one to two blocks of these spaces, which are also similarly priced and offer all-day parking for $6.00-$8.00.

In Over-the-Rhine (OTR), rates of on-street parking spaces are lower than in the Central Business District (CBD): six minutes for $0.05, 12 minutes for $0.10, and 30 minutes for $0.25. All of the affected metered spaces have time limits that range from 30 to 120 minutes. As in the Downtown area, there are available and comparably priced on-street spaces in the immediate vicinity. In a few areas, parking spaces that would be affected are at no charge and all of these locations feature similar no-metered spaces in the immediate vicinity.

The area that would experience the greatest reduction of on-street spaces is Henry Street, based on its location of two of the three maintenance and storage facilities under consideration. These spaces are not metered, only sporadically used, and feature a comparable number of non-metered spaces in the immediate vicinity.

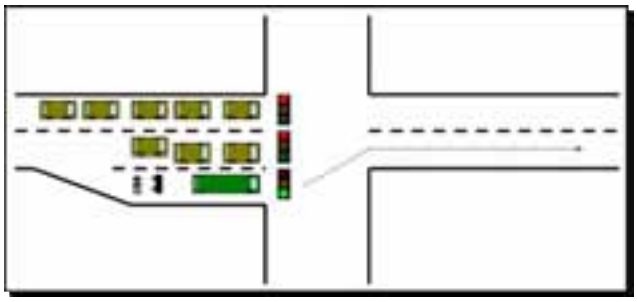
A detailed list and mapping of on-street parking spaces available and number of spaces lost is located in the traffic analysis in Appendix E.

The No Build Alternative would not require the removal of any of the available on-street parking spaces in the study area.

5.1.3.2 Mitigation

The Build Alternatives will require upgrades to the signage, striping and traffic signals at various locations along the alignment for safety and to increase transit speed and reliability. Intersections that are currently controlled by stop signs do not appear to warrant signals at this time. A transit-only, or "queue jump," lane will allow the streetcar to move through the intersection while other traffic is stopped (Figure 7).

Figure 7. Example of Queue Jumping



Curb lane bump-outs will be used wherever possible to minimize removal of curb lane on-street parking. The dual side entry design of the streetcar would allow for stations loading on the left side of the vehicles as it travels in the CBD, and on the right side of the vehicle when traveling in OTR and The Banks. Curb lanes are often used as mandatory turn lanes due to downtown's one-way street grid, making it prohibitive to run the streetcar in the curb lane as it would interfere with turning traffic. Likewise, peak period traffic operations depend on the use of curbside travel lanes that are used as parking lanes during off-peak hours.

Two mid-block signals already exist at the intersection of 13th Street and Race Street and on Walnut Street south of Fifth Street. Mid-block signals will be designed with transit priority, thus allowing the streetcar to change lanes safely while traffic in adjacent lanes waits at a red light.

The elimination of 61 parking spaces would not be a notable impact, as there are a number of other parking options available in the study area. In addition, the parking garage planned for the redeveloped Washington Park near Elm Street and 14th Street will have approximately 500 new spaces. Public parking is also available at many existing lots within the study area, including facilities at:

- Elm Street at 14th Street
- Elm Street at Central Parkway
- Main Street at Central Parkway
- Main Street at 3rd Street
- Main Street at 6th Street
- Main Street at 7th Street
- Main Street at 8th Street
- Main Street at 9th Street
- Main Street at Central Parkway
- Walnut Street at 9th Street
- Walnut Street at 8th Street
- Walnut Street at 5th Street
- Walnut Street at 3rd Street
- Walnut Street at Central Parkway
- Vine Street at 12th Street
- Vine Street at Mercer Street

5.2 Transportation

Alternative transportation options exist within the study area. Pedestrian facilities, bicycle routes, and bus transit service were identified in the study area through field review and from secondary sources.

5.2.1 Existing Transportation Conditions

5.2.1.1 Pedestrian

Sidewalks are available throughout the entire study area along the streets that both Build Alternatives follow. Pedestrians are able to cross at nearly all intersections throughout the study area.

5.2.1.2 Bicycle

The City of Cincinnati adopted a Bicycle Master Plan in June 2010. None of the streets on which the streetcar would operate are designated as preferred bicycle routes and are not recommended for any preferential treatment such as bike lanes or shared lane pavement markings ("sharrows"). The Bicycle Master Plan recommends different streets in Downtown, OTR and Uptown for preferential treatments and usage. Similarly, the Cincinnati Bicycle Route Guide, produced by the Ohio Kentucky Indiana Regional Council of Governments (OKI) in 2009, does not list any of the streets used by the streetcar as preferred routes. It does, however, identify the segment of Vine Street between McMicken and McMillan as a "Use with Caution" and "Memorable Hills (Points Uphill)" roadway due to its relatively steep grade, sight lines and traffic volumes. The Bicycle Route Guide recommends alternative routes between downtown and Uptown that do not interact with the streetcar alignment.

5.2.1.3 Bus Transit

Southwest Ohio Regional Transit Agency (SORTA), which operates Metro, and the Transit Authority of Northern Kentucky (TANK) provide local bus service to and/or within Cincinnati (Appendix F). Many downtown stops, along with the Government Square transit center, function as primary transfer points among routes in both systems (Figure 8). The alignment for the streetcar alternatives is shared by several existing bus routes.

5.2.2 Potential Impacts

5.2.2.1 Pedestrian and Bicycle

There would not be a loss of pedestrian or bicycle facilities as a result of Build Alternative 1 or 2. Impacts would mostly occur at intersections and stops where curb bump-outs are needed. The use of signs at traffic signals where pedestrians would cross the path of the streetcar would limit impacts to pedestrians.

The amount of space available for a bicyclist on Vine Street would be reduced with Build Alternative 1 would be wide enough to accommodate a bicyclist at the same time as the streetcar. No bicycle routes would be eliminated as a result of Build Alternative 1 or 2.

Figure 8. Bus Routes

For a bicyclist, there is a potential to catch a wheel in the track groove at every intersection where a left-turn is possible. Also, there may be concern that rails may have an electric shock. However, the steel rails in the pavement are not electrified and are insulated to protect against any stray currents.

Development of a MSF would not impact pedestrian and bicycle facilities at any of the three proposed sites.

The No Build Alternative would not have an impact on pedestrian and bicycle facilities.

5.2.2.2 Bus Transit

The streetcar would create new, direct connections not currently possible by bus.

The streetcar project is not designed to, nor is it expected to, change or replace existing bus routes. SORTA has several routes that operate through Downtown and OTR, and a number of routes that operate through Downtown, OTR and Uptown. However, there is no route that provides a direct connection from the Riverfront and Government Square to Findlay Market, or from Uptown to Findlay Market and the Riverfront (Figure 8).

All of the SORTA routes in the study area are local service designed primarily to transport people from neighborhoods and suburban communities to and from the urban core. They are not designed to provide a simple, direct shuttle or circulator service for short-haul trips between Downtown, OTR, and Uptown. All current local bus routes stop every one to two blocks as described in Section 2.3.

With the No Build Alternative, there would be no impact on existing transit operations and stops since no new station stops would be introduced to the study area.

Because there is no comparable bus route along the streetcar alignment, it is difficult to compare travel time. However, based on the average speed of buses Downtown and the projected running time of the streetcar, travel speed will be similar since both modes operate in mixed traffic. The streetcar may have a modest advantage due to:

- Fewer stops;
- Pre-paid fare collection, facilitating passenger boarding;
- All low-floor vehicles and raised curbs, facilitating boarding and alighting for persons with disabilities, passengers with strollers, and the general public; and
- Multiple and wider doors and aisles, facilitating passenger boarding and alighting.

Service frequency varies by route, from 10 minutes during peak periods on the Clifton Avenue corridor to 30 to 40 minutes along other corridors. The main line routes currently experience overcrowding during peak periods, hindering the use of the bus for short trips.

The streetcar would provide additional connectivity between the bus systems and the origins/destinations within the study area. Both Build Alternatives would have stops near Government Square transit center, allowing passengers to transfer to and from nearly all SORTA (local and express), TANK (local and express) and Clermont Transit Connection (CTC) (express only) routes.

There would be impacts on a few bus stops, as described in Section 5.2.1 and in Table 4. SORTA is currently in the process of reviewing bus stop spacing with the intent of consolidating duplicate stops with the streetcar, such as those at Washington Park. As a result, impacts of the streetcar on access to the bus system are expected to be minimal. No impacts are expected to TANK and CTC routes or stops.

Because the streetcar would not duplicate or compete with existing bus service, there would not be a negative impact on bus ridership. The streetcar would, in part, serve a new travel market consisting of persons who currently do not use public transportation, especially for short trips. The consolidation of stops would coincide with implementation of the streetcar and have a minimal impact on bus ridership. By improving regional transit connectivity, the streetcar may have a positive impact on bus ridership, especially on express routes where the dedicated Downtown-Uptown connection at the Government Square Transit Center is currently lacking.

None of the proposed locations for the MSF would impact existing bus transportation routes. Bus stops would not be removed or relocated to accommodate any of the proposed MSF locations.

5.2.2.3 Transportation Mitigation

Mitigation measures for impacts to pedestrians and bicyclists will include:

- The use of signs at traffic signals where pedestrians will cross the path of the streetcar will limit impacts to pedestrians.
- An education program oriented to bicyclists, encouraging use of designated, alternative routes, along with the use of signage to warn cyclists of the dangers of riding along and the tracks.

5.3 Zoning

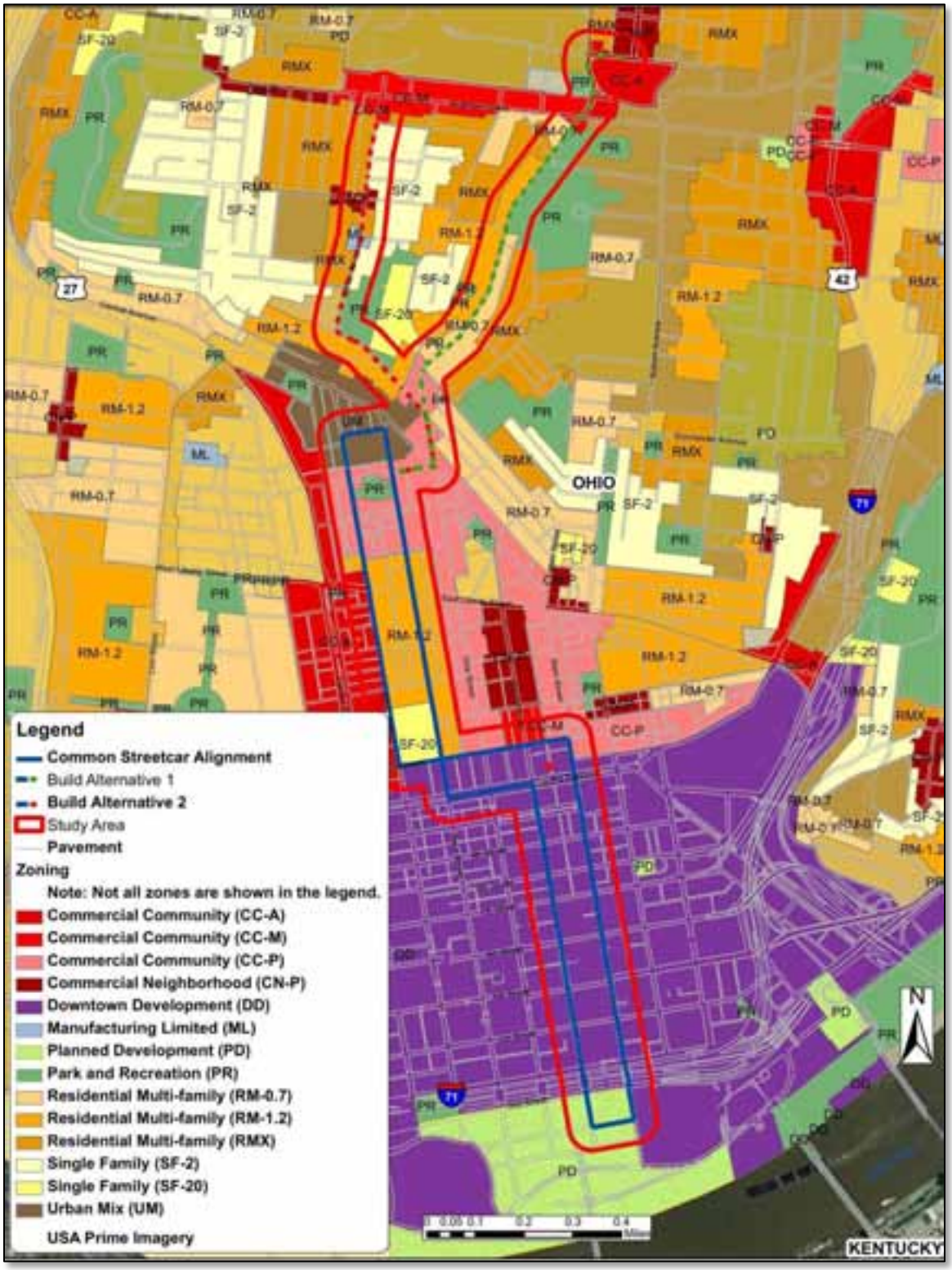
Existing zoning classifications in the study area were reviewed to determine compatibility with the Build Alternatives. Existing zoning in the study area was identified through data obtained from Cincinnati Area Geographic Information System (CAGIS) (2009).

5.3.1 Existing Conditions

OTR contains 24 zone districts ranging from R-7, High-Density Residential, which permits some business use and housing at a density of 79 units per acre, to 0-2, Office Zone, to M-2, Manufacturing Zone District. This is a result of the highly mixed land use patterns in the neighborhood. The following zones cover the study area (Figure 9):

- DD (the entire Downtown/CBD): Downtown Development
- CC-P: Commercial Community
- CC-A: Commercial Community
- CC-M: Commercial Community
- CN-P: Commercial Neighborhood
- ML: Manufacturing Limited
- PD: Planned Development
- RM-1.2: Residential Multi-family
- RM-0.7: Residential Multi-family
- RMX: Residential Multi-family
- SF-20: Single Family
- SF-2: Single Family
- PR: Park and Recreation
- UM: Urban Mix

Figure 9. Existing Zoning Classifications



5.3.2 Potential Impacts

Build Alternatives 1 and 2 would be within existing transportation right of way and therefore do not require the use of a new zone in the study area. No zoning changes are required to implement the streetcar. The No Build Alternative would not impact the zoning within the study area.

All three alternative sites for the MSF are allowed and will be consistent with the current zoning in each respective area. Locations 1 and 2 are within the Urban Mix zone and Location 3 is in the Downtown Development zone.

5.3.3 Zoning Mitigation

No zoning changes or mitigation measures are required to implement the streetcar.

5.4 Land Use

Land uses in the study area were identified through review of various local plans, aerial photographs, field reviews, and CAGIS. Land use impacts and potential acquisition needs are discussed in this section.

A review of local plans and projects was completed to determine if the streetcar project would be consistent with plans developed by the City of Cincinnati. Plans reviewed included, but were not limited to, comprehensive, transportation, economic, and development plans.

5.4.1 Existing Conditions

Existing land uses within the study area are shown in Figure 10. The alternatives for the streetcar project go through various land uses within the three distinct areas of Downtown, OTR, and Uptown.

5.4.1.1 Neighborhood Land Uses

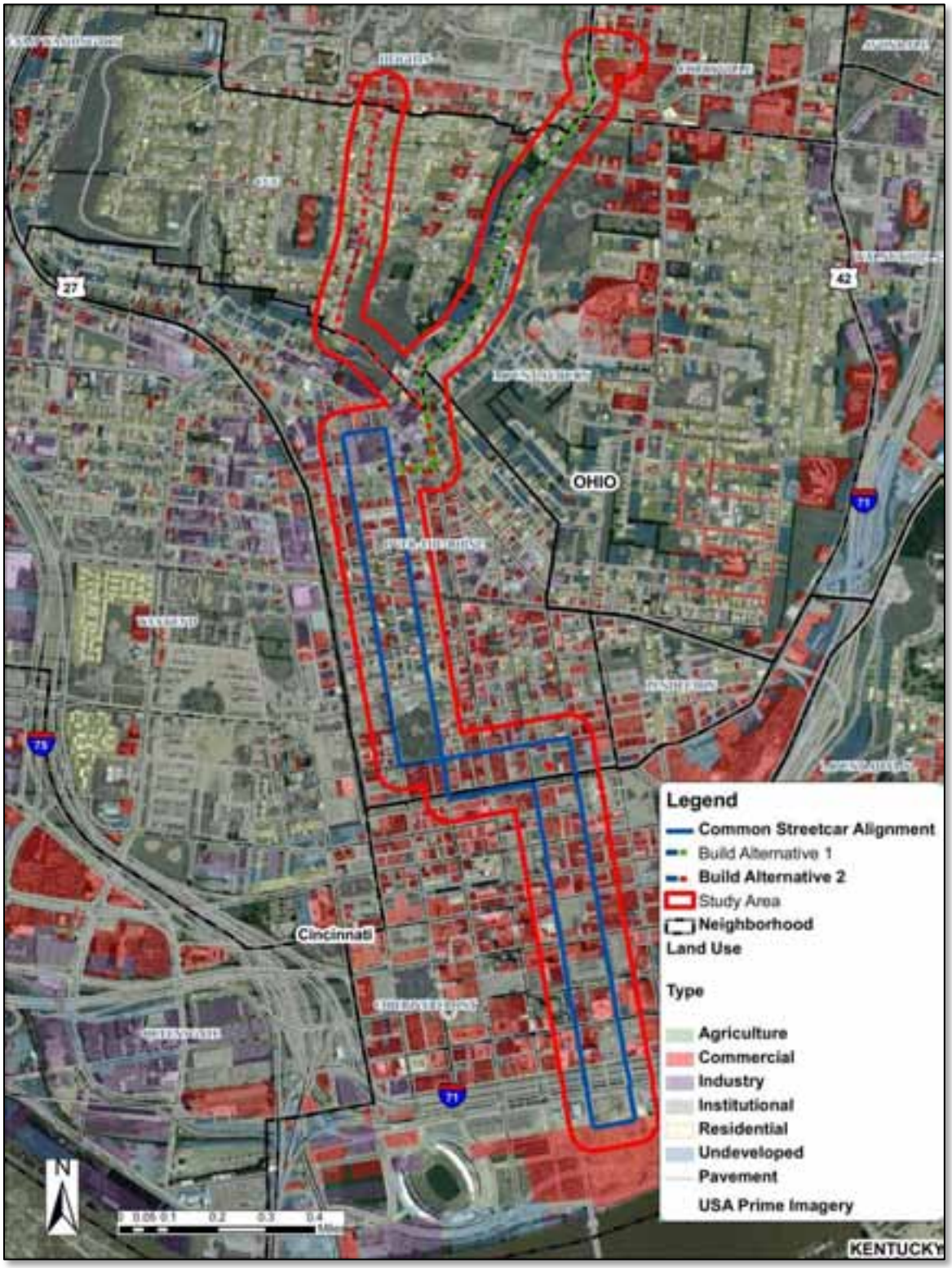
Downtown/Central Business District (CBD)

Land uses in downtown are typical for a CBD. They include retail, commercial, office, governmental institutional, residential, sports, hospitality and entertainment. Civic and public gathering places, parks, a major transit presence, parking garages, and surface parking lots are also common.

Over-the-Rhine (OTR)

OTR is a mixed-use commercial and residential neighborhood. Distinctive land use patterns are mixed commercial/residential along Vine and Main streets, large institutional and office uses along Central Parkway and Central Avenue, single and multiple-family residential units, and industrial uses north of Liberty Street along McMicken Avenue. Many of the retail and small businesses are located on the first floor of two- to four-story buildings throughout the neighborhood. The neighborhood has substantial open space in Washington Park and several other smaller green spaces and park areas. Notable civic institutions from a land use standpoint include Findlay Market, located north of Liberty Street, and Music Hall, located south of Liberty Street. OTR is also the site of several social service agencies and outreach services.

Figure 10. Existing Land Use



Uptown

Land uses in Uptown include mixed-use commercial, institutional and residential. The portion of Uptown in the vicinity of the study area is mostly institutional, bordering the University of Cincinnati campus. Residential uses are concentrated along West Clifton Avenue and Vine Street. The Clifton Heights and Corryville business districts feature a mix of retail, restaurants, commercial and open space uses centered on Calhoun and McMillan streets.

5.4.1.2 Local Planning Documents

The streetcar project is consistent with several local plans and development projects as described in Section 2.4 including:

- GO Cincinnati (2008)
- Agenda 360 (2009)
- OKI 2030 Regional Transportation Plan (2008)
- Over-The-Rhine Comprehensive Plan (2002)
- Over-The-Rhine Comprehensive Plan Implementation Update (2002 – 2006)
- Uptown Parks and Neighborhood Revitalization Plan (2006)
- Uptown Transportation Study (2007)
- University Village Urban Renewal Plan (2005)
- Central Riverfront Urban Design Master Plan (2000)
- Washington Park Master Plan (2008)
- SORTA MetroMoves (2002)

5.4.2 Potential Impacts

5.4.2.1 Land Use

Build Alternatives 1 and 2 are compatible with existing land uses in the study area. The medium to high-density development that is characteristic of the study area was originally built around streetcar lines. The modern streetcar would support the mixed land uses in the study area and potentially influence the redevelopment of the high percentage of vacant land uses in the study area. The project would support the activity centers in the study area that are traffic generators. The University of Cincinnati (UC), commercial land uses, and a CBD are all activity centers that have the potential to generate streetcar and additional transit use. Streetcar stops are proposed in strategic locations that would provide easy access to the activity centers.

The MSF is consistent with existing and planned land use at each of the proposed sites. The uses are a mix of industrial and commercial.

The No Build Alternative would not impact land use within the study area.

5.4.2.2 Consistency with Local Plans

The Cincinnati Streetcar project is expected function as a key factor that has the potential to support and encourage new development in study area. This development will largely be infill since this area is mostly developed. Build Alternatives 1 and 2 are consistent with local plans. The Build Alternatives, as well as the proposed MSF locations, are located in areas that are planned for redevelopment or are currently experiencing new development.

The No Build Alternative would not support and encourage new development in the study area and is not consistent with local planning documents.

5.4.2.3 Land Acquisition and Relocations

No displacements or relocations of residences, businesses, or community facilities are anticipated for either Build Alternative 1 or 2 for trackway and stop locations. Nearly all work related to trackway and stop locations would be completed within existing right of way. Construction related impacts to residences and businesses are described in Section 5.22.3.

Property may need to be acquired for the MSF, dependent on the location. Location 1 on the south side of Henry Street would not require displacements or relocations. Location 2 on the north side of Henry Street would result in a displacement and require the relocation of the Volunteers of America (VOA)/Cincinnati Success for Life Center halfway house. Location 3 on Broadway between Third Street and East Pete Rose Way is currently an empty lot used for temporary construction staging by the City of Cincinnati.

Three of the electrical substations would be located in areas that are currently parking lots or city property. The substation between Second Street and eastbound Fort Washington Way (I-71) just east of Main Street would be in an unused middle portion of roadway right of way. These locations are identified in the conceptual engineering plans included in Appendix C. No property will be required for substations as they would be located in existing public parking lots and garages.

The No Build Alternative would not displace any residences or businesses and it would not require any property acquisition.

5.4.3 Land Use Mitigation

If MSF Location 2 is selected, the VOA/Cincinnati Success for Life Center halfway house is expected to be able to relocate within the same neighborhood to minimize impact that will result from displacement. Since federal funds are directed to the streetcar, the project will comply with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. This act provides protection and assistance for residents and businesses affected by the acquisition or demolition of real property during the construction of federally funded projects.

5.5 Community Characteristics

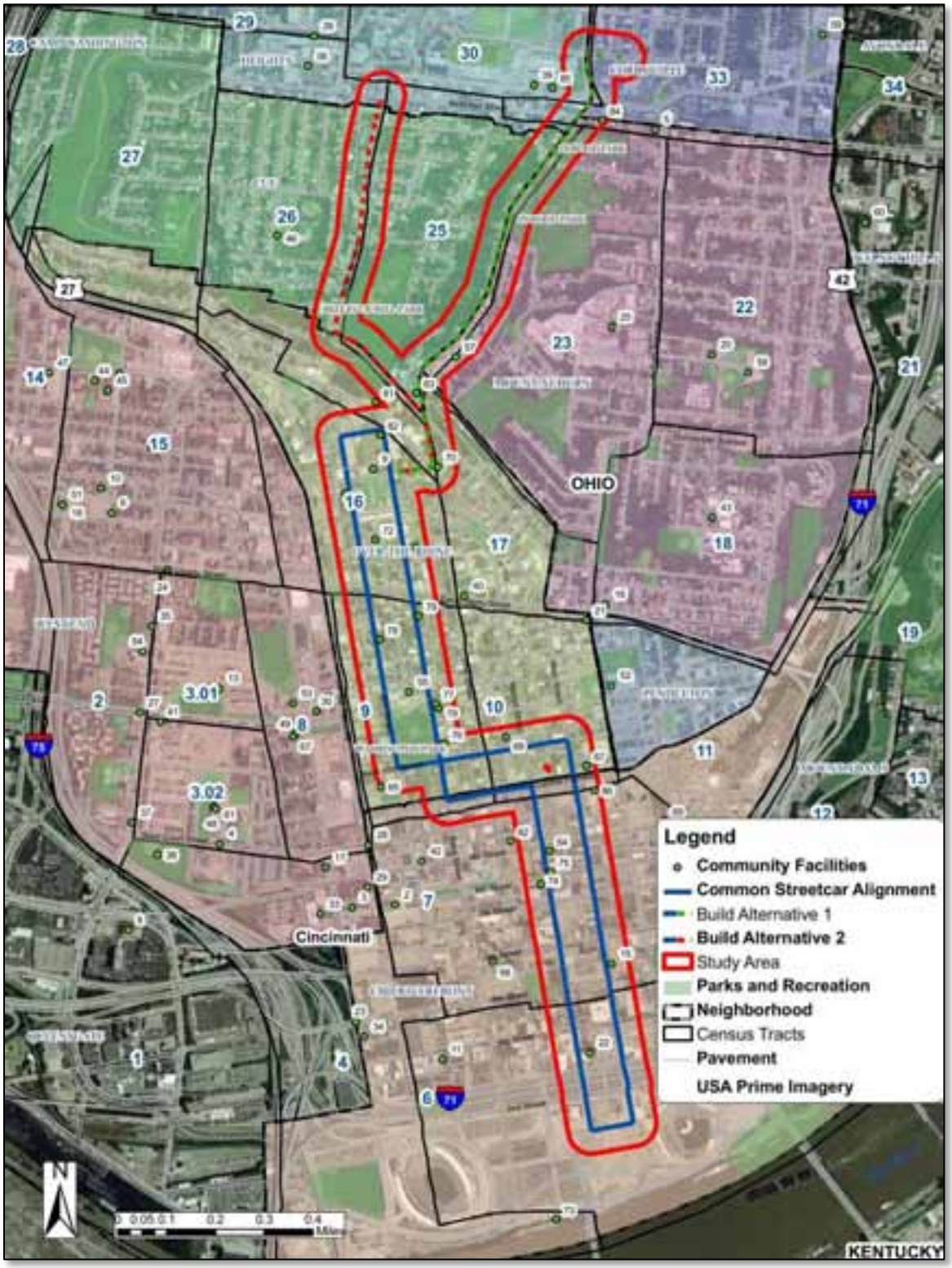
This section identifies the characteristics of the neighborhoods and existing community facilities. Facilities identified included parks and recreation, churches, schools, social services, fire, and police. Field reviews, aerial photographs, and previous planning documents were utilized to assess existing conditions of neighborhoods. The existing community within neighborhoods would be consumers of the proposed transportation mode and would also be directly affected by the project. Build Alternatives 1 and 2 were assessed on physical impact, access, and community cohesion impacts.

5.5.1 Existing Conditions

5.5.1.1 Neighborhoods

The proposed streetcar would travel through three neighborhoods/areas in Cincinnati. These areas include Downtown/CBD; OTR; and Uptown (Figure 11). Activity centers within these neighborhoods are discussed in Section 2.2. General demographic data for the neighborhoods are shown in Table 5.

Figure 11. Neighborhoods and Community Facilities



Downtown/Central Business District

Downtown is bordered by I-75 to the west, the Ohio River to the south, I-71 to the east, and Central Parkway to the north. Downtown is a central business district with a variety of uses. Downtown is bordered by OTR and the West End neighborhoods.

