Westshore Corridor Transportation Project

Westshore Corridor Alternatives Analysis Study

Final Report

June 2013

Westshore Corridor Transportation Project

Quality Assurance Review Certification

Client:	Cleveland RTA
	Westshore Corridor
Project:	Alternatives Analysis Study
PB Project No:	21526

Document(s)/Task(s) Reviewed:

Final Report

A Quality Assurance Review has been completed by the QA Reviewer(s) indicated below. The specific project document(s) and/or task(s) stated above were reviewed with the intention that the design and associated tasks regarding this project were undertaken in accordance with accepted engineering practices and requirements set forth by the Client. All work has been reviewed in regards to its technical soundness, ethical content, and cost effectiveness.

Project Manager	Timothy J. Rosenberger
Deputy Project Manager	
Task Manager	

Name (Print)	Signed	Date

Quality Assurance Reviewer (Content)

Name (Print)	Signed	Date

Quality Assurance Reviewer (Form)

Name (Print)	Signed	Date

Table of Contents

Table of Figures

Table of Tables

Executive Summary

The Westshore Corridor Transportation Project (WCTP) study is a continuation of the work from the NEORail study, which assessed the potential for commuter rail service in Northeast Ohio and recommended service in the Westshore Corridor. The WCTP study picked up where NEORail left off, assessing the potential for commuter rail service in the corridor. Local citizens and political leaders have put in more than seven years of effort in moving the WCTP study forward.

At the onset of the WCTP study five distinct project goals were identified:

1. Improve the mobility, connectivity and accessibility within the Westshore Corridor.
2. Develop a transportation solution that encourages both sustainable, transit-friendly development in new areas and revitalization and repopulation of existing core areas within the corridor including Lorain, Sandusky, Vermilion, Lakewood and Cleveland.
3. Develop a transportation solution that is an efficient and cost effective use of the region's transit funding.
4. Develop a transit improvement that can realistically be funded by local and county governments in the Westshore Corridor.
5. Develop a transportation solution that conserves resources, improves air quality and promotes environmental sustainability and social and environmental justice project goals

Using these goals, the WCTP study evaluated multiple transit alternatives in the Westshore Corridor area, including commuter bus and commuter rail. The conclusion of the WCTP study is that commuter rail may be possible in the future, but that much work has to be done to make this a reality. The rest of this executive summary lists the steps required to construct and operate a commuter rail service in the Westshore corridor.

Steps to Commuter Rail

Despite the progress made in the WCTP study, the work is only beginning to make commuter rail a reality in the Westshore corridor. The analysis conducted in this study suggests that developing commuter rail service in the Westshore corridor should be a multi-tiered process. The outcome of this study is a recommended four-step process that can be used as a roadmap for developing commuter rail in the Westshore area over the next 15+ years.

Phase 1: Establish Transit Market (Years 1-5)

In order to make the case for commuter rail service in the future, a transit market must first be established in the Westshore Corridor. The WCTP study determined the most effective way to do this is by first operating commuter bus service in the corridor. What this really is saying is, "if you run it, they will come."

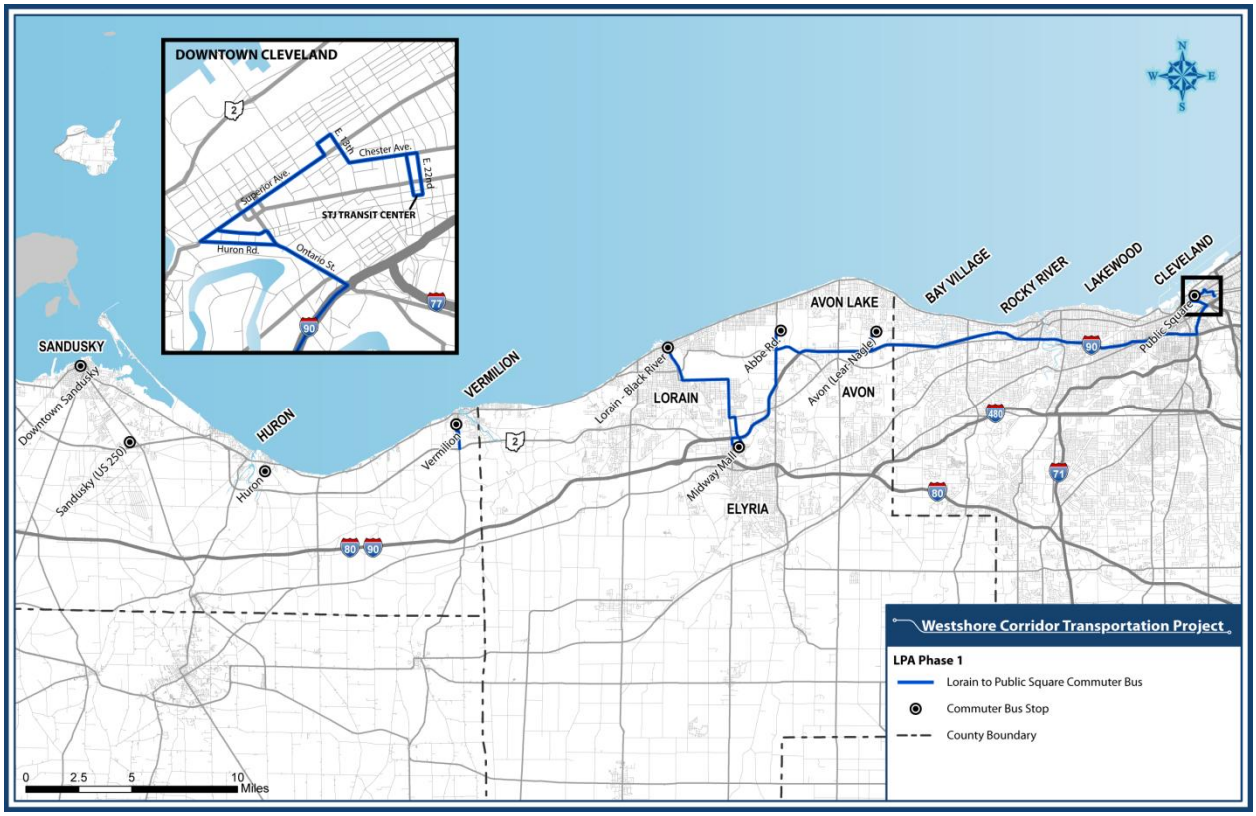
In Phase 1 Lorain County is recommended to operate basic commuter bus service between the city of Lorain and downtown Cleveland. The commuter bus would stop at Black River Landing, Midway Mall, and two new park and rides locations in Sheffield and Avon (at the sites of future commuter rail stations) before continuing to downtown Cleveland. Concurrently,

Lorain County Transit would be restored to its pre-2009 service levels to distribute passengers throughout the county. Service to Erie County would be provided by a private operator, if warranted.

While bus service is being operated in the corridor, work on the commuter rail project should continue. This includes submitting an application to the Federal Transit Administration (FTA) for consideration in their New Starts grant program, and entering environmental and preliminary engineering. A larger issue needing attention during Phase 1 will be funding and governance issues for transit service in Lorain County.

Key Phase 1 Milestones:

- Operate new commuter bus service from Avon, Sheffield, Lorain to downtown Cleveland
- Develop Park-n-Ride lot locations with possible changes to adjacent land use for TOD
- Restore LCT service
- Complete Westshore Alternatives Analysis and begin environmental, preliminary engineering
- Tackle funding and governance issues within Lorain County



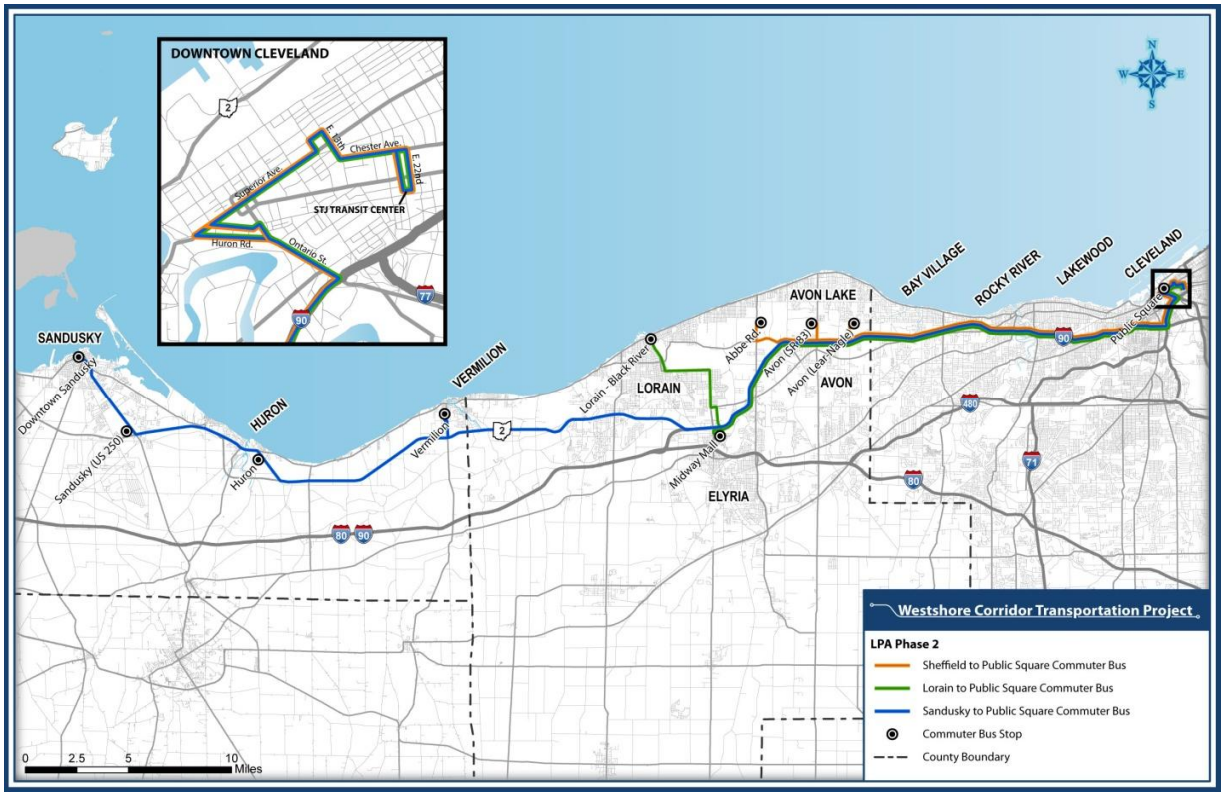
Phase 2: Consolidate Market (Years 6-10)

In the second phase of the project, commuter bus service would be expanded to consolidate the transit market in the Westshore corridor. The single commuter bus route established in Phase 1 would now be served by two routes, with one route continuing to serve Black River Landing and Midway Mall, and a second route serving park and rides in Sheffield and Avon. An additional park and ride lot would be established at the site of the future commuter rail station at Abbe Road. Finally, a third commuter bus route would begin providing service between Erie County and downtown Cleveland, with stops in downtown Sandusky and at park and ride facilities located in Sandusky, Huron and Vermilion.

The funding and governance issues from Phase 1 should be settled by the end of Phase 2. This will be vital towards making progress on the commuter rail service. Environmental, preliminary engineering, and final design should all be completed during Phase 2. Signing a full funding grant agreement with FTA will be contingent on the commuter rail service having a strong financial and governance plan.

