



FEASIBILITY STUDY SEGMENT II-III RELOCATED SR 32

EASTERN CORRIDOR
MULTI-MODAL PROJECTS
HAM/CLE-32F-2.50/0.00
PID 86462



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EXECUTIVE SUMMARY

Eastern Corridor Background

The Eastern Corridor program of highway, transit and local network improvements addresses short- and long-term travel needs between the City of Cincinnati in Hamilton County and western Clermont County, Ohio. A tiered approach is being followed to assess consequences to the natural and social environment as required under the National Environmental Policy Act (NEPA). An Eastern Corridor Tier 1 Final Environmental Impact Statement (EIS) was approved by FHWA on September 30, 2005 (FHWA-OH-EIS-04-02-F) and a Tier 1 Record of Decision (ROD) was issued on June 2, 2006. The Eastern Corridor Tier 1 ROD identified a multi-modal plan for improving mobility in the Eastern Corridor region, and established logical termini for major transportation investments to be further evaluated in Tier 2, including new highway and rail transit.

Segment II-III Development Process

Segment II-III, one of several new highway capacity projects carried forward from the Tier 1 ROD, involves developing a controlled-access, relocated SR 32 highway from US 50 in Hamilton County to the I-275/SR 32 interchange in Clermont County, including a multi-modal crossing of the Little Miami River and close coordination with Oasis Rail Transit and other multi-modal components of the Eastern Corridor. In Tier 2, Segment II-III is following ODOT's new five-path Project Development Process (PDP). Tier 1 for Segment II-III covered the Planning Phase of the new PDP and identified 21 preliminary alternative corridors for a relocated SR 32 between US 50 and SR 32/I-275. Tier 2 for Segment II-III will move forward with the Preliminary Engineering Phase of the new PDP, including this Feasibility Study that evaluates the 21 preliminary alternatives carried over from Tier 1 and identifies a refined set of alternative corridors to be advanced for further study. Following the Segment II-III Feasibility Study, further studies will be performed on the refined set of alternatives, and an Alternatives Evaluation Report will be completed that identifies a preliminary Preferred Alternative.

Purpose and Need

Key transportation needs in the Eastern Corridor documented in the Tier 1 EIS include: 1) existing network deficiencies affecting transportation capacity, safety, and accessibility, 2) limited available modal options, 3) inadequate regional linkage and mobility, and 4) anticipated continued inadequacies in the existing transportation network due to future growth. The purpose of the Eastern Corridor project as a whole is to implement a multi-modal transportation improvement plan that increases capacity, reduces congestion and delay, improves safety, provides transportation options, and connects the region's key transportation corridors and social and economic centers for the efficient movement of people, goods and services. The specific goal of Segment II-III in support of the overall purpose and need for the Eastern Corridor is to establish relocated SR 32 as a controlled-access facility west of I-275, coordinated with new rail transit that provides a transportation alternative to driving. Existing SR 32 experiences high commuter, truck, and residential traffic, and improvements are needed due to poor levels-of-service and high crash rates.

Environmental Setting

Segment II-III of the Eastern Corridor contains a rich mix of man-made and natural resources. Variable topography, high quality streams that include the Little Miami National and State Scenic River, historic properties, archaeological resources including Native American sites and known burials, floodplain and aquifers, threatened and endangered species habitat, and developed communities all contribute to the aesthetic and environmentally important context of this part of the Cincinnati metropolitan area. The Tier 1 work established a context-sensitive framework for the Eastern Corridor by incorporating recommendations of a community-based land use vision and green infrastructure master plan into the project development process.

Additionally, resource agency coordination conducted in Tier 1 resulted in a project commitment to clear-span the Little Miami River in order to minimize impacts to this important resource. Consistent with commitments made in the Tier 1 EIS, Segment II-III is continuing with the development of an environmental stewardship plan that focuses on sensitive features and community needs and meets the requirements for resource protection and consideration of public input under NEPA.

Alternatives Evaluation

The Segment II-III preliminary alternatives evaluated in this Feasibility Study are broad corridors (400 to 600 feet wide) carried over from Tier 1 and based on preliminary engineering sufficient to establish approximate footprint area. For this comparative evaluation, the Segment II-III study area was divided into five subareas defined by land use, multi-modal connectivity, anticipated typical section requirements, and/or corridor footprint opportunities and constraints.

Subareas, preliminary alternatives, and environmental and community resources within the Segment II-III study area are presented in Appendix J in an interactive pdf format. Alternative corridors recommended for advancement are presented on Figure 17. Key considerations and an evaluation summary for each of these subareas and follows:

US 50/Red Bank Road Subarea (west project terminus)

This subarea, centered on the existing US 50/Red Bank Road interchange west of the Little Miami River, occurs in a heavily-developed portion of Cincinnati, Fairfax and Mariemont where US 50, Red Bank Road and existing rail freight lines converge. Key considerations in the evaluation of alternatives included: 1) tie-in with adjacent Eastern Corridor Segment I alternatives, 2) potential residential and commercial displacements, 3) interchange configuration, traffic flow, levels-of-service, and local road network compatibility, and 4) accommodation of proposed rail transit, a multi-modal transit station, and existing rail freight.

Three alternative configurations for the new US 50/Red Bank Road interchange were evaluated in this subarea. All three alternatives (Alternatives B1, B2 and B3) are being advanced as one combined preliminary alternative corridor in which an interchange configuration will be further developed in conjunction with Eastern Corridor Segment I alternatives development, a river crossing location and multi-modal transit station planning.

River Crossing Subarea

This subarea is centered on the Little Miami River channel and is mostly undeveloped due to limitations posed by the broad floodway/floodplain. A large landfill occurs west of the river and large tracts of woodland and agricultural land with sensitive archaeological resources associated with the NRHP-listed Hahn Archaeological District occur east of the river. Key considerations in the evaluation of alternatives included: 1) multi-modal clear-span crossing of the Little Miami River, 2) encroachment on floodway/floodplain and associated ecological resources, 3) sensitive archaeological resources including Native American sites and known burials, 4) the Hafner Landfill, 5) potential construction cost issues, and 6) connectivity with adjacent River Plains Subarea alternatives, as well as coordination with the Oasis Rail Transit component of the Eastern Corridor.

Four alternative river crossing locations were evaluated in this subarea. Alternatives D, E and F were eliminated from further consideration due to critical cost and design issues associated with a clear-span river crossing in reaches of the Little Miami River identified as unstable based on recent geomorphological studies, as well as extensive floodway crossings. Alternative C is recommended to be modified and advanced for further study as an expanded corridor (Alternative C1) to allow greater flexibility in alignment development relative to coordination with Oasis Rail Transit, as well as avoidance/minimization of impacts to the Hahn Archaeological District should significant resources be identified as further archeological studies are conducted.

River Plains Subarea

This subarea is located in Little Miami River floodplain/floodway and is primarily in agricultural land use and undeveloped outside of Newtown and the community of Shademoor. It is generally bisected by Clear Creek, a tributary to the Little Miami River, and contains sensitive archaeological resources associated with the NRHP-listed Hahn and Perin Village Archaeological Districts, as well as several public parks and recreational features (Section 4f and Section 6f resources). Key considerations in the evaluation of alternatives included: 1) high-sensitivity archaeology areas (Native American sites and known burials) and other Section 4(f)/6(f) resources (public parks), 2) the Little Miami River floodplain and Clear Creek riparian corridor, 3) agricultural and ecological impacts (wetlands and streams), 4) potential residential and commercial impacts in Newtown and Shademoor, 5) potential construction cost issues, and 6) connectivity with River Crossing and Newtown/Ancor Subarea alternatives, as well as coordination with the Oasis Rail Transit component of the Eastern Corridor.

Six alternative corridors were evaluated in this subarea. Alternatives H, I, J and K were eliminated from further consideration due to lack of a feasible connection to an alternative recommended for further study from the adjacent River Crossing Subarea, as well as other impact and cost considerations. Alternative G is recommended to be modified and advanced as an expanded corridor (Alternative G1) in order to provide opportunity for avoidance and minimization of impacts to potential significant archaeological resources and to provide sufficient footprint for coordination with Oasis Rail Transit (potential joint or side-by-side rail transit use with the existing rail corridor through this area). Alternative L is also recommended for advancement as a modified corridor (Alternative L1) to provide sufficient footprint for coordination with Oasis Rail Transit.

Newtown/Ancor Subarea

This subarea contains mostly residential and commercial/industrial land uses within Newtown's village limits. Several public parks and historic properties (Section 4f resources) and churches are located in this subarea, as well as a school, a large cemetery with two preserved Native American burial grounds, several gravel pit lakes, and two landfills. Key considerations in the evaluation of alternatives included: 1) residential/commercial displacements and potential disruption to Newtown, 2) impacts to sensitive community resources and features (churches, cemeteries, schools, and Section 4f resources), 3) gravel pit lake crossings and associated constructability and construction cost issues, 4) landfill impacts, and 5) coordination with the Oasis Rail Transit component of the Eastern Corridor.

Four alternative corridors were evaluated in this subarea. Alternatives M and N were eliminated from further consideration, and a hybrid corridor (Alternative M1/N1) that reduces impacts to Newtown and avoids a NRHP-listed property (the William Edwards House) is recommended to be advanced. Alternative O is also recommended to be modified (Alternative O1) to reduce impacts to Newtown and advanced for further study. Alternative P is also recommended for advancement to provide sufficient footprint for coordination with Oasis Rail Transit in conjunction with Alternative L1 from the River Plains subarea.

Mount Carmel Hill Subarea (east project terminus)

This subarea extends east from Newtown to the east project terminus near the I-275/SR 32 interchange and is defined by a steep wooded hillside located north of existing SR 32. This subarea contains large tracts of woodland, several of which are public or private greenspaces, as well as residential and commercial land uses. Historic properties (Section 4f resources) also occur in this subarea. Key considerations in the evaluation of alternatives included: 1) residential and commercial displacements, 2) construction costs, 3) impacts to large woodland tracts/greenspaces and surface streams, and 4) impacts to Section 4(f) resources.

Four alternative corridors were evaluated in this subarea. Alternatives S and T were eliminated from further consideration due to high potential residential and commercial displacements, stream and other ecological impacts, potential impacts to historic properties, and/or high costs. Alternative Q and a modification of Alternative R (Alternative R1) avoid a historic property and are both recommended to be advanced for further study due to comparatively lower residential/business, ecological and cultural resource impacts.

Summary of Recommendations

This Feasibility Study describes key environmental features and design/cost considerations for five subareas in the Segment II-III study area and presents a comparative impact evaluation (by subarea) of the 21 preliminary alternative corridors carried over from the Eastern Corridor Tier 1 work. Recommended alternative corridors to be advanced for further Tier 2 study from each of the five subareas include: Alternative B1/B2/B3, Alternative C1, Alternative G1, Alternative L1, Alternative M1/N1, Alternative O1, Alternative P, Alternative Q, and Alternative R1.

These recommended alternative corridors, shown on Figure 17, generally form three broad west-to-east corridors through the Segment II-III study area. The southernmost of these three corridors primarily follows the existing Norfolk Southern rail freight line through Newtown and further alternatives development in Segment II-III will be closely coordinated with the Eastern Corridor Oasis Rail Transit study being conducted by others (HAM/CLE Oasis Rail Corridor; PID 86463).

The next step of work for Segment II-III involves additional environmental and engineering studies to develop end-to-end alternative alignments that will be further refined, evaluated and presented in a Segment II-III Alternatives Evaluation Report (AER). The Segment II-III AER will identify a preliminary Preferred Alternative to carry forward into detailed design and environmental clearance.

1. INTRODUCTION/BACKGROUND

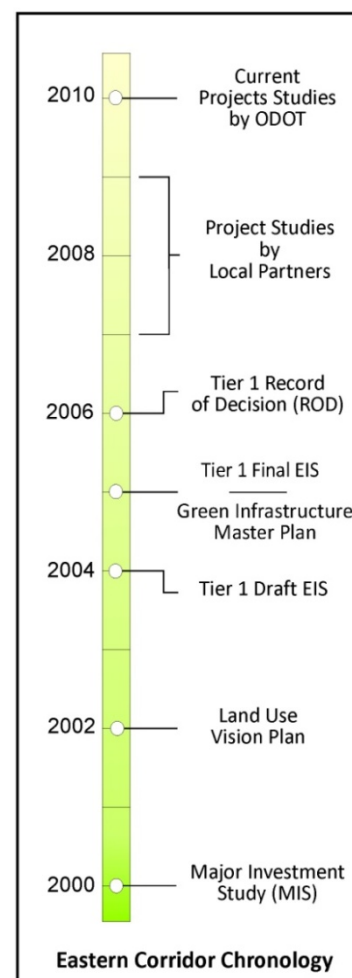
1.1 Eastern Corridor Background

The Eastern Corridor is a program of highway, transit and local network improvements being planned and implemented in a multi-modal strategy to address short- and long-term travel needs between the City of Cincinnati in Hamilton County and western Clermont County, Ohio. The project is following a tiered approach to assessing consequences to the natural and social environment as required under the National Environmental Policy Act (NEPA). In accordance with the definition of tiering outlined in 40 CFR 1508.28(b), Tier 1 of the Eastern Corridor focused on broad issues for the full multi-modal program including identifying transportation needs, mode choice, general corridor locations, preliminary impacts, and land use implications of the transportation improvements being considered. The Tier 1 work was documented in a Tier 1 Final Environmental Impact Statement (EIS) approved by FHWA on September 30, 2005 (FHWA-OH-EIS-04-02-F). A Tier 1 Record of Decision (ROD) issued on June 2, 2006 (see Appendix A) identified recommended multi-modal improvements for the Eastern Corridor and established logical termini for major transportation investments to be further evaluated in Tier 2. Segment II-III is one of several new highway capacity projects carried forward from the Tier 1 ROD. Separate Tier 2 analyses for Segment II-III and other independent projects identified by the Tier 1 ROD are focusing on more detailed environmental impacts, refinement of alignment location and configuration, identification of a preferred alternative, and mitigation. Applicability of tiering for the Eastern Corridor and details of the tiered project approach and appropriate studies were developed with scoping input and guidance from federal and state transportation and resource agencies.

1.2. Chronology of Eastern Corridor Development and Decisions

The following chronology summarizes key studies and decisions in the development of the Eastern Corridor to date:

- Eastern Corridor Major Investment Study (MIS): Led by the Ohio-Kentucky-Indiana Regional Council of Governments (OKI), the MIS evaluated preliminary options for addressing regional transportation problems and determined that the most effective solution for the Eastern Corridor needed to: encompass a multi-modal approach; support economic goals; balance impacts with environmental protection; and consider land use. The MIS recommended plan (concepts and general corridor proximities) included the need for a new transportation corridor crossing of the Little Miami River and was used to establish the Eastern Corridor study area for Tier 1 NEPA analyses. MIS recommendations were adopted by OKI in April 2000 and are incorporated into the region's long range transportation plan.
- Eastern Corridor Land Use Vision Plan (LUVV): Completed in 2002 following recommendation of the MIS, the LUVV identified a desired future land use scenario for the Eastern Corridor based on input from local jurisdictions, environmental groups, business leaders, public agencies, and citizen planners. The LUVV was incorporated into local land use, zoning, and development decisions and is being used as a framework to develop alternatives for the Eastern Corridor (see Appendix B1).
- Tier 1 Environmental Impact Statement and Record of Decision: The Tier 1 studies established project purpose and need, evaluated preliminary



broad corridors, and identified a conservative range of impacts for a program of recommended multi-modal improvements. The Tier 1 ROD established logical termini for major transportation investments to be carried forward into Tier 2 detailed evaluation, and identified a program-level implementation strategy where the intent is for proposed improvements to be constructed incrementally over time. Tier 1 also established a context sensitive framework for the Eastern Corridor by incorporating recommendations of the LUVF and Green Infrastructure Master Plan. Tier 1 was sponsored by a partnership of six local and state jurisdictions (ODOT, Hamilton County, Clermont County, OKI, the City of Cincinnati and SORTA/Metro) and was administered by the Hamilton County Transportation Improvement District. Recommended improvements identified in the Tier 1 ROD included (see Figure 1):

Oasis Rail Transit: 17 miles of new rail transit extending from the Cincinnati riverfront to Milford, a portion of which involves coordination with highway Segment II-III (Relocated SR 32).

New Highway Capacity: 13 miles of highway corridor improvements extending from Red Bank Road at I-71 in Hamilton County through the SR 32/I-275 interchange in Clermont County, divided into implementation segments referred to as Segments I, II-III, IV, IVa and IVb.

Improved Bus Transit: Including expanded routes, new bus hubs, community circulators, and bus feeder routes to compliment rail transit.

Transportation Network Improvements: Including a variety of local road network and intersection improvements and various bike connections.

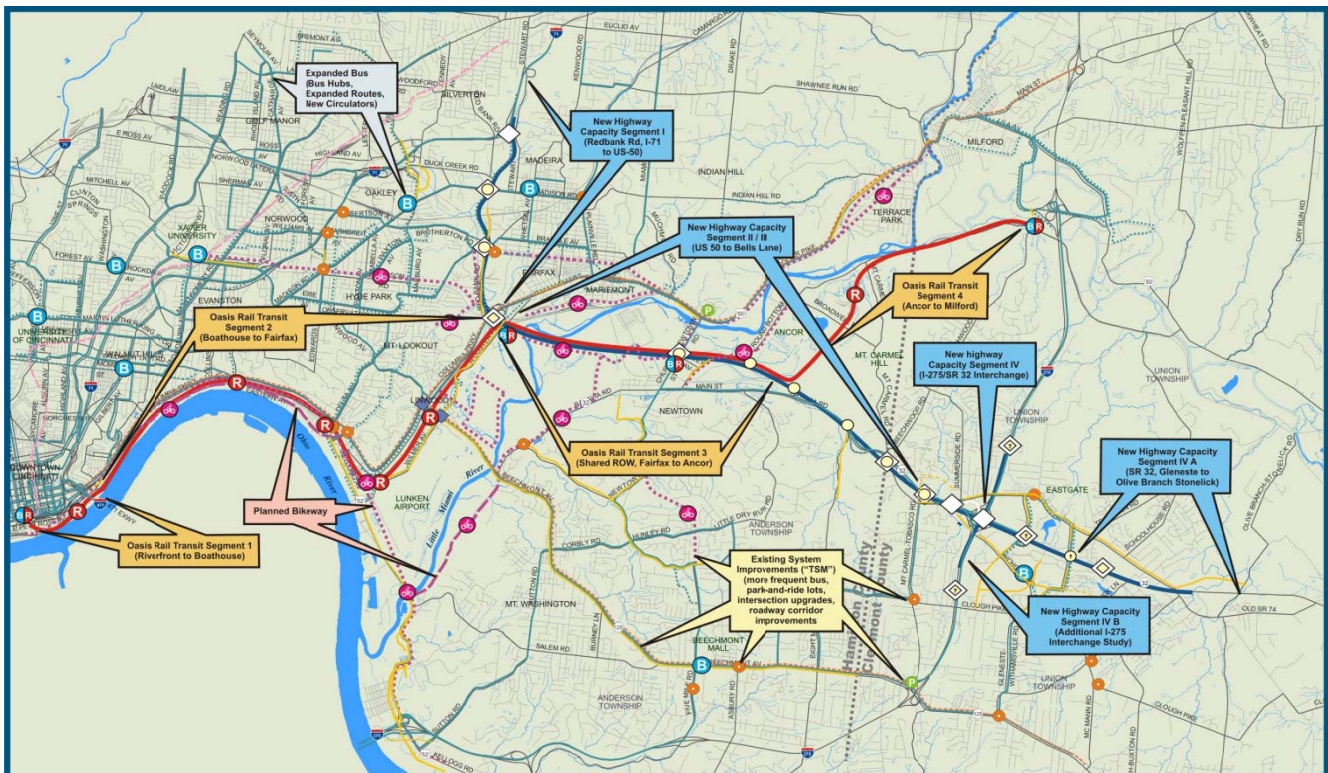


Figure 1 - Tier 1 Recommended Multi-Modal Plan

- **Eastern Corridor Green Infrastructure Master Plan (GIP):** Consistent with commitments in the Tier 1 EIS, the Eastern Corridor is moving forward with the development of a comprehensive, coordinated “green infrastructure” preservation, restoration and enhancement plan that focuses on sensitive features, needs and opportunities. A green infrastructure framework for the Eastern Corridor, initially focused on the

Little Miami River valley, was developed and presented in the 2005 GIP. This local planning effort identified community and resource priorities, as well as ecological and cultural resource mitigation and preservation opportunities in the area (see Appendix B2). The GIP will continue to be developed during Tier 2 to help refine alternatives for Segment II-III and develop detailed mitigation.

- Eastern Corridor Studies (post-Tier 1) by Local Partners: Following the 2006 Tier 1 ROD, the Eastern Corridor local partners (Hamilton County, Clermont County and the City of Cincinnati) in cooperation with ODOT sponsored a number of studies to address important environmental issues identified in Tier 1. These studies, conducted in 2008 and 2009, included an archaeological modeling investigation, Little Miami River geomorphological studies, a local jurisdiction/land use vision update, and a preliminary draft conceptual alternatives evaluation and related environmental studies for Segment II-III of the Eastern Corridor; an Eastern Corridor construction cost estimate update (all modes); and an Oasis riverfront rail transit study.
- Current Eastern Corridor Studies: Current work for the Eastern Corridor initiated in 2010 is being administered by ODOT, with the Federal Highway Administration (FHWA) as the lead federal agency, and in cooperation with the Federal Transit Administration (FTA) and a local partnership that includes Hamilton County, Clermont County, the City of Cincinnati, OKI, and SORTA/Metro. Four projects identified in the Tier 1 ROD are currently in Tier 2 development (preliminary engineering) as part of the program's goal of improving transportation in the Eastern Corridor, including Segment I: Red Bank Corridor, I-71 to US 50; Segment II-III: Relocated SR 32, US 50 to I-275/SR 32; Segment IVa: SR 32, I-275/SR 32 to Olive Branch Stonelick Road; and new rail transit (Oasis Rail Transit from Cincinnati Riverfront to Milford) (see Figure 2). Additionally, Segment IV (I-275/SR 32 interchange improvements), also identified in the Tier 1 ROD, is in the final design phase.

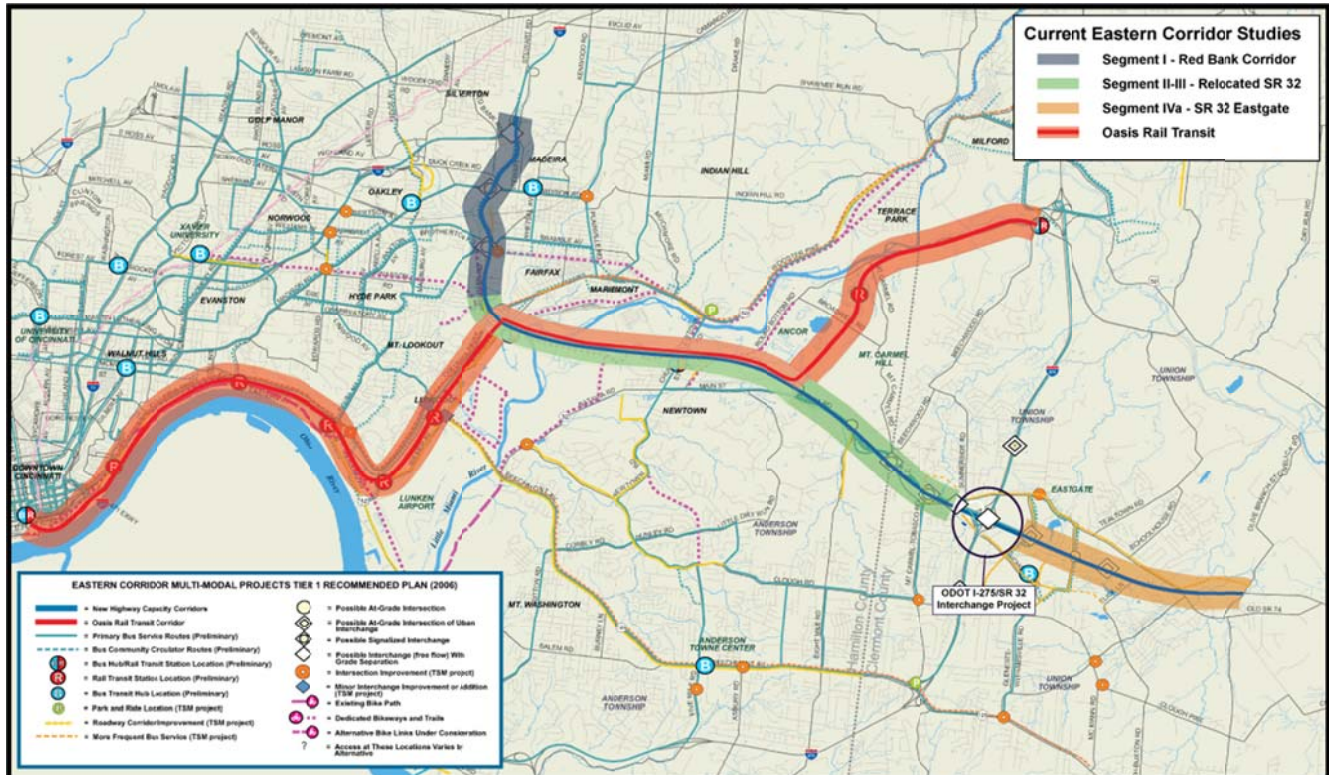


Figure 2 – Current Eastern Corridor Studies

1.3 Segment II-III Project Approach and Purpose of the Feasibility Study

Four projects identified in the Tier 1 ROD are currently in Tier 2 development (preliminary engineering) as part of the program's goal of improving transportation in the Eastern Corridor, including three highway projects (Segment I, Segment II-III, and Segment IVa) and new Oasis Rail Transit. Additionally, Segment IV (I-275/SR 32 interchange improvements), also identified in the Tier 1 ROD, is undergoing final design. Tier 2 studies for all of these projects are being closely coordinated, although each is being individually designed and environmentally cleared under NEPA.

The Segment II-III project involves development of a controlled-access, relocated SR 32 roadway from US 50 in Hamilton County to the I-275/SR 32 interchange in Clermont County (see Figure 3). In Tier 2, Segment II-III is following ODOT's new five-path Project Development Process (PDP), classified as a "Path 5" project characterized by a high level of complexity, multiple alternatives and potential impacts. Each of the new ODOT PDP pathways contains five phases, including: the Planning Phase, the Preliminary Engineering Phase, the Environmental Engineering Phase, the Final Engineering and Right-of-Way Phase, and the Construction Phase.