Table 5. Neighborhood General Population Data (2000)

Neighborhood	Total Population	Total Households	Owner Occupancy	Median Household Income	Total Employees
Downtown/ CBD	3,189	1,512	1.0%	$20,618	65,349
Over-the-Rhine	7,638	3,594	3.9%	$11,363	8,393
Uptown	16,119	6,862	17.5%	$20,685	14,115

Source: Social Compact Inc. Cincinnati Neighborhood Market Drilldown. June 2007.

Over-the-Rhine

The OTR neighborhood is located in the heart of the City of Cincinnati, north of the CBD. It is bordered by the West End, Mount Auburn, Pendleton, and Clifton/University Heights/Fairview (CUF) neighborhoods. The neighborhood boundaries generally follow Central Parkway, Central Avenue, Clifton Avenue, and Sycamore Avenue. OTR is an urban residential neighborhood. New development has occurred along Vine Street, called the Gateway Quarter, a mixed use project that includes condominiums, apartments, retail and dining. Points of interest in OTR include Washington Park, Music Hall, School for the Creative and Performing Arts (SCPA), and the Ensemble Theatre.

OTR is one of Cincinnati's oldest neighborhoods, developing in the early to mid – 19th century. The neighborhood is listed as a National Register of Historic Places Historic District. Although OTR is approximately 67 percent vacant, it remains densely developed, as most of the vacancy is in the form of standing, but vacated, structures.

Uptown

The Uptown/CUF neighborhoods are located north of OTR. The community is a mixture of established neighborhoods, boutiques, restaurants, churches, hospitals, and the University of Cincinnati. The neighborhoods are densely populated with a large student population. The student population is somewhat seasonal although off-campus rental housing is generally occupied by students throughout the year. There is also notable summer school activity. Many of the residences are apartment complexes and multifamily rental housing. Residents are predominantly white; minorities comprise approximately 20 percent of the population. Uptown/CUF's business district (Clifton Heights Business District) is centered on Calhoun and McMillan streets.

The Uptown Consortium, an organization consisting of Uptown's five largest employers (University of Cincinnati, Cincinnati Zoo & Botanical Gardens, The Health Alliance of Greater Cincinnati, TriHealth, Inc., and Cincinnati Children's Hospital Medical Center) undertakes a variety of investment and program activities to help provide housing, healthcare and job

opportunities. The Uptown Consortium's areas of focus generally include the neighborhoods of Avondale, Clifton, Clifton Heights, Corryville, Fairview, Mount Auburn, and University Heights.

5.5.1.2 Community Facilities

Community facilities located within or adjacent to the study area are listed in Table 6 and shown in Figure 11 (see figure for corresponding identification number). Additional community facilities outside of the study area are also noted in Figure 11 and in Appendix F.

Table 6. Community Facilities Within and Adjacent to Study Area

Facility Type	Name	Location	Figure ID
Institutions	Cincinnati Public Library - Main Branch	800 Vine Street	62
	Cincinnati Public Library – Corryville Branch north of study area in Uptown	2802 Vine Street	63
	YWCA	898 Walnut Street	64
	YMCA	1105 Elm Street	65
Post Offices	Downtown/Queen City Branch	525 Vine Street	66
Schools	School for Creative and Performing Arts	1223 Central Parkway	67
	Rothenberg Preparatory School	2120 Vine Street	57
	Art Academy of Cincinnati	1212 Jackson Street	68
	University of Cincinnati	2600 Clifton Avenue	-
	Hughes Center High School	2515 Clifton Avenue	56
	Cincinnati Hills Christian Academy - Armleder School	140 West 9th Street	42
	Fairview – Clifton Language School	3689 Clifton Avenue	46
	Corryville Catholic School	108 Calhoun Street	39
	St. Francis Seraph	14 East Liberty Street	40
Police/Fire	Police District 1	310 Ezzard Charles Drive	30
	Police District 5	1012 Ludlow Avenue	
	Fire Company 14 (Headquarters)	430 Central Avenue	23
	Fire Company 3 (District 1)	386 East 9th Street	69
	Fire Company 5 (District 1)	8 East McMicken Street	70
	Fire Company 19 (District 1)	2846 Vine Street	71
	Records Cincinnati PD		31
	Traffic Cincinnati PD		32
Parks/Recreation	Washington Park	12th Street between Elm and Race streets	55
	Inwood Park	2308 Vine Street	-
	Bellevue Hill Park	2191 Ohio Avenue	-
	OTR Recreation Center	1715 Republic Street	72
	Central Riverfront Park (construction in progress)	Mehring Way between Elm and Main streets	73
Churches	St. Louis Church	29 East 8th Street	74
	Archdiocese of Cincinnati	100 East 8th Street	75
	First Lutheran Church	1208 Race Street	76
	Nast-Trinity Methodist Church	1310 Race Street	77
	New Unity Church of God	1508 Elm Street	78
	Prince of Peace Lutheran Church	1524 Race Street	79

Table 6. Community Facilities Within and Adjacent to Study Area

Facility Type	Name	Location	Figure ID
Churches	New Prospect Baptist Church	1829 Elm Street	80
	Philippus United Church	106 West McMicken Avenue	81
	House of Deliverance	1939 Race Street	82
	Nazareth Church of God in Christ	2013 Vine Street	83
	Asbury Tabernacle	11 East McMillan Street	84
	Old St. George	42 Calhoun Street	85
Hospitals (adjacent to study area)	Deaconess Hospital	311 Straight Street	26
	Christ Hospital	2139 Auburn Avenue	25
Government	Hamilton County Courthouse	Main Street and Central Parkway	86
	Hamilton County Family Services	Central Parkway and Main Street	87
Day Care Services	YMCA Christ Child Day Nursery	112 Findlay Street	9
	Emanuel Child Care Center	Race Street	19
	Bright Horizon's Family Solutions, Inc.	550 Main Street	15
	Walnut Corner Children's Center	312 Walnut Street	22
	TLC - A Bright Horizon Center	4th Street and Elm Street	11
	Lytle Park Child Development Center	300 Lytle Street	14

Source: Cincinnati Area Geographic Information System, 2009

The following are additional places of interest that are within the study area or accessible from the streetcar Build Alternatives. As shown previously, these places of interest are included in Figure 4.

- National Underground Railroad Freedom Center
- Findlay Market
- Contemporary Arts Center
- Great American Ballpark
- Music Hall
- Aronoff Center for the Arts
- Fountain Square

5.5.1.3 Parks and Recreation

Parks and recreational facilities within the study area are shown on Figure 11. There are four parks that are publicly owned and primarily used for recreational purposes:

- Washington Park is located in OTR between 12th and 14th streets between Elm and Race streets. It is one of the oldest parks in the City of Cincinnati and renovation began in 2010.
- Bellevue Hill Park, in Uptown, is located on West Clifton Avenue.
- Central Riverfront Park is currently in the planning and design stage as part of The Banks development along the Riverfront. The first phase of the park is planned to open in the spring of 2011.
- Inwood Park, in Uptown, is located on Vine Street, south of McMillan Street.

An additional recreational facility is the OTR Recreation Center, located near Findlay Market.

5.5.2 Potential Impacts

Build Alternatives 1 and 2 would have the same potential impacts to community facilities and community cohesion within the portion of the streetcar route south of Henry Street. No community facilities would be directly impacted by the project. The streetcar would provide additional access to community facilities and parks along the route and adjacent to the study area. Community cohesion would be enhanced by the presence of a highly visible, high frequency fixed transit line with 10 station stops serving OTR alone.

Build Alternatives 1 and 2 have the potential to impact school bus staging and parent drop-off locations for SCPA. SCPA is bounded by Central Parkway, Elm Street, Race Street and 12th Street. A streetcar stop proposed on 12th Street is in the same area that is used for student pick-ups and drop-offs. Coordination between the streetcar operation and final student arrival/departure bus staging plans will be necessary to mitigate potential conflicts.

Build Alternative 1 will run by Inwood Park. In part, due to the grade on adjacent Vine Street, a stop is not proposed to directly serve Inwood Park. The in-street alignment would have no direct impacts to the park. All catenary poles added as part of the operating system will be within existing right of way and not directly impact the park. Build Alternative 2 would provide access to Bellevue Hill Park. Proposed stops located on both Elm and Race streets at Washington Park would provide direct access to the park under both Build Alternatives. Neither alternative will impact plans of the Cincinnati Riverfront Park; but both alternatives would provide for a stop location to access this area. The OTR Recreation Center would be accessible by stops on Elm and Race streets.

Neither of the Build Alternatives would have an impact on parks and recreation facilities.

The streetcar is not expected to create any new barriers within the downtown, OTR, or Uptown neighborhoods. Both Build Alternatives would benefit community cohesion by helping to increase development potential and reducing the amount of vacant areas. Residential development has increased recently in the OTR neighborhood and it is anticipated to increase with this project, based on examples from other cities that have built a streetcar, some of which are described in Section 5.6.2. Also, as demonstrated by the results of other streetcars across the United States (US), the project has the potential to facilitate transit-oriented development. Residences would be better connected to community facilities since stop locations are proposed at or near parks and other community facilities. Because it would be one of the few neighborhoods in Cincinnati with streetcar service, and because the streetcar line would be a prominent transit facility, the streetcar could provide a unique neighborhood characteristic to OTR. In addition for OTR, a fixed guideway will improve connections to adjacent neighborhoods — downtown and Uptown — that are the largest and second largest employment and activity centers in the region. Portions of this neighborhood are largely vacant but are experiencing new infill development in certain locations (see Sections 5.6.1.2 and 5.6.1.3 for more detail).

None of the proposed locations for the MSF are on or adjacent to park and recreation facilities. Locations 1 and 2 are at sites that are currently in an immediate industrial area. However, Location 2 is currently a facility functioning as the VOA halfway house will result in relocation. Location 3 is not within a cohesive community and would not have community impacts.

The No Build Alternative would not impact community facilities and would not improve community cohesion in the study area.

5.5.3 Community Characteristic Mitigation

If MSF Location 2 is selected, the VOA halfway house is expected to be able to relocate within the same or comparable neighborhood to minimize community impacts that would result from its displacement.

Coordination between the streetcar operation and student arrival/departure bus staging at the SCPA will be necessary to mitigate potential conflicts.

5.6 Economic Conditions

Transit provides mobility to users and accessibility to jobs and housing. Based on the experiences of cities such as Portland, Oregon; Seattle, Washington; Little Rock, Arkansas; Tampa, Florida and Kenosha, Wisconsin streetcars have proven that they facilitate the attraction of businesses, encourage investment of time and money, and help attract housing and jobs. In other cities throughout the US, streetcars have demonstrated their potential to stimulate broad economic development benefits.

5.6.1 Existing Conditions

Population in all census tracts within the study area declined from 1990 to 2000, resulting in decreased tax revenues for the City of Cincinnati (Section 2.1). Cincinnati has also seen a loss of businesses over the past 15 years, resulting in a reduction in jobs. However, major investments since 2000 appear to have stabilized and fostered a turnaround in population in some of the study are neighborhoods, including the CBD and OTR.

5.6.1.1 Employment

The Build Alternatives would operate within the two highest concentrations of employment in the region: downtown and Uptown (University of Cincinnati and medical complex). Table 7 shows characteristics of persons employed by census tract in the study area.

Table 7. Employment Characteristics (2000)

Census Tract	Total Employed	Unemployed	Median Household Income
6	391	50 (11.3%)	$35,278
7	720	163 (18.5%)	$17,721
9	558	260 (31.8%)	$6,972
10	535	55 (9.3%)	$14,539
16	355	156 (30.5%)	$8,175
17	366	149 (28.9%)	$8,511
25	1,331	88 (6.2%)	$19,802
Cincinnati	150,574	11,892 (7.3%)	$29,493

The largest concentrations of unemployment are in OTR. The *Over the Rhine Comprehensive Plan* (2002) noted the lack of job opportunities that is, in part, due to the lack of economic activity in the neighborhood. However, employment is expected to slightly increase by 2030 in the overall Cincinnati area.

5.6.1.2 Vacancy

Approximately 92 acres of land is vacant or occupied by parking lots along the proposed streetcar alignment. Portions of OTR north of Liberty Street have more vacant land than the portion near Central Parkway in the Gateway Quarter. City of Cincinnati records indicate that of the estimated 280 vacant buildings in OTR nearly 75 percent - or roughly 200 – are located north of Liberty Street.

According to the OTR *Comprehensive Plan* (2002), there has been a continual decline of both population and economic investment from 1970 to 2002. However, in the mid- to late-2000's, housing occupancies have increased as a result of the Gateway Quarter development.

5.6.1.3 Development (Existing and Planned)

Several development plans have been conducted and implemented in and around the study area. The Cincinnati Streetcar project has the potential to influence these plans. Several projects have been completed, others are under construction, and others are planned (Figure 12).

Downtown:

- Renovation and revitalization of Fountain Square and its ongoing transformation into a popular entertainment district (completed; new stores and restaurants are planned)
- Expansion of the Duke Energy Convention Center (completed).
- Construction of the Great American Tower at Queen City Square, which became the tallest building in Cincinnati when it opened in January 2011 (completed).
- Relocation of several thousand Procter & Gamble employees from suburban sites to its downtown headquarters (completed).
- Construction of Phase 1 of The Banks development on the riverfront, scheduled to open in 2011. It will include housing and commercial space (under construction).
- Conversion of the Metropole building into a luxury hotel (planned).
- A significant increase in housing in the CBD and OTR, located in renovated structures and new construction (partially completed; additional units under construction and planned).

OTR:

- Renovation of Findlay Market's main market house (completed).
- Development of the Gateway Quarter, focusing on the renovation of existing structures into market rate housing with associated retail has resulted in 400 new residential units. The Gateway Quarter is centered at Vine and 12th streets. Development projects being currently being undertaken by Cincinnati Center City Development Coorporation (3CDC) are extending north on Vine Street and along the Race Street and Elm Street corridors between 14th and Liberty streets (partially completed; new phases under construction and planned).
- The new K-12 SCPA, occupying an entire city block on the south side of Washington Park, opened in August 2010 (completed).
- A renovation of Washington Park will be complete in 2012 (planned).
- Renovation of Music Hall is scheduled to begin by 2011 (planned).
- The revitalized Rookwood Pottery moved its operations from outside the area to Race Street (completed).

Figure 12. Development Activities Near Study Area Since 2005

Uptown:

- The Calhoun Street Marketplace was built to accommodate 291 units of student housing and 37,000 square feet of commercial space that draws students and customers from outside the area (completed).
- An extension of the Calhoun Marketplace as far east as Vine Street is being designed (planned).
- New market rate housing was constructed on Jefferson Avenue, across from the UC campus (completed).

5.6.2 Potential Impacts

The routes for Build Alternatives 1 and 2 were selected, in part, to serve planned redevelopment areas and stimulate reinvestment in those areas. The *Streetcar Feasibility Study* (2007), based on other cities with streetcar service, found potential economic benefits that include increased development density, stimulation of housing demand near stations, and increased property value.

As determined by the study, approximately 1,500 housing units could be created in vacant or underutilized buildings in the vicinity of the streetcar route. Up to 314 new residential units could be created within 10 years of the streetcar opening.

The streetcar project is anticipated to help bring economic development to Downtown, Uptown, and especially OTR. Other cities (e.g. Portland, Little Rock, and Seattle) that recently opened streetcar lines demonstrate new investment occurred within three blocks of their streetcar project areas. For the proposed Cincinnati Streetcar, most development is expected to occur within one to three blocks of the streetcar alignment (Figure 13). The amount of development anticipated to occur as a result of either Build Alternative 1 or 2 cannot be certain, but other examples have shown economic impacts to be substantial.

For example, industry research and reporting have confirmed the potential for improved housing availability as a result of similar streetcar projects in the US. In the report prepared for the Federal Transit Administration (FTA), *Realizing the Potential: One Year Later- Housing Opportunities Near Transit in a Changing Market* (December 2008) by the Center for Transit-Oriented Development, the experience of streetcar extensions in Portland was examined. This report noted that, “In spite of recent losses, home sales in the streetcar neighborhoods have dramatically outperformed the region.”

Industry research has also identified the potential of generating economic development in the vicinity of streetcar stops. In the report sponsored by FTA, *Relationships Between Streetcars and the Built Environment* (2010) by the Transportation Research Board Transit Cooperative Research Program (TCRP) Synthesis 86, the positive impact on property values has been documented. For example, the appraised values of property located within ¼-mile of streetcar stops have been far greater than the average for the city of Memphis as a whole. These include houses, condominiums and apartments.

The report *Street Smart: Streetcars and Cities in the Twenty-First Century* (2009) by the American Public Transportation Association and the Community Streetcar Coalition documents several case studies of economic investment along streetcar lines that would not have occurred without the investment in the streetcars. The characteristics of these systems and case studies are not dissimilar and are relevant to Cincinnati and the Cincinnati Streetcar project. Private

returns on public investment in streetcar lines, calculated by Reconnecting America, are shown in the report as follows:

- Kenosha, Wisconsin: 2319.35 percent
- Little Rock, Arkansas: 920.41 percent
- Tampa, Florida: 1970.39 percent
- Portland, Oregon (1st line): 1794.93 percent
- Portland, Oregon (extension): 7501.12 percent

The Wall Street Journal, June 21, 2007 noted that after five years of operation of the TECO Line streetcar in Tampa, "Some $450 million in residential and retail space is complete along the route, most of it in the Channel District, a once-languishing maritime neighborhood. With another $450 million in development underway and $1.1 billion in the planning stages, local officials expect the district to be home to as many as 10,000 residents within the next decade." Similarly, *USA Today*, January 8, 2007, reported that "streetcars are coming back and reviving the same neighborhoods they helped create." It noted that the Portland Streetcar "attracted about 100 projects worth $2.3 billion in less than five years, all within two blocks of the line" and in Little Rock, "about $400 million in development has either been planned or built along the $19.6-million line."

More recently, *The Times Picayune* (New Orleans), December 12, 2010, reported that "Since the Loyola Avenue streetcar project was announced in February, hotel renovations, apartments and retail projects have been springing up along the moribund 1.5-mile strip. The investments could transform a corner of the city best known for surface parking lots and blighted buildings into a place where people live, work and gather without losing time and money to automobile travel."

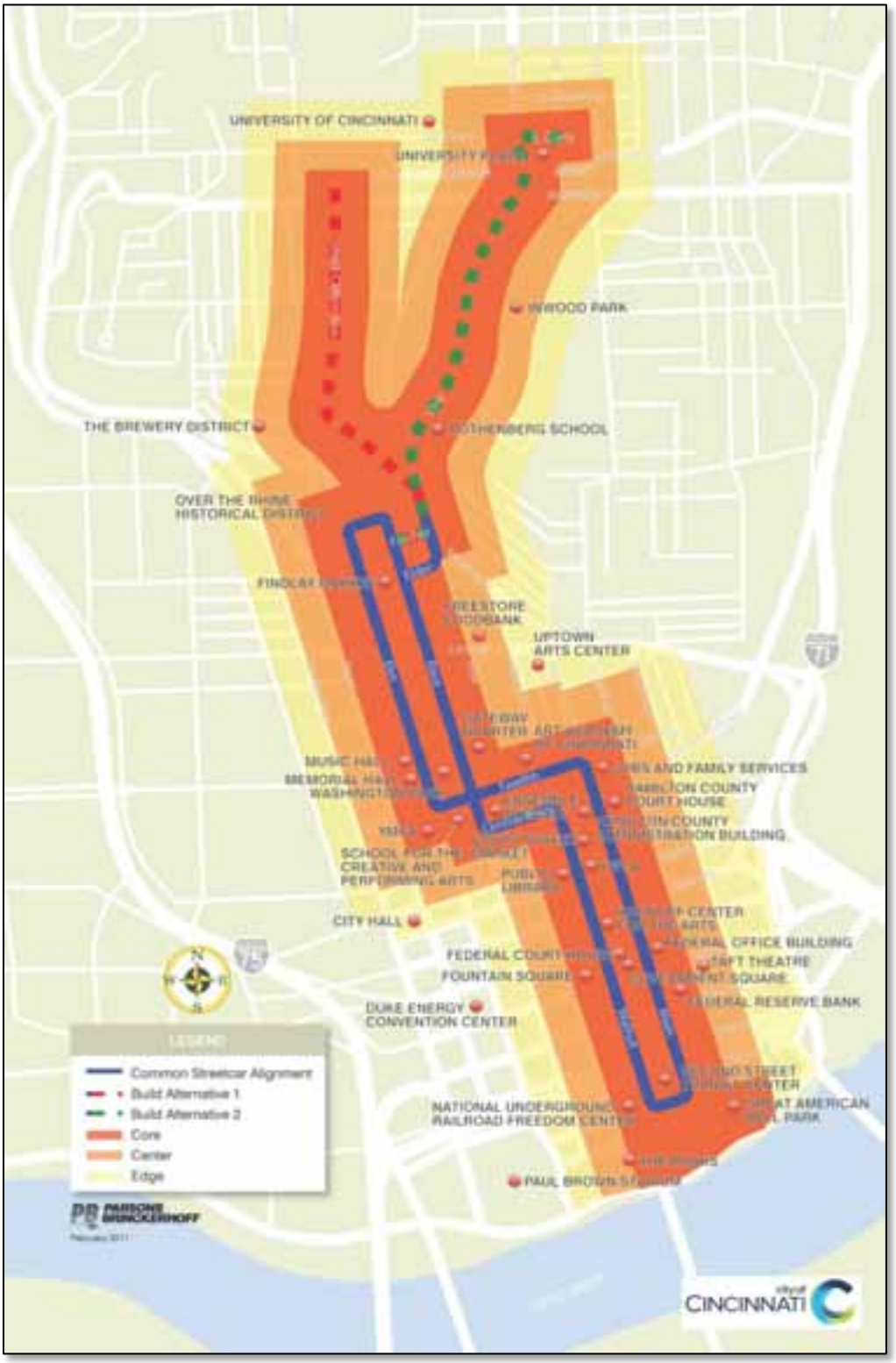
Although anecdotal, these examples described above represent the external basis, in concert with the Cincinnati Streetcar *Feasibility Study*, of the potential of the streetcar project to attract business, encourage investment, attract housing and jobs and influence area redevelopment plans.

Induced development resulting from the streetcar would also have an impact on property values and tax revenues. Redevelopment and infill development would help to increase property values and tax revenues for the City of Cincinnati, including an estimated $34 million in additional property taxes. There would be no loss of existing tax revenues as a result of either Build Alternative 1 or 2 since the project is planned within existing right of way.

For the MSF, Locations 1 and 2 could result in changes to property values and tax revenues. Currently, Location 1 has a higher land value and total market value than Location 2. Location 2 would result in the need to relocate the VOA halfway house. However, this social service is expected to be able to relocate within the same neighborhood and tax revenues would not be lost. Location 3 is located within a city owned property, which is leased to Hamilton County, and does not have a land value.

Employment opportunities are anticipated to increase as a result of the streetcar project. New development would promote new jobs in the study area and neighborhoods. Residents would have additional transportation options to access current employment opportunities within Uptown and the CBD. Temporary employment would also increase for construction of the streetcar. Construction-related impacts are further discussed in Section 5.22.

Figure 13. Development Potential within Streetcar Alignment



The No Build Alternative would not support and encourage new development in Downtown and OTR. The No Build Alternative would not promote new jobs nor provide additional transportation options within the study area.

5.6.3 Economic Conditions Mitigation

No mitigation measures will be required.

5.7 Environmental Justice

Title IV of the Civil Rights Act of 1964 prohibits discrimination, on the grounds of race, color, or national origin, in federally assisted programs by emphasizing the need to identify and address disproportionate effects of federal programs, policies, and activities. Executive Order 12898 (EO 12898), Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations was established in 1994 as the formal federal policy on environmental justice (EJ). EO 12898 requires that federal agencies consider and address disproportionately high and adverse environmental effects of proposed federal projects on minority and low-income populations.

Definitions of terms include:

- Low income is defined as household income at or below the Department of Health and Human Services poverty guidelines.
- Minority is defined as a person who is Black, Hispanic, Asian American, American Indian, or Alaskan Native.
- Low-income population is any readily identifiable group of low-income persons who live in geographic proximity.
- Minority population is any readily identifiable group of minority persons who live in geographic proximity.
- Disproportionately high and adverse effect on minority and low-income populations is an adverse effect that: (1) is predominately borne by a minority population and/or a low income population; or (2) will be suffered by the minority population and/or low income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non low income population.

The process for evaluating environmental justice concerns included the following steps:

- Determine the criteria for minority and low-income populations within the study area
- Identify the EJ populations within the study area by census tract and block groups
- Analyze the burdens and net benefits of anticipated impacts by the feasible alternatives
- Determine disproportionate high and adverse impact to EJ populations.

Based on *Guidance and Best Practices for Incorporating Environmental Justice in Ohio Transportation Planning and Environmental Processes* (August 2002), the percentages that are meaningfully greater than the regional average is used as the threshold to identify target areas with high percentages of EJ populations. Low-income and minority populations whose percentage exceeds the county average are used as the target areas for EJ populations. The target areas were defined as 27.1 percent for minority and 11.8 percent for low-income populations (US Census, 2000).

Data were obtained from the US Census Bureau by block group to identify low-income and minority populations and target areas. The block groups analyzed were those that are totally or partially within the study area.

5.7.1 Existing Conditions

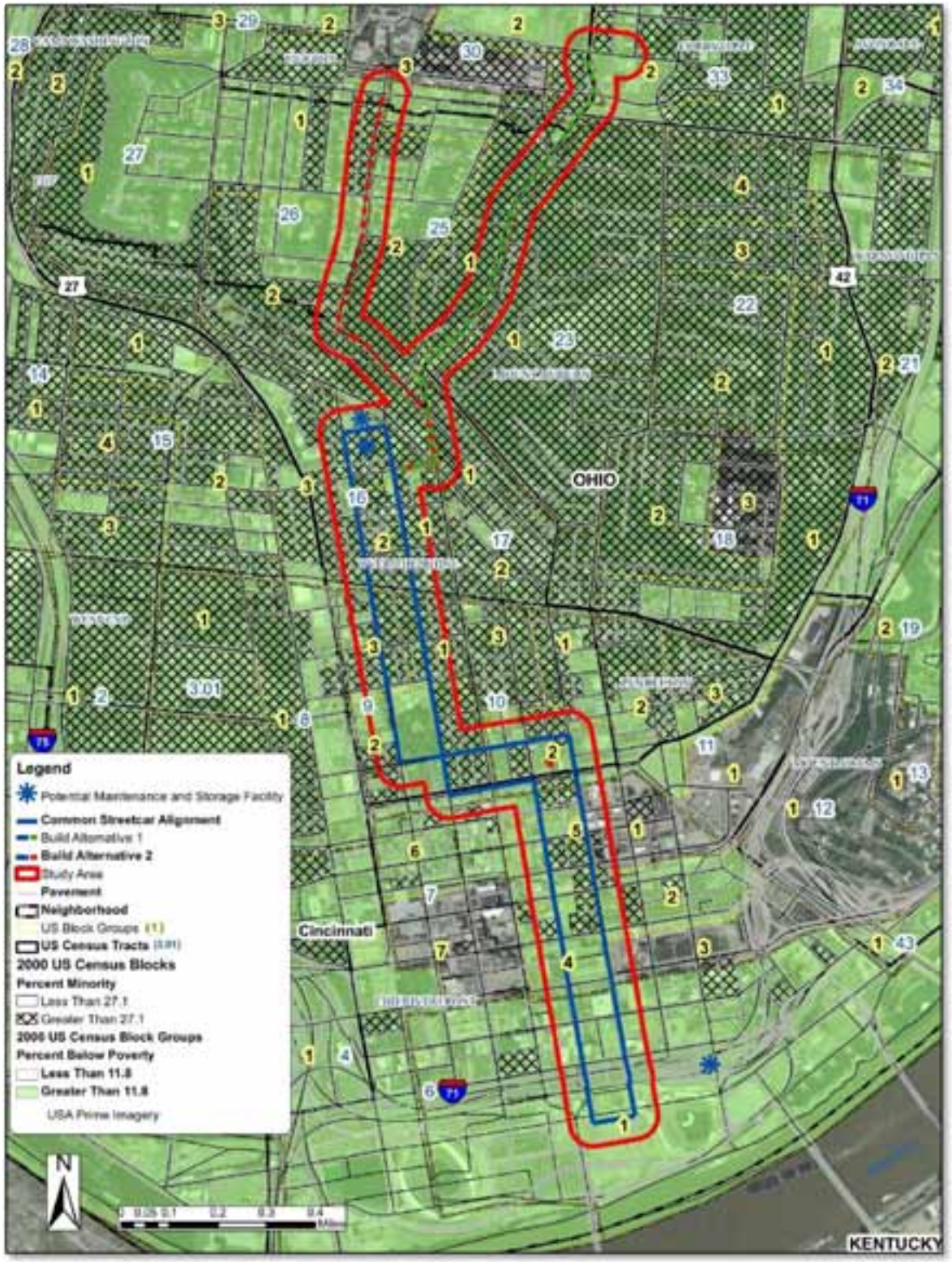
The potentially affected neighborhoods are all that are included in the study area: Downtown, OTR, and Uptown. The 20 corresponding block groups in these neighborhoods are shown on Figure 14 and in Table 8.