Key Phase 2 Milestones:

- Expand commuter bus service in Lorain
- Establish commuter bus service in Erie
- Complete environmental and final design
- Settle funding and governance issues
- Sign FTA Full Funding Grant Agreement

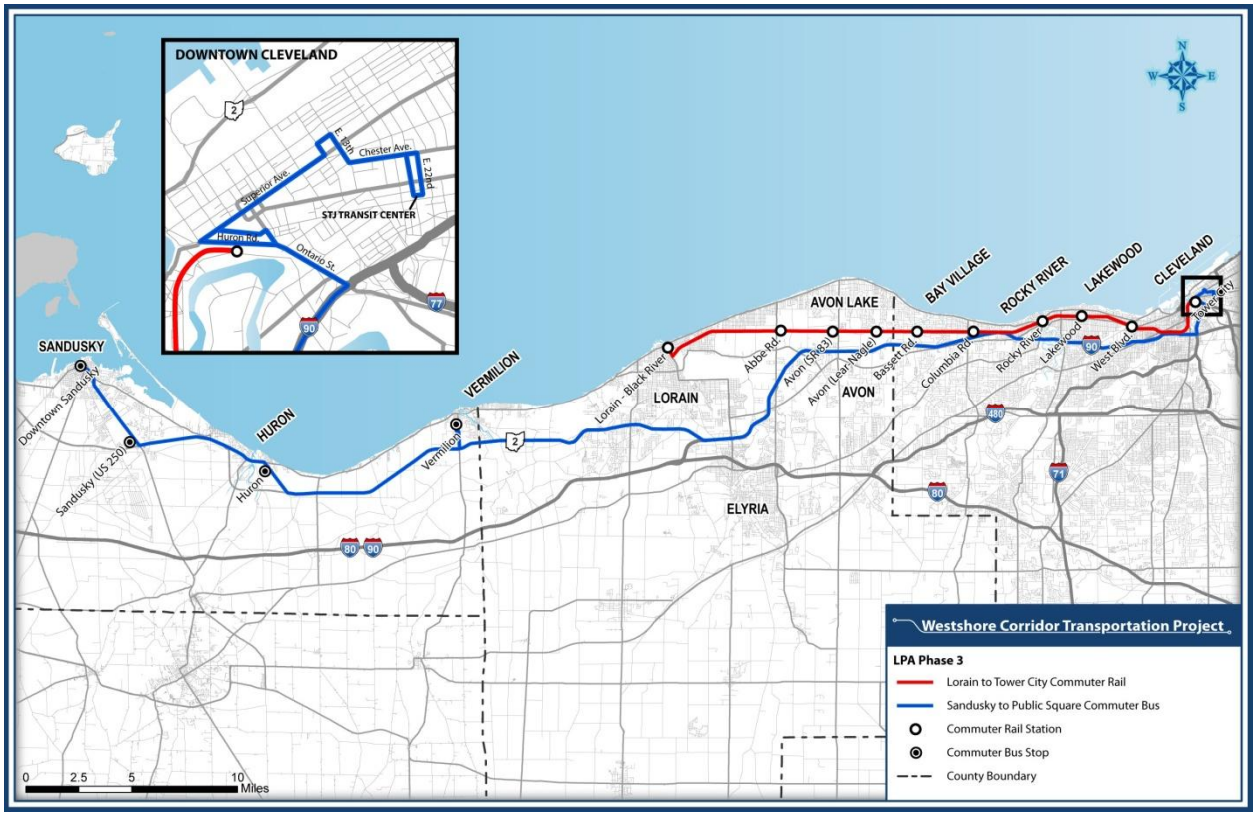


Phase 3: Develop Commuter Rail Service (Years 10-15)

In the third phase of the project, commuter rail would begin operating between Black River Landing in Lorain and Tower City in downtown Cleveland. In addition to previously established stations in Lorain, Sheffield and Avon, the commuter rail would also serve stations in the Cuyahoga County communities of Westlake, Bay Village, Rocky River, Lakewood and Cleveland. Many of the park and ride facilities developed in the first two phases of the project would continue to serve this purpose at the new commuter rail stations, while others would become potential sites for transit oriented development. Commuter bus service would continue to be operated between Sandusky and Cleveland in this phase.

Key Phase 3 Milestones:

- Final design and construction of commuter rail (Lorain to Tower City)
- Replace Lorain commuter bus services with commuter rail



Phase 4: Extend Commuter Rail Service to Erie County (15+ Years)

After successful implementation of the commuter rail service in Phase 3, a fourth phase would consider expansion of the rail service into Erie County. Demonstration of the successful operation of the commuter rail between Lorain and Cuyahoga Counties, along with the demonstration of transit demand in Erie County, would help make the case to the FTA for an extension of the service.

Key Phase 4 Milestones:

- Re-examine extension of commuter rail to Erie County market

Challenges and Opportunities

Many challenges lie along the path to developing inter-country transit service in the Westshore corridor, but these also present an opportunity for Lorain County to lead the development of new transit services. Chief among these challenges is identifying a sustainable funding source to support the service. An operating agency would have to be selected either from an existing operator or a newly formed multi-county agency. Finally, changes to land use policies must be implemented to support transit oriented development around proposed park and ride and commuter rail station locations.

Governance

There are many options for operating the proposed inter-county service in the Westshore Corridor. An existing agency, such as Greater Cleveland RTA or a revitalized LCT, could elect to operate the service, or it could be contracted out to a private company. A new multi-county agency could also be formed to operate the service. Regardless of the operator, consensus will be needed among all stakeholders to begin operating the new service.

Land Use

Current land use policies in most of the Corridor's municipalities are not very supportive of transit. Areas around the proposed park and rides and commuter rail stations are largely zoned for low density residential or commercial development, with few areas that permit a mix of uses. Rezoning or creating overlay zones that support increased densities and transit oriented development will not only increase ridership on the new transit service, but will also have a significant impact on the project's application for Federal funds. Land use and economic development make up 40% of the rating that FTA uses to evaluate transit projects for capital funding in their New Starts funding program.

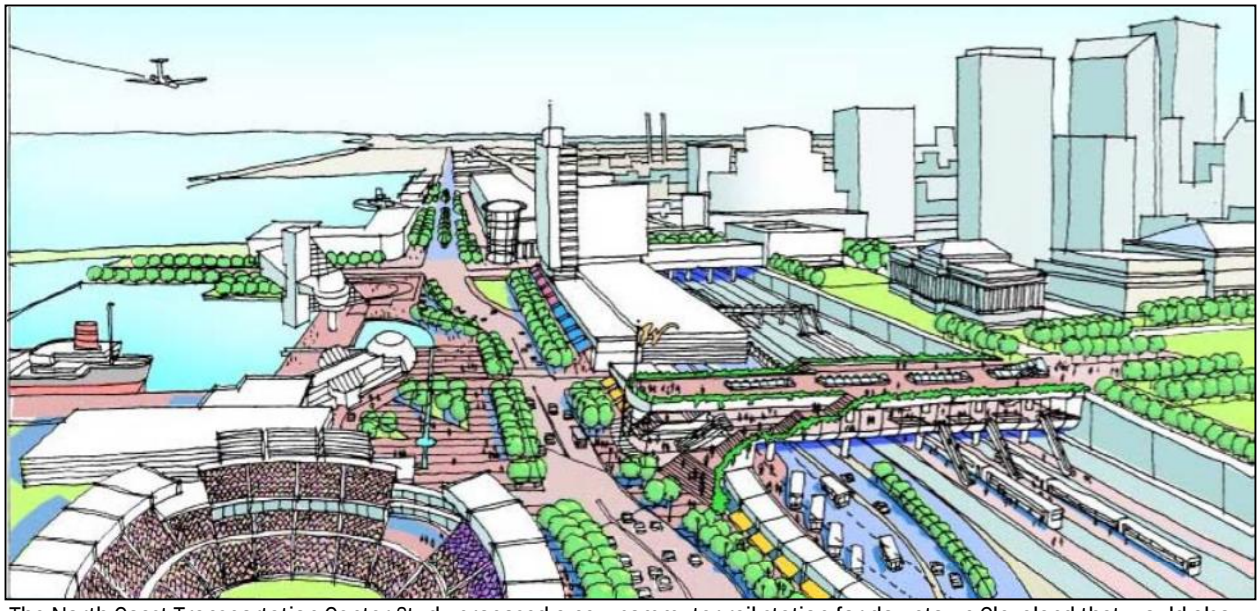
Funding

The estimated capital costs of the inter-county service range from $11.2 million for the Phase 1 commuter bus service to $220.7 million for the Phase 4 commuter rail service from Sandusky to Cleveland[1]. These capital costs are in addition to the costs of operating and maintaining the service, which will vary based on the chosen operator. Obviously, identifying a sustainable funding source is the largest challenge to implementing the project. The high cost of commuter rail is beyond the funding capacity of the region at this time, and funding at the State and Federal levels remains uncertain. The phased approach to the project may allow the for the more fiscally manageable commuter bus service to begin operating while the region continues to work towards the goal of developing commuter rail.

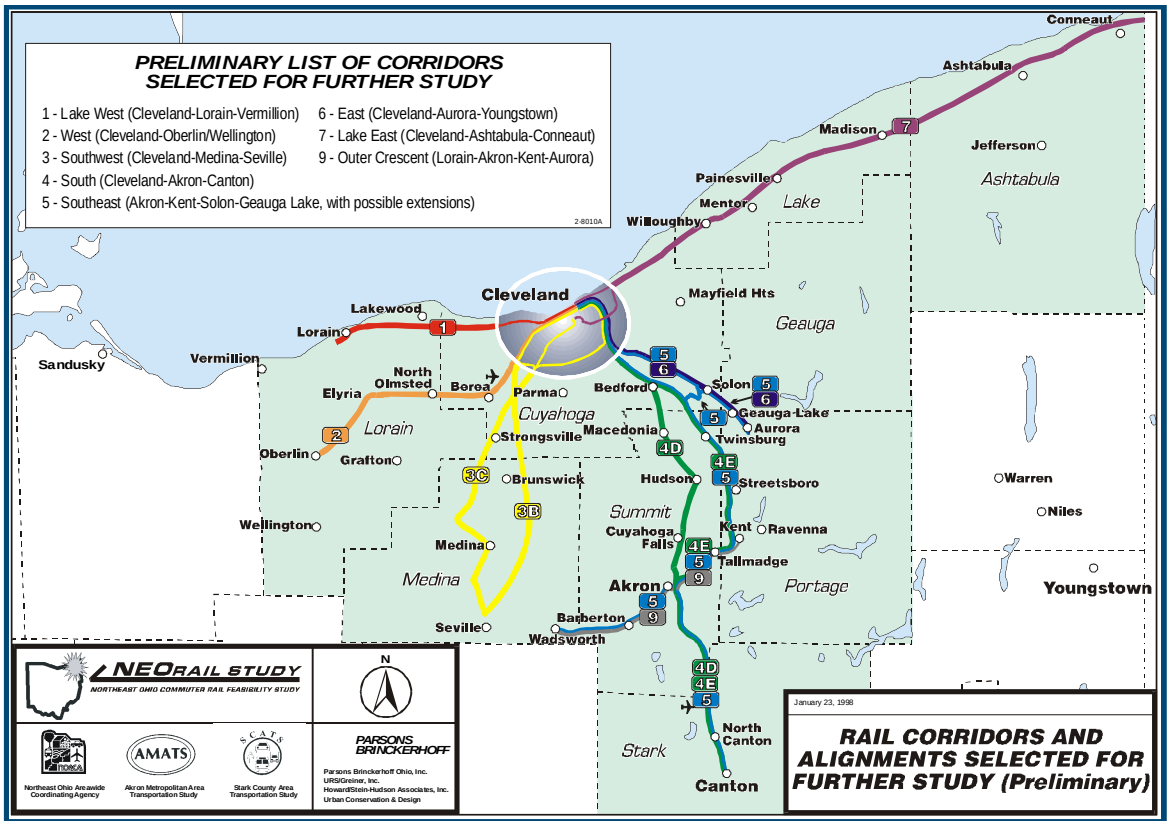
[1] Costs are in 2010 dollars, the year of analysis

Chapter 1 - Introduction

The Westshore Corridor Alternatives Analysis Study is the culmination of years of effort on the part of public officials and concerned citizens including advocates for rail and transit service in the corridor. Concepts for restoring passenger rail to Northern Ohio have been discussed almost since the end of most private passenger rail service in the early 1970s. Concepts for developing commuter rail service focused on downtown Cleveland likewise have been under discussion for many years. In the late 1990s, the Northeast Ohio Areawide Coordinating Agency (NOACA), the Metropolitan Planning Organization (MPO) responsible for transportation policy in the five county region surrounding Cleveland, initiated a study of the potential for a commuter rail network for the Cleveland area. This study, the Northeastern Ohio Commuter Rail Feasibility Study (NEORail), analyzed more than 40 potential existing rail alignments to identify the most promising elements of a potential regional commuter rail network focused on downtown Cleveland. In 1999, the Cleveland Intermodal Hub study identified the Cleveland Lakefront (not far from the existing Cleveland Amtrak station) as the selected site for the commuter rail system's downtown hub. The second phase of the NEORail study, which was completed in 2002, identified seven alignments as being potentially feasible for the implementation of commuter rail service. The Westshore route through Lorain, which uses the Norfolk-Southern (former "Nickel Plate ") rail alignment, was deemed among the three most feasible. The analysis found that a commuter rail service between downtown Cleveland and Lorain, serving the West Side of Cleveland, Lakewood, Rocky River, Westlake/Bay Village, Avon and Sheffield Lake could generate significant daily ridership.



The North Coast Transportation Center Study proposed a new commuter rail station for downtown Cleveland that would also help bridge Cleveland's downtown and Lakefront districts.



The NEORail Study, conducted by NOACA between 1997 and 2002, was the first major step in developing a commuter rail network in the region. Corridor 1, from Cleveland to Lorain, was considered one of the more promising of the more than 40 corridor combinations that were analyzed.

After the completion of the NEORail study, regional public and transportation officials did not choose to pursue the development of the commuter rail system. However, a group of public officials from Erie, Lorain and Cuyahoga Counties, representing communities in the Westshore corridor, together with rail and transit advocacy groups like All Aboard Ohio, continued to pursue the development of a commuter rail line connecting the Westshore communities to downtown Cleveland. In 2003, the Black River Landing & Transportation Center, which included a potential future rail station, opened in downtown Lorain, on the west bank of the Black River. In 2007, a Transportation for Liveable Communities Initiative (TLCI) project sponsored by NOACA identified some of the issues associated with connecting the Norfolk Southern rail line to a crossing line connecting to the proposed rail station location in downtown Lorain.