Tier 1 for Segment II-III covered the Planning Phase of the new PDP, and identified a number of preliminary alternative corridor segments (21 overall) that could be combined into 264 full-length alternatives between US 50 in Hamilton County and SR 32/I-275 in Clermont County (see Figure 4). Tier 2 for Segment II-III will move forward with the Preliminary Engineering Phase of the new PDP, including this Feasibility Study, the purpose of which is to narrow down the number of Tier 1 alternative corridors for further development. Specifically, this Feasibility Study evaluates the 21 preliminary alternative corridor segments carried over from Tier 1 and identifies a refined set of alternative corridors to be advanced for further study.

Upon completion of the Segment II-III Feasibility Study, further preliminary engineering and environmental studies will be performed on the refined set of alternative corridors and an Alternatives Evaluation Report (AER) will be completed. The AER will be a combined preliminary engineering/environmental document that identifies a preliminary Preferred Alternative to be carried forward into the Environmental Engineering Phase of the project. The Environmental Engineering Phase will include Stage 1 design approval and additional environmental studies for the Preferred Alternative, followed by preparation of the draft and final EIS and Stage 2 design. The Final Engineering and Right-of-Way Phase will involve preparation of Stage 3 design plans and the final plan package.

Proposed Segment II-III Transportation Improvements

Segment II-III involves consolidating and managing access points to establish relocated SR 32 as an Access Category II urban arterial roadway west of I-275 (public access provided by interchange or public street intersection only as defined in ODOT's State Highway Access Management Manual). Proposed improvements identified from Tier 1 consist of a new interchange at US 50/Red Bank Road; the relocation of SR 32 and coordination with Oasis Rail Transit; a multi-modal clear-span crossing of the Little Miami River for roadway, rail transit and bike/pedestrian access; multi-modal transit stations at US 50 and Newtown Road (being developed separately as part of the Oasis Rail Transit study, but coordinated with Segment II-III); and coordination with other planned components of the Eastern Corridor project, including expanded bus transit, new bike/pedestrian facilities, local road network improvements, and preservation of a future Wasson rail transit corridor that extends to Clermont County. Total length of Segment II-III (for roadway) is about six miles.

Three conceptual configurations for the US 50/Red Bank Road interchange and 18 preliminary alternative corridor segments (21 preliminary alternative segments total) for Segment II-III have been carried over from Tier 1 and are evaluated in this Feasibility Study. Additional discussion on the development and characteristics of these 21 preliminary alternative corridor segments is presented in Section 2.

1.4 Segment II-III Study Area Conditions

The Segment II-III study area encompasses the east limits of the City of Cincinnati, the south edges of the Villages of Fairfax and Mariemont, the southern edge of the community of Shademoor, the Village of Newtown, the north edge of Anderson Township in Hamilton County, as well as the west edge of Union Township and the community of Mount Carmel in Clermont County (see Figures 3 and 4). This study area was developed from the range of preliminary alternatives evaluated in Tier 1 between US 50 in Hamilton County (the south terminus of Eastern Corridor Segment I) and Bells Lane/Mount Carmel-Tobasco Road near the I-275/SR 32 interchange in Clermont County (the west terminus of Eastern Corridor Segment IV). The following sections summarize existing conditions in the Segment II-III study area, including: the existing transportation network (roadways, railroads, transit, airports, bikeway/ pedestrian), utilities, geotechnical conditions, earthwork/drainage, land use/right-of-way, structures, and traffic/safety.

Existing Transportation Network

Primary Roadway Network

There are no interstate highways within Segment II-III; however, I-71 is located just west of the study area in Hamilton County and I-275 is located just east of the study area in Clermont County. Access to the Cincinnati Business District and surrounding communities in Hamilton County and portions of northern Kentucky is provided by I-71 and I-471, while access to the US 50 corridor at Milford, the SR 32 corridor at Eastgate, and the SR 125/Beechmont Road corridor is provided by I-275. The primary roadway network in the Segment II-III study area consists of the following facilities:

- Red Bank Road: A four and five-lane urban principal arterial extending from I-71 south to US 50 in the Cincinnati/Fairfax/Mariemont area. Current posted speeds range from 35 mph to 50 mph.
- US 50: A four-lane urban minor arterial that generally parallels the Little Miami River in the Cincinnati/Fairfax/Mariemont portion of the Segment II-III study area. The US 50/Red Bank Road interchange is located just west of the Little Miami River. US 50 classifies as an urban principal arterial west of the Red Bank Road interchange. Current posted speeds range from 25 mph to 50 mph.
- SR 32: A two and three-lane urban minor arterial that crosses west to east through the Segment II-III study area. Current posted speeds within the Village of Newtown range from 25 mph to 50 mph. Outside of Newtown, the current posted speed is 55 mph.
- Newtown Road/Church Street: The primary north/south local road in the Village of Newtown. Newtown Road (known as Church Street within the village limits) is a two and three-lane urban collector that begins at US 50 north of Newtown and ends at Clough Pike south of Newtown. The three-lane Newtown Road bridge over the Little Miami River (at US 50) is the only roadway bridge crossing over the Little Miami River in or near the Segment II-III study area. Current posted speed ranges from 25 mph to 35 mph.
- Round Bottom Road: A two and three-lane urban collector that extends from SR 32 northeast out of Newtown, through the industrial Ancor area, and into Clermont County at Milford. Current posted speed is 35 mph in Newtown and 45 mph outside of the Newtown village limits.
- Little Dry Run Road and Eight Mile Road: Two-lane roadways that extend south from SR 32 (east of Newtown) and serve residential areas of northern Anderson Township. Little Dry Run Road classifies as a local roadway, and Eight Mile Road is an urban minor arterial. Current posted speed is 35 mph.

- Mount Carmel Road/Cincinnati-Batavia Pike: A two-lane local roadway that runs north/south along the Hamilton/Clermont County line and connects Round Bottom Road, SR 32, and Mount Carmel-Tobasco Road. Current posted speed is 35 mph.

Railroad System

Three railroad freight lines occur in the Segment II-III study area (see Figure 4). Two are owned by Norfolk Southern and one (the Cincinnati Terminal Railway) is owned by the Ohio Railway System (I&O Railroad) and SORTA/Metro as described below.

- Cincinnati Terminal Railway (CTER) Line: The CTER line, also known as the Oasis line, begins near the Cincinnati Central Business District and extends east, paralleling the Ohio River, Eastern Avenue (US 52), and Columbia Parkway (US 50), then turns to the north near Lunken Airport and continues generally north along US 50 and Red Bank Road in the Segment II-III study area. SORTA/Metro owns the real estate for this rail line, but the active main track is owned by I&O Railroad, which operates trains on the route. SORTA/Metro owns a second set of unused tracks which parallels the active I&O track along this rail corridor, providing a double-track capacity within the rail right-of-way. The CTER railroad continues northwest out of the Segment II-III study area and eventually merges with a Norfolk Southern line in northern Cincinnati near Sharonville. Primary traffic on the CTER line is the continuation of the Norfolk Southern line, providing freight service to local industries in the area.
- Norfolk Southern Main Line: The Norfolk Southern main line is the major east-west rail corridor in the Segment II/III study area. It begins at the CTER line in the Red Bank Road corridor and extends east along the southern edge of Mariemont, across the Little Miami River and through Newtown, turns generally northeast to Milford (Clermont County), and then continues east through eastern Ohio. At this time, Norfolk Southern uses the line for certain through-train freight operations. The Norfolk Southern railroad bridge crossing over the Little Miami River is the only rail bridge crossing of the river in the Segment II-III study area and surrounding vicinity.
- Wasson Line: A second Norfolk Southern line, also known as the Wasson Line, begins in Cincinnati at Montgomery Road/Dana Avenue (near I-71 and Xavier University). This line generally parallels Wasson Road and is used only for industrial service without through-train traffic. The Wasson Line crosses over the CTER/Norfolk Southern main line at Red Bank Road and continues east along the Little Miami River to the Clare Yard (a switching station along the Norfolk Southern main line in Mariemont). From the Clare Yard, trains can access the adjacent Norfolk Southern main line.

Transit System

No existing passenger rail transit occurs in the greater Cincinnati area. Fixed-route bus transit service in the City of Cincinnati, Hamilton County, and Clermont County is provided by SORTA/Metro. Additional bus transit service from Clermont County to the Cincinnati Business District, and shuttle service within Clermont County is provided by Clermont Transportation Connection (CTC). Within the Segment II-III study area, there are no park-and-ride facilities and only one SORTA/Metro bus transit route, which runs on US 50 from the Cincinnati Central Business District to Milford.

Airports

There are no airports located in the Segment II-III study area. Lunken Airport, a general aviation facility owned and operated by the City of Cincinnati, is located between the Little Miami River and US 50 approximately two miles southwest of the Segment II-III study area (see Figure 3). Lunken Airport was formerly the commercial

airport for the Cincinnati area, but has been replaced by the Cincinnati-Northern Kentucky International Airport (CVG) located in Hebron, Kentucky. Lunken Airport currently provides general aviation, private charter, and corporate air services, and houses approximately 60 businesses.

Bike/Pedestrian Facilities

Two bike/pedestrian facilities occur in the vicinity of the Segment II-III study area:

- Little Miami River Scenic Trail: The Little Miami River Scenic Trail is a paved shared-use trail that follows an abandoned railroad right-of-way along the Little Miami River through four counties in southwest Ohio. The trail begins in the Little Miami Golf Center in the Newtown area and extends north approximately 50 miles to the Springfield area in Champaign County, Ohio. A southwestern extension of the Little Miami Scenic River Trail through the Segment II-III study area is being planned by the Hamilton County Park District, with the goal of connecting the Little Miami Scenic River Trail with the Lunken Airport Trail.
- Lunken Airport Trail: This paved shared-use trail is owned by the City of Cincinnati and extends around Lunken Airport and adjacent parks. Plans are underway to connect the Little Miami Scenic Trail to the Lunken Airport Trail, and ultimately to the future Ohio River Trail, which will extend from downtown Cincinnati east along the Ohio River to New Richmond, Ohio.

Utilities

Preliminary utility coordination with the Ohio Utilities Protection Service (OUPS) was conducted in 2008 for the Segment II-III study area. Utility maps were received from Duke Energy, Cincinnati Bell, the Cincinnati Metropolitan Sewer District, and Cincinnati Water Works. The major utility lines owned by these entities in the Segment II-III study area are shown on Figure 16, and include electric transmission lines, water lines, and sanitary sewer lines. Smaller utility lines serving individual residential and commercial properties are located throughout the Segment II-III study area. Further discussion of utilities is provided in Section 3.12.

Geotechnical

Soils

Soils mapping for the Segment II-III study area is included in Appendix F1. Soils in the area are predominantly loams, silt loams, and silty clay loams. Disturbed urban land complex soils occur in Fairfax, Mariemont, Newtown, and in the Mount Carmel area. Upland soils occur on terraces and plateaus and are characterized as well-drained, gentle to steeply sloped, and with small to medium-sized streams. In the Segment II-III study area, they are mostly occur along the Mount Carmel Hill area east of Newtown. Floodplain and bottomland soils occur in areas of low topographic relief that are occasionally inundated by floodwaters. In the Segment II-III study area, they occur along the Little Miami River, Dry Run, McCullough Run, and Duck Creek. Most of these soils are rich and well-drained and used for agricultural purposes (sod farms and row crop). Highly-erodible soils in the Segment II-III study area (Casco silt loam, 25-35 percent slopes) are mostly restricted to valley walls above the Little Miami River and steep slopes in the Mount Carmel Hill area.

Geology

Geological archive information for the Segment II-III study area was researched by H.C. Nutting in 2008 and documented in a *Geotechnical Archive Review and Data Submittal for Eastern Corridor Segment II-III*. This document, included in Appendix F1, contains general background information on Little Miami River valley geology, as well as archive data from borings previously taken in and adjacent to the Segment II-III study area.

The geology of the valley region surrounding the lower Little Miami River was greatly influenced by North American ice age events. During this period, more than one ice sheet advanced into the Cincinnati area forcing the Ohio River to its present day channel. As the last ice melted and dropped its final load of sand and gravel outwash, the melt water subjected the lakebed sediments to erosion while the modern channels of the Ohio and Little Miami Rivers evolved. Deposition of granular outwash from the retreating glaciers formed a complex stratification with the underlying glacial lake deposits; however, borings have shown that in parts of the modern lower Little Miami River valley, lake deposits were fully removed and replaced with granular outwash. Currently, the uppermost zone in the modern valley is covered by a sandy alluvium which grades up into silts and clays associated with recent flooding of the modern Ohio River and its tributaries. Additionally, flooding and alluvial deposits have contributed to modern day course changes and meandering of the Little Miami River and its tributaries. Presently, the Little Miami River is flowing on sand and gravel. There is a direct hydraulic connection between the channel and the outwash deposits beneath the Little Miami floodplain area. The groundwater or phreatic surface is significantly affected by water levels of the Little Miami and Ohio Rivers. Deep borings indicate the presence of two distinct aquifers; however, these aquifers may be interconnected beyond the lateral extent of these borings.

The Ohio Department of Natural Resources characterizes the geological setting of the Segment II-III area as one of a buried valley where surficial deposits were formed. The modern Little Miami River has abraded a portion of the glacial lakebed deposits and glacial outwash through change of course and meandering. Modern flooding of the plain has produced deposits of recent alluvium. The bulk of the region lies within the lower flood plain area between the elevations of 475 to 480 feet. The general subsurface soil flood profile is characterized by a thin veneer of loam immediately underlain by a stratum of lean clay with variations in the clay typical of alluvial deposits. These alluvial deposits have a lower elevation ranging between 455 and 465 feet with variations in gradation due to past meandering as well as velocity fluctuations of the Little Miami River. Permeable silt and sand seams are common within this zone. Underlying the alluvial flood deposits, the soil column may be described as a complex layering between sand and gravel with minor fines, thick sequences of outwash/valley train deposits with minor alluvium and lacustrine deposits. The local bedrock is Ordovician interbedded soft shale and limestone. The subsurface profile can be characterized by six primary categories: fill, upper clayey alluvium, upper sands, lake bed clays, granular outwash and bedrock.

Based on this information, field observations and aerial photograph review, three primary geotechnical issues occur in the Segment II-III study area with regard to transportation construction: 1) landslide-prone areas, 2) landfills, and 3) gravel mine lakes (see Figure 16). These issues are further discussed in Section 3.12.

Earthwork/Drainage

Earthwork and drainage are important engineering considerations for the Segment II-III study area. Excessive earthwork activity, special excavation or fill requirements, special drainage requirements, and substantial excavation/fill imbalances drive up construction costs and extend construction schedules.

There are four locations in the Segment II-III study area where excessive earthwork activity, special drainage considerations, or special excavation or fill requirements are expected to be required, including: 1) Little Miami River floodplain/floodway, 2) gravel-mined areas, 3) landfills, and 4) the Mount Carmel Hill area (see Figure 16). These issues are further discussed in Section 3.12.

Land Use/Right-of-Way

The Segment II-III study area contains residential/commercial land use in Anderson Township and the Villages of Fairfax, Newtown and Mariemont, large tracts of farmland in the Little Miami River floodplain, commercial/industrial properties and gravel pits in the Ancor area east of Newtown, and steep wooded hillsides with scattered residential properties along SR 32 in the Mount Carmel Hill area. Future land use plans for the study area were developed and coordinated in Tier 1, using extensive community input to establish a context sensitive framework for addressing environmental and community issues in the Eastern Corridor area based on recommendations of an Eastern Corridor Land Use Vision Plan and Green Infrastructure Master Plan (see Appendix B).

Overall, the amount of existing public right-of-way in the Segment II-III study area is limited. There are no interstate highways in the study area and major roadways are mostly two-lane facilities, with the exception of Red Bank Road (four and five-lane facility) and US 50 (four-lane facility). Three rail freight lines also occur in the Segment II-III study area. Existing right-of-way widths along roadways and railways in the Segment II-III study area range from approximately 40 feet to 120 feet.

Structures

Information on existing major bridge/culvert structures in the Segment II-III study area was obtained from the ODOT-Office of Structural Engineering website. There are six ODOT bridges/major culverts in the Segment II-III study area; five of which are on US 50 in the US 50/Red Bank Road interchange area, and one is on SR 32 in the Ancor area.

Route: SR 32	SFN: 3102203	Sufficiency Rating: 96.4	General Appraisal: 6
Route: US 50	SFN: 3103811	Sufficiency Rating: 89.0	General Appraisal: 6
Route: US 50	SFN: 3103846	Sufficiency Rating: NA	General Appraisal: 6
Route: US 50	SFN: 3103870	Sufficiency Rating: 94.0	General Appraisal: 6
Route: US 50	SFN: 3103900	Sufficiency Rating: 74.0	General Appraisal: 5
Route: US 50	SFN: 3103935	Sufficiency Rating: 80.7	General Appraisal: 7

There are also a number of other railroad/local road structures in the study area, including a large culvert on Red Bank Road for Duck Creek; three Wasson rail line bridges over the CTER rail line/Red Bank Road, US 50 and Wooster Pike; a Wooster Road bridge over the Norfolk-Southern rail line; a Norfolk-Southern rail bridge over Duck Creek; a Debolt Street bridge over Clear Creek; two Norfolk-Southern rail line bridges over Little Dry Run and an adjacent private drive (in the Ancor area); a Round Bottom Road bridge over Little Dry Run (in the Ancor area); five local road bridges/culverts over McCullough Run (Church Street, Drake Street, River Hills Drive, Ivy Hills Drive, Miljoie Road), and two local road bridges/culverts over Little Dry Run (Little Dry Run Road and Hickory Creek Drive).

Traffic/Safety

Traffic Volumes

The Tier 1 EIS reported that traffic volumes on SR 32 in the Segment II-III study area are projected to increase 21 to 37 percent by 2030. In 2010, an update to Ohio-Kentucky-Indiana's (OKI) regional travel demand Model 7.6 was initiated for the Eastern Corridor under the administration of the Eastern Corridor local partners. The original OKI Model 7.6 included 817 traffic analysis zones (TAZs) within the Eastern Corridor. A review of OKI's socioeconomic database for the TAZs revealed a need for refinement, specifically disaggregation into smaller zones (1,157 total) that more accurately reflected socioeconomic and transportation network conditions.

Hamilton County, the City of Cincinnati, and Clermont County provided assistance in determining appropriate disaggregation boundaries, as well as updates to existing and future household and employment data and transportation network for building the updated existing and future baseline model runs.

Existing (2005), 2030 No Build, and Baseline 2030 Build average daily traffic (ADT) volumes for the primary road network in the Segment II-III study area from the Eastern Corridor TDM update (HNTB, October, 2011; revised January 2012) and approved by ODOT are included in Table 1. Percentages in **red** indicate a 20 percent or greater increase in traffic volume over the 2005 Existing or 2030 No Build condition. Percentages in **green** for the 2030 Build condition indicate a decrease in traffic volume from the 2030 No Build condition. Baseline 2030 traffic volumes for Segment II-III will continue to be refined as alternatives and network connections are further developed, and updated volumes will be reported in the alternatives evaluation study (AER).

Table 1. Traffic Volumes for the Primary Road Network in Segment II-III

Roadway/Segment	2005 (Existing)	2030 No Build	Percent Change (from Existing to 2030 No Build)	Baseline 2030 Build	Percent Change (from 2030 No Build to Baseline 2030 Build)
Red Bank Road					
Erie to Wal-Mart	21,500	23,500	9.3	49,000	108.5
Wal-Mart to Fair	20,800	22,800	9.6	48,600	113.2
Fair to Woodland	19,300	21,700	12.4	48,400	123.0
Woodland to US 50 (Colbank)	19,100	21,500	12.6	48,400	125.1
Colbank to Wooster	10,500	11,000	4.8	8,900	-19.1
SR 32					
Beechmont to Clough	23,900	31,100	30.1	23,100	-25.7
Clough to Turpin	12,700	17,900	40.9	9,600	-46.4
Turpin to Church	12,700	17,700	39.4	9,500	-46.3
Church to Round Bottom	14,600	19,800	35.6	9,400	-52.5
Round Bottom to Miljoie	23,400	28,300	20.9	11,100	-60.8
Miljoie to Baltic	22,800	27,700	21.5	9,500	-65.7
Baltic to Ivy Hills	22,000	26,900	22.3	8,100	-69.9
Ivy Hills to Little Dry Run	21,800	26,700	22.5	7,800	-70.8
Little Dry Run to Hickory	22,000	27,600	25.5	8,200	-70.3
Hickory to Eight Mile	21,900	27,400	25.1	8,000	-70.8
Eight Mile to Mount Carmel	23,800	30,500	28.2	13,900	-54.4
East of Mount Carmel	24,900	31,000	24.5	NA (see Relocated SR 32)	
Relocated SR 32					
US 50 to Church (Newtown)	NA	NA	NA	29,900	NA
Church to Round Bottom	NA	NA	NA	28,200	NA
Round Bottom to Eight Mile	NA	NA	NA	30,000	NA
Eight Mile to Mount Carmel	NA	NA	NA	30,100	NA
East of Mount Carmel	NA	NA	NA	41,800	NA
Newtown Road (Church Street)					
South of SR 32	5,200	6,600	26.9	6,100	-7.6
SR 32 to Center	5,300	8,400	58.5	5,000	-40.5
Center to Valley	5,100	8,400	64.7	5,300	-36.9
Valley to Relocated SR 32	15,900	17,900	12.6	11,900	-33.5

Table 1. Traffic Volumes for the Primary Road Network in Segment II-III

Roadway/Segment	2005 (Existing)	2030 No Build	Percent Change (from Existing to 2030 No Build)	Baseline 2030 Build	Percent Change (from 2030 No Build to Baseline 2030 Build)
Relocated SR 32 to US 50	15,900	17,900	12.6	14,100	-21.2
Round Bottom Road					
SR 32 to Valley	12,300	13,300	8.1	7,400	-44.4
Valley to Relocated SR 32	3,200	5,600	75.0	6,600	17.9
North of Relocated SR 32	2,200	4,800	118.2	5,500	14.6
US 50					
Beechmont to Eastern	11,400	12,100	6.1	14,100	16.5
Eastern to Colbank	19,900	22,800	14.6	28,500	25.0
Colbank to Wooster	17,300	21,700	25.4	20,300	-6.5
Wooster to Watterson	17,900	22,000	22.9	20,700	-5.9
Watterson to Belmont	17,400	21,500	23.6	20,000	-7.0
Belmont to Plainville	18,500	22,600	22.2	19,900	-11.9
Plainville to West	22,000	26,800	21.8	21,500	-19.8
West to Miami	20,900	26,000	24.4	20,100	-22.7
Miami to Indian View	18,800	23,300	23.9	17,770	-24.0
Indian View to Miami Run	17,400	21,900	25.9	16,300	-25.6
Miami Run to Spring	17,400	22,000	26.4	16,400	-25.5
Spring to Walton Creek	24,700	28,400	15.0	20,900	-26.4
Walton Creek to Ashley Oaks	22,200	26,300	18.5	19,000	-27.8
Ashley Oaks to Newtown	22,000	26,100	18.6	18,900	-27.6
East of Newtown	10,100	13,400	32.7	14,700	9.7
SR 125/Beechmont Avenue					
Wooster to SR 32 Ramps	47,700	61,700	29.4	54,200	-12.2
East of SR 32 Ramps	26,800	33,400	24.6	32,900	-1.5
Clough Pike					
East of SR 32	11,300	13,400	18.6	13,600	1.5
Valley Avenue					
Church to Round Bottom	11,400	13,000	14.0	7,000	-46.2
Wooster Pike					
Beechmont to Armleder	12,500	13,100	4.8	11,800	-9.9
Armleder to Red Bank	11,700	12,500	6.8	11,400	-8.8
Red Bank to Mariemont	2,600	3,500	34.6	5,600	60.0
Mariemont to US 50	2,700	3,500	29.6	6,000	71.4
Linwood Avenue (SR 561)					
US 50 to Sheffield	22,900	34,700	51.5	29,500	-15.0
Sheffield to Beverly Hill	23,700	35,000	47.7	30,300	-13.4
Beverly Hill to Herschel	27,600	37,600	36.2	32,100	-14.6
Herschel to Delta	25,300	34,300	35.6	29,500	-14.0
North of Delta	19,000	25,400	33.7	20,900	-17.7

Crash Data

The Tier 1 EIS reported that most of SR 32 in the Segment II-III study area had an annual crash rate (from 1998 through 2000) that exceeded the statewide average, with a high number of accidents at key intersections, including SR 32 and Round Bottom Road, SR 32 at Eight Mile Road and SR 32 at Mount Carmel-Tobasco Road. Updated three-year crash data (2007 through 2009) for the primary road network in and adjacent to the Segment II-III study area was obtained in 2010 and is summarized in Table 2. Crash rates in **red** indicate the crash rate for that segment exceeds the statewide rate for that facility type/functional class.