Table 8. Environmental Justice Populations (2000)

Block Group	Total Population	White	African American or Black	Asian and Pacific Islander	Native American	Hispanic	Minority (%)	Low Income[1] (%)
6.00 1	513	395	70	31	0	18	23.0	17.2
7.00 1	1,192	297	835	12	0	35	75.1	8.5
7.00 2	129	72	57	0	0	0	44.2	22.5
7.00 3	0	0	0	0	0	0	0	0
7.00 4	238	188	42	0	8	8	21.0	58.8
7.00 5	267	119	134	14	0	10	55.4	59.6
7.00 6	458	374	63	21	0	0	18.3	17.7
7.00 7	352	280	54	7	0	0	20.5	8.5
9.00 1	492	53	439	0	0	11	89.2	66.5
9.00 2	1,035	374	616	17	0	24	63.9	70
9.00 3	546	185	345	0	0	154	66.1	46.3
10.00 2	248	78	170	0	0	0	68.5	54.2
16.00 1	518	75	412	9	0	0	85.5	80.2
16.00 2	371	39	332	0	0	0	89.5	68.2
16.00 3	829	134	640	0	0	0	83.8	53.4
23.00 1	1,690	316	1,325	0	20	16	81.3	39.7
25.00 1	1,405	917	349	106	0	26	34.7	48.7
25.00 2	857	694	125	0	8	30	19.0	34.5
26.00 1	2,079	1,489	392	61	23	11	28.4	44.3
26.00 2	1,340	1,025	285	11	7	6	23.5	34.6
Total Study Area	14,559	7,104	6,685	289	66	349	51.2	45.4

Source: US Census Bureau Summary File 3, 2000
1. Population for whom poverty status is determined
Note: Shaded areas indicate block groups that meet target area threshold.

Figure 14. Low-Income and Minority Populations



The poverty percentages for the City of Cincinnati and Hamilton County are 21.9 percent and 11.8 percent, respectively (2000). The study area low-income population is 45.4 percent (by block groups). All block groups, except for two, within the study area reach the EJ threshold for low-income target areas (Figure 14).

The minority populations for the City of Cincinnati and Hamilton County are 47.5 percent and 27.1 percent, respectively (2000). The study area minority population is 51.2 percent (by block group). Thirteen of the block groups within the study area reach the EJ threshold for minority target areas (Figure 14). Within the study area, minority populations are concentrated north of Central Parkway, along Elm and Race streets, and along Vine Street (Figure 14). Additional study area population and housing data are included in Tables 1, 2, and 3 in Section 2.1.

The majority of the study area is English-speaking, which is approximately 88.75 percent of the study area block groups. Approximately 3.7 percent (677 people) of the population is a limited English proficient population (persons who do not speak English well or not at all). The Limited English Proficiency figure in Appendix F shows the distribution of languages by block group.

5.7.2 Potential Impacts

There are three fundamental EJ principles: (1) to avoid, minimize or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority and low-income populations; (2) to ensure the full and fair participation by all potentially affected communities in the transportation decision making process; and (3) to prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

The majority of block group percentages of minority and low income populations within the study area are higher than the both the City and County percentages. Potential adverse impacts considered included displacements, community cohesion, community facilities and services, access, traffic, noise/vibration, and construction.

This project would have a beneficial impact on both minority and low-income populations by re-introducing a form of transportation to the City that was available from 1889 to 1951. Additionally, from a City and County perspective, impacts to EJ populations would be disproportionate but not adverse due to the demographics of the study area. It is anticipated that the project will provide transportation and economic benefits to the EJ populations. Transit improvements should improve mobility and provide access to the opportunities that the urban core provides in terms of jobs, shopping and social services.

- Displacements. For the MSF locations, Location 2 would result in the displacement of the VOA halfway house. No other displacements will occur for the mainline, streetcar stops, power substations, or other two MSF locations.

- Neighborhood and Community Cohesion. The project would not directly impact cohesion as no displacements or facilities and services that EJ populations rely upon would be lost. Neighborhoods would remain intact as they exist. Communities would not lose any cohesion based on no loss of residences, businesses, or facilities that EJ populations would rely upon.

  The availability of affordable housing for low-income populations was determined for the neighborhoods in the study area. Through various city, state, and federal housing

subsidies (Low Income Housing Tax Credits, Project-Based Section 8, and Housing Opportunities Made Equal) a number of units in the study area are required by contract to adhere to various affordability criteria and a significant number of those will remain subject to the affordability requirements well after the operational date of the streetcar (Appendix F). There are 1,899 units in the study area that are currently affordable due to the use of one or more of these subsidies. A total of 61.8 percent will continue to be affordable for an average of 11.8 years after the operational date of the streetcar (2013). A discussion of development impacts is discussed further in the secondary and cumulative effects in Section 5.23.

- Community Facilities and Services. Community facilities located within the study area are discussed in Section 5.5.1. No community facilities identified will be directly impacted by the proposed project. The streetcar will also offer an additional means of access to social service facilities near the streetcar route.

- Employment. No existing employment will be lost by the Build Alternatives and stops. One proposed MSF location would displace a social service resource and those employed at the VOA halfway house. The other two proposed MSF locations would not affect existing employment.

- Access/Travel Patterns. This project is expected to increase accessibility options. Overall, the streetcar would allow all populations to have increased access options to employment centers and community facilities within Downtown, OTR, and Uptown. The streetcar would provide an additional mode of transportation for EJ populations. EJ populations would still maintain full access to bus transportation. Since there will be no change in roadways and the streetcar will run in existing lanes, travel patterns and opportunities will remain for EJ populations.

- Traffic/Mobility. The proposed streetcar project would not have an adverse traffic impact on EJ populations. The LOS at the intersections within the study area would improve from LOS C in the No Build to LOS B or better with the Build Alternatives.

- Parking. A small number of on-street parking spots will be lost in EJ target areas since low-income populations cover the whole study area. Parking impacts are discussed in detail in Section 5.1.3.

- Air Quality. The streetcar project would not impact the air quality of EJ populations because the project would not result in air quality impacts for the entire study area. Overall air quality impacts are discussed further in Section 5.8.

- Noise and Vibration. Noise and vibration would not have adverse impacts to EJ populations because the project, as a whole, would not exceed thresholds for the entire study area. Overall noise and vibration impacts are discussed further in Sections 5.9 and 5.10.

- Visual Quality. Catenary lines and poles associated with the streetcar would have a visual impact in target areas. Station stops would also have a visual impact. The highest level of visual impact would be in areas where there are mature trees and historic architecture since new elements (that are not existing utility lines and poles) are

introduced into the landscape. This impact will occur to EJ populations as well as non-EJ populations.

- Safety and Security. Impacts to EJ populations would be the same as non-EJ populations. Safety and Security is discussed in Section 5.21.

- Cultural Resources. The streetcar project would not directly impact historic resources within EJ target areas. Impacts to cultural resources are discussed in Section 5.18.

- Construction. Construction-related impacts to EJ populations are discussed in Section 5.22. Since the majority of the study area has been identified as meeting the threshold for EJ target areas, construction-related impacts will occur. Traffic-related impacts would be similar for non-EJ populations as EJ populations. This highest traffic impacts would be on Vine Street and Clifton Avenue. Construction-related impacts to businesses will occur throughout the study area, including those located in EJ target areas. These business impacts would be the same for non-EJ populations as EJ populations. Mitigation to reduce construction-related impacts is further discussed in Section 5.22.3.

- Maintenance and Storage Facility. The existing land uses surrounding the MSF locations on Henry Street are industrial and would be compatible with a facility of this type. Impacts would include displacements, visual, noise, and vibration. Potential mitigation measures will include Last Resort Housing for those displaced, and design guidelines to fit the existing landscape to reduce the level of impact to residences in the area, although no residences are adjacent. The third MSF location is surrounded by public right of way, and businesses associated with a Downtown. Impacts would include visual, noise, and vibration. Impacts would be the same for both EJ and non-EJ populations. For the MSF locations, Location 2 would result in the displacement of the Volunteers of America half-way house. However, the facility is expected to be able to relocate within the same neighborhood to minimize the impact that would result from displacement.

5.7.2.1 Denial of Benefits

The benefits of this project are expected to be: connection of jobs and trip generators; redevelopment/reinvestment of adjacent properties; stimulate businesses and activity; enhance transit potential and walkability of the urban core; and linking existing bus service with new transit for a more comprehensive transit system.

EJ populations would not be denied the intended benefits of the project. The project would provide a connection between EJ target areas and jobs, shopping, schools, and entertainment located in Downtown, OTR, and Uptown. Those who currently use, and who would use, existing bus service would be able to link to new transit, providing more mobility options. Populations that are dependent on transit or walk are expected to have better potential to access areas. Reinvestment is anticipated to continue in areas where there are several vacancies or dilapidation to help improve the quality of life level.

5.7.2.2 Environmental Justice Disproportionate Analysis

A disproportionately high and adverse effect is defined as an effect predominantly borne by, or would be suffered by, an EJ target population and that is appreciably more severe and greater in magnitude than adverse effects suffered by a non-EJ population.

Although the majority of block groups in the study area were found to be EJ areas, the effects associated with the proposed project are similar throughout the study area. No EJ community would experience appreciably more severe or greater in magnitude impacts than those experienced by non-environmental justice communities.

Conditions under the No Build Alternative would remain the same as they exist today and no effects would be anticipated on EJ populations. The No Build Alternative would not have a disproportionate and adverse impact on EJ populations within the study area.

5.7.2.3 Outreach

The City of Cincinnati held public meetings within areas of EJ populations to inform citizens of the streetcar project. They were held at locations accessible to all populations in and around the study area. Informational presentations were also given to organizations that historically represent EJ populations. Presentations were also made during the *Feasibility Study* (2007) to the OTR community. Public involvement will continue as part of the project. Public outreach and participation for this project is discussed in Section 6.0.

5.7.3 Environmental Justice Mitigation

To off-set the removal of on-street parking spaces required for the development of the streetcar line, there are alternative parking options available throughout the affected area, including 16 lots. In addition, a new 500-space parking garage, currently under construction, will be available along the streetcar line under Washington Park and 14th Street between Elm and Race streets.

If MSF Location 2 is selected, the VOA halfway house will be able to relocate within the same neighborhood to minimize the impact that would come from displacement. The acquisition and relocation will be conducted in accordance with 49 CFR and the Uniform Relocation Assistance and Real Property Act of 1970 as amended.

5.8 Air Quality

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants degrade the atmosphere by reducing visibility, damaging property, reducing the productivity or vigor of crops or natural vegetation, or harming human or animal health.

Particulate matter (PM) is made of many small elements and chemical substances. US Environmental Protection Agency's (USEPA) definition is: "Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

An air quality technical study was completed for the Cincinnati Streetcar project. The full results of the study are presented in Appendix G. A summary of the technical study is discussed in this section.

5.8.1 Applicable Regulations

5.8.1.1 Clean Air Act Amendments of 1990

The Clean Air Act (CAA) Amendments of 1990 and the Final Transportation Conformity Rule [40 CFR Parts 51 and 93] direct the USEPA to implement environmental policies and regulations that will ensure acceptable levels of air quality. The CAA and the Final Transportation Conformity Rule affect proposed transportation projects.

5.8.1.2 National and State Ambient Air Quality Standards

As required by the CAA, National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants. Pollutants that have established national standards are referred to as "criteria pollutants." The sources of these pollutants, their effects on human health and the nation's welfare, and their final deposition in the atmosphere vary considerably (Table 9). The criteria pollutants are ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2), lead (Pb), and sulfur dioxide (SO_2). Criteria pollutants that can be traced principally to motor vehicles are relevant to the evaluation of the project's impacts; these pollutants include CO, O_3, PM_{10}, and $PM_{2.5}$. Transportation sources account for a small percentage of regional emissions of SO_2 and Pb.

Table 9. Criteria Pollutants and Effects

Pollutant	Health Impact	Significance to Project
Carbon Monoxide (CO)	CO is a colorless gas that interferes with the transfer of oxygen to the brain. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, and eventually death. It also can cause heart disease.	CO is emitted almost exclusively from the incomplete combustion of fossil fuels. On-road motor vehicle exhaust is the primary source of CO.
Ozone (O_3)	O_3 is the main ingredient of smog. O_3 enters the blood stream through the respiratory system and interferes with the transfer of oxygen, depriving sensitive tissues in the heart and brain of oxygen. It also damages vegetation by inhibiting their growth.	Automotive exhaust is a source of the precursors of O_3, nitrogen oxides and volatile organic compounds (VOC).
Nitrogen Dioxide (NO_2)	$NO_2$is a brownish gas which can irritate the lungs. It can cause breathing difficulties at high concentrations.	Automotive exhaust is a source of the precursors of nitrogen dioxide, which is formed by a reaction between nitric oxide and oxygen. NO_2also contributes to the formation of particulate matter.
Lead (Pb)	Pb is a stable element that can affect the blood-forming, nervous and renal systems of the body.	With the mandated switch to lead-free gasoline, the contribution from automotive exhaust sources for this pollutant have decreased greatly. As such this is not a pollutant of concern for this project.

Table 9. Criteria Pollutants and Effects

Pollutant	Health Impact	Significance to Project
Sulfur Dioxide (SO_2)	$SO_2$is an irritant gas that attacks the throat and lungs. It can cause acute respiratory symptoms and diminish ventilator function in children. It can also yellow plant leaves and erode iron and steel.	$SO_2$is a product of high-sulfur fuel consumption. As this project is not predicted to significantly impact high-sulfur fuel combustion, it has not been evaluated for this project.
Particulate Matter (PM_{10} and $PM_{2.5}$)	The main health effect of airborne particulate matter is on the respiratory system.	A major source of PM_{10} and $PM_{2.5}$ is fuel combustion.

5.8.1.3 Mobile Source Air Toxics

In addition to the criteria pollutants for which there are NAAQS, the USEPA also regulates mobile source air toxics (MSAT). Toxic air pollutants are those pollutants known or suspected to cause cancer or other serious health effects. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

5.8.1.4 Attainment Status/Regional Air Quality Conformity

Section 107 of the 1977 CAA Amendment requires that the USEPA publish a list of all geographic areas in compliance with the NAAQS, as well as those areas not in attainment of the NAAQS. Areas not in compliance with the NAAQS are termed nonattainment areas. Areas that have insufficient data to make a determination are unclassified, and are treated as being in attainment areas until proven otherwise. The designation of an area is made on a pollutant-by-pollutant basis. The USEPA's area designations are shown in Table 10. Hamilton County is classified as an attainment area for CO, PM_{10}, NO_2 and SO_2 and a nonattainment area for O_3 and $PM_{2.5}$.

Table 10. Attainment Classifications and Definitions

Attainment	Unclassified	Maintenance	Nonattainment
Area is in compliance with the NAAQS.	Area has insufficient data to make a determination and is treated as being in attainment.	Area once classified as nonattainment but has since demonstrated attainment of the NAAQS.	Area is not in compliance with the NAAQS.

5.8.1.5 Transportation Conformity

The CAA requires that all transportation plans and programs pass the air quality conformity test. This process involves forecasting future emissions of air pollution to determine whether the amount of future pollution resulting from the plan or program would be within the allowable limit for motor vehicle emissions.

Transportation conformity must be determined for all nonattainment area pollutants classified as regional pollutants. In Hamilton County, those pollutants are O_3 and $PM_{2.5}$. Transportation

projects also generate CO, which is considered a localized pollutant. CO micro-scale modeling is required to determine whether a transportation project would cause or contribute to localized violations of CO NAAQS.

Project level conformity is demonstrated by showing that it will not cause local CO and/or PM_{10} standards to be exceeded, and that it will not interfere with "timely implementation" of Transportation Control Measures called out in the State Implementation Plan (SIP).

5.8.2 Existing Conditions

5.8.2.1 Ambient Air Quality in the Study Area

Cincinnati is located in the southwest corner of the state of Ohio, situated north of the Ohio River. Cincinnati is located within the northern limit of the humid subtropical climate and the southern limit of the humid continental climate zone, with average temperatures by US standards. Summers are hot, humid and wet. July is the warmest month, with an average high of 87°F (31°C) and an average low of 68°F (20°C). Winters are generally cool to cold, with occasional snowfall. January is the coldest month, with an average high of 38°F (3°C) and an average low of 21°F (-6°C). Precipitation is fairly evenly distributed each month, averaging 41 inches of rainfall and 14 inches of snowfall annually.

Ambient air quality monitor data at the monitoring stations closest to the study area for the years 2006-2008 are presented in Table 3 of Appendix G. As shown in Table 3 of Appendix G, no violations of the CO, PM_{10} or NO_2 standard have been observed. Several violations of the eight-hour O_3 standard have been observed throughout the three-years of monitored data at the locations near the study area. The monitors have also observed violations of the $PM_{2.5}$ standards, though no violations in the most recent year of available data (2008). These monitored values support the O_3 and $PM_{2.5}$ nonattainment status of the study area as well as the attainment status of the study area for the other criteria pollutants.

5.8.3 Potential Impacts

The results of the air quality analysis are based on the traffic analysis completed for the for the Cincinnati Streetcar project. The full results of the traffic analysis are presented in Appendix E.

5.8.3.1 Traffic Analysis Overview

The traffic analysis followed a conventional approach that included data collection, investigation of existing roadway and traffic conditions, and analysis of opening year operational impacts (see Section 5.1 and Appendix E). Most of the background data were obtained from the Synchro traffic model for this project, which included 2009 traffic volumes (vehicular and pedestrian), existing signal timing data, roadway geometry, peak hour factor, heavy vehicle percentage and lane configurations. The model served as a sufficient foundation for conducting the analysis. Refinements were required in order to tailor the information to the existing traffic conditions (lane configuration, signal timing, transit and on-street parking information) in the study area. The additional data collected as part of the initial reconnaissance task were related to lane geometry and on-street parking.

The year 2012 was considered as the project opening year. An annual growth rate of one percent was assumed to adjust the 2009 traffic volumes to opening year 2012 volumes. The evening rush hour (PM peak) traffic was considered as the heavy traffic condition during the day. The following scenarios were analyzed to study the impact of streetcar operations on the roadway system for the opening year during the PM peak hour.

- 2009 Existing Conditions - The roadway network includes existing roadway conditions.
- 2012 No Build - The roadway network will remain the same as the existing 2009 roadway conditions with the addition of The Banks street grid.
- 2012 Build Alternative 1 - The roadway geometry, traffic control and roadway capacity will remain the same as the No Build scenario. The proposed streetcar would occupy one lane and require on-street parking adjustments as noted in the conceptual engineering plans. Six streetcar trips per hour were included in the Build scenario. The lane with the streetcar can also be used by traffic. Both Build Alternatives will have the same impacts between Freedom Way and Henry Street. This alternative includes an analysis of Vine Street.
- 2012 Build Alternative 2 - The roadway geometry, traffic control and roadway capacity will remain the same as the No Build scenario. The streetcar will occupy one lane and will cause parking adjustments as noted in the conceptual engineering plans. Six streetcar trips per hour were included in the Build scenario. The lane with the streetcar can also be used by traffic. Impacts between Freedom Way and Henry Street were analyzed. This alternative also includes an analysis of West Clifton Avenue instead of Vine Street.

Analyses of roadway and intersection operational performance for the study scenarios were performed using the Synchro/SimTraffic simulation analysis package (Version 7). The determinations of level of service for existing traffic conditions and future traffic conditions were based on the *Highway Capacity Manual 2000*. The analyses results are expressed using LOS, intersection capacity utilization, and intersection delay. LOS is a qualitative measure ranging from LOS A (free-flow) to LOS F (congested), to describe operational conditions within a traffic stream and the perception of traffic operational conditions by motorists and passengers.

5.8.3.2 Criteria Pollutants

Pollutants that can be traced principally to motor vehicles are relevant to the evaluation of the project's impacts; these pollutants include CO, hydrocarbons (HC), NO_x, O_3, PM_{10}, $PM_{2.5}$, and MSAT. Transportation sources account for a small percentage of regional emissions of SO_x and Pb; thus, a detailed analysis is not required.

HC and NO_x emissions from automotive sources are a concern primarily because they are precursors in the formation of O_3 and particulate matter. O_3 is formed through a series of reactions that occur in the atmosphere in the presence of sunlight. Since the reactions are slow and occur as the pollutants are diffusing downwind, elevated O_3 levels often are found many miles from the sources of the precursor pollutants. Therefore, the effects of HC and NO_x emissions generally are examined on a regional or "mesoscale" basis. However, because the project alternatives are not projected to measurably affect regional travel patterns, no significant increase in regional emissions (O_3, HC, or NO_x) is anticipated.

5.8.3.3 Particulate Matter Analysis

Following the guidelines in USEPA's *Transportation Conformity Guidance for Qualitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (March 29, 2006, referred to as "PM_{10} Guidance"), a $PM_{2.5}$ hot-spot analysis should be conducted according to qualitative guidance only if the project is a project of air quality concern, defined in 40 CFR 93.123(b)(1) as:

(i) New or expanded highway projects that have a significant number of or significant increase in diesel vehicles;
(ii) Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles, or those that would change to LOS D, E or F because of increased traffic volumes from a significant number of diesel vehicles;
(iii) New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;
(iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; and
(v) Projects in or affecting locations, areas, or categories of sites which are identified in the $PM_{2.5}$ or PM_{10} applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

The streetcar is not expected to change the vehicle mix (gasoline cars and diesel trucks) within the study area. Therefore, the project would not cause a significant increase in diesel vehicles, nor would it affect intersections operating at LOS D, E or F because of increased traffic volumes from a significant number of diesel vehicles. As such, the proposed streetcar is not considered a project of air quality concern, and USEPA has determined that such projects meet the CAA's conformity requirements without any further hot-spot analysis. The MSF would not have a significant number of diesel vehicles congregating at a single location and are not considered a project of air quality concern. Therefore, no $PM_{2.5}/PM_{10}$ impacts are expected with the Build Alternatives. Similarly, no $PM_{2.5}/PM_{10}$ impacts are expected with the No Build Alternative.

5.8.3.4 Carbon Monoxide Analysis

CO impacts are generally localized. Even under the worst meteorological conditions and most congested traffic conditions, high concentrations are limited to a relatively short distance (300 to 600 feet) of heavily traveled roadways. Vehicle emissions are the major sources of CO. Traffic analyses determined that the project would not increase overall annual average daily traffic (AADT) within the study area and would improve traffic flows within the study area as compared to the No Build alternative. For all roadway segments within the study area, the LOS estimates for the Build alternatives, when compared to the No Build alternative were either the same or better. The roadway segments analyzed include:

- Walnut Street & Freedom Way
- Walnut Street & 2nd Street
- Walnut Street & 3rd Street
- Walnut Street & 4th Street
- Walnut Street & 5th Street
- Walnut Street & 6th Street
- Walnut Street & 7th Street
- Walnut Street & 8th Street
- Walnut Street & 9th Street
- Walnut Street & Court Street
- Central Parkway &Walnut Street
- Central Parkway & Vine Street
- Central Parkway & Race Street
- Elm Street & 12th Street
- Elm Street & 14th Street
- Elm Street & Liberty Street
- Race Street & Liberty Street
- Race Street & 15th Street
- Race Street & 14th Street
- Race Street & 13th Street
- Race Street & 12th Street
- 12th Street & Vine Street
- 12th Street & Walnut Street
- Main Street & 12th Street
- Main Street & Central Parkway
- Main Street & Court Street
- Main Street & 9th Street
- Main Street & 8th Street
- Main Street & 7th Street
- Main Street & 6th Street
- Main Street & 5th Street
- Main Street & 4th Street

- Elm Street & Findlay Street
- Race Street & Findlay Street
- Race Street & Green Street
- Main Street & 3rd Street
- Main Street & 2nd Street
- Main Street & Freedom Way

Currently, the study area is classified as an attainment area for CO and is in compliance with the NAAQS. As the proposed streetcar and MSF locations are not predicted to cause any location to have a LOS C or worse, the project is not anticipated to substantially increase CO levels. As such, the project is not anticipated to cause a violation of the NAAQS for CO. Based on the analysis results for the No Build Alternative, all of the study intersections would function at LOS C or better, therefore the No Build Alternative is not anticipated to cause a violation of the NAAQS for CO.

While it is possible that CO levels at sensitive land uses directly adjacent to the affected roadway could change as a result of locating travel lanes closer to these receptors, it is unlikely, based on the projected vehicular volumes and levels of service that CO levels at these locations would approach the NAAQS.

5.8.3.5 Mobile Source Air Toxics

On February 3, 2006, the Federal Highway Administration (FHWA) released "Interim Guidance on Air Toxic Analysis in NEPA Documents." It groups projects into the following categories:

- Exempt Projects and Projects with No Meaningful Potential MSAT Effects
- Projects with Low Potential MSAT Effects
- Projects with Higher Potential MSAT Effects

Since the streetcar project does not add capacity, add a new interchange or involve a new road on a new alignment, it is considered a Project with No Meaningful Potential MSAT Effects. It has been determined to generate minimal air quality impacts for CAA Amendments criteria pollutants and has not been linked with any special MSAT concerns. As such, the streetcar and MSF locations would not result in changes in traffic volumes, vehicle mix, or any other factor that would cause an increase in MSAT impacts of the project from that of the No Build Alternative.

5.8.4 Conclusions

The proposed streetcar and MSF locations are not predicted to cause or exacerbate a violation of the NAAQS. The Build Alternatives are not predicted to affect the overall vehicle miles travelled (VMT) within the study area, and the project is considered a Project with No Meaningful Potential MSAT Effects. Therefore, no $PM_{2.5}$ or MSAT impacts are expected with the project. Construction-related effects of the project will be limited to short-term increased fugitive dust and mobile-source emissions during construction. Construction-related air quality impacts are further discussed in Section 5.22.3.7.

The No Build Alternative is not expected to cause or exacerbate a violation of the NAAQS and $PM_{2.5}$ or MSAT impacts are not expected.

5.8.5 Air Quality Mitigation

To minimize the amount of construction dust, state and local regulations regarding dust control and other air quality emission reduction controls will be followed.

5.9 Noise

A noise study was completed for the streetcar project. A summary of the noise study is presented in this section and a full detailed discussion of the noise study is in Appendix H.

5.9.1 Noise Levels

Noise levels are measured in units called decibels. Since the human ear does not respond equally to all frequencies (or pitches), measured sound levels (in decibels at standard frequency bands) often are adjusted or weighted to correspond to the frequency response of human hearing and the human perception of loudness. The weighted sound level is expressed in single-number units called A-weighted decibels (dBA) and is measured with a calibrated noise meter.

To measure this noise accurately, noise energy (expressed in dBA) produced by different activities are averaged over a period of time in order to obtain a single number. This single number is called the equivalent continuous noise level (L_{eq}). In other words, L_{eq} is the average sound level over a period of time. It is represented in terms of a constant noise level with the same energy content. For a one hour study, the abbreviation $L_{eq}(h)$ can be used. "L_{eq}" can represent any time period. Another noise measure considers people's increased sensitivity to noise during sleeping hours. This measure is calculated by measuring noise levels over a 24-hour period to calculate what is called the day-night sound level (L_{dn}).

FTA uses both L_{eq} and L_{dn} to evaluate transit noise effects. Use of L_{eq} and L_{dn} is appropriate because these levels are sensitive to the frequency of occurrence and duration of noise events, including transit operations, which may be characterized by infrequent noise.

5.9.2 Methodology

The noise exposure calculations were completed following the procedures and methodologies described in the FTA *Transit Noise and Vibration Guidance Manual* (May 2006). The procedure predicts vehicle noise emissions and quantifies the attenuation of sound as it travels from the vehicle to noise-sensitive receptor locations along the Build Alternatives. In this study, residents along the streetcar alignment are the primary focus. Schools, churches, libraries, medical facilities, and parkland are also of concern. The principal sources of noise that are likely to cause annoyance to residences living adjacent to the MSF include moving transit cars with auxiliary equipment, trains negotiating tight curves (wheel squeal noise), car wash facilities, shop repair work and pings and bangs emanating from train car coupling and train wheels passing through switches and joints in the special track work included in the MSF. These sources produce randomly occurring noises that are of considerably different character than typical community background noise and therefore, if higher than the background noise level, they can be noticeable and intrusive.