In 2008, the Lorain County Commissioners received a grant from the US Department of Transportation to conduct an Alternatives Analysis study under the Federal Transit Administration's (FTA) Section 5309 New Starts program, the major funding program through which the Federal government supports the development of major new investments in corridor-based public transportation improvements. This Alternatives Analysis study builds on the work of the NEORail Study, the TLCI study and other work that public agencies and private advocacy groups have performed to support the development of rail service in the Westshore corridor.

Lorain's Black River Landing development includes a potential station that could serve as a commuter rail or commuter bus hub for downtown Lorain.

An Alternatives Analysis study is the first major step in the process under which the New Starts program provides funding for such projects. In an Alternatives Analysis study, the community evaluates a set of alternative transit improvements in terms of their potential transportation, economic, social and environmental benefits, costs and impacts. The Alternatives Analysis study identifies the purpose and need for a transportation improvement, details the goals and objectives of the potential project, and develops a set of alternative strategies to meet the transportation needs of the corridor. These alternatives are made up of a conceptual route alignment, transit mode (bus, commuter rail, light rail, etc.) and supporting infrastructure, and a schematic operating plan for the proposed service. A No-Build and Low Cost alternative are always considered among the alternatives. The outcome of the Alternatives Analysis study is the identification of a Locally Preferred Alternative (LPA) for approval by the community and regional transportation bodies such as the MPO.

The Westshore Corridor is an important and growing commuter corridor. Passing through the Cleveland suburbs of Lakewood, Rocky River, and near the border of Bay Village and Westlake, the line also serves the fast-growing suburban areas of Avon, Avon Lake and Sheffield Lake in Lorain County. The corridor line extends through Lorain, and service could potentially be extended to Vermillion and Sandusky Improvements related to the Ohio Hub rail plan and the Midwest Regional Rail Initiative could further bolster the case for developing rail service in this important commuter-intercity rail corridor.

State and local funding of the operation of service, and the non-Federal portion of the capital costs of the service, remain major, unaddressed challenges to development of commuter service in the corridor. However, other developments are somewhat more favorable to the development of commuter service. Governmental entities are interested in expanding rail and transit options for reasons related to transportation policy, environmental concerns, and the potential for transit improvements to generate federal investment and economic development benefits. Consumers are increasingly searching for alternatives to driving due to high gasoline prices and environmental concerns. The population of Lorain County and many of its communities, including some in the corridor, is growing. The opening of the Horseshoe Casino in downtown Cleveland in early 2012 has increased the already high interest in services that provide connections to the jobs and entertainment venues in downtown Cleveland. Large and growing employers in Erie County, such as the Cedar Point amusement park and Kalahari resort, are seeking access to the consumer and employment markets of Lorain and Cuyahoga Counties. All of these factors are considerations in development of commuter transportation services in the Westshore Corridor.

Chapter 2 – Goals and Objectives

Statement of Purpose and Need

The WCTP seeks to identify cost-effective regional transportation investments that improve inter-county mobility and public transit connectivity within the Westshore Corridor.

Project Goals and Objectives

Goal 1: Transportation Improvement

Improve the mobility, connectivity, and accessibility within the Westshore corridor.

1. Expand park and ride opportunities for inter-county transit trips in the corridor.
2. Increase transit ridership and market share for travelers in the Westshore corridor.
3. Improve transit quality for travelers within the Westshore corridor.
4. Improve the diversity of transportation options in the corridor.
5. Improve travel times for travelers in the corridor.
6. Maximize reverse-commute opportunities from lower-income areas of the corridor to job opportunities in other portions of the corridor.
7. Promote the use of transit for recreational trips within the Westshore corridor.

Goal 2: Transit Oriented Land Use

Develop a transportation solution that encourages both sustainable, transit-friendly development in new areas and revitalization and repopulation of existing core areas within the corridor including Lorain, Sandusky, Vermilion, Lakewood and Cleveland.

1. Redevelop and Improve city cores within the Westshore corridor, including Lakewood, Rocky River, Lorain, Vermilion, and Sandusky.
2. Promote use and redevelopment of downtown Cleveland.
3. Serve existing activity centers in the Westshore corridor.
4. Attract developers to new development and redevelopment opportunities through expanded transit service.
5. Promote the transportation and development goals of the region as identified in the NOACA Long Range Transportation Plan and other regional planning documents.

Goal 3 Cost Effectiveness

Develop a transportation solution that is an efficient and cost effective use of the region's transit funding.

1. Maximize user benefits for the transit improvement.

Goal 4 Fiscal Responsibility

Develop a transit improvement that can realistically be supported by local and county governments and transit authorities in the Westshore corridor.

1. Promote a transit solution that is competitive for an FTA New Starts grant
2. Consider the annual impact to local and county government budgets for Westshore communities

Goal 5 Environmental Impact

Develop transportation solutions that conserve resources, improves air quality. and promotes environmental sustainability and social and environmental justice.

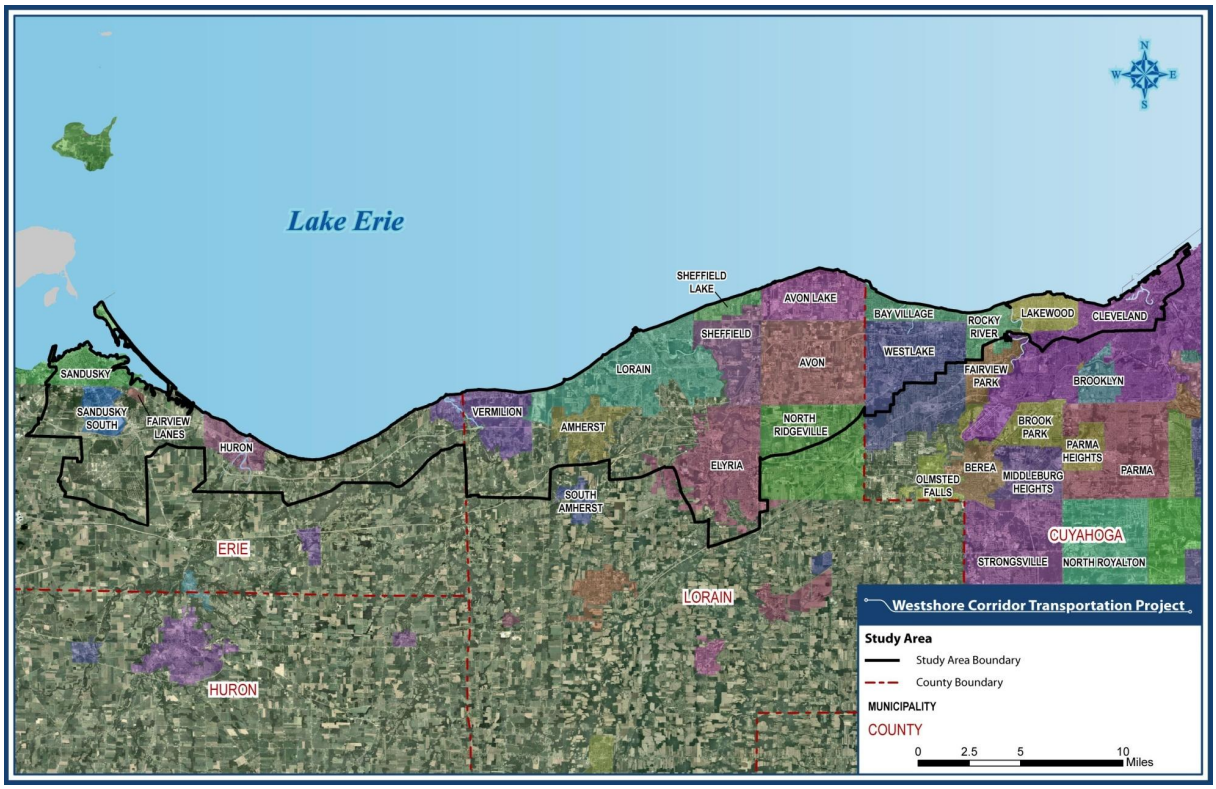
1. Improve air quality within the Westshore corridor
2. Minimize the amount of needed right-of-way for corridor and stop/station improvements in the study area.
3. Consider impacts to existing adjacent land uses.
4. Minimize impacts to historic and potentially historic sites and structures in the corridor.
5. Promote environmentally sustainable land use patterns and LEED certified buildings as part of development and redevelopment efforts within the study area.
6. Avoid or identify mitigation strategies and funding for locations with sensitive soils, groundwater sources, and hazardous materials sites.
7. Minimize transportation-related noise impacts.
8. Protect and, where possible, enhance environmentally sensitive areas.
9. Ensure that impacts are minimized and benefits are fairly provided to low income, minority and other environmental justice communities.

Chapter 3 – Public Involvement

Introduction

The Lorain County Commissioners, the Lorain County Community Alliance (LCCA), Lorain County Transit and the Westshore Commuter Rail Task Force are interested in providing public transit service to Downtown Cleveland and have partnered in supporting the Westshore Corridor Transportation Project. This project is evaluating the feasibility of providing public transit service along a corridor that would connect Cleveland, Ohio with Sandusky, Ohio. The project area covers Erie, Lorain and Cuyahoga Counties, as illustrated in Figure 3.1.

Figure 3.1: Westshore Corridor Study Area



This project follows the Northeast Ohio Rail Study (NEORail), completed in 2002, which evaluated commuter rail transit service in the greater Cleveland region. The alternative which would provide rail service from Cleveland west into Erie County, Ohio, was assessed as feasible by the NEORail Study and ranked it as the second priority of the seven possible transit corridors that were identified as feasible alternatives.

The Westshore Corridor Transportation Project builds upon existing studies, evaluating the potential provision of transit service via commuter rail, bus, or a combination of both, in accordance with the requirements of the Federal Transit Administration (FTA) New Starts program. The project incorporates a community outreach and public involvement program, designed to obtain and incorporate the thoughts, opinions and ideas of the stakeholders and the general public into the development and evaluation of the potential alternatives.

Effective public involvement and outreach are essential in building consensus and delivering a successful plan. The public involvement program for the Westshore Corridor Transportation Project engaged the Westshore Commuter Rail Task Force, the Technical Committee, the stakeholders and members of the general public in the plan development and alternatives analysis process. The program informed and involved these agencies and individuals, enabling them to provide vital input into the development of the Westshore Corridor plan. The program's goal is to optimize the participation of affected parties through meetings with agency and community representatives. Engaging the community in the development of the plan fosters consensus building and ensures that the Locally Preferred Alternative will be accepted by and best meets the needs of the communities.

Given the nature of the project and the extent of the study area, the public involvement program actively engaged the populations in Erie, Lorain and Cuyahoga Counties along with current transit riders. Means of outreach included the project website, LCCAs website and Facebook page, community websites, local and regional newspapers, email distributions, and through the FTA announcement in the Federal Register.

This Public Involvement Plan was designed to provide a focused and effective outreach program geared toward the successful completion of the study. The public involvement program supported the project by:

- Establishing and maintaining open and ongoing dialogue on issues related to the study between the Task Force, the Technical Committee, project stakeholders and the general public from all three counties.
- Creating a climate of trust where information and concerns may be exchanged and common goals achieved.
- Involving parties with input in the decision making process during plan development, to provide a clear understanding of the process and level of detail of the analysis. This effort was geared toward fostering ownership in the results of the project by those involved with and affected by the project.
- Reaching consensus on the potential corridor alignments that will move forward into the next project phase. This started with development of the potential alternatives, which were subsequently narrowed down to the conceptual alternatives followed by the feasible alternatives.

The project team focused on developing and implementing a strong, inclusive communications program, one that was sensitive to community concerns and promoted the benefits the project will bring to the area. Community engagement occurs throughout the project, beginning with development of the purpose and need, through identification and analysis of alternatives to selection of the Locally Preferred Alternative. Accordingly, this Plan was organized to allow for

seamless integration with concurrent planning efforts and the scheduling of contingent activities. This Plan is also a flexible, "living" document; able to be altered to accommodate the needs of the study area and its constituents, as well as updated to reflect developing planning efforts.

Levels of Engagement

The four levels of involvement that are incorporated into this project are the Westshore Commuter Rail Task Force (Task Force), the Technical Committee, project stakeholders, and the general public. Effective engagement at each level is critical to the project's success.

Westshore Commuter Rail Task Force

The Task Force includes the key decision-makers for the project who guide its development, providing input, assessing issues and rendering decisions as the project moves forward. The Task Force has first review of all materials and final authority to make project decisions. The Task Force is comprised of representatives from the agencies and organizations listed below, with technical guidance and input from the consultant team.

- Bettcher Industries
- City of Cleveland
- Congresswoman Betty Sutton
- Erie County Commissioner
- Greater Cleveland Partnership
- Grubb & Ellis Company
- Jet Express
- K.E. McCartney & Associates
- Lorain County Commissioner
- Lorain County Community Action Agency
- Lorain County Community Alliance
- Lorain County Transit
- Lorain Port Authority
- MS Consultants
- Oberlin By Design
- WSSR Observer Project

Task Force meetings were held on a regular basis to maintain project momentum and keep all key members informed of the project's progress. The meetings were led by the consultant team, with information concerning key decisions presented for discussion. The consultant team facilitated the discussions to reach decisions in a timely manner and to keep the project progressing.

