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6.0 TRANSPORTATION IMPACT ANALYSIS

This chapter reviews the existing transportation conditions in the Interstate-71 (I-71) Corridor and the potential transportation impacts of each of the proposed alternative Light Rail Transit (LRT) alignments. Potential impacts and mitigation measures are documented in this chapter for the following transportation subjects:

- Roadway Operations
- Bus Transit Operations
- Rail Transit Ridership and Operating Costs
- Regional Travel Demand
- Parking
- Railroad Facilities and Services
- Pedestrians
- Utilities
- Rail Transit Construction
- Environmental Justice

6.1 ROADWAY OPERATIONS

This section reviews the existing roadway conditions and estimates the potential impacts of the alignment to the roadway system within the I-71 Corridor. This section includes the following:

- A review of the existing roadway system in the I-71 Corridor and planned improvements.
- A roadway segment and intersection Level of Service (LOS) impact analysis for the street segments and intersections that could be affected by the LRT alignments.
- An assessment of the need for grade separated LRT crossings of the surface streets at selected locations to maintain an acceptable LOS.
- A review of potential traffic impacts at LRT sites including an analysis of traffic generated at park & ride facilities.

6.1.1 Methodology And Assumptions

Figure 6.1-1a – Figure 6.1-1c show the main transportation influence areas that have been defined for each of the LRT alignment alternatives throughout the I-71 Corridor. The influence areas were assumed to be within ½-mile of the LRT alignment between the communities of Covington and Blue Ash. Roadway segments, intersections, and grade crossings that were perceived to have the most impact on the transportation network in the corridor study area were chosen for this analysis. Where the LRT alignment is located in the railroad right-of-way there are expected to be minimal impacts to roadway operations because the railroad crossings already exist, though the increase in the number of train crossings will have impacts to the traffic operations.

6.1.1.1 Alignment Alternatives

Four alternatives were considered along the 19-mile corridor for the transportation analysis. As described in Chapter 2, both an above grade and at-grade alignment was considered near the Covington Riverfront through the Fourth and Fifth Street area. In addition, two alignments were analyzed in the Medical Center area. These included an alignment that is located parallel to Martin Luther King, Jr. (MLK) Drive south of the hospital area and an alignment that serves the Cincinnati Zoo north of and through the hospital district. The four alternatives are defined as follows:

- Alternative 1 – At-grade in Covington and parallel to MLK Drive
- Alternative 2 – Above grade in Covington and parallel to MLK Drive
- Alternative 3 – At-grade in Covington and serves the Cincinnati Zoo
- Alternative 4 – Above grade in Covington and serve the Cincinnati Zoo

6.1.1.2 Existing Roadways

The existing roadway system in the study area includes limited access roadways, principal and minor arterial streets, collector streets, and local streets. Limited access roadways, such as the interstate system, are physically separated from the surface street system and include grade-separated crossings of the surface streets. These roadways provide both intercity and regional travel. Access to the street network is provided via interchange ramps, typically at principal or minor arterial roadways. Principal arterials accommodate trips across the region and typically include at-grade intersections with other surface streets. Minor arterial streets supply access to sub-regions. Collector streets connect local and residential streets with either principal or minor arterial roadways, while local streets provide access to individual residences or businesses. Figure 6.1-1a – Figure 6.1-1c also shows many of the main roadways serving the corridor, including the limited access roadways, principal arterial roadways, and minor arterial roadways, along with important collector and local roadways to the alignments.

6.1.1.3 Planned Roadway System

In 2001, the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) adopted the Year 2030 Long Range Transportation Plan (LRTP). Transportation investments in the OKI region are short and long term in nature. The short term component is the 2004-2007 Transportation Improvement Program (TIP). The long range component is the OKI Regional Transportation Plan. Many of the improvements recommended in this plan would improve the operating efficiency and utilization of the existing network without the need for large capacity expansions. Limited roadway expansion projects were included in these plans and are described below for each segment of the I-71 Corridor.

Covington Segment

2004-20077 TIP

- No improvements identified.

2030 LRTP

- Traffic improvements at US 25/US 127 (at Clay Wade Bailey Bridge) Fourth Street and Fifth Street in Covington

- I-75 Kentucky 1072 to Brent Spence Bridge, add two lanes
- Kentucky Route 8 from Fourth Street Bridge over Licking River, add three lanes
- US 25/Kentucky Route 8 from Fourth Street and Fifth Street at US 25, add one lane, and realign

Ohio River Crossing Segment

2004-2007 TIP

- New bridge over Ohio River (Funding Committed)

2030 LRTP

- Interstate-75 (I-75) from Brent Spence Bridge over Ohio River replaced with new ten lane bridge

Cincinnati Riverfront Segment

2004-2007 TIP

- No improvements identified

2030 LRTP

- No improvements identified

Downtown Cincinnati Segment

2004-2007 TIP

- No improvements identified

2030 LRTP

- No improvements identified

Over-the-Rhine Segment

2004-2007 TIP

- No improvements identified

2030 LRTP

- No improvements identified

Mount Auburn Tunnel Segment

2004-2007 TIP

- No improvements identified

2030 LRTP

- No improvements identified

Uptown Segment

2004-2007 TIP

- No improvements identified

2030 LRTP

- Vine Street from Nixon Street to Erkenbrecker Avenue, add one lane

Avondale to Norwood Segment

2004-2007 TIP

- No improvements identified

2030 LRTP

- Reading Road from Clinton Springs to Paddock, add one lane
- Dana Avenue from Victory Parkway to I-71, add two lanes

Norwood to Blue Ash Segment

2004-2007 TIP

- US 22 from Kenwood Road to Hosbrook Road, widen to seven lanes (Funding Committed)

2030 Draft LRTP

- Ridge Road from Highland to Woodford Road, add one lane
- Ridge Road from I-71 to Highland Avenue, add two lanes
- Galbraith Road from Blue Ash Road to Kenwood Road, add one lane
- Ridge Road from Galbraith Road to Benson Street, add two lanes
- US 22 from Kenwood Road to Galbraith Road, add two lanes

Blue Ash Segment

2004-2007 TIP

- I-275 at Reed Hartman Highway, upgrade interchange and add two lanes to Reed Hartman Highway (Funding Committed)

2030 LRTP

- Pfeiffer Road/Glendale-Milford Road between Bob Evans Drive and Reed Hartman Highway, add one lane to the east bound lanes
- US 22 from Weller to Fields Ertel, add two lanes

6.1.1.4 Traffic Volumes

Peak period turning movement counts and 24-hour daily counts were collected at intersections and grade crossings throughout the corridor. Weekday base year 2001 turning movement counts were obtained from data collected from 7:00 AM to 9:00 AM and from 4:00 PM to 6 PM. 24-hour daily counts were collected at selected areas where the alignment crosses the roadway system mid-block along the corridor.

Forecast Year 2020 turning movement counts were calculated by applying a growth factor of one percent per year to the base year counts. Population, employment, and travel demand forecasts were considered for the Year 2020 for the development of this growth factor. Typically, a one-percent growth per year is a conservative estimate for this level of analysis, especially when these socioeconomic and traffic forecasts were taken into account. In the Blue Ash area, where significant growth is forecasted, a three-percent per year growth factor was applied to the base year counts. This was done to take the significant number of planned developments in the community into account.

In Downtown Cincinnati, the reconstruction of Fort Washington Way (I-17/75 and US-50) was taking place during the study, so it was necessary to develop design hour traffic assignments for the post-project roadway network. Both existing and future traffic forecasts were completed using TRANPLAN output from OKI. Engineering judgment and field reviews were applied to this raw output and reviewed by the City of Cincinnati Traffic Engineering Department. The reconstruction of Fort Washington Way reversed the direction of Third Street and created a new Second Street. These two streets are assumed to act as a collector distributor one-way pair to remove local traffic from the limited access portion of the project. Several existing interchanges were removed and relocated.

For the Fourth and Fifth Street Corridor in Covington, the OKI Regional Travel Model forecast a 17.8% increase in traffic volumes between 2001 and 2020. However, the Kentucky Transportation Cabinet recommended a 35% growth factor to account for unforeseen development. Therefore, the analysis of Fourth and Fifth Streets in Covington assumes a 35% growth factor.

6.1.1.5 Light Rail Transit Operational Assumptions

The LRT operations plan assumed for this analysis included 16 per trains per hour during the peak travel periods. This operating plan equates to eight trains at 7.5-minute headway for each direction. It is assumed that each train will require 35 seconds to clear an intersection or grade crossing.

Two types of train traffic signal control have been assessed:

- Pre-emption – In most of the corridor it was assumed that traffic signals would be preempted by the LRT system. This means that an approaching train would signal a call to the traffic signal causing it to cycle to a rail-crossing phase. The traffic signal would provide a green clearance interval to allow vehicles to clear off the trackway prior to the arrival of the LRT.

The traffic signal would then allow the LRT to pass through the intersection. After the LRT crossing, the signal would return to standard operations.

- Priority - From Fifth Street in Covington north to Central Parkway in the CBD, was assumed that LRT would have priority signal control. This means that signal phases controlling the LRT would be extended if a LRT is approaching. This allows an extended green time for the light rail vehicle (LRV) to clear the tracks, but does not give the LRV priority over the coordinated signal system. Because of the complexity of traffic operations and high density of traffic in a central business district, priority signal timing will minimize the disruptions to the existing traffic network because it will not significantly impact the coordinated signal system.

6.1.1.6 Software Analysis Methodology

The approach to the traffic operations analysis is derived from the established methodologies documented in the *Highway Capacity Manual, Third Edition, 1997*. *The Highway Capacity Manual* (HCM) contains a series of analysis techniques that are used to evaluate the operation of transportation facilities under specified conditions. Synchro5, a Highway Capacity Manual implementing operation analysis software package, was used to build the roadway network and as an input database for all the lane geometrics, turn movement volumes, traffic control and signal timing characteristics. In addition, all the signal timing parameters were determined using Synchro5. The existing signal timing was used for the existing conditions and optimized signal timing was used for the Year 2020 no-build, Transportation System Management (TSM), and build conditions. This information was transferred to SimTraffic5, a microscopic traffic simulation model, for the results. SimTraffic was used to report the existing and Year 2020 no-build condition results for the following areas:

- Blue Ash
- Deer Park
- Sycamore Township
- Norwood
- Silverton
- Cincinnati

A third traffic operations analysis model, Corsim5, was used to evaluate the impacts of the LRT alignment at the essential intersections located in the above areas. Corsim, much like Sim Traffic, is a traffic simulation model, but allows for a limited analysis of transit operations at railroad grade crossings.

Due to the model limitations of both SimTraffic and Corsim, the Cincinnati central business district (CBD) and Covington areas were modeled using Vissim. Vissim is a microscopic, time step and behavior based simulation model developed to model traffic and transit operations. Vissim allows for the input and analysis of many transportation condition and/or constraint, including transit vehicle priority. The results for the existing, Year 2020 no-build, and each of the Year 2020 build alternatives were reported using the Vissim simulation model.

The software programs used to conduct the analysis for this report require varying levels of data input and follow slightly different analysis processes. Therefore, the results of one software program versus another may vary.

6.1.1.7 Project Trip Generation

A trip generation analysis estimates the amount of traffic, including both feeder buses and automobiles, generated at station locations and specifically at park & ride facilities. Trip generation rates for proposed park & ride facilities for both the daily AM and PM peak hours were estimated based on a survey completed by URS/BRW, Inc. in Portland, Oregon (Table 6.1.1).

These trip generation rates were applied to the proposed parking spaces and added to the 2020 build background volumes of adjacent intersections chosen for analysis. In addition, the trip distribution on to the local roadway network was developed based on knowledge of current travel patterns, surrounding land uses, and professional judgement.

Table 6.1.1: Trip Generation Estimates for Park & Ride Facilities

	Vehicle Trips per Occupied Space				
Portland Survey Results		**AM Peak Hour**		**PM Peak Hour**	
	Daily	**In**	**Out**	**In**	**Out**
Trip Generation Rates	3.53	0.60	0.15	0.19	0.63

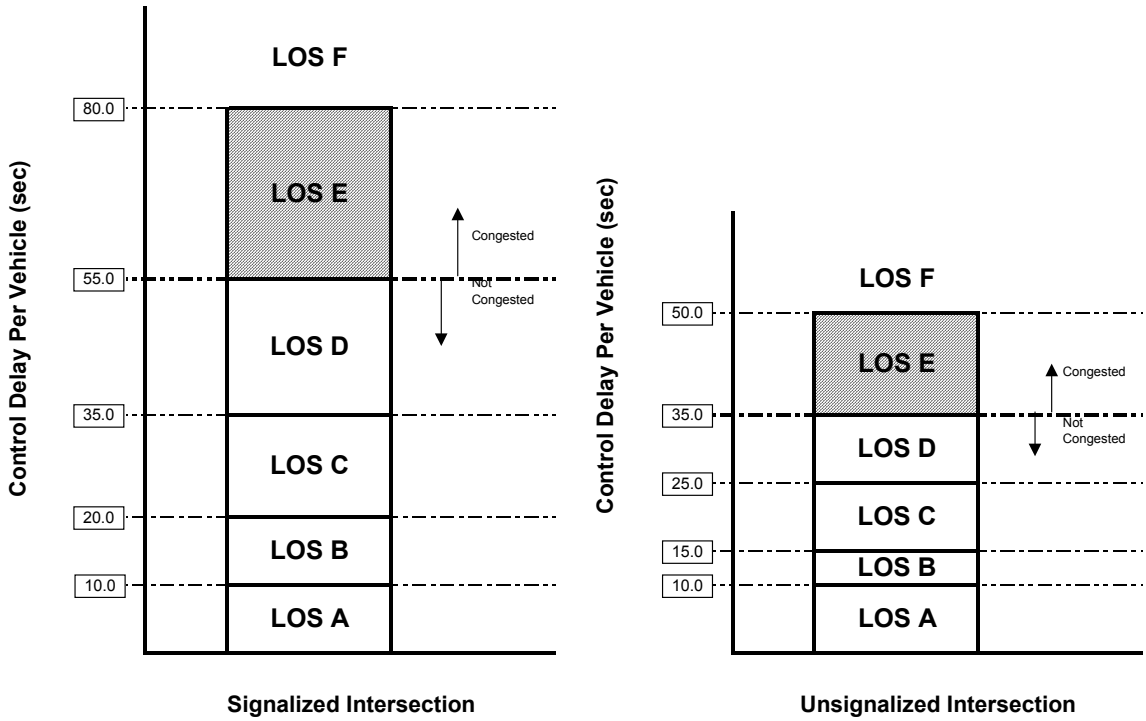
Source: URS

6.1.1.8 Capacity Analysis

A capacity analysis is a process that estimates the quality of traffic flow along segments of roadway and through intersections. The essential factors affecting capacity include roadway geometry, traffic volumes, incidents, and intersection control.

The results of a capacity analysis are typically presented in the form of a letter grade (A through F) that provides a qualitative indication of the operational efficiency or effectiveness. The letter grade assigned to the analysis is referred to as LOS. By definition, LOS A conditions represent high-quality operations (i.e., motorists experience very little delay or interference) while LOS F conditions represent failing operations (i.e., extreme delay or severe congestion). Exhibit 6.1.1 shows a graphical interpretation of LOS of intersections.

Exhibit 6.1.1: Level of Service Criteria



Source: Highway Capacity Manual, 2000 – Based on Exhibit 16-2 and Exhibit 17-2

LOS for roadway segments typically range from A to F and are described as follows:

- LOS A – represents virtually free flow of traffic with no congestion or delay.
- LOS B – represents stable traffic flow, but other vehicles in the flow are noticeable.
- LOS C – represents stable flow, but marks the beginning of the range where individual vehicles become significantly affected by interactions with other vehicles in the traffic stream.
- LOS D – represents high density of traffic but stable flow.
- LOS E – represents operating conditions at or near the capacity level. All speeds are reduced to a low but relatively uniform flow.
- LOS F – represents a breakdown in the operating conditions resulting in significant congestion and delay.

In general, LOS A through D is considered acceptable in the Cincinnati metropolitan area. Typically, designing a new roadway for a LOS D is acceptable or practical in an urban environment. In general, metropolitan areas such as Cincinnati consider a LOS E or F to be unacceptable, as this indicates that the roadway has reached or exceeded its capacity, resulting in extended travel delays and substantial congestion.

Each movement (left turn, through, and right turn) at an intersection approach has a corresponding LOS grade. The overall intersection LOS is calculated by using a weighted average of the volumes and delay associated with each individual movement.

6.1.1.9 Grade Separation Analysis

At-grade roadway crossings of rail facilities known as grade crossings are subject to operational concerns with respect to interference between roadway and rail traffic. These concerns include: vehicular traffic delay due to the activation of railroad warning systems and occupancy of the grade crossing by trains; traffic operational impacts such as disruption of the traffic signal system due to the rail preemption; and safety concerns due to violation of traffic control devices or by queuing of roadway vehicles in the grade crossing area. Grade separations at crossings are used when other reasonable and effective traffic mitigation measures are not feasible, and there are no physical, environmental, financial, or other constraints that would preclude a grade separation system.

The grade separation analysis is based on a methodology outlined in *the Light Rail Transit Grade Separation Guidelines*, which appeared as an ITE Journal Report in 1993. This report identifies threshold average daily cross-street traffic ranges to assist in the determination of at-grade operational feasibility. The analysis also considers the number of rail transit vehicles per hour at each street crossing based on the operating plan for the rail transit alternatives. The following threshold numbers, which are a function of the level of exposure of the LRV to traffic (See Table 6.1.2), aid in the determination of the feasibility of crossing the surface street system at-grade:

Grade Separation Thresholds

- Threshold #1 – Light Rail at-grade is feasible
- Threshold #2 – Light Rail at-grade should be feasible
- Threshold #3 – Possible traffic signal solutions if LRV delay is acceptable
- Threshold #4 – At-grade crossing is probably not feasible

This methodology is meant as a general guideline and not a hard and fast rule. There may be occasions in which a grade separation can be avoided even with high levels of LRV interference of traffic. For instance, in congested urban areas where travel speeds are very low and where timesavings provided by a grade separation would not be significant. In addition, other areas may not meet the quantitative threshold for grade separation but it may be highly desirable.

Table 6.1.2: Vehicular Traffic Exposure to Light Rail Vehicles at Grade Crossings

Threshold Levels for 16 LRVs per Hour	Peak Hour Vehicles per Lane (# of vehicles)
1	Less than 345
2	Less than 716
3	Less than 1095
4	Greater than or equal to 1095

Source: Light Rail Transit Grade Separation Guidelines, ITE Journal 1993

6.1.1.10 Impact Definitions

Traffic impacts can be defined in a number of ways including: a) by the LOS of an overall intersection, b) by the LOS of individual movements within an intersection, and c) by the relationship between the roadway volume and the number of trains at a grade crossing to determine if the threshold level for grade separation is exceeded.

Once a deficiency in an intersection, an intersection movement, or for a grade crossing is identified, the next step is to determine if the deficiency warrants a roadway improvement (if the result is from background traffic) or a mitigation measure (if the result is from project traffic). The following standards are applied:

- For an intersection, the overall LOS is expected to be LOS E or F;
- For one or more individual movements at an intersection, the LOS is expected to be at LOS E or F, which results in a significant decrease in the overall operational efficiency at the intersection;
- For a grade crossing, the combination of roadway volume and the number of trains exceed threshold level 3.

6.1.2 EXISTING TRAFFIC CONDITIONS AND LEVELS OF SERVICE (LOS)

The surface streets and intersections that could potentially be affected by the proposed I-71 Corridor LRT alignments have been identified for this impact assessment. This existing conditions analysis defines the transportation network for 2001 and serves as a base for the forecasted future analysis.