Every noise prediction must characterize three elements: 1) the noise source, 2) the sound propagation path, and 3) the affected noise receptor. For a given type of vehicle, noise emissions depend upon the operating conditions. Noise generated by line operation movements along the streetcar alignment was determined using pass-by frequency (headway) and vehicle travel speed data provided along each segment of the corridor.

Noise generated from MSF related activities was calculated based on the reference Sound Exposure Levels (SEL dBA), screening distances and calculation procedures provided in Chapters 4, 5, and 6 of the FTA *Transit Noise and Vibration Guidance Manual*. Total noise exposure from all of the operations and maintenance activities was determined by applying

distance reduction correction, usage factors and any shielding by buildings or other obstructions from the site boundary.

5.9.2.1 FTA Noise Criteria for Transit Projects

The basic goals of noise criteria, as they apply to transit projects, are to minimize the adverse noise impacts on the community and to provide feasible and reasonable noise control where necessary and appropriate. Several types of criteria are used to assess the impacts of noise from transportation projects. These include FHWA highway traffic noise abatement criteria and FTA transit noise guidelines. Both the FHWA and FTA criteria are based on land use category. For this study, the proposed transit alignments do not include any modification or expansions to existing roadways and therefore impact assessment can be evaluated based solely using FTA transit guidelines. The FTA guidelines for land use categories and noise metrics used in impact assessment are presented in Table 11.

Table 11. FTA Guideline Land Use Categories and Metrics for Transit Noise

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor L_{eq} (h)*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land used as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor L_{eq} (h)*	Institutional land uses with primary daytime and evening use. This category includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material.

* L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.

5.9.2.2 FTA Noise Impact Assessment Based on Project Noise Exposure

The FTA noise impact criteria presented in Table 1-2 of Appendix H is used for assessing transit noise impacts by comparing the existing exterior noise levels and the future exterior noise levels generated solely from transit line operations and these criteria are broken down by three land use categories. Furthermore, not only are there different levels of acceptable (and non-acceptable) noise levels for each category, but what noise descriptors required to complete the assessment also varies by land use type. For example, for residential land uses adjoining a transit corridor, the cumulative for 24-hour L_{dn} level needs to be determined reflecting a greater sensitivity to noise during the nighttime hours when people are sleeping. Whereas, for land uses involving daytime and evening uses the noise measurement used is the noisiest hour of transit–related activity is the noise descriptor which must be determined for noise measurement and future line operations. The FTA noise impact criteria presented in Table 1-2 of Appendix H, categorizes project noise levels into three levels of impact defined as “No Impact”, “Moderate Impact”, or “Severe Impact” based on the allowable project-generated noise exposure over the existing ambient conditions. For example, at a given residential property (Category 2 land use) with an L_{dn} of 60 dBA, the predicted day-night noise level generated by the rail vehicles moving along the tracks over a 24-hour period would be a moderate impact if it is predicted to be in the range of 58 to 63 dBA, a severe impact if it is predicted to be 64 dBA or greater, and no impact at all if it is predicted to be under 58 dBA.

5.9.3 Existing Conditions

5.9.3.1 Noise Monitoring

Existing land uses surrounding the proposed streetcar Build Alternatives and MSF locations were reviewed to select representative noise monitoring sites. Noise sensitive properties in close proximity to the Build Alternatives and MSF were selected as monitoring sites considered representative of the ambient noise environment of that portion of the study area. The most relevant noise assessment locations include sites where night time sensitivity to noise is of utmost importance. The night time sensitive sites are described under the FTA Category 2 in Table 11 and include land uses such as residences, hospitals, and hotels. Daytime sensitive land uses are grouped under the FTA Category 3 in Table 11. and include schools, churches, and libraries. Eight representative locations (R1 through R8) scattered throughout the study area along the Build Alternatives and two representative locations (R9 and R10) for the MSF were selected based on several factors, the most important of which was the site's sensitivity to changes in noise levels, proximity to the proposed alignments and ability to provide adequate geographic coverage within the study area. Existing noise levels measured at a given location are considered representative of general noise conditions at all other nearby similar properties, within reasonable distance of the alignment. Representative noise impact assessment locations are depicted in Table 11. All ten noise monitoring locations are evaluated as FTA Category 2 land uses. The addresses of these properties are provided in Table 12 and Table 14 for the Build Alternatives and the MSF locations, respectively.

A calibrated Bruel and Kjaer Type 2231 sound level meter with its Type 4165 condenser microphone and windshield was used at the noise-monitoring sites. The sound level meter was mounted on a tripod at a height of approximately 5.5 feet above ground level. At the end of the preset time period of 20 minutes, the statistical levels and the L_{eq} noise levels were read on the digital display of the meter. All noise measurements were collected under acceptable weather and road surface conditions consisting of rain free days with wind speed of less than 12 miles per hour.

5.9.3.2 Noise Levels

Existing noise levels for the Build Alternatives within the study area were measured over a two day time period on November 4 and 5, 2009. Noise measurements were collected during peak, off peak midday and during late night time periods. Existing noise levels for the MSF locations were measured on November 15 and 17, 2010. All noise measurements were recorded for a 20 minute duration per monitoring time period. The short-term duration noise level readings were then averaged using the methodology contained in the Appendix D section of the FTA *Transit Noise and Vibration Guidance Manual* to determine the L_{dn} noise level. The L_{dn} level is used to determine if noise generated from the line operations will result in impact at any of representative noise measurement locations identified within the study area.

The measured noise levels and the estimated day-night noise levels at the eight monitoring sites for the Build Alternatives are summarized and presented in Table 12 and in Table 14 for the MSF locations (Figure 15). Existing L_{dn} noise levels throughout the study area are typical of noise levels found in urban communities. The principal source of ambient noise within the study area is primarily motor vehicles. The proposed streetcar alignment would follow existing roadways, most of the communities directly adjacent to the proposed Build Alternatives are currently exposed to moderate to high ambient noise levels. Measured peak daytime noise levels ranged from a maximum peak hour noise level (L_{eq} 1hr) of 73 dBA at site R8 to a minimum noise level of 57 dBA at Site R1. For the MSF locations, existing L_{dn} ranged from 59 dBA at Site R9 to 67 dBA at Site 10. Estimated 24 hour L_{dn} ranged from 69 dBA at Site R8 to 61

dBA at Site R1. Estimated L_{dn} for the MSF locations ranged from 54 dBA at Site R10 to 56 dBA at Site R9.

5.9.4 Potential Impacts

5.9.4.1 Build Alternatives

In general, a modern streetcar is a quiet mode of transportation. Noise from a streetcar can be produced by the rolling interaction of the car wheels on the track on a curve or by a streetcar horn. Noise impacts related to streetcar operations were determined at the eight representative residential sites within the study area. Table 13 presents a summary of the estimated noise levels and impact assessment from streetcar operations. The noise analysis findings indicate that the principal source of ambient noise along the Build Alternatives is road traffic that would continue to be the dominant noise source in the future with or without streetcar operations. The existing L_{dn} noise levels at the eight monitoring sites were determined to be in the range of 61 to 69 dBA. The predicted L_{dn} noise levels from future streetcar operations are expected to be the range of 48 to 52 dBA. Noise levels generated from line operations are significantly lower than the Moderate Impact thresholds shown in Table 13. Consequently, noise generated from line operation on the streetcar system is not expected to cause noise impacts within the study area. Construction-related impacts are discussed in Section 5.22.3.8.

The No Build Alternative would not impact existing noise levels.

5.9.4.2 Maintenance and Storage Facilities

The principal sources of noise that are likely to cause annoyance to residences living adjacent to the MSF include moving transit cars with auxiliary equipment, trains negotiating tight curves (wheel squeal noise), car wash facilities, shop repair work and pings and bangs emanating from train car coupling and train wheels passing through switches and joints in the special track work included in the MSF. These types of activities are expected to take place at varying times of the day.

A summary of the existing and future day-night noise level estimates due to noise generated from MSF activities is provided in Table 14. Noise generated at MSF Locations 1 and 2 is expected to be 2 to 3 dBA below the FTA minimum impact threshold and noise generated from the MSF Location 3 is projected to be 9 dBA below the FTA minimum impact threshold. Therefore no noise mitigation measures will be required at any of the three MSF locations.

Figure 15. Noise Monitoring Locations

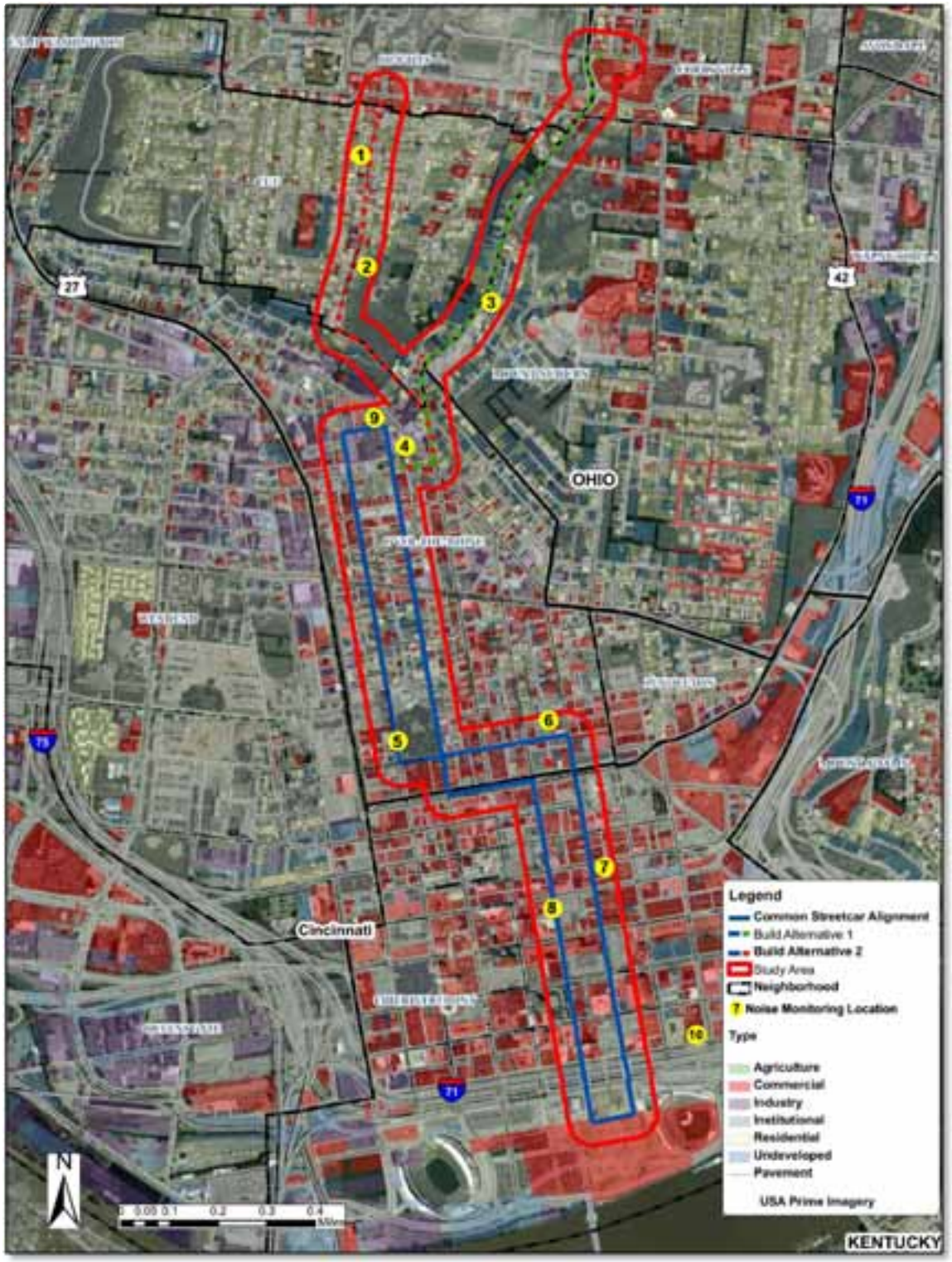


Table 12. Summary of Noise Measurements along Build Alternatives

Receptor Number	Address	Date	Start Time	Leq (1-hr)* (dBA)	Estimated L_{dn}
1	2409 Clifton Avenue	11/5/2009	7:56 a.m.	62	61
		11/4/2009	9:22 a.m..	61	
		11/4/2009	1:34 p.m.	62	
		11/5/2009	3:57 p.m.	62	
		11/4/2009	9:06 p.m.	57	
2	2148 Clifton Avenue	11/5/2009	8:23 a.m.	66	62
		11/4/2009	9:54 a.m.	64	
		11/4/2009	1:12 p.m.	61	
		11/5/2009	4:21 p.m.	64	
		11/4/2009	9:25 p.m.	58	
3	2216 Vine Street	11/5/2009	7:26 a.m.	70	68
		11/4/2009	8:40 a.m.	69	
		11/4/2009	2:05 p.m.	68	
		11/5/2009	3:29 p.m.	71	
		11/4/2009	9:32 p.m.	64	
4	1900 Race Street	11/5/2009	9:40 a.m.	68	65
		11/4/2009	12:14 p.m.	66	
		11/4/2009	3:09 p.m.	67	
		11/5/2009	5:15 p.m.	65	
		11/4/2009	9:18 p.m.	60	
5	1211 Elm Street	11/5/2009	9:00 a.m.	65	64
		11/4/2009	11:44 a.m.	64	
		11/4/2009	3:02 p.m.	63	
		11/5/2009	4:51 p.m.	65	
		11/4/2009	9:50 p.m.	60	
6	1201 West 12th Street	11/5/2009	7:23 a.m.	66	63
		11/4/2009	8:40 a.m.	68	
		11/4/2009	1:07 p.m.	63	
		11/5/2009	4:20 p.m.	65	
		11/4/2009	9:09 p.m.	58	
7	722 Main Street	11/5/2009	7:53 a.m.	72	67
		11/4/2009	9:20 a.m.	70	
		11/4/2009	1:45 p.m.	69	
		11/5/2009	3:20 p.m.	70	
		11/4/2009	9:45 p.m.	62	
8	641 Walnut Street	11/5/2009	8:20 a.m.	73	69
		11/4/2009	9:50 a.m.	71	
		11/4/2009	2:15 p.m.	70	
		11/5/2009	3:45 p.m.	73	
		11/4/2009	9:50 p.m.	65	

Table 13. Projected Noise Exposure Levels and Impact Assessment using FTA Criteria Associated with the Build Alternatives

Site #	Description	Approximate Distance to Streetcar Track (Feet)	Average Streetcar Travel Speeds (mph)	Existing Noise Levels [Ldn (dBA)]	FTA Moderate Impact Threshold Levels [Ldn (dBA)]	Streetcar Project Generated Line Operation Noise Levels [Ldn (dBA)]	Build Alternative Noise Impact Assessment
R1	2409 Clifton Avenue	24	10	61	59	50	No Impact
R2	2148 Clifton Avenue	25	10	62	59	50	No Impact
R3	2216 Vine Street	25	10	68	63	50	No Impact
R4	1900 Race Street	32	10	65	61	48	No Impact
R5	1211 Elm Street	34	10	64	61	48	No Impact
R6	1201 West 12th Street	19	10	63	60	52	No Impact
R7	722 Main Street	33	10	67	63	48	No Impact
R8	641 Walnut Street	30	10	69	64	49	No Impact

1. Existing L_{dn} noise levels are derived from day and night time 20-minute noise measurements collected at each representative monitoring location identified on Figure 15.
2. Headways of 20 minutes (7:00 p.m. to 12:00 a.m., 6:00 a.m. to 8:00 a.m., and 10:00 a.m. to 5:00 p.m.), 10 minutes (8:00 a.m. to 10:00 a.m.; and 5:00 p.m. to 7:00 p.m.) were used for the impact assessment, with no service assumed from 12:00 a.m. to 6 a.m..
3. Land use at each site is residential.

Table 14. Projected Noise Exposure Levels and Impact Assessment using FTA Criteria Associated with Maintenance and Storage Facilities

Site #	Receptor Site Address	Maintenance and Storage Facility (MSF) Location	Existing Day-Night Noise Level Ldn (dBA)	FTA Moderate Impact Threshold Level Ldn (dBA)	Projected Day-Night Noise Level (Ldn dBA) FTA Impact Assessment
R9	Residential property located at 1941 Race Street	Location 1 (South side of Henry Street Between Elm & Race streets)	59	58	56 No Impact
R9	Residential property located at 1941 Race Street	Location 2 (North side of Henry Street Between Elm & Race streets	59	58	55 No Impact
R10	Residential property located at 405 Broadway Street	Location 3 (South west corner of E 3rd & Broadway streets)	67	63	54 No Impact

5.9.5 Noise Mitigation

FTA requires that mitigation be evaluated for all areas where an impact is expected to occur, although consideration of factors such as cost-effectiveness can be incorporated into the decision regarding whether to specific mitigation for a particular location. Mitigation normally would be specified for areas expected to experience severe impact, unless there is no practical method of achieving a reduction in noise levels.

The projected noise levels associated with operation of a streetcar under both Build Alternatives will not exceed the FTA criteria for a "moderate impact" or "severe impact" at any of the representative sites evaluated. The analysis findings indicate that noise generated from MSF locations is expected to be below the FTA impact threshold at the nearest noise sensitive properties. Therefore, no noise mitigation measures associated with streetcar operations will be required. Mitigation of noise during construction is discussed in Section 5.22.3.

5.10 Vibration

A vibration study was completed for the streetcar project. A summary of the vibration noise study is presented in this section and a full detailed discussion of the vibration study is in Appendix H.

The major source of streetcar vibration is the rolling interaction of the car wheels on the track; the vibration resulting from this interaction increases with greater speeds. Factors that influence the amplitudes of ground-vibration include car suspension parameters, condition of the wheels and rails, type of track, track support system, type of building foundation, and the properties of the soil and rock layers through which the vibration propagates.

5.10.1 Ground-Borne Vibration and Criteria

The analysis of ground-borne vibration requires a discussion of both ground-borne vibration levels and interior noise levels resulting from ground-borne vibration. Ground-borne noise refers to the noise effects that are caused by ground-borne vibration. For example, ground-borne vibration from a passing train can cause building floors and walls to vibrate and produce sound. The noise levels resulting from this effect depend on the amplitude and frequency of the vibration produced; the path of vibration propagation, and the acoustical characteristics of the structure and the receiving room. Vibration levels expressed in V dB are 1 micro inch/second. Vibration can be measured in terms of the displacement, velocity, or acceleration of ground movement. Similar to noise, vibration levels are often recorded on a logarithmic scale expressed as decibels, but vibration levels are denoted as "V dB" to differentiate them from sound levels. Common sources of vibration and their maximum velocity levels are shown in Appendix H, Figure1-2.

Ground-borne vibration and ground-borne noise from transit operations are governed by the criteria shown in Table 15. These criteria address maximum vibration levels associated with a single event, unlike noise levels, which are associated with cumulative exposure within a 24-hour period. To address the cumulative effects of multiple vibration events the criteria are divided into "frequent" and "infrequent" event categories.

Table 15. FTA Ground-Borne Vibration and Noise Impact Criteria[1]

Land Use Category	Ground-Borne Vibration Impact Levels		Ground-Borne Noise Impact Levels	
	Frequent Events[2]	Infrequent Events[3]	Frequent Events[2]	Infrequent Events[3]
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 V dB [4]	65 V dB [4]	NA [5]	NA [5]
Category 2: Residences and buildings where people normally sleep.	72 V dB	80 V dB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 V dB	83 V dB	40 dBA	48 dBA

Source: Transit Noise and Vibration Impact Assessment (FTA, May 2006)
Vibration levels expressed in V dB are 1 micro inch/sec and noise levels expressed in dBA.

1. "Frequent Events" are defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
2. "Infrequent Events" are defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
3. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the heating/ventilation/air conditioning (HVAC) systems and stiffened floors.
4. Vibration-sensitive equipment is not sensitive to ground-borne noise.

Existing vibration levels within the study area are currently predominately generated from motor vehicles traveling on the local roadways. Typical vibration levels caused by road traffic movements are typically in the 50 to 60 V dB range and are considered barely perceptible. On the other hand, vibration generated from a truck speeding over a bump in the road are about 72 V dB and those generated from high speed rail or freight trains approach 80 V dB will result in annoyance to people exposed to either frequent or infrequent events at these levels of vibration. Furthermore vibration generated from a bulldozer or other heavy tracked construction equipment range from 85 to 95 V dB will result in difficulty reading text on a digital display screen. Lastly, at the very high end of vibration scale that people can potentially experience in everyday life (with the exception of an earth quake) vibration levels generated from construction related blasting can approach 100 V dB resulting in minor structural damage to buildings.

5.10.2 Existing Vibration Levels

The FTA impact assessment procedure does not require the measurement of baseline vibration levels to determine if vibration from line operations would result in an impact to the adjoining communities. Potential vibration impacts from line operation movements are determined based on vibration threshold levels which must be exceeded. These vibration limits are provided in Table 16. Existing vibration levels within the transit corridor are currently predominately generated from motor vehicles traveling on adjacent roadways. Typical vibration levels caused by road traffic movements are typically in the 50 to 60 V dB range and are considered below the minimum threshold of perception.

Table 16. Estimated Vibration Levels

Site	Description	Distance to Receptor from Tracks (feet)	Average Streetcar Travel Speeds (mph)	Estimated Vibration Levels (V dB)	FTA Vibration Criteria (V dB)	Impact Yes/No
R1	2409 Clifton Avenue	24	10	64	72	No
R2	2148 Clifton Avenue	25	10	64	72	No
R3	2216 Vine Street	25	10	64	72	No
R4	1900 Race Street	32	10	62	72	No
R5	1211 Elm Street	34	10	61	72	No
R6	1201 West 12th Street	19	10	65	72	No
R7	722 Main Street	33	10	62	72	No
R8	641 Walnut Street	30	10	63	72	No

5.10.3 Potential Impacts

Estimated vibration levels from the proposed streetcar operations were determined by following the methodology described in Chapter 10 of the FTA *Transit Noise and Vibration Guidance Manual*. Vibration-sensitive land uses within 100 feet of the study area are primarily residential properties. If the vibration impact criteria are exceeded, the potential long-term vibration impacts at these locations could include structural damage and annoyance to building occupants.

The vibration impact assessment for streetcar operations was completed at the closest representative properties identified within the study area. Historic or other vibration sensitive structures would need to be located within a centerline distance of five feet or less to approach or exceed the 72 V dB impact threshold. There are no building facades located within a five-foot centerline distance of the proposed alignment and therefore no vibration impacts are expected to occur to sensitive properties.

The results of the vibration impact analysis completed along the Build Alternatives are presented in Table 16. Vibration levels at all locations are significantly below the minimum impact threshold of 72 V dB. Based on the results of the vibration impact analysis, vibration levels for operation of the streetcar throughout the proposed transit corridor can be expected to remain below the vibration impact threshold. The highest estimated vibration level is projected to occur at site R6 a residential property located at 1201 West 12th Street where the vibration level would reach 65 V dB. Construction-related impacts are discussed in Section 5.22.3.8.

Activities at a MSF location are not the type of activities which generate vibration levels that would travel beyond any of the facility locations. Vibration levels generated by the maintenance and storage facility would be similar to that generated by street traffic.

The No Build Alternative would not result in vibration impacts.

5.10.3.1 Vibration Mitigation

FTA requires that mitigation be evaluated for all areas where an impact is expected to occur, although consideration of factors such as cost-effectiveness can be incorporated into the decision regarding whether to specific mitigation for a particular location. Mitigation normally would be specified for areas expected to experience severe impact, unless there is no practical method of achieving a reduction in vibration levels. The projected ground vibration levels generated from streetcar line operations were found to be below the minimum vibration impact threshold of 72 V dB at all representative sites. Therefore, no vibration mitigation measures are

required for the project. Mitigation of vibration related to construction is discussed in Section 5.22.3.8.

5.11 Water Resources

Wetlands, surface waters and ground water are limited within the study area due to the urban environment. A field survey and review of secondary source information was completed to locate these water resources.

5.11.1 Existing Conditions

5.11.1.1 Wetland and Surface Waters

Activities performed to indicate the potential for wetlands and surface waters in the study area included field observations and desktop review of CAGIS maps, U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) online maps, and aerial photo resources. The field survey and review of secondary source information determined that there are no wetlands or surface waters in the study area.

The study area has two distinctly different topographic areas that affect the flow of runoff. The project portion north of West McMicken Avenue includes highly undulating topography ranging from 490 feet above mean sea level (AMSL) to 830 feet AMSL. Although runoff water flows in different directions within this area, its main direction of flow is south-southwest. The project portion south of West McMicken Avenue has relatively flat topography with a south-southwest flow declination toward the Ohio River.

5.11.1.2 Groundwater

According to *Groundwater Pollution Potential of Hamilton County, Ohio* (University of Cincinnati Groundwater Research Center, 1989), the Cincinnati urban area is located in a hydrogeologic setting referred to as Buried Valley. This report indicates that the depth to groundwater within the study area ranges between 30 and 50 feet below grade. The main direction of groundwater flow may be inferred to be to the south-southwest, based on the predominant topography in the study area.

5.11.1.3 Project Area Stormwater Drainage Velocity and Volume

Drainage velocities in the north portion of the study area are generally faster flowing than the southern project portion because of the steeper topography and comparatively less number of street drains. However, the northern project portion has many natural areas that passively function to reduce the volume of runoff by providing percolation area.

Drainage velocities in the south portion of the project area are generally slower than those in the north portion of the project area due to the flatter topography and greater presence of stormwater control structures that are typical of a highly urbanized environment. However, the volume of drainage in the south portion of the project area is greater because of the higher amount of non-permeable surface area (roads, roofs, sidewalks, etc).

5.11.1.4 Stormwater Quality

The quality of stormwater in the northern project portion is likely to be somewhat better than that of the southern project portion. This is due to three factors: a greater amount of vegetation area that provides some level of filtration; fewer vehicles per square mile generating less vehicular borne stormwater contaminants; and fewer urban pollutant sources (industrial and commercial

source contaminants). The southern project portion has far more vehicular, industrial and commercial sources for generating stormwater contaminants.

5.11.2 Potential Impacts

The depth of excavation for constructing the streetcar tracks is not expected to penetrate the groundwater table and, therefore, no construction phase groundwater dewatering is anticipated. Rain event dewatering would be performed in a manner that would significantly reduce the conveyance of suspended soil particles, and the chemical nature of the waters is expected to be the same as surface runoff. No water quality impacts are anticipated with construction phase dewatering. The project will comply with all local stormwater regulations.

The streetcar tracks would be imbedded into existing roadways with less than a half-inch vertical protrusion from the paved surface, and its maintenance facilities would be developed in locations that currently contain a high amount of impermeable surfaces. Because of this, the project would have negligible potential to change stormwater drainage velocities or volume.

The streetcar project would have negligible potential for water quality impacts. There are no wetlands or surface waters within the study area; therefore the project, including the maintenance and storage facility, would have no potential for impacts these resources.

The No Build Alternative would not impact water resources within the study area.

5.11.3 Water Resource Mitigation

The streetcar vehicles will be electrically powered by overhead catenary and will include on-board controls to prevent the release of oil, grease or other vehicle-borne pollutants onto surfaces below. The MSF will employ procedural and structural best management practices (BMPs) for proposer storage and use of vehicle maintenance substances and to prevent accidental releases of potential stormwater contaminants. The MSF will not have a separate wash bay; instead, portable wash equipment will be used. Wash water will be recycled to the maximum extent possible and any remaining wastewater will be pre-treated per Cincinnati's Metropolitan Sewer District requirements prior to discharge in the sanitary sewer system.

5.12 Floodplains

The National Flood Insurance Program defines 100-year floodplains as "areas that would be inundated by the flood event having a one percent change of being equaled or exceeded in any given year". Executive Order 11988 and 23 CFR 650.11 require that federal actions, to the extent possible, avoid short- and long-term impacts to floodplains and avoid direct and indirect support of floodplain development where a practicable alternative exists. The Federal Emergency Management Agency (FEMA) is the organization that provides oversight at the local level.

5.12.1 Existing Conditions

CAGIS and FEMA flood insurance rate maps (FIRMS) were reviewed to determine if floodplains are located in the study area. Figure 16 indicates that the 100 and 500 year floodplains run along the north bank of the Ohio River at the southern extent of the study area. The 100-year flood elevation is 498.5 feet.