Technical Committee

The Technical Committee helped guide the project development process and advance the project in a timely manner. Members of the Technical Committee brought specific information of benefit to the project, providing insight and guidance on technical matters as the project progresses. The Technical Committee is comprised of representatives from the agencies and organizations listed below:

- City of Westlake
- Erie Regional Planning Commission (ERPC)
- Greater Cleveland Regional Transit Authority (GCRTA)
- Lorain County Community Development
- Northeast Ohio Areawide Coordinating Agency (NOACA)
- ODOT District 3
- ODOT District 12
- Sandusky Transit System

The Technical Committee worked in collaboration with the Task Force in developing project goals and measures of success, forming and evaluating alternatives, and in making decisions that move the project forward. The Technical Committee attended all Task Force meetings.

Stakeholders

Due to the nature of this project, engagement at the stakeholder level is critical. Stakeholders and stakeholder groups are individuals and organizations directly affected by this project, as identified by the Task Force and Technical Committee. In addition to the members of the Task Force, the following Stakeholders were encouraged to participate in the study:

- Representatives of communities in the corridor
- Neighborhood and community organizations
- Area business representatives

Stakeholder input and support is necessary for project success. Stakeholders were invited to participate at the public meeting. In addition, meetings with specific stakeholder groups were held to provide project-specific information as well as to solicit input and feedback.

General Public

Public meetings provide opportunities for concerned citizens to provide feedback through questionnaires and verbal responses. Members of the general public had ample opportunity to make their voices heard as they are kept up to date on the project's purpose and progress. Given the nature of this public transit project, it was particularly important to invite interested citizens to participate in the project development process. Public meetings were held to keep

the public informed about the project and to gather public opinion, ideas and feedback. The project team reviewed the project with and solicited feedback from the public.

A critical component of the public involvement program for this project was effectively engaging the populations of all three counties and integrating successful meetings and outreach events. As such, the program implemented duplicate meetings and events at separate locations in each of the three counties on subsequent days, allowing participants to attend the events that were most convenient. In addition, opportunities for feedback were provided via on-line surveys and through a project email site.

Public meetings were held at milestone points to present project issues and ideas to the public and to solicit their feedback. These meetings were in an open house format to allow the orderly presentation of information and public response. Formal presentations are given, ending with a question and answer session. This portion is followed with additional one-on-one conversations, allowing for additional feedback on an individual basis which facilitated additional public comment without fear of censure.

Public Outreach and Community Meetings

As previously mentioned, public involvement events were held in each of the three counties. This provided convenient opportunities for citizens to share their thoughts on the project, giving them the opportunity for both flexibility of schedule and location. In addition, on-line surveys and a project email address are provided. This approach maximized the project's opportunity for obtaining feedback. Two sets of public outreach events and public meetings are held at key development stages. The first set which was held early in the process:

- Introduced the project to the community, and
- Presented the Purpose and Need statement, develop ideas and solicit feedback for the creation of alternatives.

The second set was held toward the end of the process:

- Presented and evaluated alternatives and solicit feedback, and
- Present the Locally Preferred Alternative.

Communication, Outreach and Documentation

A variety of outreach methods were used to communicate with the many and varied individuals and agencies who were interested and involved with this project. Examples of communication methods are listed below. Additionally, newspaper articles appeared in the Morning Journal (Lorain County) and the Plain Dealer (Cuyahoga County). Feedback was acquired from project participants through the use of questionnaires and recording of comments at each meeting to obtain thoughts, ideas and opinions that address the issues at hand.

- Public notices and articles published in local and regional newspapers (Morning Journal and Plain Dealer)
- Project web site (www.ridewestshore.com) and Facebook
- Email blast to interested parties (those who contacted the Task Force and all public meeting attendees)
- Press releases to major media outlets
- Posted notices (at outreach events, in transit vehicles, etc.)

The consultant team documented all meetings, with meeting notes that recorded attendance as well as providing a record of subjects discussed and decisions made. Additionally, the consultant team summarized comments, input and feedback obtained from meeting participants in a meaningful manner that assisted with project input and decision-making.

Meetings

The meetings held as part of the public involvement program are listed and summarized below. Documentation of the public meetings is included in Appendix A3.

Task Force and Technical Committee Kick-Off Meeting

August 26, 2010

At the kick-off meeting the Task Force leaders and consultant team provided an overview of the history behind and development of this project. The project goals and objectives were developed, the project schedule was established, data needs were identified, and the public involvement program was reviewed.

Outreach Events and Public Meeting #1

Cuyahoga County

September 14, 2010

The morning public outreach event was held at GCRTA's Westlake Park-and-Ride, and the afternoon public outreach event was held at Crocker Park, the lifestyle center (regional shopping center), both in Westlake, Ohio. The public meeting was held at St. John Medical Center, also in Westlake. The purpose of the outreach events and the public meeting was to introduce the project to the community and to review and obtain feedback from them on the project's purpose and goals, as initially developed by the Task Force and Technical Committee.

Lorain County

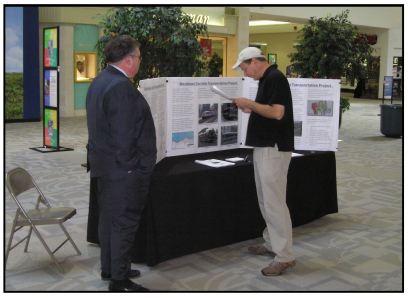
September 15, 2010

The morning public outreach event was held at Lorain County Community College, and the afternoon public outreach event was held at Midway Mall, both in Elyria, Ohio. The public meeting was held at Black River Landing in Lorain, Ohio. The purpose of the outreach events and the public meeting was to introduce the project to the community and to review and obtain feedback from them on the project's purpose and goals, as initially developed by the Task Force and Technical Committee.

Erie County

September 16, 2010

The morning public outreach event was held at the Downtown Erie County Building, and the afternoon public outreach was held at Sandusky Mall, both in Sandusky, Ohio. The public meeting was held at Erie County Administration Building in Sandusky, Ohio. The purpose of the outreach events and the public meeting was to introduce the project to the community and to review and obtain feedback from them on the project's purpose and goals, as initially developed by the Task Force and Technical Committee.



Task Force and Technical Committee Meetings

October 28, 2010

Project meeting to formalize the Purpose and Need and to review the existing conditions, public involvement plan and conceptual alternatives.

November 16, 2010

Initial Alternatives Workshop. Project meeting to develop a short list of alternatives that will be moved forward into detailed analysis.

December 15, 2010

Project meeting to review the draft existing conditions report, the preliminary screening of alternatives and the planned submission to the Federal Transit Administration (FTA). Review recent and planned activities, capital cost estimates, Small Starts options and next steps.

January 20, 2011

Project meeting to review changes to the alternatives, with a focus on the TSM alternatives. Capital and operating costs, funding strategies, and partial detailed screening results were also reviewed.

March 7, 2011

Project meeting to review the alternatives and ridership information.

March 24, 2011

Project update meeting to review land use and economic development, value capture, ridership, cost estimates (revised and expanded), recent activities in Erie County and elsewhere, and upcoming workshops and meetings.

April 7, 2011

Project meeting to conduct detailed screening of the alternatives. Agenda items included definition and presentation of detailed screening, questions to help determine the Locally Preferred Alternative (LPA) and the recommended LPA.

April 21, 2011

Project meeting to discuss the Locally Preferred Alternative (LPA). Agenda items include presentation of the LPA, discussion of LPA screening criteria, value capture, financial analysis, and upcoming steps and public meetings.

Public Meeting #2

Cuyahoga County

October 24, 2011

The Cuyahoga County public meeting was held at the Lakewood City Hall Auditorium in Lakewood, Ohio. The purpose of the public meeting was to discuss the project, present the preferred alternative, obtain feedback and answer questions.

Erie County

October 25, 2011

Due to publication of two meeting different meeting locations, the Erie County public meetings were held at the Erie County Administration Building (247 Columbus Avenue, Sandusky, Ohio) and at the Erie County Commissioner's Chambers (2900 Columbus Avenue, Sandusky, Ohio). The project team presented the same information at both venues. The purpose of the public meeting was to discuss the project, present the preferred alternative, obtain feedback and answer questions.

Lorain County

October 26, 2011

The Lorain County public meeting was held at Black River Landing in Lorain, Ohio. The purpose of the public meeting was to discuss the project, present the preferred alternative, obtain feedback and answer questions.

Chapter 4 – Existing Conditions Assessment

Introduction

This document assesses the existing transportation, land use, and demographic conditions of the Westshore Corridor Transportation Project (WCTP). These existing conditions illustrate and provide substance to the project purpose and need statement and goals and objectives. The analysis of existing conditions will demonstrate the following transit problems that exist within the corridor:

- A lack of transit connections between GCRTA and LCT bus systems, which make inter-county transit travel between Cuyahoga and Lorain counties impossible. Inter-county transit connections to Erie County are also unavailable.
- Reduced transit service in Lorain County makes intra-county transit travel difficult or impossible.
- A lack of a fixed-route transit system in Erie County make intra-county transit travel difficult or impossible.
- Lack of direct, frequent transit service for trips between Erie, Lorain, and Cuyahoga counties to retail and job destinations in the study area.
- Difficulty in reaching key health care, shopping, education and tourist destinations within the corridor via public transit.
- Land use patterns and densities in regional suburban growth areas that are generally unsupportive of transit.

Table 4.22 lists the transportation problems that have been identified and the corresponding information that substantiates each problem. The transportation recommendations that result from this study will be developed to address the existing transportation needs in the corridor.

Study Area

The WCTP study area is shown with a black border in Figure 4.1. The study area stretches from downtown Cleveland west to the city of Sandusky. The northern border is the shore of Lake Erie. The southern border is irregular because the border was drawn based on traffic analysis zones (TAZs). TAZs are a unit of analysis used by a Metropolitan Planning Organization (MPO) to model regional travel trips. Creating a study area that corresponds to the boundaries of TAZs simplifies the aggregation of transportation and demographic data from the MPO's regional travel forecasting model for the purposes of the study. However, the study corridor generally includes areas that are served by I-90 from downtown Cleveland west to Elyria and SR 2 from Elyria west to Sandusky.

The study area includes multiple jurisdictions, including three counties (Cuyahoga, Lorain, and Erie) and 16 individual jurisdictions (from east to west):

- Cleveland (partial)
- Lakewood
- Rocky River (partial)
- Westlake
- Bay Village
- Avon
- Avon Lake
- North Ridgeville (partial)
- Sheffield
- Sheffield Lake
- Elyria
- Lorain
- Amherst
- Vermilion
- Huron
- Sandusky

The breadth of municipality type is notable. Cleveland, Lakewood, Elyria, and Lorain are older communities developed in the 19th and early 20th centuries, before the advent of the automobile. These cities are urban in character, with high population, employment and development densities. In between are newer suburban communities, many of which are still growing. These communities, such as Westlake, Avon, and North Ridgeville, are characterized by lower development densities and an auto-oriented character. The Sandusky-Huron area and Vermilion are small cities separated from the continuous development of the Cleveland-Lorain-Elyria metropolitan area by rural and undeveloped land. Sandusky and Huron are themselves surrounded by their own small belt of suburban development.

The study area includes portions of three U.S. Congressional districts and numerous State of Ohio House and Senate seats, as shown in Figures 4.2 through 4.4, respectively. The multiple counties and municipalities in the study corridor provide numerous potential stakeholders and supporters for any proposed projects to improve transportation in the corridor. These numerous stakeholders likewise could make developing a transit solution with unanimous support a challenging task.