6.1.2.1 Roadway Segments Analysis

Roadway segments were identified for analysis based on whether one of the LRT alignments is located parallel to, adjacent to, or within the existing roadway system. The selected roadway segments are shown in Figure 6.1-2a – Figure 6.1-2c**.** Some of the segments reviewed included areas where the alignment crosses the street mid-block, in addition to those that are parallel to the street system.

For each of the selected roadway segments that were chosen for this analysis of the existing conditions, the following information has been collected:

- Number of lanes (geometry)
- Estimated daily traffic capacity
- Average Daily Traffic (ADT)
- Peak hour directional traffic volumes

The resulting roadway segment LOS was identified using these data. The segments were analyzed following the methodologies defined by the Florida Department of Transportation (DOT) Level of Service Handbook. These methodologies, which are essentially an implementation adaptation of the *1997 Highway Capacity Manual (HCM)*, establish a measure of effectiveness based on average travel speed. Table 6.1.3, which was extracted for this analysis, is the basis for the LOS valuation given to the existing and forecasted roadway segment analysis. This table, referenced as Table 5-4 in the LOS Handbook, was developed for use on non-state roadways or major city/county roadways in urbanized areas.

Table 6.1.3: Average Daily Traffic Volumes Thresholds for Roadway Segment LOS

	Level of Service				
Lane Geometries	**A**	**B**	**C**	**D**	**E**
2 – Undivided	N/A	N/A	8,600	14,600	16,000
4 – Divided	N/A	N/A	19,800	31,700	33,900
6 – Divided	N/A	N/A	30,800	47,800	51,000

Source: Florida DOT Level of Service Handbook 1998 and URS

Adjustment factors were applied to the Annual Average Daily Traffic (AADT) thresholds to take one-way roadway facilities, left-turn bays, and medians into consideration. One-way roadway facilities AADT were calculated by applying the equivalent two-way volumes and adjusting the indicators by 60% of the baseline volumes. Left-turn bays were also adjusted for, dependent on the roadway facilities and the existence of a median. The following adjustment factors were used when determining the representative LOS:

- 2-lane divided roadway with left-turn bays (+5 percent)
- 2-lane undivided roadway with no left-turn bays (-20 percent)
- Multi-lane undivided roadway with left-turn bays (-5 percent)
- Multi-lane undivided roadway with no left-turn bays (-25 percent)

Table 6.1.4 summarizes the existing conditions for the major and principal arterials that could be potentially impacted by the LRT alignments throughout the I-71 Corridor.

No roadway segments in this existing conditions analysis are operating below the acceptable threshold of LOS D on a daily basis. Peak hour operations are addressed as part of the intersection analysis.

Table 6.1.4: Existing Roadway Segment LOS

Map Number	Facility	Segment	Estimated ADT (Year 2001)[1]	2001 Existing LOS
1	Cornell Road	Huntwick Place and Cornell Park Drive	18,300	D
2	Reed Hartman Highway	Lake Forest Drive and Cornell Park Drive	26,500	D
3	Creek Road	West of Reed Hartman Highway and Kenwood Road	8,500	C
4	Pfeiffer Road	Reed Hartman Highway and Kenwood Road	25,000	C
5	Blue Ash Road	Ronald Reagan Highway and Cooper Road	9,200	C
6	Blue Ash Road	Galbraith Road and Ronald Reagan Cross County Highway	7,300	C
7	Galbraith Road	Queens Avenue and Plainfield Road	8,100	C
8	Blue Ash Road	Plainfield Road and Galbraith Road	6,800	C
9	Montgomery Road	Ohio Avenue and Plainfield Road	12,500	C
10	Ridge Avenue	Mapleleaf Avenue and Highland Avenue	25,400	D
11	Highland Avenue	Linden Avenue and Beech Street	20,000	D
12	Lafayette Avenue	Montgomery Road and Smith Road	2,500	C
13	Montgomery Road	Williams Avenue and Wanda Avenue	13,000	C
14	Reading Road	MLK Drive and Ridgeway Avenue	17,500	C
15	Vine Street	MLK Drive and Erkenbrecher Avenue	18,600	D
16	MLK Drive	Jefferson Avenue and Reading Road	23,000	C
17	Jefferson Avenue	Charlton Street and MLK Drive	19,700	C
18	East Liberty Street	Vine Street and Sycamore Street	17,800	D
19	Central Parkway	Vine Street and Sycamore Street	10,500[2]	C
20	Walnut Street	Central Parkway and Liberty Street	2,800[2]	C
21	Main Street	Central Parkway and Liberty Street	2,900[2]	C
22	Main Street	Third Street and Central Parkway	4,500[2]	C
23	Walnut Street	Third Street and Central Parkway	6,500[2]	C
24	Fourth Street (Covington)	Russell Avenue and Main Street	14,500	C
25	Fifth Street (Covington)	Russell Avenue and Main Street	10,500	C

Source: Florida Department of Transportation Level of Service Handbook 1998 and URS.

[1] ADT was calculated using data collected in June 2001 assuming the PM peak period represented the following percentages of the daily volumes: Downtown Cincinnati 15%, Covington 11%, and remainder of corridor 11%

[2] ADT was calculated using data forecasted for the year 1995 by Burgess and Niple.

6.1.2.3 Intersections Analysis

Major intersections throughout the I-71 Corridor were identified for analysis, specifically chosen because of the potential impacts of the LRT alignments. The intersections analyzed are illustrated in Figure 6.1-3a – Figure 6.1-3c**.** The signalized intersections, along with some unsignalized intersections that are significant to the traffic operations of the roadway network, were identified to be evaluated along the

corridor because either the LRT alignments cross the intersection at-grade or the intersection is located adjacent to the alignment or because of the proximity of a LRT station site.

For each of the major intersections selected for analysis, the geometry, signal timings, and turning movement counts were collected. Recently completed traffic impact studies and other traffic related plans for projects along or adjacent to the I-71 Corridor were also collected, to utilize existing data for analysis. Based on the information collected, existing AM and PM peak hour intersection LOS has been estimated. The AM and PM peak hour existing conditions LOS for the selected intersections are shown in Table 6.1.5.

During the AM peak hour, all intersections included in this analysis are expected to operate at LOS D or better except for the following intersections:

- The intersection of Reed Hartman Highway and Kemper Road operates at LOS F.
- The intersection of Pfeiffer Road and Kenwood Road operates at LOS E.

During the PM peak hour, all intersections included in this analysis are expected to operate at LOS D or better except for the following intersections.

- The intersection of Reed Hartman Highway and Kemper Road operates at LOS E.
- The intersection of Reed Hartman Highway and Cornell Road operates at LOS F.
- The intersection of Ridge Avenue and Highland Avenue operates at LOS F.
- The intersection of Vine Street, West Nixon Street and Ruth Lyons Way operates at LOS F.

Table 6.1.5: Existing AM and PM Peak Hour Intersection LOS

Map Number	Intersection	AM Peak Hour LOS Existing Conditions Year 2001	PM Peak Hour LOS Existing Conditions Year 2001
1	Reed Hartman Highway/Kemper Road	F	E
2	Reed Hartman Highway/Cornell Park	B	B
3	Reed Hartman Highway/Cornell Road	C	F
4	Reed Hartman Highway/Creek Road	C	C
5	Reed Hartman Highway/Pfeiffer Road	D	D
6	Reed Hartman Highway/Lake Forest Drive	B	B
7	Pfeiffer Road/Kenwood Road	E	D
8	Pfeiffer Road/Lake Forest Drive	A	A
9	Kenwood Road/Cooper Road	C	C
10	Blue Ash Road/Kugler Mill Road	B	B
11	Blue Ash Road/Galbraith Road	C	C
12	Montgomery Road/Highland Avenue/Ohio Avenue	A	B
13	Montgomery Road/Plainfield Avenue	B	C
14	Ridge Avenue/Highland Avenue	C	F
15	Robison Street/Woodford Street	A	A
16	Smith Road/Sherman Avenue	B	B
17	Smith Road/Lafayette Avenue/Park Avenue	B	B
18	Lafayette Avenue/Ashland Avenue	A	A
19	Montgomery Road/Hopkins	B	C
20	Montgomery Road/Cleneay Avenue	B	A
21	Montgomery Road/Dana Avenue	C	C
22	Reading Road/Hickman Street	A	A
23	Reading Road/Whittier Street	A	A
24	Harvey Avenue/Hickman Street	B	B
25	MLK Drive/Harvey Avenue	B	B
26	MLK Drive/Reading Road	C	B
27	Erkenbrecher Avenue/Vine Street	A	A
28	Vine Street/W. Nixon Street/Ruth Lyons Way	C	F
29	Jefferson Avenue/University Avenue	A	B
30	Jefferson Avenue/W. Daniels Street	A	A
31	Jefferson Avenue/Charlton Street	A	A
32	Main Street/McMicken Avenue	A	A
33	Main Street/Liberty Street	A	B
34	Liberty Street/Walnut Street	B	B
35	Main Street/Central Parkway	-	B[1]
36	Main Street/Sixth Street	-	C[1]
37	Main Street/Fifth Street	-	C[1]
38	Main Street/Third Street	-	B[1]
39	Main Street/Second Street	-	B[1]
40	Walnut Street/Central Parkway	-	C[1]
41	Walnut Street/Sixth Street	-	C[1]
42	Walnut Street/Fifth Street	-	C[1]
43	Walnut Street/Third Street	-	C[1]
44	Walnut Street/Second Street	-	C[1]
45	Fifth Street/Johnson Street	-	B
46	Fifth Street/Main Street	-	B

Map Number	Intersection	AM Peak Hour LOS Existing Conditions Year 2001	PM Peak Hour LOS Existing Conditions Year 2001
47	Fourth Street/Johnson Street	-	C
48	Fourth Street/Main Street	-	B
49	Sixth Street/Johnson Avenue	A	A
50	Pike Street/Russell Street	B	B
51	12th Street/Russell Street	B	B
52	12th Street/Madison Avenue	B	B

Source: URS

[1] The existing condition results for Downtown Cincinnati and Downtown Covington were analyzed for the year 1995.

Table 6.1.6 documents the intersection movements that are expected to operate at LOS E or F during the AM peak hour.

Table 6.1.6: Existing AM Peak Hour Movements at LOS E and F

Intersection	Movement	Movement LOS
Reed Hartman Highway/Kemper Road	North Approach All East Approach Left Turn	F F
Reed Hartman Highway/Cornell Park	East Approach Left Turn	F
Reed Hartman Highway/Pfeiffer Road	West Approach Left Turn East Approach Left Turn	F E
Pfeiffer Road/Kenwood Road	East Approach All South Approach Left Turn North Approach Left Turn	E E E

Source: URS

Table 6.1.7 documents the intersection movements that are expected to operate at LOS E or F during the PM peak hour.

Table 6.1.7: Existing PM Peak Hour Movements at LOS E and F

Intersection	Movement	Movement LOS
Reed Hartman Highway/Kemper Road	South Approach Through South Approach Right Turn	F E
Reed Hartman Highway/Cornell Road	South Approach All	F
Reed Hartman Highway/Pfeiffer Road	East Approach Left Turn West Approach Left Turn	F F
Pfeiffer Road/Kenwood Road	North Approach Left Turn South Approach Left Turn West Approach Through West Approach Right Turn	E E E E
Ridge Avenue/Highland Avenue	North Approach All South Approach All	F F
Walnut Street/Second Street	West Approach[1]	E

Source: URS

[1] Downtown Intersection individual movements not reported, only overall approach LOS

6.1.3 YEAR 2020 ROADWAY SEGMENT AND INTERSECTION LEVELS OF SERVICE

Roadway segment and intersection levels of service analyses were completed for the Year 2020, including analysis of the no-build, TSM, and the four build alternative conditions. In Downtown Covington and Downtown Cincinnati, the PM peak was analyzed because it was perceived to have the most severe congestion and negative traffic implications.

As previously noted, the LOS estimates are based on traffic forecasts resulting from a combination of a variety of projections, including the regional travel demand model from OKI and the population and economic growth estimations by region. A standardized growth factor was assigned to the base year turning movement counts, based on these forecasts. In addition, traffic generated by LRT park & ride facilities was added to the future traffic volume forecast at adjacent intersections.

6.1.3.1 Year 2020 Roadway Segment Analysis

Table 6.1.8 shows the roadway segment levels of service for the defined alternatives: Existing Conditions, No-Build Alternative, TSM Alternative, and the Build LRT Alternatives 1, 2, 3, and 4. The existing condition represent 2001 (except for the Cincinnati CBD which is 1995), and all future alternatives assume Year 2020 forecast traffic volumes created from the growth factor assigned to each segment.

Limited roadway segments are forecasted to operate below the acceptable LOS. Cornell Road, which is expected to operate at LOS E, is the only segment forecasted to operate below LOS D. The LRT alignment, which is to cross the east leg of the intersection of Cornell Road and Reed Hartman Highway, is not expected to have considerable traffic impacts.

Table 6.1.8: Year 2020 Forecast Roadway Segment AADT Levels of Service

Map Number	Facility	Segment	Estimated ADT (Year 2001)[1]	2001 Existing LOS	Forecast 2020 ADT	2020 No-Build LOS	2020 TSM LOS	2020 Build LRT Alternative 1	2020 Build LRT Alternative 2	2020 Build LRT Alternative 3	2020 Build LRT Alternative 4
1	Cornell Road	Huntwick Place and Cornell Park Drive	18,300	D	32,200	E	E	E	E	E	E
2	Reed Hartman Highway	Lake Forest Drive and Cornell Park Drive	26,500	D	46,500	D	D	D	D	D	D
3	Creek Road	West of Reed Hartman Highway and Kenwood Road	8,500	C	14,900	C	C	C	C	C	C
4	Pfeiffer Road	Reed Hartman Highway and Kenwood Road	25,000	C	44,000	D	D	D	D	D	D
5	Blue Ash Road	Ronald Reagan Highway and Cooper Road	9,200	C	13,400	C	C	C	C	C	C
6	Blue Ash Road	Galbraith Road and Ronald Reagan Highway	7,300	C	8,800	C	C	C	C	C	C
7	Galbraith Road	Queens Avenue and Plainfield Road	8,100	C	9,700	C	C	C	C	C	C
8	Blue Ash Road	Plainfield Road and Galbraith Road	6,800	C	8,300	C	C	C	C	C	C
9	Montgomery Road	Ohio Avenue and Plainfield Road	12,500	C	15,100	C	C	C	C	C	C
10	Ridge Avenue	Mapleleaf Avenue and Highland Avenue	25,400	D	29,700	D	D	D	D	D	D
11	Highland Avenue	Linden Avenue and Beech Street	20,000	D	22,900	D	D	D	D	D	D
12	Lafayette Avenue	Montgomery Road and Smith Road	2,500	C	3,000	C	C	C	C	C	C
13	Montgomery Road	Williams Avenue and Wanda Avenue	13,000	C	15,700	D	D	D	D	D	D
14	Reading Road	MLK Drive and Ridgeway Avenue	17,500	C	21,100	D	D	D	D	D	D
15	Vine Street	MLK Drive and Erkenbrecher Avenue	18,600	D	22,500	D	D	D	D	D	D
16	MLK Drive	Jefferson Avenue and Reading Road	23,000	C	27,800	C	C	C	C	C	C
17	Jefferson Avenue	Charlton Street and MLK Drive	19,700	C	23,800	D	D	D	D	D	D

Map Number	Facility	Segment	Estimated ADT (Year 2001)[1]	2001 Existing LOS	Forecast 2020 ADT	2020 No-Build LOS	2020 TSM LOS	2020 Build LRT Alternative 1	2020 Build LRT Alternative 2	2020 Build LRT Alternative 3	2020 Build LRT Alternative 4
18	Liberty Street	Vine Street and Sycamore Street	17,800	D	21,500	D	D	D	D	D	D
19	Central Parkway	Vine Street and Sycamore Street	10,500*	C	10,000*	C	C	C	C	C	C
20	Walnut Street	Central Parkway and Liberty Street	2,800*	C	3,100*	C	C	C	C	C	C
21	Main Street	Central Parkway and Liberty Street	2,900*	C	3,400*	C	C	C	C	C	C
22	Main Street	Third Street and Central Parkway	4,500*	C	4,500*	C	C	C	C	C	C
23	Walnut Street	Third Street and Central Parkway	6,500*	C	5,500*	C	C	C	C	C	C
24	Fourth Street	Main Street and Russell Avenue	14,500	C	12,800*	C	C	C	C	C	C
25	Fifth Street	Main Street and Russell Avenue	10,500	C	4,200*	C	C	C	C	C	C

Source: Florida DOT Level of Service Handbook and URS

[1] These ADTs were estimated assuming that the PM peak hour traffic represented 11% of the daily traffic volumes except in Downtown Cincinnati where it represents 15%. This table presents LOS threshold values developed to denote operational characteristics of a roadway and their perception by motorists and passengers.

6.1.3.2 Year 2020 Intersection Analysis

Intersection levels of service have also been estimated for each of the defined future alternatives. The signal timings have been optimized for the Year 2020 conditions to maximize the capacity of the intersections and minimize potential delay. The results are summarized in Tables 6.1.9 and 6.1.10 for the AM and PM peak hour conditions, respectively. A summary of all the resulting levels of service for the Year 2020 alternatives are described in the following sections.

The future Year 2020 No-build and TSM conditions analyses were assumed to result in similar results since the difference between the conditions with respect to the traffic operations was expected to be minimal. Therefore, the No-build and TSM conditions analyses were performed together. In addition, the build alternatives differ only by which intersections are included in each of the alternatives. Therefore, all of the intersection analyses results are reported together in this section and by alternative in the summary description at the end of this section.

Year 2020 No-build and TSM

During the AM peak hour, all intersections included in the future Year 2020 No-build and TSM conditions analyses are expected to operate at LOS D or better except for at the following intersections:

- Reed Hartman Highway and Kemper Road is expected to operate at LOS F.
- Reed Hartman Highway and Cornell Road is expected to operate at LOS F.
- Reed Hartman Highway and Pfeiffer Road is expected to operate at LOS F.
- Pfeiffer Road and Kenwood Road is expected to operate at LOS F.
- Kenwood Road and Cooper Road is expected to operate at LOS F.
- Erkenbrecher Avenue and Vine Street is expected to operate at LOS F.
- Vine Street, West Nixon Street and Ruth Lyons Way is expected to operate at LOS F.

During the PM peak hour, all intersections included in this analysis are expected to operate at LOS D or better except for the following intersections:

- Reed Hartman Highway and Kemper Road is expected to operate at LOS F.
- Reed Hartman Highway and Cornell Road is expected to operate at LOS F.
- Reed Hartman Highway and Creek Road is expected to operate at LOS F.
- Reed Hartman Highway and Pfeiffer Road is expected to operate at LOS F.
- Reed Hartman Highway and West Lake Forest Drive is expected to operate at LOS F.
- Pfeiffer Road and Kenwood Road is expected to operate at LOS F.
- Kenwood Road and Cooper Road is expected to operate at LOS F.
- Ridge Avenue and Highland Avenue is expected to operate at LOS F.
- Vine Street, West Nixon Street and Ruth Lyons Way is expected to operate at LOS F.
- Pike Street and Russell Street is expected to operate at LOS F.