5.12.2 Potential Impacts

The southern extent of the Build Alternatives would extend 120 feet and 620 feet into the 100 year and 500 year floodplains, respectively. However, the streetcar track would be located on top of a subterranean parking structure in this location that would raise it out of the 100 and 500 year floodplains. Because of this, no impacts are expected with respect to flooding for the Build Alternatives.

Location 3 for the MSF is on Broadway Street between Third Street and Pete Rose Way. This facility would be in the 500-year floodplain, but not within the 100-year floodplain. Because of this, the MSF (if selected to be constructed at this location) would be inundated in a 500-year flood. MSF Locations 1 and 2 are not within the floodplain.

The No Build Alternative would not impact floodplains within the study area.

5.12.3 Floodplain Mitigation

No mitigation measures will be necessary for MSF Locations 1 and 2. If MSF Location 3 is chosen, a Conditional Letter of Map Revision based on Fill (CLOMR-F) analysis will be required for this location.

5.13 Ecologically Sensitive Areas

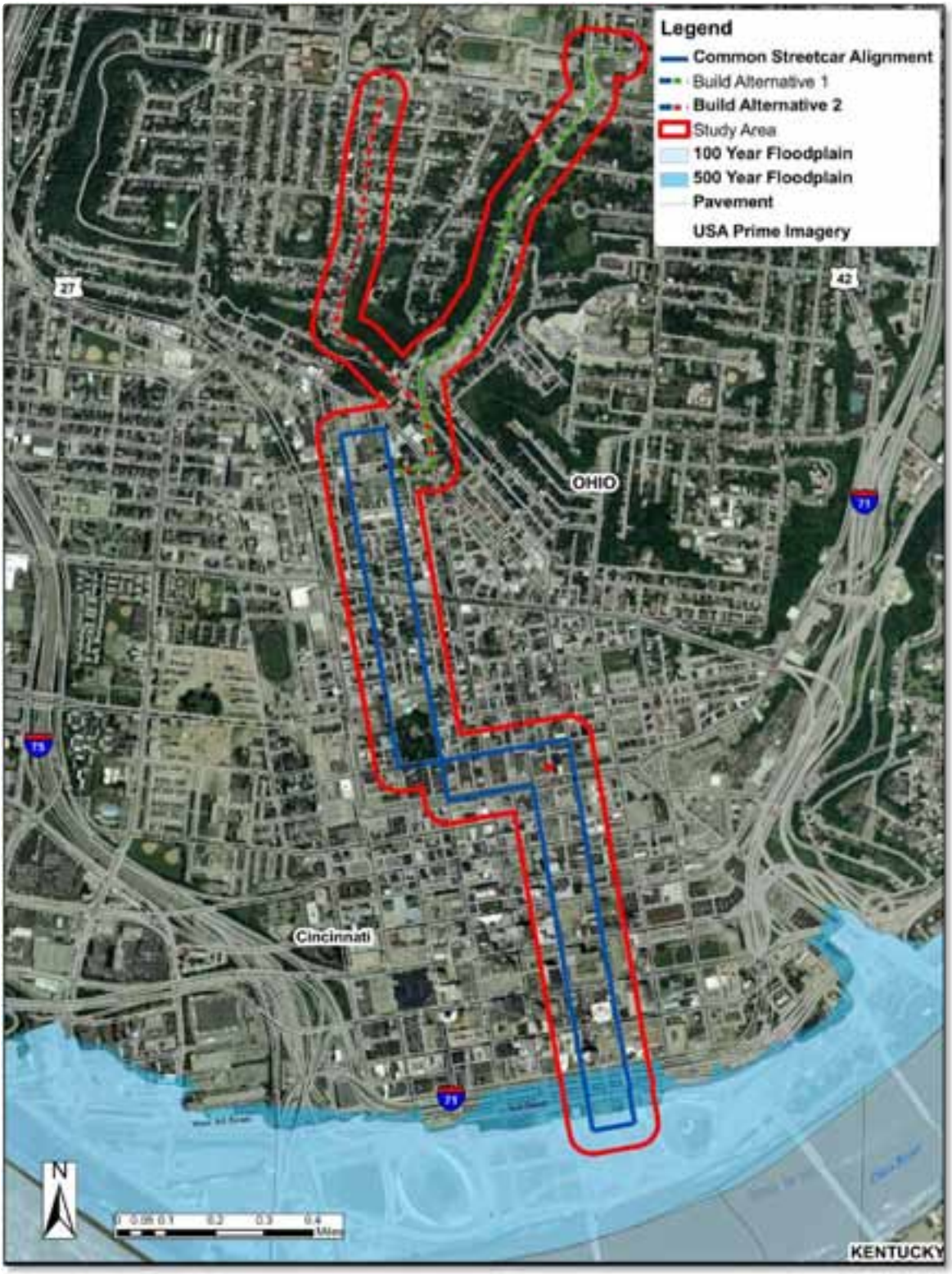
Section 2 of the *Fish and Wildlife Coordination Act* of 1934 as amended through 1965 (FWCA), serves as the regulatory authority for the USFWS to protect and increase the supply of wildlife and wildlife resources and evaluate impacts from proposed projects. The FWCA requires federal and state agencies involved in projects having the potential for fish and wildlife impacts to consult with the USFWS and state fish and wildlife agencies, to determine measures to prevent the loss or damage of wildlife resources.

5.13.1 Existing Conditions

Aerial photograph review, CAGIS review and field observation indicate that the locations with the greatest potential for plant and animal habitats are located in the northern portion of the study area, north of West McMicken Avenue. These areas include Bellevue Park, Inwood Park and the relatively dense urban forests that surround them. Also within the northern portion of the study area are large stands of trees mixed in with residential parcels.

Areas having the potential to support plant and animal habitats in the southern and more urbanized portion of the study area are largely limited to urban parks such as Washington Park. The study area contains no streams, rivers or other water bodies. Because of this, no riparian or aquatic habitat exists to support fish species.

Figure 16. Floodplains



5.13.2 Potential Impacts

Build Alternatives 1 and 2 would not impact ecologically sensitive areas because they would be constructed within existing roadway alignments and the MSF would be constructed upon parcels that are already urban uses. Locations 1 and 2 are existing buildings surrounded by light industrial uses and Location 3 is an existing surface lot surrounded by transportation uses.

The streetcar would be electric, emit no pollutants, and be relatively quiet. The vehicle's nighttime lighting would fall within background lighting levels of existing sources (car and trucks). The project's potential to impact ecologically sensitive areas by means of additional air pollutants, noise and light would be negligible.

The No Build Alternative would not impact ecologically sensitive areas within the study area.

5.13.3 Ecologically Sensitive Area Mitigation

Since ecologically sensitive areas will not be impacted, no mitigation will be necessary.

5.14 Threatened and Endangered Species

The Endangered Species Act of 1973 (ESA) (Public Law 93-205, as amended, US Code 16, § 1536), provides protection for imperiled species and the ecosystems on which they depend. The ESA covers plant and animal species whose populations are at risk of becoming extinct. It is administered by two federal agencies, the USFWS and the National Oceanic and Atmospheric Administration (NOAA), which includes the National Marine Fisheries Service (NMFS). Ohio Revised Code 1531 provides the regulatory authority to the Ohio Department of Natural Resources (ODNR), Division of Wildlife for the protection of threatened and endangered species within the State.

5.14.1 Existing Conditions

State and federal threatened and endangered species found in Hamilton County, that could be present in the study area are listed in Table 17. The Build Alternatives run along segments of discontinuous wooded areas totaling 0.95 miles. Trees are immediately adjacent to the roadways that are proposed to be rights of way for the project for a total of 0.95 miles. No wooded riparian areas, wetlands, swamps or rivers exist within the study area. Because of this, there are no potential habitat areas for the black crowned night heron, riverbank paspalum, Virginia mallow and smooth buttonweed.

Table 17. State and Federal Threatened and Endangered Species

Species	Common Name	Binomial	Federal Status	State Status	General Habitat	Potential in Project Area
Bird	Black Crowned Night Heron	*Nycticorax nycticorax*	N	T	Wooded riparian areas and wetlands	None
	Bald Eagle	Haliaeetus leucocephalus	SC	N	Near water, along rivers, lakes or sea coasts.	Low
Mammal	Indiana Bat	*Myotis sodalis*	E	N	Caves for hibernation, dead or live trees with exfoliating bark and split tree trunks.	Low
Plant	Riverbank paspalum	*Pasalum repens*	N	PT	Shallow water, wet muddy soils, riverbanks and river woodlands	None

Table 17. State and Federal Threatened and Endangered Species

Species	Common Name	Binomial	Federal Status	State Status	General Habitat	Potential in Project Area
	Virginia Mallow	*Sida hermaphrodita*	N	PT	Loose sandy or rocky soils of scoured riversides and floodplains	None
	Smooth buttonweed	*Spermacoce glabra*	N	PT	Swamps and wet woods	None
	Running buffalo clover	*Trifolium stoloniferum*	E	N	Trails, grazed bottomlands, stream banks and partial light areas.	Low
Reptile	Kirtland's Snake	*Clonophis kirtlandii*	N	T	Moist meadows, open woods, urban backyards	Low

E = Endangered
C = Candidate
N = Not Listed
PT = Potentially Threatened
T = Threatened
SC = Species of Concern

Source: Ohio Department of Natural Resources, Division of Wildlife and Ohio Natural Heritage Database, 2010.

The only known nesting location for the bald eagle within Hamilton County is located approximately 15 miles northeast of the study area along the Great Miami River. For this reason, the potential for the bald eagle to occur within the study area is low.

The habitat of the Indiana bat's habitat includes dead or live trees with exfoliating bark and split tree trunks in wooded areas, agricultural areas, and areas at the agricultural- to suburban-fringe. The potential for this species within the study area is considered low due to:

- Closed canopy that permits little light to the forest floor along the wooded segments of Vine Street and west Clifton Avenue.
- Less dense forested areas are mowed and maintained.
- The wooded area in Washington Park is somewhat open with a mowed and maintained lawn. However, the vegetation below is mowed and maintained.

The running buffalo clover's habitat includes trails, grazed bottomlands, stream banks and partial light areas. Because the study area is densely wooded, mowed and maintained or otherwise heavily urbanized, the potential for the running buffalo clover to occur is low.

The habitat for the Kirtland's snake includes moist meadows, open woods and urban backyards. Although the study area includes some urban grass areas, wooded areas and urban backyards, the grass areas are mowed and maintained, the wooded areas are isolated from larger forest bodies because of the urban areas roadways and freeways, and most urban backyards back onto other urban backyards. The potential for Kirtland's snake to occur within the study area is low.

5.14.2 Potential Impacts

Since this project is located in an urban, developed area, the presence of threatened and endangered species is low. Habitats do not exist for the above cited floral and faunal species and the potential for these species occurring within the study area is low. For these reasons, the Build Alternatives and the MSF, would not impact threatened and endangered species.

5.14.3 Threatened and Endangered Species Mitigation

Since threatened and endangered species will not be impacted, no mitigation measures will be necessary.

5.15 Hazardous Materials

Industrial and hazardous waste materials and their management are federally regulated under two laws: the 1980 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the 1986 Superfund Amendment and Reauthorization Act (SARA); and the Resource Conservation and Recovery Act (RCRA). CERCLA focuses on liability for cleanup of contaminated sites and establishes innocent landowner defense. RCRA addresses the management of hazardous materials, including the manufacture, storage, transportation, use, treatment, and disposal of waste materials.

5.15.1 Methodology

A preliminary Environmental Screening Assessment (ESA) was conducted in the study area to identify properties that potentially may have hazardous material concerns. The purpose of the preliminary ESA was to screen the alignments of the Build Alternatives, potential maintenance and storage facility sites and adjoining properties for documented environmental contamination and current or historic site operations that may result in a substantial risk of surface or subsurface contamination.

In order to determine which properties in the study area have the potential for hazardous material concerns, a search was performed of the relevant government environmental databases for records of release events and known hazardous material conditions. Environmental Data Resources (EDR), Inc. performed the database search and developed a report of their findings (Appendix I). This report listed 279 properties within a 0.5-mile distance of the project area. Thirty-two of the 279 properties were evaluated for project impacts based on the criteria in Table 18.

Table 18. Considerations for Selecting Properties for Evaluation

Known Attributes of Hazardous Materials	Site or Project Conditions	Conclusion
Hazardous materials have a limited lateral spread in dry soils, but spread much further once they encounter flowing groundwater.	Groundwater in the project area ranges between 30 and 50 feet below grade and is assumed to flow in a south-southwest direction based on the predominant topography.	Only adjacent, nearby and hydrologically up-gradient properties would be of concern due to contaminants being moved under the excavation area. However, groundwater depth as compared to excavation depth would make interaction very unlikely.
	Project excavation would occur in existing roadways to a maximum depth of 20 inches below grade.	Only adjacent properties would be of concern because of lateral spreading, but not groundwater flow because of depth.
Once in groundwater, hazardous materials travel in the direction of groundwater flow.	Per the EDR Report a number of potential hazardous material properties are down-gradient of the project area.	Potential hazardous material properties located down-gradient of the project area would be of no concern because their contaminants would move away from the project site.
Asphalt and concrete paving effectively separate hazardous materials from human receptors.	The project's construction would be the only phase of which humans could interact with hazardous materials. Once construction is complete, no human contact would be possible.	The construction phase would be the timeframe with the most potential for human to hazardous material contact. The operation phase would be of far less concern.

5.15.2 Existing Conditions

A total of 32 properties were evaluated for project impacts. These properties are located adjacent to and nearby the Build Alternatives and MSF. A table of the 32 properties and the EDR Report map showing the locations of the sites are in Appendix I.

5.15.3 Potential Impacts

There is one property (University Auto Service LLC) of potential concern adjacent the study area located at 2218 Clifton Avenue. This site is in the area north of OTR and south of West McMillan Street. It is considered a potential hazardous materials concern because it has a record of a leaking underground storage tank with no apparent closure; however project related excavation would not likely encounter hazardous materials associated with this site because construction excavation depth would not come close to groundwater. Since the depth of excavation would be only 20 inches below grade, there is limited potential for lateral spreading of hazardous materials into the dry soil in the construction area.

The MSF would house a minimum amount of potential hazardous substances, such as lubricants and solvents, due to the electrical propulsion of the streetcar vehicles.

Three potential sites identified for the MSF are:

- Location 1: South side of Henry Street (120 Henry Street) - This 36,000-square foot site is located in OTR. It is currently owned by Nineteen Ten Elm Street, LLC and consists of a 30,000-square foot industrial building with basement located on this site.

- Location 2: 115 North side of Henry Street (115 West McMicken Avenue) - This 27,000-square foot site is located in OTR. It is currently owned by VOA/ORV Property Company, Inc. and consists of a 21,000-square foot industrial building without a basement. The building currently serves as a halfway house for the VOA.

- Location 3: Broadway Street between Third Street and East Pete Rose Way - This 54,000-square foot in site and is owned by the City of Cincinnati. It is currently an unpaved construction staging site situated beneath expressway ramps with no structures.

Location 3 for the maintenance and storage facility is located in the same general area as three properties, E. C. Shaw Company and Cincinnati Gas & Electric located at 310 and 315 Main Street, respectively; and 312 Walnut Street. However, none of these sites indicates a cause for environmental concern.

Demolition of existing structures to accommodate the MSF could involve hazardous materials such as asbestos and lead paint. Since MSF Location 1 is the recommend preferred MSF location, Phase I and Phase II Environmental ESAs will be performed at only this location. However, if MSF Location 2 or 3 are selected, Phase I and Phase II ESAs will be performed at that location instead.

The No Build Alternative would not be affected by hazardous materials within the study area.

5.15.4 Hazardous Material Mitigation

Oil separation technology and a grit chamber will be employed in the design of the MSF to avoid any discharge of potential hazardous materials into the sanitary sewer system. If asbestos and

lead paint or other hazardous materials are identified by the Phase I and II ESAs of the preferred MSF site, a remediation plan for removal will be developed and undertaken in accordance with relevant regulations and requirements.

5.16 Energy Requirements and Potential for Conservation

Transportation accounts for a major portion of energy consumption in the United States. Energy is consumed by vehicle propulsion and is a function of volume, speed, distance traveled, and vehicle mix. The streetcars for this project would be powered by electricity instead of fossil fuels.

5.16.1 Existing Conditions

The traffic levels on Cincinnati's urban roadways are typical of dense urban environments throughout the nation. The main thoroughfares within the study area include Central Parkway and Walnut, Main, and Liberty streets. Traffic on and around these roadways can be slowed during the peak morning and afternoon hours because of the increased volumes. Parking, particularly in the Downtown area, can be difficult to find between morning and evening peak hours. In brief, under existing conditions, trip delays caused by congestion and limited on-street parking equate to an expenditure of energy loss compared with conditions of unimpeded travel and free and plentiful parking. The latter conditions do not exist in the study area.

5.16.2 Potential Impacts

Implementing the streetcar would provide an alternative travel mode to motorists on Cincinnati's congested urban roadways. While vehicle miles travelled is not affected under the Build Alternative, future phases of the project may potentially result in less fossil fuel consumption due to fewer motorists on the roadways and a reduction in mileage generated by motorists searching for open on-street parking. In addition, with future or expansion of the streetcar lines, the amount of fossil fuel required to generate the electricity[1] to power the streetcar may be less than the amount of fossil fuel that would have been consumed by the motorist who converted to streetcar use. Therefore, the project may have a direct reduction in the consumption of fossil fuels, thus resulting in a positive impact to energy and potential for conservation.

The No Build Alternative would not change the energy use within the study area.

5.16.3 Energy Requirement Mitigation

No mitigation measures will be necessary.

5.17 Electromagnetic Fields

This section describes the environmental setting and effects of the proposed project with regard to electromagnetic fields (EMFs).

5.17.1 Existing Conditions

Electrical systems produce both electric fields, which result from the strength of the electric charge, and magnetic fields, which result from the motion of the charge. Together, electric and magnetic fields create invisible, non-ionizing, low-frequency radiation referred to as "electromagnetic fields". The strength of an EMF depends upon the current; the higher the

[1] Nearly all of the electrical power plants within a 25 radius of downtown Cincinnati are coal or oil fired.

current, the stronger the magnetic field. The strength of an EMF is represented in milligauss (mG).

Cincinnati's streetcar system would operate on a 750-volts direct current (DC) electrical system. The five traction power substations would be located along the alignment. The substations would transform and invert alternating current (AC) power to DC power. Each car would draw a maximum of approximately 1,300 amps of current from the system. The streetcar system is anticipated to generate EMFs that would vary depending upon factors such as streetcar length, operating mode (acceleration, deceleration, stationary), the number of streetcars, and the number of passengers.

Apart from the streetcar system itself, there are no known facilities housing nanotechnology equipment or buildings housing sensitive equipment that could be potentially impacted by the streetcar electrical system, including catenary and substations.

5.17.2 Potential Impacts

No negative impacts caused by EMFs resulting from the Cincinnati Streetcar are anticipated. Electromagnetic levels would be significantly less than those which studies have identified would have an adverse impact on human health.

There are no established or regulatory federal or state governmental standards for EMF exposure directly applicable to the proposed project. Voluntary standards for EMF exposure have been developed by the International Committee on Electromagnetic Safety (ICES). The ICES standards recommend a maximum permissible 6-Hz magnetic field exposure level which is approximately 300 milliGaus (mG). The International Commission on Non-Ionizing Radiation Protection and the American Conference of Governmental Industrial Hygienists (ACGIH) have developed guidelines for AC and DC magnetic fields[2].

Electromagnetic fields for streetcars are higher than those of trains and buses but are comparable to those found in subway systems with a range between 2 and100 mG.

The No Build Alternative would not have EMF impacts within the study area.

5.17.2.1 Human Health

The strength of EMFs associated with the proposed streetcar system will vary considerably depending on factors such as streetcar length, mode (acceleration, deceleration, stationary), the number of streetcars, where in the streetcar the measurement is taken, and the number of passengers.[3,4] It is difficult to obtain an accurate measurement of a person's exposure to EMFs because of these variables. To correlate an individual's exposure to EMFs associated with riding or operating a streetcar becomes exceptionally difficult when other factors are incorporated such as an individual's exposure from other EMF generators such as high voltage transmission and distribution lines, and such common items as household appliances and cell phones. Because of this, and in spite of the numerous studies conducted in this area, there is still no persuasive evidence that EMFs pose any health risks.[5] Therefore, there is no evidence

[2] ICNIRP Guidelines on Limits of Exposure to Static Magnetic Fields, April 2009.
[3] Federal Transit Administration and Santa Clara Valley Transportation Authority, 2000
[4] Havas, M, S. Shum, and R. Dhalla 2004. Passenger Exposure to Magnetic Fields on GO-Trains and on Buses, Streetcars, and Subways run by the Toronto Transit Commission, Toronto, Canada.
[5] Ministry of Health, National Radiation Laboratory, New Zealand. 2008. Electric and Magnetic Fields and Your Health.

at this time that human health would be impacted as a result of EMFs generated as part of this project.

5.17.2.2 Sensitive Equipment

EMFs have the potential to interfere with equipment that is sensitive to electromagnetic interference. The interference, which would be generated by the streetcar system and the movement of large ferromagnetic objects, could potentially impact equipment involving nano-technology such as equipment associated with biomedical research if such facilities are located near the streetcar alignment. There is no known sensitive equipment located within 30 meters of the proposed streetcar line or substation sites. Potential substation locations are listed in Section 4.2.4.

5.17.3 Electromagnetic Field Mitigation

To mitigate any potential impacts resulting from EMFs and circulating ground/net and AC ripple currents on the traction system, substations will be located at least 30 meters from buildings that house sensitive equipment.

5.18 Cultural Resources

Under 36 CFR 800.16(y) an undertaking is defined as a "project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency…." The streetcar project meets this definition of an undertaking. Once an undertaking is identified the next step is to determine whether the undertaking has the "potential to cause effects on historic properties" (those eligible for or listed in the National Register of Historic Places [NRHP]).

A historic architecture survey was completed in 2010 for the Cincinnati Streetcar project. The results of this survey are presented in *Phase I Cultural Resources Investigations* (February 2011) which is provided in Appendix L.

A literature review and background research were conducted for this project to identify historic resources listed or eligible for inclusion in the NRHP, as well as previously identified and surveyed historic period (pre-1960) resources located within the defined project area of potential effects (APE). The APE was defined to include all parcels fronting Build Alternatives 1 and 2 (Figure 17). The APE is a dense urban mix of commercial and residential buildings, with some industrial and institutional resources. The majority of the properties within the area pre-date 1960.

The principal sources utilized for literature review and background research included the Ohio Historic Inventory (OHI), NRHP files available on the Ohio Historic Preservation Office's (OHPO) Online Mapping System, data from the downtown historic resource survey and evaluation conducted in 2001, and the OTR survey and evaluation conducted in 2003 in CAGIS. The CAGIS data include recommendations regarding the NRHP eligibility of all surveyed resources.

Additional historic map research, including a review of Sanborn Fire Insurance maps, was conducted at the Public Library of Cincinnati and Hamilton County in Cincinnati, Ohio. The Hamilton County Auditor's online site was utilized to determine building dates. Additionally, the City of Cincinnati's Historic Conservation Office, and the Cincinnati Preservation Association were consulted to identify properties designated as Local Landmarks and Local Historic Districts.

Field efforts included a review of the APE designed to determine whether previously evaluated resources remain extant, and whether previous recommendations remain appropriate, as well as a field survey of properties along Vine Street, north of the OTR Historic District.

5.18.1 Existing Conditions

Architecturally, the APE is dominated by dense commercial and residential development. Most of the of buildings within the APE are over 50 years old and include building styles and types associated with varying architectural traditions.

The literature review for the Cincinnati Streetcar project identified several previous studies conducted within the project APE as noted in Table 19. A total of 104 resources within the APE were previously documented in the OHI. The literature review identified 17 properties listed in the NRHP (Table 20). This includes historic districts, as well as individually listed resources. The literature review also identified 10 properties that have been previously determined eligible for listing in the NRHP (Table 21). There are five locally designated historic districts in the APE (Table 22). The field survey determined that five additional properties are eligible for listing in the NRHP (HAM-8347-44, HAM-6926-44, HAM-6927-44, HAM-6931-44, and Inwood Park at 2326 Vine Street). In total, 32 resources within the APE are listed or recommended eligible for inclusion in the NRHP. The city streets, including curbs and pavement, are not considered NRHP eligible resources. Detailed mapping of the APE and locations of resources are shown in Appendix L.

5.18.2 Potential Impacts

5.18.2.1 Historic Resources

The Cincinnati Streetcar project entails laying tracks in city streets; building 22 stops, similar in design to downtown bus stops with a small shelter and a ticket vending machine; erecting catenary poles adjacent to the roadways within sidewalk areas along the streetcar alignment; constructing four electrical substations, and constructing a MSF. No historic properties would be demolished or altered by the project.

Cincinnati's streets are not considered historic properties and are not listed as contributing resources within NRHP-listed or local historic districts. Streetcar tracks have been located within streets throughout the APE since the last quarter of the nineteenth century. Installation of new tracks does not constitute a significant change from historic patterns of use. The construction of the track system would have no adverse effect upon any historic property within the APE, including both individual properties and historic districts.