Table 2. 2007-2009 Crash Data for the Primary Road Network in Segment II-III

Roadway/Segment	Length (miles)	ADT ¹ (2005)	PDO	Injury	Fatal	Total	Func. Class ²	Rate ³	Statewide Rate ⁴
Red Bank Road									
Fair to Colbank (US 50 Ramps)	0.28	19,200	2	1	0	3	14 (U4)	0.51	1.89
Colbank to Wooster	0.45	10,500	11	5	0	16	17 (U2)	3.09	1.19
SR 32									
SR 125 to Clough	0.62	23,900	29	3	0	32	16 (U2)	1.97	1.37
Clough to Newtown Corp.	1.56	12,700	28	6	1	35	16 (U2)	1.61	1.37
Newtown Corp. to Round Bottom	0.75	14,650	33	3	0	36	16 (U4)	2.99	2.18
Round Bottom to Newtown Corp.	1.46	22,700	53	5	0	58	16 (U2)	1.60	1.37
Newtown Corp. to Eight Mile	0.89	21,900	19	4	0	23	16 (U2)	1.08	1.37
Eight Mile to Bifurcated SR 32	0.49	23,800	21	10	0	31	16 (D4)	2.43	1.05
Bifurcated SR 32 to County Line	0.18	23,800	5	0	0	5	16 (U4)	1.07	1.66
County Line to Bells Lane	0.64	24,900	5	6	0	11	14 (D4)	0.63	0.88
Newtown Road (Church Street)									
SR 32 to Valley	0.50	5,200	2	1	0	3	17 (U2)	3.86	1.19
Valley to US 50	0.57	15,900	11	5	0	16	17 (U2)	1.31	1.19
Round Bottom Road									
SR 32 to Newtown Corp.	1.11	12,300	9	2	0	11	17 (U2)	0.74	1.19
Newtown Corp. to County Line	2.58	3,800	12	2	0	14	17 (U2)	1.30	1.19
US 50									
SR 125 to Heekin	0.46	11,400	2	0	0	2	12 (D4)	0.35	0.59
Heekin to Fairfax Corp.	0.90	19,900	9	1	0	10	12 (D4)	0.51	0.59
Fairfax Corp. to Red Bank	0.17	19,900	1	0	0	1	14 (D4)	0.27	0.88
Redbank to Southern	0.68	17,600	4	0	0	4	16 (U4)	0.38	1.66
Southern to Mariemont Corp.	0.37	17,550	22	5	0	27	16 (U4)	3.80	1.66
Mariemont Corp. to Plainville	0.42	18,500	8	3	0	11	16 (U4)	1.41	1.66
Plainville to Mariemont Corp.	0.61	20,250	14	1	0	15	16 (U4)	1.11	1.66
Mariemont Corp. to Walton Creek	0.41	21,050	18	1	0	19	16 (U4)	2.01	1.66
Walton Creek to Newtown	0.48	22,100	8	1	0	9	16 (U4)	0.77	1.66
Newtown to Terrace Park Corp.	2.00	10,100	24	4	0	28	16 (U4)	1.27	1.66
Wooster Pike									
SR 125 to Emerald	0.57	12,500	13	3	0	16	17 (U2)	2.05	1.19
Emerald to Red Bank	0.97	11,800	18	1	0	19	17 (U3)	1.52	1.45
Red Bank to US 50	0.45	2,650	2	0	0	2	17 (U2)	1.53	1.19

Table 2. 2007-2009 Crash Data for the Primary Road Network in Segment II-III

Roadway/Segment	Length (miles)	ADT ¹ (2005)	PDO	Injury	Fatal	Total	Func. Class ²	Rate ³	Statewide Rate ⁴
Valley Avenue									
Church to Round Bottom	0.29	11,400	8	0	0	8	17 (U2)	2.21	1.19

1 Average Daily Traffic (TDM Base Year Volumes, HNTB 2011)

2 Functional Classifications per ODOT

3 Rate = crash rate for the three year period in million vehicle miles traveled

4 Three-Year Statewide Crash Rate (2007-2009) by ODOT Functional Class, number of lanes, and facility type (divided/undivided).

In addition, 62 crashes were reported at key intersections on SR 32 and US 50 in the project area from 2007 to 2009, including SR 32/Church Street (7 crashes), SR 32/Round Bottom Road (15 crashes), SR 32/Eight Mile Road (16 crashes), SR 32/Mount Carmel Road (12 crashes), and US 50/Newtown Road (12 crashes).

Level-of-Service

The Tier 1 EIS reported that levels-of-service on the majority of SR 32 in the Segment II-III study area are projected to be “E” or “F” by 2030, indicating heavy congestion and substantial delays. Levels-of-service (planning level) for the Existing (2005) and 2030 No Build were updated in December 2011 for the primary road network in the Segment II-III study area and are summarized in Table 3.

Table 3. Preliminary Levels-of-Service for the Primary Road Network in Segment II-III

Roadway/Segment	2005 (Existing) Level-of-Service	2030 No Build Level-of-Service
SR 32 (SR 125 to Turpin Lane)	C	C
SR 32 (Turpin Lane to Little Dry Run)	B - D (Overall C)	C - F (Overall D)
SR 32 (east of Little Dry Run)	C	D
Red Bank Road (Erie to Wooster Pike)	C - F (Overall D)	C - F (Overall D)
US 50/Wooster Pike (Red Bank to Newtown Road)	B - F (Overall C)	B - F (Overall C)
US 50/Columbia Parkway (west of Red Bank)	A	A
Round Bottom Road (SR 32 to Broadwell Road)	B	B
Church Street/Newtown Road (Ragland to US 50)	C	C

Level-of-service for the 2030 Build scenario will be developed in the next phase of work as alternative alignments and network connections are further refined, and will be reported in the Alternatives Evaluation Report (AER).

1.5 Purpose and Need Summary

Tier 1 Framework

Key transportation needs in the Eastern Corridor are documented in the Tier 1 EIS and include: 1) existing network deficiencies affecting transportation capacity, safety, and accessibility, 2) limited available modal options, 3) inadequate regional linkage and mobility, and 4) anticipated continued inadequacies in the existing transportation network due to future growth (see Appendix C). The purpose of the Eastern Corridor, as described in the Tier 1 ROD, is to implement a multi-modal transportation improvement plan that increases capacity, reduces congestion and delay, improves safety, provides transportation options, and connects the

region's key transportation corridors and social and economic centers for the efficient movement of people, goods and services.

Segment II-III Purpose and Need Summary

The specific goal of Segment II-III in support of the overall purpose and need for the Eastern Corridor is to establish relocated SR 32 as a controlled-access facility west of I-275, coordinated with new rail transit that provides a transportation alternative to driving. The new facility will improve traffic safety and local and regional travel efficiency by providing a modern, four-lane, east-west highway connection from the east Cincinnati suburbs to the I-275/Eastgate area and developing areas of western Clermont County.

Existing SR 32 experiences high commuter, truck, and residential traffic, and improvements are needed because of poor levels-of-service and high crash rates. The Tier 1 EIS reported that traffic volumes on SR 32 in the Segment II-III study area will increase 21 to 37 percent by 2030 under No Build conditions, and that levels-of-service on a majority of this route will be "E" or "F", indicating heavy congestion and long delays (see Appendix C). Eastern Corridor TDM data updated in 2010-2012 indicates that existing SR 32 will experience 21 to 41 percent traffic growth by 2030 under No Build conditions (see Table 1). US 50, SR 125 (Beechmont Avenue), SR 561 (Linwood Avenue), Newtown Road, Wooster Pike, Clough Pike, Round Bottom Road, Valley Avenue, and most of Red Bank Road in the Eastern Corridor will also experience traffic growth between 5 percent and 118 percent by 2030 based on the updated TDM. Additionally, planning-level levels-of-service for the Existing (2005) and 2030 No Build conditions developed in December 2011 (see Table 3) indicates that congestion and delays currently exist in the area and that conditions are expected to either stay the same or worsen on key roadways in Segment II-III, including SR 32 and portions of Red Bank Road and US 50.

The Tier 1 EIS reported that almost the entire length of SR 32 in the Segment II-III study area had an annual crash rate that exceeded the statewide average between 1998 and 2000, with a high number of crashes at key intersections, including SR 32 and Round Bottom Road, SR 32 at Eight Mile Road and SR 32 at Mount Carmel-Tobasco Road (see Appendix C). Current crash data (see Table 2) indicates that crash rates on key roadways in and adjacent to the Segment II-III study area exceed the statewide average, including most of SR 32 in the Segment II-III study area, Red Bank Road, Newtown Road and Wooster Pike. High numbers of crashes also occur at key intersections based on the recent crash data, including SR 32 and Round Bottom Road, SR 32 and Eight Mile Road, SR 32 and Mount Carmel Road, and US 50 and Newtown Road. This data confirms the need to address safety issues in this segment of the Eastern Corridor.

Based on Baseline 2030 Build traffic volumes (see Table 1), implementation of the Segment II-III project will reduce traffic volumes on key segments of the adjacent local road network (up to 70 percent) from 2030 No Build levels, with the exception of Red Bank Road. As a result, the Segment II-III improvements are expected to improve motorist safety by reducing traffic volumes and congestion on much of the local road network.

Logical Termini and Independent Utility

Following recommendation of the 2006 Tier 1 ROD, the Eastern Corridor is proceeding with a number of individual Tier 2 transportation projects, each with independent utility and appropriate NEPA documentation.

The Segment II-III project will establish relocated SR 32 as an Access Category II urban arterial roadway west of I-275. The west terminus of Segment II-III is the existing US 50/Red Bank Road interchange, where the Tier 1 work established that a new interchange and multi-modal transit station would be developed. Segment II-III then extends east across the Little Miami River to Newtown Road (the proposed location of a second multimodal transit station), continues east through the industrial Ancor area, then follows existing SR 32 east to Bells Lane/Mount Carmel-Tobasco Road (near the I-275/SR 32 interchange), which represents the west

terminus of Eastern Corridor Segment IV. Segment II-III also includes close coordination with Oasis Rail Transit from US 50 to Ancor, and preservation of a future Wasson rail transit corridor to Eastgate.

Compatibility with State and Regional Plans

The Eastern Corridor MIS Recommended Plan, which includes Segment II-III transportation improvements, was originally adopted in OKI's *2030 Regional Transportation Plan* (September 2001). The Segment II-III project is listed as "SR 32 West of IR 275" (preliminary engineering and environmental analysis to consolidate, manage access for relocated SR 32 west of IR 275; PID 86462) in OKI's *FY 2012-2015 Transportation Improvement Program* (TIP) adopted April 14, 2011 and ODOT's *2012-2015 Statewide Transportation Improvement Program* (STIP). The improvement of SR 32 in Hamilton and Clermont Counties (PID 86462) is listed in ODOT's *Draft 2013-2016 Major New Program List* (January 17, 2012) as a Tier III (Multi-Phase) project. The Major New Program List is administered by ODOT's Transportation Review Advisory Council (TRAC).

1.6 Supporting Documentation

Segment II-III in Tier 2 is following "Path 5" of ODOT's new five-path Project Development Process (PDP). This Feasibility Study is part of the Preliminary Engineering Phase of the new PDP, and is based on review of information from Tier I, as well as public involvement and engineering and environmental studies completed since the 2006 Tier 1 ROD. The purpose of this Feasibility Study is to evaluate the 21 preliminary alternative corridors carried over from Tier 1 and identify a refined set of alternative corridors to advance for further study.

Project studies conducted during the Eastern Corridor Tier 1 work program, as well as additional (new) public involvement and environmental studies conducted for sensitive features in the Segment II-III study area reviewed for this Feasibility Study are listed in Table 4.

TABLE 4. Supporting Documentation for the Segment II-III Feasibility Study

Eastern Corridor Tier 1 Documentation (2002-2006)
<i>Eastern Corridor Tier 1 Record of Decision</i> (FHWA, 2006)
<i>Eastern Corridor Green Infrastructure Master Plan</i> (Meisner + Associates, Balke American, and Gray and Pape, 2005)
<i>Eastern Corridor Tier 1 Final Environmental Impact Statement</i> (FHWA, 2005)
<i>Eastern Corridor Tier 1 Draft Environmental Impact Statement</i> (FHWA, 2004)
<i>Ecological Resources Inventory Report for the Eastern Corridor</i> (Balke American/ENTRAN 2003)
<i>Cultural Resources Context Information in Support of Eastern Corridor Part A Development of Feasible Alternatives</i> (Gray and Pape, 2002)
<i>Environmental Site Assessment Study for the Eastern Corridor – Corridor Inventory and File Review of Priority Sites</i> (H.C. Nutting, 2002)
<i>Eastern Corridor Land Use Vision Plan</i> (Meisner + Associates, 2002)
Eastern Corridor Segment II-III Post Tier 1 Studies (2008-2009) - included in Appendix I
<i>Segment II-III Ecological Resources Inventory Report</i> (ENTRAN 2008) - includes field survey within the Segment II-III study area and updates the 2002 study following current ODOT guidelines (2005).
<i>Segment II-III History/Architecture Red Flag Report</i> (Gray and Pape 2009) - includes updated windshield survey within the Segment II-III study area and updates the 2002 study following current ODOT guidelines (2004).

TABLE 4. Supporting Documentation for the Segment II-III Feasibility Study

<i>Segment II-III Environmental Site Assessment Screening</i> (ENTRAN 2008) - updates and re-packages the 2002 Environmental Site Assessment (ESA) corridor inventory.
<i>Segment II-III Preliminary Noise Screening Analysis</i> (ENTRAN 2009) - identifies preliminary sound level impacts through use of the FHWA TNM look-up table (for highway noise) and the FTA general noise assessment spreadsheet (for rail transit noise) following current ODOT noise policy (2008) and FTA (2006) transit noise assessment guidelines.
Special Studies for Sensitive Environmental Features (2008-2010) - included in Appendix I
<i>Archaeological Modeling for Segment II-III of the Eastern Corridor Multi-Modal Projects</i> (Gray and Pape 2009) - identifies archaeological sensitivity within the Segment II-III study area and the potential for significant resources through secondary source review, field reconnaissance, and limited ground truthing in identified sensitive areas. No Phase 1 shovel-testing or other detailed field investigations were included in this phase of work.
<i>Phase I and Phase II Little Miami River Geomorphologic Assessment</i> (Stantec 2009) and <i>Phase I and Phase II Geomorphic Assessment and 2-D Hydraulic Modeling Evaluation of the Little Miami River in the Eastern Corridor Segment II-III Study Area - Phase I and Phase II Report</i> (CH2MHill 2009) - two complementary approaches were conducted to evaluate past, present, and potential future channel migration of the Little Miami River, and to identify suitable clear-span crossing locations; the studies included two-dimensional hydraulic modeling and a river morphology (Rosgen) investigation.
<i>Background Literature Review and Disturbance Assessment for Segment II-III of the Eastern Corridor Multi-Modal Project</i> (Gray and Pape 2010) - included identification of known archaeological resources, NRHP properties, and locations where human remains may be expected within the study area, and an evaluation of the level and intensity of disturbance within the study area relative to the potential for areas to contain intact archaeological sites.
<i>Eastern Corridor Land Use Vision Update for Segment II-III</i> (Meisner + Associates and ENTRAN, 2009) – public involvement effort that reviewed land use recommendations originally identified in the 2002 Land Use Vision Plan, identified current issues and community needs, and developed an updated vision for future land use in these areas.

2. DEVELOPMENT OF SEGMENT II-III ALTERNATIVES

2.1 History of Alternatives Development

The full range of alternatives considered for the Eastern Corridor, including those within the Segment II-III study area, is documented in the Tier 1 EIS. The development of alternatives occurred in conjunction with public involvement and oversight from project advisory groups. Transportation improvements for Segment II-III identified by the Tier 1 ROD include the following:

- A new interchange at US 50/Red Bank Road.
- A multi-modal clear-span crossing of the Little Miami River, including highway, rail transit, and bike / pedestrian access.
- Multi-modal transit stations at the new US 50/Red Bank Road interchange and at Newtown Road (being developed separately as part of the Oasis Rail Transit study, but closely coordinated with Segment II-III).
- The relocation of SR 32 from US 50 to Bells Lane/Mount Carmel-Tobasco Road (near the I-275/SR 32 interchange), with planning for Oasis Rail Transit from the US 50/Red Bank Road interchange to Ancor, and preservation of the future Wasson Rail Transit corridor to Eastgate.

Three US 50/Red Bank Road interchange options and 18 preliminary alternative corridor segments (21 total alternative corridor segments) for relocated SR 32 and parallel rail transit were carried over from Tier 1 and are evaluated in this Feasibility Study (see Figure 4).

2.2 Characteristics of Alternatives

The Segment II-III alternatives evaluated in this Feasibility Study are not specific alignment locations, but broad corridors (approximately 400 to 600 feet wide) that were carried over from Tier 1 and are being further developed in Tier 2. Sufficient preliminary engineering was conducted in Tier 1 to establish an approximate footprint area for each of the preliminary alternative corridors, but specific alignment location, configuration, and access details were not established.

Section 2.3 summarizes the design assumptions used in the development of the preliminary alternative corridors. Descriptions of the preliminary alternative corridors are presented in Section 2.4.

2.3 Design Assumptions

Program Coordination

Tier 1 of the Eastern Corridor established that transportation investments in the area need to be land-use driven and coordinated around a future Land Use Vision Plan developed by the local communities (initially developed in 2002, with 2009 updates from local jurisdictions for Segment II-III; see Sections 1.2 and 4.3). Additionally, the different transportation modes comprising the Eastern Corridor program (bus, rail transit, highway, local network improvements) are to be coordinated and implemented to function together.

Segment II-III, which involves a multi-modal crossing of the Little Miami River and coordination with a portion of the Oasis Rail Transit corridor, is a critical component of the broader Eastern Corridor program, and must be developed in coordination with adjacent Eastern Corridor project termini, alignment alternatives, and design considerations. Segment II-III must also be developed in consideration of design and operational requirements for both highway and rail transit.

The Oasis Rail Transit study for the Eastern Corridor being conducted by others (HAM/CLE Oasis Rail Corridor; PID 86463) is evaluating potential rail station locations as well as potential use of the existing Norfolk Southern rail corridor for joint or side-by-side rail transit operation. The Segment II-III study, therefore, must closely coordinate alternatives development and evaluation with the Oasis Rail Transit study as both projects further develop, so as not to preclude use of the existing rail corridor, as well as the potential for a highway/rail transit mode-split east of the multi-modal Little Miami River bridge crossing in Segment II-III.

Tier 1 Environmental Commitments Important to Tier 2 Alternatives Development

Throughout Eastern Corridor project development, emphasis has been placed on avoidance and minimization of impacts to community, economic, and environmental resources. Through development and coordination of the Eastern Corridor Land Use Vision Plan and subsequent green infrastructure planning (see Appendix B), there are expectations at the local level, as well as requirements by state and federal resource agencies, that environmental protection measures initially identified in Tier 1 will be carried forward into more detailed development in Tier 2.

Segment II-III involves sensitive environmental and community issues. A key commitment carried forward from Tier 1 is development of a multi-modal, clear-span crossing of the Little Miami River in order to minimize impacts to this scenic river resource. A preliminary mitigation strategy and list of environmental commitments developed in Tier 1 is summarized in the Tier 1 EIS and Tier 1 ROD (see Appendix D).

Mitigation measures developed for Segment II-III will be consistent with state and federal requirements, and may be in part administered at the local level in conjunction with other local preservation, mitigation or enhancement plans, with a combination of local, state and/or federal funding, as applicable. One mitigation strategy initiated during Tier 1 is the 2005 Green Infrastructure Master Plan, which was administered under local jurisdiction and coordinated with the Eastern Corridor program. This joint planning effort was a continuation of land use goals established during the Eastern Corridor MIS and the 2002 Eastern Corridor Land Use Vision Plan (see Section 1.2). The Green Infrastructure Master Plan work focused on identifying priority natural features, community resources and cultural resources in the Segment II-III area, especially the sensitive Little Miami River corridor, including preliminary measures for resource protection and providing a context-sensitive framework for transportation planning. The Green Infrastructure Master Plan recommendations are being used by local communities to guide future land use planning and community development, and provide context for the refinement of alternatives and mitigation development in the Eastern Corridor transportation investment area during Tier 2. Further discussion of environmental commitments and mitigation for Segment II-III are presented in Section 3.15.

Design Assumptions for Relocated SR 32

Segment II-III involves consolidating and managing access points to establish relocated SR 32 as an Access Category II urban arterial roadway west of I-275 (public access provided by interchange or public street intersection only as defined in ODOT's State Highway Access Management Manual). Total length of Segment II-III (highway) is approximately six miles.

Existing SR 32 in the Segment II-III study area is classified as a two-lane, urban minor arterial with no access control as journalized. The posted speed limit is 25 to 50 mph in Newtown and 55 mph in remaining portions of the study area. Existing average daily traffic (ADT) volumes on SR 32 in Segment II-III range from approximately 12,700 to 23,900 vehicles per day west of Newtown to approximately 22,000 to 24,900 vehicles per day east of Newtown (see Table 1). Design Year 2030 Build ADT volumes on relocated SR 32 are projected to range from approximately 29,900 vehicles per day west of Newtown to up to 41,800 vehicles per day east of Newtown (see Table 1). Other key design assumptions for Segment II-III include the following:

- A mainline typical section for relocated SR 32 consisting of (see Figure 5):
 - Four 12-foot wide driving lanes (two in each direction) with an 11-foot wide raised median
 - Travel lanes bordered by ten-foot wide outside shoulders, four-foot inside shoulders and a vertical curb, an eight-foot wide greenspace, a ten-foot wide bike/pedestrian path, and an outside two-foot wide greenspace on the north side of centerline¹
 - A 40-foot wide transit corridor located along the south side of the eastbound travel lanes (to accommodate a two-track rail transit facility)
 - A total typical section width of 148 feet excluding slopes
- Design speed of 55 mph with a posted legal speed of 50 mph. All geometric aspects of alignment will meet or exceed requirements set forth in the ODOT Location and Design (L&D) Manual, Volume 1 based on this design speed. Posted and design speeds for roadways crossing relocated SR 32 are as follows:
 - Red Bank Road: 55 mph design; 50 mph posted
 - US 50: 55 mph design; 50 mph posted
 - Newtown Road/Church Street: 40 mph design; 35 mph posted

¹ East of Newtown (in the Mount Carmel Hill area), the proposed typical section for relocated SR 32 excludes the bike/pedestrian path.

- Round Bottom Road: 45 mph design; 35 mph posted
 - Little Dry Run/Eight Mile Road: 40 mph design; 35 mph posted
 - Eight Mile Road/Mount Carmel Road/Cincinnati-Batavia Pike: 40 mph design; 35 mph posted
- Closed/surface drainage systems.
- Major interchange modification at US 50/Red Bank Road and coordination of a rail transit tie-in to the proposed interchange and multi-modal station at this location.
- A multi-modal, clear-span crossing of the Little Miami River including roadway, rail transit and bike/pedestrian access with no in-stream piers or other in-stream structures in the river channel.
- Controlled-access along the Little Miami River bottom (except for recreational purposes, as appropriate; access to the community of Shademoor via the local roadway network will be maintained).
- Consideration of floodplain issues in Newtown and in the river plains to the west of Newtown.
- A new at-grade intersection at Newtown Road coordinated with a proposed multi-modal transit station, access to parks and bike paths, and a crossing of an existing rail line (the Norfolk Southern line).
- At-grade intersections at Round Bottom Road/Little Dry Run Road, and a tie-in to the proposed Ancor Connector².
- An urban interchange at Mount Carmel Road.
- Left-turn storage lanes for all at-grade intersections.
- A profile which does not exceed a five (5) percent vertical grade (approximate) to accommodate parallel rail transit (particularly an issue in the Mount Carmel Hill area; see *Design Assumptions for Rail Transit and Transit Corridor Preservation* section below for further discussion).
- Coordination with other planned modal improvements, including bus transit, local network improvements, and bike/pedestrian facilities.
- Development of Post Construction Stormwater BMP's for both water quantity and water quality, since the project involves new construction with earth-disturbing activities greater than five acres. In addition, efforts to mitigate stormwater runoff in the sensitive Little Miami River floodplain will be appropriately addressed during project development, as discussed in the Land Use Vision Plan and the Green Infrastructure Master Plan.

Design Assumptions for Rail Transit and Transit Corridor Preservation

Segment II-III must be designed to accommodate rail transit components of the Eastern Corridor as established in the Tier 1 EIS/ROD, including: 1) Oasis Rail Transit - extending from downtown Cincinnati to Milford, and 2) preservation of a future Wasson Rail Transit corridor - extending from I-71 near Xavier University to the Eastgate area of Clermont County.

The Eastern Corridor Tier 1 study assumed that the Oasis Rail Transit corridor would utilize a diesel multiple unit (DMU) technology (which can run on standard freight rail track), and that the Wasson Rail Transit

2 The Ancor Connector is Hamilton County roadway project that will connect existing SR 32 to Broadwell Road east of Newtown.

corridor would utilize an electrified light rail transit (LRT) technology to link with a planned LRT facility to be located along I-71. Tier 2 studies being conducted as part of the Oasis Rail Transit study are further assessing the appropriate rail transit technology for the Eastern Corridor for consistency with current regional rail transit planning efforts. In general, DMU represents a worst-case scenario in terms of profile and geometric limitations. A rail transit corridor planned for DMU will geometrically accommodate LRT or similar rail transit technology should future studies determine that such technology is warranted. In one area of the Eastern Corridor - the Segment II-III Mount Carmel Hill area from Ancor to Eastgate - heavy DMU transit vehicles are not reasonably accommodated due to vertical grade constraints (the reasonable grade for proposed relocated SR 32 exceeds the maximum 2.5 percent grade for DMU). LRT technology, however, could be accommodated in this area, assuming that the maximum vertical grade for relocated SR 32 does not exceed five (5) percent. Other design assumptions and considerations for rail transit in Segment II-III are as follows:

- Joint rail operations (if utilized) will require temporal separation of transit and freight operations (see Section 3.11 for further discussion).
- A rail transit tie-in to the proposed new US 50/Red Bank Road interchange and nearby multi-modal station will be coordinated.
- The proposed rail transit will parallel relocated SR 32 for all or a portion of the Segment II-III length (to be determined as the project further develops), and will include joint use of a new Little Miami River crossing; the Segment II-III typical section includes a designated 40-foot wide transit facility on the south side of the proposed roadway travel lanes.
- The location of the proposed multi-modal station at Newtown Road (being developed as part of the Oasis Rail Transit study) will be coordinated with the new roadway intersection (relocated SR 32) and park/bikeway access; potential new at-grade crossings may be required in the Newtown area.
- A crossing of the existing Norfolk Southern rail line east of Newtown will be required (at-grade or grade-separated).
- Flood issues along Little Miami River and Dry Run will be considered.
- Preservation of the future Wasson Rail Transit corridor to Eastgate will be coordinated.

Design Considerations for Multi-modal Transit Stations

Multi-modal transit stations are proposed at two locations in the Segment II-III study area, including the US 50/Red Bank Road interchange area and Newtown Road. The location and design details of these stations are being developed as part of the separate Oasis Rail Transit study (PID 86463). Design assumptions for transit stations used in this Feasibility Study (from Tier 1 studies) are summarized below and will continue to be coordinated with the current Oasis Rail Transit study:

- US 50/Red Bank Road Interchange Transit Station: The new US 50/Red Bank Road interchange area is planned as a multi-modal convergence point for the Wasson rail line from the west, the Oasis rail line from the south, proposed bike paths along Wasson Road, Red Bank Road, and the south edge of Mariemont (not included in this project), and bus transit routes using Red Bank Road, Wooster Pike and US 50. The preliminary location of the multi-modal transit station identified in Tier 1 is just east of the proposed new US 50/Red Bank Road interchange, on the south side of relocated SR 32 between Wooster Pike and the Little Miami River. Station access from Wooster Pike (with limited parking) would be

provided. Rail platforms would be elevated from the station/parking area (grade-separated). The preliminary estimated land area required for this station (from Tier 1) is 3.3 acres (143,360 square feet).

- Newtown Road Transit Station: The location of this multi-modal transit station varies with the alternatives under consideration in the Newtown area. Access from Newtown Road, limited parking and pedestrian access would be provided. The preliminary estimated land area required for this station (from Tier 1) is 3.3 acres (143,360 square feet).