Table 6.1.9: Summary of Year 2020 AM Peak Hour Intersection Level of Service

Map Number	Intersection	2001 Existing LOS	2020 No-Build	2020 TSM	2020 Build LRT Alternative 1	2020 Build LRT Alternative 2	2020 Build LRT Alternative 3	2020 Build LRT Alternative 4
1	Reed Hartman Highway/Kemper Road	F	F	F	F	F	F	F
2	Reed Hartman Highway/Cornell Park	B	B	B	F	F	F	F
3	Reed Hartman Highway/Cornell Road	C	F	F	F	F	F	F
4	Reed Hartman Highway/Creek Road	C	D	D	F	F	F	F
5	Reed Hartman Highway/Pfeiffer Road	D	F	F	F	F	F	F
6	Reed Hartman Highway/West Lake Forest Drive	B	B	B	B	B	B	B
7	Pfeiffer Road/Kenwood Road	E	F	F	F	F	F	F
8	Pfeiffer Road/ East Lake Forest Drive	A	A	A	A	A	A	A
9	Kenwood Road/Cooper Road	C	F	F	F	F	F	F
10	Blue Ash Road/Kugler Mill Road	B	B	B	B	B	B	B
11	Blue Ash Road/Galbraith Road	C	C	C	C	C	C	C
12	Montgomery Road/Highland Avenue/Ohio Avenue	A	B	B	B	B	B	B
13	Montgomery Road/Plainfield Avenue	B	C	C	C	C	C	C
14	Ridge Avenue/Highland Avenue	C	C	C	D	D	D	D
15	Robison Street/Woodford Street	A	A	A	A	A	A	A
16	Smith Road/Sherman Avenue	B	B	B	B	B	B	B
17	Smith Road/Lafayette Avenue/Park Avenue	B	B	B	B	B	B	B

Map Number	Intersection	2001 Existing LOS	2020 No-Build	2020 TSM	2020 Build LRT Alternative 1	2020 Build LRT Alternative 2	2020 Build LRT Alternative 3	2020 Build LRT Alternative 4
18	Lafayette Avenue/Ashland Avenue	A	A	A	A	A	A	A
19	Montgomery Road/Hopkins Avenue/Lafayette Avenue/Cameron Avenue	B	B	B	B	B	B	B
20	Montgomery Road/Cleneay Avenue	B	B	B	B	B	B	B
21	Montgomery Road/Dana Avenue	C	C	C	C	C	C	C
22	Reading Road/Hickman Street	A	A	A	A	A	A	A
23	Reading Road/Whittier Street	A	A	A	A	A	A	A
24	Harvey Avenue/Hickman Street	B	B	B	B	B	B	B
25	MLK Drive/Harvey Avenue	B	B	B	B	B	B	B
26	MLK Drive/Reading Road	C	C	C	E	E	E	E
27	Erkenbrecher Avenue/Vine Street	A	F	F	F	F	F	F
28	Vine Street/W. Nixon Street/Ruth Lyons Way	C	F	F	F	F	F	F
29	Jefferson Avenue/University Avenue	A	A	A	B	B	B	B
30	Jefferson Avenue/W. Daniels Street	A	A	A	A	A	A	A
31	Jefferson Avenue/Charlton Street	A	A	A	A	A	A	A
32	Main Street/McMicken Avenue	A	A	A	A	A	A	A
33	Main Street/Liberty Street	A	B	B	B	B	B	B
34	Liberty Street/Walnut Street	B	B	B	B	B	B	B
49	Sixth Street/Johnson Avenue	A	A	A	A	A	A	A
50	Pike Street/Russell Street	B	C	C	B	B	B	B
51	12th Street/Russell Street	B	B	B	C	C	C	C
52	12th Street/Madison Avenue	B	B	B	B	B	B	B

Source: URS

Table 6.1.10: Summary of Year 2020 PM Peak Hour Intersection Level of Service

Map Number	Intersection	2001 Existing LOS	2020 No-Build	2020 TSM	2020 Build LRT Alternative 1	2020 Build LRT Alternative 2	2020 Build LRT Alternative 3	2020 Build LRT Alternative 4
1	Reed Hartman Highway/Kemper Road	E	F	F	F	F	F	F
2	Reed Hartman Highway/Cornell Park	B	D	D	F	F	F	F
3	Reed Hartman Highway/Cornell Road	F	F	F	F	F	F	F
4	Reed Hartman Highway/Creek Road	C	F	F	F	F	F	F
5	Reed Hartman Highway/Pfeiffer Road	D	F	F	F	F	F	F
6	Reed Hartman Highway/West Lake Forest Drive	B	F	F	F	F	F	F
7	Pfeiffer Road/Kenwood Road	D	F	F	F	F	F	F
8	Pfeiffer Road/ East Lake Forest Drive	A	C	C	C	C	C	C
9	Kenwood Road/Cooper Road	C	F	F	F	F	F	F
10	Blue Ash Road/Kugler Mill Road	B	D	D	F	F	F	F
11	Blue Ash Road/Galbraith Road	C	C	C	D	D	D	D
12	Montgomery Road/Highland Avenue/Ohio Avenue	B	B	B	B	B	B	B
13	Montgomery Road/Plainfield Avenue	C	C	C	C	C	C	C
14	Ridge Avenue/Highland Avenue	F	F	F	F	F	F	F
15	Robison Street/Woodford Street	A	A	A	A	A	A	A
16	Smith Road/Sherman Avenue	B	B	B	B	B	B	B

Map Number	Intersection	2001 Existing LOS	2020 No-Build	2020 TSM	2020 Build LRT Alternative 1	2020 Build LRT Alternative 2	2020 Build LRT Alternative 3	2020 Build LRT Alternative 4
17	Smith Road/Lafayette Avenue/Park Avenue	B	B	B	B	B	B	B
18	Lafayette Avenue/Ashland Avenue	A	A	A	A	A	A	A
19	Montgomery Road/Hopkins Avenue/Lafayette Avenue/Cameron Avenue	C	C	C	C	C	C	C
20	Montgomery Road/Cleneay Avenue	A	B	B	B	B	B	B
21	Montgomery Road/Dana Avenue	C	C	C	C	C	C	C
22	Reading Road/Hickman Street	A	A	A	C	C	C	C
23	Reading Road/Whittier Street	A	A	A	B	B	B	B
24	Harvey Avenue/Hickman Street	B	B	B	A	A	A	A
25	MLK Drive/Harvey Avenue	B	B	B	B	B	B	B
26	MLK Drive/Reading Road	B	C	C	C	C	C	C
27	Erkenbrecher Avenue/Vine Street	A	B	B	B	B	B	B
28	Vine Street/W. Nixon Street/Ruth Lyons Way	F	F	F	F	F	F	F
29	Jefferson Avenue/University Avenue	B	B	B	C	C	C	C
30	Jefferson Avenue/W. Daniels Street	A	A	A	A	A	A	A
31	Jefferson Avenue/Charlton Street	A	A	A	A	A	A	A
32	Main Street/McMicken Avenue	A	A	A	A	A	A	A
33	Main Street/Liberty Street	B	B	B	B	B	B	B
34	Liberty Street/Walnut Street	B	B	B	B	B	B	B
35	Main Street/Central Parkway	B[1]	B	B	B	B	B	B
36	Main Street/Sixth Street	C[1]	C	C	C	C	C	C

Map Number	Intersection	2001 Existing LOS	2020 No-Build	2020 TSM	2020 Build LRT Alternative 1	2020 Build LRT Alternative 2	2020 Build LRT Alternative 3	2020 Build LRT Alternative 4
37	Main Street/Fifth Street	C[1]	C	C	C	C	C	C
38	Main Street/Third Street	B[1]	B	B	B	B	B	B
39	Main Street/Second Street	B[1]	B	B	B	B	B	B
40	Walnut Street/Central Parkway	C[1]	B	B	B	B	B	B
41	Walnut Street/Sixth Street	C[1]	C	C	C	C	C	C
42	Walnut Street/Fifth Street	C[1]	C	C	C	C	C	C
43	Walnut Street/Third Street	C[1]	C	C	C	C	C	C
44	Walnut Street/Second Street	C[1]	D	D	D	D	D	D
45	Fifth Street/Johnson Street	B	B	B	B	B	B	B
46	Fifth Street/Main Street	B	B	B	B	B	B	B
47	Fourth Street/Johnson Street	C	C	C	C	C	C	C
48	Fourth Street/Main Street	B	C	C	C	C	C	C
49	Sixth Street/Johnson Avenue	A	A	A	A	A	A	A
50	Pike Street/Russell Street	B	F	F	F	F	F	F
51	12th Street/Russell Street	B	C	C	B	B	B	B
52	12th Street/Madison Avenue	B	C	C	C	C	C	C

Source: URS

Table 6.1.11 documents the intersection movements that are expected to operate at LOS E or F during the AM peak hour for the future Year 2020 No-build and TSM conditions.

Table 6.1.11: Future Year 2020 No-build and TSM AM Peak Hour Movements at LOS E and F

Intersection	Movement	Movement LOS
Reed Hartman Highway/Kemper Road	East Approach All	F
	North Approach All	F
Reed Hartman Highway/Cornell Park	East Approach Left Turn	F
Reed Hartman Highway/Cornell Road	East Approach All	F
	West Approach Through and Left Turn	F
Reed Hartman Highway/Creek Road	South Approach Left Turn	F
Reed Hartman Highway/Pfeiffer Road	East Approach All	F
	North Approach Left Turn	E
	South Approach All	F
	West Approach Left Turn	F
Pfeiffer Road/Kenwood Road	East Approach All	F
	South Approach Left Turn	E
	North Approach Left Turn	F
Pfeiffer Road/East Lake Forest Drive	North Approach Left Turn	F
Kenwood Road/Cooper Road	West Approach Left Turn	E
	East Approach All	F
	South Approach All	F
Reading Road/Hickman Street	West Approach Left Turn	F
MLK Drive/Reading Road	South Approach Left Turn	F
	West Approach Left Turn	F
Erkenbrecher Avenue/Vine Street	North Approach All	F
	East Approach Left Turn	F
Vine Street/W. Nixon Street/Ruth Lyons Way	North Approach All	F
	South Approach Left	F
	West Approach All	F
	East Approach Left	F
Liberty Street/Walnut Street	East Approach Left Turn	E

Source: URS

Table 6.1.12 documents the intersection movements that are expected to operate at LOS E or F during the PM peak hour for the future Year 2020 No-build and TSM conditions.

Table 6.1.12: Future Year 2020 No-build and TSM PM Peak Hour Movements at LOS E and F

Intersection	Movement	Movement LOS
Reed Hartman Highway/Kemper Road	South Approach All	F
	North Approach All	F
	West Approach Left Turn	F
Reed Hartman Highway/Cornell Park Road	East Approach All	F
	West Approach Left Turn	F
Reed Hartman Highway/Cornell Road	South Approach All	F
	East Approach All	F
	North Approach Left Turn	F
	West Approach All	F
Reed Hartman Highway/Creek Road	North Approach All	F
	West Approach All	F
	East Approach All	F
Reed Hartman Highway/Pfeiffer Road	South Approach All	F
	West Approach All	F
	North Approach Left Turn	F
	East Approach Left Turn	E
Reed Hartman Highway/West Lake Forest Drive	West Approach All	F
	North Approach All	F
Pfeiffer Road/Kenwood Road	North Approach All	F
Pfeiffer Road/East Lake Forest Drive	North Approach All	F
Kenwood Road/Cooper Road	All Intersection Movements	F
Blue Ash Road/Kugler Mill Road	North Approach All	F
Montgomery Road/Plainfield Avenue	North Approach All	F
	South Approach All	F
Ridge Avenue/Highland Avenue	All Intersection Movements	F
Reading Road/Hickman Street	West Approach All	F
MLK Drive/Reading Road	West Approach Left	F
	North Approach Left	F
	South Approach Left	F
Vine Street/W. Nixon Street/Ruth Lyons Way	South Approach All	F
	North Approach All	F
Jefferson Avenue/University Avenue	North Approach Left Turn	F
Jefferson Avenue/W. Daniels Street	East Approach Left Turn and Through	E
Walnut Street/Second Street	West Approach[1]	F
Pike Street/Russell Street	South Approach All	F

Source: URS

[1]Downtown Intersection individual movements not reported, only overall approach LOS

Year 2020 Build Condition

The results of the Year 2020 build conditions yielded the same results for each alternative analysis. During the AM peak hour, all intersections included in the Year 2020 Build conditions analyses are expected to operate at LOS D or better except for at the following intersections:

- Reed Hartman Highway and Kemper Road is expected to operate at LOS F.
- Reed Hartman Highway and Cornell Park is expected to operate at LOS F.
- Reed Hartman Highway and Cornell Road is expected to operate at LOS F.
- Reed Hartman Highway and Creek Road is expected to operate at LOS F.
- Reed Hartman Highway and Pfeiffer Road is expected to operate at LOS F.
- Pfeiffer Road and Kenwood Road is expected to operate at LOS F.
- Kenwood Road and Cooper Road is expected to operate at LOS F.
- MLK Drive and Reading Road is expected to operate at LOS E.
- Erkenbrecher Avenue and Vine Street is expected to operate at LOS F.
- Vine Street, West Nixon Street and Ruth Lyons Way is expected to operate at LOS F.

During the PM peak hour, all intersections included in this analysis are expected to operate at LOS D or better except for the following intersections:

- Reed Hartman Highway and Kemper Road is expected to operate at LOS F.
- Reed Hartman Highway and Cornell Park is expected to operate at LOS F.
- Reed Hartman Highway and Cornell Road is expected to operate at LOS F.
- Reed Hartman Highway and Creek Road is expected to operate at LOS F.
- Reed Hartman Highway and Pfeiffer Road is expected to operate at LOS F.
- Reed Hartman Highway and West Lake Forest Drive is expected to operate at LOS F.
- Pfeiffer Road and Kenwood Road is expected to operate at LOS F.
- Kenwood Road and Cooper Road is expected to operate at LOS F.
- Blue Ash Road and Kugler Mill Road is expected to operate at LOS F.
- Ridge Avenue and Highland Avenue is expected to operate at LOS F.
- Vine Street, West Nixon Street and Ruth Lyons Way is expected to operate at LOS F.
- Pike Street and Russell Street is expected to operate at LOS F.

Table 6.1.13 documents the intersection movements that are expected to operate at LOS E or F during the AM peak hour for the future Year 2020 build condition.

Table 6.1.13: Future Year 2020 Build AM Peak Hour Movements at LOS E and F

Intersection	Movement	Movement LOS
Reed Hartman Highway/Kemper Road	East Approach All	F
	North Approach All	F
Reed Hartman Highway/Cornell Park	North Approach All	F
Reed Hartman Highway/Cornell Road	South Approach All	F
	North Approach Left Turn	F
Reed Hartman Highway/Creek Road	South Approach All	F
	North Approach Left Turn	F
Reed Hartman Highway/Pfeiffer Road	South Approach Left Turn	F
	West Approach All	F
	North Approach All	F
Reed Hartman Highway/West Lake Forest Drive	West Approach Left Turn	F
Pfeiffer Road/Kenwood Road	East Approach All	F
	South Approach All	F
	North Approach All	F
Pfeiffer Road/East Lake Forest Drive	North Approach Left Turn	E
Kenwood Road/Cooper Road	West Approach All	F
	East Approach All	F
	South Approach All	F
Reading Road/Hickman Street	West Approach Left Turn	F
MLK Drive/Reading Road	South Approach All	F
Erkenbrecher Avenue/Vine Street	North Approach All	F
	East Approach Left Turn	F
Vine Street/W. Nixon Street/Ruth Lyons Way	West Approach All	F
Liberty Street/Walnut Street	East Approach Left Turn	E

Source: URS

Table 6.1.14 documents the intersection movements that are expected to operate at LOS E or F during the PM peak hour for the future Year 2020 build condition.

Table 6.1.14: Future Year 2020 Build PM Peak Hour Movements at LOS E and F

Intersection	Movement	Movement LOS
Reed Hartman Highway/Kemper Road	South Approach All	F
	North Approach Left Turn	F
	East Approach Left Turn	F
Reed Hartman Highway/Cornell Park	North Approach All	F
Reed Hartman Highway/Cornell Road	South Approach All	F
	North Approach Left	F
Reed Hartman Highway/Creek Road	North Approach All	F
	South Approach Left Turn	F
	West Approach All	F
Reed Hartman Highway/Pfeiffer Road	South Approach All	F
	West Approach All	F
	North Approach Left Turn	F
	East Approach Left Turn	F
Reed Hartman Highway/West Lake Forest Drive	West Approach All	F
	North Approach All	F
Pfeiffer Road/Kenwood Road	South Approach All	F
	East Approach Right Turn	E
	East Approach Through and Left Turn	F
	North Approach All	F
Pfeiffer Road/East Lake Forest Drive	North Approach All	F
Kenwood Road/Cooper Road	All Intersection Movements	F
Blue Ash Road/Kugler Mill Road	North Approach All	F
Montgomery Road/Plainfield Avenue	North Approach All	F
	South Approach All	F
Ridge Avenue/Highland Avenue	North Approach All	F
	South Approach All	F
Reading Road/Hickman Street	West Approach All	F
MLK Drive/Reading Road	West Approach Left	F
	East Approach Left	F
	South Approach Left	E
Vine Street/W. Nixon Street/Ruth Lyons Way	South Approach All	F
	North Approach All	F
Jefferson Avenue/University Avenue	North Approach Left Turn	F
Jefferson Avenue/W. Daniels Street	East Approach Left Turn and Through	E
Walnut Street/Second Street	South Approach[1]	E
Pike Street/Russell Street	South Approach All	F

Source: URS

[1]Downtown Intersection individual movements not reported, only overall approach LOS

6.1.3.3 Potential Mitigation

The following locations were identified for potential mitigation measures to address future Year 2020 conditions. The implementation of these potential mitigation measures would be expected to improve the

operating conditions at the intersections. These potential mitigation measures were not evaluated in this analysis, but can be expected to improve the operations at the respective intersections:

- Reed Hartman Highway / Kemper Road intersection additional through lane on Reed Hartman Highway, extend the north approach left turn storage bay, and additional left turn lane and right turn lane for the east approach.
- Reed Hartman Highway / Cornell Road intersection additional north approach left turn lane.
- Reed Hartman Highway / Creek Road intersection additional south approach left turn lane.
- Reed Hartman Highway / Pfeiffer Road intersection additional south approach and west approach left turn lanes.
- Reed Hartman Highway / West Lake Forest Drive intersection extend the west approach left turn lane storage bay.
- Pfeiffer Road / Kenwood Road intersection additional north and south approach left turn lanes.
- Ridge Avenue / Highland Avenue intersection add north and south approach right turn lanes.
- MLK Drive / Reading Road intersection extend the south approach left turn storage bay.
- Erkenbrecher Avenue / Vine Street intersection revise the north approach geometry.
- Vine Street / W. Nixon Street / Goodman Avenue intersection additional west approach left turn lane, and extend the south approach left turn lane and the north approach left and right turn lane storage bays.
- Jefferson Avenue / University Avenue intersection extend the north approach left turn storage bay.
- Pike Street / Russell Street intersection add south approach right turn lane.

Additional potential mitigation measures could be applied and will be evaluated as part of the project development process.

6.1.4 GRADE SEPARATED CROSSINGS OF THE SURFACE STREET SYSTEM

A grade separation analysis was conducted to determine the impact of adding rail transit crossings to the future surface street system. The analysis was conducted for 26 of the highest volume traffic crossings of the LRT system.

Tables 6.1.15 and 6.1.16 summarize both the AM and PM peak hour grade separation analysis. This analysis indicates that the LRT crossing of Fourth Street in Covington attains a threshold Level 4, which indicates that an at-grade crossing is probably not feasible. This conclusion is based in an assumed 35% growth in traffic on Fourth Street. As noted previously, the OKI Regional Travel Model forecasts 17.8% growth in this corridor between 2001 and 2020. With 17.8% growth, the LRT crossing of Fourth Street would attain threshold Level 3. Alternative 2 and 4 would place the LRT on an aerial structure over Fourth Street and thereby avoid any grade crossing impact. Two alternatives proposing an above grade crossing of Fourth and Fifth Street have already been proposed in Covington. Seven crossings attained threshold Level 3. One of these crossings that attained threshold Level 3 is Fifth Street in Covington, which is part of the above grade crossing proposed in Alternatives 2 and 4. The other crossings that attain threshold Level 3 are:

- Liberty Street between Vine Street and Sycamore Street
- MLK Drive between University Avenue and Nixon Avenue
- Nixon Avenue between MLK Drive and Shields Street
- Ridge Avenue between Auten Avenue and Highland Avenue
- Pfeiffer Road between Reed Hartman Highway Highway and Kenwood Road

As noted above, traffic control measures and geometric improvements can be implemented to minimize the potential impacts of the grade crossing of the LRVs.