Figure 4.1: Westshore Corridor Study Area

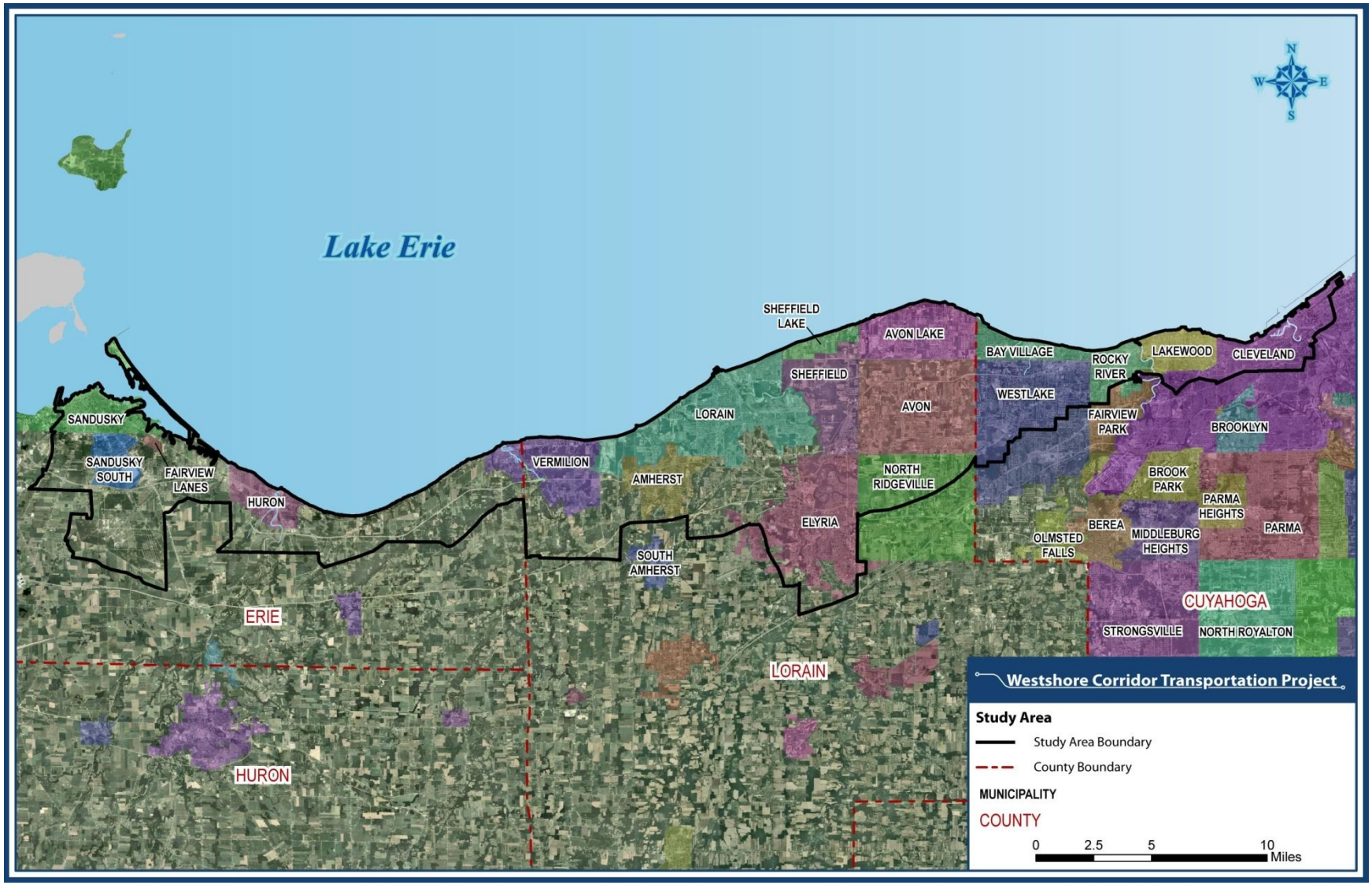


Figure 4.2: US House of Representative Districts

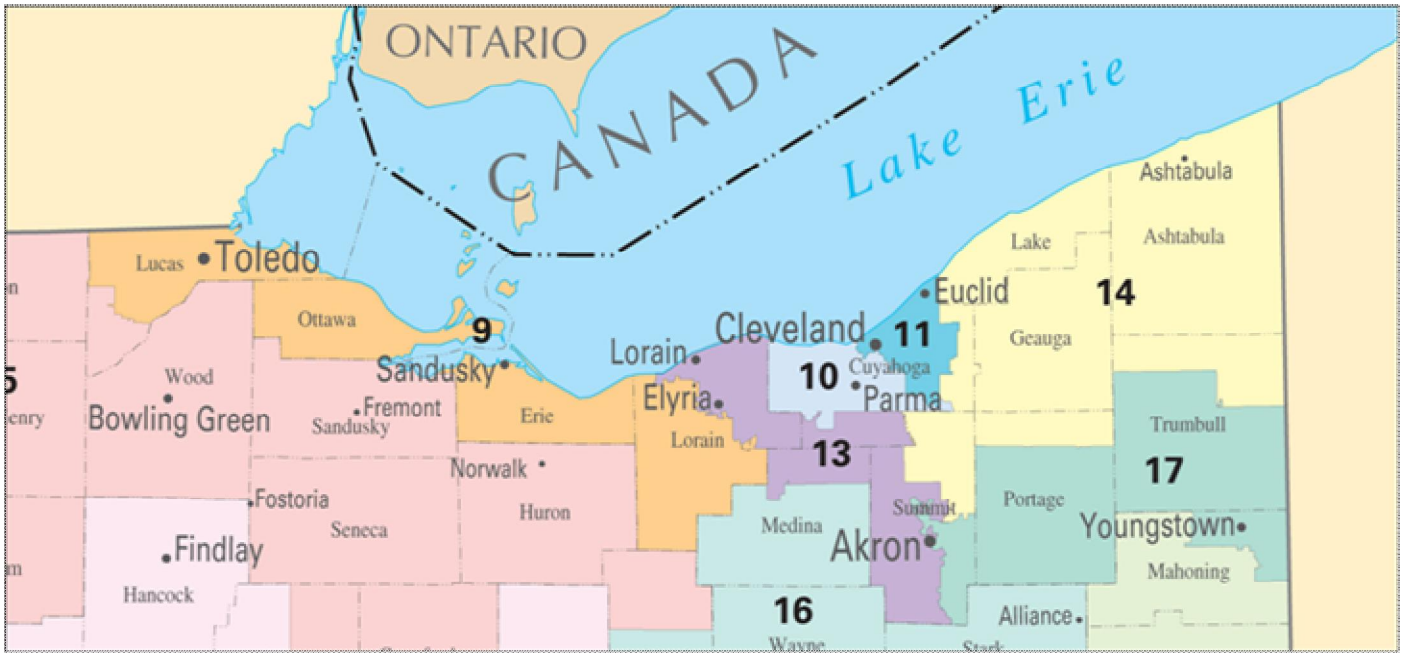


Figure 4.3: Ohio House of Representative Districts

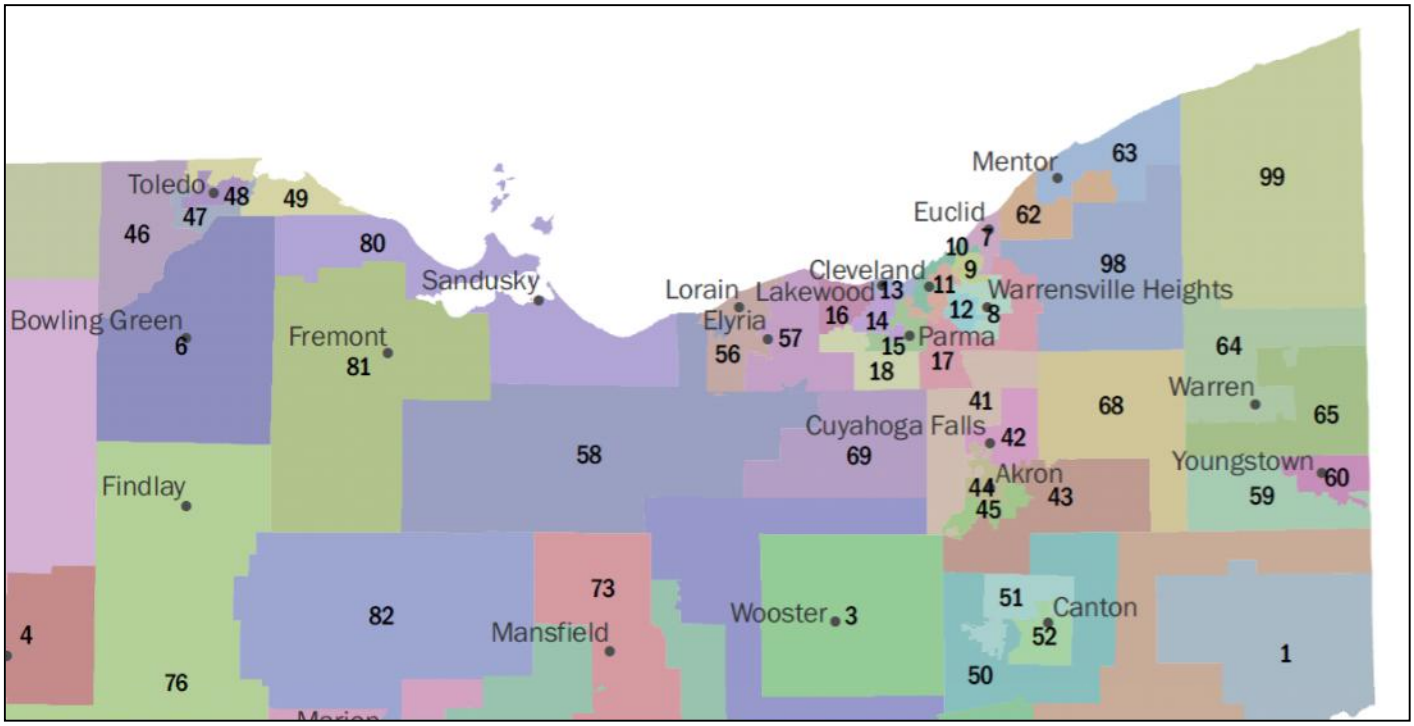
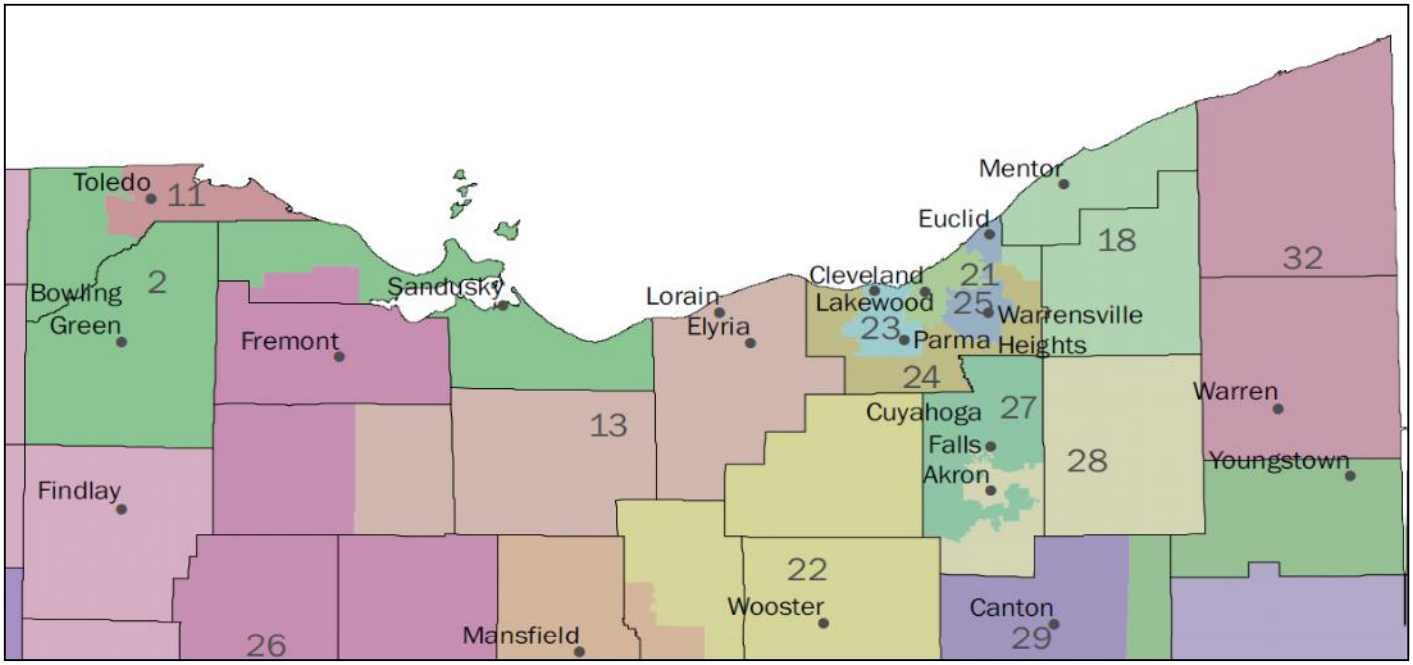


Figure 4.4: Ohio Senate Districts



Planning Context

This section describes the planning context of the study area and provides an overview of previous transportation studies performed in the Westshore Corridor. The studies have identified various transportation problems and recommended solutions or improvements, but no one study has identified a comprehensive program to address all of the transportation needs of the area. Nevertheless, these studies provide historical context and a starting point for the Westshore Corridor Transportation Project.

The planning context also includes a review of the demographic, socioeconomic, and land use in the study area. Additional information on previous master and land use plans for the municipalities in the study area is included in Appendix A4. These plans and demographics will ultimately drive existing and future demand for transportation services and impact the transportation improvements that might address the needs of the study area.

Previous Projects and Studies

The list of previous projects and studies is extensive due to the large size of the study area. Those listed here are divided by the area covered, with multi-county studies presented first and studies for individual counties listed later.

Projects and Studies Covering the Entire Study Area:

Ohio Rail Development Commission Statewide Rail Plan (2010)

The ORDC developed a statewide rail plan as part of their efforts to increase passenger rail service in the state of Ohio. The plan assesses both freight and passenger service since each would use the same infrastructure. The infrastructure assessment includes an initial assessment of statewide rail capacity and how additional passenger services would interact with freight trips.

The centerpiece of the passenger rail section of the plan is the 3C corridor which is to operate between Cleveland, Columbus, and Cincinnati. In Cleveland the 3C corridor is expected to terminate at a lakefront location, either at the existing Amtrak station or a new station in the same vicinity.