2.4 Description of Alternatives

Improvements in Segment II-III involve access management to establish relocated SR 32 as an Access Category II urban arterial roadway west of I-275, including a multi-modal, clear-span crossing of the Little Miami River for roadway, rail transit and bike/pedestrian access, coordination with the Oasis Rail Transit project, and new multi-modal transit stations at US 50/Red Bank Road and Newtown Road. For the development of preliminary alternative corridors in Tier 1, Segment II-III was divided into five subareas defined by land use, multi-modal connectivity, anticipated typical section requirements, and/or corridor footprint opportunities and constraints. These five subareas are referred to as:

- US 50/Red Bank Road Subarea: Includes the Red Bank Road corridor from Fair Lane in Fairfax south through the US 50/Red Bank Road interchange to just west of the Little Miami River.
- River Crossing Subarea: Consists of the area immediately to the west and east of the Little Miami River.
- River Plains Subarea: Extends east across the Little Miami River floodplain to Newtown Road.
- Newtown/Ancor Subarea: Extends from Newtown Road through the Ancor area just east of the Newtown village limits.
- Mount Carmel Hill Subarea: Extends east from Ancor through the Mount Carmel Hill area to the east project terminus at Bells Lane/Mount Carmel-Tobasco Road (near the I-275/SR 32 interchange).

Alternative segments developed in each of these five subareas are depicted on Figure 4 and are described below. Due to the various uses of the term “segment” in Tier 1 and this document (such as “Segment II-III” and “Rail Transit Segment 3”), the 21 preliminary alternative corridor segments advanced from Tier 1 for evaluation in this Feasibility Study will be referred to as “alternative(s)” for the remainder of this document.

US 50/Red Bank Road Subarea Alternatives

Three alternatives carried forward from Tier 1 are were evaluated in the US 50/Red Bank Road Subarea, generally distinguished by different interchange configurations:

- Alternative B1: This alternative involves a conventional full diamond-access interchange, with Red Bank Road/relocated SR 32 overpassing US 50, and two signalized at-grade ramp intersections at US 50.
- Alternative B2: This alternative uses a full-access “folded-diamond” interchange, with Red Bank Road/relocated SR 32 overpassing US 50, and two signalized at-grade intersections at US 50 (similar to Alternative B1, except that instead of a four-quadrant diamond, all ramps would be located in two quadrants to provide some advantages in footprint and signal-spacing).

- Alternative B3: This alternative would include a signalized at-grade intersection of Red Bank Road/SR 32 and a reconfigured Colbank Road connection to US 50. A second signalized “T” intersection would be located at Colbank Road and US 50. In Alternative B3, Red Bank Road/relocated SR 32 would underpass US 50. An additional at-grade intersection just south of US 50 would be utilized to provide connection to special-purpose lanes that could be utilized in Segment I improvements.

River Crossing Subarea Alternatives

Four multi-modal alternatives which include a clear-span crossing of the Little Miami River were evaluated in this subarea:

- Alternative C: Extends northeast along US 50 from the US 50/Red Bank Road interchange and crosses the Little Miami River upstream of Horseshoe Bend.
- Alternative D: Extends southeast from the US 50/Red Bank Road interchange and crosses the Little Miami River at Horseshoe Bend.
- Alternative E: Extends southeast from the US 50/Red Bank Road interchange and crosses the Little Miami River downstream of Horseshoe Bend, but upstream of Clear Creek.
- Alternative F: Extends south, then east from the US 50/Red Bank Road interchange, crossing the Little Miami River downstream of both Horseshoe Bend and Clear Creek.

River Plains Subarea Alternatives

Six multi-modal alternatives which traverse the Little Miami River floodplain west of Newtown were evaluated in this subarea:

- Alternative G: Connects to Alternative C and extends east to Newtown Road near Valley Avenue.
- Alternative H: Connects to Alternatives D or E and extends east, along the north side of Clear Creek, to Newtown Road near Valley Avenue.
- Alternative I: Connects to Alternatives D or E and extends east across Clear Creek (multiple crossing locations) to Newtown Road near Valley Avenue.
- Alternative J: Connects to Alternative F and extends east (generally south of Clear Creek) to Newtown Road near Valley Avenue.
- Alternative K: Connects to Alternative F and extends east (slightly south of Alternative J) and then northeast to Newtown Road near Valley Avenue.
- Alternative L: Connects to Alternative F and extends east, following the south side of the existing Norfolk Southern rail line to Newtown Road.

Newtown/Ancor Subarea Alternatives

Four multi-modal alternatives extending from Newtown Road east to the Ancor area were evaluated in this subarea:

- Alternative M: Connects to Alternatives G, H, I, J, or K and extends east along the north limits of Newtown and across a large gravel pit lake in the Ancor area.
- Alternative N: Connects to Alternatives G, H, I, J, or K, (located south of Alternative M), and crosses the Ancor area between several gravel pit lakes.
- Alternative O: Connects to Alternatives G, H, I, J, or K, and extends southeast (south of Alternative N), crossing Round Bottom Road and a large gravel pit lake (Barber Lake) in the Ancor area.
- Alternative P: The southernmost alignment in this subarea; connects to Alternative L and extends east thorough Newtown along the south side of the existing Norfolk Southern rail line.

Mount Carmel Hill Subarea Alternatives

The Mount Carmel Hill is a steeply-sloped wooded hill located north of existing SR 32 generally between Ancor and Bells Lane/Mount Carmel-Tobasco Road. Four multi-modal alternatives were evaluated in this subarea:

- Alternative Q: Connects to Alternatives M, N, O, or P and extends east across upper slopes of the Mount Carmel Hill on the north side of SR 32.
- Alternative R: Connects to Alternatives M, N, O, or P and extends east across middle slopes of the Mount Carmel Hill on the north side of SR 32.
- Alternative S: Connects to Alternatives N, O, or P and extends east across lower slopes of the Mount Carmel Hill, generally on the north side of SR 32.
- Alternative T: Connects to Alternatives N, O, or P and consists of a bifurcated design along Dry Run Creek, which runs parallel to SR 32 on the south side. The north (westbound) lanes of relocated SR 32 would generally follow the existing SR 32 alignment, while the new parallel eastbound lanes would be constructed south of the Dry Run channel.

No-Build Alternative

The No-Build Alternative consists of the continued use of the existing transportation network (including existing roadway and bus transit components) to meet the long-term transportation needs of the region within the Eastern Corridor. The No-Build transportation network includes the maintenance of existing facilities and systems, as well as near-term improvements scheduled for implementation for which funding has been committed (near-term projects included in the OKI Region's *Transportation Improvement Program*, or TIP, and Ohio's *State Transportation Improvement Program*, or STIP).

The Eastern Corridor Major Investment Study (OKI, April 2000) concluded that the No-Build Alternative would not meet the long-term transportation needs of the region or the Eastern Corridor area, and the specific consequences of the No-Build Alternative for the Eastern Corridor area (including the Segment II-III area) were documented in the Tier 1 EIS (see Appendix E). The No Build will continue to be among the alternatives studied as part of the Tier 2 evaluation and results will be documented in the Tier 2 environmental document and considered as part of the decision-making process.

3. ENVIRONMENTAL AND DESIGN ANALYSIS

3.1 Methodology and Environmental Resources Review

This section describes the key environmental features and design issues identified in the Segment II-III study area through the Tier 1 EIS work and post Tier 1 ROD studies (see Table 4 for list of supporting documentation). These features/issues relative to the Segment II-III alternatives are depicted on Figures 6 through 16. Preliminary impacts by alternative, calculated for 400- to 600-foot wide corridors depending on alternative/location, are reported in the comparative impact matrices (Tables 11 through 15) and represent the criteria upon which alternatives were evaluated for advancement into the next phase of work, or eliminated from further study. Preliminary alternatives and environmental and community resources within the Segment II-III study area are presented in an interactive pdf format in Appendix J.

3.2 Community Resources/Environmental Justice and Land Use

Population and Employment

Current population and employment projections used in the updated TDM modeling effort for the Eastern Corridor (HNTB, 2011) indicate an estimated 4% increase in population and 26% increase in employment from 2005 to 2030 within the Eastern Corridor Tier 1 detailed study area, which is generally consistent with trends reported in the Eastern Corridor Tier 1 EIS (which reported a 7% and 19% increase in population and employment by 2030, respectively). Updated socioeconomic information will continue to be refined using new 2010 U.S. census data when fully available for the Segment II-III area, and will be considered in further project development.

Developed Areas and Potential Displacements

The Segment II-III study area crosses the east edge of the City of Cincinnati, the south edges of Fairfax and Mariemont, the southwest edge of the community of Shademoor, the Village of Newtown, the north edge of Anderson Township in Hamilton County, as well as the west edge of Union Township and the community of Mount Carmel in Clermont County. At the west project terminus, the Cincinnati/Fairfax/Mariemont area contains a high-density mix of residential, commercial, and industrial land uses. Between US 50 and Newtown, the study area is comprised of the wooded and agricultural Little Miami River floodplain. High-density residential, commercial, and industrial land uses dominate the study area in and around the Village of Newtown. East of Newtown in the Mount Carmel Hill area, the Segment II-III study area contains a mix of undeveloped wooded uplands with scattered residential properties and subdivisions. At the east project terminus near the community of Mount Carmel, the study area is primarily comprised of residential and commercial land uses.

The Segment II-III study area contains several recreational land uses, including the Little Miami River Golf Center, the Little Miami Scenic Trail, and public parks with playing fields (along the Little Miami floodplain west of Newtown). These recreational areas are further described in Section 3.7 and shown on Figure 14.

Other notable commercial land uses in the Segment II-III study area include large gravel pit lakes located in the Ancor area to the north and east of Newtown, and three landfills, including the Hafner Landfill located along US 50 to the west of the Little Miami River, and the Newtown and Berger Landfills located along existing SR 32 just east of Newtown. These features are further discussed in Section 3.12 and shown on Figure 16.

A recent large development in the Segment II-III study area is the Horizon Community Church – located on the east side of Newtown Road between Valley Drive and the Little Miami River (see Figure 6). In the Tier 1 EIS, this site was identified as the privately-owned Indian Valley Golf Course. The new facility is a mega-church

built on fill in the Little Miami River floodplain with access provided from Newtown Road and Round Bottom Road. Coordination between Anderson Township and Horizon Community Church regarding the Eastern Corridor project took place during site development, and as a result, none of the alternatives evaluated in this Feasibility Study directly impact the new structure, however access from Round Bottom Road and some parking will be affected.

Other new development has occurred since Tier 1 or is planned in Newtown within the Segment II-III study area, including the newly-constructed Wags Dog Park on Newtown Road adjacent to the new Horizon Community Church, a planned indoor shooting range facility along Round Bottom Road, and a planned future business expansion (HydroSystems) along Round Bottom Road (see Figure 6). Each of these new businesses may be affected by one of more of the alternatives evaluated in this Feasibility Study, and are accounted for in the Potential Residential and Commercial Displacements listed in Tables 11 through 15. Additionally, in 2011 Martin Marietta obtained zoning approval by Anderson Township to develop an underground limestone mine in the Ancor area just northeast of Newtown. Based on review of preliminary site plans dated July 2008 that were included in the zoning permit package (provided by Anderson Township), the entrance to the mine and all surface facilities are located along Broadwell Road, outside the limits of the Segment II-III study area. The Segment II-III study area, however, does clip the edge of the proposed underground alignment, and coordination with Martin Marietta will be required in Tier 2 to assess and avoid/minimize potential encroachment. Development of the mine is pending ongoing litigation.

The Newtown area was identified in the Eastern Corridor Land Use Vision Plan effort as one of twelve “zones of potential change” in future land use (see Appendix B1), and the new businesses described above are generally consistent with anticipated future land uses in this area. The new and planned businesses in Newtown occur within areas designated in the Land Use Vision Plan as office, office/industrial and mixed land use, and are therefore consistent with the Land Use Vision Plan. An exception, however, is the new Horizon Community Church, which was constructed in an area designated in the Land Use Vision Plan as greenspace, leaving only a remnant greenspace corridor between the new church and the Little Miami River at this location.

Estimated residential and commercial displacements for Segment II-III by alternative segment are shown on Figure 8. Potential displacements were identified through review of the Tier 1 preliminary alternative corridors (400- to 600-foot wide corridor widths) overlain onto aerial photography and field observations.

Environmental Justice/Title VI Communities

Executive Order 12898 states that input from and consideration of low-income and minority populations must be included in the planning process to promote nondiscrimination in Federal programs. Elderly, disabled, and zero-car households are also considered when addressing environmental justice/Title VI community issues. Environmental justice and Title VI communities in the Segment II-III study area were documented in the Tier I EIS using 2000 Census Block Group data in accordance with the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) Policy for Environmental Justice (OKI, 2003). The data available during the Tier 1 work indicated that: a) Census 2000 Block Groups generally north of existing SR 32 in the Fairfax, Little Miami River valley, Newtown, Ancor, and Mount Carmel areas had low income populations, elderly populations, and disabled populations at or above the regional average for these population categories, b) there were no Census 2000 Block Groups in the Segment II-III study area with minority populations at or above the regional average, and c) there was one 2000 Census Block Group in the Segment II-III study area (in Mount Carmel) with zero car household populations at or above the regional average. Exhibits illustrating the Census 2000 Block Groups and environmental justice population data as presented in the Tier 1 EIS are included in Appendix F2. Updated socioeconomic information will continue to be refined using new 2010 U.S. census data when fully available for the Segment II-III area, and will be considered in further project development.

Schools

There is one school in the Segment II-III study area - the Miami Valley Christian Academy - located in Newtown just north of the intersection of SR 32 and Newtown Road (also known as Church Street). This property contains two school buildings and the Faith Christian Fellowship Church. The school is private and has an enrollment of approximately 275 students (preschool through 12th grade). There are no recreational facilities on the school property. The location of the school is shown on Figure 6.

Churches

There are six churches in the Segment II-III study area, including to the Faith Christian Fellowship Church (located just north of the intersection of SR 32 and Newtown Road), the Newtown United Methodist Church (on Newtown Road just south the Norfolk Southern rail line), the Faith Baptist Church (on SR 32 in the Village of Newtown, just east of Newtown Road), the Horizon Community Church (on the east side of Newtown Road on the former Indian Valley Golf Course property), the Greater Cincinnati Worship Center (on SR 32 in the Mount Carmel Hill area), and the All Saints Lutheran Church (in the community of Mount Carmel). The locations of these six churches are shown on Figure 6.

Cemeteries

Two cemeteries occur in the Segment II-III study area - the Flagg Spring Cemetery (also known as the Newtown Cemetery) and a small family cemetery. The Flagg Spring Cemetery is located in Newtown at the intersection of Round Bottom Road and the Norfolk Southern rail line (see Figure 6). Graves date to the early 1800's and two Native American burial mounds are preserved in this cemetery. The mounds and cemetery are listed on the National Register of Historic Places (see Section 3.6). The family cemetery (formerly the Rose Hill-Mount Carmel Presbyterian Cemetery), located north of SR 32 in the Mount Carmel Hill area, was partially relocated for the current SR 32 roadway and contains at least six graves, some dating back to the early 1900's. Locations of possible Native American burials in the Hahn Archaeological District west of Newtown are discussed in Section 3.6. Another family cemetery has been reported in the literature adjacent to the National Register Williams Edwards farm house (see Section 3.6), although previous surveys (by others) do not address whether it is still present.

Hospitals/Emergency Services Facilities

There are no hospitals or urgent medical care facilities located in or near the Segment II-III study area based on the results of field surveys and community directory searches. The Newtown police station is located on Newtown Road (Church Street) just north of SR 32 (see Figure 6). The Little Miami Joint Fire Department formed in 2004 as a merger between the Newtown Fire Department and the Fairfax/Madison Place Fire Department, and the new joint fire station is located at 7036 Main Street in Newtown (see Figure 6). The fire station is just outside the limits of the preliminary alternative corridors, but access will need to be considered as the project further develops. Police and fire stations serving Fairfax, Mariemont, and the Mount Carmel area (Union Township) are located outside of the Segment II-III study area. Evaluation of the effects of the Segment II-III project on emergency response routes/times will be conducted later in the project study, once additional access point locations/design details and maintenance-of-traffic plans are finalized.

Community Buildings/Facilities

No community/social centers or senior care facilities are known to exist in the Segment II-III study area, based on the results of field surveys and community directory searches.

Agricultural Land

Agricultural lands comprise approximately 15 percent of the Segment II-III study area, a majority of which is located in the Little Miami River floodplain west of Newtown (see Figure 6). These tracts of agricultural land are a combination of row-crop fields and sod fields. As documented in the Eastern Corridor Tier I EIS, most of the agricultural land in the Little Miami River floodplain is in agricultural districts. Other smaller areas of agricultural land occur east of Newtown along Round Bottom Road and existing SR 32.

Greenspace

Five publicly-owned and four privately-owned greenspace areas occur within the Segment II-III study area as listed in Table 5 and as shown in Figure 14. The Tier 1 work noted that these properties may not be Section 4(f)-applicable since they are either privately-owned, or their primary use/function (according to the owner) is land use preservation/control (not recreation or wildlife management). Section 4(f) applicability will be further evaluated as the project develops. These greenspaces are important land uses from an ecological and/or community perspective, and are therefore are an important impact consideration for this project.

Table 5. Public and Private Greenspaces in the Segment II-III Study Area

Greenspace Name	Size (acres)	Location	Owner
Old Fort Greenspace	21	Along the Little Miami River west of Newtown	Anderson Township
Greenspace - Batavia Road 1	34	East of Newtown in the Mount Carmel Hill Area	Anderson Township
Greenspace - Batavia Road 2	2	East of Newtown in the Mount Carmel Hill Area	Anderson Township
Anderson Township Greenspace	49	East of Newtown in the Mount Carmel Hill Area	Anderson Township
Greenspace - Whiting Way	10	East of Newtown in the Mount Carmel Hill Area	Anderson Township
Horseshoe Bend Preserve	NA	Along the west and east banks of the Little Miami River	Private
Miljoie Riding Academy	NA	South of SR 32 in Newtown	Private
Ivy Hills Country Club	NA	South of SR 32 in Newtown	Private
Homestead Stables	NA	East of Newtown in the Mount Carmel Hill Area	Private

The five Anderson Township greenspaces in Segment II-III were acquired with public funds which were obtained by township levy. The purpose of the Township's greenspace program is to preserve sites as permanent greenspace, and although public use is allowed, recreation is not the primary function of the properties and no recreational improvements (parking, trails, or amenities) are provided or planned.

The Horseshoe Bend Preserve is a privately-owned nature preserve located along both sides of the Little Miami River near the US 50/Red Bank Road interchange area. The property is owned by Little Miami River, Incorporated. As documented in the Tier 1 EIS, this preserve provides foraging and/or nesting habitat for a variety of mammals, herpetofauna, and birds, including several rare migratory species.

Visual Resources

Visually sensitive resources per Federal Highway Administration guidelines are defined as landscape components (landform, water, vegetation, manmade development, etc.) considered as having high visual quality in either the natural or urban area environment. Landscape components could be visually sensitive due to values related to visual excellence, as well as importance for historic, scientific, recreational or local community reasons.

Visually sensitive resources in the Eastern Corridor study area were discussed in the Tier 1 EIS. Visual resources specific to the Segment II-III study include: 1) the scenic Little Miami River corridor and Horseshoe Bend area, 2) the adjacent Little Miami River floodplain and surrounding wooded hills/bluff areas (including the Little Miami Golf Center, Little Miami Scenic Trail, Clear Creek Park, and Short Park recreational areas), and 3) the large areas of wooded hillside along existing SR 32 in the Mount Carmel Hill area, including the Anderson Township greenspaces. An important element of the Segment II-III project is a multi-modal “corridor” with rail transit and bike/pedestrian components paralleling the new SR 32 alignment, which will maximize right-of-way efficiency and minimize the size and visual impact of the project in the study area landscape.

3.3 Little Miami River Crossing

Segment II-III involves a multi-modal crossing of the Little Miami River in the area referred to as the “Horseshoe Bend”. The Little Miami is designated as a State Scenic River (per Section 1517.14 to Section 1517.18 of the Ohio Revised Code) and as a state-administered component of the National Wild and Scenic Rivers System per Section 2(a) (ii) of the Wild and Scenic Rivers Act (WSRA). These state and federal designations require the protection and enhancement of the Little Miami River’s free-flowing character, water quality, and designated Outstanding Remarkable Values (ORV’s) which include: scenic (aesthetic), recreational, fish and wildlife, geological, and historical.

Minimizing impacts of the proposed multi-modal crossing of the Little Miami River and developing an environmental stewardship plan has been an important consideration for the Eastern Corridor. Coordination conducted in Tier 1 with the Ohio Department of Natural Resources (ODNR), the National Park Service (NPS), and other agencies resulted in a project commitment to clear-span the Little Miami River in order to minimize impacts to this important resource.

The Tier 1 work documented historical meandering of the Little Miami River and the potential for future channel movement in the vicinity of the Horseshoe Bend. This migration history presents engineering challenges with respect to ensuring (to a reasonable extent) a clear-span crossing of the river, as well as addressing NPS Section 7 and other resource agency concerns.

To help address important issues related to the Little Miami River, the Eastern Corridor local partners (Hamilton County, Clermont County and the City of Cincinnati) administered two complimentary channel studies of the Horseshoe Bend:

1. Phase I and II geomorphic assessment and 2-D hydraulic modeling evaluations of the Little Miami River in the Eastern Corridor Segment II-III study area (CH2MHill, March and December 2009)
2. Geomorphological assessment of the Little Miami River - feasibility study and stream stability analysis (Stantec, February and December 2009)

The goal of this work was to better understand past, present, and potential future channel conditions of the Little Miami River in order to identify reaches within the Segment II-III study area determined suitable or unsuitable for a potential new clear-span crossing. Suitability was based on consideration of channel stability (river reaches with minimal future migration potential versus reaches where the likelihood/anticipated extent of future channel migration would preclude bridge construction), anticipated length of a clear-span crossing (more complex design and higher cost associated with longer structures), and other potential design constraints that could add to design complexity and/or project cost. Recommendations would be considered in Tier 2 as part of the evaluation of alternatives to be advanced for further study. Copies of the Little Miami River channel studies are included in Appendix I3 and I4 and findings are summarized below.

Hydraulic Modeling

This study (CH2MHill, March and December 2009) involved hydrologic analyses, a historic channel morphology and migration analysis, two-dimensional hydraulic and sediment transport modeling, and a suitability assessment of geomorphic reaches for a clear-span bridge crossing. The study concluded that the river reach upstream of Horseshoe Bend (see Figure 7) is the most stable and suitable for a clear-span crossing, while the stream reaches at the Horseshoe Bend area and downstream of the Horseshoe Bend were determined to have low suitability for a clear-span crossing due to dynamic hydraulic/channel conditions and an anticipated future avulsion or meander "cut-off".

Geomorphological Assessment

This study (Stantec, February and December 2009) involved a geomorphic analysis of the Little Miami River channel using Rosgen assessment methods. This study included historic map reviews and channel and adjacent floodplain surveys to determine morphological, channel stability and flow characteristics, as well as depositional, meander and erosion patterns of the Little Miami River channel. Findings of this study were similar to the hydraulic modeling assessment, having concluded that the river reach upstream of Horseshoe Bend is the most stable and suitable for a clear-span bridge crossing, while the stream reaches in the Horseshoe Bend area and immediately downstream of the Horseshoe Bend were determined to exhibit the least favorable characteristics for a clear-span crossing due to unstable channel conditions and an anticipated future avulsion. This study also identified a narrow reach just upstream of Clear Creek as being moderately stable (see Figure 7).

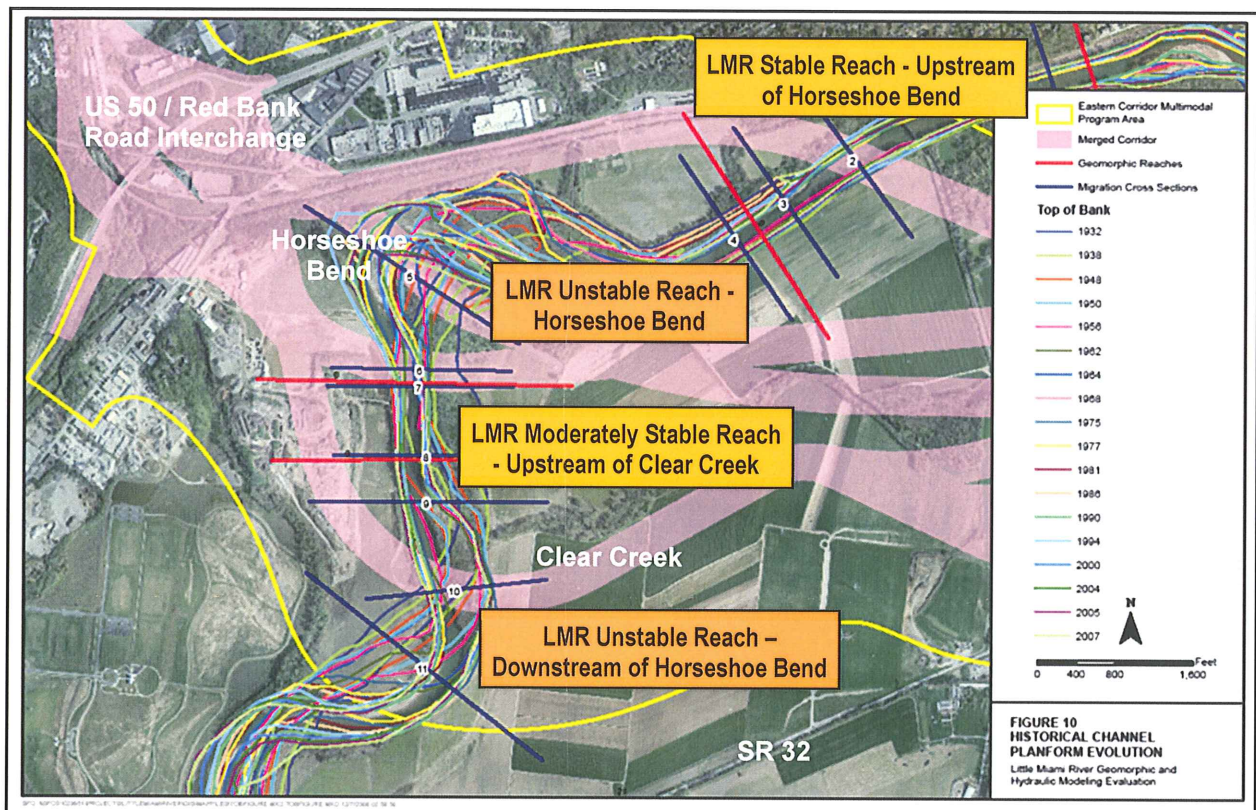


Figure 7 – Little Miami River Channel Studies (2009)

Evaluation

The Eastern Corridor Tier 1 work evaluated alternative multi-modal corridors that crossed the Little Miami River at three potential locations within the Segment II-III study area - at Horseshoe Bend, upstream of Horseshoe Bend and downstream of Horseshoe Bend. Both the hydraulic modeling and geomorphological studies completed after Tier 1 recommend against a crossing at the Horseshoe Bend and downstream of the Horseshoe Bend (at the southern limits of the Segment II-III study area) because of an anticipated river avulsion within the design-life of a new bridge, deeming it difficult from an engineering perspective to locate and appropriately design a clear-span crossing at these locations. The geomorphologic assessment (Stantec, December 2009) also identified a moderately stable channel reach just upstream of the mouth of Clear Creek (see Figure 7), but concluded that although a bridge crossing at this location may be feasible, siting a potential crossing would have design implications relative to the length of the required clear-span and the potential roadway embankment needed to accommodate Clear Creek, its slough, and adjacent floodplain.