Nineteen other locations, which were analyzed, attained threshold Level 1 or 2. Although the grade separation warrants analysis did not indicate special measures would be required at these locations, improvements have been suggested at some of these locations based upon field observations. Other grade crossing locations were not analyzed because traffic volume data was not available, but many of these streets serve residential areas and traffic volumes are expected to be relatively low.

Table 6.1.15: AM Peak Hour Grade Separation Analysis

Roadway	From	To	Total Number of Lanes	AM Peak Hour Percentage	Threshold for 16 LRT Vehicles per Peak Hour					
					Build Rail 2000			Build Rail 2020 - Defined Growth		
					ADT	Vehicles per lane in peak hour	Threshold #*	ADT	Vehicles per lane in peak hour	Threshold #*
Fifth Street	Philadelphia Street	Madison Avenue	3	0.120	14,800	590	2	20,000	800	3
Fourth Street	Philadelphia Street	Madison Avenue	3	0.120	17,300	690	2	24,000	960	3
Sixth Street	Vine Street	Sycamore Street	3	0.120	4,000	160	1	4,200	170	1
Fifth Street	Vine Street	Sycamore Street	3	0.120	9,000	360	2	12,800	510	2
Central Parkway	Vine Street	Sycamore Street	4	0.120	10,500	320	1	10,000	300	1
Liberty Street	Vine Street	Sycamore Street	4	0.120	12,300	370	2	14,800	440	2
University Avenue	University of Cincinnati	Vine Street	4	0.080	4,300	90	1	5,200	160	1
Harvey Avenue	Hickman Avenue	MLK Drive	4	0.080	8,600	170	1	10,400	210	1
Reading Road	Hickman Avenue	Linton Street	4	0.080	12,800	260	1	15,500	310	1
MLK Drive	University Avenue	Nixon Avenue	4	0.080	22,600	450	2	27,300	550	2
Nixon Avenue/Goodman	MLK Drive	Shields Street	2	0.080	12,800	510	2	15,700	630	2
Reading Road	Ridgeway Avenue	MLK Drive	4	0.080	12,800	260	1	15,500	310	1
Ivanhoe Avenue	Hopkins Avenue	Montgomery Road	2	0.080	2,750	110	1	3,303	130	1
Williams Avenue	Huston Avenue	Montgomery Road	2	0.080	2,250	90	1	2,702	110	1
Smith Road	Sherman Avenue	Ashland Avenue	2	0.080	6,900	280	1	8,300	330	1
Norwood Avenue	Ash Street	Beech Street	2	0.080	4,350	170	1	5,224	210	1
Ridge Avenue	Auten Avenue	Highland Avenue	4	0.080	14,600	290	1	17,600	350	2
Robison Avenue	Kimberly Avenue	Kennedy Avenue	2	0.080	3,700	150	1	4,500	180	1
Montgomery Road	Park Avenue	Plainfield Road	4	0.080	7,600	150	1	9,200	180	1
Plainfield Road	South Avenue	Webster Avenue	2	0.080	6,200	250	1	7,500	300	1
Galbraith Road	Beech Avenue	Dalton Avenue	2	0.080	5,900	240	1	10,300	410	2
Cooper Road	Highland Avenue	Kenwood Road	2	0.080	6,500	260	1	7,800	310	1
Pfeiffer Road	Reed Hartman Highway	Kenwood Road	5	0.080	12,800	200	1	22,500	360	2
Creek Road	Lake Forest Drive	Osborne Avenue	4	0.080	6,200	120	1	10,900	220	1
Cornell Road	Osborne Boulevard	Cornell Park Road	4	0.080	13,100	260	1	23,000	460	2
Cornell Park Road	Cornell Road	Kemper Road	2	0.080	3,200	130	1	5,500	220	1

Source: Light Rail Transit Grade Separation Guidelines, ITE Journal 1993

Notes: ADT based on 2001 Base Year Volumes, * Threshold Number based on LRV Exposure to Traffic, Threshold # 1 means Light Rail at-grade should be feasible, Threshold # 2 means Light Rail at-grade should be feasible, Threshold # 3 means possible traffic signal solutions if LRT delay is acceptable, Threshold # 4 means at-grade crossing probably not feasible

Table 6.1.16: PM Peak Hour Grade Separation Analysis

Roadway	From	To	Total Number of Lanes	AM Peak Hour Percentage	Threshold for 16 LRT Vehicles per Peak Hour					
					Build Rail 2000			Build Rail 2020 - Defined Growth		
					ADT	Vehicles per lane in peak hour	Threshold #*	ADT	Vehicles per lane in peak hour	Threshold #*
Fifth Street	Philadelphia Street	Madison Avenue	3	0.150	14,800	740	3	20,000	1000	3
Fourth Street	Philadelphia Street	Madison Avenue	3	0.150	17,300	870	3	24,000	1200	**4**
Sixth Street	Vine Street	Sycamore Street	3	0.150	4,000	200	1	4,200	210	1
Fifth Street	Vine Street	Sycamore Street	3	0.150	9,000	450	2	12,800	640	2
Central Parkway	Vine Street	Sycamore Street	4	0.150	10,500	390	2	10,000	380	2
Liberty Street	Vine Street	Sycamore Street	4	0.150	17,800	670	2	21,500	810	3
University Avenue	University of Cincinnati	Vine Street	4	0.110	4,300	120	1	5,200	140	1
Harvey Avenue	Hickman Avenue	MLK Drive	4	0.110	8,600	240	1	10,400	290	1
Reading Road	Hickman Avenue	Linton Street	4	0.110	17,500	480	2	21,100	580	2
MLK Drive	University Avenue	Nixon Avenue	4	0.110	23,000	630	2	27,800	760	3
Nixon Avenue/Goodman	MLK Drive	Shields Street	2	0.110	12,800	700	2	15,700	860	3
Reading Road	Ridgeway Avenue	MLK Drive	4	0.110	17,500	480	2	21,100	580	2
Ivanhoe Avenue	Hopkins Avenue	Montgomery Road	2	0.110	2,750	150	1	3,303	180	1
Williams Avenue	Huston Avenue	Montgomery Road	2	0.110	2,250	120	1	2,702	150	1
Smith Road	Sherman Avenue	Ashland Avenue	2	0.110	6,900	380	2	8,300	460	2
Norwood Avenue	Ash Street	Beech Street	2	0.110	4,350	240	1	5,224	290	1
Ridge Avenue	Auten Avenue	Highland Avenue	4	0.110	25,400	700	2	29,700	820	3
Robison Avenue	Kimberly Avenue	Kennedy Avenue	2	0.110	3,700	200	1	4,500	250	1
Montgomery Road	Park Avenue	Plainfield Road	4	0.110	13,000	360	2	15,700	430	2
Plainfield Road	South Avenue	Webster Avenue	2	0.110	6,200	340	1	7,500	410	2
Galbraith Road	Beech Avenue	Dalton Avenue	2	0.110	8,100	450	2	9,700	530	2
Cooper Road	Highland Avenue	Kenwood Road	2	0.110	6,500	360	2	7,800	430	2
Pfeiffer Road	Reed Hartman Highway	Kenwood Road	5	0.110	25,000	550	2	44,000	970	3
Creek Road	Lake Forest Drive	Osborne Avenue	4	0.110	8,500	230	1	14,900	410	2
Cornell Road	Osborne Boulevard	Cornell Park Road	4	0.110	18,300	500	2	32,200	890	3
Cornell Park Road	Cornell Road	Kemper Road	2	0.110	3,200	180	1	5,500	300	1

Source: Light Rail Transit Grade Separation Guidelines, ITE Journal 1993

Notes: ADT based on 2001 Base Year Volumes, * Threshold Number based on LRV Exposure to Traffic, Threshold # 1 means Light Rail at-grade should be feasible, Threshold # 2 means Light Rail at-grade should be feasible, Threshold # 3 means possible traffic signal solutions if LRT delay is acceptable, Threshold # 4 means at-grade crossing probably not feasible

6.1.5 ASSESSMENT OF TRAFFIC IMPACTS AT STATION LOCATIONS

The potential traffic impacts at proposed station locations for each of the rail transit alignments has been identified. This includes a review of the likely auto traffic access patterns and impacts. The evaluation is based on field observations, preliminary station concept plans and descriptions of station locations. The assessment was completed for potential stations that will accommodate park & ride facilities, thus attracting automobile access to the area for the stations. At station locations without parking, auto traffic impacts would be limited to pick-up and drop-off activity, which is estimated to be a small percentage of total boardings at most stations, and thus not evaluated for the purposes of this study. Downtown area stations are not anticipated to include automobile access and thus are not addressed relative to station-generated traffic impacts.

Table 6.1.17 summarizes the results of a qualitative assessment of potential traffic impacts at station locations. A total of seven station locations that are expected to provide park & ride facilities were assessed. Stations with parking represented approximately 3,900 parking spaces. The proposed number of parking spaces for each of the stations is identified in the table. In addition, the table identifies the expected potential impact of the station-generated traffic on the adjacent signalized intersections and the expected primary access routes for automobiles and buses to the stations. The routes and access for bus "feeder" service at the station locations will be primarily limited to major arterial or minor arterial roadways. The previous analysis of roadway segments and intersections included the additional traffic generated by LRT park & ride sites.

Table 6.1.18 presents a quantitative assessment of traffic impacts at the station locations with park & ride facilities. The estimated daily and peak hour traffic volumes expected to be generated by the stations are included in the table. (A discussion of the methodology for the station-generated trips is provided earlier in this chapter.) In addition, the table includes the primary access streets for each station along with the estimated percentage of the station traffic using these access streets and the estimated daily and peak hour capacities for each of the primary access streets. From this information, the table provides a calculation of the expected percentage of the access streets' capacity that will be used by traffic accessing the stations. As shown in the table, the potential daily and peak hour traffic generated at station sites is low (less than 10 percent) compared to the daily and peak hour capacity of the roadways that would provide access to each of the stations, with the exception of five of the access roadways.

The station access streets on which more than 10 percent of the capacity is expected to be utilized to accommodate station-generated traffic include Ridge Avenue, Lake Forest Drive, Pfeiffer Road, and Cornell Park Drive. On Ridge Avenue, which provides access to the Ridge Station, the station-generated traffic would account for about 15 percent of the peak hour traffic. On Lake Forest Drive and Pfeiffer Road, which both provide access to the Pfeiffer Station, the station-generated traffic would account for about 21 percent of the daily traffic and 49 percent of the peak hour traffic on Lake Forest Drive, and about 12 percent of the peak hour traffic on Pfeiffer Road. On Cornell Park Drive, which provides access to the Cornell Park Station, the station-generated traffic would account for about 19 percent of the daily traffic and 44 percent of the peak hour traffic.

Table 6.1.17: Impacts Related to Station Area Traffic

Station Number	Corridor Station	Parking Capacity (Spaces)	Potential Impact of Station Traffic on Signals	Expected Primary Access Routes
1	12th Street	253	Negligible	12th Street
				Russell Street
				Madison Street
2	Xavier/Evanston	460	Negligible	Montgomery Road
				Dana Avenue
3	Ridge	683	Delay would be expected to increase at the Ridge Ave./Highland Ave. signal.	Ridge Avenue
				Highland Avenue
4	Silverton	303	Negligible	Montgomery Road
				Hedge Avenue
				Ohio Avenue
5	Galbraith Road	423	Delay would be expected to increase at the Blue Ash Rd./Kugler Mill Rd. signal.	Blue Ash Road
				Kugler Mill Road
				Galbraith Road
6	Pfeiffer	954	Delay would be expected to increase at the Reed Hartman Highway/Pfeiffer Rd., Reed Hartman Highway/Lake Forest Dr., Pfeiffer Rd./Lake Forest Dr., and Pfeiffer Rd./Kenwood Rd. signals.	Lake Forest Drive
				Pfeiffer Road
				Reed Hartman Highway
7	Cornell Park	857	Delay would be expected to increase at the Reed Hartman Highway/Cornell Park Dr. and Reed Hartman Highway/Cornell Rd. signals.	Cornell Park Drive
				Reed Hartman Highway
				Cornell Road

Source: URS

Table 6.1.18: Adjacent Street Capacity used by Station Traffic for Stations with Parking

Station Number	Corridor Station	Parking Capacity (Spaces)	Estimated Volume Generated [1]		Access Street (Number of Lanes)	Estimated Percent of Station Traffic Using Street [2]	Estimated Capacity		Percent of Capacity Used by Station Traffic	
			Daily	Peak Hour			Daily [3]	Peak Hour [4]	Daily	Peak Hour
1	12th Street	253	893	207	12th Street (2)	55%	16,000	1,600	3%	7%
					Russell Street (2)	45%	16,000	1,600	3%	6%
					Madison Avenue (4)	18%	32,000	3,200	1%	1%
2	Xavier/Evanston	460	1,624	377	Montgomery Road (4)	50%	32,000	3,200	3%	6%
					Dana Avenue (4)	50%	32,000	3,200	3%	6%
3	Ridge	683	2,411	560	Ridge Avenue (4)	85%	32,000	3,200	6%	15%
					Highland Avenue (4)	15%	32,000	3,200	1%	3%
4	Silverton	303	1,070	248	Montgomery Road (4)	80%	27,000	2,700	3%	7%
					Hedge Avenue (2)	10%	16,000	1,600	1%	2%
					Ohio Avenue (2)	10%	16,000	1,600	1%	2%
5	Galbraith Road	423	1,493	347	Blue Ash Road (2)	40%	16,000	1,600	4%	9%
					Kugler Mill Road (2)	15%	13,000	1,300	2%	4%
					Galbraith Road (2)	45%	16,000	1,600	4%	10%
6	Pfeiffer	954	3,368	782	Lake Forest Drive (2)	100%	16,000	1,600	21%	49%
					Glendale-Milford Road (5)	75%	51,000	5,100	5%	12%
					Reed Hartman Highway (6)	20%	51,000	5,100	1%	3%
7	Cornell Park	857	3,025	703	Cornell Park Drive (2)	100%	16,000	1,600	19%	44%
					Reed Hartman Highway (6)	60%	51,000	5,100	4%	8%
					Cornell Road (4)	35%	34,000	3,400	3%	7%

Source: URS

[1] Source is URS/BRW, Inc. and ITE Trip Generation Manual (6th Edition)

[2] Estimate based on station location and potential station configuration.

[3] Source is Florida Department of Transportation, Level of Service Handbook, Table 5-4 (total for both directions), 1998.

[4] Assumes peak hour capacity is 10 percent of daily capacity.

6.1.6 SYSTEM SAFETY

System safety issues are defined in detail in Chapter 3.

6.1.7 SUMMARY OF ROADWAY OPERATIONS

This section of the transportation impact analysis provides a summary of the results of the traffic analysis of select roadway segments, key intersections, and grade crossings of the I-71 LRT line proposed by OKI. The results and proposed mitigations are reported in the following defined segments.

6.1.7.1 Covington

Potential traffic impacts were identified on the roadway operations in the Covington area for alignment Alternatives 1 and 3. These alternatives, which operate at-grade, may be infeasible depending on the actual growth in traffic on Fourth Street. The grade-separated alternatives at this location would have minimal traffic impacts.

In addition, the intersection of Pike and Russell Streets is expected to operate at a LOS F during the PM peak hour in all of the forecasted analyses (2020 No-build, TSM, and Build alternatives). The addition of a right-turn lane at the south approach of this intersection is a potential mitigation measure to minimize the impact of the LRT alignment, in addition to the forecasted future growth in traffic. No significant impacts are expected from the park & ride facility located at 12th Street and Russell Street.

6.1.7.2 Ohio River Crossing

No roadway operation impacts are expected in this segment, due to the development of an exclusive bridge for the LRVs.

6.1.7.3 Cincinnati Riverfront

No significant operation impacts are expected in this segment. The south approach at the intersection of Walnut Street and Second Street is the only approach expected to operate below the acceptable LOS standard. All other segments, intersections, and grade crossings are expected to operate above the acceptable LOS D.

6.1.7.4 Downtown Cincinnati

No significant roadway operation impacts are expected in Downtown Cincinnati. The availability of parallel routes with the grid network of streets minimizes the direct impacts to specific roadway segments and intersections. Traffic growth in downtown is forecasted to be minimal, due to the high volumes of traffic that already exists and the limited planned land development due to the already high-density land uses in the existing downtown. In addition, route diversions in the downtown area were forecasted due to the LRT alignment.

6.1.7.5 Over-the-Rhine

Minimal impacts to the roadway operations in the Over-the-Rhine segment can be expected for the forecasted Year 2020 analysis. The east approach left-turn and through movements at the intersection of Liberty Street and Walnut Street is expected to operate at LOS E for the future no-build, TSM, and build alternatives in the AM peak hour. Although these movements are expected to operate below the acceptable LOS, the intersection can be expected to operate above the LOS D threshold.

6.1.7.6 Mount Auburn Tunnel

No roadway operation impacts are expected in this segment, as the development of an exclusive tunnel for the LRVs would not impact the existing traffic operations.

6.1.7.7 Uptown

In the existing conditions of alternatives 1 and 2, the intersection of Vine Street, West Nixon Street, and Ruth Lyons Way is currently operating at a LOS F in the PM peak hour. Multiple intersections in the Uptown area are expected to operate below the acceptable LOS for all of the forecasted conditions analyzed in the AM peak hour. These intersections include:

- Vine Street, West Nixon Street, and Ruth Lyons Way (LOS F)
- Erkenbrecher Avenue and Vine Street (LOS F)
- MLK Drive and Reading Road (LOS E)

In the future conditions of alternatives 3 and 4, the intersection of Vine Street, West Nixon Street, and Ruth Lyons Way is the only intersection in the University of Cincinnati area that is expected to operate below the acceptable LOS in the PM peak hour. This intersection is expected to operate at LOS F for all of the forecasted conditions analyzed for the PM peak hour. For alternatives 1 and 2, if traffic signal solutions do not minimize the impacts of the LRVs, then grade separation may be needed on MLK Drive and Nixon Avenue. Potential mitigation measures were recommended, including adding and or extending the turn-lane storage bays, adding left-turn lanes, and revising the intersection geometries.

All alternatives in the Uptown area have impacts to the traffic operations, including the no-build, TSM, and all four-build alternatives. Distinguishing the highest impact to this segment by alternative should be further investigated.

6.1.7.8 Avondale to Norwood

Limited impacts can be expected to the roadway segments, intersections, and grade crossings in the Avondale to Norwood segment. The addition of the 460 parking space Xavier park & ride facility is expected to have negligible impacts on the surrounding roadway network and adjacent traffic signal system.

6.1.7.9 Norwood to Blue Ash

The segment from the City of Norwood to the City of Blue Ash is expected to have considerable impacts to the roadway operations. Currently, the only intersection operating below the acceptable LOS is Ridge Avenue and Highland Avenue, which operates at LOS F. Both the north and south approaches to this intersection are expected to operate at LOS F. For the future analysis conditions, the roadway segment of

Highland Avenue between Linden Avenue and Beech Street is expected to operate at LOS E. No difference in the roadway segment is expected between the future No-build, TSM, or the four-build alternatives. Additional travel lanes, providing a median, or the addition of left-turn bays can be expected to improve the operating LOS for this roadway segment.