Figure 17. Cultural Resources Area of Potential Effects

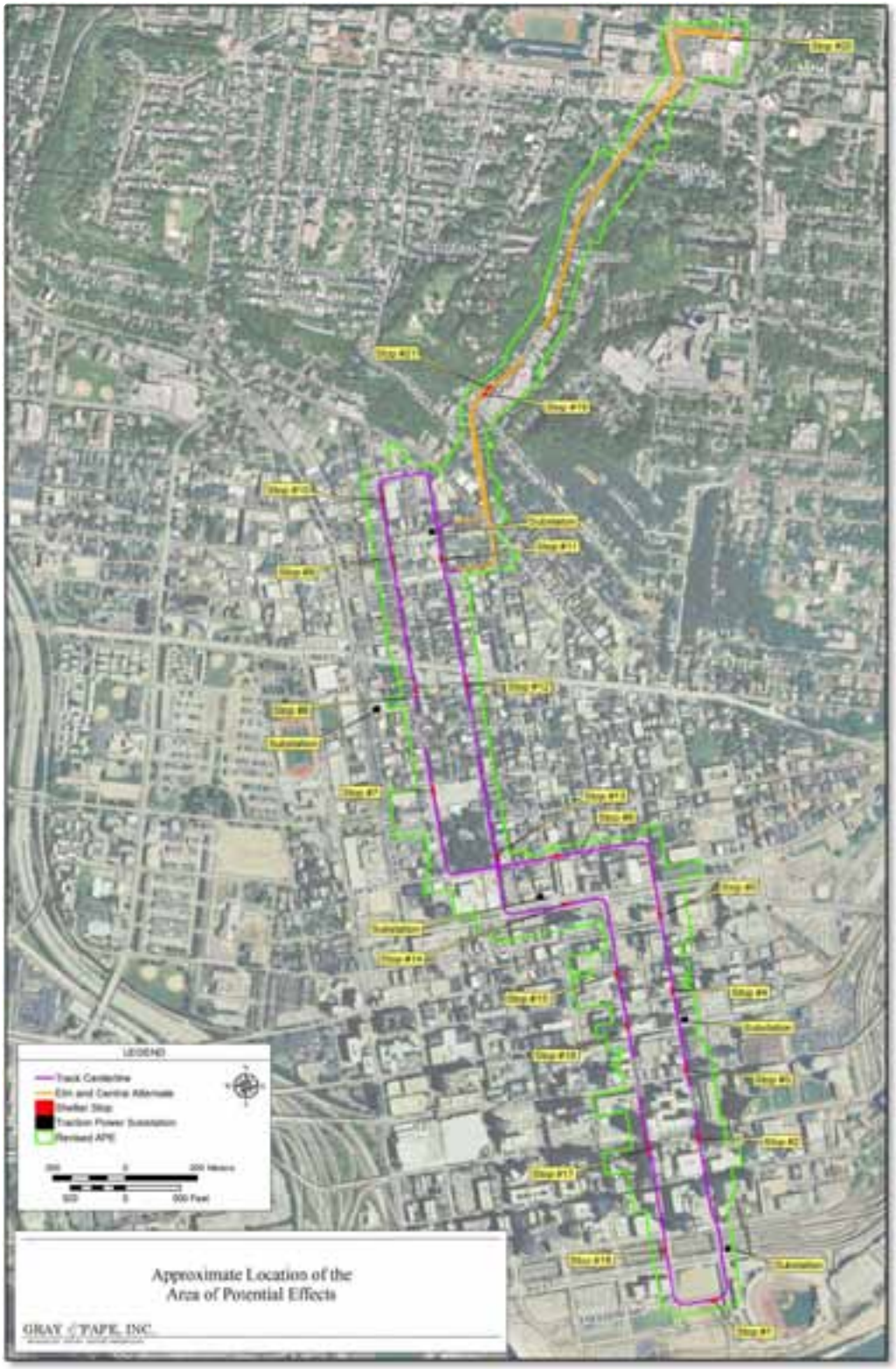


Table 19. Previous Studies in the Area of Potential Effect

ID	Title	Author	Organization	Date
NRHP Multiple Property Documentation Form	The Historic Resources of Cincinnati Park and Parkway System	Nancy Recchie, Historic Preservation Consultant	Benjamin D. Rickey & Co.	2008
	Phase I Architecural Survey of the Proposed I-71 LRT Corridor, Hamilton County, Ohio	Leah Konicki	Gray & Pape, Inc.	2001
H00138	Cincinnati's Historic Properties	N/A	Cincinnati City Planning Department, Historic Conservation Office	1983/ 1989
H00350	City of Cincinnati Historic Inventory Part I	N/A	Cincinnati City Planning Department	2001
H00382	City of Cincinnati Historic Inventory Part II	N/A	Cincinnati City Planning Department	2003
H00424	Over-the-Rhine Conservation Plan	N/A	Cincinnati City Planning Department	2002/ 2006
H00444	Fourth Street: A Bridge to the Future: A Conservation/ Development/Design Strategy	Geddes Brecher Qualls Cunningham	Cincinnati City Planning Department, Historic Conservation Board	1985

Table 20. National Register of Historic Places-Listed Properties

NRHP Number	Resource Name	Address	Listed Date
83001984	Main and Third Streets Cluster	300-302, 304-306 Main Street and 208-210 E 3rd Street	1983
88000078	East Fourth Street Historic District	123, 127, & 135-137 E 4th Street	1988
8000802	Union Trust Building	36 E 4th Street	1980
79001856	Gwynne Building	6th and Main streets	1979
9000443	Hotel Metropole	609 Walnut Street	1990
82003589	Underwriters Salvage Corps	110-112 E 8th Street	1982
82003591	Young Women's Christian Association of Cincinnati	9th and Walnut street	1982
82003585	Nathaniel Ropes Building	917 Main Street	1982
84001046	Courtland Flats	117-121 E Court Street	1984

Table 20. National Register of Historic Places-Listed Properties

NRHP Number	Resource Name	Address	Listed Date
83001985	Over-the-Rhine Historic District	Bounded by Dorsey, Sycamore, Liberty, Reading, Central Parkway, McMicken Avenue and Vine Street	1983
80003035	Alms and Doepke Dry Goods Company Building	222 East Central Parkway	1980
82001467	Theodore Krumberg Building	1201 Main Street	1982
73001453	Apostolic Bethlehem Temple Church	1205 Elm Street	1973
78002076	Hamilton County Memorial Building	Elm and Grant streets	1978
70000496	Cincinnati Music Hall	1243 Elm Street	1970
80003054	First German Methodist Episcopal Church	1310 Race Street	1980
72001020	Findlay Market Building	Esplanade at Elder Street between Elm and Race streets	1972

Table 21. Properties Previously Determined Eligible for Listing in the National Register of Historic Places

Reference Number	Resource Name	Address	OHI Number
NRHP 83001984	Extension of Third and Main Streets Cluster Historic District	308-310 Main Street 312-314 Main Street 316-318 Main Street	N/A
100010	Proposed Fourth & Walnut Street Commercial Style Historic District	432 Walnut Street 414 Walnut Street 41 East Fourth Street 101 East Fourth Street 36 East Fourth Street	HAM-1788-44 HAM-1716-44 HAM-1713-44 HAM-1658-44 NRHP 08000802
N/A	Main Street Locally Certified Historic District	Main Street between East Sixth and East Court streets	N/A
N/A	Court Street Locally Certified Historic District	Court Street between Plum and Sycamore streets	N/A
N/A	Cincinnati Gas & Electric Company Building	139 E. 4th Street	HAM-1659-4
N/A	St. Louis Church, Cincinnati Local Landmark	29 East Eighth Street	HAM-2053-44
N/A	Hibbens Dry Goods Company Building	700 Walnut Street	HAM-5487-44
N/A	Olympic Auto Park Garage	38 E. 3rd Street	HAM-5573-4
N/A	Federal Courthouse	100 E 5th Street	HAM-7570-4
N/A	Olympic Garage	116-120 E 7th Street	HAM-7585-4

Table 22. Local Historic Districts

Resource Name	Address
Court Street Historic District	Court Street
Main Street Historic District	Main Street
Over-the-Rhine Historic District	Various Streets
Third-Main Street Historic District	Third Street
St. Louis Church	29 East Eighth Street
Citadel Building	118-120 East Eighth Street

Station stops would be small, transparent structures, similar in design to bus shelters and located on the sidewalk. The streetcar stops are freestanding structures that would not be attached to, or in contact with, any extant building or structure. The simple, utilitarian design of the stops assures that they would not constitute either a falsely historic or a distractingly modern appearance within the streetscape. The 22 proposed streetcar stops would have no adverse effect upon any historic property within the APE, including both individual properties and historic districts. The stops would be simple and utilitarian in design and will neither create a false historic appearance nor introduce a distracting modern design element.

Construction of the catenary system would entail the removal of extant overhead wires, reducing visual clutter within the APE. The catenary poles would be placed in the sidewalk zone and resemble telephone or utility poles. They would not have any direct connection to buildings. The catenary system would have no adverse effect upon any historic property within the APE, including both individual properties and historic districts. The system would be entirely freestanding, and would not be attached to, or in contact with, any extant building or structure. The poles would be simple and utilitarian in design and would neither create a false historic appearance nor introduce a distracting modern design element. As with the track system, catenary systems have been located throughout the APE since the last quarter of the nineteenth century. Installation of a new catenary does not constitute a significant change from historic patterns of use.

The four electrical substations would consist of 20-foot by 40-foot one-story buildings, which contain electrical equipment that distribute electricity to the overhead wires that power the vehicles. These structures are prefabricated and placed, so it is anticipated that on-site construction would be limited to construction of a concrete foundation pad and installation of a security fence. The substations will be located in areas that are currently parking lots or city property, with the exception of the Second Street location, which is in an unused middle portion of roadway right of way. The substations would have no adverse effect upon any historic property within the APE, including both individual properties and historic districts. Construction of the substations will not alter, directly or indirectly, any of the characteristics of any historic property that qualifies it for inclusion in the NRHP by diminishing the integrity of a property's location, design, setting, materials, workmanship, feeling, or association.

A MSF is where transit vehicles are stored and maintained, and from where they are dispatched and recovered from service. The MSF for the Cincinnati Streetcar project will be designed to store nine vehicles and would measure approximately 250 feet in length and approximately 50 feet in width. The MSF would accommodate up to 12 vehicles. Two service bays, washing equipment, parts and equipment storage, and employee and administrative facilities also would be located within the MSF. The MSF location would include site lighting and protective fencing.

None of the three proposed maintenance and storage facility sites are existing NRHP listed or eligible properties. Two of the three MSF sites are located in the OTR Historic District. The MSF would not have an effect upon the qualities that make the OTR Historic District significant. No contributing resource would be demolished or damaged. The proposed Locations 1 and 2 would require demolition of a non-contributing resource within the OTR Historic District. Location 3 is a surface parking lot and therefore would not have an effect on historic districts or properties.

Construction of the MSF would not alter, directly or indirectly, any of the characteristics of any historic property that qualifies it for inclusion in the NRHP by diminishing the integrity of a property's location, design, setting, materials, workmanship, feeling, or association. The size and scale of the proposed MSF is in keeping with that of the non-contributing resource that would be demolished to make way for the new facility.

The criteria of adverse effects was applied to the various components of the streetcar system to determine whether any of these components would have an adverse effect upon the characteristics that make individual historic properties, or historic districts, within the APE eligible for inclusion in the NRHP. As presently designed, the proposed undertaking would not require the demolition or alteration of any NRHP-listed or -eligible property within the APE.

Since the project would not require the destruction, demolition, or alteration of any buildings or structures within the APE, *potential adverse effects are limited to visual effects* that might diminish the integrity of a historic property's setting, feeling, or association. The extent of potential adverse impacts on any particular historic resources and the resolution have not yet been determined as noted in the March 16, 2011 Section 106 letter from FTA to the OHPO (Appendix K, Agency Coordination).

The No Build Alternative would not impact historic resources within the APE.

5.18.2.2 Archaeological Resources

The street construction would entail an 18-inch deep excavation for placement of foundation material and laying track. The shallow depth of the excavation precludes disturbance of subsurface archaeological resources that may be located below the streets. The undertaking will have no adverse effect upon subsurface archaeological resources in the track areas and no further archaeological investigations are required.

Of the three sites for the MSF, only Location 2 has the potential to contain intact subsurface archaeological resources. Location 1, on the south side of Henry Street, has an existing basement that was previously disturbed, with no intact subsurface archaeological resources. Location 3, on Broadway Street between Third Street and Pete Rose Way, is located in an area previously disturbed by the construction of I-71 (Fort Washington Way).

The No Build Alternative would not impact archaeological resources within the study area.

5.18.3 Cultural Resources Mitigation

A Memorandum of Agreement (MOA) is being developed between the FTA, City of Cincinnati and OHPO, to facilitate future consultation so that specific aspects of the design that may affect historic properties will be considered. This approach will allow avoidance or minimization of potential effects where possible. The MOA will establish a structure for discussions so that, as the project moves towards final design, consulting parties who have an interest in various

aspects of the project can return to consultation. Mitigation of visual impacts to historic resources listed in or eligible for the listing in the NRHP by catenary lines and poles, atmospheric, or audible elements will be carried out through the measures stipulated in the MOA. As part of the Section 106 process, consulting parties will have the opportunity to review and comment on design drawings in relation to the visual setting.

Should MSF Location 2 be selected, a Phase 1 Archaeology Survey will be completed prior to construction to determine whether there is a potential for impacts to subsurface archaeological resources.

5.19 Section 4(f) Resources

Section 4(f) of the Department of Transportation Act of 1966, as amended (49 U.S.C. Section 303[c]) was enacted to preserve publicly owned land used for recreation, wildlife, and waterfowl refuges. Section 4(f) properties are publicly owned parks, wildlife management areas, historic resources that are listed on or eligible for listing on the NRHP and archaeological sites that are eligible for the NRHP and warrant preservation in place.

The Secretary of the U.S. Department of Transportation may approve a transportation project that "uses" a Section 4(f) resource only if the Secretary makes the following findings:

- There is no feasible and prudent alternative available to the use of land from the Section 4(f) resources; and
- The project includes all possible planning to minimize harm to the Section 4(f) resource resulting from the use [see 49 U.S.C. § 303(c)].

In general, a Section 4(f) "use" occurs with a transportation project or a program when:

- Section 4(f) land is permanently incorporated into a transportation facility;
- There is a temporary occupancy of Section 4(f) land that is adverse to the protected activities, features, or attributes that qualify the resource for protection under Section 4(f); or
- Land from a Section 4(f) resource is not incorporated into the project but the proximity effects of the project or program are so severe that the protected activities, features, or attributes that qualify the resource for protection under Section 4(f) are substantially impaired.

5.19.1 Existing Conditions

Section 4(f) resources within the study area consist of parks and historic resources. Parks and recreational facilities within the study area are listed in Table 23, shown on Figure 18a-c and also discussed in Section 5.5. There are three parks that are publicly owned and primarily used for recreational purposes:

- Washington Park, between 12th and 14th streets and between Elm and Race streets
- Bellevue Hill Park, on West Clifton Avenue
- Inwood Park, on Vine Street, south of McMillan Street.

Table 23. Section 4(f) Resources - Parks

Resource	Address	Ownership	Description	Impact
Washington Park	1230 Elm Street (Between 12th and 14th streets and between Elm and Race streets)	City of Cincinnati	Renovation in progress; 8 acres; Public green space that will include play area, water feature, gazebo/performance stage, event plaza, dog park, underground parking garage	No direct impacts: No new right of way required from property; stops and poles located within existing right of way at this location; No proximity impacts from noise or vibration.
Bellevue Hill Park	2191 Ohio Avenue	City of Cincinnati	1 basketball court; open area; small restroom facility and pavilion; playset equipment; benches and picnic tables	No impact by preferred alternative
Inwood Park	2308 Vine Street (South of McMillan Street)	City of Cincinnati	Pavilion; walking paths; open space; reflection pond; tennis courts; basketball courts; playset equipment; pool available (not in operation)	No direct impacts: no stops placed at the park and no new poles placed outside of existing right of way at this location; No proximity impacts from noise or vibration.

There are 17 properties listed on the NRHP within the APE for the project. An additional 15 properties have been determined as eligible for listing on the NRHP. These properties are discussed in Section 5.18 and in the *Phase I Cultural Resources Investigations* (February 2011), which is provided in Appendix L. No wildlife or waterfowl refuges are present within the study area.

5.19.2 Potential Impacts

As shown in Table 23, none of the three publicly-owned parks would be directly impacted or have a constructive use as a result of the streetcar project, including the MSF. No right of way is required from Section 4(f) resources within the study area. All system elements for the project will be placed in the existing right of way. No proximity impacts are expected from noise and vibration to these resources as discussed in Sections 5.9 and 5.10. Additionally, no other adverse effects related to access and use of Inwood Park are anticipated (Letter from the Cincinnati Park Board dated February 25, 2011; Appendix K; Agency Coordination).

The impacts to historic resources are described in Section 5.19.2.1. Since the project will not require the destruction, demolition, or alteration of any buildings or structures within the APE, potential adverse effects are limited to visual effects that might diminish the integrity of a historic property's setting, feeling, or association.

The No Build Alternative would not result in the use of any Section 4(f) resources.

Figure 18a. Section 4(f) Resources – Parks

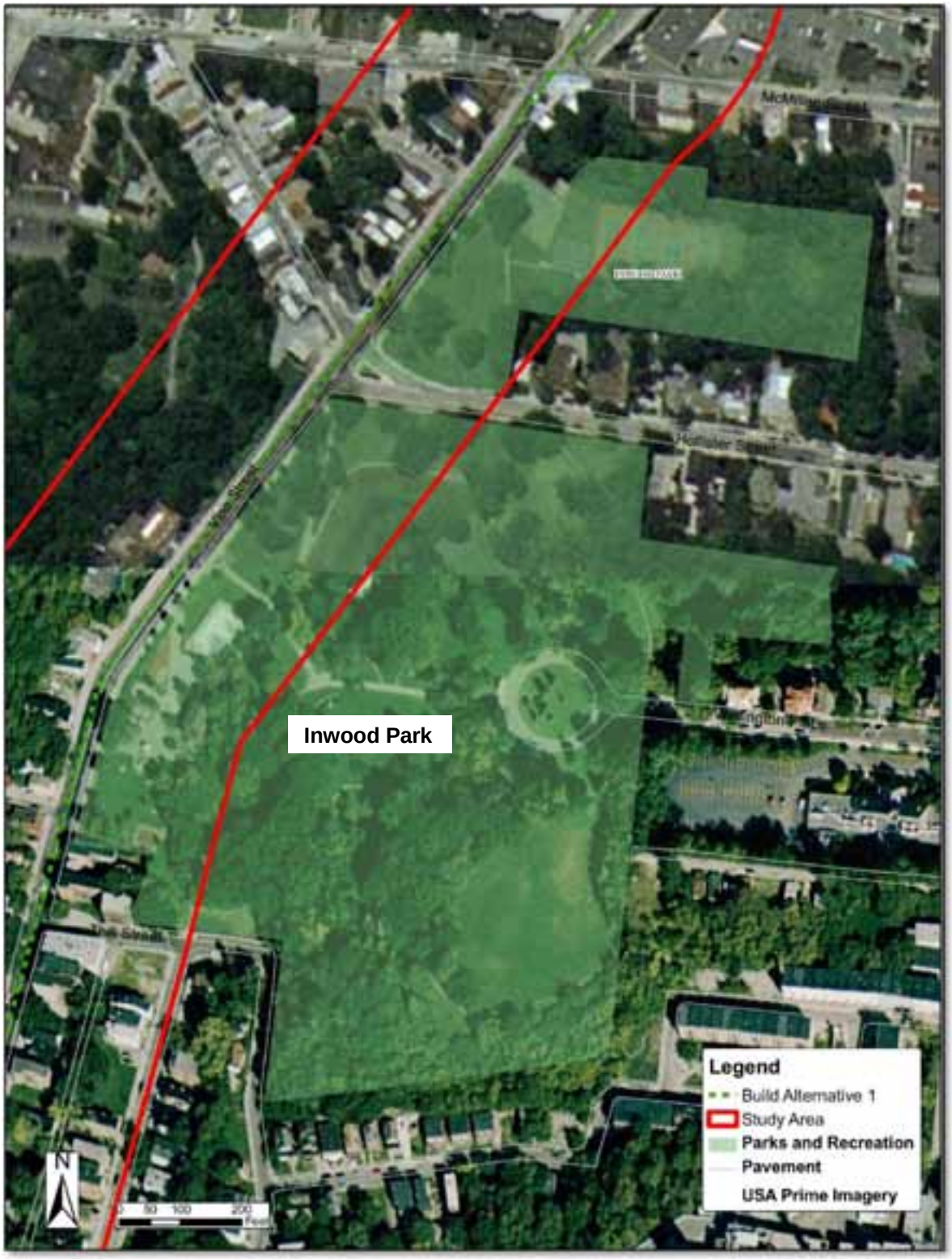
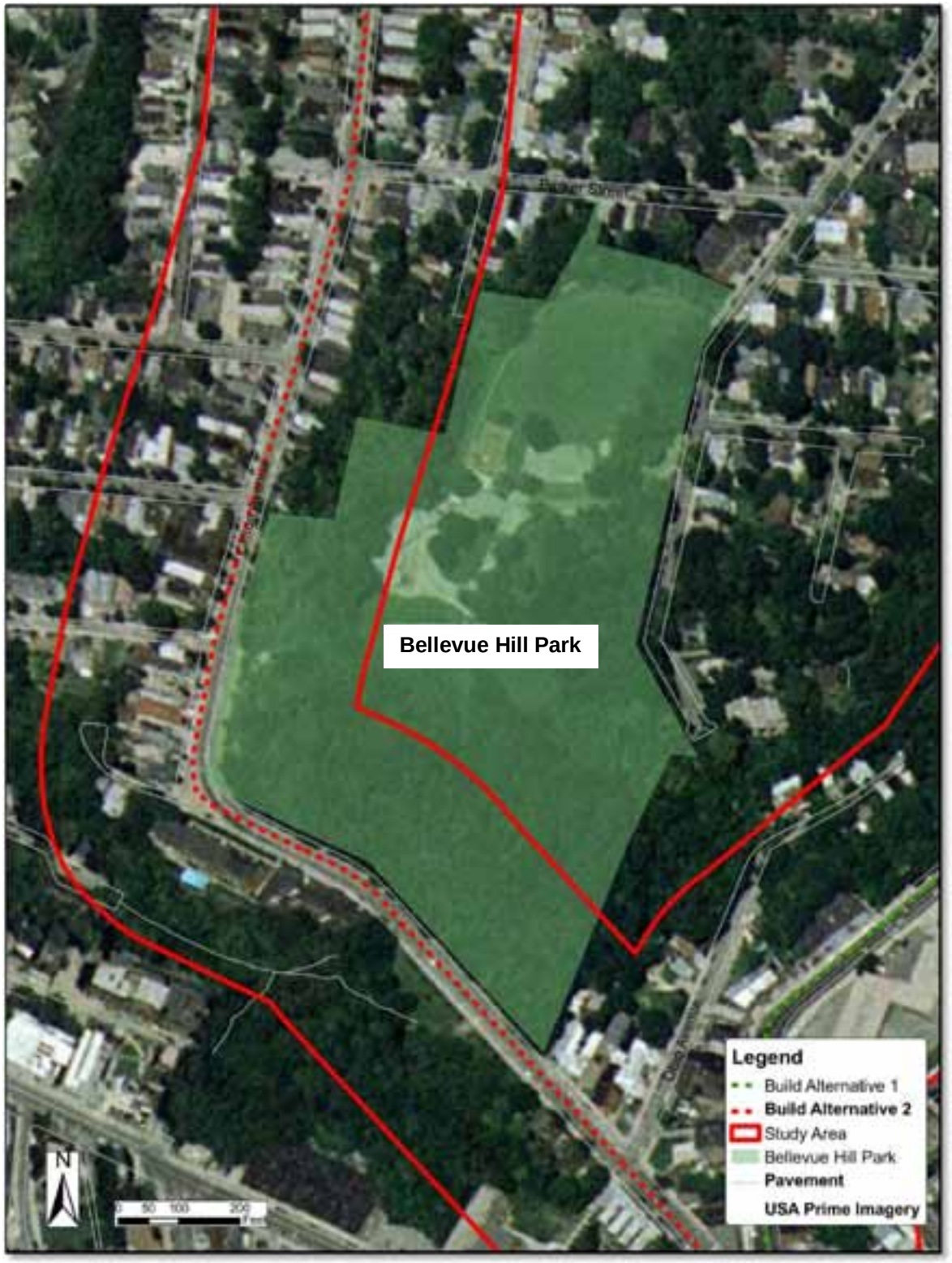


Figure 18b. Section 4(f) Resources – Parks

Figure 18c. Section 4(f) Resources – Parks



5.19.3 Section 4(f) Mitigation

Based on the findings of the Section 4(f) analysis, no mitigation measures are required for the publically-owned parks.

Mitigation of visual impacts to historic resources listed in or eligible for the listing in the NRHP by catenary lines and poles, atmospheric, or audible elements will be carried out through the measures stipulated in the MOA with the OHPO. As part of the Section 106 process, consulting parties will have the opportunity to review and comment on design drawings in relation to the visual setting.

5.20 Visual Quality

Title 23 USC 109(h) cites the aesthetic effect of the proposed project as a matter which must be fully considered. The visual quality and aesthetics of an area are composed of the visible physical characteristics (i.e., landscaping, water, and geography) and manmade features (i.e., buildings, structures, and roadways).

- **Regional Landscape** – Regional landscapes are discussed in terms of their landform, topography and/or land cover components, which would include water, vegetation and manmade development.

- **Landscape Unit** – Landscape units are within the regional landscape and are "outdoor rooms" that often correspond to places or districts that are named (i.e. downtown). Landscape units are usually enclosed by clear landform or land cover boundaries.

- **Visual Survey Locations –** Visual survey locations (VSL) are locations of specific interest to persons within the larger study area and landscape unit. Attributes of VSLs are described in terms of visual character, quality, and visually sensitive resources. These are discussed below:

    - Visual Character – Visual character is discussed in terms of landform, water, vegetation, and manmade development found within the location.

    - Visual Quality – Visual quality is discussed in terms of the vividness, intactness, and unity of the location's landscape components.

        - Vividness: Vividness is defined as the memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.

        - Intactness: Intactness is defined as the integrity of visual order in the natural and man-built landscape, and the extent to which the landscape is free from visual encroachment.

        - Unity: Unity is defined as the degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony or compatibility between landscape elements.

The visual quality of a location is considered high when its landscape components (landform, water, vegetation, manmade development) exhibit striking characteristics that convey visual excellence.

- Visually Sensitive Resources (VSL) – Visually sensitive resources are those that are noted because of their potential to be important for historic or recreational reasons.

5.20.1 Existing Conditions

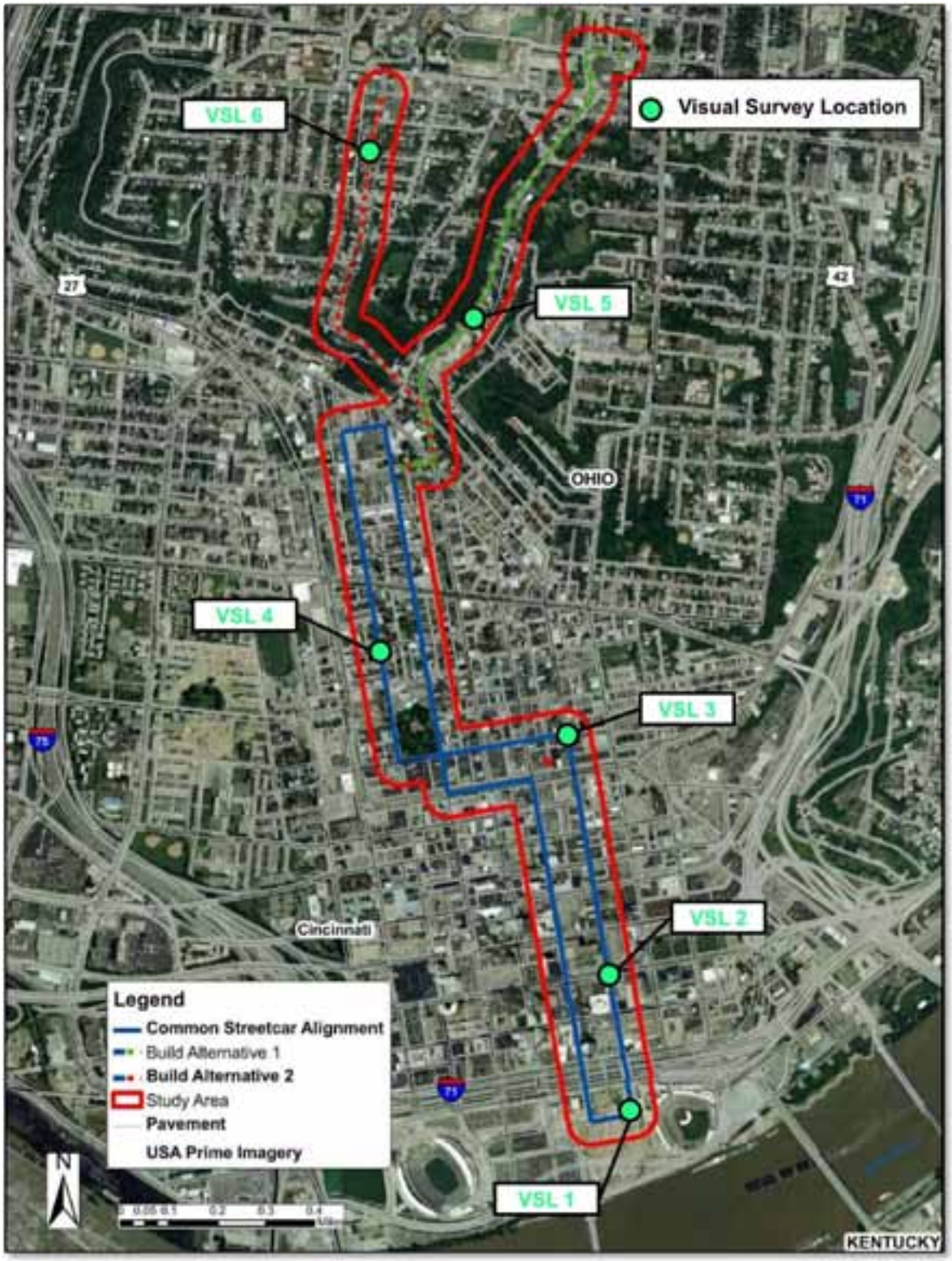
The study area is located within one regional landscape unit that is comprised of high to medium density urban uses within the City of Cincinnati. Within this regional landscape there are two distinct landscape units. The first is located in the heavily urbanized area of Downtown Cincinnati from the vicinity of the Great American Ball Park to West McMicken Avenue. For this assessment, this area is identified as the Cincinnati Southern Landscape Unit (CSLU). The second landscape unit is located north of West McMicken Avenue in the transitional zone from highly urbanized land uses to high and medium density urban residential land uses. This landscape unit is identified as the Cincinnati Northern Landscape Unit (CNLU).

VSLs were selected based on two criteria: 1) by the presence of residents in the area; and 2) by their potential to represent or typify a distinct visual character within the project area. The VSLs selected are shown in Figure 19. Photographs of the VSLs are in Appendix J. For this assessment, the VSLs are numbered one through six, and are discussed below.