3.4 Floodplains and Drinking Water Resources

Federal Emergency Management Agency (FEMA)-designated 100-year floodplain occurs in the Segment II-III study area along the Little Miami River, Duck Creek, McCullough Run, and Dry Run (see Figure 9). Floodplain along the Little Miami River in the study area is primarily associated with backwater flooding of the Ohio River. Floodplain widths along the river reach up to 6,000 feet, covering most of the study area from the US 50/Red Bank Road interchange in Fairfax to the east limits of Newtown, and the designated floodway width ranges from approximately 400 to 3,700 feet within the Segment II-III study area. Additional project costs are involved with crossing these broad floodway and floodplain areas along the Little Miami River. Specifically, structures will be required in lieu of embankment in order to cross the floodway, and appropriately-sized and placed drainage structures will be required throughout the length of the floodplain. These additional costs are included in the estimates discussed in Section 5.1 and presented in Tables 11 through 15 and Appendix G.

According to the Ohio Environmental Protection Agency (OEPA), most of the Segment II-III study area is located within a Class I portion of the Greater Miami Sole Source Aquifer (previously known as the Buried Valley Aquifer System), which was designated by the USEPA Region V in 1988 as a Sole Source Aquifer under Section 1424(e) of the Safe Drinking Water Act (see Figure 10 and Appendix F3 for location of this aquifer in relation to the project). In the Segment II-III study area, the Greater Miami Sole Source Aquifer covers the same general area as the Little Miami River floodplain. Overall, the aquifer covers portions of 14 counties in Ohio, extending from the Ohio River (Hamilton and Clermont Counties) in the southwest part of the state to Logan and Shelby Counties in west-central Ohio. The Class I portion of the aquifer consists of high to high-intermediate potential productivity areas, with well yields of ≥ 500 gpm based on aquifer characteristics and proximity to recharge. There is one public water system well within the Segment II-III study area - on the former Anderson Township Practice Range property, which is now owned by the Anderson Township Park District (see Figure 10 and Appendix F3). The well location on this property will not be impacted by any of the alternatives being evaluated in this Feasibility Study. Another protection area reported by OEPA in the general vicinity - the Township Fields and Tavern - is located outside of the Segment II-III study area and will also not be impacted.

3.5 Ecological Resources

An ecological study of the Segment II-III study area was conducted in the summer/fall of 2008 using methodologies outlined in ODOT's Ecological Manual (2005) and project-specific guidance provided by ODOT-Office of Environmental Services (November 2008). The findings of this study were documented in an *Environmental Resources Inventory Report* (ENTRAN, December 2008). Ecological resources in the Segment II-III study area are summarized below and depicted on Figure 11. Detailed mapping of ecological features from

the 2008 Ecological Resources Inventory Report are included in Appendix F4, and the complete document is included in Appendix I1.

Surface Streams

Field inspection and qualitative analyses of 51 stream sites (including two sites on the Little Miami River) were conducted in the Segment II-III study area in a manner consistent with ODOT and OEPA methodologies. Of the 51 stream sites evaluated, 14 involved USGS-mapped blueline streams. The largest of these, the Little Miami River, is designated by OEPA as an Exceptional Warmwater Habitat (EWH). The ecological study identified two provisional Warmwater Habitat (WWH) streams in the Segment II-III study area, including Unnamed Tributary #5 (tributary of the Little Miami River), and Dry Run (see Figure 11). Streams are assigned the provisional WWH designation if they contain high-quality channel structure/aquatic habitats and diverse aquatic biota. One Class III Primary Headwater Habitat (PHWH) stream - Unnamed Tributary #2 (tributary of Duck Creek) - was identified in the study area. Class III-PHWH streams possess a unique assemblage of cool/cold water-adapted species of fish, and/or salamanders, and/or cool water-adapted benthic macroinvertebrates that require flowing water on an annual basis for the resident species to complete their life cycles. Unnamed Tributary #2 is considered a provisional Class III-PHWH due to the field-confirmed presence of both juvenile and adult two-lined salamanders.

Wetlands

Twenty-six wetlands were identified in the Segment II-III study area (see Figure 11 and detailed ecological mapping in Appendix F4). Twenty-four of the 26 wetlands are less than one acre in size, and a majority of those 24 wetlands are less than 0.25 acre in size. All 26 wetlands are either limited-quality Category 1 features (eight wetlands) or moderate-quality Category 1 or 2, Modified Category 2, or Category 2 features (18 wetlands) based on OEPA qualitative and quantitative ORAM assessment criteria. Category 1 wetlands typically support minimal wildlife habitat, minimal hydrological and recreational functions, and do not provide critical habitat for (or contain) rare, threatened or endangered species. Category 2 wetlands typically support moderate wildlife habitat or moderate hydrological or recreational functions and, in general, are dominated by native species, but are generally without the presence of, or habitat for, rare, threatened or endangered species. Category 1 or 2 and Modified Category 2 wetlands are intermediate wetlands, possessing some of the qualities of both Category 1 and 2 features. No high-quality Category 3 wetlands were identified in the Segment II-III study area.

Wooded Habitat

There are approximately 950 acres of wooded habitat in Segment II-III, comprising about 29 percent of the total study area (see Figure 11 and detailed ecological mapping in Appendix F4). The most extensive tracts occur along the Little Miami River and in the Little Miami River floodplain, and along SR 32 in the Mount Carmel Hill area. Several of these wooded areas occur in public parks and public and private greenspace areas.

Federal and State-Listed Species

Suitable habitat for the federal endangered Indiana bat and running buffalo clover was identified in the Segment II-III study area, and suitable habitats for bald eagle and five mussels listed as federal candidate or special concern species were also identified, as described below (updated in December 2011):

- Indiana bat: Foraging habitat for Indiana bat occurs along streams within or on the edge of forested areas, with an open subcanopy, in floodplain forests, in and around forested wetlands and impoundments. Roost trees are live or standing dead trees or snags typically over eight inches in

diameter with exfoliating, peeling or loose bark, split trunks and/or branches, or cavities. Winter hibernacula are typically caves or abandoned mines. Approximately 29 percent of the Segment II-III study (about 950 acres) is wooded. No winter hibernacula are known to occur or have been observed in the Segment II-III study area.

- Running buffalo clover: Habitat requirements for this species include mesic conditions (rich soils most often, but not exclusively, derived from limestone or other calcareous bedrock); some form of prolonged, moderate, periodic disturbance from mowing, trampling, or grazing; and partial-to-filtered sunlight. Suitable habitat for this species was observed in the Segment II-III study area in a cemetery in Newtown, on wooded terraces adjacent to the Little Miami River and tributaries, in wooded areas within the Little Miami River 100-year floodplain, and along several trails (horse paths, deer trails, and all-terrain vehicle trails) through bottomland and upland wooded areas.
- Pink mucket mussel, fanshell mussel, rayed-bean mussel, sheepnose mussel, and snuffbox mussel: Pink mucket is found in the lower Ohio River and its larger tributaries in waters with strong currents, rocky or boulder substrates, with depths up to about three feet. It is also found in deeper waters with slower currents and sand and gravel substrates. Fanshell mussel is typically found in areas of packed sand and gravel at locations in a good current. The rayed bean mussel inhabits streams and small rivers having clean, coarse sand and gravel runs. The sheepnose mussel occurs in rivers with gravel substrates, relatively deep waters, and moderate current. Snuffbox mussel inhabits riffles of medium and large rivers with stony or sandy bottoms, usually buried deep in swift currents. Suitable habitat for all five mussel species is found in the Little Miami River within the Segment II-III study area boundaries, specifically in a riffle/pool reach of the Little Miami River occurring in the upstream portion of the Horseshoe Bend.
- Bald Eagle: Bald eagles prefer habitat near seacoasts, rivers, large lakes, and other large areas of open water. They prefer to nest, perch, and roost primarily in old-growth and mature stands of conifers or hardwoods. Eagles usually select the oldest and tallest trees that have good visibility, an open structure, and are near a good source of food. Studies have shown a preference for areas with "superdominant" trees, areas away from human disturbance and nesting sites near lakes with an abundance of warm-water fishes. Potential habitat for bald eagle occurs along the Little Miami River in the Segment II-III study area, although no nesting sites are known to occur within one mile of the study area.

Suitable habitats for five state-listed mussels (wartyback, threehorn wartyback, fawnsfoot, flat floater, and deertoe), five state-listed fish (blue sucker, mountain madtom, northern madtom, river redhorse, and burbot), two state-listed birds (loggerhead shrike and sora), and one reptile (false map turtle) were also observed in the Segment II-III study area, primarily in the Little Miami River corridor.

3.6 Cultural Resources

History/Architecture

The Eastern Corridor Tier 1 study included preparation of a cultural resources literature review and historic context report (Gray and Pape, 2002) for the entire Eastern Corridor, including the Segment II-III study area. That study identified 151 previously inventoried architectural resources, twenty-four of which (19 properties and 5 districts) were listed on the National Register of Historic Places (NRHP).

In January 2009, Gray and Pape completed a *History/Architecture Red Flag Summary for Segments II/III of the Eastern Corridor Multi-Modal Project in Hamilton and Clermont County* (see Appendix I5) in accordance with ODOT's Cultural Resources Manual (2004). The purpose of this study was to update the findings of the Tier 1 report, field-verify previously-reported resources, and document any new history/architecture resources that

may be of concern in the Segment II-III study area. The study identified eighteen resources in the Segment II-III study area that are either listed on the NRHP, or may be eligible for listing on the NRHP. These eighteen resources are summarized in Table 6 and shown on Figure 12. ODOT-Office of Environmental Services approved this Segment II-III red flag study in an IOC dated March 13, 2009.

Table 6. History/Architecture Resources in the Segment II-III Study Area

Resource Name (OHI Number)	Location	Status/Characteristics
Newtown Cemetery and Storage Building (HAM-2165-59 and HAM-2160-59)	Round Bottom Road, Newtown	Listed on the NRHP
Harrison Ladders House (HAM-6417-58)	6838 School Street, Newtown	Listed on the NRHP
Joseph Martin House (HAM-6416-59)	6838 School Street, Newtown	Listed on the NRHP
William Edwards Farmhouse (HAM-6411-59)	3851 Edwards Road, Newtown	Listed on the NRHP
Mariemont Historic District	Mariemont	Listed on the NRHP
N&W Bridge over the Little Miami River (HAM-2321-57)	West of Newtown	Further study required; one of the few bridges of its type still extant in Ohio
Cultural landscape in Anderson Township encompassing the Motz and Turpin Farms	Little Miami River floodplain west of Newtown	Further study required due to the history of farming and the longevity of the Motz and Turpin families on this land (over 100 years)
Newtown Feed and Supply (HAM-6432-59)	6876 Main Street, Newtown	Further study required; good example of an architectural style
Scot and Nancee Rogers House (HAM-6429-59)	6730 Main Street, Newtown	Further study required; good example of an architectural style
Universalist Church/Van Lock Building (HAM-1970-59)	3607 Church Street, Newtown	Further study required; good example of an architectural style
Isaac Edwards House (HAM-6412-59)	3872 Round Bottom Road, Newtown	Further study required; good example of an architectural style
Apple House (HAM-3260-59)	8002 Cincinnati-Batavia Road (SR 32) East of Newtown	Further study required; good example of an architectural style
William C. Apple House (HAM-3261-59)	8210 Cincinnati-Batavia Road (SR 32), east of Newtown	Further study required; good example of an architectural style
Rose Sava House and Barn	8016 Cincinnati-Batavia Road (SR 32), east of Newtown	Further study required; good example of an architectural style
Gerard Lodge F&AM/No. 11 District School (HAM-4938-59)	3511 Debolt Street, Newtown	Further study required; good example of an architectural style
Imogene Whitley House	6810 Main Street, Newtown	Further study required; good example of an architectural style
Herbert Waddell House	3520 Crawford Street, Newtown	Further study required; good example of an architectural style
Mary Ingram House	7913 Cincinnati-Batavia Road (SR 32), east of Newtown	Further study required; good example of an architectural style

Cultural resources which are listed or determined eligible for listing on the NRHP are protected by Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966; avoidance or minimization/mitigation of impacts to those resources is required.

Archaeology

Tier I Archaeology Efforts

Initial cultural work documented in the Tier 1 EIS was based on review of secondary source data (no field studies), which identified a number of previously inventoried archaeological resources in the Eastern Corridor, primarily concentrated in the Segment II-III study area along the Little Miami River floodplain and adjacent bluffs. Two districts listed on the National Register of Historic Places (NRHP) were reported from the project study area, including: 1) Hahn Archaeological District - a 690 acre rectangular shaped district located north of SR 32 just west of the Village of Newtown and including village/burial sites and a range of activity-areas dating to the late Woodland and Fort Ancient cultural periods, and 2) Perin Archaeological District located in Newtown west of Newtown Road and comprised of an extensive Middle Woodland-period and Hopewell village site. The Tier 1 work noted that site boundaries and significance of resources within these districts have never been fully evaluated and that additional study in Tier 2 was needed. The Tier 1 work also noted that all of the preliminary alternative corridors under consideration impacted either one or both of these known National Register archaeological districts.

Early coordination letters were sent in June 2003 during the Eastern Corridor Tier 1 work to 17 Native American Tribes as part of the Section 106 consulting process. Letters of response during Tier 1 were received from the Delaware Tribe of Western Oklahoma (now Delaware Tribe of Indians) and Peoria Tribe of Indians of Oklahoma. Neither tribe had expressed objection at the time to the proposed Eastern Corridor project, but requested that appropriate tribes be contacted should skeletal remains be found during construction activities.

Preliminary mitigation measures for the Eastern Corridor described in the Tier 1 EIS and the Tier 1 ROD noted the need to further address archaeological resources in Tier 2 project development. Specifically, commitment was made to complete all required field studies in order to locate and identify significant archaeological resources, conduct Section 4(f) evaluation (as needed) and develop appropriate mitigation measures following coordination with resource agencies during the Section 106/4(f) process. Additionally, a framework for cultural resources protection and mitigation was included in the Green Infrastructure Master Plan to be further developed in Tier 2, providing opportunity for continued coordination with Segment II-III mitigation needs.

Post-Tier 1 Archaeology Efforts

Archaeological Modeling Study (2009) - Recognizing the archaeological sensitivity of the area from Tier 1 and the need for additional study to help identify important resources for avoidance/minimization, the Eastern Corridor local partners in 2008-2009 sponsored a preliminary investigation to help identify locations of high archaeological potential within the Segment II-III study area. This study was based on ODOT guidance from a scoping meeting held on June 11, 2008 and involved evaluation of secondary source materials including previously recorded archaeological site information, archaeological background/historic context information, maps showing historical land uses and Little Miami River migration, soil data, informal reconnaissance of the project area, and landowner interviews. Findings are reported in *An Archaeological Modeling for Segment II-III of the Eastern Corridor Multi-modal Projects* (Gray & Pape, January 2009; see Appendix I6). For this effort, the Segment II-III study area was divided into three zones (see Figure 13) based on geographical setting and potential for development to have affected the presence and integrity of archaeological deposits. Preliminary high-sensitivity areas were identified within each of these zones.

Zone 1 encompassed the undeveloped Little Miami River floodplain and terraces between US 50 and Newtown, including the Hahn Archaeology District and associated Hahn Village site, which contains a known Fort Ancient village and a known Middle Woodland occupation that were the foundation for the NRHP listing of this district. Zone 1 is rich in known archaeological resources. Areas of high sensitivity were identified as

those expected to contain sites related to food-producing cultures, i.e., sites that are generally artifact-rich, highly complex, and with a high potential to contain human burials. Available information suggested that village and burial sites are expected to occur in areas with elevations above 484 or 486 feet, and that sites at lower elevations are likely to be hunter-gatherer sites of lesser complexity. Locations in Zone 1 impacted by recent meandering of the river were considered to have a low potential to contain intact sites.

Zone 2 encompassed portions of the Little Miami River floodplain and terrace areas that have been subject to historical development, including portions of Fairfax, Mariemont, Newtown and a portion of the Hahn Field and Perin Village Archaeological Districts. Areas of high sensitivity in Zone 2 were identified as those with known archaeology sites not apparently affected by recent development, including an NRHP-listed mound complex and cemetery site referred to as the Odd Fellows Cemetery Mounds 1 and 2 (located in the Flagg Spring Cemetery, which is also known as the Newtown Cemetery). Locations impacted by recent development were considered less likely to contain intact archeological resources. This included the NRHP-listed Perin Village Archaeological District, where although intact sites have been documented, earthmoving activities associated with construction of a golf course in this area in the 1960s is anticipated to have disturbed many of these sites, potentially affecting archaeological integrity.

Zone 3 encompassed the portion of the Segment II-III study area east of Newtown, including the McCullough Run and Dry Run valleys and surrounding uplands. Relative to Zones 1 and 2, there are fewer known archaeological sites in these areas, although the potential exists for mounds (high sensitivity) to be located on ridge tops overlooking stream valleys.

Archaeology Literature Review (2010) - Based on review of the 2009 archaeological modeling study, ODOT in cooperation with FHWA and coordination with the Ohio Historic Preservation Office (OHPO), determined the need to obtain broader context on the possibility of encountering Native American burials through a comprehensive literature review of known archaeological sites (especially burials) and previously disturbed areas for use in Segment II-III alternatives development. The scope of the literature review included identification of known archaeological resources, NRHP properties, and locations where human remains may be expected within the study area, and an evaluation of the level and intensity of disturbance within the study area relative to the potential for areas to contain intact archaeological sites. Findings were reported in: *Background Literature Review and Disturbance Assessment for Segment II-III of the Eastern Corridor Multimodal Project* (Gray & Pape, December 2010). This report included a bibliography of relevant archaeological work, tables containing pertinent archaeological information, and a series of comprehensive GIS map layers illustrating various aspects of the literature review findings (see Appendix I8). This archaeological literature review identified 87 bibliographical references including 44 cultural resource management (CRM) sources, 26 museum/university sources, 6 publications, 6 amateur sources, 3 newspaper articles and 3 other informants. A total of 98 archaeology sites and 13 cemeteries were identified in the literature review study area. Eighty-three of these sites were previously recorded with the Ohio Historic Preservation Office. An overview of key information associated with the 98 sites is presented in Table 7:

Table 7. Archaeology Literature Review (2010) Site Information Summary

Site Type	No. Sites	NR Status	Complexity	Human Remains	Disturbance Level
Mound (various)	47	Listed: 4 sites Eligible: 1 site Destroyed: 16 sites Add. Study: 26 sites	Simple: - Complex: 31 sites Destroyed: 16 sites Unknown: -	Yes: 26 sites Suspect: 21 sites	Minimal: 2 sites Moderate: 8 sites Severe: 21 sites Destroyed: 16 sites
Habitation	6	Listed: 3 sites Eligible: 2 sites Destroyed: - Add. Study: 1 site	Simple: - Complex: 6 sites Destroyed: - Unknown: -	Yes: 6 sites Suspect: -	Minimal: 2 sites Moderate: 3 sites Severe: 1 sites Destroyed: -

Table 7. Archaeology Literature Review (2010) Site Information Summary

Site Type	No. Sites	NR Status	Complexity	Human Remains	Disturbance Level
Village	3	Listed: 1 site Eligible: - Destroyed: - Add. Study: 2 sites	Simple: - Complex: 3 sites Destroyed: - Unknown: -	Yes: 3 sites Suspect: -	Minimal: - Moderate: 3 sites Severe: - Destroyed: -
Cemetery / Burial	5	Listed: - Eligible: - Destroyed: 1 sites Add. Study: 4 sites	Simple: - Complex: 4 sites Destroyed: 1 site Unknown: -	Yes: 5 sites Suspect: -	Minimal: - Moderate: 4 sites Severe: - Destroyed: 1 site
Unknown	43	Listed: - Eligible: 2 sites Destroyed: 1 site Add. Study: 40 sites	Simple: 22 sites Complex: 14 sites Destroyed: 1 site Unknown: 6 sites	Yes: 10 sites Suspect: -	Minimal: 16 sites Moderate: 19 sites Severe: 7 sites Destroyed: 1 site
SUMMARY - ALL SITES	98	<u>NR Status</u> Listed: 5 sites Eligible: 3 sites Destroyed: 17 sites Add. Study: 73 sites	<u>Complexity</u> Simple: 22 sites Complex: 53 sites Destroyed: 17 sites Unknown: 6 sites	<u>Human Remains</u> Yes: 21 sites Suspect: 45 sites	<u>Disturbance Level</u> Minimal: 18 sites Moderate: 34 sites Severe: 29 sites Destroyed: 17 sites

Of the 98 identified sites, about half (54%) are characterized as archaeologically complex and a majority (67%) are known or suspected to contain human remains. Slightly more than half of the sites in the project area (53%) are reported as being minimally or moderately disturbed, primarily occurring along the broad Little Miami River floodplain, adjacent bluffs and older (pre-1960) developed areas of Newtown. Forty-seven percent of the sites are characterized as severely disturbed or completely destroyed, primarily occurring in gravel-mined areas to the west of Newtown and areas where recent development has occurred.

The findings of the literature review indicate a high probability that Native American burials could be encountered at almost any location in the project study area, excluding known sites identified as destroyed. Of the sites reported in the literature review, human remains are known from or are suspected to be encountered in areas along the Little Miami River floodplain, bluff areas located to the north of river channel along the south edge of Mariemont, as well as upland areas both north and south of SR 32 through Newtown east to Clermont County. The 2010 literature review also included an evaluation of the level and intensity of disturbances in the Segment II-III study area relative to potential for containing intact archaeological resources. Several of the least likely areas for encountering burials based on this evaluation are: gravel mined areas to the east of Newtown; floodplain areas associated with historical meandering of the Little Miami River, and recent (post 1960) development areas in Newtown.

Detailed information is not available for most of the sites described in the literature review. Comprehensive field excavations have historically not been allowed by key landowners in the floodplain area, and most of the Phase II work that has been performed in the area is limited to linear projects. As a result, actual site boundaries and/or relation of sites to each other have not been determined. Additionally, sites reported as moderately or severely disturbed may contain intact resources (even underneath existing developed areas) that may or may not retain archaeological integrity. Overall, the literature review reports that 74% of the sites identified in the study area require additional evaluation to determine National Register eligibility.

Reinitiated Tribal Consultation (2011) – Having obtained additional archaeological information from the 2010 literature review, FHWA in cooperation with ODOT reinitiated contact with 15 Native American tribes in March

2011³. Tribal consultation materials and summary of responses are presented in Appendix H4. The purpose of the recent coordination was to: a) notify the tribes that additional archaeological information was available for Eastern Corridor Segment II-III of potential interest and importance to them (access to the archaeology literature review information via a secure electronic website was established by ODOT with website instructions provided in the coordination letter), b) inform the tribes that FHWA, ODOT and the Ohio Historic Preservation Office (OHPO) were in the process of developing procedures and preparing a draft Programmatic Agreement (PA) for the treatment of human remains to be applied through all aspects of upcoming archaeological investigations for the project, and c) invite the tribes to participate as a Section 106 consulting party.

Of the 15 tribal consultation letters sent in March 2011, four tribes responded with acceptance to participate as a Section 106 consulting party (The Delaware Nation, Eastern Shawnee Tribe of Oklahoma, Seneca-Cayuga Tribe of Oklahoma, and Peoria Tribe of Indians of Oklahoma); three tribes have declined to participate (Prairie Band of Potawatomi Nation, The Shawnee Tribe, and Turtle Mountain Band of Chippewa), one tribe declined to participate but requested to be notified if and when human remains are encountered (Delaware Tribe of Indians), and the remaining seven tribes have not responded to date. None of the tribes expressed opposition to the project moving forward. These responses were generally consistent with those received during tribal consultation conducted in Tier 1.

Cultural Resources – Next Steps

In the next step of the Preliminary Engineering Phase of the project, prior to completion of the Alternative Evaluation Report, Phase I History/Architecture studies will be conducted for the alternatives advanced for further study. Phase II History/Architecture will be conducted in the Environmental Engineering Phase for the preliminary Preferred Alternative prior to completion of the Environmental Impact Statement.

Complex issues associated with archaeological resources in Segment II-III, specifically the likelihood for encountering Native American burials, will require additional studies, coordination with Native American Tribes and other consulting parties, and potential extensive mitigation. As noted in Tier 1 and confirmed by the 2010 archaeology literature review, detailed information is not available for most of the sites known from the area and comprehensive field investigation is needed to determine site boundaries, presence of intact resources and significance. The Tier 1 work identified on a broad scale the potential for encountering complex archaeological resources along the Little Miami River floodplain and adjacent bluffs in Segment II-III, and consistent with the intent of tiering, more detailed studies will be performed in Tier 2 to determine significance of resources and appropriate avoidance, minimization of impacts and mitigation measures will be developed in consultation with consulting parties as required under NEPA. Comparative impact matrices used in this Feasibility Study (Tables 11 through 15) include factors that help differentiate alternatives relative to the anticipated effort to address archaeological resources from information in the 2010 archaeology literature review.

3.7 Public Parks and Recreation Areas

Thirteen parks or recreational facilities occur within the Segment II-III study area boundaries (see Figure 14), based on community directory and maps reviews, stakeholder coordination, and field observations. Included are ten public parks, one public golf center, one nature preserve, and one bike trail. Descriptions of these features are presented in Table 8:

3 The two additional tribes contacted in Tier 1 (the Hannahville Indian Community of Wisconsin Potawatomi Indians of Wisconsin and the Pokagon Band of Potawatomi Indians of Michigan) have sent notification that they are interested in tribal issues in northern Ohio around Lake Erie only.