For the forecasted intersection analysis, the intersection of Blue Ash Road and Kugler Mill is expected to operate at LOS F for the four build alternatives in the PM peak hour, in addition to Ridge Avenue and Highland Avenue that operates at LOS F. The addition of right turn lanes on the north and south approaches of the Ridge Avenue and Highland Avenue are potential mitigation measures that should minimize the impacts of the build alternatives to the roadway operations. The forecasted no-build and TSM alternatives for the intersection of Blue Ash Road and Kugler Mill Road are expected to operate at a LOS D, although the north approach through lane is expected to operate at a LOS F.

Three park & ride facilities are proposed at three stations within this segment: Ridge, Silverton, and Galbraith Road. The stations result in an additional 1,409 parking spaces and an estimated 4,974 daily trips generated by the stations. The Ridge Station and Galbraith Station are both expected to account for over 10 percent of the traffic on adjacent roadways during the PM peak hour. Due to these new trips, delay is expected to increase at the Ridge Avenue/Highland Avenue signal and the Blue Ash Road/Kugler Mill Road signal.

6.1.7.10 Blue Ash

The City of Blue Ash is expected to experience impacts on its roadways due to the high amount of forecasted employment and population growth. As noted before, the following intersections are currently operating below the acceptable LOS:

AM Peak Hour

- Reed Hartman Highway and Kemper Road (LOS F)
- Pfeiffer Road and Kenwood Road (LOS E)

PM Peak Hour

- Reed Hartman Highway and Kemper Road (LOS E)
- Reed Hartman Highway and Cornell Road (LOS F)

No roadway segments are expected to operate below the acceptable LOS standard for any of the alternatives analyzed through this Draft Environmental Impact Statement (DEIS). Forecasted growth in this suburb is expected to have considerable impacts to the future roadway operations, specifically the signalized intersections. In fact, nearly every intersection that was analyzed in the Blue Ash area is expected to operate at LOS F for nearly all of the alternatives analyzed. Because of the forecasted growth in the Blue Ash area, many of the intersections are forecasted to be operating at LOS F in the no-build and TSM conditions. The intersections that are expected to operate at a LOS F include:

AM and PM Peak Hours

- Reed Hartman Highway and Kemper Road (LOS F)
- Reed Hartman Highway and Cornell Park (LOS F)
- Reed Hartman Highway and Cornell Road (LOS F)

- Reed Hartman Highway and Creek Road (LOS F)
- Reed Hartman Highway and Pfeiffer Road (LOS F)
- Pfeiffer Road and Kenwood Road (LOS F)
- Kenwood Road and Cooper Road (LOS F)

PM Peak Hour Only

- Reed Hartman Highway and West Lake Forest Drive (LOS F)

The following mitigation measures were proposed to minimize the impacts to these intersections:

- Reed Hartman Highway / Kemper Road
  - Additional through lane on Reed Hartman Highway
  - Extend the north approach left-turn storage bay
  - Add a left turn lane and right turn lane for the east approach
- Reed Hartman Highway / Cornell Road
  - Additional north approach left-turn lane
- Reed Hartman Highway / Creek Road
  - Additional south approach left turn lane
- Reed Hartman Highway / Pfeiffer Road
  - Additional south approach and west approach left turn lanes
- Reed Hartman Highway / West Lake Forest Drive
  - Extend the west approach left-turn lane storage bay
- Pfeiffer Road / Kenwood Road
  - Additional north and south approach left turn lanes

The majority of the intersections in the Blue Ash area are expected to operate below the accepted standard of LOS D. These intersections are forecasted to operate at these levels in nearly all of the alternatives analyzed, including the no-build, TSM, and four-build alternatives. The actual impact of the light rail system is not accurately weighed in this analysis because there is no measurable difference between the alternatives.

6.2 BUS TRANSIT OPERATIONS

This section describes the existing and planned bus transit system serving the I-71 Corridor. The potential impacts to the bus transit system routes resulting from each of the alternatives considered are also described.

6.2.1 EXISTING AND PLANNED BUS TRANSIT SERVICES

Metro has embarked on an aggressive planning process to enhance existing bus transit service in the region. The MetroMoves Plan Executive summary can be found in Appendix 6-1.

6.3 RAIL TRANSIT OPERATIONS

6.3.1 RAIL TRANSIT OPERATING HOURS

Rail transit operating hours for each of the build alternatives is assumed 5:30 AM to 12:00 AM with variations in headways as follows:

- Weekday:
  - Early Morning 5:30 to 6:30 AM 15 minutes
  - AM Peak 6:30 to 9:00 AM 7.5 minutes
  - Midday 9:00 to 4:00 PM 15 minutes
  - PM Peak 4:00 to 6:30 PM 7.5 minutes
  - Early Evening 6:30 to 9:00 PM 15 minutes
  - Late Evening 9:00 to Midnight 30 minutes
- Weekends:
  - Early Morning 5:30 to 9:00 AM 30 minutes
  - Midday 9:00 to 9:00 PM 15 minutes
  - Late Evening 9:00 to Midnight 30 minutes

6.3.2 RAIL OPERATING STATISTICS

Table 6.3.1: Forecast Light Rail Operating Statistics

	Alternate 1	Alternate 2	Alternate 3	Alternate 4
NB Travel Time	48:35	47:35	52:25	51:35
SB Travel Time	50:19	49:29	54:09	53:19
Proposed Layover Time	21:06	15:16	20:56	21:36
Total Cycle Time	120:00	120:00	127:30	127:30
Trains Required	16	15	17	17
Cars per Train	2	2	2	2
Peak Cars Required	32	30	34	34
Fleet Cars Required	39	36	41	41
Opening Year Ann. Rev. Car-Miles	1,977,000	1,976,300	2,032,500	2,031,800
Opening Year Ann. Rev. Train-Hours	58,190	56,920	64,950	64,950

Assumes an opening year line load slightly lower than 2020 peak hour forecast of 2100, 1.67 load standard of 75 seated and 50 standing passengers (i.e., 125 passengers per rail car) and a 20% spare ratio. One additional fleet car will be required by 2020 to enable a peak hour three-car train to operate and maintain the 1.67 load standard.

6.4 REGIONAL TRAVEL DEMAND SUMMARY

This section presents the estimated regional travel demand characteristics for the build alternative. This includes estimates of total boardings in opening year and forecast year; forecasted transit system linked trips, number of transit trips and total person trips.

PROJECT DESCRIPTION			
Project Planning Dates	**Base Year**	**Opening Year**	**Forecast Year**
	1995	2008	2020
Capital Cost Estimate	Constant dollars	$743 million (1999$)	
	Year of Expenditure	$899.8 million	
Levels of Service	Headways		
	Weekday Peak	7.5 minutes	
	Weekday Off-peak	15 minutes	
	Weekday Evening	15 minutes (30 minute 9:00 pm to midnight)	
	Weekend	15 minute 9:00 am to 9:00 pm 30 minute 5:30 am to 9:00 am 30 minute 9:00 pm to midnight	
	Hours of Service		
	Weekday	5:30 am to midnight	
	Weekend	5:30 am to midnight	
Travel Demand Estimates	**Project Boardings**	**Opening Year**	**Forecast Year**
	Average Weekday	19,500	27,900
	Peak Period	14,800	21,200
	Midday	4,600	6,600
	Evening	N/A	N/A
	Weekend	N/A	N/A
	Peak Hour	2,900	4,200
	Pk Hr, Peak Direction	N/A	N/A
	Peak Load	N/A	N/A
	Annual	5,850,000	8,366,100
	Transit System Linked Trips[1]	**Opening Year**	**Forecast Year**
	Average Weekday	N/A	111,659
	Annual	N/A	33,497,700
	Avg WD New Riders	N/A	21,223
	Annual New Riders	N/A	6,366,900
Linked Trips if Proposed System Operated with Current Land Use Patterns and Population/Employment[2]		**Build Alternative**	
		111,224	

[1] Linked Trips refer to trips that begin at the trip origin and end at the FINAL destination. One linked trip could be composed of several unlinked trips such as driving to a park and ride, riding a commuter train, and taking a bus to the final destination is all one linked trip which is made up of three unlinked trips and two transit system boardings.

[2] Project sponsor shall generate this estimate by running their regional travel demand model using the proposed project transit network, the existing highway network, and existing populationa and emplyment estimates. If the proposed project is within 5 years of the planned opening year, opening year estimates can substitute for this measure.

Corridor Travel Markets	Linked Trips in Forecast Year	Number	Percent
	Number of Transit Trips		
	Corridor-CBD	2,961,900	12%
	Corridor-UC/Hospitals	1,025,400	4%
	Corridor-Xavier	157,200	1%
	Corridor-Blue Ash	546,900	2%
	Corridor-Central Covington	762,000	3%
	Other Intra-Corridor	6,270,300	26%
	Other Corridor-Related	12,424,500	51%
	Total Corridor	24,148,200	100%
	Person Trips		
	Intra-Corridor Work Person Trips	5,141,700	26%
	Corridor-Related Work Person Trips	6,541,500	74%
	Total Corridor-Related Work Person Trips	11,683,200	100%
	Intra-Corridor Non-Work Person Trips	6,582,000	42%
	Corridor-Related Non-Work Person Trips	5,883,000	58%
	Total Corridor-Related Non-Work Person Trips	12,465,000	100%

6.5 PARKING

This section presents a summary of the number of parking spaces affected by LRT operations. Parking availability is important to the vitality of the metropolitan area's economy. This section presents the existing parking conditions in specific areas where parking space availability has become a considerable issue. The areas that have been identified for review include:

- City of Covington
- The City of Cincinnati including the Riverfront, Central Business District and Over-the-Rhine Segments
- The City of Cincinnati Uptown Segment
- City of Norwood
- City of Deer Park

6.5.1 EXISTING PARKING

The inventory of the parking capacity and conditions in the areas mentioned above are presented in the following sections.

6.5.1.1 City of Covington

Off-street Parking in the Covington segment is composed of both surface and structured parking. On street non-metered parking is provided on most streets with the exception of Madison Avenue and Scott Boulevard and areas surrounding the Kenton County government center.

The City of Covington currently owns and maintains surface parking lots between Washington Street and the CSX Railroad on either side of Eighth Street. Additionally, private surface lots for commercial enterprises are traversed by and adjacent to the alignment from Fifth Street north to the Ohio River. Covington owns and maintains a parking garage at Seventh and Scott Boulevard and is beginning construction on a similar structure at Fifth and Scott Boulevard. The City of Covington and Kenton County have explored the potential of constructing a large parking garage to serve the proposed Riverfront West development site adjacent to the proposed Covington Riverfront LRT Station.

6.5.1.2 City of Cincinnati

Hamilton County currently owns and operates several surface lots on the Cincinnati riverfront serving Paul Brown Stadium, Great American Ball Park and the downtown office market. The County has contractual commitments to provide parking for the Cincinnati Reds and Cincinnati Bengals on the riverfront during game days. The County recently completed a 1250-space garage at Broadway and Pete Rose Way and a second 720-space garage is currently under construction between Walnut and Vine Streets south of Second Street. This garage is to serve the National Underground Freedom Center. The County has plans to construct a series of two level garages between Main and Elm Streets south of Second Street to serve the proposed Banks redevelopment project. On-street metered parking is provided in the south curb lane of Third Street from Main Street to Elm Street. The City of Cincinnati owns and maintains a 900 space surface lot at Third Street and Central Avenue. There are no significant public parking garages directly incorporated into Paul Brown Stadium and Great American Ballpark.

Currently, there are approximately 23,000 off-street parking spaces available in the core of the CBD. Private companies own and operate approximately 60 percent of the existing parking spaces (13,350 spaces), while the City's Division of Parking operates the remaining 40 percent (9,715 spaces). Major underground parking garages are located between Vine and Walnut Streets in the blocks between Fourth and Sixth Streets.

On-street parking is limited, especially in the core of the downtown, with roadway surfaces primarily used for traffic lanes. Along Main Street and Walnut Street, where the LRT alignment is proposed to be located in downtown Cincinnati, there are currently 217 metered on-street parking spaces. However, most of these spaces are limited to non-peak hour driving, to provide additional roadway capacity during the peak hours of traffic operations.

New parking structures and facilities are being developed in the downtown area to adhere to the perceived shortages of parking for visitors. Demand based meter rates, accelerated parking structure construction, improved signage to available visitor parking facilities, and increased publicity about available short-term parking spaces were proposed in the Parking Improvement Plan for the City of Cincinnati in June 1999.

The city is in the planning and design phase for new garage structures at Seventh and Vine, Seventh and Broadway and on Elm Street.

Non-metered parking is provided on Walnut Street and both non-metered and metered parking is provided on Main Street in the Over-the-Rhine neighborhood. Parking has been seen a significant problem for the Main Street Entertainment District which is a large group of restaurants/bars and night clubs located on Main Street from 12th Street to Liberty.

6.5.1.3 Uptown

Currently, there are an estimated 12,000 parking spaces available in the Uptown area. These spaces are operated by the Parking Services Department of the University of Cincinnati and includes 10 parking structures and 17 surface lots, in addition to limited on-street parking. A new 1,300 space parking structure, the University Hospital Parking Garage Addition, is currently under construction adjacent to Sabin Way and the proposed Medical Center Option A LRT station location. It is scheduled for completion in 2003. The surface parking lots and several garage structures surround the medical related facilities in the medical center complex bounded by Vine Street, Erkenbrecher Avenue, Harvey Avenue and MLK Drive. On-street parking is currently available on some of the surrounding streets, including on Jefferson Avenue and Vine Street as well as the residential side streets in nearby areas of Clifton Heights, Corryville and Avondale surrounding the Campus and Medical Center. The Cincinnati Zoo has plans for new surface and structured parking south and west of Vine Street adjacent to the proposed Zoo LRT Station.

6.5.1.4 City of Norwood

Parking near the LRT alignment in the City of Norwood consists primarily private surface lots. Large surface lots are provided at Surrey Square Shopping Center and in the Central Parke Commercial/Office Development. In general, on-street parking is provided on most streets.

6.5.1.5 City of Deer Park

In the City of Deer Park, head-in parking spaces are currently located along the east side of the tracks immediately adjacent to the railroad, including some spaces that are partially located in the right-of-way of the Blue Ash line. These parking spaces are accessed off the west side of Blue Ash Road. Today, there are approximately 343 head-in parking spaces in Deer Park adjacent to the alignment. There is additional off-street parking available on the opposite side (east side) of Blue Ash Road, which serve the adjacent retail and residential land uses.

6.5.1.6 Other Parking Locations

On and off-street parking is available in other locations in the I-71 Corridor. Parking demand is high near Xavier University and the Cintas Center because of the large number of students who commute to campus everyday. In addition, hundreds of thousands of visitors visit the campus annually for special events. Xavier University has recently developed several large surface parking lots surrounding the Cintas Center and adjacent to the proposed Xavier/Evanston Station between Dana and Lexington Avenue west of Montgomery Road.

Parking in Blue Ash and Sycamore Township is generally not metered on the street or in private surface lots. The alignment in many of the other areas in the corridor is located in the existing railroad right-of-

way. Parking availability and demand is traditionally low in these locations and the LRT system is not expected to have significant impacts on parking.

6.5.2 PARKING IMPACTS

Impacts to the parking facilities in the I-71 Corridor are described below by the defined segments used in this analysis. Parking is considered a valuable commodity for adjacent businesses, especially in commercial districts such as a central business district. Mitigation measures may need to be further investigated in the project development process, though many of the parking impacts may easily be diverted to adjacent spaces, lots, or structures.

6.5.2.1 Covington Parking Impacts

There will be limited impacts to existing on and off-street parking in Covington. The LRT alignment will operate in and adjacent to the CSX railroad right-of-way between 13th Street and Fifth Street. The City of Covington owns and maintains a municipal surface lot at the southwest corner of Washington and Eighth Streets. This lot will be displaced in its entirety. Approximately 60 spaces will be eliminated from a city-owned public surface lot located between Eighth and Pike Streets.

Some parking will be displaced and reconfigured for the Covington Station office building at the corner of Pike and Russell Street. Some on-street parking will be displaced on Athey, Kentucky, and Johnson Streets. Alternatives 1 and 3, at-grade alignments through Fourth and Fifth Streets may displace some of the private parking spaces that currently serve the existing restaurant and businesses. The businesses are expected to be relocated due to the alignment, so the loss of parking spaces at this location is not considered a significant impact. Alternatives 2 and 4 will have less impact on parking because they operate above grade on new bridge structures. The City of Covington's proposed garage facilities for the Riverfront West development site would be integrated into the LRT Riverfront Station. The Internal Revenue Service lot between Third and Fourth Street will lose the row of parking spaces adjacent to the Clay Wade Bailey Bridge.

6.5.2.2 Ohio River Crossing Parking Impacts

No significant parking impacts can be expected for the LRT system in the Ohio River crossing area. Some spaces may be reconfigured along Pete Rose Way for piers for the proposed LRT bridge.

6.5.2.3 Cincinnati Riverfront Parking Impacts

Impacts to parking are expected on the Cincinnati Riverfront due to the implementation of the LRT system. The impacts will primarily be limited to the City of Cincinnati's Third and Central parking lot. Approximately 120 of the 900 spaces in the lot will be lost for the southbound trackway to be located adjacent to the south side of Third Street between Central Avenue and the Clay Wade Bailey Bridge. All on-street parking in the south curb lane on Third Street between Walnut and Elm Street will be displaced. Structured parking south of Second Street will not be directly impacted, with the exception of the substation planned to be located within the Block 4 garage between Main and Walnut Streets. This would displace an unspecified number of spaces depending on the final design of the garage.

6.5.2.4 Downtown Cincinnati Parking Impacts

On-street parking is expected to have significant impacts for the four-build LRT alternatives. All four of the LRT alternatives will have identical impacts to downtown parking. Table 6.5.1 documents on-street parking in the downtown area. The LRT would displace existing curbside uses on the west side of Main Street and the east side of Walnut Street. A total of 58 parking spaces and 57 loading zone spaces will be displaced. A privately owned surface parking lot at the northwest corner of Eighth and Main Streets will also be displaced to allow for the placement of a LRT substation structure.

Table 6.5.1: On-street Parking in Downtown Cincinnati

	Main Street				Walnut Street			
	Metered Parking Spaces		Loading Zone Spaces[1]		Metered Parking Spaces		Loading Zone Spaces[1]	
	East Side	West Side	East Side	West Side	East Side	West Side	East Side	West Side
Third to Fourth	5	7	3	0	0	5	13	5
Fourth to Fifth	4	6	0	3	5	4	9	0
Fifth to Sixth	0	0	0	0	0	0	4	3
Sixth to Seventh	6	8	3	3	5	0	11	6
Seventh to Eighth	1	3	2	3	0	0	4	0
Eighth to Ninth	3	5	2	4	4	6	8	0
Ninth to Court	4	4	3	4	4	2	0	4
Court to Central	0	4	0	0	3	3	3	0
Total by Direction	23	37	9	17	21	20	40	18
Total	**60**		**26**		**41**		**58**	

[1] Assumption made that each loading zone space is 18 feet in distance.

The 115 spaces displaced by the LRT will reduce the total number of on-street spaces in downtown. Some reconfiguration of the other on-street uses may provide for replacement loading areas or short-term parking needs. The City of Cincinnati has plans to construct three new municipal parking garages as indicated in Table 6.5.2:

Table 6.5.2: Proposed Parking Garages for Downtown Cincinnati

Location	Number of Parking Spaces
Seventh and Broadway	400 spaces
Seventh and Vine	500 spaces
Sixth and Elm	800 spaces
Total	**1,700 spaces**

These new off-street spaces will provide replacement parking but will be less convenient to business users along Main and Walnut Streets than the existing on-street parking.

6.5.2.5 Over-the-Rhine Parking Impacts

Parking facilities in the Over-the-Rhine segment are expected to be impacted by LRT. The on-street parking on the west side of Main Street and the east side of Walnut Street will be displaced. The affected spaces include 110 metered parking spaces and seven loading zone spaces in this area.