The statewide plan also makes mention of both the NEORail study for Northeast Ohio commuter rail and the Midwest Regional Rail System (MWRRS) that would Minneapolis, Milwaukee, Cleveland, Detroit, St. Louis, Cincinnati, and Indianapolis with a hub in Chicago. Each of these systems would provide passenger rail connections in Cleveland between the Westshore corridor and the rest of the country.

Projects and Studies Covering Lorain and Cuyahoga Counties:

NOACA 2008-2011 Transportation Improvement Program (2007)

The NOACA Transportation Improvement Program (TIP) serves as an implementation plan for the agency's long range transportation plan, documenting the proposed highway, transit,

bikeway, and enhancement projects that area expected to be implemented in a four year period. NOACA's TIP is developed in coordination with the statewide TIP and is a financially constrained document, meaning that every included project in it must have an identified funding source. The TIP has a four year time frame, and is updated every two years. NOACA's most recent TIP was updated in 2007 to cover the 2008-2011 time period. In the last quarter of 2010, NOACA began the process of updating the TIP.

The TIP includes many projects that are within the study area, most of which are smaller projects aimed at maintaining existing infrastructure, including pavement resurfacing, rehabilitation, and reconstruction. As a result, most NOACA TIP projects are not expected to significantly increase capacity or improve travel speed on east-west transportation facilities in the corridor, or significantly improve transit service in the corridor.

The one TIP project that will increase capacity is the Innerbelt Bridge Project, which would serve this corridor as its main Interstate connection to downtown Cleveland. The TIP lists this as several different contracts that include construction of a new bridge for westbound lanes, rehabilitation of the existing bridge for eastbound lanes, and the reconfiguration of the I-90/I-71/I-77/ E. 9th Street interchange adjacent to downtown Cleveland. The project will be a major capacity improvement for automobile travelers on the west side of the region. The project is expected to take more than ten years to complete. During the construction period, the Innerbelt project will affect access to downtown Cleveland for Westshore Corridor travelers.

Connections 2030 NOACA Long Range Transportation Plan (2009)

The NOACA Long Range Plan identifies the major transportation projects to be implemented over a 25 year time period. Projects must be in the plan in order to qualify for Federal funding. In the most recent Long Range Transportation Plan, NOACA employed population, employment and other data, along with an assessment of conditions and performance of transportation modes, to develop transportation goals for the region. The plan calls for a renewed focus on sustainable development, preservation of existing roadways, prioritizing investments in the urban core and increasing regional coordination. The transit portion of the plan was developed in collaboration with regional transit agencies and focuses on maintaining and improving existing transit routes and infrastructure, investing in the urban core, improving services for transit dependent riders, and advocating for multi-modal transportation services.

The most recent Long Range Transportation Plan was adopted in 2005 and updated 2007 to make it consistent with the planning requirements of SAFETEA-LU. An additional update was completed in April of 2009, but due to fiscal uncertainties, no additional projects were added to the plan at that time. The only major changes to the plan's content included an amendment of the Regional Bicycle Transportation Plan in 2008 and the movement of Opportunity Corridor from the list of illustrative projects to the fiscally-constrained portion of the plan to reflect its status as a recipient of stimulus funding. Additional language regarding climate change was also added to the plan's goals.

NOACA's Project Development and Member Services Team has determined that WCTP "is consistent with NOACA's Connections 2030 goals, specifically Goal #3 (Preserve and Improve the Efficiency of the Transportation System), Goal #4 (Establish a More Balanced Transportation System which Enhances Modal Choices),Goal #5 (Improve the Mobility of Transit Dependent and Low-Income Individuals) and Goal #7 (Foster Reinvestment in the Urban Core, Target and Manage Transportation Investments to Implement Plan Goals).

Of the projects listed in the Long Range Transportation Plan, three are recommended that will impact the capacity of roadways and travel patterns within the WCTP Study Area:

1. The Innerbelt Bridge Replacement project
2. The Avon Interchange project
3. Opportunity Corridor

The Innerbelt Bridge project, which carries I-90 through central Cleveland, will impact Westshore Corridor residents in accessing downtown Cleveland, particularly during the expected ten-year construction period.

The Avon Interchange project will construct a new interchange on I-90 at Nagel Road in Lorain County, allowing a new access point for Cleveland-bound commuters. New traffic generators in the area (specifically the new Cleveland Clinic campus) will increase reverse commute traffic as well.

The proposed Opportunity Corridor is being planned to improve access between University Circle and the interstate system while improving access to the southeast section of Cleveland and its eastern suburbs. The project would affect Westshore Corridor travelers accessing these areas.

Northeastern Ohio Commuter Rail Feasibility Study (NEORail) Phases I and II (2001)
The NEORail study was completed in two phases between 1998 and 2001. The study was a collaboration of nine counties in Northeast Ohio, including Cuyahoga, Lorain, Medina, Lake, Geauga, Summit, Stark, and Ashtabula.

Phase I of the study included assessing commuter rail feasibility on 39 alignments that cross the nine-county study area. In this phase the 39 corridors were reduced to a final ten. Of those ten seven connected to downtown Cleveland, two were circumferential, and one connected two cities outside of Cleveland. One of the ten corridors selected was "Lake West," which was proposed to connect Cleveland with Lorain. This corridor is completely within the identified Westshore Corridor study area.

Phase II carried forward the ten corridors and conducted refined cost/benefit analyses and detailed service plans. Of the ten corridors considered in Phase II, the Lake West corridor was rated as having a medium-to-high cost effectiveness and was recommended to be one of the first two lines in operation. No implementation of commuter rail has occurred in Northeast

Ohio since the completion of the study in 2001. However, since the study's completion, new or planned trip generators have been added to downtown Cleveland that would attract inter-county trips, including an expanded and modernized convention center, the addition of the Medical Merchandise Mart, and a new gambling casino. Growth also has occurred in the Euclid Avenue corridor since introduction of the RTA Healthline in 2008, particularly in the Cleveland State University and Cleveland Clinic areas. Further growth is anticipated in other parts of the Euclid Avenue corridor.

Projects and Studies Covering Cuyahoga County:

GCRTA 2010-2020 Strategic Plan (2010)

The 2010-2020 Strategic Capital Plan is an update to GCRTA's *Transit 2025* plan from 2004, with a stated purpose of providing a clear path forward for the agency to become the transportation mode of choice for Greater Cleveland. Population and employment loss in the region, coupled with declining revenues from its sales tax funding source, were the impetus for the agency's need to redefine its goals and objectives for capital spending over the next ten years. A market analysis was conducted to identify RTA's strengths and weaknesses. Constraints the agency faces, as well as the many opportunities the agency has for improving its services, were also considered.

The plan builds upon the identified opportunities and constraints to recommend how the agency can get the most out of its services, efficiently restore and enhance its infrastructure, stabilize and expand its funding sources, and create a coordinated regional transit system. Specific to the study area, the plan recommends making Detroit Avenue a priority transit corridor between downtown Cleveland and the Westgate Transit Center. There is potential for capturing new western Cuyahoga transit markets by better connecting the study area to downtown.

GCRTA Transit Oriented Development Guidelines (2007)

RTA's Transit Oriented Development Guidelines study created guidelines for future development near RTA bus and rail stations. The study noted that transit oriented development (TOD) is typically a public/private enterprise which includes higher density development and interaction with transit service in order to reduce the degree to which those who use the development are automobile dependent.

The guidelines include both land use and transportation "keys" that are necessary in order for transit oriented development to be realized. While the guidelines are not a comprehensive assessment of the RTA transit stations/stops, it does identify several of the most viable sites for transit oriented development within Cuyahoga County. While none of these sites are within the Cuyahoga County portion of the study area, the guidelines are a valid option for guiding new TOD development that may be planned as part of the WCTP.

GCRTA Transit 2025 Plan (2004)

In 2004 RTA completed a new long range plan based on its "Back to Basics" strategy, with a focus on serving customers needs and enhancing service quality with cost-effective and financially prudent investments. The stated purpose of the Transit 2025 plan was to maximize the near-term and long term quality, safety and productivity of RTA services by targeting the customer focus and financial health of the agency.

A demographic and market analysis was conducted as part of the planning process, as well as a service analysis of the system's performance. Future service concepts were developed, including new corridor-level approaches to service and amenities improvements, regional coordination, and intercity and commuter rail options. The potential for transit oriented development (TOD) was also examined in detail. The plan makes both operating and capital investment recommendations, including better development of RTA's annual capital and operating budget and service management plan. Recommended capital investments include development of downtown transit centers, new or expanded park and ride and transit center facilities, and state-of-good repair projects.

Projects and Studies Covering Lorain County:

Lorain Port Authority Black River Landing Rail Corridor and Access Study (2009)

The Lorain Port Authority completed a 2009 study that assessed access to the Black River Landing site in downtown Lorain. The plan made a number of recommendations to improve access to the site, from small architectural improvements to improve visibility all the way up to improved rail access in the form of streetcar and commuter rail improvements.

The visibility recommendations center on improving the aesthetics of the site, including new wayfinding signage and color scheme. Transportation recommendations include a connection from the site to a NOACA Priority Bike Route that includes circulation on the east side of the Black River. A streetcar loop is recommended in two phases. Phase 1 is a small loop from the Black River Landing site to downtown Lorain, mostly along Broadway. The Phase 2 recommendation is to expand the loop to include a larger portion of Lorain, including near west and south side neighborhoods.

Commuter rail is also considered in the study, primarily from the findings of the NEORail study. The Black River Landing site is considered as a potential commuter rail station, but the study notes there are a number of technical hurdles to overcome before this could be a reality. As such, the study states that commuter rail could either serve the Black River Landing site directly or could serve a station south of the Black River Landing site, with the streetcar distributing passengers to both Black River Landing and the rest of Lorain. The study estimates a connection between the Black River Landing site and the Norfolk Southern line to cost between $3-5 million. Figure 4.5 shows one of the several different alternatives considered for access to the Black River Landing site.

Figure 4.5: Example Alternative from the Black River Landing Rail Corridor and Access Study

Lorain County Transit Development Plan (2002)

In 2002 Lorain County completed a transit development plan for Lorain County Transit. The plan was necessary due to the growth in ridership LCT was experiencing as a result of rapid suburbanization in the eastern part of the county. The TDP notes that Lorain County Transit ridership had recently experienced an increase in ridership as a direct response to more service being offered, an indication that there was unmet demand for transit service in the county.

The study assessed the existing condition of the system and made recommendations for improved service that would increase ridership relative to the amount of money being spent on the system. Among the recommendations were:

- Changes to fixed route and demand-response services, including increases in service hours and frequency for fixed-route service
- Introduction of new routes providing better connections to Greater Cleveland RTA and downtown Cleveland.
- Fare simplification
- A marketing plan
- Schedule for replacement of transit vehicles
- Plans for a new Transit Center and an Operations & Maintenance Facility

Lorain County Multi-modal Transportation Plan (2001)

In 2001 Lorain County completed a Multi-modal Transportation Plan. The plan considered all facets of transportation within the county, including highways, transit, rail, airports, water ports, and broadband capability, and made recommendations regarding connectivity between the modes. The goal of the plan was to make traveling easier, regardless of mode, and make changing modes easier as well.

The plan included several recommendations for Lorain County Transit, including:

- Expanded service hours
- Offering bicycle racks on buses
- The downtown Intermodal Transportation Center serving the Elyria Greyhound and Amtrak stations so that passengers could transfer to intercity services
- Inter-county fare coordination
- Use of traffic signal pre-emption for transit
- Park-and-Ride lots
- Establishment of a dedicated funding source for Lorain county Transit

The plan also recommended the use of transit-oriented design, addition of new or improved sidewalks and bike paths, installation of broadband infrastructure at all County industrial parks, and identified key areas for development of multi-modal synergies, including:

- The Grove Site Multi-Modal hub – incorporating light rail, excursion rail, transit, water port, bicycle, etc., as well as use as the terminus for Lorain-Cleveland commuter rail
- The Elyria New York Central Depot – Renovation plans would allow this facility to serve Amtrak, taxis, bicycles, LCT buses, pedestrians and Greyhound riders, as well as provide space for LCT offices.
- The Turnpike Interchange at SR 58 – linking highway to a planned excursion rail route, and use as a park-and-ride.
- The Lorain County Regional Airport – This airport and industrial park links highway and air modes, and is a good candidate for high-technology infrastructure and potential bus and rail connections
- Freight Facility – development of an intermodal freight transportation in central or northern Lorain County to link rail and air facilities with the Ohio turnpike and other major highways.

Projects and Studies Covering Erie County:

Erie County MPO 2008-2011 TIP

The Erie County MPO TIP is Erie County's equivalent of the NOACA TIP, and includes the same timeframe of 2008-2011. The TIP includes all of the planned highway, bicycle, and pedestrian improvements within the county.

Most of the projects in the TIP are related to infrastructure maintenance, and there are no projects identified that would increase roadway capacity within the corridor. While Erie County's population increases with seasonal visitors, the infrastructure appears to be adequate for existing capacity.

Erie County Regional Planning Commission 2035 Long Range Transportation Plan (2010)

The Erie County Regional Planning Commission's 2035 Long Range Transportation Plan seeks to address transportation needs for the county over the next 25 years. The plan is multimodal, making recommendations for roadway, bus, rail, aviation, and non-motorized modes of transportation.