Table 8. Public Parks and Recreation Areas in the Segment II-III Study Area

Name	Size (acres)	Location	Owner	Description
Ault Park	224	City of Cincinnati, just west of the US 50/Red Bank Road interchange	Cincinnati Parks	Contains picnic facilities, nature trails, children's play areas, a pavilion, a lookout point, and numerous gardens.
Little Miami Golf Center	273	North of Newtown, west of Newtown Road (Church Street)	Hamilton County Park District	The property contains a 9-hole regulation golf course, a 9-hole par 3 golf course, a driving range, an 18-hole miniature golf course, a lawn bowling facility. The potential Section 4(f) portions of the property include Bass Island (for bird watching, fishing, and canoeing), and the parking lot/clubhouse area which serves as the southern terminus of the Little Miami Scenic River Trail.
Little Miami River Scenic Trail	NA	North of Newtown, along the Little Miami River and Newtown Road (Church Street)	Hamilton County Park District	A paved trail that follows an abandoned railroad along the Little Miami River from Newtown north for about 50 miles to Springfield in Clark County, Ohio. The southern terminus of the trail is located in the Little Miami Golf Center. The trail provides biking, cross-country skiing, rollerblading, backpacking and horseback riding opportunities, and canoeing access to the Little Miami River.
Mariemont Community Gardens	76	South of Mariemont along the Little Miami River	Village of Mariemont	A greenspace area owned by the Village of Mariemont. The site is mostly wooded, with some tracts of agricultural land. The potential Section 4(f) portion of the property involves an area used by residents of the Mariemont for gardening activities.
Mariemont Pool / Dogwood Park	16	Mariemont, just west of the US 50/Red Bank Road interchange	Village of Mariemont	Contains a public swimming pool and an adjacent park with hiking/nature trails.
Miami Bluff Park (The Concourse)	12	Mariemont, just west of the US 50/Red Bank Road interchange and Dogwood Park	Village of Mariemont	A park located on a high ridgeline (along Miami Bluff Drive) that overlooks the Little Miami River valley.
Short Park	22	Newtown	Village of Newtown	Contains a walking path, playgrounds, basketball courts, soccer fields, a gazebo, and open space for a yearly carnival. The Little Miami Golf Center is located north of Short Park. Land and Water Conservation Funding (LWCF) involved.
Newtown Firefighters Memorial	0.31	Newtown	Village of Newtown	A small park located just west of Church Street in the Village Newtown. Contains a memorial, gazebo, and benches.
Village of Newtown Mini-Park	0.3	Newtown	Village of Newtown	A small park located just west of Church Street in the Village Newtown. Contains benches and a gazebo.
Clear Creek Park	83	West of Newtown in the Little Miami River floodplain	Anderson Township Park District	Located in the Hahn Archaeological District. This park contains soccer fields, restrooms, concessions, and a shelter area. Future plans include a playground and a hike/bike trail.
Anderson Township Property	28	West of Newtown in the Little Miami River floodplain	Anderson Township Park District	Anderson Township Park District recently purchased this golf driving range property (formerly known as the Anderson Township Practice Range) adjacent to Clear Creek Park.

Table 8. Public Parks and Recreation Areas in the Segment II-III Study Area

Name	Size (acres)	Location	Owner	Description
				This property will continue as a driving range in the near-term but is expected to be converted to park use in the future.
Broadwell Woods	69	East of Round Bottom Road in the Mount Carmel Hill area east of Newtown	Anderson Township Park District	This property is listed by the Anderson Township Park District as a nature preserve.
Riverside Park	45	Along Round Bottom Road and the Little Miami River east of Newtown	Anderson Township Park District	Contains six ball diamonds, a hike/bike trail, a concession/restroom building, a playground and land available for soccer, rugby and lacrosse matches.
Mount Carmel Park	6	East project terminus in the community of Mount Carmel	Union Township	A small community park with soccer fields and a playground.

In 2011, the Village of Newtown purchased Barber Lake - a former gravel pit lake on north side of SR 32 just east of Round Bottom Road (see Figure 6). Plans for the lake have not been determined. The site is currently not open to the public, but may become a Section 4(f) resource in the future as use(s) are developed and implemented by the Village of Newtown.

Publicly-owned parks, recreation areas, and preserves are protected under Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966, and avoidance or minimization/mitigation of impacts to those resources is required. One of the facilities listed in Table 8 (Short Park) has also received Land and Water Conservation funding (LWCF) and is therefore subject to protection under Section 6(f) of the U.S. Department of the Interior Land and Water Conservation Act of 1965.

In the next step of the Preliminary Engineering Phase prior to completion of the Alternative Evaluation Report, recreational Section 4(f)/6(f) determinations will be completed for the alternatives advanced for further study in Segment II-III. Section 4(f)/6(f) Evaluations will then be conducted in the Environmental Engineering Phase for any Section 4(f) or 6(f) resource with an impact (transportation “use”) by the Segment II-III preliminary Preferred Alternative.

3.8 Noise Analysis

A *Preliminary Noise Screening* (ENTRAN, 2009) was completed for the Segment II-III project (see Appendix 17) and approved by ODOT in an IOC dated March 9, 2009. This screening was conducted in accordance with ODOT’s *Standard Procedure for Analysis and Abatement of Highway Traffic Noise; Standard Procedures (2008)*. An aerial photograph and field review was completed to identify noise-sensitive land uses occurring near the Segment II-III alternatives, and a total of 19 “analysis sites” were identified for screening. Field measurement of ambient sound levels was conducted at each of the 19 analysis sites to serve as a baseline for evaluating noise screening results. Traffic modeling data from 2003 was used for this screening, which consisted of Base Year (1995) and preliminary (non-certified) Design Year (2030) volumes. The volumes used in the identification of potential sound-level impacts are afternoon (p.m.) peak hour volumes, which typically present the daily “worst case” scenario at each analysis site.

In consideration of the rail transit component of this project, the Federal Transit Administration’s (FTA) *Transit Noise and Vibration Assessment* manual (FTA-VA-90-1003-06, May 2006) was consulted for procedural guidance as part of the preliminary noise screening. Section 3 of the *Transit Noise and Vibration Assessment* states that for projects which involve transit as part of new highway construction, the appropriate method for noise prediction and impact assessment depends on which noise source (highway or transit) is the dominant

source. In order to establish whether highway traffic or transit noise sources are dominant under Design Year (2030) conditions, a transit noise assessment model was used. This model, which is based on the *General Transit Noise Assessment* spreadsheet developed by FTA, assesses noise emissions associated with a variety of transportation-related sources, including moving and stationary railroad and highway sources. The results of the transit model runs for Segment II-III showed that highway traffic noise is the dominant peak hour source for all representative receptors under all applicable Build alternatives, and in 122 of the 136 total model runs, sound levels from highway sources were substantially higher (6.5 dBA to 19.5 dBA higher) than transit sources. Since the transit model runs indicate that highway noise is the dominant source for all representative receptors under all Build alternatives, ODOT determined that the FHWA Traffic Noise Model (Version 2.5) Lookup Table program would be utilized for the preliminary screening of sound levels and the identification of potential areas of noise impact.

Results of the Noise Screening

For the purposes of this screening, any receptor predicted by the TNM Lookup Table model to experience a Design Year (2030) sound level of 60 dBA or greater was considered a “potentially impacted” receptor. Sound-level modeling was conducted for Base Year (1995) and preliminary (non-certified) Design Year (2030) traffic conditions at the 19 analysis sites, addressing all applicable project alternatives. FHWA’s TNM 2.5 Lookup Table program was used to identify potential Design Year (2030) sound-level impacts at 45 representative noise-sensitive receptors selected for analysis within the 19 analysis sites. Of the 45 receptors analyzed, 22 could potentially experience Design Year (2030) sound-level impacts associated with one or more of the alternatives under study.

A preliminary cost of structural noise abatement was estimated for each area of potential impact, and a preliminary noise abatement cost per potentially benefitted receptor was calculated (see Appendix I7 for additional details). Preliminary noise abatement cost estimates were completed for 32 potential noise abatement areas located adjacent to 17 of the 21 alternatives under study for this project (Segments B1, B2, using ODOT noise policy methodologies. The preliminary noise abatement cost estimates range from \$379,600 (Alternative S) to \$2,330,800 (Alternative D) and are reported for each alternative in Tables 11 through 15.

Preliminary noise abatement cost estimates per potentially benefitted receptor were completed on the noise abatement areas located adjacent to Alternatives B1, B2, B3, L, M, N, O, P, Q, R, S, and T, using 2008 ODOT noise policy methods. Preliminary noise abatement cost per potentially benefitted receptor were not provided for the potential noise abatement areas located along Alternatives C, D, E, F and G since the only noise-sensitive receptor in those areas is the Little Miami River; likewise, a cost per potentially benefitted receptor was not provided for Potential Noise Abatement Area M1 since the Horizon Community Church is the only noise-sensitive receptor in that area and equivalent residences calculations were not available at the time the screening was conducted. Based on the preliminary analysis, 14 potential noise abatement areas have costs per potentially benefitted receptor that are below the \$35,000 threshold (potential noise abatement areas B1, B2, B3, L2, M2, N2, O1, O2, P1, Q1, Q2, R2, S1, and T2) (see Appendix I7).

Noise Considerations Involving the Little Miami River

As part of this screening-level analysis, an ambient field measurement was taken in October 2008 along the Little Miami River in the Eastern Corridor Segment II-III study area. An ambient sound level of 53 dBA was recorded, and a screening-level analysis for future (Design Year 2030) noise levels was performed using FHWA’s TNM Lookup Table program. The TNM Lookup Table program (highway-only analysis) predicted a Design Year 2030 noise level of 63 dBA for the four receptors representing the Little Miami River at the four alternative crossing locations (Alternatives C, D, E and F).

These predicted Design Year 2030 noise levels are below the FHWA Noise Abatement Criteria (23 CFR Part 772) threshold for recreational land uses (67 dBA). However, following the guidelines outlined in ODOT's noise policy (2008), these Little Miami River receptors were identified as "potentially-impacted" since the 2030 Build-condition sound levels at these receptors - as predicted by the TNM Lookup Table program - exceed the screening-level threshold for "potential impact" (60 dBA; see Appendix I7 for additional details).

Noise Analysis - Next Steps

The noise screening evaluated for this Feasibility Study is not a design-level noise impact analysis, and results will not be used to form final conclusions about sound-level impacts, abatement locations, or abatement costs. While this screening was conducted using FHWA and FTA-approved methods, certain information critical to making final sound-level impact determinations (such as certified design-year traffic data, detailed design plans, detailed land use, and topographic data) were not available at the time of the screening study or could not be utilized because the screening-level modeling programs used in this analysis are not designed to process those types of data. Furthermore, the current ODOT noise policy (effective July 2011) no longer includes use of TNM Lookup Tables for preliminary noise analyses. In the next step of the Preliminary Engineering Phase prior to completion of the Alternative Evaluation Report, a Preliminary Noise Analysis will be performed according to current (2011) ODOT noise policy for the alternatives advanced for further study in Segment II-III. This analysis will use updated traffic data and TNM 2.5 to investigate existing and predicted design-year sound levels, and will report the number of representative receptors predicted to experience sound-level impacts and an updated cost estimate for noise abatement associated with each alternative. If necessary, a Final Noise Analysis will be performed on the preliminary Preferred Alternative in the Environmental Engineering Phase, prior to completion of the Environmental Impact Statement.

3.9 Air Quality

The Segment II-III project is located within the jurisdiction of the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) Metropolitan Planning Organization (MPO). The relocation of SR 32 in the Segment II-III area is currently identified as a recommended project in OKI's *2030 Regional Transportation Plan 2008 Update* (adopted June 12, 2008). The Segment II-III project is also listed as "SR 32 West of IR 275" (preliminary engineering and environmental analysis to consolidate, manage access for relocated SR 32 west of IR 275; PID 86462) in OKI's *FY 2012-2015 Transportation Improvement Program* (TIP) (adopted April 14, 2011) and ODOT's *2012-2015 Statewide Transportation Improvement Program* (STIP).

All of Hamilton County and Clermont County is in a non-attainment area for eight-hour ozone and PM_{2.5}, (particulate matter) and a project-level PM_{2.5} conformity determination by ODOT will be required for this project. Based on traffic volumes presented in Table 1, project-level "hot spot" analyses for PM_{2.5} and carbon monoxide are not expected to be required for the Segment II-III project, though a qualitative Mobile Source Air Toxics (MSAT) analysis is anticipated. With regard to the alternatives currently under consideration for the Segment II-III project, are all expected to have similar effects on local and regional air quality since these alternatives: 1) are all located within the same general area, 2) will carry the same transportation modes and the same (or similar) traffic volumes and fleet mixes, and 3) will have the same (or similar) access-point locations and configurations.

In the next step of the Preliminary Engineering Phase prior to completion of the Alternative Evaluation Report, the need for project-level air quality studies will be determined, once certified Design Year (2030) traffic data is available and additional design work is completed. All project-level air quality studies will be completed in the Environmental Engineering Phase, prior to completion of the Environmental Impact Statement.

3.10 Potential Hazardous Materials Sites

A screening for potential hazardous materials sites was conducted in the Segment II-III study area in the summer/fall of 2008. This screening included visual inspection of all properties in the study area and a review of historic aerial photographs, USGS maps, Sanborn Fire Insurance Maps, and regulatory database information. The findings were reported in an *Environmental Site Assessment (ESA) Screening* (ENTRAN, December 2008) (see Appendix I2). A total of 89 sites were determined to have hazardous materials concerns and warrant further study if impacted. Of these, 41 occur within or immediately adjacent to the alternatives being evaluated in this Feasibility Study (see Figure 15), and were therefore recommended for Phase I study.

The majority of the 41 sites of concern are located: 1) at the west project terminus, in the immediate vicinity of the US 50/Red Bank Road interchange, 2) in Newtown, mainly along SR 32 and Round Bottom Road, and 3) at the east project terminus in the Mount Carmel area. These sites were recommended for Phase I study due to a wide range of potential hazardous material concern factors, including:

- Listing in one or more hazardous materials databases (no observed hazardous materials concerns; 13 sites). Most of these sites involve business that store, generate, or transport hazardous materials (RCRA database) or spill sites that required emergency response (SPILLS database).
- No database records but visual observations of potential hazardous materials concerns, including the presence of above-ground or below-ground storage tanks, drums, stained ground/odors, or business operations/types that could involve hazardous materials (9 sites). These sites mainly involve such businesses as repair shops, machine shops, and equipment storage/salvage yards. The Newtown Landfill (located along SR 32 in Newtown) is also included in this group.
- A combination of a database record listings and visual observations of potential hazardous materials concerns (19 sites). The majority of these sites involve current or former gas stations (UST/LUST database, indicating the presence of underground storage tanks), industrial properties in the Newtown area (RCRA/UST/LUST/SPILLS databases), the Hafner Landfill (located between US 50 and the Little Miami River), and the Burger Landfill (located along SR 32, just east of Newtown); both landfills are listed in the state-licensed landfill database. The three landfills in the area (Hafner Landfill, Newtown Landfill and Burger Landfill) will require special consideration (project time and cost) relative to site testing and potential remediation if impacted by the project. An estimated contingency for excavation/fill activities in these landfills is included in the cost estimates discussed in Section 5.1 and presented in Tables 11 through 15 and in Appendix G.

Phase I ESA's will be performed for hazardous materials concern sites occurring within the preliminary Preferred Alternative during the Environmental Engineering Phase of the project, prior to completion of the Environmental Impact Statement, followed by additional testing and remediation for individual impacted properties as necessary.

3.11 Rail Freight Considerations

Proposed multi-modal transportation improvements in Segment II-III will be developed to provide continued access for existing rail freight in the area which utilize the existing Cincinnati Terminal (Oasis), Norfolk Southern, and Wasson rail corridors and connect to the national railroad network to the east and west of the Cincinnati area. The DMU and LRT rail transit technologies proposed for the Eastern Corridor are non-FTA compliant and cannot operate concurrently with freight traffic. Thus, any shared track usage in the Segment II-III area (such as in the vicinity of the proposed US 50/Red Bank Road interchange) will require temporal separation of transit and freight for joint operation.

Multi-modal alternatives in the US 50/Red Bank Road vicinity will also be coordinated to provide continued access for existing rail freight to the Clare Yard located along the south edge of Mariemont. Alternatives in the River Plains area crossing the existing Norfolk-Southern rail line will be designed to adequately accommodate current and future freight use through the area.

3.12 Engineering/Design Considerations

Geotechnical

Soils throughout the Segment II-III study area are predominantly loams, silt loams, and silty clay loams. Highly-erodible soils in the Segment II-III study area are generally restricted to the valley walls above the Little Miami River and the steep slopes in the Mount Carmel Hill area (Casco silt loam, 25-35 percent slopes). Floodplain and bottomland soils occur in areas of low topographic relief along the 100-year floodplains of the Little Miami River, Dry Run, McCullough Run, and Duck Creek. Most of these soils are rich and well-drained, and primarily used for agricultural purposes (sod farms and row crop). The Ohio Department of Natural Resources characterizes the geological setting of the Segment II-III area as one of a buried valley where surficial deposits were formed. The modern Little Miami River has abraded a portion of the glacial lakebed deposits and glacial outwash through change of course and meandering. Modern flooding of the plain has produced deposits of recent alluvium. Underlying the alluvial flood deposits, the soil column may be described as a complex layering between sand and gravel with minor fines, thick sequences of outwash/valley train deposits with minor alluvium and lacustrine deposits. Overall, the local bedrock is Ordovician interbedded soft shale and limestone. The subsurface profile can be characterized by six primary categories: fill, upper clayey alluvium, upper sands, lake bed clays, granular outwash and bedrock. Soils and bedrock mapping in the Segment II-III vicinity is included in Appendix F1.

Three primary geotechnical issues were identified in the Segment II-III study area relative to transportation construction: 1) landslide-prone areas, 2) landfills, and 3) gravel mine lakes (see Figure 16):

- **Landslide-Prone Areas:** Landslide-prone areas in the Segment II-III study area correspond to steep relief areas along the Little Miami River in the US 50/Red Bank Road interchange area and in the Mount Carmel Hill area. These areas are typically associated with certain bedrock/soil/slope combinations, particularly colluvial soils along slopes derived from Kope Formation and lacustrine deposits. According to H.C. Nutting, who conducted a *Geotechnical Archive Review* for the Segment II-III study area in October 2008 (see Appendix F1), upper alluvium soils, which extend 10 to 15 feet below existing grade, are prone to stability issues on existing side-slopes with ratios steeper than 3:1. The additional costs involved with excavation/fill activities in landslide-prone areas are included in the cost estimates presented in Tables 11 through 15 and in Appendix G.
- **Landfills:** There are three landfills in the Segment II-III study area: the Hafner Landfill (located between US 50 and the Little Miami River) and the Newtown and Burger Landfills (located along SR 32 in Newtown). Landfills are geotechnical concern areas due to the array of materials that could potentially be buried in the landfill, compaction/stability issues, and potential hazardous materials issues. The additional costs involved with excavation/fill activities in landfills are included in the cost estimates discussed in Section 5.1 and presented in Tables 11 through 15 and in Appendix G.
- **Gravel-Mined Areas:** Gravel-mined areas are located in the Ancor area east of Newtown. Gravel-mining operations have formed the four lakes that currently are located in that area. According to Martin-Marietta, the depth of the northernmost lake (adjacent to Broadwell Road) is approximately 35 feet. The depth of the large lake crossed by Segments M and N ranges from approximately 18 to 28 feet, while the

depth of the small lake crossed by Segment M is unknown; likewise, the depth of the large lake crossed by Segment O (Barber Lake) is also unknown, though neither lake is expected to be greater than 30 feet deep. Special granular fill material is required for lake crossings of this nature, and the additional costs involved with crossing these lakes is included in the cost estimates discussed in Section 5.1 and presented in Tables 11 through 15 and in Appendix G.

In the next step of the Preliminary Engineering Phase prior to completion of the Alternative Evaluation Report, detailed geotechnical studies will be conducted for the alternatives advanced for further study in Segment II-III. Geotechnical studies will then be finalized in the Environmental Engineering Phase prior to completion of the Environmental Impact Statement.

Utilities

Preliminary utility coordination for Segment II-III was conducted in fall 2008 through the Ohio Utilities Protection Service (OUPS). Utility maps were received from Duke Energy, Cincinnati Bell, Cincinnati Metropolitan Sewer District, and Cincinnati Water Works. The *major* utility lines owned by these entities in the Segment II-III study area are shown on Figure 16, and include:

- Electric Transmission Lines: Two major electric transmission lines cross the Segment II-III study area. Both lines run southeast along Red Bank Road to the US 50 interchange. One line continues southeast across the Little Miami River at Horseshoe Bend, the southwest corner of the Village of Newtown, and extends south into Anderson Township. The second line runs east along the Little Miami River, then across the river and the north side of the Village of Newtown, and into the Ancor area. From there, the transmission line turns south, crosses SR 32, and extends into Anderson Township.
- Water Lines: One major water line is located in the Segment II-III study area. This water line is 36-inches in diameter and runs south along Red Bank Road, to the west of the US 50 interchange, and south along Wooster Road.
- Sanitary Sewer Lines: Six major sanitary sewer lines are currently located or are under construction in the Segment II-III study area. Four of these sewer lines (ranging from 33 inches to 60 inches in diameter) are located in the Red Bank Road/US 50 interchange area. A fifth sewer line, ranging from 30 inches to 54 inches in diameter, runs north-south along Newtown Road (Church Street). The sixth sewer line (under construction), ranges from 21 inches to 42 inches in diameter, and when complete will run east from the Newtown Road line through Ancor, southeast along SR 32, and south along Eight Mile Road.

Smaller utility lines serving individual residential and commercial properties are located throughout the Segment II-III study area. Preliminary estimated costs for utility relocations (including the major lines listed above) are included in the cost estimates presented in Tables 11 through 15 and in Appendix G.

In the next step of the Preliminary Engineering Phase prior to completion of the Alternative Evaluation Report, additional utility coordination and subsurface utility engineering (SUE) will be conducted for the alternatives advanced for further study in Segment II-III. Utility and SUE work will continue during the Environmental Engineering Phase prior to completion of the Environmental Impact Statement.

Earthwork and Drainage

Earthwork and drainage are important engineering considerations for the Segment II-III study area. Excessive earthwork activity, special excavation or fill requirements, special drainage requirements, and substantial excavation/fill imbalances drive up construction costs and extend construction schedules. In the Segment II-III

study area, there are four general locations where excessive earthwork activity, special drainage considerations, or special excavation or fill requirements are expected to be required:

- Little Miami River Floodplain/Floodway: Little Miami River and Clear Creek FEMA-designated floodway zones in Segment II-III are anticipated to require structure crossings (bridges) to accommodate flood events (assumed for this Feasibility Study as a worst-case scenario). In addition, substantial amounts of fill, with adequate openings to accommodate flood flows outside designated floodways, are expected to be required for all alternatives that cross the Little Miami River floodplain. Alternatives with shorter lengths through the floodplain area, consequently, will require less fill and have lower earthwork costs.
- Gravel-Mined Areas: Alternatives that cross the large gravel pit lakes in the Newtown/Ancor area will have special excavation and fill requirements, including placement of special, higher-cost granular fill material.
- Landfills: Three landfills occur in the in the Segment II-III study area. Landfill material is undesirable for use as a construction base, and alternatives that cross the landfills will have special excavation/fill and potential remediation needs.
- Mount Carmel Hill: The steeply-sloped Mount Carmel Hill area has a higher landslide potential; alternatives that cross these slopes will require more extensive excavation/fill work.

Earthwork and drainage issues will be continually evaluated throughout the project development process. Preliminary estimated costs for earthwork and anticipated drainage structures (including the specific issues described above) are included in the cost estimates presented in Tables 11 through 15 and in Appendix G.

Horizontal and Vertical Geometry

Based on preliminary engineering analysis, horizontal and/or vertical geometry issues may affect the location, design, or feasibility of Segment II-III alternatives in two primary areas - the Little Miami River crossing and the Mount Carmel Hill.

At the Little Miami River, preliminary assessment indicates that at several of the proposed crossing locations in the Segment II-III study area, the structure needed to clear-span the Little Miami River and account for potential future channel movement could require a lengthy tangent alignment, and therefore would pose geometric limitations (see Section 5.1). Additionally, the bridge type needed at several of the proposed crossing locations is expected to require the construction of high towers, which would encroach on the Lunken Airport glide path and therefore would not be feasible.

As described in Section 2.3, the vertical grade for relocated SR 32 in the Mount Carmel Hill area cannot exceed five (5) percent in order to accommodate future rail transit to Eastgate (the Eastern Corridor Wasson line).

Other potential geometry issues include location/design/alignment constraints associated with access points and intersections in the US 50 interchange area, and proposed access point locations at Newtown Road, Round Bottom Road, the proposed Ancor Connector, and Mount Carmel Road.

3.13 Fit with Other Eastern Corridor Improvements/Plans

The different transportation modes comprising the Eastern Corridor, including expanded bus, rail transit, highway, bike/pedestrian, and local network improvements, are to be coordinated and implemented to function together. Segment II-III improvements must not preclude planned Red Bank mainline and local

network improvements in Segment I and planned SR 32 mainline and local network improvements in Segments IV and IVa, as well as planned improvements associated with the Oasis Rail Transit.

The Oasis Rail Transit Study for the Eastern Corridor is being conducted by others (HAM/CLE Oasis Rail Corridor; PID 86463) and is examining use of the existing Norfolk Southern rail corridor for joint or side-by-side rail transit operation. The Segment II-III study, therefore, must closely coordinate alternatives development and evaluation with the Oasis Rail Transit study as both projects further develop, so as not to preclude use of the existing rail corridor, as well as the potential for a highway/rail transit mode-split east of the multi-modal Little Miami River bridge crossing.

In addition, the Eastern Corridor Tier 1 work established that proposed transportation improvements are to be coordinated around a future Land Use Vision Plan developed and adopted by local communities. Segment II-III improvements must consider specific land use goals identified for the Newtown/Ancor and Anderson Township areas, which include:

- Consolidate and manage access points to establish relocated SR 32 as a controlled-access roadway west of I-275, with a shared roadway/transit crossing over the Little Miami River.
- Improve connectivity.
- Reduce flood hazards and moderate stormwater runoff.
- Preserve land in the river plains area for agriculture or open-space, and re-establish forested streamside corridors along the Little Miami River to preserve and enhance water quality.
- Develop the Ancor and northeast Newtown area with a mix of office, industrial, and recreational land use (infill development).
- Revitalize the Newtown Neighborhood Business District.
- Create pedestrian-friendly areas.
- Preserve existing parks and greenspace, and create new parks and greenspace for underserved areas.