Table 6.5.3: On-street Parking in the Over-the-Rhine District

	Main Street				Walnut Street			
	Metered Parking Spaces		Loading Zone Spaces		Metered Parking Spaces		Loading Zone Spaces	
	East Side	West Side	East Side	West Side	East Side	West Side	East Side	West Side
Central to 12th	12	7	3	4	6	4	0	1
12th to 13th	5	12	0	1	12	6	0	6
13th to 14th	10	19	6	0	23	18	0	2
14th to Liberty	6	12	4	2	19	14	0	0
Total by Direction	33	50	13	7	60	42	0	9
Total	83		20		102		9	

Most of these short-term metered parking spaces serve the retail businesses that depend on these spaces for walk-in business. Mitigation measures to replace the impacted on-street parking will need to be further investigated and coordinated with city planning efforts. The private parking lots on the southeast corner of Walnut Street and Liberty Street will be reconfigured due to the alignment crossing this block diagonally. No parking spaces will be displaced, but the lots will be reconfigured as part of this project.

6.5.2.5 Mount Auburn Tunnel Parking Impacts

Limited impacts are expected to the existing parking facilities in the Mount Auburn Tunnel segment. Designated drop-off zones for parents on the east side of Main Street serving the Rothenburg Elementary School will have to be relocated to the north side of the school on Clifton Avenue. This is not expected to have a direct impact to the school, traffic, or safety of the children. Loading for semi-trailers will not likely be feasible from Main Street north of Liberty Street after LRT is implemented. In addition, an off-street surface parking lot will have to be reconstructed between Gilman and Albion Streets on Auburn Avenue after the construction of the Mount Auburn station. The net change in parking spaces will be zero in the Mount Auburn Tunnel segment.

6.5.2.6 University of Cincinnati Parking Impacts

Parking will be impacted in the University of Cincinnati area by the proposed build alternatives (Table 6.5.4). Approximately 48 metered parking spaces on Jefferson Avenue will be displaced. An additional 62 on-street parking spaces will be displaced due to the Zoo Alignment. The VA has indicated that they are required to provide parking at no charge to patients, visitors and staff. Parking displaced by the LRT would need to be mitigated. The Avondale Station site between Harvey Avenue and Reading Road is expected to impact 30 on-street parking spaces. Another 252 parking spaces located in existing parking lots are also expected to be impacted, but not necessarily eliminated by the Zoo Alignment. The MLK Alignment alternative is expected to have less impact to on-street parking. Although the impact to on-street parking is expected to be less, the impact to surface parking lots is expected to impact approximately 430 parking spaces. Some of these parking facilities can be reconfigured to minimize the number of spaces lost. Currently, a 1,300 parking space structure is being constructed for the Health

Alliance near the intersection of Sabin Way and Burnett Avenue. Any mitigation measures will have to be investigated in the project development process.

Table 6.5.4: University of Cincinnati Build Alternative Parking Impacts

	Location	On-Street Parking Spaces	Surface Parking Lot Spaces
Health Alliance/ City of Cincinnati	MLK Drive between Harvey Avenue and Reading Road	0	110
BRP Pediatrics Office	MLK Drive between Burnett Avenue and Harvey Avenue	0	108
Cincinnati Health Department	MLK Drive between Burnett Avenue and Highland Avenue	0	35
University of Cincinnati/ Health Alliance	MLK Drive between Bellevue Avenue and Highland Avenue	0	180
Veterans Administration Hospital	Vine Street between Nixon Avenue and Shields Street	0	92
Louis Avenue	East of Vine Street	12	0
Children's Hospital (University of Cincinnati)	Between Erkenbrecher Avenue and Sabin Way	10	50
Health Alliance Business Center	Sabin Way between Burnett Avenue and Harvey Avenue	0	50
Health Alliance	Harvey Avenue on either side of Hickman Avenue	0	60
Avondale Station Area	Hickman Avenue between Harvey Avenue and Reading Road	30	0
Varland Metal Company Lot	Fredonia Avenue north of Whittier Avenue	0	12
Van Buren Avenue	North of MLK Drive	10	0
Whittier Avenue	East of Reading Road	10	0

6.5.2.7 Avondale to Norwood Parking Impacts

Impacts on parking will be minimal in the Avondale to Norwood segment. Some off-street parking will be displaced from Surrey Square Shopping Center and Central Parke Commercial Center. Parking in the Central Parke development will be reconfigured to minimize the loss of spaces. Some spaces will be lost in a private lot for Varland Metal Products. 460 parking spaces will be added in the Xavier Station park & ride facility. Minimal impacts to on-street parking are expected on Mentor Avenue, Ivanhoe Avenue, and Williams Avenue because the alignment crosses these streets mid-block.

6.5.2.8 Norwood to Blue Ash Parking Impacts

The alignment through Pleasant Ridge and Kennedy Heights neighborhoods of Cincinnati is largely separated from the local road network and there will be no significant parking impacts. The existing

SORTA park & ride location on Montgomery Road in Silverton will be completely reconfigured with a minimal loss of spaces.

Approximately 400 head-in parking spaces currently along the west side of Blue Ash Road are partially located in SORTA owned Blue Ash line right of way in the City of Dear Park. The majority of these parking spaces serve the businesses on the east side of Blue Ash Road and Chamberlain Park on the west side of the existing railroad right-of-way. Approximately 40 spaces adjacent to the Galbraith Station site would be eliminated. The remaining head-in parking along Blue Ash Road could be maintained by shifting the LRT to the western side of the rail right-of-way. Alternatively, the head-in parking could be replaced with parallel parking. If parallel parking were provided, approximately half of the existing number of spaces would be maintained. Impacts to other parking facilities in this segment should be minimal.

6.5.2.9 Blue Ash Parking Impacts

Approximately six head-in parking spaces on Blue Ash Road, just south of Cooper Road, will be displaced. All other impacts to any parking facilities are expected to be limited. The Pfeiffer and Cornell Park LRT station areas in Blue Ash will feature on-site parking. Some parking in the surface lots of the Techwoods Office Park and a Procter and Gamble office building in the Cornell Park office park will be reconfigured.

6.5.3 PARK & RIDE FACILITIES

Park & ride facilities are proposed to be provided at seven of the 21 stations in the I-71 Corridor for the four build alternatives. Based on ridership projections and regional accessibility to major residential and activity centers, the number of parking spaces at the proposed transit stations were identified. Table 6.5.5 summarizes the proposed stations that are proposed to provide park & ride spaces. Only those stations that are planned to provide these facilities are shown in this table.

Table 6.5.5: Proposed Park & Ride Facilities

Station	Segment	Proposed Park & ride Spaces	Proposed ADA Accessible Spaces	Proposed Drop-and-Ride Spaces	Proposed Bus Parking Stalls
12th Street	Covington	247	6	20	3
Xavier	Avondale to Norwood	456	4	4	3
Ridge Avenue	Norwood to Blue Ash	667	16	23	4
Silverton	Norwood to Blue Ash	291	12	7	3
Galbraith	Norwood to Blue Ash	413	10	0	4
Pfeiffer Road	Blue Ash	932	54	49	6
Cornell Park	Blue Ash	838	19	12	6
Total		**3,844**	**121**	**115**	**29**

As shown in Table 6.5.5, a total of 3,965 parking spaces (3,844 park & ride spaces and at least 115 accessible spaces) are proposed. In addition to these spaces, most of the 21 stations will accommodate

spaces for drop-and-ride accommodations. Numerous spaces are also provided at each station for bus parking, primarily for feeder buses that are proposed to serve each station area.

6.6 RAILROAD FACILITIES AND SERVICES

This section reviews the existing railroad facilities and services and assesses the potential impacts associated with each of the alternatives under consideration.

6.6.1 EXISTING AND FUTURE RAILROAD FACILITIES AND SERVICES

Two Class I Railroads, CSX Transportation (CSX) and Norfolk Southern (NS), and one regional railroad, Indiana and Ohio Railroad, a subsidiary of RailAmerica Corporation (I&O), serve the corridor. The impacts resulting from the construction and operation of the proposed I-71 Corridor LRT will vary throughout the alignment. Existing railroad facilities and services are described for each of the applicable LRT segments (see Figure 6.6-1).

6.6.1.1 Covington Segment

The LRT alignment will be located on, or adjacent to, CSX Transportation rights-of-way from 13th Street to Fourth Street. This is designated as CSX Louisville Division, Cincinnati Terminal Railway Subdivision, MP CA-663 to CA-664.5. This heavily used railroad right-of -way consists of two through-tracks and one siding. Amtrak currently uses these tracks for passenger service for the "Cardinal" from Chicago to Washington DC. The right-of-way is generally 100 ft. wide. The tracks are slightly depressed from grade at 13th Street and gradually ascend to grade in the vicinity of 10th Street and then continue onto a grade-separated retained fill section from Eighth Street to Fifth Street. This is an abutment for the approach structure to the C&O Ohio River Bridge. There are several railroad-owned bridge structures in this segment. Bridges carry local streets over the tracks at 11th Street, CSX MP CA-663.08, and Robbins Street, CSX MP CA-663.16. The bridge decks are owned and maintained by the City of Covington while the steel superstructure and concrete substructure are maintained by CSX. The Robbins Street Bridge is currently restricted to pedestrian traffic only. In addition, there are six concrete and steel underpass structures carrying the tracks over local streets. These underpass structures are located at Eighth, Russell, Pike, Seventh, Pershing, and Sixth Streets. The railroad is elevated on steel plate girder bridges from Fifth Street to the steel truss Ohio River bridge immediately west of the Clay Wade Bailey highway bridge which, in turn, would be immediately west of the proposed new LRT bridge.

This segment experiences high volume train movements and connects the CSX Queensgate railyard in Cincinnati with three railroad corridors to Russell, Corbin and Louisville, Kentucky. CSX has indicated that no additional right-of-way acquisition is envisioned in this segment of the corridor and that two additional tracks could be constructed in the existing right-of-way.

6.6.1.2 Ohio River Crossing Segment

As noted above, the CSX railroad crosses the Ohio River on a double track steel truss bridge immediately to the west of the Clay Wade Bailey Bridge. This bridge shares river piers with the Clay Wade Bailey highway bridge. The CSX railroad turns west at the north end of the Ohio River bridge on an elevated steel viaduct leading to the Queensgate railyard.

6.6.1.3 Cincinnati Riverfront Segment

There are no railroad facilities in this segment at this time. SORTA owns an easement for potential commuter rail in this segment, which is located in the riverfront transit center below Second Street. There is no physical impact on the proposed LRT segment.

6.6.1.4 Downtown Cincinnati, Over-the-Rhine, Mount Auburn Tunnel, and University of Cincinnati Segments

There are currently no existing or proposed railroad facilities in these segments.

6.6.1.5 Avondale to Norwood Segment

The proposed I-71 Corridor LRT alignment in this segment will primarily occupy former Conrail railroad right-of-way, the majority of which was purchased by SORTA in 1986. This railroad right-of-way was originally developed in the period between 1870 and 1890 as the Cincinnati, Lebanon and Northern Railroad. The railroad subsequently came under control of the Pennsylvania Railroad in the early 20th Century and finally Conrail prior to its sale to SORTA. Most of the tracks have been removed.

This segment also includes use of an existing unused railroad bridge constructed for the Pennsylvania Railroad and owned by the Ohio Department of Transportation (ODOT) over Victory Parkway. This two-track plate girder bridge will accommodate the proposed I-71 Corridor LRT over Victory Parkway. The SORTA-owned property also abuts an unused single track railroad bridge constructed for the Pennsylvania Railroad over I-71 just south of Whittier Street. This bridge will not be utilized for the proposed I-71 Corridor LRT.

NS-owned right-of-way is located west of, and adjacent to, the Blue Ash line from just north of Victory Parkway to just north of Cleneay Avenue in Norwood. NS also owns right-of-way located east of the Blue Ash line between Dana and Lexington Avenue. This is the site of the proposed Xavier/Evanston Station. The NS right-of-way in this vicinity is a portion of the former Norfolk & Western Hyde Park Branch. An explosion at an adjoining industrial facility in 1990 resulted in the removal of the tracks. The tracks west of the LRT alignment have been rarely used in recent years. NS has indicated that it intends to abandon this right-of-way. SORTA has the right of first refusal on purchase of these lines for potential LRT corridors to the east and northwest.

South of the Norwood Lateral, the LRT alignment will cross over CSX right-of-way. The proposed I-71 Corridor LRT alignment will cross over the CSX tracks on a new LRT bridge. This two-track segment is identified as CSX Louisville Division, Cincinnati Terminal Railway Subdivision, MP-BB 10.68. The CSX right-of-way is approximately 90 ft wide at the crossing location. This segment carries significant train movements.

The LRT alignment will return to grade at Norwood Avenue and proceed northward in newly acquired right-of-way adjacent to and east of the Indiana & Ohio Railroad right-of-way from Norwood Avenue to Highland Avenue. This segment of single track is identified as I&O MP-50.7 to MP-50.2 and serves as a connection between I&O's McCullough Yard and the CSX railroad. There are two active spurs to the east side of I&O's track in this area that will be crossed by the LRT alignment. The first is Metro Container Corporation, (4927 Beech Street). They typically service one to two cars per month. The second is a new tenant in the former ABC NACO building (now owned by King Wrecking, 5038 Beech Street). TRIAD is the tank car-servicing firm, currently located at the terminus of the NS Wasson Line in Evanston. This firm is planning to relocate to this new location in Norwood. Triad would potentially service 10-20 cars per week.

There are a minimum of four one-way trips, daily from McCullough Yard to the CSX Queensgate Rail Yard to move engines. The majority of through movements bypass the yard from CSX via the rail connection between CSX and the Oasis line located to the east of McCullough Yard. Movements on the connection from CSX to the McCullough Yard may occur at any time of the day everyday. Much of the train schedules are based on customer demand and are not regularly scheduled.

North of Highland Avenue the LRT alignment will proceed on a retained fill embankment along the east side of I&O's McCullough Rail Yard. SORTA obtained an easement from I&O for this alignment as part of its purchase of the I&O Blue Ash Subdivision Right-of-way. This easement is designated at the "East McCullough Yard Corridor", it begins at I&O MP-50.2 and terminates at I&O MP-49.6.

Operations in the yard are seven days a week, 24 hours a day. The yard is often full. Engine maintenance is carried out at the yard. Trips on the "Mill Connection" trackage to the Oasis line at the north end of the yard are as follows:

- 1 round trip M/W/F to the NS Sharon Yard in Sharonville
- 1 round trip T/W/Sat. to the CSX Queeensgate Yard
- 1 through train to Detroit
- Various engine movements during all time periods.

There is one tenant located within the yard on the western portion of the site. This is a drywall manufacturing/warehouse operation that utilizes approximately 300 cars per year.

The LRT alignment will cross over the SORTA owned Oasis railroad right-of-way on a new LRT bridge just south of Lester Road.

6.6.1.6 Norwood to Blue Ash and Blue Ash Segments

North of Lester Road the LRT alignment will enter Blue Ash Subdivision Railroad Right-of-way. This railroad right-of-way was also originally developed in the between 1870 and 1890 as the Cincinnati, Lebanon and Northern Railroad. SORTA purchased the railroad right-of-way in 1997. The Indiana & Ohio Railroad continues to have the exclusive right to provide common carrier rail freight operations and freight rail service per an Operating Agreement with SORTA that became effective at the time of SORTA's purchase of the right-of-way.

The LRT alignment will occupy the Blue Ash Subdivision Railroad Right-of-way currently used by the I&O Railroad for freight operations for 6.9 miles from Lester Road, I&O MP-49.6 to north of Glendale-Milford Road I&O MP-42.7. This is a single-track railroad with several spurs to both the left and right side of the tracks. Some of the spurs are not currently used or are not functional.

Currently, there is one train movement per day, five days a week, during daylight hours. Cars are stored on the track periodically. There is no central dispatching of this line since it is a single stub ended track.

The majority of customers are located on the west side of the track, except Meiers Winery, (6955 Plainfield Road), which services one to two cars per year. It is the lowest volume customer on the line. The largest customer is Smurfit-Stone Container Corporation, (9960 Alliance Road). Also at this location is the S. Rosenthal Company, (9933 Alliance Road). Both customers are located off the Blue Ash industrial track, which is a siding along the west side of the track between Cooper and Pfeiffer Roads. There are additional customers to the north of the LRT portion of the alignment.

Running speed along the line is currently limited to 10 miles per hour (mph). With improvements to the tracks, trains could increase to 25 mph. The line would operate with one engine only. Trains could be as little as one car or up to a maximum of 16 cars.

The I&O has indicated that there has been a gradual reduction of the number of customers on the Blue-Ash subdivision but that traffic from the current customers has been stable. Additional customers would be solicited if access was feasible and improvements made. The I&O stated that there are no significant changes anticipated the current number or sizes of trains in the near future.

6.6.2 IMPACTS RELATED TO RAILROAD FACILITIES AND SERVICES

Potential impacts to railroad facilities and services resulting from the build alternative in the individual segments are described as follows. The most significant impacts will result from the joint use of the SORTA owned Blue Ash line right-of-way.

6.6.2.1 Covington Segment

Potential impacts in the Covington segment will primarily occur during construction of the LRT trackway and associated structures. The proposed location of the trackway and 12th Street Station are located adjacent to the active CSX railroad. CSX had indicated that 25 ft. clearance between the centerline of the nearest active track to an intrusion barrier will be required in areas where equipment or personnel from either the LRT or freight operations could encroach on each others right-of-way. This condition is present south of Robbins Street and north of Seventh Street.

The LRT alignment will require the demolition and replacement of the CSX owned 11th Street and Robbins Street bridges.

A new LRT tunnel structure under the existing railroad tracks south of Eighth Street will require construction temporary track realignments and associated structures. These temporary realignments and restorations will require close coordination with CSX during design and construction so that there is minimal disruption to the heavy freight service in this segment. This will also require CSX to grant an easement to SORTA/Transit Authority of Northern Kentucky (TANK) for the LRT tunnel.

The LRT alignment will also require modifications to the existing retaining walls, embankment and overpass structures along the east side of the tracks from Athey Street to Fifth Street. This will require acquisition of CSX right-of-way or the granting of an easement to SORTA/TANK for the construction and operation of the LRT in this area.

Long-term impacts to rail service, including Amtrak, will be insignificant. A significant amount of coordination with CSX will be required during the design and construction of the LRT trackway and its associated infrastructure. A telecommunication fiber optic line located in CSX right-of-way will require relocation in some areas. Design of facilities on CSX right-of-way will be in accordance with design standards set forth by CSX.

6.6.2.2 Ohio River Crossing Segment

There are no impacts to the CSX railroad anticipated in this segment.

6.6.2.3 Cincinnati Riverfront Segment

While there are no current railroad facilities or services in this segment, future commuter, freight or high-speed rail in the vicinity could be impacted by the LRT alignment. As noted in section 6.6.1.3 the Cincinnati Riverfront Transit Center was designed to accommodate potential commuter rail and LRT. The block bounded by Pete Rose Way, Clay Wade Bailey Bridge, Third Street, and Central Avenue has been investigated as the terminus for a potential high speed rail service to Chicago and/or Cleveland. The proposed I-71 Corridor LRT alignment would preserve the clearance from the prior rail spur that served the Crosset Company prior to the construction of Fort Washington Way. Other potential rail alignments would be impacted by the LRT alignment. Furthermore this site has been investigated as a potential future location for LRT storage and turnback tracks.

The Banks LRT station is envisioned to provide a transfer point to any future LRT/Commuter rail located in the Cincinnati Riverfront Transit Center.