VSL 1 – VSL 1 is located in the far southern portion of the CSLU at the corner of Main Street and Freedom Way. The visual character of this VSL is a roadway and high-rise building dominated flat area that is within 600 feet of the Ohio River's northern bank. The area is almost without vegetation, with the exception of ornamental trees and vegetation attributable to the buildings in the area. Views to the south open onto the Ohio River. Views to the west open onto the Roebling Suspension Bridge, Paul Brown Stadium, and the Brent Spence Bridge (I-71/75). Views to the north and east are closed in by high-rise buildings, Great American Ball Park, and transportation uses. With respect to visual quality:

- **Vividness** - The vividness of this VSL is medium because the positive visual attributes associated with riverfront views are offset by the negative visual attributes of expansive parking lots.
- **Intactness** - The intactness of this VSL is low because a number of different land uses are within view (high and medium-rise buildings, stadium, riverfront and parking).
- **Unity** - The unity of this VSL is low because the structures and uses within view do not form a cohesive visual pattern.
- **Visually Sensitive Resources** – The visually sensitive resources at this VSL include the Ohio River.
- **Visual Receptors** – The visual sensitive receptors in this VSL are largely transient users of the area and include persons in vehicles on local roadways and parking lots, persons on sidewalks, including those using the Roebling Suspension Bridge to walk to Covington, and persons attending sporting events at nearby stadiums, Great American Ball Park and Paul Brown Stadium.

Figure 19. Visual Survey Locations



VSL 2 – VSL 2 is located in the southern portion of the CSLU at the corner of Main and Fifth streets in downtown. The visual character of this VSL is a high-rise building dominated flat area in an urban environment. The VSL includes trees that are associated with Fountain Square (a civic plaza). Views are closed in by high-rise buildings in all directions. With respect to visual quality:

- **Vividness** - The vividness of this VSL is medium because although VSL 2 is homogenous with the rest of the urban environment in the area, the visual "spilling over" of the vegetation in Fountain Square makes a notable view when compared to the rest of the urban environment.
- **Intactness** - The intactness of this VSL is low because a number of different building heights and architectural styles are within view.
- **Unity** - The unity of this VSL is low because the structures and uses within view do not form a cohesive visual pattern.
- **Visually Sensitive Resources** – There are no visually sensitive resources at this VSL.
- **Visual Receptors** – The visual sensitive receptors in this VSL are the roadway users and pedestrians on Main and Fifth streets.

VSL 3 – VSL 3 is located in the central portion of the CSLU at the corner of Main Street and 12th Street. The visual character of this VSL is a high and mid-rise building dominated flat area in an urban environment. The VSL is entirely without vegetation, with exception of one tree in a parking lot. Views are closed in by high and mid-rise buildings in all directions. With respect to visual quality:

- **Vividness** - The vividness of this VSL is low because the VSL is homogenous with the rest of the urban environment in the area, and there are no uses that would make it otherwise memorable.
- **Intactness** - The intactness of this VSL is low because a number of different building heights and architectural styles are within view.
- **Unity** - The unity of this VSL is low because the structures and uses within view do not form a cohesive visual pattern.
- **Visually Sensitive Resources** – There are no visually sensitive resources at this VSL.
- **Visual Receptors** – The visual sensitive receptors in this VSL are the roadway users and pedestrians on Main and 12th streets.

VSL 4 – VSL 4 is located in the northern portion of the CSLU at the corner of Elm Street and 15th Street. The visual character of this VSL is a low-rise building dominated, aging, inner city residential area that includes several structures that are dilapidated. The VSL includes many mature street trees that form and arch over the roadway. Views are closed in by the trees and buildings. With respect to visual quality:

- **Vividness** - The vividness of this VSL is medium because the street trees form a memorable visual attribute. However, the positive visual attribute of the street trees are negatively offset by the dilapidated conditions of some of the buildings in this VSL.
- **Intactness** - The intactness of this VSL is high because although there are a number of buildings with somewhat different architectural styles in the VSL, they are of similar height and placement.

- **Unity** - The unity of this VSL is high because the structures and uses within view form a cohesive visual pattern.
- **Visually Sensitive Resources** – The visually sensitive resources at this VSL include the street trees.
- **Visual Receptors** – The visual sensitive receptors in this VSL are the residents of the buildings adjacent to the roadway and pedestrians on Elm and 15th streets.

VSL 5 – VSL 5 is located in the southern portion of the CNLU at the corner of Saint Joe and Vine streets. The visual character of this VSL is a low-rise building dominated aged, urban area at the commercial/industrial to residential fringe. Residences are located in the north portion of this VSL and commercial/industrial buildings and parking lots are in the south portion. Dense tree growth is on the western side of the roadway. Views are closed in by vegetation and buildings to the north and buildings to the east. The views are somewhat open due to elevation change to the south, but are completely closed by trees to the west. With respect to visual quality:

- **Vividness** - The vividness of this VSL is medium because the historic residences and trees represented positive visual attributes. However, the lack of maintenance of some of the residences and nearby commercial/industrial and parking lots negatively detract from vividness.
- **Intactness** - The intactness of this VSL is medium because although some of the residences form a harmonious visual pattern, they are offset by the nearby commercial/industrial uses.
- **Unity** - The unity of this VSL is low because of the presence of at least three different land use types.
- **Visually Sensitive Resources** – The visually sensitive resources at this VSL include the trees.
- **Visual Receptors** – The visual sensitive receptors in this VSL are mainly the residents in the buildings adjacent the roadway, but also include persons traveling on the roadway and pedestrians on Vine and Saint Joe streets.

VSL 6 – VSL 6 is located in the northern portion of the CNLU at the corner of West Clifton Avenue and Atkinson Street. The visual character of this VSL is that of an urban residential setting that is dominated by residences of mixed ages and mature street trees. Views are closed in all directions by residences and vegetation. With respect to visual quality:

- **Vividness** - The vividness of this VSL is low because it is homogenous with the other urban residential environments in the area.
- **Intactness** - The intactness of this VSL is high because the residences, although different in architecture, are roughly the same height and use and form a somewhat harmonious visual pattern.
- **Unity** - The unity of this VSL is high because of the presence of one land use type.
- **Visually Sensitive Resources** – The visually sensitive resources at this VSL include the trees.
- **Visual Receptors** – The visual sensitive receptors in this VSL are mainly the residents in the residences along West Clifton Avenue and Atkinson Street, and secondarily motorists or pedestrians.

5.20.2 Potential Impacts

Throughout the study area, the project would be visually represented as two metal rails in a nine foot wide concrete track slab within existing roadways with electrical lines on catenary poles installed in the sidewalks. In all cases, the slab and tracks would recede into background views because they are at ground level and frequently hidden by moving vehicles (cars, trucks and the streetcar). The most visible portions of the project would be the catenary lines and poles. Construction of the catenaries would entail removal of existing overhead wires, reducing visual clutter in the study area. Table 24 indicates the level of potential visual impact by the project. Build Alternatives 1 and 2 would have the same impact on VSL 1 – 4. VSL 6 would be impacted by Build Alternative 1. VSL 5 would be impacted by Build Alternative 2.

Table 24. Potential Visual Impact

VSL	Location	Visual Quality	Potential Level of Impact
1	Main Street and Theodore M. Berry Way	Medium to Low	Low
2	Main and 5th streets	Medium to Low	Low
3	Main and 12th streets	Low	Very Low
4	Elm and 15th streets	Medium to High	Medium to High
5	Saint Joe and Vine streets	Medium to Low	Very Low
6	West Clifton Avenue and Atkinson Street	Medium	Medium to High

VSL 1 and VSL 2 both have medium to low visual quality and are located within the portion of Cincinnati's urban area that has underground utilities. Because of the underground utilities in these locations, the presence of the catenary system would be somewhat noticeable. However, because of the visual quality in this area, the catenary system would recede into background urban use views and would have a low potential for visual resource impacts.

VSL 3 has low visual quality and is located within the portion of Cincinnati's urban area that has utilities on pole. Because of this, the catenary system would not represent a notable change in views, therefore, VSL 3 would have a very low potential for visual resource impacts.

VSL 4 has medium to high visual quality because of its architecture and mature street trees. Utilities in this area are on poles and in many cases there are many lines on a pole. Although the presence of the catenary system would fall within background views in this area due to the presence of other lines, the potential for visual resource impacts in this area is medium to high because the mature street trees would need to be cut back for the catenary to operate properly.

VSL 5 has a medium to low visual quality and many utilities lines are present on poles. Because of this, the presence of the catenary system would have very low potential for visual resource impacts.

With the low vividness, high intactness and high unity ratings of VSL 6, its general visual quality is medium. Also, its visually sensitive resource is its street trees. Utilities lines are present on poles and many have a number of lines each. Although the presence of the catenary system would fall within background views in this area due to the presence of other lines, the potential for visual resource impacts in this area is medium to high because the mature street trees would need to be cut back for the catenary to operate properly.

Locations 1 and 2 for the MSF are at sites with existing buildings. Changes in visual quality would be low due to the existing characteristics of the locations. The current views are of

industrial buildings ranging from occupied to those in need of repair. In addition, Locations 1 and 2 are located mainly in the interior of their respective block and would not be visible from all surrounding streets except for Henry Street, on which the facility would front. Both Henry Street locations would involve the facility being set back from the sidewalk. Location 3 would have a low potential for visual impacts since the site is underneath an interstate and near various ramps.

5.20.3 Visual Quality Mitigation

Project components such as catenary poles, stops, and electrical substations will be designed to meet city building codes and historic guidelines to minimize visual impact. Mitigation of visual impacts by catenary lines and poles will be carried out through the measures stipulated in the MOA between the FTA, City of Cincinnati and OHPO. As part of the Section 106 process, consulting parties will have the opportunity to review and comment on design drawings in relation to the visual setting.

5.21 Safety and Security

U.S Code of Federal Regulations (CFR), Chapter 53, Sections 5321 and 5330 provide legislation for safety and security on public rail transportation systems. Section 5321 *Crime Prevention and Security* provides for funding, security standards and recommendations for oversight, Section 5330 *State Safety Oversight* provides the funding and mechanism for each state to implement its safety and security programs.

5.21.1 Existing Conditions

Statistics for crimes within the study area and crimes on existing public transit properties and vehicles were provided by the Cincinnati Police Department (CPD) Geographical Information Systems Division. The CPD also provided data on pedestrian, bicyclist and motorist safety in the study area. All data provided by the CPD were from January 1, 2009 to October 23, 2009. For purposes of this discussion, the study area is divided into three geographic sub-areas, Downtown, OTR, and Uptown.

5.21.1.1 Crime in the Study Area

Table 25 provides statistics of crimes that have occurred within each sub-area as shown on Figure 20. The highest crime sub-area is the OTR sub-area, with the greatest number of petty, property, and violent crimes for this area being vandalism, theft and assault/menacing, respectively.

Figure 20. Project Sub Areas

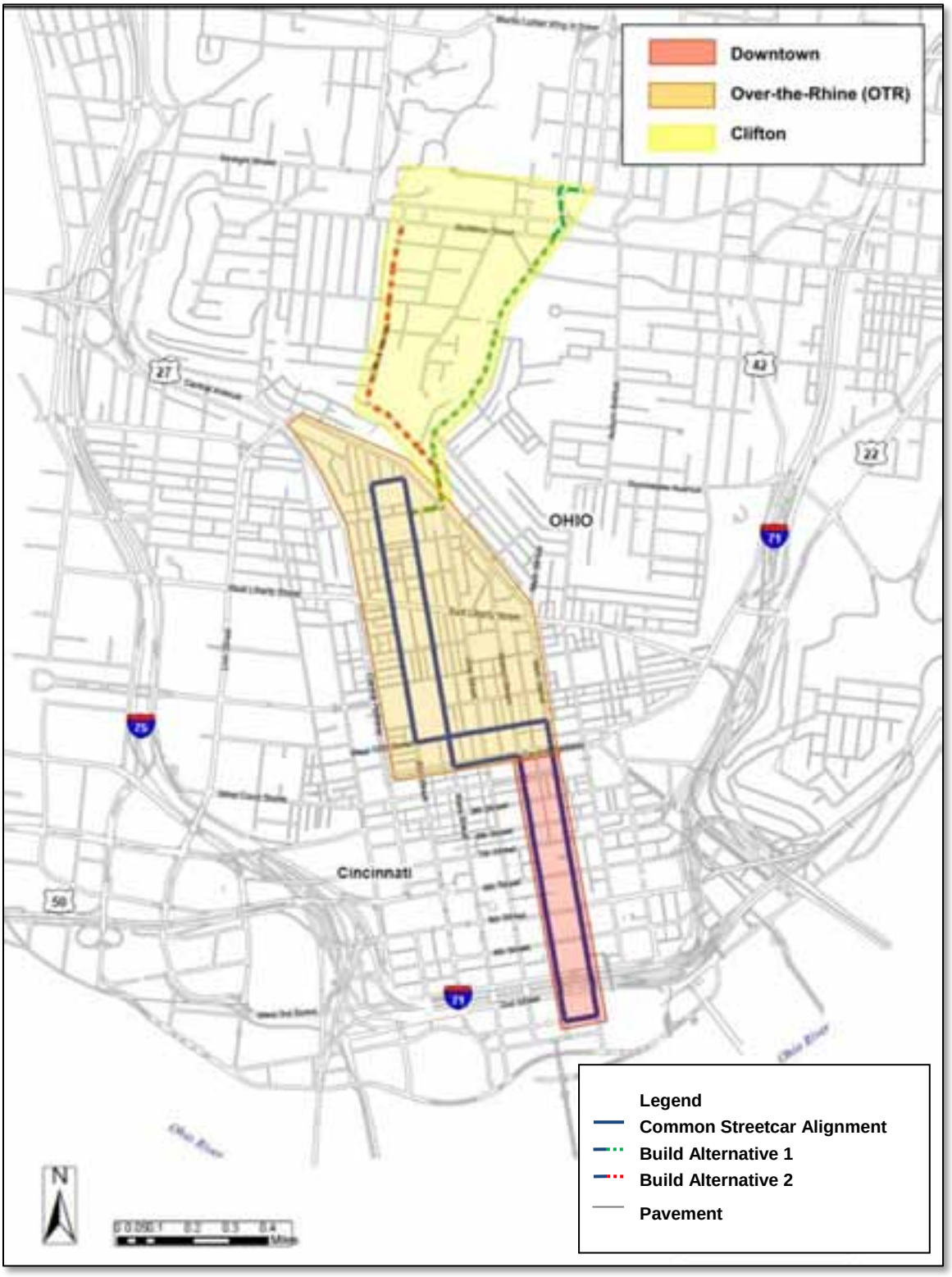


Table 25. Crime per Project Sub-Area

Crime Type	Downtown	Over-the-Rhine	Uptown
Petty Crimes			
Vandalism	26	73	48
Disorderly Conduct	10	17	16
Weapons Offense	0	0	1
Property Crimes			
Auto Theft	3	19	17
Theft	203	155	63
Burglary	25	59	41
Robbery	23	84	22
Fraud	1	1	3
Violent Crimes			
Aggravated Assault	4	50	10
Assault/Menacing	85	156	41
Sexual Offense	0	0	2
Rape	0	3	2
Homicide	0	2	0
Totals[1]	**380**	**619**	**266**

1. Between January 1, 2009 – October 23, 2009

Table 26 provides statistics of crimes that have occurred within 250 feet of the proposed Build Alternatives and throughout the whole of the existing public transit system. The total crime reported within the 250 feet is three incidents between January and October 2009. The project sub area with the greatest amount of crime at public transit facilities and on public transit vehicles is Downtown. However, it is important to note that the highest concentration of public transit is Downtown.

Table 26. Crime at Public Transit Facilities and on Vehicles

Crime Type	System Wide Crime	Crimes within 250 Feet of the Streetcar Alignment (Build Alternatives 1 and 2)		
		Downtown	Over-the-Rhine	Uptown
Crime at Public Transit Facilities				
Robbery	1	0	0	0
Thefts	8	0	0	0
Assault/Menacing	4	0	0	0
Sex Offense	1	0	0	0
Crimes on Public Transit Vehicles				
Aggravated Assault	1	1	0	0
Theft	5	1	0	0
Sex Offense	3	0	0	1

Table 26. Crime at Public Transit Facilities and on Vehicles

Crime Type	System Wide Crime	Crimes within 250 Feet of the Streetcar Alignment (Build Alternatives 1 and 2)		
		Downtown	Over-the-Rhine	Uptown
Vandalism	1	0	0	0
Assault/Menacing	1	0	0	0
Totals[1]	**25**	**2**	**0**	**1**

1. Between January 1, 2009 – October 23, 2009

5.21.1.2 Pedestrian, Bicyclist and Motorist Safety

Table 27 provides statistical on pedestrian, bicyclist and motor vehicle accidents that have occurred within 250 feet of the Build Alternatives. The project sub-area with the greatest amount of pedestrian, bicyclist, and motorist accidents is Downtown.

Table 27. Pedestrian, Bicyclist, and Motorist Accidents within 250 Feet of the Build Alternatives

Accident Type	Downtown	Over-the-Rhine	Uptown
Pedestrian	7	3	1
Bicyclist	1	1	0
Motorist	122	97	110
Totals[1]	**130**	**101**	**111**

1. Between January 1, 2009 – October 23, 2009

5.21.1.3 Safety and Security Attributes of the Proposed Streetcar and Facilities

Streetcar

The streetcar vehicle's interior will be lighted at all operation timeframes when ambient light is low and would include trip hazard indicators and lighting along the floor. The vehicle will also include two enter/exit points and would have a mobile communications system. Low floor vehicles will be used and the interior would incorporate standard side, brace, and overhead hand rails.

Facilities

The proposed streetcar stops will feature lighted shelter structures comprised of two to four poles and a roof and will contain a bench and ticket vending machine. No walls are proposed for the structures. The MSF will include lighting, garage doors and protective fencing. Four substations will be located throughout the study area and would be housed above ground in small metal structures. There is no inherent advantage to substations being located either on the surface or below ground. The trackway will have a less than half-inch protrusion from the roadway surface and the electrical power will be supplied by overhead catenaries well out of the reach of persons. Traffic signals within the existing roadways will assure safe lane crossing, intersection crossing and stopping of the streetcar vehicle as it travels among other motorists.

5.21.2 Potential Impacts

Less crime occurs at public transit facilities and on public transit vehicles than elsewhere within the same survey area (250 feet from the streetcar alignment). Crime incidents at public transit facilities and on transit vehicles are less for the Downtown, OTR, and Uptown areas combined than systemwide crime.

The streetcar vehicle will be well lit and would have dual enter/exit points and on-board communications, to improve its safety and security potential. Streetcar stops will be well lit and would have no potential hiding areas for criminals since no walls would be present.

With respect to passenger, pedestrian, bicyclist and motorist safety, the vehicle's lighted interior, floor indicator and hand rails will reduce the likelihood of passenger trip/fall hazards. Streetcar-oriented traffic signals would act to reduce pedestrian, bicyclist, and motorist accidents. The streetcar track protrusion from the roadway will be less than half-inch to reduce the potential for pedestrian and bicyclist trips and falls.

With respect to accidents related to other streetcar attributes, the catenaries will be out of reach to persons at grade and the electrical substations would be fully enclosed with a security fence, thereby reducing the potential for electrocution incidents.

As indicated above, the proposed streetcar will respond to existing known safety and security concerns; will provide a safe and secure environment for its passengers and employees; and will not introduce new forms of safety or security concerns. Because of this, safety and security impacts are not anticipated for either Build Alternatives 1 or 2. Construction-related activities in terms of safety are discussed in Section 5.22.

The MSF will be fenced and lighted during construction to deter crime. Cameras will also be installed for surveillance to deter crime at facilities. Security issues of the facility will be addressed with assistance from local law enforcement agencies.

The No Build Alternative would not have an impact on safety and security.

5.21.3 Safety and Security Mitigation

Based on the design features and practices incorporated into the streetcar project (streetcar vehicles, stops, trackway and MSF) no further mitigation measures will be required.

5.22 Construction

Most regulatory guidance for construction within roadway corridors is relevant to construction safety for workers, pedestrians, bicyclists and motorists. The City of Cincinnati requires that persons performing construction activities within City roadways utilize the safety control measures found in the *City of Cincinnati Traffic Safety Handbook* (Pflum, Klausmeier & Gerum, undated). The handbook was developed with content from the *FHWA Traffic Control Devices Handbook* (USDOT, Revised 2007) and *Ohio Manual of Uniform Traffic Control Devices* (ODOT, Revised 2005).

5.22.1 Existing Conditions

Construction of the streetcar and its facilities will be completed in phases and take approximately 21 months to complete. The streetcar trackway installation will occur in three segments:

- Freedom Way – Central Parkway/12th Street (Downtown)
- Central Parkway/12th Street – Henry Street (OTR)
- Henry Street - Uptown

Freedom Way – Central Parkway/12th Street

The downtown segment passes through primarily urban commercial and office uses that are interspersed with institutional. The commercial, office and institutional land uses are with 10 feet of the curb; all utilities are underground.

Construction - Preparing Track for Concrete Placement

Central Parkway/12th Street

The OTR segment passes through areas that are primarily urban residential uses with interspersed commercial and institutional uses. Structures tend to be situated within 10 feet of the street curb. Electric and communications utilities are typically located above ground on poles; gas, water and sewer utilities are located underground.

Henry Street – Uptown

The two alternatives pass through areas that are primarily urban residential uses with interspersed commercial uses, but are somewhat less dense than similar land uses in the OTR segment. Residential and commercial structures and facilities typically range between 10 and 30 feet of the curb. Electric and communications utilities are located above ground on poles; gas, water and sewer utilities are located underground. The Uptown segment may be constructed after the downtown and OTR segments are completed.

Catenary Poles and Substations

Catenary poles will be constructed adjacent to the roadways within the sidewalk areas along the streetcar alignment. The installation of the catenary poles, electric lines and substations will be completed after the trackway construction. Catenary poles will be installed to support the overhead wire in a two step process. The first step will be to drill 30-inch diameter holes behind the curbs that when filled with concrete and reinforcing steel will create the foundation for the catenary poles. After the foundations have been set, poles will be bolted into place and cross-arms attached to carry the catenary wire.

Construction - Remove Asphalt and Sub-grade Material

Electrical substations will be located at the following locations:

- Between Second Street and eastbound Fort Washington Way (I-71) just east of Main Street
- Court Street just west of Walnut Street
- Southwest corner of Findlay and Race streets
- Northwest side of Vine Street between Mulberry and St. Joe streets across from the Rothenberg Preparatory School.

Three of the electrical substations will be located on sites that are currently used as parking lots or city property. The substation between Second Street and eastbound I-71 just east of Main Street will be located in an unused center portion of roadway right of way. As these structures are prefabricated and placed, it is anticipated that on-site construction will be limited to placement of a concrete pad and installation of a security fence.

Maintenance and Storage Facility

The MSF would be constructed at one of three sites:

- South side of Henry Street between Elm and Race streets (120 Henry Street)
- North side of Henry Street between Elm and Race streets at (115 West McMicken Avenue)
- Broadway between Third Street and East Pete Rose Way.

It will be constructed independently of the streetcar trackway, catenary poles and electrical substations. The MSF would likely be constructed several months prior to the trackway construction to provide storage for the streetcars.

5.22.2 Construction Activities

Construction of the trackway will occur in a cascading method. During Week 1, Construction Team 1 will saw cut and remove approximately 18 inches of asphalt and sub grade material. Beginning Week 2, Construction Team 1 will move to the next block and will perform its saw cutting and pavement removal preparation work. Also during this second week, Construction Team 2 will begin placing rail and reinforcing steel, preparing the track section for concrete placement.

As Week 3 begins, Construction Teams 1 and 2 will cascade to the next blocks to perform their tasks. Construction Team 3 will set the final alignment and profile. Construction Team 3 would then place concrete and lock the rails in place.

The first phase of construction involves removal and relocation of existing utilities from the path of the streetcar alignment. The utilities include water, gas, sewer, telephone and electric. Both above and underground utilities that could conflict with the streetcar track substations and catenaries will be relocated.

The second phase of construction involves laying the steel track rails. Construction will be carried out in one block segments that will be comprised of three cells representing the activities and timeframes shown in Table 28. Cells within a one-block segment will move forward as each cell on the back side of the construction is completed.

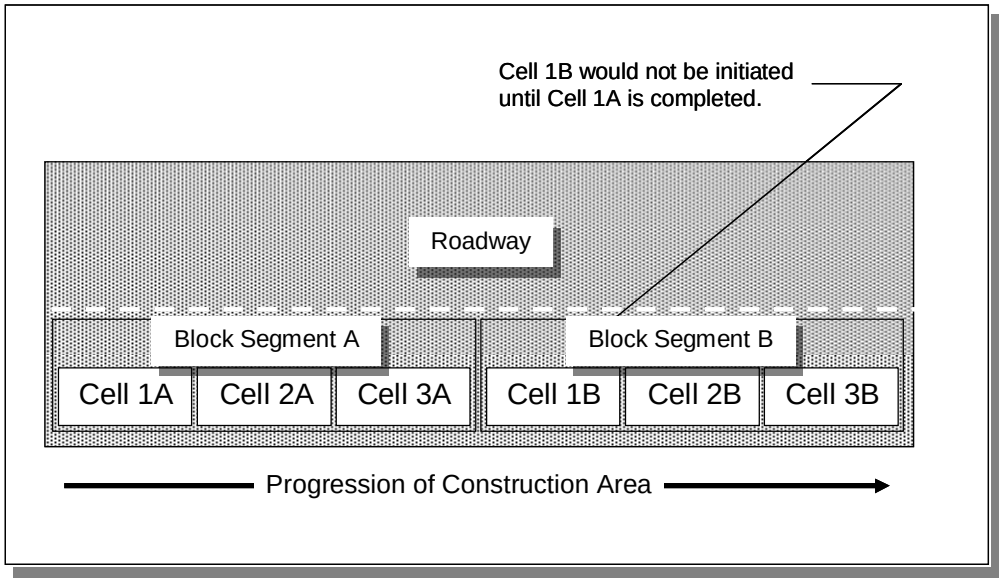
Table 28. Construction Activities and Equipment

Cell	Timeframe of Completion	Activity	Equipment Present at Site
1	1 week	Cutting the existing pavement	• Asphalt saw to cut the pavement
2	1 week	Removing the cut and demolished asphalt	• Wheeled backhoe for crude asphalt breaking • Jackhammers for fine asphalt breaking • Wheeled backhoe for debris pick up • Dump truck for offsite transport
		Excavation of track slab trench	• Wheeled backhoe for excavation and removal • Dump truck for offsite transport
		Laying base aggregate	• Dump truck for transport of aggregate to site
		Installing reinforcing steel and tracks	• Flatbed trailer truck to bring steel and track rails
3	1 week	Verification of track placement	• None
		Pouring of concrete track slab	• Concrete truck for pouring

The third phase of construction includes installation of the catenary poles, electric lines and substations. The fourth, and overlapping, phase is construction of the MSF.

Figure 21 illustrates the progression of construction within the one-block segments. Construction segment lengths at intersections will range between 12 feet (one lane width) and the whole intersection, depending on the traffic and complexity of the intersection. The 12-foot segment length will allow for the rerouting of traffic into adjacent lanes. Intersection segments would require closure of the intersection and will last approximately one weekend.

Figure 21. Construction Progression



5.22.3 Potential Impacts

5.22.3.1 Construction Related Traffic Impacts

Construction of the streetcar alignment will impact traffic operations one block at a time along the route. One lane of traffic will be closed to through traffic, which may result in construction phase traffic delays. Since roadways within the study area have multi-lanes, traffic will be routed onto the adjacent lanes with minor effects to travel time. The roadways that will have the greatest potential delay are those listed in Table 29.

Table 29. Potential Construction Related Traffic Impacts

Street	Between	Arrangement	Typical Traffic Level	Level of Effort to Detour Traffic
12th Street	Main and Elm streets	One lane in each direction with on street parking.	High	Low: These roadways are within the urban grid roadway network
Henry Street	Elm and Race streets		Low	
Findlay Street	Race and Vine streets		Low	
Walnut Street	2nd Street and Freedom Way	One lane in each direction with on street parking.	Low*	Medium: Detours that would coincide with sporting events could cause substantial delays; other timeframes will not be as large of a problem.
Vine Street	Findlay and West McMillan streets		Medium	High: traffic would have to be routed to Clifton Avenue causing substantial delays to southbound travelers.
Clifton Avenue	Vine and West McMillan streets		Medium	High: traffic would have to be routed to Vine Street causing substantial delays to southbound travelers.

* Although traffic levels are typically low for this location, they increase during sporting events because of the roadway's proximity between two major league stadiums.

Regardless of the mitigation option, these roadways will experience levels of delay that are greater than other roadways within the study area.

Traffic delays will also occur at intersections where the entire intersection must be crossed by construction activities.

Installation of the catenary poles, electric lines and substations along the streetcar alignment would also impact traffic operations. Streets will be closed as the poles and electric wires are erected along streets.