Finally, both the Eastern Corridor Land Use Vision Plan and the Green Infrastructure Master Plan emphasized protection of important natural, recreational, and land-use resources in the Segment II-III area, including the Little Miami River and other riparian corridors, parkland, agricultural bottomlands, wooded greenspace, and culturally-sensitive areas (see Appendix B). Segment II-III improvements must consider protection of these important resources.

3.14 Preliminary Cost Estimates

Construction Cost Estimates

Preliminary highway construction costs were developed in January 2012 using ODOT's C1 cost estimating methods. Per lineal foot rail transit construction costs prepared by URS were incorporated into the C1 estimates to provide a preliminary multi-modal construction cost estimate by alternative segment, as reported in Tables 11 through 15 and Appendix G1. Key cost estimate assumptions include the following:

- Preliminary construction cost estimates are in 2012 dollars (no inflation factors applied).
- Earthwork/drainage estimates include a combined highway/rail transit footprint.
- Rail transit costs associated with DMU technology were used for alternatives in the US 50/Red Bank Road Subarea, the River Crossing Subarea, the River Plains Subarea, and the Newtown/Ancor Subarea.

Rail transit costs associated with electrified LRT technology were used for alternatives in the Mount Carmel Hill Subarea.

- Costs associated with the crossing of the Little Miami River were based on estimated (preliminary) crossing lengths and structure types needed to clear-span the existing channel and account for potential future channel movement over an 80-year bridge life span.
- Costs associated with the crossing of floodway zones assumed that bridge structures would be required.
- Costs associated with the crossing of floodplain areas assumed use of special drainage accommodations.
- Costs associated with the crossing of gravel pit lakes were estimated for two scenarios: 1) crossing by use of a fill section and 2) crossing by bridge structure. An estimated lake depth of 20-feet was assumed based on information obtained from the property owner (Martin Marietta). Costs for the fill scenario assumed 2:1 embankments with the use of Granular Material, Type E for all volume below the water surface. The top of the granular material would be covered with Geotextile, Type D.
- Costs associated with the crossing of landfills included use of special excavation/fill/remediation contingencies.
- Electric transmission towers within the corridor limits were included as a unit cost for relocation (exact impacts to each tower and whether multiple towers would require modification if one tower is impacted will be determined as design progresses).

Right-of-Way Cost Estimates

Preliminary right of way cost estimates were prepared in December 2011 in accordance with ODOT requirements for preliminary project development. A separate cost estimator form was completed for each alternative (see Appendix G2). Key right-of-way cost estimate assumptions include the following:

- Preliminary right-of-way cost estimates are in 2012 dollars (no inflation factors applied).
- Preliminary construction limits were used to determine take areas as an alternative to using broader corridor widths.
- An average unit land value by category was determined for each alternative using auditor's tax card data.
- The number of structures taken was estimated using aerial photography overlaid with preliminary construction limits for each alternative.
- The cost for residential structures was based upon a representative sample for each alternative multiplied by the number of residential structures taken.
- The cost for commercial, industrial and agricultural structures taken is the sum of the auditor's values for structures taken in the alternative.
- Damages were not considered for this step in the estimating process.

3.15 Environmental Commitments and Mitigation

Throughout Eastern Corridor project development, emphasis has been placed on avoidance and minimization of impacts to community, economic, and environmental resources. Through development of and coordination with the land use vision and green infrastructure efforts there is expectation at the local level, as well as

requirement by state and federal resource agencies, that environmental protection measures initially developed in Tier 1 will be carried forward into more detailed development in Tier 2.

Preliminary mitigation measures for the Eastern Corridor are described in the Tier 1 EIS and Tier 1 ROD (see Appendices A and D). The general environmental mitigation strategy for the project includes six components: address project impacts; integrate mitigation with local programs; establish multi-jurisdictional and multi-agency participation; provide opportunity for a diverse funding source, using locally available resources as well as traditional transportation funding; and exemplify proactive environmental stewardship. Additionally, a framework for cultural resources protection and mitigation was included in the 2005 Green Infrastructure Master Plan (see Appendix B2) to be further developed in Tier 2, providing opportunity for continued coordination with Segment II-III mitigation needs.

Relative to environmental commitments to be carried forward into Tier 2, the preliminary measures identified in Tier 1 are still valid. Additionally, a commitment has been made for continued consultation with Native American tribes and other parties and groups with interests in cultural resources in the Eastern Corridor to develop appropriate field studies for compliance with Section 106 (see Section 3.6), as well as developing measures to minimize harm to identified significant sites and provide Section 4(f) evaluations, as necessary.

4. PUBLIC INVOLVEMENT

4.1 Eastern Corridor Tier 1 Public Involvement

The Eastern Corridor Tier 1 work included an extensive public outreach effort, consisting of a project information center, an Eastern Corridor website, community workshops, and stakeholder/advisory committee meetings (also open to the public). In addition, three rounds of public workshops were held during Tier 1 in May 2002, May 2003 and January 2004. A Public Hearing was held on December 9, 2004 to provide the public with an opportunity to review and comment on the Tier 1 Draft Environmental Impact Statement. An Eastern Corridor project website was also developed for the Tier 1 work, and a staffed public information drop-in center and project office was available within the project study area.

Four Tier 1 resource agency coordination meetings were held in January 2002, April 2002, October 2002, and October 2003. Representatives from one or more of the following were involved: Ohio Department of Transportation, Federal Highway Administration, Federal Transit Administration, Ohio Department of Natural Resources, Hamilton County Transportation Improvement District, the City of Cincinnati, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the U.S. Department of the Interior - National Park Service, the U.S. Army Corps of Engineers, the Ohio Environmental Protection Agency, the Ohio-Kentucky-Indiana Regional Council of Governments, the Southwest Ohio Regional Transit Authority (SORTA/Metro), and Clermont County.

4.2 Eastern Corridor Updates with Local Jurisdictions (2008)

A series of Eastern Corridor update meetings with local jurisdictions in the Segment II-III study area were held from October through December 2008. These meetings were sponsored by the Eastern Corridor local partners (Hamilton County, Clermont County and City of Cincinnati) to provide an update on Eastern Corridor Segment work, review current jurisdictional plans and concerns in order to coordinate with Eastern Corridor Segment II-III alternatives development, and discuss future green infrastructure plans and opportunities. Meeting minutes are included in Appendix H1 and summary by jurisdiction is presented in Table 9.

Table 9. Summary of 2008 Update Meetings with Local Jurisdictions

Jurisdiction and Date(s)	Comment/Discussion Summary	Disposition Relative to Tier 2 Project Development
Hamilton County Park District 10-07-08	<ul style="list-style-type: none"> Plans for Little Miami Golf Center and extension of the Little Miami River Scenic Trail Opportunities for coordination with the Eastern Corridor and green infrastructure development 	Comments consistent with Tier 1 input; coordination to continue relative to LMR facilities and green infrastructure opportunities
Village of Fairfax 10-20-08	<ul style="list-style-type: none"> Development and access plans for the Red Bank Road corridor Tier 1 US 50/Red Bank Road interchange options 	Comments consistent with Tier 1 input; coordination to continue relative to Red Bank corridor access and US 50 interchange development
Anderson Township 11-05-08	<ul style="list-style-type: none"> Need to identify a preferred alternative for Segment II/III Favors using existing rail corridor New church (Horizon Church) being constructed on east side of Newtown Road (Church Street) between Valley Drive and the Little Miami River. Access is to be provided from Newtown Road and Round Bottom Road. Anderson Township noted that they coordinated the Eastern Corridor Tier 1 alternatives with the church during site development. Noted a Native American re-burial site along Clear Creek Approximately half of 600 total parcels in the Old Fort area along Little Miami River recently acquired by township for potential future passive recreational use (this site was already identified in Tier 1 as a potential 4(f) area) Interest in continuing participation in green infrastructure work, including exploration of conservation easements 	Comments on the need to identify a preferred alternative and support for green infrastructure are consistent with Tier 1 input; as a result of coordination between Anderson Township and Horizon Church during site development, none of the Tier 1 alternatives directly impact the new structure, but affect access from Round Bottom Road and some parking; coordination to continue in Tier 2 to avoid/minimize impacts to the church and other identified resources and further develop green infrastructure opportunities
Village of Newtown 11-14-08 12-03-08	<ul style="list-style-type: none"> Primary concerns include avoiding/minimizing impacts to Newtown businesses and residences Southernmost corridor (from Tier 1) that follows existing NS rail line and SR 32 would not be acceptable due to business/residential impacts Newtown favors an alternative that extends as far north as possible, paralleling the Little Miami River Noted planned improvements to Short Park and the location of several new and planned businesses in Newtown: <ul style="list-style-type: none"> Wags Dog Park - located east of Newtown Road just north of Valley Drive, adjacent to the new Horizon Church Planned One-Stop Indoor Shooting Range - to be located off Round Bottom Road just east of the new Horizon Church Future HydroSystems expansion - planned for the north side of Round Bottom Road east of the shooting range Planned purchase of Barber Lake by Newtown (former gravel pit on north side of SR 32 east of Round Bottom) December 10, 2008 - Newtown letter to Hamilton County TID and Eastern Corridor resolution stating that the Village is not opposed to the concept of the Eastern Corridor, but opposes all alternatives proposed in Tier 1 through Newtown due to anticipated adverse impacts to the community, and calls for a new alternative less detrimental to Newtown 	Tier 1 preliminary alternatives represented broad corridors (not specific alignment locations) to be further developed, so there is opportunity during Tier 2 to consider new development in the Newtown area in the refinement of alternatives and identification of a preferred alignment; coordination to continue in Tier 2 to avoid/ minimize impacts to Newtown businesses and residences and the project team will continue to work with Newtown to address concerns regarding alternatives through this community
Village of Mariemont 11-18-08	<ul style="list-style-type: none"> Supports Eastern Corridor but concerned about pot. noise Noted recent stability issues in the bluffs area along the Little Miami River after recent heavy rains Discussed area's extensive cultural resources potential Discussed future plans for a bike route on US 50 from village library to Little Miami River Scenic Trail at Newtown Road 	Comments consistent with Tier 1 input; coordination to continue in Tier 2 relative to alternatives development and identified resources; a detailed noise analysis will be conducted to identify and mitigate potential noise impacts

4.3 Eastern Corridor Land Use Vision Update (2009)

A Land Use Vision Plan update sponsored by the Eastern Corridor local partners was conducted with local jurisdictions within Segment II-III including: Anderson Township, Columbia Township, Fairfax, Mariemont, Newtown, and Union Township (*Eastern Corridor Land Use Vision Update for Segment II-III*; Meisner + Associates and ENTRAN, 2009; see Appendix H2). The purpose of this effort was to review land use recommendations originally identified in the 2002 Land Use Vision Plan, identify current issues and community needs, and develop an updated vision for future land use in these areas. This work will be used in Tier 2 to help refine alternatives that support current economic development and natural resource preservation and enhancement goals of communities in the Segment II-III area.

Updated (2009) action agendas for the six jurisdictions were generally consistent with previous Eastern Corridor Land Use Vision planning conducted in 2002 and included:

- Consider importance of land use, greenspace development and economic development
- Protect property values in residential areas and retain businesses
- Encourage appropriate infill and new development
- Revitalize and renovate neighborhood business districts
- Conserve and preserve green areas and agricultural land
- Encourage and provide bikeways and pedestrian walkways
- Coordinate land use and transportation planning with local goals
- Reduce through traffic impacts and safety on community lands
- Better manage through traffic and anticipated construction traffic
- Encourage and provide multi-modal transportation/ bus/rail
- Minimize sound and light impacts on residential lands from new transportation improvements
- Evaluate economic impacts on Hamilton County and each jurisdiction
- Reduce negative impacts on jurisdictions (economic, community)
- Encourage economic growth

Additionally, the Village of Newtown continued to voice concerns first expressed during the 2008 Eastern Corridor update meetings regarding potential disruption to the Village's business and residential communities by a new transportation (roadway) facility, specifically by preliminary alternatives carried over from Tier 1.

4.4 Tier 2 Public Involvement Plan (PIP)

Planned Tier 2 public involvement efforts are described in the (draft) Segment II-III Public Involvement Plan (PIP) included in Appendix H3. In summary, ODOT and FHWA in cooperation with the Eastern Corridor local partners are implementing an integrated public involvement effort that includes 'program-level' and 'project-level' initiatives that provide regular input opportunities and consideration of public opinion as required under the National Environmental Policy Act (NEPA). The focus of the program-level PI effort, which is being administered by Hamilton and Clermont Counties in cooperation with ODOT/FHWA, is to actively engage stakeholders from communities across the Eastern Corridor and provide an accurate and consistent message about the multi-modal program, as well as provide input opportunities on the development/implementation of the multi-modal program as a whole. Key program-level initiatives include stakeholder advisory input, public meetings, social networking, media relations, newsletters, an Eastern Corridor project website and a telephone hotline. Project-level PI initiatives for Segment II-III are being administered by ODOT; key components include stakeholder advisory input (coordinated/integrated with the program-level PI initiatives), public meetings/hearing at key project development concurrence points, input opportunities as part of the Section 106 consultation process, resource agency/tribal coordination, and continuation of context sensitive/green infrastructure stakeholder initiatives carried over from Tier 1. A draft Project Coordination Plan that

establishes the framework for public and agency involvement during the Segment II-III environmental review process as required by Section 6002 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act (SAFETEA-LU 6002) is included with the Segment II-III PIP in Appendix H3.

5. COMPARATIVE EVALUATION OF ALTERNATIVES

The purpose of this Feasibility Study is to document key environmental features and design/cost considerations identified in the Segment II-III study area and perform a detailed comparative impact evaluation of alternatives carried over from Tier 1. Based on the results of this evaluation, alternatives for advancement to the next phase of work are identified.

5.1 Comparative Matrices and Impact Evaluations

The key environmental features and design/cost considerations identified in Segment II-III are described in Sections 3.2 to 3.14 and graphically depicted on Figures 6 through 16. Subareas, preliminary alternatives, and environmental and community resources within the Segment II-III study area are also presented in an interactive pdf format in Appendix J. Supporting documentation used in the comparative evaluation is listed in Table 4. The Segment II-III study area is divided into five subareas for the evaluation of preliminary alternatives (see Figure 4), including: 1) US 50/Red Bank Road Subarea, 2) River Crossing Subarea, 3) River Plains Subarea, 4) Newtown/Ancor Subarea, and 5) Mount Carmel Hill Subarea. Not all alternatives in one subarea connect to all alternatives in adjacent subareas. Therefore, in addition to evaluating environmental impact and design/cost characteristics, the ability to connect with favorable alternatives in adjacent subareas was also considered in recommending which alternatives within a subarea to advance for further study.

Tables 11 through 15 present comparative information by preliminary alternative corridor segment. Impacts for each alternative were estimated for 400- to 600-foot wide corridors, depending on location. Each subarea has a separate summary table, and at the bottom of each table, a preliminary recommendation is made for each alternative (“advance”, “eliminate”, or “eliminate and advance modification”). Comparative evaluations by subarea are presented in the following sections.

US 50/Red Bank Road Subarea Alternatives Evaluation

The US 50/Red Bank Road Subarea extends from the Segment II-III west terminus at Fair Lane (where it ties into Segment I) to an area just west of the Little Miami River. It consists of the area required for the proposed new US 50/Red Bank Road interchange and associated multi-modal improvements, and includes Alternatives B1, B2, and B3 carried over from the Tier 1 study.

Key Considerations in the US 50/Red Bank Subarea: The US 50/Red Bank Road Subarea is centered on the existing US 50/Red Bank Road interchange and occurs in a heavily-developed portion of Cincinnati/Fairfax/Mariemont (numerous residences and businesses). US 50, Red Bank Road, several local roads, as well as the existing Wasson, CTER, and Norfolk Southern rail lines all converge at this location. Key considerations in the evaluation of alternatives included: 1) tie-in with Segment I alternatives⁴, 2) residential and commercial displacements, 3) interchange configuration, traffic flow, levels-of-service, and local road network compatibility, and 4) accommodation of proposed rail transit, a multi-modal transit station, and existing rail freight.

4 Alternatives in Segment I at the time of the development of Alternatives B1, B2, and B3 consisted of two options: a Red Bank Road mainline widening alternative and a bypass alternative. Since the Tier 1 ROD, the Segment I bypass alternative has been eliminated, and the new US 50/Red Bank Road interchange being developed for Segment II/III must be configured to center on the existing Red Bank Road mainline (the location of current Segment I alternatives).

Comparative Evaluation of Alternative Corridors in the US 50/Red Bank Subarea: A comparative evaluation of alternatives in this subarea is presented in Table 11 and summarized below.

- Alternatives B1/B2/B3 - Alternatives B1, B2, and B3 each require minor modifications at their north termini in order to align with current Segment I alternatives. These modifications substantially reduce the number of residential displacements, and as a result, anticipated relocations for all three alternatives are expected to be similar (0 residential and 7 potential commercial displacements for Alternative B1; 0 residential and 7 potential commercial displacements for Alternative B2; and 2 potential residential and 5 potential commercial displacements for Alternative B3).

The conceptual US 50/Red Bank Road interchange designs for Alternatives B1, B2, and B3 as documented in the Tier 1 EIS included a full-diamond interchange, a folded-diamond interchange, and an urban interchange with at-grade signalized intersections, respectively. These were developed using 1995 base year traffic data and preliminary-level engineering, and were advanced through the Tier 1 study as concepts that could potentially be implemented - pending completion of certified traffic and more detailed design analyses, and pending the development of Segment I alternatives. Additionally, as documented in the Tier 1 EIS, the location and design of the Oasis Rail Transit (including the US 50/Red Bank Road multi-modal transit station) will be coordinated with the US 50/Red Bank Road interchange location and configuration, once appropriate design and traffic data become available.

Alternative B1/B2/B3 Recommendation: Combine into one corridor and advance for further study - Alternatives B1, B2, and B3 (with minor modifications to align with Eastern Corridor Segment I alternatives) have similar impact footprints and impact scenarios. All three alternatives will impact similar numbers of residences and businesses, and none of the alternatives is expected to have notably higher impacts to other environmental resources or features (see Table 11). Furthermore, none of the three alternatives has distinguishing design, traffic, rail transit compatibility, or anticipated cost benefits (or disadvantages) based on information available at this time. Effective evaluation of such benefits and disadvantages cannot be conducted until additional traffic modeling is completed (certified traffic) and additional design work is conducted in conjunction with Segment I alternatives development, a river crossing location, and a multi-modal transit station location. As a result, all three alternatives are being advanced as one combined preliminary alternative corridor footprint (see Figure 17), in which roadway/transit alignments and interchange configurations will be further developed.

US 50/Red Bank Road Subarea - Recommendations Summary (see Figure 17):

- Alternative B1: Combine footprint with Alternatives B2 and B3 and advance for further study.
- Alternative B2: Combine footprint with Alternatives B1 and B3 and advance for further study.
- Alternative B3: Combine footprint with Alternatives B1 and B2 and advance for further study.

River Crossing Subarea

The River Crossing Subarea extends from the US 50/Red Bank Road interchange east across the Little Miami River to the agricultural Little Miami River floodplain. It consists of the area needed to cross the river and associated floodway, and includes Alternatives C, D, E, and F carried over from the Tier 1 study.

Key Considerations in the River Crossing Subarea: This subarea is centered on the Little Miami River channel and is mostly undeveloped due to limitations posed by the broad floodway/floodplain through this area. A landfill is located on the west side of the river (the Hafner Landfill), and large tracts of agricultural and wooded land with sensitive archaeological resources associated with the NRHP-listed Hahn Archaeological District are located to the east of the river. Key considerations in the evaluation of alternatives included: 1) design of a

multi-modal crossing that clear-spans the Little Miami River channel (as required by commitment in the Tier 1 ROD), 2) encroachment on the Little Miami River and Clear Creek floodway/floodplain and associated ecological resources (see Figures 9 and 11), 3) sensitive archaeological resources associated with the Hahn Archaeological District and other Section 4(f) resources (see Figures 13 and 14), 4) the Hafner Landfill (see Figure 16), 5) potential construction cost issues, and 6) connectivity with adjacent River Plains Subarea alternatives.

Rail Transit Considerations: Two existing rail freight corridors occur within this subarea. The Norfolk Southern main line follows along the south edge of Mariemont and crosses the Little Miami River towards Newtown. The Wasson line parallels this main line along the south edge of Mariemont, terminating at the Clare Yard.

The Oasis Rail Transit study for the Eastern Corridor being conducted by others (HAM/CLE Oasis Rail Corridor; PID 86463) will be examining potential use of portions of the existing Norfolk Southern rail corridor for potential joint or side-by-side rail transit operation. The Segment II-III study in the River Crossing Subarea (as well as the River Plains and Newtown/Ancor Subareas) must closely coordinate alternatives development and evaluation with Oasis Rail Transit as both projects further develop, so as not to preclude use of the existing rail corridor, as well as the potential for a highway/rail transit mode-split east of the multi-modal Little Miami River bridge crossing.

Comparative Evaluation of Alternative Corridors in the River Crossing Subarea: A comparative evaluation of alternatives in this subarea is presented in Table 12 and summarized below. Supportive findings of two Little Miami River geomorphology studies and archaeological modeling and literature review studies conducted for Segment II-III are described in Sections 3.3 and 3.6, and the complete reports are included in Appendix I.

- Alternative C - Alternative C is located in a reach of the Little Miami River considered suitable for a clear-span crossing. There are no anticipated geometric issues with a bridge crossing at this location, and because the crossing occurs in a stable channel reach with a narrow floodway (requiring a shorter clear-span length and fewer structures to cross the floodway), the estimated construction cost of Alternative C (approximately \$111 million) is substantially lower than the other alternatives in this subarea, however the estimated right-of-way cost is \$1.4 million to \$1.8 million higher due to the potential displacement of one business. Alternative C closely parallels the existing rail freight crossing of the Little Miami River and crosses the Mariemont Community Gardens (a Section 4[f] property). Alternative C also clips the edge of the NRHP Hahn Archaeology District, but there are no known recorded or unrecorded archaeology sites within this alternative. The Village of Mariemont does not support Alternative C due to potential noise concerns. A preliminary noise screening conducted for Segment II-III concluded that 2030 Build sound levels in Mariemont are not likely to approach or exceed FHWA's noise abatement criteria. Further noise analyses will be conducted, once certified traffic is available additional design work completed.

Alternative C Recommendation: Expand corridor and advance for further study (Alternative C1) - Alternative C's estimated construction cost is \$186 million to \$506 million lower than the other River Crossing Subarea alternatives and it has no comparatively disproportionate environmental impact or design issues (or combination of issues) that would warrant its elimination at this time. It is the only alternative located in a stable reach of the Little Miami considered suitable for a clear-span river crossing. The Alternative C corridor, however, should be expanded (in conjunction with the Alternative G corridor) to allow greater flexibility in alignment development relative to coordination with the Oasis rail transit corridor, as well as avoidance/minimization of impacts to the Hahn Archaeological District should sensitive resources/sites be identified as further archeological studies are conducted.

- Alternative D - Alternative D crosses a highly unstable reach of the Little Miami River called the Horseshoe Bend, as well as an expansive area of floodway. Not only has the Horseshoe Bend area been historically

unstable, preliminary hydraulic and geomorphologic analyses indicate that future channel instability (meandering) is anticipated, such as a potential future avulsion (“cut off”) of the bend or a down-valley migration. Development of clear-span lengths and associated costs must account for these variables. There are also additional costs associated with this alternative due to an expansive floodway crossing (multiple structures anticipated). Consequently, the estimated construction cost of Alternative D is approximately \$617 million. In addition to high-cost issues, preliminary assessment indicates that the structure needed to clear-span the Little Miami River in the Horseshoe Bend area could require a lengthy tangent alignment, and therefore would pose geometric limitations. Additionally, the bridge type needed at this location is expected to require the construction of high towers, which would encroach on the Lunken Airport glide path and therefore not be feasible.

Alternative D Recommendation: Eliminate from further study - Critical cost and design issues associated with the construction of a clear-span bridge in this unstable Horseshoe Bend area and extensive floodway crossing warrants the elimination of Alternative D from further consideration.

- Alternative E - Alternative E crosses the Little Miami River and an expansive area of floodway just south of the Horseshoe Bend. Not only has the Horseshoe Bend area been historically unstable, preliminary hydraulic and geomorphologic analyses indicate that future channel instability (meandering) is anticipated, such as a potential future avulsion (“cut off”) of the bend or a down-valley migration. Development of clear-span lengths and cost estimates must account for these variables and, like Alternative D, there are also additional costs associated with this alternative due to an expansive floodway crossing (multiple structures anticipated). Consequently, the estimated construction cost of Segment E is approximately \$371 million. In addition to high-cost issues, preliminary assessment indicates that the structure needed to clear-span the Little Miami River at this location could require a lengthy tangent alignment, and therefore would pose geometric limitations. Additionally, the bridge type needed at this location is expected to require the construction of high towers, which would encroach on the Lunken Airport glide path and therefore not be feasible.

Alternative E Recommendation: Eliminate from further study - Like Alternative D, critical cost and design issues associated with a clear-span bridge in this unstable Little Miami River channel reach, as well as extensive floodway crossing, warrant the elimination of Alternative E from further consideration.

- Alternative F - Alternative F, the longest alternative in this subarea, encroaches on a large portion of the Hafner Landfill, crosses high-sensitivity archaeology sites, and crosses the Little Miami River and an expansive area of floodway south of the Clear Creek confluence downstream of Horseshoe Bend. This crossing area has been moderately stable historically (less stable within and south of the Alternative F crossing, but more stable just north of Clear Creek), and preliminary hydraulic and geomorphologic analyses indicate that future channel instability is anticipated. Development of clear-span lengths and cost estimates must account for these variables and, like Alternatives D and E, there are also additional costs associated with this alternative due to an expansive floodway crossing (multiple structures anticipated). Consequently, the estimated construction cost of Alternative F is \$296 million. In addition to high-cost issues, preliminary assessment indicates that the structure needed to clear-span the Little Miami River at this location could require a lengthy tangent alignment, and therefore would pose geometric limitations.

Alternative F Recommendation: Eliminate from further study - Like Alternatives D and E, critical cost and design issues associated with a clear-span bridge in this unstable Little Miami River channel reach, as well as extensive floodway crossing, warrant the elimination of Alternative F from further consideration.

River Crossing Subarea - Recommendation Summary (see Figure 17):

- Alternative C: Expand corridor and advance for further study (Alternative C1).
- Alternative D: Eliminate from further study.
- Alternative E: Eliminate from further study.
- Alternative F: Eliminate from further study.