6.6.2.4 Avondale to Norwood Segment

While there are no current railroad facilities or services on SORTA owned Blue Ash line, implementation of LRT would preclude future rail freight service from being reintroduced to the segment. LRT would also preclude service to the NS tracks from Victory Parkway to Cleneay Avenue and to the NS Wasson Line between the Berry and Claire rail yards. None of these tracks have been in active service for many years and have been disconnected.

The existing ODOT owned railroad bridge over Victory Parkway would undergo minor rehabilitation to accommodate the LRT alignment. ODOT and SORTA/TANK will have to enter into an operating agreement or transfer ownership of the bridge to SORTA/TANK.

The proposed new LRT bridge spanning over the CSX railroad just south of the Norwood Lateral will not create significant impacts. SORTA/TANK will need to obtain an easement from CSX for construction and operation of the bridge. The bridge will be designed and constructed in accordance with CSX standards for overhead bridges.

Where the proposed I-71 Corridor LRT alignment is located in newly acquired right-of-way adjacent to and east of the Indiana & Ohio Railroad from Norwood Avenue to Highland Avenue there will be temporary impacts due to construction of the trackway. Replacement and/or modification of spurs and construction of new crossings may cause minor, temporary loss of railroad access for the customers served by the spurs. The need for, and nature of, intrusion barriers between the LRT and I&O in this vicinity has not been determined. Switch interlocking and revised hours for rail service to customers would result from LRT implementation.

Similarly, there will be minor temporary impacts due to construction of the retained embankment trackway adjacent to the I&O McCullough Yard. The driveway to Highland Avenue will be relocated. The need for, and nature of intrusion barriers between the LRT and I&O McCullough Yard has not been determined. There will also be minor temporary impacts due to construction of the LRT bridge over the SORTA owned OASIS railroad right of way at the north end of McCullough Yard. No significant impact to yard freight operations or engine maintenance is anticipated.

6.6.2.5 Norwood to Blue Ash and Blue Ash Segments

As discussed previously, the proposed I-71 Corridor LRT alignment will occupy the SORTA owned Blue Ash line right-of-way currently used by the I&O Railroad for freight operations for 6.9 miles from Lester Road, I&O MP-49.6 to north of Glendale-Milford Road I&O MP-42.7. These freight operations may no longer be in service at the time the LRT is implemented. However, in the event that this is an active freight corridor at the time, implementation of LRT would result in significant impacts to the I&O's current freight operations, if those operations are still active at the time of implementation.

The proposed joint use operations would be regulated by the joint *FRA/FTA Policy on Use of the General Railroad System by Light Rail Transit*, (7/10/2000). This policy covers 49 CFR Parts 209 and 211. The proposed joint use of the tracks by the LRT system and the I&O Railroad assumes temporal separation between light rail and conventional railroad freight operations. Specific hours for the respective operations are subject to determination at the time that LRT is implemented. There could be impacts to properties near the joint use tracks due to the revised hours of freight operations.

In addition to Federal, state, and local regulations, joint use is subject to the provisions of the *Joint Operating Agreement* executed between SORTA and I&O on December 30, 1997 (the closing of the purchase of right-of-way by SORTA). The terms of this agreement are anticipated to be reviewed and possibly revised to account for changes to the LRT and/or freight operating strategies This could impact current as well as to adhere with applicable Federal, State and local regulations.

The existing single track will be removed and replaced with two new tracks. The western (southbound) track of the new LRT would be designated for joint use. A turn out located near Lester Road and a right hand joint-use crossover north of Glendale Milford Road will serve to switch freight operations to the eastern, (northbound) LRT track for joint-use to a turnout north of the Pfeiffer Road station. Freight operations will continue north on the existing track while the LRT tracks will diverge west toward Reed Hartman Highway and on to the northern terminus. Other crossovers between tracks would be provided as necessary for LRT operations. Turnouts to serve freight customers would be provided in the designated joint use tracks. The construction of the new tracks including relocation and or removal of the existing tracks will be staged to minimize disruption to existing freight rail service where feasible. Short suspension of rail service to particular customers may be required. Construction staging and related impacts to existing freight rail operations will be determined during final design and construction phases of the project. Freight service to the Blue Ash industrial track, I&O MP-44.0 will be restored. The inactive spur serving Meier's Winery is proposed to be eliminated as is the inactive spur serving the Blue Ash Distribution Center II on Lake Forest Drive I&O MP-42.8.

The existing ODOT owned single track railroad bridge over the Ronald Reagan Highway will be replaced with a new two track bridge designed for joint use.

I&O follows clearance criteria set forth by the American Railway Engineering and Maintenance-of-Way Association (AREMA) and the Ohio Public Utilities Commission of Ohio (PUCO). Clearance from centerline of freight track to the nearest obstruction is 8 ft. There is no Ohio regulation concerning the clearance to a platform. Additional review of platform clearance requirements remains to be completed. The existing sub-standard vertical clearance of 19' 1-1/2" at Kennedy Avenue, I&O MP-48.4, will be maintained for the joint use segments.

Joint use structures are to be designed in accordance with AREMA E-80 Cooper loading and 286 kip cars. Freight or joint use tracks are to be designed in accordance with AREMA standards. The improved track conditions should allow for freight operations up to 25 mph.

At-grade crossings will be eliminated wherever possible. All grade crossings and crossing protection equipment would be replaced and upgraded.

6.7 PEDESTRIAN AND BICYCLIST SYSTEMS

6.7.1 EXISTING CONDITIONS

The pedestrian and bicycle environment in the Cincinnati metropolitan area changes in quality depending on the municipal jurisdiction and the time period of urbanization. In general, older neighborhoods developed before the introduction of automobiles have consistent sidewalks on both sides of the street. Newer suburban areas developed in the later decades of the twentieth century do not provide sidewalks in many areas. However, many of those suburban communities are installing sidewalks incrementally where none previously existed.

6.7.1.1 Covington Segment

Covington has sidewalks in its historic downtown. In many areas the sidewalks are generous in width and have added amenities such as street trees. Particular attention has been given to providing a quality pedestrian environment in the Pike Street area, including brick pavers and marked crosswalks. The railroad corridor running through downtown Covington does constitute a barrier to pedestrian and bicycle movement, but there are sidewalks on bridges passing over the tracks, north of Fifth Street the tracks are carried on an overhead bridge structure which does not inhibit pedestrian or bicycle movement. A regional trail is in preliminary development along Kentucky Route 8 in Covington which would be part of the regional path along the Ohio River through Kenton, Boone and Campbell counties.

6.7.1.2 Ohio River Crossing Segment

The Clay Wade Bailey Bridge is a recommended route for pedestrians and bicyclist to cross the Ohio River from Covington, Kentucky to Cincinnati, Ohio. This bridge provides a single sidewalk approximately four feet wide. There has been some preliminary discussion about providing a wider sidewalk on the bridge to serve pedestrians. The bridge provides access from Fourth Street in Covington to Second and Third Streets in Cincinnati. Also, the "Purple People Bridge", formerly the L&N railroad/roadway bridge, has re-opened as a pedestrian- and bicycle-exclusive facility. It connects the commercial areas at Newport on the Levee with Pete Rose Way in Cincinnati. Southbank Partners owns the bridge and is reserving the rail side of the facility for future use by the "Newport Light Rail spur" off of the I-71 LRT line.

6.7.1.3 Cincinnati Riverfront Segment

The Cincinnati riverfront is dominated by large structures that require good pedestrian access, specifically the football and baseball stadiums. However, the below grade Fort Washington Way (I-71) and the expressway interchanges at either end of the downtown riverfront present pedestrian barriers. Pedestrian access from the central business district to the riverfront is provided by overpass bridges at each of the intersection from Elm to Main Street over Fort Washington Way. Pedestrians and bicyclists can also reach the riverfront at grade via Central Avenue and Broadway. The latter has been relocated to provide a

direct connection to the Taylor Southgate Bridge to Campbell County. The proposed Banks redevelopment project is designed to have full pedestrian access.

On the eastern end of the downtown riverfront the pedestrian and bicycle environment has received careful attention and high-quality facilities exist at Yeatman's Cove Park and Sawyer Point. Additional riverfront promenades and paths are included in the development plans for future recreational facilities on the riverfront. Cincinnati is in the preliminary planning stages for a proposed bike/pedestrian path from the central riverfront east to Lunken Airport.

6.7.1.4 Downtown Cincinnati Segment

The pedestrian environment in downtown Cincinnati is the highest quality to be found in the metropolitan area. Sidewalks are generally wide and in many places constructed of special paving materials. Crosswalks are marked, and in some places special paving materials continue through the drive lanes, and walk signals are provided. Bicycling in downtown is relatively safe due to slower speeds, however there are no designated and marked bicycle lanes. The City of Cincinnati has installed new bicycle lockers and racks throughout the downtown.

6.7.1.5 Over-the-Rhine Segment

The historic streets of the Over-the-Rhine neighborhood are generally favorable to pedestrians. Sidewalks are wide on main streets, with street trees, pedestrian level lighting, and signage provided. Crosswalks are marked. No specific facilities or lanes are provided for bicycles.

6.7.1.6 Mount Auburn Tunnel Segment

A good pedestrian environment is provided in the Mount Auburn neighborhood with wide sidewalks on main thoroughfares. Lighting is generally at the street level for automobile visibility rather than at the pedestrian level. No bicycle lanes are marked.

6.7.1.7 Uptown Segment

The pedestrian environment in the Uptown area is good, with sidewalks set back from Jefferson Avenue, greenspace between the curb and walk and maturing street trees. Sidewalks on some blocks of Vine Street complement the small storefronts with plenty of walking space and mid-block and intersection bump-outs. MLK Drive and University Avenue are signed as bicycle routes. In the medical complex area north of MLK Drive there are bicycle lanes striped on Goodman and Nixon Streets. The University of Cincinnati has embarked on a significant capital program to enhance the pedestrian environment of its campus areas.

6.7.1.8 Avondale to Norwood Segment

Sidewalks are provided in the Avondale and Evanston neighborhoods. Victory Parkway is signed as a bicycle route. There is a significant amount of pedestrian traffic in the vicinity of Xavier University. The former railroad right of way in the segment is not currently a significant barrier to pedestrian or bicycle traffic.

Sidewalks and marked crosswalks are provided in the vicinity of the LRT alignment in the City of Norwood. No bicycle lanes or paths were identified. Most sidewalks are in good to fair condition.

6.7.1.9 Norwood to Blue Ash Segment

Sidewalks are provided in the Pleasant Ridge and Kennedy Heights neighborhoods of Cincinnati. Pedestrian and bicycle facilities are lacking in the large shopping area in Columbia Township at Ridge Avenue. Narrow sidewalks are found in the City of Silverton. The City of Deer Park also has sidewalks. Sycamore Township does not have sidewalks or bicycle facilities. The City of Blue Ash provides sidewalks along major thoroughfares, however these are sometimes limited to one side of the road.

6.7.2 IMPACTS

6.7.2.1 No-Build Alternative

The No-Build Alternative would have no positive or negative impact on pedestrian or bicyclist systems in the Study Area.

6.7.2.2 TSM Alternative

The TSM Alternative would have no positive or negative impact on pedestrian or bicyclist systems in the Study Area.

6.7.2.3 Build (LRT) Alternatives

Impacts to the pedestrian and bicyclist systems from the Build Alternatives would be low under any of the four Build Alternatives. There are no substantial differences in impact to pedestrian or bicyclist systems among these four alternatives.

Build Alternative 1

Along most of its length, the LRT tracks would be in a current railroad right-of-way, along which permissible crossings have already been established in conjunction with the street system. In that portion of the project, there would be no change to the locations of pedestrian or bicyclist crossings and, hence, to change in mobility. The segments in which there would be some change in pedestrian or bicyclist habits are described below.

In the Covington segment, the LRT tracks and stations would be at-grade but would not create any interruptions to the to the pedestrian or bicyclist systems, which are entirely along streets. Pedestrians and bicyclists would be able to cross the LRT tracks at any street crossing.

In the Ohio River segment, the LRT tracks would be elevated and would not create any interruptions to the pedestrian or bicyclist systems.

In the Riverfront segment, not including the ramps to and from the Ohio River LRT Bridge, the tracks would be located at-grade along Second and Third Streets, where crossings would be possible anywhere except the stations.

In the Downtown Cincinnati and the Over-the-Rhine segments, pedestrians and bicyclists would be able to cross the at-grade tracks at any location except the stations.

In part of the Mount Auburn segment, the route would be underground, presenting no barrier except at the ramps into and out of the tunnels.

In the Uptown segment, there may be some fences along portions of the tracks, limiting pedestrian and bicyclist crossings to automobile crossing points.

Build Alternatives 2, 3 and 4

Under Build Alternative 2, 3 and 4, there would be no substantial differences in impact to the pedestrian and bicyclist systems from Build Alternative 1.

6.7.3 POTENTIAL MITIGATION MEASURES

Enhanced pedestrian and bicyclist systems would be very helpful to the success of the LRT system, as recommended in *Guidelines for Station Neighborhood Development* (OKI *et. al*., September 2000) (See Appendices 6-2). Thus, cities will be urged to improve pedestrian and bicyclist connections to the LRT stations and across the tracks. Factors that would encourage walking and bicycling include safety, reasonable distance and pleasant surroundings. Those objectives could be achieved by continuous sidewalks, bicycle lanes, demarcated crossings, directional signs, bicycle parking, lighting and shade throughout the neighborhoods near the stations and out five miles or more for bicyclists. The SORTA/TANK and OKI would coordinate with the cities and bike-pedestrian advocacy groups to promote system improvements.

6.8 UTILITIES

This section provides general information on existing utilities and identifies potential impacts that may result from the LRT alignment. Only major utility companies that service the proposed I-71 Corridor from the LRT study area were contacted. The intent of this section is not to identify every utility providing service in the study area but to address those that could be significantly impacted by the LRT alignment.

6.8.1 EXISTING UTILITIES

The location and general distribution of existing major utilities within the I-71 Corridor are described below.

6.8.1.1 Existing Water Service

Covington Segment

The Northern Kentucky Water District provides water and owns and maintains distribution and storage facilities service in the Covington segment of the study area. The water mains cross the LRT alignment numerous times between Eighth Street and the Ohio River. These watermains range in size from 4- to 20-inches in diameter.

Ohio River Crossing Segment to Blue Ash Segment

Cincinnati Water Works provides water service in the study area throughout the Ohio River Crossing Segment to the Blue Ash Segment. It also owns and maintains water distribution and storage facilities

along the LRT alignment except in the City of Norwood. Water mains cross the LRT alignment at most intersections and also run longitudinally along the LRT alignment. The water mains range in size from 4- to 48-inches.

6.8.1.2 Existing Sanitary Sewer Service

Covington Segment

Sanitation District Number 1, owns and maintains sanitary, storm, and combined storm/sanitary sewers and treatment facilities in Kenton County, Kentucky.

Ohio River Crossing Segment to Blue Ash Segment

The Metropolitan Sewer District of Greater Cincinnati (MSD) operates and maintains sanitary and combined sewers and treatment facilities in Hamilton County, Ohio. Individual municipalities in Hamilton County, Ohio are responsible for maintenance of storm sewers. The Hamilton County Storm Sewer Authority is responsible for storm sewers in unincorporated areas.

6.8.1.3 Existing Long Distance Telephone Lines

Covington Segment to Cincinnati Riverfront Segment

Subsurface core cables are located west of the existing CSX railroad tracks. The LRT alignment crosses the cable in the vicinity of 10th Street.

Covington Segment to Blue Ash Segment

Cincinnati Bell's telephone lines are located primarily overhead, except in downtown Cincinnati (Ohio River Crossing Segment to Downtown Cincinnati Segment) where they are located underground. Depth varies from 18-inches to 4-feet. Cable and communication companies also utilize Cincinnati Bell's conduit system.

All of AT&T long distance transmission lines or core cables are located underground near the LRT alignment. The majority is within Cincinnati Bell's conduit system. AT&T core cables cross or are adjacent to the LRT alignment from the Cincinnati Riverfront Segment to the Blue Ash Segment.

MCI Worldcom has subsurface cables in Third Street, Main Street, Walnut Street, as well as some intersecting streets in the southern portion of downtown Cincinnati.

6.8.1.4 Existing Electric and Gas Lines

Cinergy Corp. provides electrical service throughout the corridor. Electric transmission lines along the LRT alignment are typically overhead, except within the Ohio River Crossing, Cincinnati Riverfront, and Downtown Cincinnati segments. Substations are located at the following intersections:

- Jefferson Avenue and MLK Drive, Uptown Segment
- Shields Street and Vine Street, Uptown Segment
- Red Bank Road and Standish Avenue, Norwood to Blue Ash Segment

- Galbraith Road and Blue Ash Road, Norwood to Blue Ash Segment

Several high voltage transmission lines cross the LRT alignment in Hamilton County, Ohio. No major crossings occur in Kentucky.

Several subsurface Cinergy gas transmission lines are located in public street right-of-ways along the LRT alignment. Gas lines range from 4- to 24-inches in diameter.

6.8.1.5 Existing Pipelines

No hazardous liquid or petroleum pipelines are known to exist within the study area.

6.8.1.6 Additional Existing Utilities

Covington Segment

All cable television lines within the study area are overhead and poles contain both trunk and feeder cables. Only two cross the LRT alignment.

Ohio River Crossing Segment to Blue Ash Segment

All cable lines follow Cinergy and Cincinnati Bell overhead poles and underground duct. From the Ohio River to approximately 13th Street, cable lines are underground. The majority of lines north of 13th Street are overhead.

Cincinnati Riverfront Segment to Downtown Cincinnati Segment

Trigen Cinergy Solutions, a subsidiary of Cinergy owns and provides steam and chilled water to downtown Cincinnati. Underground lines exist in portions of Main Street and Walnut Street between Third Street and Seventh Street.

Uptown Segment

A private 12-foot diameter subsurface utility tunnel, servicing the University of Cincinnati, crosses the LRT alignment under Jefferson Avenue. This tunnel contains major electric, steam, gas, chilled water, and telecommunication lines servicing the west campus of the University of Cincinnati. The University of Cincinnati as well as several private healthcare organizations own and maintain a variety of utilities in the University area that are located on or adjacent to the LRT alignment. A detailed inventory of these facilities is not currently available.

6.8.2 UTILITY IMPACTS

The following paragraphs describe the utility impacts by alternative.

6.8.2.1 No-Build Alternative

Under the No-Build Alternative four proposed roadway projects would be constructed. They include the addition of two lanes on I-71 between I-275 and State Route 48 (one lane in each direction); the reconstruction/realignment of Fort Washington Way, the addition of one southbound lane on I-71/75

between Dixie Highway and Kyles Lane; and the addition of one eastbound lane on Montgomery Road between Kenwood Road and I-71 and one travel lane in each direction from I-71 to Hosbrook Road.

Three of the four proposed roadway projects are outside the search area of the existing major utilities investigated in Section 6.8.1. Therefore, without expanding the search, it is unknown if the existing major utilities near these three proposed roadway projects have the potential to be impacted. The reconstruction/realignment of Fort Washington Way was included in the search area and a description of any potential impacts is described below in the Build Alternatives section.

6.8.2.2 TSM Alternative

Under the TSM Alternative four proposed transit centers would be constructed. They include the Peebles Corner Transit Center, in the vicinity of Gilbert Avenue and McMillian Street; the Kenwood Transit Center, in the vicinity of Kenwood Road and I-71; the Fields Transit Center, on Ertel Road and I-71; and the Reading Transit Center, located in the vicinity of US 42 and Galbraith Road.

6.8.2.3 Build (LRT) Alternatives

The potential impact to utility lines depends on the nature of the LRT alignment and whether it tunnels or bridges at the utility intersection. In general underground utilities located beneath the LRT alignment will be relocated. Manholes, valves, vaults, etc. located beneath the LRT alignment will generally be relocated or access restricted. All overhead or subsurface utility crossings will be relocated where physical conflicts occur. In addition, construction of station facilities, traction power systems, as well as civil construction (roads, sidewalks, walls, traffic signals, etc.) will have site-specific impacts. Major potential utility impacts are identified below.