There would be minimal traffic impacts at each of the three maintenance and storage facility locations as nearly all of the construction would be within the parcel limits and not in the roadways. The primary impact would occur during the construction of tracks from the street into

the facility, which would involve a brief, temporary closure of the curbside traffic lane and sidewalk. Pedestrian access will be restricted with pedestrians directed to the sidewalk across the street.

5.22.3.2 Construction Related Utility Impacts

Utilities will be relocated from the streetcar alignment prior to the initiation of the project construction activities. Therefore, construction of the streetcar alignment will not impact above- or below-ground utilities. The project may require trimming of some trees along Elm Street. It will require the installation of electrical catenary poles and lines throughout the entire study area. These activities would have the potential for sporadic and temporary service interruptions of electrical power and/or communications, depending on their location. The MSF's electricity will be obtained from the existing power grid that consists of above-ground and below-ground wires, and will be separate from the catenary power system for the vehicles. If necessary, communications can be routed through SORTA's primary operating facility in the nearby Queensgate area. Vehicle spacing could be maintained through visual contact and use of street supervisors. Although a major storm or disaster could affect both facility and service, a service disruption to the facility would not directly result on a streetcar service disruption.

Utility service disruptions would be brief, involving shutting off one connection and almost immediately replacing it with another. Communications between persons and business affected will be handled by a personal visit from a member of the project team to explain the necessary action and timing. If the occupant does not respond or cannot be found, every effort will be made to contact them by leaving a message that includes the relevant information (including contact information), phone call or message, and mail.

Utility impacts created at the MSF sites would be minimal.

5.22.3.3 Construction Related Residential Impacts

The project will result in the brief, temporary cutoff of some residential access way. This is not expected to be a substantial concern in OTR because properties can be accessed by rear alleys. However, construction may be a concern to residences along Vine Street and Clifton Avenue between OTR and Uptown because many, if not most, do not have alley access. A temporary alternative parking plan will to be developed with community input. It will include provisions for parking for persons with disabilities. A construction-related reduction in residential parking availability is not anticipated to be a significant concern because parking is available in the grid street network areas, and is available on both sides of the Vine Street and Clifton Avenue between OTR and Uptown. Construction-related noise impacts will occur over a three week span, with the greatest amount of noise being in the second week. However, the construction-related noise will be temporary and limited in duration. It is subject to City of Cincinnati noise regulations which prohibit nighttime construction adjacent to residential areas except in emergency situations. Construction of the MSF would not have a notable impact on access to residences.

5.22.3.4 Construction Related Business Impacts

The project will result in the brief, temporary disruption to customers and deliveries of businesses along the alignment. The City of Cincinnati, working with businesses, will develop an access maintenance and communication plan. The plan will be designed to publicize to customers that businesses are open and describe how to reach them, direct customers to nearby parking should on-street parking be disrupted, and direct delivery vehicles to alternative loading zones.

Impacts on walk-up customer patronage are expected to be minimal as most construction-related activities will occur at the curbside portion of the sidewalk and not the building side. However, signage will be used to let patrons know that businesses are open.

In OTR, delivery access is not expected to be a problem because properties can be accessed by the rear or side alleys. However, this may be a concern to a few businesses along Vine Street because they do not have alley way access. For other locations without alley access, the City will negotiate special circumstance access and parking for these businesses prior to construction.

Construction related noise impacts will occur over a three week span, with the greatest amount of noise being in the second week. However, the construction phase noise will be temporary and therefore.

Construction of the MSF would not have a significant impact on access to businesses.

5.22.3.5 Construction Related Environmental Justice Impacts

Environmental justice (EJ) population groups near the alignment would be affected by access impacts to residences and businesses, lane closures, detours, and dust and noise from construction activities in the same manner as other local residents. These groups are not expected to be inconvenienced by these activities to a greater extent than the non-EJ population overall. Therefore these impacts would not be disproportionate and adverse to EJ populations. These populations may be somewhat more transit-dependent than the overall population, and local bus routes may be slowed or delayed moving through the project area during construction. This impact would affect all transit users equally, and would be temporary in time and location as new tracks are laid along the proposed route. Thus, a minor impact may occur on local mobility. However, all construction-related impacts would affect all populations and EJ populations would not experience appreciably more severe or greater impacts than others. Thus, construction-related impacts are not expected to disproportionately or adversely affect EJ populations.

5.22.3.6 Construction Related Public Safety Impacts

During construction, traffic warning devices will be utilized and appropriate signage, indication of zones, fences and watch personnel to inform pedestrians and motorists of construction related hazard areas.

5.22.3.7 Construction Related Air Quality Impacts

In general, construction-related effects of the project would be limited to short-term increased fugitive dust and mobile-source emissions during construction. State and local regulations regarding dust control and other air quality emission reduction controls will be followed to minimize air impacts dusting construction.

Fugitive dust is airborne particulate matter, generally of a relatively large particulate size. Construction-related fugitive dust will be generated by haul trucks, concrete trucks, delivery trucks, and earth-moving vehicles operating around the construction sites. This fugitive dust will be caused by particulate matter that is re-suspended by vehicle movement over paved and unpaved roads, dirt tracked onto paved surfaces from unpaved areas at access points, and material blown from uncovered haul trucks.

Generally, the distance that particles drift from their source depends on their size, the emission height, and the wind speed. Small particles (30 to 100 micron range) can travel several hundred feet before settling to the ground. Most fugitive dust, however, is comprised of relatively large particles (that is, particles greater than 100 microns in diameter). These particles are responsible for the reduced visibility often associated with this type of construction. Given their relatively large size, these particles tend to settle within 20 to 30 feet of their source.

5.22.3.8 Construction Related Noise and Vibration Impacts

Construction noise generated by the project will be similar to the noise generated by typical construction projects in urban areas. Preliminary analysis of construction noise assumes an hourly L_{eq} noise level of 85 d_{BA} at a distance of 50 feet from the construction site boundary. This noise level has been found to be consistent with noise levels from roadway construction activities where maximum instantaneous noise level from individual construction equipment is limited to 86 d_{BA}. Noise levels at noise sensitive properties located at known distances from the construction site boundary can be estimated by assuming a 6 d_{BA} drop-off for every doubling of distance from the site boundary.

The major sources of vibration in the corridor include automobiles, trucks, and buses. Typical velocity levels generated by these types of vehicles range from 50 to 60 VdB and are below the threshold of perception. FTA vibration criteria do not require baseline measurement of existing vibration levels to access potential damage from transit construction operations (FTA, 2006). However, damage risk criteria will be developed during the construction phase of the project. Construction of the streetcar and its components could result in short-term increases in vibration levels at properties in the immediate vicinity of construction activities. Common vibration-producing equipment includes jackhammers, pavement breakers, hoe rams, augur drills, bulldozers, and backhoes. Typical vibration source levels for construction equipment range from 58 to 104 VdB (Table 30). Pavement breaking and soil compaction would produce the highest levels of construction-related vibration. Generally, annoyance effects may be expected during construction near sensitive sites within approximately 200 feet of the construction activity. Actual distances at which effects would occur will depend on the type of construction equipment used and soil characteristics in the area. Construction of a streetcar line in an existing street usually does not require an extended construction period that would make construction vibration a serious concern.

Table 30. Vibration Source Levels for Construction Equipment

Equipment		Peak Particle Velocity at 25 feet (in/sec)	Approximate L_v at 25 feet (VdB)
Pile driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile driver (sonic)	Upper range	0.734	105
	Typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Hydromill (slurry wall)	In soil	0.008	66
	In rock	0.017	75
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: *Transit Noise and Vibration Impact Assessment*, FTA, May 2006.

Notes: L_v = RMS velocity in decibels (VdB) re 1 micro-inch/sec.
RMS = The square root of the mean-square value of an oscillation waveform.

The control of noise and vibration during the construction phase is important to minimize potential adverse impacts on the neighboring communities. Construction activities associated with the Build Alternatives will have short-term noise impacts on receptors in the immediate vicinity of the construction site including the proposed maintenance and storage facility, track beds and station stops. Potential construction activities which could cause annoyance on the adjacent residential communities during construction phase include noise from the operation of construction equipment and noise from construction and delivery vehicles traveling to and from the site. The level of impact of these noise sources depends upon the noise characteristics of the equipment, activities involved, the construction schedule, and the distance of equipment from sensitive receptors. Tables identifying typical construction equipment noise emission levels are in Table 4-1 of Appendix H.

During final design when construction methods, staging, type and number of equipment and duration at a specific location will be known, an accurate assessment of potential impacts associated with construction activities at nearby noise sensitive properties will be determined.

5.22.4 Construction Mitigation

Construction effects will require the use of industry best practices and various mitigation measures. Traffic impacts on the six streets listed in Table 29 will be mitigated by the following options:

- Route traffic onto opposite direction lanes using flag personnel and cones. By re-routing traffic onto adjacent lanes that are temporarily closed due to construction (approximately three weeks per block) only minor impacts on travel time will result.
- Temporarily prohibit on street parking and route traffic through parking lanes.
- Detour traffic around the roadway segment under construction.
- Post construction notices at community facilities.
- Provide construction notices in foreign languages so all populations are informed.

In order to reduce the level of delay, construction activities in intersections requiring full crossings will be carried out on the weekends, with a high level of effort to complete such construction by the start of the business week. In a worst case scenario, these areas will be detoured around similar to the roadway segments discussed above.

A maintenance of traffic (MOT) plan will be developed for the construction phase of the streetcar project. The MOT plan will determine road and sidewalk closures and detour routes throughout construction. This plan will also include methods to inform the community at large and homes, businesses and other establishments directly affected by construction. It will involve communications by several mean including flyers, brochures, website, social media and print and broadcast media. It will also include signage directed at motorists and pedestrians and will indicate what lanes and sidewalk segments maybe closed for a particular time period and what lanes and sidewalks are available as alternates. Traffic warning devices and techniques, including signage, fencing and personnel will be employed by the City to inform motorists and pedestrians of any potentials safety-related conditions.

The City of Cincinnati, working with area businesses and residents, will develop an access maintenance and communication plan. The plan will be designed to publicize to customers that businesses are open and describe how to reach them, direct customers to nearby parking

should on-street parking be disrupted, and direct delivery vehicles to alternative loading zones The City will develop and install signage to direct walk-up customer patronage to businesses and to direct patrons and visitors to nearby available parking. The plan will include alternative parking for residents which will include parking for persons with disabilities.

A communications program will be instituted to inform residents of any construction-related impacts, including timing. The first step will be personal communication, followed by messages, phone and mail. The City of Cincinnati, as part of its overall communications plan for the project, will also publicize construction schedules and events.

To minimize the amount of construction dust generated, prevention and mitigation measures will be taken to minimize the potential particulate pollution problem. These measures include:

- Cover trucks when transferring materials
- Use of dust suppressants
- Minimize unnecessary vehicular and machinery activities

Since carbon monoxide (CO) emissions from motor vehicles generally increase with decreasing vehicle speed, disruption of traffic during construction (such as a temporary reduction of roadway capacity and increased queue lengths) could result in short-term, elevated concentrations of CO. To minimize the amount of emissions generated, every effort will be made during construction to limit disruption to traffic, especially during peak travel hours.

Potential noise and vibration from short-term construction activities will be controlled by having construction noise and vibration criteria in construction contracts documents, including no construction in residential and hotel areas at night. Use of vibratory pile drivers or auguring for setting piles in lieu of impact pile drivers will minimize impacts. Other vibration-control measures provided in contract documents include communicating with residents and businesses near construction activities about the potential for possible elevated vibration levels. The specification will require the construction contractor to comply with any city, state or local ordinances and regulations.

Construction is subject to City of Cincinnati regulations that prohibit nighttime construction adjacent to residential areas except in emergency situations. The construction plan and mitigation measures, will be used to reduce the impact of construction activities and also minimize any impacts to EJ populations.

5.23 Secondary and Cumulative Effects

The requirement for analyzing secondary and cumulative effects is found National Environmental Policy Act 40 CFR Section 1500 – 1508. Under the implementing regulations secondary and cumulative effects are defined as follows:

- Indirect (Secondary) Effects – Subsection 1508.8 (b) states that indirect (secondary) effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.

- Cumulative Effects – Subsection 1508.7 states that cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what

agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

5.23.1 Secondary and Cumulative Effects Study Area

The project's secondary and cumulative effects (SCE) study area includes the area around the proposed project that would have the potential for secondary and/or cumulative effects upon the environmental concerns discussed in the direct impacts sections of this EA. The SCE study area is shown in Figure 22.

5.23.2 Relevant and Community Neighborhood Plans

The City of Cincinnati organizes and controls its development and redevelopment by means of comprehensive, community and neighborhood plans. Plans that exist for the SCE study area:

- *City of Cincinnati Comprehensive Plan* (City of Cincinnati, Undated)
- *Over-The-Rhine Comprehensive Plan Final* (City of Cincinnati, 2002)
- *University Village Urban Renewal Plan* (Kinzelman, Kline, Gossman, Goody, Clancy Associates, March 2005)
- *Central Riverfront Urban Design Master Plan* (Urban Design Associates, 2000)
- *West End Comprehensive Plan* (City of Cincinnati, Undated)

5.23.3 Potential Impacts

The following summary discusses secondary and cumulative impacts on land use, community facilities and neighborhoods, economics, environmental justice, air quality, noise and vibration, ecological resources, transportation, cultural resources, utilities, construction, visual quality, and safety and security.

5.23.3.1 Traffic, Parking and Transit

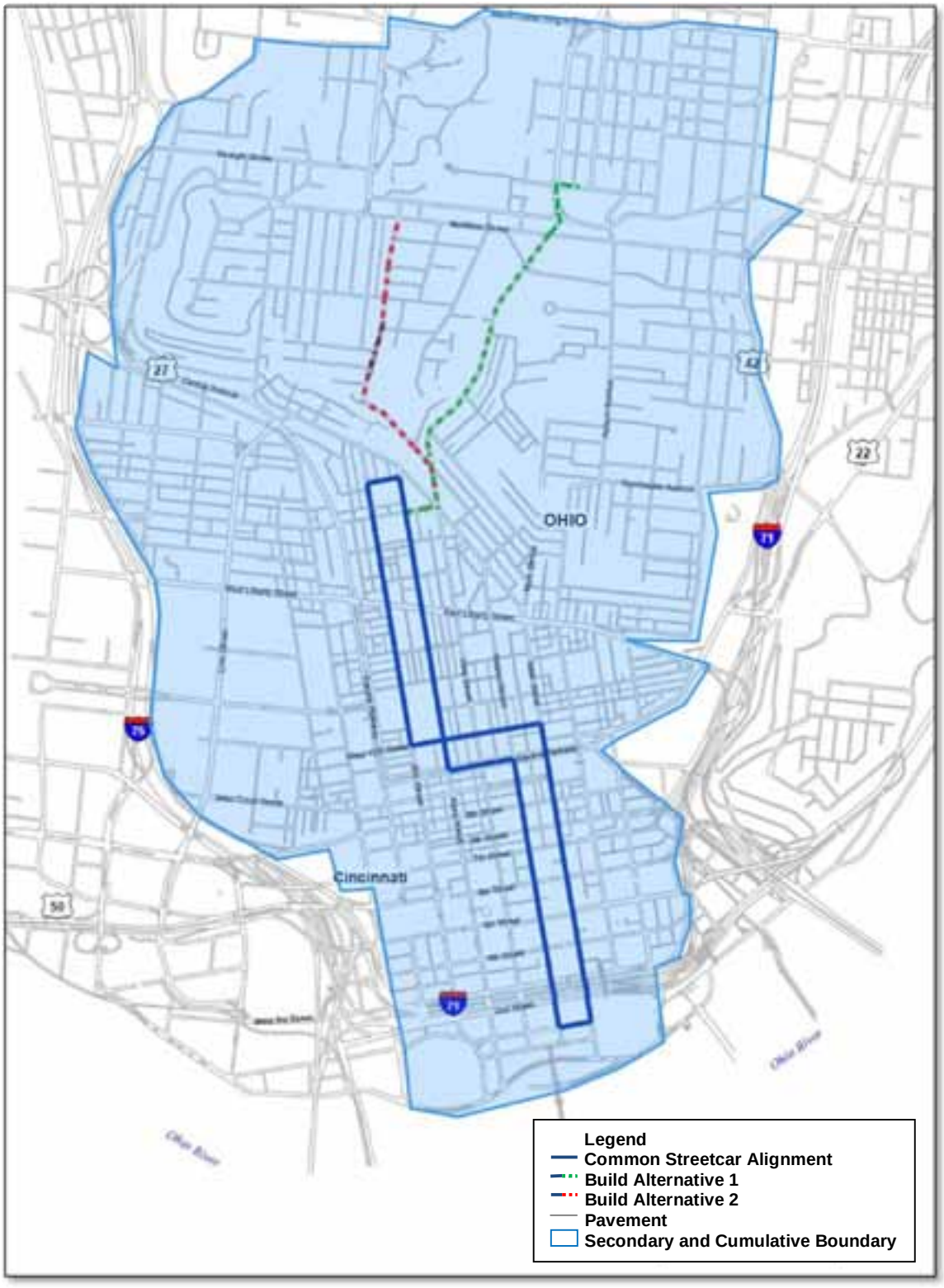
A beneficial secondary effect to local highway traffic could occur with the project because the potential reduction of traffic in the streetcar service area could reduce peak hour traffic queuing, especially those serving the CBD.

5.23.3.2 Land Use

Positive secondary effects may occur to residential, commercial and industrial land uses because the potential increase in redevelopment in the streetcar service area could revive many of these uses that have been either underutilized or vacant. Any secondary land use changes in the form of redevelopment would likely occur within three blocks of the chosen streetcar alternative. Land uses in the rest of the SCE area will not be influenced by this project.

Positive cumulative effects to residential and commercial land uses are anticipated because this project would be developed to be consistent with local land use and comprehensive plans. Residential and commercial land uses are currently being introduced in vacant properties in OTR and the Gateway Quarter. The streetcar project would promote a mix of these future land uses.

Figure 22. Secondary and Cumulative Boundary



Community and Neighborhoods

No secondary effects are anticipated to occur with respect to reducing access to public and private facilities, isolating some land uses, or separating formerly contiguous areas within SCE study area communities.

Economic and Fiscal

Positive secondary effects may occur to Downtown businesses for the sake of reducing the hindrance of finding and paying for parking as part of short-duration business patronage. Positive secondary effects may occur from the potential for increased residential and commercial development in the area and the additional investment interest that it could bring. Beneficial secondary effects may occur to local commercial uses along McMillan Street. There could be a potential increase in interest of McMillan Street among residents further south in the neighborhoods along West Clifton Avenue due increased ease of travel. Minor beneficial secondary effects may occur to commercial and industrial businesses along Vine Street and at the intersections of Vine Street and McMicken Avenue; and Vine Street and McMillan Street. The reason that these could be minor effects is because the businesses in these locations are more prone to intentional trips rather than pass-by patronage.

The project is anticipated to help bring economic development to Downtown, Uptown, and especially OTR, in conjunction with other planned projects. New investments are expected to occur within one to three blocks of the streetcar alignment after implementation of the streetcar. The Gateway Quarter development north of Central Parkway is already within one to two blocks of the streetcar alignment.

New housing is expected to occur in along the streetcar route and in redevelopment presently occurring in the Gateway Quarter (centered on Vine Street). This development is independent of the streetcar project but would likely increase with the construction of the streetcar.

5.23.4.1 Environmental Justice

A concern of a secondary effect to the EJ population in this area has been the potential loss of affordable housing in currently low-income areas as the result of development and redevelopment of residential uses.

As indicated in the land use discussion, a secondary effect of the project may be more residential and commercial development and redevelopment in this area. However, through various City, State, and Federal housing subsidies (Low Income Housing Tax Credits, Project-Based Section 8, and Housing Opportunities Made Equal) a number of units in the study area are required by contract to adhere to various affordability criteria and that a significant number of those will remain subject to the affordability requirements even after the operational date of the proposed project. The affordability criteria require that qualified tenants make no more than 60 percent of the Area Median Income and that rents cannot exceed 30 percent of the tenants' income. A list of affordable housing near the study area is included in Appendix F. Currently, there are 1,899 units in the study area that are affordable due to the use of one or more subsidies. A total of 61.8 percent will continue to be affordable for an average of 11.8 years after the operational date of the streetcar (2013).

In addition, Appendix E of the *Over-The-Rhine Comprehensive Plan Final* cites existing programs implemented by the City of Cincinnati that are used to make affordable housing resources available in the area. These programs also list the City, State, and Federal housing

subsidies noted in the previous paragraph. Local programs cited include, but are not limited to, Tax Abatement, Homesteading Program, and Community Development Block Grants. Examples in Tampa, Florida and Seattle, Washington show that while property values increased near the streetcar line, single family property values rose slower. Development also occurred in vacant areas and areas ready for redevelopment. This makes it less likely for existing EJ populations to be pushed out for new development. This trend would be expected for the Cincinnati Streetcar.

Secondary development that supports existing land uses and geared toward high-density would benefit EJ populations living without a vehicle. An example in neighborhoods in Portland demonstrated a greater mix of market rate to low-income housing near streetcar corridors. A secondary effect of the Cincinnati Streetcar project is expected mix of housing throughout the study area. This would also meet goals of the *Over the Rhine Comprehensive Plan*.

Beneficial secondary effects to environmental justice in the form of additional employment opportunities may occur with the secondary effect of commercial development in the area.

5.23.4.2 Air Quality

Beneficial secondary effects to air quality may occur as a result of future streetcar lines. These lines could further reduce traffic and have incremental improvements in the ambient air quality of the downtown, OTR, and Uptown areas.

Beneficial cumulative effects to air quality are anticipated because the streetcar project along with other local and regional wide programs would have the potential to reduce local traffic and mobile source air pollutants.

5.23.4.3 Noise and Vibration

With potential future streetcar lines, vehicular traffic may be reduced in the area. This could lead to further incremental reductions in ambient noise and vibration from passenger vehicles in the Downtown, OTR, and Uptown areas.

Beneficial cumulative effects to noise and vibration are anticipated because the project's operation would be relatively silent and there would be an incremental reduction in noise by the number of passenger vehicles removed from the roadway with the project in combination with other local and region-wide programs.

5.23.4.4 Water Resources

Secondary effects to water resources in the form of surface water runoff could occur. Runoff quantity would likely have minimal change because most of the area is developed and any properties that could be developed are already covered with impervious surfaces. Also, their development or redevelopment would mean little change in runoff. Runoff quality could improve because future streetcar lines could further reduce passenger vehicle usage in the area.

Minor cumulative effects are anticipated with respect to stormwater runoff and velocity because the project would have little to no direct effects.

5.23.4.5 Natural Resources

The majority of the study area and surrounding areas is occupied by intensively developed urban land, including commercial, residential, and industrial uses. Additionally, transportation facilities (e.g., highways, streets, railways) and maintained lawns are also present. Terrestrial

habitats include mixed-age woods, young woods, and old field. Water resources in close proximity to the study area include the Ohio River and its tributaries.

No adverse secondary effects to natural resources are anticipated from the streetcar project operations due to the urban setting of the area. Minor cumulative effects to natural resources are anticipated because the project has minimal potential for direct impacts.

5.23.4.6 Electromagnetic Interference

Minimal secondary effects of additional electromagnetic interference may occur. This is dependent on any future streetcar lines. The reason that minimal effects may occur is because they would be on the same order as the electromagnetic interference of this project's streetcar plans.

Minor adverse cumulative effects are anticipated with the project because the project vehicles' electromagnetic interference would have the potential to augment or amplify the effects of existing electromagnetic interference from sources within the study area.

5.23.4.7 Cultural Resources

Adverse secondary effects to cultural resources are unlikely to occur with the project because the secondary effects of development and redevelopment would have to be carried out in accordance with the various federal, state and local protection programs established to protect cultural resources within Cincinnati area. For example, Chapter 1121 of the Cincinnati Building Code provides standards for the repair, alteration, addition, restoration and moving of historic buildings and structures.

The City of Cincinnati also has a Historic Conservation Board and a Historic Conservation Office. The responsibilities of the Historic Conservation Office are to:

- Assure compliance of the City's programs with federal and state regulations which mandate protection of historic resources.
- Advise City departments on effects of projects on historic resources.
- Provide technical assistance to homeowners, developers and other parties.
- Develop conservation guidelines for the City's historic districts.

The Historic Conservation Office developed conservation guidelines for the City's historic districts. These guidelines address new construction, additions, rehabilitation, site improvements, demolition, and non-contributing buildings. The purpose of the guidelines is to preserve the historic integrity of the districts.

Minor or no cumulative effects to cultural resources are anticipated because the project would be developed within areas (an existing industrial property, roadways, sidewalks and parking lots) where cultural resources are not present. In addition, a Memorandum of Agreement (MOA) is currently being developed between the FTA, City of Cincinnati and OHPO, to facilitate future consultation so that specific design aspects of the project that may affect historic properties can be considered.

5.23.4.8 Section 4(f) Resources

No adverse secondary effects are anticipated with the project for Section 4(f) resources. Secondary effects to historic resources (part of Section 4[f]) are discussed above. Secondary effects of residential and commercial development and redevelopment and future streetcar lines

would not be likely to develop into secondary effects to parks and recreation areas. There are enough areas available for development/redevelopment among the existing residential and commercial uses. Future streetcar development would likely be developed similar to the project and within existing roadways. There would be no potential for secondary effects to wildlife refuges, because none exist within the area.

Minor or no cumulative effects to Section 4(f) resources are anticipated because the project would not have direct impacts to Section 4(f) resources.

5.23.4.9 Visual Resources

Beneficial secondary effects are anticipated with respect to visual resources. The secondary effect of residential and commercial development and redevelopment would likely include the upgrading of existing dilapidated buildings and degraded sites, many currently vacant. Additionally, with the secondary effect of future streetcar lines, anticipated newfound interest in the study areas of any new streetcar lines would also spur on the visual improvements.

Minor cumulative effects to visual resources are anticipated. Although the project would include direct visual impacts, the level of direct impact would be offset by the residential and commercial development and visual upgrades that would come with development (as part of the goals of the community and neighborhood plans).

In areas with overhead utilities, including most of OTR and Uptown, the additional wires for the streetcar will be minimally noticeable given the extensive overhead wire array that already exists. The visual impact will be improved by the placement of attractive, unobtrusive poles that will create a more uniform visual impact along the street than what currently exists with wood utility poles. In several areas the existing overhead wires would be relocated which will improve the visual quality of the study area. In areas that currently have no overhead wires, the visual impact will be minor and can be mitigated through the use of street trees and other streetscape amenities. There will be no direct impact of overhead wires at Inwood Park on Vine Street. The City of Cincinnati is currently working with 3CDC to coordinate the design of the streetcar alignment, including catenary, on the segments of Race, Elm and 12th streets adjacent to Washington Park, which is being renovated by 3CDC.

5.23.4.10 Safety and Security

As a result of secondary residential and commercial development and redevelopment, the communities could see a related increase in perceived and actual safety and security, especially in the areas improved. Also, future development and redevelopment projects could be designed with lighting and architectural attributes that would increase safety and security on-and off-site.

Positive cumulative effects are anticipated because the project safety and security improvements would add to and strengthen the safety and security attributes of the residential and commercial improvements discussed in the community and neighborhood plans.

5.23.4.11 Utilities

No adverse secondary effects are anticipated with the streetcar project. Although the secondary effects of residential and commercial development would increase the use of existing utilities, the utility infrastructure is already in place and is in the process of being upgraded. Additionally, it is very likely that any future streetcar lines would occur in existing roadways and would address utility impacts in the same manner as the project.

Minor or no cumulative effects to utilities are anticipated. Although the project, in combination with other residential and commercial development projects identified, would have the potential for increased demand on electrical power, there are a number of power plants within 25 miles of the city that can handle the increased demand.

5.23.4.12 Construction

No secondary effects are anticipated with respect to construction. Any new development/redevelopment of residential and commercial properties and any future streetcar lines would have to meet national, state, county and local building codes, and would be subject to local public agency review and code compliance.

Minor cumulative effects would occur with the project's construction occurring at the same time of the Banks development along the Ohio River and parking facilities being developed between the Great American Ball Park and Paul Brown Stadium. These effects may include some congestion with the construction trucks and equipment. However, greater cumulative effects would likely occur with the project's construction immediately following the City's utility duct improvements. These would occur in the roadway in roughly the same locations and within a short duration of time between each other, and would have the potential to cumulatively lengthen the construction timeframe and traffic delays.

5.23.5 Secondary and Cumulative Effects Mitigation

No additional mitigation measures will be necessary due to secondary and cumulative effects.