The major transit recommendation within the plan is to develop fixed route bus service on the US 6 (Lake Road) corridor to connect population in Sandusky, Huron, and Vermilion. The plan also notes the potential for seasonal transit service to connect downtown Sandusky to Cedar Point.

Community Structure

This section documents the characteristics of the communities that exist along the corridor. As noted in the Study Area section above, there is a wide breadth of character in the various communities that comprise the WCTP study area. The character ranges from big city to suburb to developing areas to small town. Economically the study area includes a major downtown, manufacturing areas that are primed for reinvestment and redevelopment; suburban office and retail centers of various ages and stages in the development cycle, and important regional recreational attractions that make the corridor a major regional destination.

The sections following take note of these differences and also find unifying characteristics for the study area.

Study Area Demographics

The study area is among the most concentrated portions of the region in terms of population and employment density. Table 4.1 summarizes the number of jobs and people within the study area by county. The table also shows the percentage of each county that is included in the study area. Overall the study area has 25.6% of the three-county area's population, 30.2% of the area's employment, but only represents 21.3% of the area. The study area contains 13% of Cuyahoga County's population and 24 % of the jobs, but only 9% of the county's land area. Thus, the portion of the county within the study area is developed at a density that is higher than that of the county as a whole.

Table 4.1: County Job and Population Comparison

	Total Pop.	Study Area Pop.	Pop. % of total	Total Emp.	Study Area Emp.	Emp. % of Total	Total Area	Study Area	Area % of Total
Cuyahoga County	1,393,978	183,879	13.2%	748,933	178,832	23.9%	458.7	41.5	9.0%
Lorain County	284,664	209,742	73.7%	107,607	82,607	76.8%	494.0	143.9	29.1%
Erie County	79,551	56,371	70.9%	37,495	28,967	77.3%	258.1	72.3	28.0%
Total	1,758,193	449,992	25.6%	894,035	269,967	30.2%	1,210.8	257.7	21.3%

This is even more the case in Lorain and Erie counties. The study area portion in Lorain County contains 74% of the county's population and 76.8% of the county's jobs while representing only 29.1% of the total county area. In Erie County the study area represents 70.9% of the population and 77.3% of employment but in only 28.0% of the total county area.

While Greater Cleveland as a whole has experienced a trend of population decline over the last twenty years, the study area offers examples of both growth and decline. Declining population is found in the older central cities and suburbs of the study area, including Cleveland, Lakewood, Elyria, Lorain, and Sandusky. Much of this population loss is related to the loss of manufacturing jobs.

In contrast to people leaving these central cities, newer suburban areas in between Lorain/Elyria and Cleveland are growing. Portions of the Westshore corridor are an excellent example of the fifty year trend of outward movement from the city of Cleveland. Rocky River and Bay Village represent the first wave of this movement in the 1950s. Westlake developed from 1960 through the 1980s. Avon, Sheffield and North Ridgeville have largely developed as suburbs since the 1990s.

Population Density

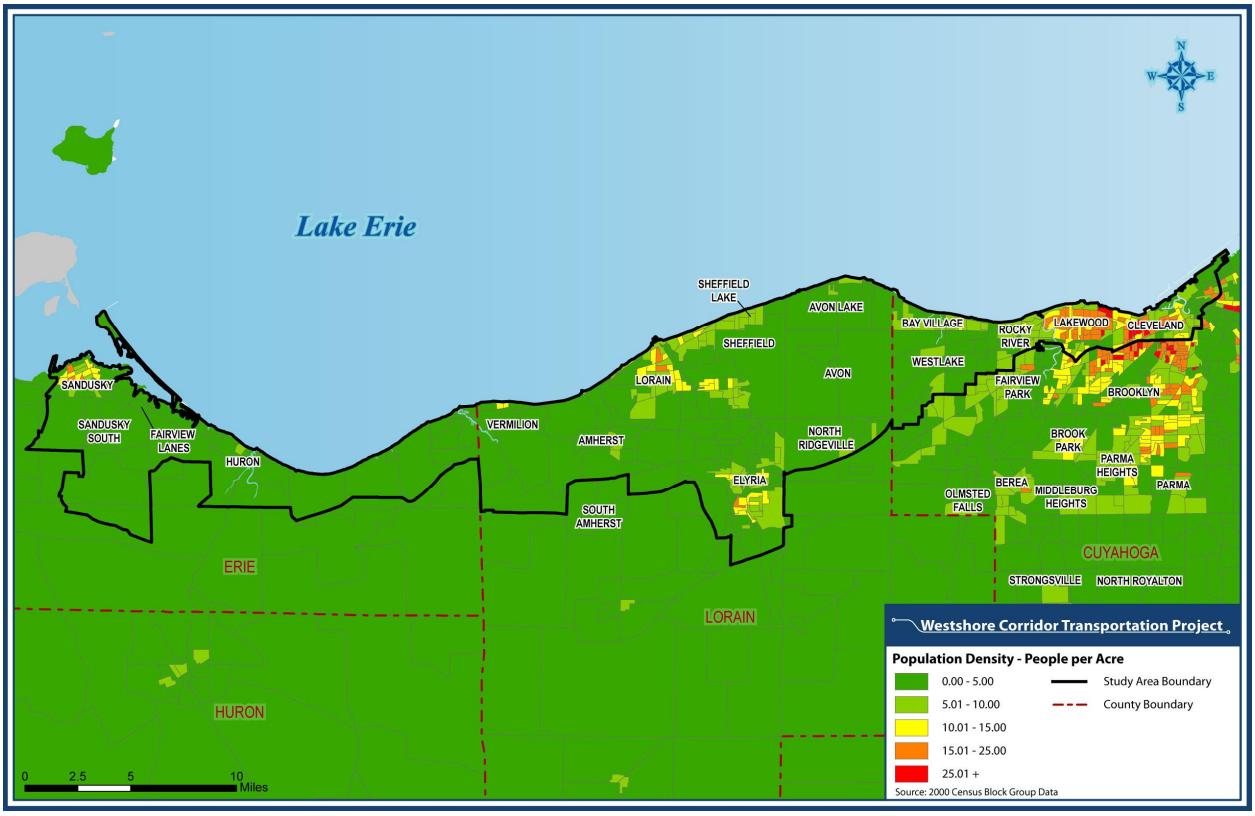
The population density by census block within the Westshore Corridor study area is shown in Figure 4.6. The density is highest within the cities of Cleveland and Lakewood, while portions of Lorain, Elyria, and Sandusky each have pockets of higher population density as well.

Beyond these areas much of the study area has census blocks with fewer than five people per acre. Some of these areas are developed (Avon and Sheffield, for example), but they are developed in a low-density pattern of large-lot single family homes.

Some areas along the coast, particularly in Erie County, experience an increase in seasonal population during the summer months.

Further discussion of year-round population and population density is in Appendix A4.

Figure 4.6: Study Area Population Density



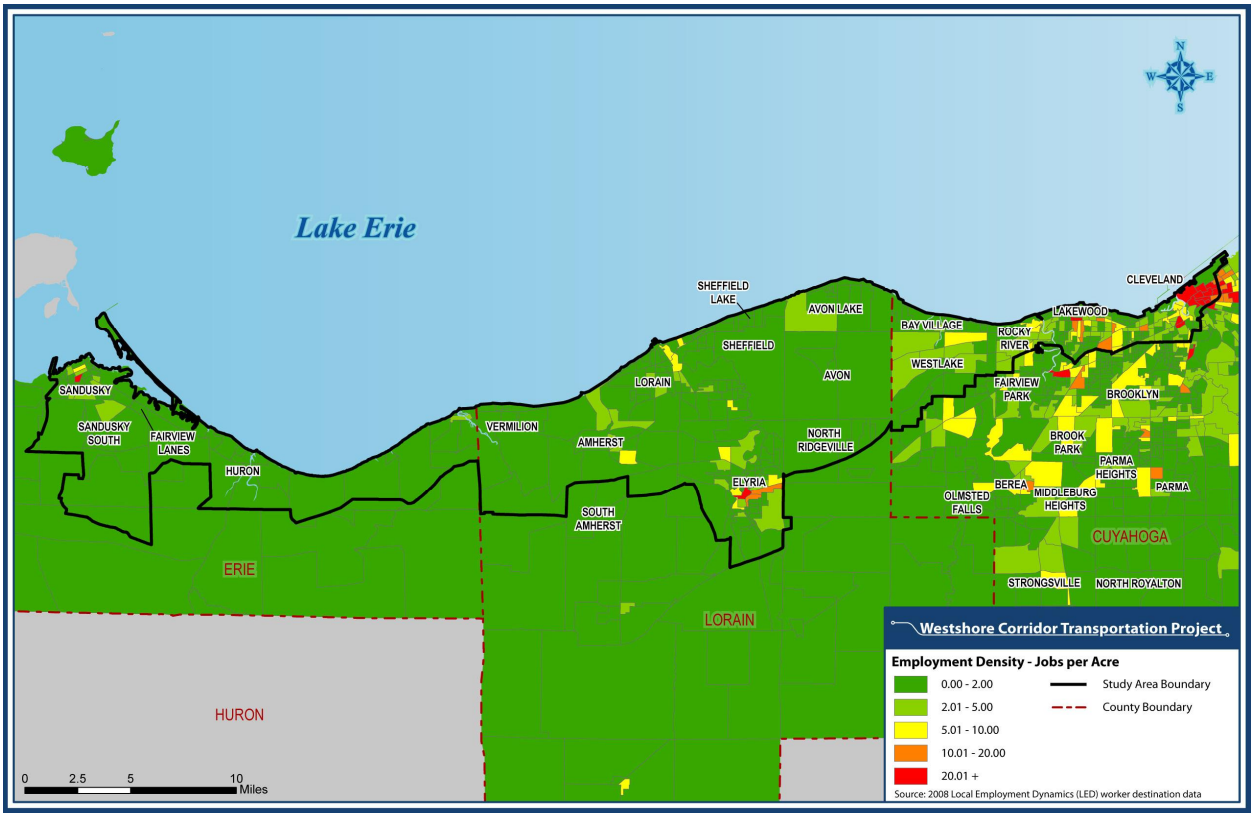
Employment Density

Employment density for the study area is shown in Figure 4.7. Downtown Cleveland is the major employment center within the region and the map shows numerous census blocks with more than 20 jobs per acre. Many of the jobs in downtown Cleveland are located in office towers, which is why it has the highest employment density in the study area.

Moving west from Cleveland, the employment density in the western Cuyahoga and eastern Lorain suburbs is lower. This is because much of the employment in these areas is in a low-density suburban office park pattern, roughly aligned on the I-90 corridor. Lorain, Elyria, and Sandusky each show pockets of higher employment density, but these areas also are surrounded with many census blocks that contain fewer than two jobs per acre.

As with population, some areas along the coast, particularly in Erie County, experience an increase in seasonal employment during the summer months, although this is not shown on the map.

Figure 4.7: Study Area Employment Density

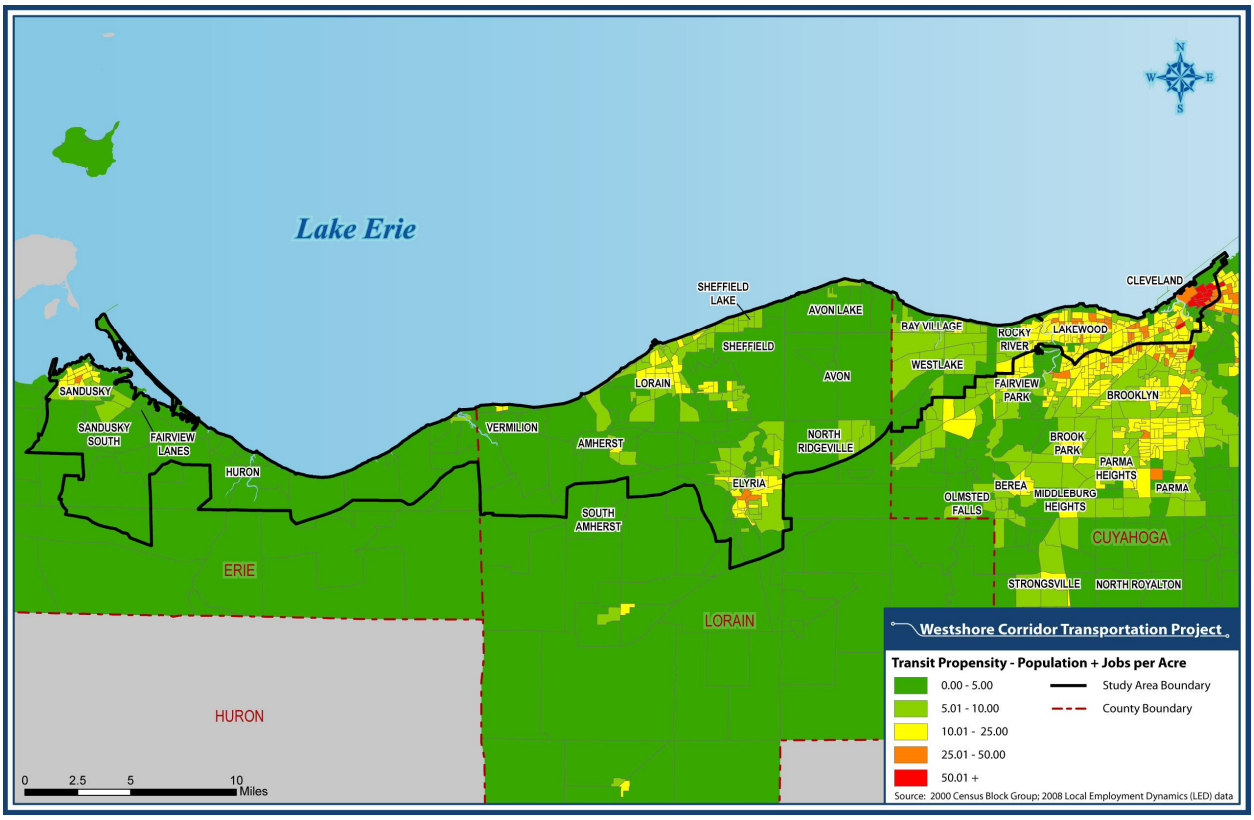


Transit Propensity

Transit propensity can be defined as the potential for transit ridership. One general way to assess this potential is by looking at the total density of jobs and people over a large area, with the idea being to identify areas with a density that is generally supportive of transit.