Potential Impacts to Water Service along the LRT Alignment

Covington Segment
It is anticipated that the LRT alignment will have minimal impact to water mains in the Covington Segment.

Ohio River Crossing Segment to Blue Ash Segment
The LRT alignment has the potential to significantly impact a 48-inch subsurface water main that runs within Burnet Avenue in the Uptown Segment. This line may need to be relocated because the LRT alignment goes below the ground surface at this location. Water mains run longitudinally adjacent to or under the LRT alignment in Third Street, Main Street, Walnut Street, Jefferson Avenue and Erkenbrecher Avenue. Additional relocations will be needed near the University of Cincinnati at all intersections affected by the construction of two proposed tunnels including a 24-inch water main located at the intersection of MLK Drive and Jefferson Avenue.

Potential Impacts to Sewer Service along the LRT Alignment

The LRT alignment may impact existing sanitary sewer facilities during construction of a proposed tunnel near 10th Street in the Covington segment and two proposed tunnels near the University of Cincinnati.

Storm sewers will be impacted throughout the LRT alignment during street reconstruction. Catch basins and manholes may have to be adjusted or relocated. Drainage from proposed bridge and tunnel structures, station platforms and parking facilities will be introduced to existing storm sewer systems. Some parking associated with the proposed stations will require stormwater detention basins or structures.

Potential Impacts to Long Distance Transmission Lines along the LRT Alignment

Covington Segment to Cincinnati Riverfront Segment
The LRT alignment may impact Sprint underground long distance communication cable in Covington. The underground cable in the vicinity of 10th Street may need to be temporarily relocated to Eighth Street during construction of a tunnel under the CSX Railroad.

Covington Segment to Blue Ash Segment
The LRT alignment may have minimal impacts on Cincinnati Bell transmission lines. Since Cincinnati Bell's conduit system is utilized by other utility companies, some potential impacts may already be identified.

The LRT alignment will not conflict with underground AT&T core cables. Manholes may need to be relocated or restricted at the following locations:

- Third Street between Central Avenue and Plum Street in the Cincinnati Riverfront segment
- Walnut Street between Court Street and Twelfth Street in the Downtown Cincinnati and the Over-the-Rhine segments
- The intersection of Seventh Street and Walnut Street in the Downtown Cincinnati segment
- The intersection of Seventh Street and Main Street in the Downtown Cincinnati segment
- The intersection of Twelfth Street and Main Street in the Over-the-Rhine segment
- The Montgomery Road intersection in the Norwood to Blue Ash segment

AT&T core cables run parallel to the LRT alignment between Deer Park Avenue in the Norwood to Blue Ash segment and Copper Road in the Blue Ash segment. AT&T core cables will not be impacted because they run in Blue Ash Road right-of-way and the LRT alignment runs in the railroad right-of-way.

Potential Impacts to Electric and Gas Lines along the LRT Alignment

The LRT alignment may impact the following facilities:

- The electrical substation located at the northeast intersection of Vine Street and Shield Street in the Uptown segment
- Electrical connections from the northwest to the substation located at the intersection of Red Bank Road and Standish Road in the Norwood to Blue Ash segment
- Cinergy's Deer Park electrical substation at the northwest corner of Galbraith Road and Blue Ash Road in the Norwood to Blue Ash segment
- Electrical connections to the substation at the intersection of Jefferson Avenue and MLK Drive in the Uptown segment.

Cinergy's electric transmission lines near Woodburn Avenue and Idlewild Avenue in the Avondale/Evanston Segment may need to be relocated due to a possible electromagnetic interference (EMI) problem.

The LRT alignment may impact Cinergy overhead electric high voltage lines near Norwood Lateral in the City of Norwood Segment. An EMI problem may exist with the Overhead Contact System (OCS) proximity to overhead transmission lines and Cinergy's lines may need to be relocated.

No significant impacts on gas transmission lines and valve houses have been identified so far.

Potential Impacts to Pipelines along the LRT Alignment

No hazardous liquid or petroleum pipelines are known to exist within the LRT alignment.

Additional Utility Impacts along the LRT Alignment

Covington Segment to Blue Ash Segment
The LRT alignment should not significantly impact cable television lines

Cincinnati Riverfront Segment to Downtown Cincinnati Segment
The LRT alignment should not significantly impact Trigen Cinergy Solutions' steam and chilled water lines.

Uptown Segment
The LRT alignment may impact a private 12-foot diameter subsurface utility tunnel that services the University of Cincinnati. The utility tunnel will need to be relocated due to a sub-surface LRT alignment in this area. There will be significant impacts to a variety of utilities in the portion of the LRT alignment that serves the University of Cincinnati and adjacent health care organizations.

6.9 EFFECTS DUE TO CONSTRUCTION

In the construction phase of the Build Alternative, constructing tracks, stations, structures, maintenance facility and other facilities would result in the generation of various construction-related effects. These construction effects are described as follows.

6.9.1 CONSTRUCTION NOISE

Construction noise varies greatly depending on the construction activity being performed and its proximity to the noise receptor. This variance is due to numerous factors including the process being implemented and the type and condition of the equipment used. Generally, construction noise levels are governed by the noisiest piece of equipment. The engine, usually diesel, is the dominant source of noise. The level of noise produced increases with engine speed or by defective or inadequate muffling.

There are a few instances where the actual construction process generates noise. These include the use of impact type tools and equipment for activities such as pile driving, boring, pavement breaking, pavement milling, and structural bolting.

In summary, construction noise at a given construction location depends on the magnitude of noise being generated during each construction phase, the duration of the noise, and the distance from the construction activities.

6.9.2 CONSTRUCTION VIBRATION

The most significant vibration-generating construction activities are blasting and pile driving. The use of blasting is not currently foreseen but is not precluded for the LRT alternative. Pile driving is envisioned to be used selectively for the project.

Other construction activities that could generate potentially intrusive vibration on the project include:

- Tracked vehicles (such as bulldozers and roadheaders)
- Jackhammers
- Vibratory compactors

6.9.3 ACCESS AND DISTRIBUTION OF TRAFFIC

Criteria and plans for construction access and for maintenance of pedestrian and automotive traffic will be prepared during future phases of the project. Such criteria and plans are expected to conform to applicable local, state and federal requirements and include appropriate site-specific provisions.

6.9.4 EXCAVATION, FILL MATERIAL, DEBRIS AND SPOIL

Construction of the LRT alternative would require demolition, clearing, grading, excavation, and tunneling activities and provision of fill materials. All of these activities will result in the generation of debris and spoil. It is anticipated that much of the spoil generated from grading, excavation, and tunneling activities would be used as fill material at various sites along the alignment, including station areas and the yard and shop facility, to bring the existing grades to the proposed final grades. The fill material obtained from these site sources may not fulfill the total project fill material requirement. Additional fill material would have to be obtained from off-site sources.

Debris and excess spoil material generated during the construction of the LRT project would be disposed of off-site. The disposal of unsuitable or excess material, trash, debris and spoil would be governed by local and/or state regulations concerning disposal of such items.

The hauling of material to be disposed off-site would be performed in accordance with all applicable local and/or state permitting requirements. It is the intent that the short-term construction impacts to neighborhoods from excavations, fill materials, debris and spoil would be minimal. The project site and any disposal areas would be left clean upon completion of the LRT project.

6.9.5 CONSTRUCTION STAGING AREAS

The construction schedule for the LRT project has not been finalized. However, it is recognized that several staging areas would be required for storage of equipment and materials used for construction. Items such as running rail, special trackwork and other long-lead procurement items as well as bridge and tunnel construction access areas would fall into this requirement. Preliminary staging areas for construction of the Mount Auburn tunnel have been identified and indicated in the DEIS Plan Set. Construction of the Ohio River Bridge may require staging of barges for erection equipment, providing access to river pier construction as well as storage for structural steel and other items. Barge staging on the Ohio River will be coordinated with the US Coast Guard. These areas will require further review and areas at other sites will need to be identified prior to the construction phase of the project or identified by construction contractors and approved prior to the start of construction.

Stormwater pollution prevention plans will be developed for construction areas in accordance with ODOT/ Kentucky Transportation Cabinet (KYTC) and local regulations to minimize the potential for stormwater runoff during construction.

6.10 ENVIRONMENTAL JUSTICE

This section explains how Environmental Justice concerns have been addressed in the evaluation of alternatives for the I-71 Corridor LRT facility. This section also identifies how areas protected under the Environmental Justice Executive Order 12898 were defined and the extent to which areas of low-income, minority, and transit dependent populations would be affected by the alternatives under evaluation. The issues discussed in this section pertain to the transportation factors analyzed in Chapter 6. These include effects related to neighborhood traffic associated with stations and access to transit. Additional analysis regarding social, environmental, and economic issues can be found in Chapters 3, 4, and 5.

The legal and regulatory requirements of Environmental Justice and the definitions of minority and low income populations, summarized below, were provided in Section 3.9.

6.10.1 LEGAL AND REGULATORY REQUIREMENTS

Presidential Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* (February 11, 1994) requires that federal agencies consider and address disproportionate adverse environmental effects of proposed federal projects on minority and low income communities.

The intent of the Department of Transportation Final Order on Environmental Justice [DOT Order 5610.2, *Environmental Justice*, (April 15, 1997)] is to integrate the goals of Executive Order 12898 into DOT operations.

In February 2000, the Ohio Environmental Justice Task Force was formed to address Environmental Justice issues in transportation projects throughout Ohio. The Task Force produced *Guidance and Best Practice for Incorporating Environmental Justice into Ohio Transportation Planning and Environmental Processes*, draft version, dated May 30, 2000, with addenda added September 2000.

In addition to the federal actions to address Environmental Justice in minority populations and low-income populations, the May 30, 2000, draft guidance states that it may be prudent to include handicapped, elderly, and households without vehicles to the same level of analysis as low income and minority populations. Therefore, to satisfy the draft guidance, this section will also address the potential effects on populations with mobility limitations, elderly populations, and concentrations of households without vehicles, and potential mitigation measures. To meet both the requirements of National Environmental Policy Act (NEPA) and Executive Order 12898, this section addresses the characteristics of the affected communities, potential effects on minority and low-income populations, and potential mitigation measures.

6.10.2 COMMUNITY CHARACTERISTICS

Ethnic composition and income characteristics within the impact assessment area have been identified in accordance with definitions established by U.S. Department of Transportation (USDOT) and the U.S. Environmental Protection Agency (EPA) guidance on Environmental Justice. Populations with mobility limitations, elderly populations, and concentrations of households without vehicles within the impact assessment area have also been identified in accordance with the G*uidance and Best Practice for Incorporating Environmental Justice into Ohio Transportation Planning and Environmental Processes*,

draft version, dated May 30, 2000. The community characteristics were previously described in Chapter 3, Section 3.9.2.

6.10.3 ENVIRONMENTAL JUSTICE ANALYSIS FOR TRANSPORTATION FACTORS

6.10.3.1 No-Build Alternative

The No-Build Alternative would result in negative impacts to roadway and intersection LOS in minority, low income, elderly, mobility limitation and no vehicle populations. Benefits offered by the Build Alternative, such as improved mobility, affordable transportation and potential redevelopment opportunities, would also not be provided with the No-Build Alternative. The No-Build would cause disproportionate impacts in terms of benefits foregone.

6.10.3.2 TSM Alternative

Benefits offered by the Build Alternative, such as affordable transportation, increased transportation choices and potential redevelopment opportunities, would also not be provided with the TSM Alternative. The TSM Alternative would cause disproportionate impacts in terms of benefits forgone.

6.10.3.3 Build (LRT) Alternatives

In general, potential traffic impacts would occur in the Covington, University of Cincinnati, Norwood to Blue Ash and Blue Ash segments. Although protected populations would be adversely effected by potential traffic impacts, significant traffic impacts would also be incurred by non-protected populations, especially in the Norwood to Blue Ash and Blue Ash segments. Therefore, potential traffic impacts would not be disproportionately borne by protected populations. Potential traffic impacts to both protected populations and non-protected populations are identified below by segment.

Covington

The Covington segment has high concentrations of minority, low income, elderly, mobility limitation, and no vehicle populations. Potential traffic impacts were identified on the roadway operations in the Covington area for alignment Alternatives 1 and 3. These alternatives, which operate at-grade, may be infeasible depending on the actual growth in traffic on Fourth Street. The grade-separated alternatives (Alternatives 2 and 4) at this location would have minimal traffic impacts.

In addition, the intersection of Pike and Russell Streets is expected to operate at a LOS F during the PM peak hour in all of the forecasted analyses (2020 No-build, TSM, and Build alternatives). The addition of a right-turn lane at the south approach of this intersection is a potential mitigation measure to minimize the impact of the LRT alignment, in addition to the forecasted future growth in traffic. No significant impacts are expected from the park & ride facility located at 12th Street and Russell Street.

Uptown

The Uptown segment has high concentrations of minority, low income, elderly, and no vehicle populations; and to a lesser extent, mobility limitation populations. In the existing conditions of Alternatives 1 and 2, the intersection of Vine Street, West Nixon Street, and Ruth Lyons Way is currently operating at a LOS F in the PM peak hour. Multiple intersections in the University of Cincinnati area are

expected to operate below the acceptable LOS for all of the forecasted conditions analyzed in the AM peak hour. These intersections include:

- Vine Street, West Nixon Street, and Ruth Lyons Way (LOS F)
- Erkenbrecher Avenue and Vine Street (LOS F)
- MLK Drive and Reading Road (LOS E)

In the future conditions of Alternatives 3 and 4, the intersection of Vine Street, West Nixon Street, and Ruth Lyons Way is the only intersection in the University of Cincinnati area that is expected to operate below the acceptable LOS in the PM peak hour. This intersection is expected to operate at LOS F for all of the forecasted conditions analyzed for the PM peak hour. For Alternatives 1 and 2, if traffic signal solutions do not minimize the impacts of the LRVs, then grade separation may be needed on MLK Drive and Nixon Avenue. Potential mitigation measures were recommended, including adding and or extending the turn-lane storage bays, adding left-turn lanes, and revising the intersection geometries.

All alternatives in the University of Cincinnati have impacts to the traffic operations, including the no-build, TSM, and all four-build alternatives. Distinguishing the highest impact to this segment by alternative should be further investigated.

Norwood to Blue Ash

The Norwood to Blue Ash segment has high concentrations of elderly and mobility limitation populations and a concentration of minority populations between the stations of Ridge and Silverton. To a much lesser extent, low income and no vehicles populations are sparsely located throughout this segment.

The segment from the City of Norwood to the City of Blue Ash is expected to have considerable impacts to the roadway operations. Currently, the only intersection operating below the acceptable LOS is Ridge Avenue and Highland Avenue, which operates at LOS F. Both the north and south approaches to this intersection are expected to operate at LOS F. For the future analysis conditions, the roadway segment of Highland Avenue between Linden Avenue and Beech Street is expected to operate at LOS E. (No difference in the roadway segment is expected between the future No-build, TSM, or the four-build alternatives.) Additional travel lanes, providing a median, or the addition of left-turn bays can be expected to improve the operating LOS for this roadway segment.

For the forecasted intersection analysis, the intersection of Blue Ash Road and Kugler Mill is expected to operate at LOS F for the four build alternatives in the PM peak hour, in addition to Ridge Avenue and Highland Avenue that operates at LOS F. The addition of right turn lanes on the north and south approaches of the Ridge Avenue and Highland Avenue are potential mitigation measures that should minimize the impacts of the build alternatives to the roadway operations. (The forecasted no-build and TSM alternatives for the intersection of Blue Ash Road and Kugler Mill Road are expected to operate at a LOS D, although the north approach through lane is expected to operate at a LOS F.)

Three park & ride facilities are proposed within this segment: Ridge Station, Silverton Station, and Galbraith Road Station. These stations result in an additional 1,409 parking spaces and an estimated 4,974 daily trips generated by the stations. The Ridge Station and Galbraith Station are both expected to account for over 10 percent of the traffic on adjacent roadways during the PM peak hour. Due to these new trips, delay is expected to increase at the Ridge Avenue/Highland Avenue signal and the Blue Ash Road/Kugler Mill Road signal.

Blue Ash

One census block group identified minority and low income populations in the Blue Ash segment. A few census block groups also identified elderly and mobility limitation populations. Populations without vehicles were not identified in this segment. The majority of this segment contains non-protected populations.

Blue Ash is expected to have significant impacts to the roadway operations, due to the high amount of forecasted employment and population growth, in addition to the LRT system. As noted before, the following intersections are currently operating below the acceptable LOS:

AM Peak Hour

- Reed Hartman Highway and Kemper Road (LOS F)
- Pfeiffer Road and Kenwood Road (LOS E)

PM Peak Hour

- Reed Hartman Highway and Kemper Road (LOS E)
- Reed Hartman Highway and Cornell Road (LOS F)

No roadway segments are expected to operate below the acceptable LOS standard for any of the alternatives analyzed through this DEIS. Forecasted growth in this suburb is expected to have considerable impacts to the future roadway operations, specifically the signalized intersections. In fact, nearly every intersection that was analyzed in the Blue Ash area is expected to operate at LOS F for all of the alternatives analyzed. These intersections include:

AM and PM Peak Hours

- Reed Hartman Highway and Kemper Road (LOS F)
- Reed Hartman Highway and Cornell Park (LOS F)
- Reed Hartman Highway and Cornell Road (LOS F)
- Reed Hartman Highway and Creek Road (LOS F)
- Reed Hartman Highway and Pfeiffer Road (LOS F)
- Pfeiffer Road and Kenwood Road (LOS F)
- Kenwood Road and Cooper Road (LOS F)

PM Peak Hour Only

- Reed Hartman Highway and West Lake Forest Drive (LOS F)
- Pfeiffer Road and East Lake Forest Drive (LOS F)

The following mitigation measures were proposed to minimize the impacts to these intersections:

- Reed Hartman Highway / Kemper Road
  - Additional through lane on Reed Hartman Highway

  - Extend the north approach left-turn storage bay
  - Add a left turn lane and right turn lane for the east approach
- Reed Hartman Highway / Cornell Road
  - Additional south approach left-turn lane
  - Extend the west approach left turn storage bay
- Reed Hartman Highway / Creek Road
  - Additional south approach left turn lane
- Reed Hartman Highway / Pfeiffer Road
  - Additional south approach and west approach left turn lanes
- Reed Hartman Highway / West Lake Forest Drive
  - Extend the west approach left-turn lane storage bay
- Pfeiffer Road / Kenwood Road
  - Additional through lane on Kenwood Road
  - Additional north and south approach left turn lanes

The majority of the intersections in the Blue Ash area are expected to operate below the accepted standard of LOS D. These intersections are forecasted to operate at these levels in all of the alternatives analyzed, including the no-build, TSM, and four-build alternatives. The actual impact of the light rail system is not accurately weighed in this analysis because there is no measurable difference between the alternatives.

6.10.4 SUMMARY AND POTENTIAL MITIGATION

Benefits and adverse impacts of the Build Alternatives to minority, low income, elderly, mobility limitation, and no vehicle populations are due to the significant number of these communities located in the project corridor. Although protected populations would be positively and negatively affected, the impacts to these populations are representative of the populations within and adjacent to the project corridor.

All negative impacts identified in this document would be mitigated, if possible, to avoid adverse impacts to all neighborhoods, with special concern and emphasis with regard to minority, low income, elderly, mobility limitation, and no vehicle populations. The active involvement of all neighborhoods in the corridor would continue to be a goal through design and implementation. Public engagement for all communities in the corridor will continue through the length of the project and is explained in detail in Chapter 8.