River Plains Subarea

The River Plains Subarea extends across the Little Miami River floodplain east to Newtown Road (Church Street) in Newtown. It includes Alternatives G, H, I, J, K carried over from the Tier 1 study.

Key Considerations in the River Plains Subarea: This subarea is primarily in agricultural land use and has historically been part of two family farmsteads - the Motz farm and the Turpin (Fischer) farm. Since much of this subarea is located in Little Miami River floodplain and floodway, it is generally undeveloped outside of Newtown and the community of Shademoor. The River Plains Subarea is bisected (east-west) by Clear Creek, a tributary to the Little Miami River, and is rich with sensitive archaeological resources associated with the NRHP-listed Hahn Archaeological District and Perin Village Archaeological District. Several public parks and recreational features (Section 4[f] and Section 6[f] resources) are also located in this subarea. Key considerations in the evaluation of alternatives included: 1) impacts to high-sensitivity archaeology areas and other Section 4(f) resources (public parks/recreational resources), 2) the Little Miami River floodplain and Clear Creek riparian corridor, 3) agricultural and ecological impacts (wetlands and streams), 4) potential residential and commercial impacts in Newtown, 5) potential construction cost issues, and 6) connectivity with River Crossing and Newtown/Ancor Subarea alternatives. Additionally, access to the community of Shademoor via the local roadway network must be maintained.

Rail Transit Considerations: The Norfolk Southern main line, which follows the south edge of Mariemont, crosses the Little Miami River and extends through the River Plains Subarea towards Newtown. The Oasis Rail Transit study being conducted by others (HAM/CLE Oasis Rail Corridor; PID 86463) will be examining potential use of portions of the existing Norfolk Southern rail corridor for joint or side-by-side rail transit operation. The Segment II-III study in the River Plains Subarea must closely coordinate alternatives development and evaluation with the Oasis rail transit study as both projects further develop, so as not to preclude use of the existing rail corridor, as well as the potential for a highway/rail transit mode-split through east of the multi-modal Little Miami River bridge crossing.

Comparative Evaluation of Alternative Corridors in the River Plains Subarea: A comparative evaluation of alternatives in this subarea is presented in Table 13 and summarized below. Supportive findings of an archaeological modeling and literature review studies conducted for the Segment II-III project are presented Section 3.6, and the complete reports are included in Appendix I.

- Alternative G - Alternative G is the only alternative in the River Plains Subarea that connects with Alternative C (an alternative recommended to be advanced for further study from the adjacent River Crossing Subarea). Alternative G has no residential or commercial displacements, no wetland or stream impacts, and approximately 21 acres of agricultural land impacts. There are high-sensitivity archaeology sites associated with the Hahn and/or Perin Village Districts in Alternative G, including two previously recorded sites, both of which are considered complex, either moderately or minimally disturbed, and with known human burials. Additionally, there are two Section 4(f) recreational resources (Little Miami Golf Center and Little Miami River Scenic Trail) in this alternative. The estimated construction cost of Alternative G is approximately \$29 million.

The Alternative G corridor as currently configured does not accommodate evaluating use of the existing Norfolk Southern rail line through the River Plains Subarea as an option for the Oasis Rail Transit (being evaluated under separate study but closely coordinated with Segment II-III) and would need to be expanded. Expanding the corridor would also allow for alignment flexibility through the sensitive Hahn Archaeological District should significant resources be identified as further archeological studies are completed in the next phase of work.

Alternative G Recommendation: Expand corridor and advance for further study (Alternative G1) - Alternative G is the only alternative that connects to Alternative C (an adjacent alternative recommended for further study), and has no comparatively disproportionate impact, construction cost, or design issues (or combination of issues) that would warrant its elimination at this time. An expanded Alternative G corridor (Alternative G1) is recommended in order to provide opportunity for avoidance and minimization of impacts to potential significant archaeological resources in the Hahn Archaeological District (archaeological resources will be further evaluated in the next phase of work). An expanded corridor will also provide sufficient footprint for the evaluation of joint or side-by-side rail transit use with the existing rail corridor through this area, as well as a potential highway/rail transit mode-split as the project further develops.

- Alternative H - Alternative H does not connect with an alternative recommended for further study from the adjacent River Crossing Subarea. This alternative has one small wetland impact, approximately 187 feet of stream impact, and 32 acres of agricultural impact. There are high-sensitivity archaeology sites associated with the Hahn and/or Perin Village Districts in Alternative H, including four previously recorded sites, three of which are considered complex, either moderately or minimally disturbed, and all with known or suspected human burials. Additionally, there are two Section 4(f) recreational resources (Little Miami Golf Center and Little Miami River Scenic Trail) in this alternative. The estimated construction cost of Alternative H is approximately \$28 million.

Alternative H Recommendation: Eliminate from further study - Since there is no connection to an alternative recommended for further study from the adjacent River Crossing Subarea (along with other impact and cost considerations), it is recommended that Alternative H be dropped from consideration. Instead, the Alternative G corridor (see above) will be expanded in the River Plains Subarea to provide flexibility in alignment development as the project further develops.

- Alternative I - Alternative I does not connect with an alternative recommended for further study from the adjacent River Crossing Subarea. This alternative has one small wetland impact, and minimal agricultural impact (due to extensive bridging of the Clear Creek floodway). Alternative I crosses Clear Creek three times, impacting 515 linear feet of stream channel and disrupting the adjacent riparian corridor and wooded bottomland. The Clear Creek corridor represents one of the few remaining natural stream corridors along the Little Miami River bottomland in the Segment II-III area (most of the bottomland has been converted to agricultural use) and was identified in the Tier 1 Green Infrastructure Master Plan as a restoration/preservation opportunity. In addition, there are high-sensitivity archaeology sites associated with the Hahn and/or Perin Village Districts in Alternative I, including six previously recorded sites, three of which are complex, either minimally or moderately disturbed, and three sites with known human burials. Additionally, there are four Section 4(f) recreational resources (Little Miami Golf Center, Little Miami River Scenic Trail, Clear Creek Park, Short Park) in this alternative. Short Park is also a Section 6(f) recreational resource. The estimated construction cost of Alternative I is approximately \$49 million.

Alternative I Recommendation: Eliminate from further study - Since there is no connection to an alternative recommended for further study from the adjacent River Crossing Subarea, it is recommended that Alternative I be dropped from consideration. Additionally, Alternative I impacts the greatest number of

Section 4(f) recreational sites (along with Alternative K), has a substantially higher construction cost than the other River Plains Subarea alternatives (\$15 million to \$30 million higher), and results in extensive impacts to the Clear Creek corridor. Instead, the Alternative G corridor (see above) will be expanded in the River Plains Subarea to provide flexibility in alignment development as the project further develops.

- Alternative J - Alternative J does not connect with an alternative recommended for further study from the adjacent River Crossing Subarea. This alternative has two small wetland impacts (totaling 0.13 acre), approximately 225 feet of stream impact, and approximately 7 acres of agricultural impact. There are high-sensitivity archaeology sites associated with the Hahn and/or Perin Village Districts in Alternative J, including four previously recorded sites, three of which are complex, either minimally or moderately disturbed, and three sites with known human burials. Additionally, there are three Section 4(f) recreational resources (Little Miami Golf Center, Little Miami River Scenic Trail, Clear Creek Park) in this alternative. The estimated construction cost of Alternative J is approximately \$34 million.

Alternative J Recommendation: Eliminate from further study - Since there is no connection to an alternative recommended for further study from the adjacent River Crossing Subarea (along with other impact and cost considerations), it is recommended that Alternative J be dropped from consideration. Instead, the Alternative G corridor (see above) will be expanded in the River Plains Subarea to provide flexibility in alignment development as the project further develops.

- Alternative K - Alternative K does not connect to an alternative recommended for further study from the adjacent River Crossing Subarea. This alternative has approximately 557 feet of stream impact, and 31 acres of agricultural impact. There are high-sensitivity archaeology sites associated with the Hahn and/or Perin Village Districts in Alternative K, including five previously recorded sites, three of which are complex, either minimally or moderately disturbed, and three sites with known human burials. Alternative K directly impacts the Hahn Village site, which contains a Fort Ancient village and a Middle Woodland occupation with known burials that were the foundation for the nomination and NRHP-listing of the Hahn Archeological District. Alternative K also impacts four Section 4(f) recreational resources (Little Miami Golf Center, Little Miami River Scenic Trail, Clear Creek Park, Short Park). Short Park is also a Section 6(f) recreational resource. The estimated construction cost of Alternative K is \$27 million.

Alternative K Recommendation: Eliminate from further study - Since there is no connection to an alternative recommended for further study from the adjacent River Crossing Subarea, it is recommended that Alternative K be dropped from consideration. Additionally, Alternative K (along with Alternative I) impacts the greatest number of Section 4(f) recreational sites (four), and would directly impact the Hahn Village site, which contains a Fort Ancient village and a Middle Woodland occupation (with known burials) that were the foundation for the NRHP-listing of the Hahn Archeological District. Instead, the Alternative G corridor (see above) will be expanded in the River Plains Subarea to provide flexibility in alignment development as the project further develops.

- Alternative L - Alternative L is the only alternative in this subarea that follows the existing Norfolk Southern rail freight line, providing opportunity for evaluating use of the existing Norfolk Southern rail corridor through the River Plains Subarea as an option for the Oasis Rail Transit (being evaluated under separate study but closely coordinated with Segment II-III). Alternative L results in 17 potential residential displacements and 6 potential commercial displacements on the west side of Newtown, no wetland or stream impacts, and impacts approximately 15 acres of agricultural land. There are high-sensitivity archaeology sites associated with the Hahn Archeological District in Alternative L, including three previously recorded sites, one of which is complex, either minimally or moderately disturbed, and one site with known human burials. Additionally, there are two Section 4(f) recreational resources (Clear Creek Park and Short Park) in this alternative. Short Park is also a Section 6(f) recreational resource. Alternative L,

however, does avoid the Little Miami Golf Center. The estimated construction cost of Alternative L is the lowest of the alternatives in this subarea (approximately \$19 million compared to \$27 to \$49 million), however, the right-of-way costs are substantially higher because of anticipated property displacements in Newtown.

Alternative L Recommendation: Modify and advance for further study (Alternative L1) - Alternative L as currently proposed will result in 17 potential residential displacements and 6 potential commercial displacements within the Village of Newtown and has a substantially higher estimated right-of-way cost compared to other alternatives in this subarea. Additionally, Alternative L can only connect to Newtown/Ancor Subarea Alternative P (see next section), which has 9 additional potential commercial displacements, the total of which may substantially impact Newtown's Central Business District.

Alternative L, however, follows the existing Norfolk Southern rail freight line, providing an opportunity for which to evaluate joint or side-by-side rail transit use with the existing rail corridor, as well as a potential highway/rail transit mode-split as the project further develops. Consequently, Alternative L, with a minor modification at the west end to follow the existing rail corridor, is recommended for further study.

River Plains Subarea - Recommendation Summary (see Figure 17):

- Alternative G: Expand corridor and advance for further study (Alternative G1).
- Alternative H: Eliminate from further study.
- Alternative I: Eliminate from further study.
- Alternative J: Eliminate from further study.
- Alternative K: Eliminate from further study.
- Alternative L: Modify and advance for further study (Alternative L1).

Newtown/Ancor Subarea

The Newtown/Ancor Subarea extends through Newtown from Newtown Road (Church Street) to the industrial Ancor area. It includes Alternatives M, N, O, and P carried over from the Tier 1 study.

Key Considerations in the Newtown/Ancor Subarea: This subarea consists of mostly residential and commercial/ industrial land uses, as most of the area is located within Newtown's village limits. Several public parks (potential Section 4[f] resources) and churches are located in this subarea, as well as a school, a large cemetery, several gravel pit lakes, and two landfills. A separate Hamilton County TID roadway project, the Ancor Connector (extending from SR 32 north to Broadwell Road), is also located in this subarea. Key considerations in the evaluation of alternatives included: 1) residential/commercial displacements and potential disruption to Newtown (the basis for the Village's voiced opposition), 2) impacts to sensitive community resources and features (churches, cemeteries, schools, and Section 4[f] resources), 3) gravel pit lake crossings and associated constructability and construction cost issues, and 4) landfill impacts.

Rail Transit Considerations: The Norfolk Southern main line parallels existing SR 32 through Newtown within this subarea. The Oasis Rail Transit study for the Eastern Corridor being conducted by others (HAM/CLE Oasis Rail Corridor; PID 86463) will be examining potential use of the existing rail corridor for joint or side-by-side rail transit operation. The Segment II-III study must closely coordinate alternatives development and evaluation with the Oasis rail transit study as both projects further develop, so as not to preclude use of the existing rail corridor, as well as the potential for a highway/rail transit mode-split through this area of the Eastern Corridor.

Comparative Evaluation of Alternative Corridors in the Newtown/Ancor Subarea: A comparative evaluation of alternatives in this subarea is presented in Table 14 and summarized below.

- Alternative M - Alternative M will result in 4 potential residential displacements and 13 potential commercial displacements in Newtown, two gravel pit lake crossings, and no landfill crossings. The estimated construction cost of Alternative M is approximately \$79 million (with a fill section to cross the gravel pit lakes) to \$149 million (with bridge crossings of the gravel pit lakes). These costs are substantially higher than the other Newtown/Ancor Subarea alternatives.

Alternative M Recommendation: Eliminate from further study and advance a “hybrid” alternative (Alternative M1/N1) - Alternative M is expected to displace a number of residences and businesses in Newtown, and will require a 2,200-foot crossing of a large gravel pit lake. This gravel pit lake crossing is a primary factor in Alternative M’s high estimated construction cost. This high construction cost is considered comparatively disproportionate, and combined with consideration of expected relocation impacts, Alternative M is being eliminated from further study. See Alternative N, below, for additional discussion of the advancement of a modified Alternative M1/N1.

- Alternative N - Alternative N will result in 12 potential residential displacements and 7 potential commercial displacements in Newtown, one gravel pit lake crossing, and no landfill crossings. Alternative N also impacts frontage on the NRHP-listed William Edwards House property (a Section 4[f] NRHP-listed property). The estimated construction cost of Alternative N is approximately \$50 million.

Alternative N Recommendation: Eliminate from further study and advance a “hybrid” alternative (Alternative M1/N1) - Alternative N is expected to result in a high number of residential and commercial displacements in Newtown and also impacts frontage on a Section 4(f) property (the NRHP-listed William Edwards House), and is therefore being eliminated from further study. However, a modified version of Alternatives N and M (Alternative M1/N1; see Figure 17) has been developed to address design and environmental constraints and concerns raised by the Village of Newtown relative to potential displacements. Alternative M1/N1 curves north of Alternative M and parallels the Horizon Community Church property limits, turns southeast across Round Bottom Road and the corner of a gravel pit lake (between Alternative M and Alternative N), and connects with Mount Carmel Hill Subarea alternatives between the Newtown Landfill and the Ancor Connector. The benefit of Alternative M1/N1 is: 1) an estimated lower construction cost compared to Alternative M (anticipated to be approximately \$22 million less) and similar construction costs compared to Alternative N, 2) fewer residential and commercial displacements (about one-half) compared to Alternatives M and N, and 3) avoidance of impacts to the NRHP-listed William Edwards House property. Consequently, Alternative M1/N1 is being advanced for further study.

- Alternative O - Alternative O will result in 6 potential commercial displacements and 13 potential residential displacements, essentially eliminating Valley Avenue along the north edge of Newtown (additional residences may be displaced on View Street north of Valley Avenue due to access issues). Alternative O will have one gravel pit lake crossing and one partial landfill crossing (Newtown Landfill). The estimated construction cost of Alternative O is approximately \$52 million (with a fill section crossing of the gravel pit lake) to \$101 million (with a bridge crossing of the gravel pit lake). The estimated right-of-way cost is \$1.6 million to \$2.2 million less than the other alternatives in the Newtown/Ancor Subarea.

Alternative O Recommendation: Modify and Advance for further study (Alternative O1) - Alternative O is expected to result in substantial residential and commercial displacements in Newtown (essentially eliminating Valley Avenue) and partially crosses the Newtown Landfill, and is therefore being eliminated from further study. However, a modified Alternative O1 (as shown on Figure 17) was developed to minimize impacts to residences and businesses in the Valley Avenue area through a shift of the preliminary alternative corridor further north and east before crossing the gravel pit lake and the Newtown landfill (at

locations similar to Alternative O). The benefit of Alternative O1 is: 1) fewer residential and commercial displacements anticipated, 2) avoidance of the elimination of Valley Avenue, and 3) a lower estimated construction cost than Alternative O (approximately \$2 million lower). Consequently, Alternative O1 is being advanced for further study.

- Alternative P - Alternative P is the only alternative in this subarea that primarily follows the existing Norfolk Southern rail freight line, providing opportunity for evaluating use of the existing Norfolk Southern rail corridor through the River Plains Subarea as an option for the Oasis Rail Transit (being evaluated under separate study but closely coordinated with Segment II-III). Alternative P will result in no residential displacements and 9 potential commercial displacements in Newtown, no gravel pit lake crossings, and one substantial landfill crossing (Newtown Landfill). The estimated construction cost of Alternative P is approximately \$30 million.

Alternative P Recommendation: Advance for further study - Alternative P as currently proposed is expected to result in 9 commercial displacements, including a number of the larger industrial facilities located along the Norfolk Southern rail line and existing SR 32 through Newtown. Alternative P will also require full longitudinal crossing of the Newtown Landfill. As described in the evaluation of River Plains Subarea alternatives, Alternative P, in combination with Alternative L, is expected to result in a total of 17 residential and 15 commercial displacements (Alternative P can only connect to Alternative L). These displacements are may be substantial with regard to Newtown's Central Business District.

Alternative P, however, follows the existing NS rail freight line, providing an opportunity for which to evaluate joint or side-by-side rail transit use with the existing rail corridor, as well as a potential highway/rail transit mode-split as the project further develops. Consequently, Alternative P (along with Alternative L from the River Plains Subarea) is recommended for advancement into the next phase of work.

Newtown/Ancor Subarea - Recommendation Summary (see Figure 17):

- Alternative M: Eliminate and advance an M/N hybrid for further study (Alternative M1/N1).
- Alternative N: Eliminate and advance an M/N hybrid for further study (Alternative M1/N1).
- Alternative O: Modify and advance for further study (Alternative O1).
- Alternative P: Advance for further study.

Mount Carmel Hill Subarea

The Mount Carmel Hill Subarea extends from the Ancor area east of Newtown to the Segment II-III east terminus (for relocated SR 32) located near Bells Lane/Mount Carmel-Tobasco Road. In this subarea, Alternatives Q, R, S, and T were carried over from the Tier 1 study. Each alternative in this subarea includes preservation of a future parallel rail transit corridor (the Wasson transit line).

Key Considerations in the Mount Carmel Hill Subarea: This subarea is defined by a steep wooded hillside located north of SR 32 between the Ancor area and the community of Mount Carmel. A substantial portion of this subarea is covered by woodland, with the remainder being in residential and commercial land uses. This subarea is generally centered on the existing SR 32 highway corridor. A number of public greenspaces are located in this subarea (additional study required to determine Section 4(f) applicability), along with several historic properties (Section 4(f) resources). Key considerations in the evaluation of alternatives included: 1) residential and commercial displacements, 2) construction costs, 3) impacts to large woodland tracts and surface streams, and 4) impacts to Section 4(f) resources.

Future Rail Transit Considerations: Refinement of alternatives in this subarea during the next work phase must also consider/coordinate preservation of a future rail transit corridor (the Wasson transit line) between Ancor and the Eastgate area of Clermont County, extending from improved SR 32 at the top of the Mount Carmel Hill (approximately Bells Lane/Mount Carmel-Tobasco Road) to a planned transit station at the Union Township Civic Center along Aicholtz Road. The Tier 1 work identified a preliminary rail transit corridor branching off relocated SR 32 at approximately Old SR 74, then generally paralleling Old SR 74/Aicholtz Road to the proposed Union Township station east of I-275. A new I-275 underpass is currently being developed as part of the Segment IV I-275/SR 32 interchange project (PID 76289) to accommodate this rail transit corridor.

All of the alternatives under consideration in the Mount Carmel Hill Subarea currently terminate at the same point along existing SR 32 at Old SR 74; therefore, recommendations for advancement/elimination of alternatives in the next phase of work will not impact this future coordination.

Comparative Evaluation of Alternative Corridors in the Mount Carmel Hill Subarea: A comparative evaluation of alternatives in this subarea is presented in Table 15 and summarized below.

- Alternative Q - Alternative Q crosses the upper Mount Carmel Hill slopes and will result in 8 potential residential displacements and 7 potential commercial displacements, 83 acres of woodland, 7 acres of public greenspace (primarily in the Mount Carmel Hill area; additional study required to determine Section 4(f) applicability), 13 acres of private greenspace, and approximately 5,088 feet of stream channel impacts. The estimated construction cost for Alternative Q is approximately \$73 million, and at \$7.0 million, this alternative has the lowest estimated right-of-way costs compared to the other alternatives in this subarea.

Alternative Q Recommendation: Advance for further study - Compared to other alternatives in the Mount Carmel Hill Subarea, Alternative Q has no disproportionate environmental impact, construction cost, or design issues (or combination of issues) that would warrant its elimination at this time.

- Alternative R - Alternative R also crosses the upper Mount Carmel Hill slopes and will result in 12 potential residential displacements and 6 potential commercial displacements, 75 acres of woodland impacts, about 13 acres of public greenspace impacts (primarily in the Mount Carmel Hill area; additional study required to determine Section 4(f) applicability), 12 acres of private greenspace, and 3,685 feet of stream channel impacts. Alternative R is expected to impact one Section 4(f) resource (the William Apple House). The estimated construction cost for Alternative R is approximately \$64 million.

Alternative R Recommendation: Modify and Advance for further study (Alternative R1) - Alternative R, overall, has environmental impact, construction cost and design issues that are either comparable to or better than the other Mount Carmel Hill Subarea alternatives. However, Alternative R (like Alternative Q) crosses the upper slopes of Mount Carmel Hill, and has one Section 4(f) historic property impact. After reviewing the Alternative R alignment, a modification of Alternative R (named Alternative R1) was identified that avoids both the William Apple House and the steep upper slopes of the Mount Carmel Hill (see Figure 17), and results in a reduction of woodland and stream channel impacts. The estimated construction cost of this alternative is approximately \$4 million lower than Alternative R. As a result, Alternative R is being eliminated from further study in combination with advancement of Alternative R1.

- Alternative S - Alternative S crosses the lower Mount Carmel Hill slopes and generally follows the existing SR 32 corridor. Alternative S will result in 22 potential residential displacements and 7 potential commercial displacements, and will impact approximately 63 acres of woodland, 19 acres of public greenspace (primarily in the Mount Carmel Hill area; additional study required to determine Section 4(f) applicability), 9 acres of private greenspace, and approximately 4,975 feet of stream channel - including 1,960 feet of high quality Warmwater Habitat (Dry Run). Alternative S is expected to impact two Section

4(f) historic resources (the Apple House and William Apple House). The estimated construction cost for Alternative S is approximately \$69 million, and this alternative has the second highest estimated right-of-way cost (\$10.2 million) compared to the other alternatives in this subarea.

Alternative S Recommendation: Eliminate from further study - Alternative S is expected to have higher residential and commercial displacements, higher stream impacts, and greater Section 4(f) historic property impacts than Alternatives Q, R, and R1. These impacts are considered to be comparatively disproportionate and consequently, Alternative S is being eliminated from further study.

- Alternative T - Alternative T generally follows the existing SR 32 corridor, but is bifurcated in order to avoid substantial longitudinal impacts to Dry Run, which parallels the south side of SR 32. Alternative T will result in 36 potential residential displacements and 7 potential commercial displacements. Alternative T will impact approximately 91 acres of woodland, 18 acres of public greenspace (additional study required to determine Section 4(f) applicability), 5 acres of private greenspace, and approximately 7,612 feet of stream channel, including 1,312 feet of high quality Warmwater Habitat (Dry Run). Alternative T is expected to impact three Section 4(f) historic resources (Mary Ingram House, Apple House and William Apple House). The estimated construction cost of \$99 million and the right-of-way cost of \$15.7 million are highest compared to the other alternatives in this subarea.

Alternative T Recommendation: Eliminate from further study - Alternative T is expected to have substantially higher residential and commercial displacements, ecological impacts (woodlands and streams), and Section 4(f) resource impacts compared to Alternatives Q, R, R1, and S. Alternative T also has substantially higher estimated construction and right-of-way costs than other Mount Carmel Hill Subarea alternatives. These costs and environmental impacts are considered to be comparatively disproportionate and consequently, Alternative T is being eliminated from further study.

Mount Carmel Hill Subarea - Recommendation Summary (see Figure 17):

- Alternative Q: Advance to for further study.
- Alternative R: Modify and advance for further study (Alternative R1).
- Alternative S: Eliminate from further study.
- Alternative T: Eliminate from further study.

5.2 Alternatives Recommended for Further Study

This Feasibility Study describes key environmental features and design/cost considerations for five subareas in the Segment II-III study area and presents a comparative impact evaluation (by subarea) of the 21 preliminary alternative corridors carried over from the Eastern Corridor Tier 1 work. The recommended alternative corridors to be advanced for further Tier 2 study based on the evaluation presented in Section 5.1 include:

US 50/Red Bank Subarea:	Alternative B1/B2/B3
River Crossing Subarea:	Alternative C1
River Plains Subarea:	Alternative G1, Alternative L1
Newtown/Ancor Subarea:	Alternative M1/N1, Alternative O1, Alternative P
Mount Camel Hill Subarea:	Alternative Q, Alternative R1

These recommended alternatives, shown on Figure 17, generally form three broad west-to-east corridors through the Segment II-III study area. Figure 18 and an interactive pdf included in Appendix J depict the recommended alternatives with known environmental and community resources in the project area.

The southernmost of these three corridors primarily follows the existing Norfolk Southern rail freight line which parallels existing SR 32 through Newtown. The Oasis Rail Transit study for the Eastern Corridor being conducted by others (HAM/CLE Oasis Rail Corridor; PID 86463) is examining potential use of the existing rail corridor for joint or side-by-side rail transit operation as well as evaluation of transit station locations within Newtown. Further alternatives development in Segment II-III corridor will be closely coordinated with the Oasis Rail Transit study so as not to preclude use of the existing rail corridor, as well as the potential for a highway/rail transit mode-split through this area of the Eastern Corridor.

The next step of work for Segment II-III involves additional environmental and engineering studies to develop end-to-end alternative alignments that will be further refined, evaluated and presented in a Segment II-III Alternatives Evaluation Report (AER). The Segment II-III AER will identify a preliminary Preferred Alternative to carry forward into detailed design and environmental clearance.