Figure 4.8 depicts jobs plus people per acre over the Westshore Corridor study area. The orange and red areas represent those that have a high density (I.e., they have potential to generate transit ridership). Most of these high density areas are clustered in Cleveland and Lakewood. The conclusion from this map is that much of the study area has low densities that are generally unsupportive of transit in their current state. However, commuter rail can be supported by lower density residential areas because a commuter rail station typically has a 2-5 mile catchment area.

Figure 4.8: Westshore Corridor Transit Propensity



Transit Dependent Population

The location of transit dependent population is an important indicator of the need of transit within the study area. There are many different ways to measure transit dependents, but two of the most widely used are household income (Figure 4.9) and zero car households (Figure 4.10).

Each of these shows where potential transit riders are located in the study area. In the case of household income, the areas with low household income in red are places where more people either cannot afford a car or are less likely to use their car to commute due to the costs involved. Portions of Elyria, Lorain, and Sandusky each have areas with low household income, along with parts of Lakewood and Cleveland.

Zero car households are an even better indicator of transit dependent population because these are households that have limited options for transportation. Figure 4.10 shows roughly the same areas as the household income map, however, there are also additional zero car households in western Cuyahoga County that could indicate a larger than average senior population.

A more detailed look at study area demographics can be found in Appendix A4. This appendix also includes further information on age, race, household income, and housing tenure statistics.

Figure 4.9: Westshore Corridor Household Income

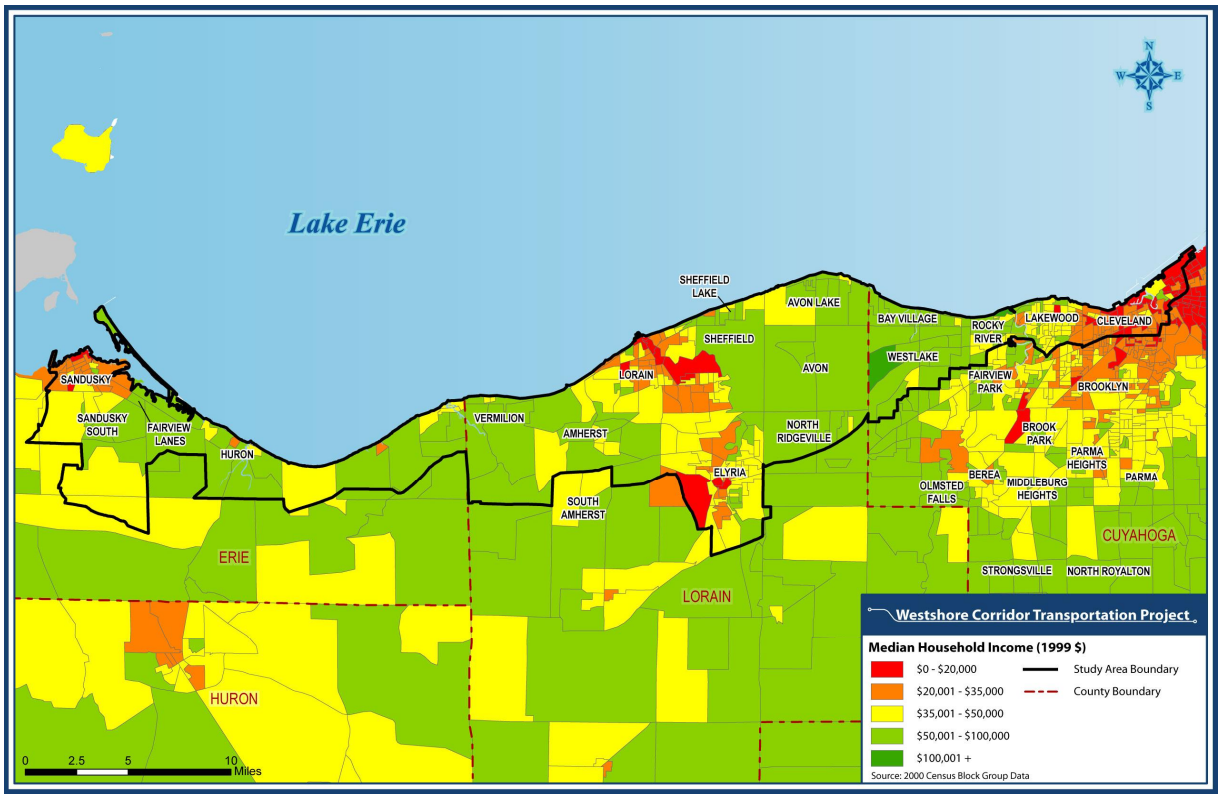
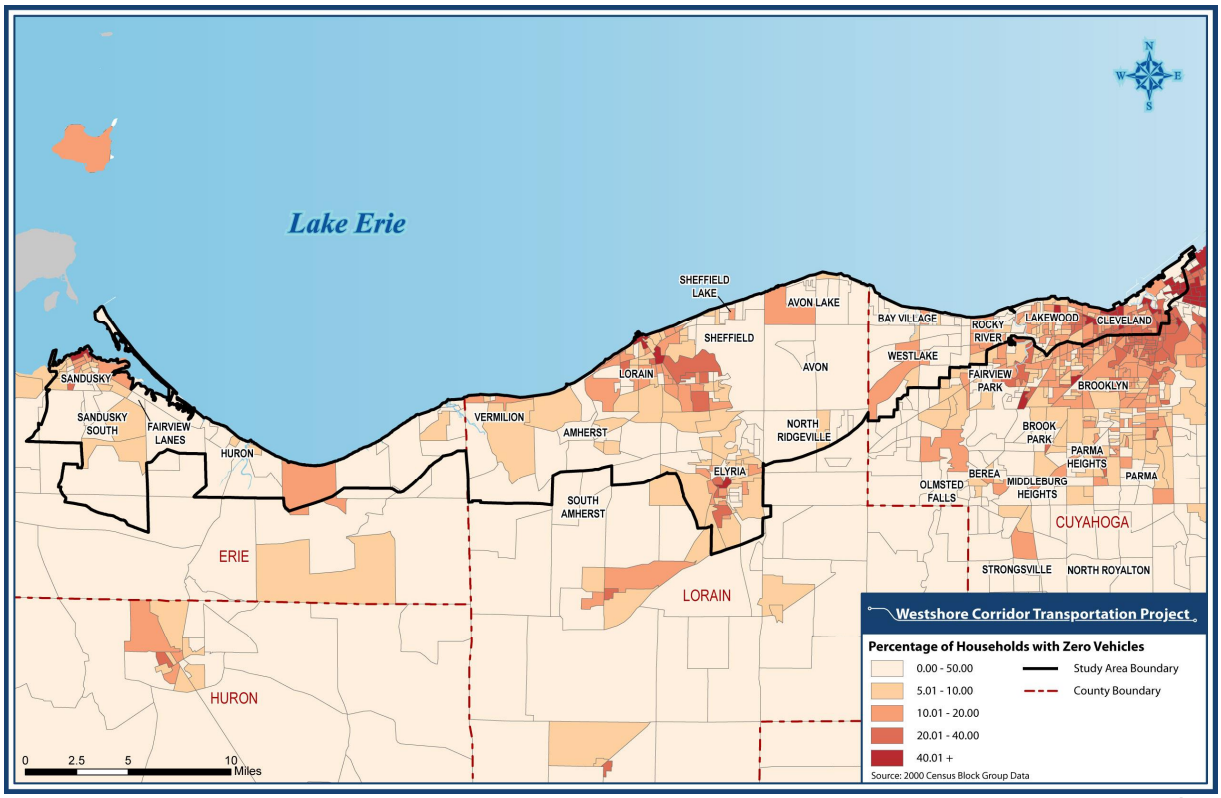


Figure 4.10: Westshore Corridor Zero Car Households



Land Development Patterns and Plans

The land use development pattern for the study area includes a wide array of different uses and densities. Figure 4.11 maps land use over the Westshore Corridor study area.

Moving from east to west and starting in downtown Cleveland, the level of density transitions as follows:

- Downtown Cleveland – high density job center and regional hub
- West side of Cleveland – older urban development from 80-120 years ago. Neighborhoods include apartments and single family homes, with retail concentrated on main urban (former streetcar) arterials like Lorain and Detroit Avenues. Much land is underused or abandoned, and ripe for redevelopment.
- Lakewood – inner-ring suburb with older urban neighborhoods comprised of single family homes, doubles, and apartment buildings. Retail concentrated along Madison and Detroit Avenues, two older "main street" corridors. The city has little or no undeveloped land, but a few areas are ripe for redevelopment.
- Rocky River – second ring suburb with older homes near the lakefront, more recent development near I-90. Little or no undeveloped land, few parcels available for redevelopment.
- Bay Village – second ring suburb comprised mostly of single family homes. Little or no undeveloped land, few parcels available for redevelopment.
- Westlake – third ring suburb with single family homes and auto-oriented office and retail development near I-90. Few undeveloped parcels remain, and little existing development is available for redevelopment.
- Avon/Avon Lake – third ring suburb characterized by a separation of land uses, single family homes, and strip-center retail development. Much of the suburb remains undeveloped and rural land is still available for development. Has office and retail development along I-90.
- Sheffield/Sheffield Lake – third ring suburb characterized by a separation of land uses, single family homes, and strip-center retail development. Much of the suburb remains undeveloped and rural land is still available for new development.
- North Ridgeville – third ring suburb with recent growth spurred by access to I-480. Much of the suburb remains undeveloped, and rural land is still available for new development.
- Elyria – older development at center, including manufacturing. Downtown includes Lorain County government. More recent auto-oriented neighborhoods and retail away from downtown. Some areas have land that is under-developed and is ripe for redevelopment.

- Lorain – older development at center, including manufacturing. Lakefront includes port. More recent auto-oriented development in neighborhoods away from downtown, especially on the west side. Some areas have land that is under-developed and is ripe for redevelopment.

West of Lorain and Elyria the development character changes. The density gradient from downtown to urban neighborhood to suburban sprawl related to Greater Cleveland ends. Cities are better defined by boundaries between developed and non-developed areas.

There are four cities of note in this area:

- Amherst – a small city located to the southwest of Lorain. Has a small, walkable downtown district and surrounding neighborhoods of single family homes of recent development.

- Vermilion – small city located along Lake Erie, with a historical center and more recent development away from downtown.

- Huron – a city located on Lake Erie, with a downtown district and recreational marina and residences stretching mainly east-west along the shore of Lake Erie.

- Sandusky – moderate sized city and hub of Erie County. City center includes older neighborhoods of single family homes and industrial uses tied to the lakefront. Recent development includes more tract homes, auto-oriented retail near OH-2 freeway, and growth in tourism from Cedar Point and Lake Erie islands.

Further information about planning and zoning by municipality is located within Appendix A4.

Major Destinations

Figure 4.12 maps major destinations—the most important places that attract trips from within and outside the corridor–that exist within the corridor. Destinations were defined as hospitals, higher education facilities, major retail developments (such as Midway Mall), social service offices, or major recreational facilities (such as Progressive Field or Cedar Point).

The map shows a number of interesting patterns. Downtown Cleveland, the hub of Northeast Ohio, contains the largest number of destinations, including three major sports facilities, Cuyahoga County social services, and Cleveland State University. Moving west, the downtowns of Elyria and Lorain each contain their share of destinations, including Black River Landing in Lorain, Lorain County social services, and several hospitals.

Between downtown Cleveland and the Lorain-Elyria axis the destinations are mostly aligned along the I-90 corridor. They are spread out evenly along the corridor, which is indicative of the suburban, auto-oriented nature of this area. To the west, Sandusky, as the hub and largest city of Erie County, contains most of the major destinations in that county.

Figure 4.11: Land Use in Study Area

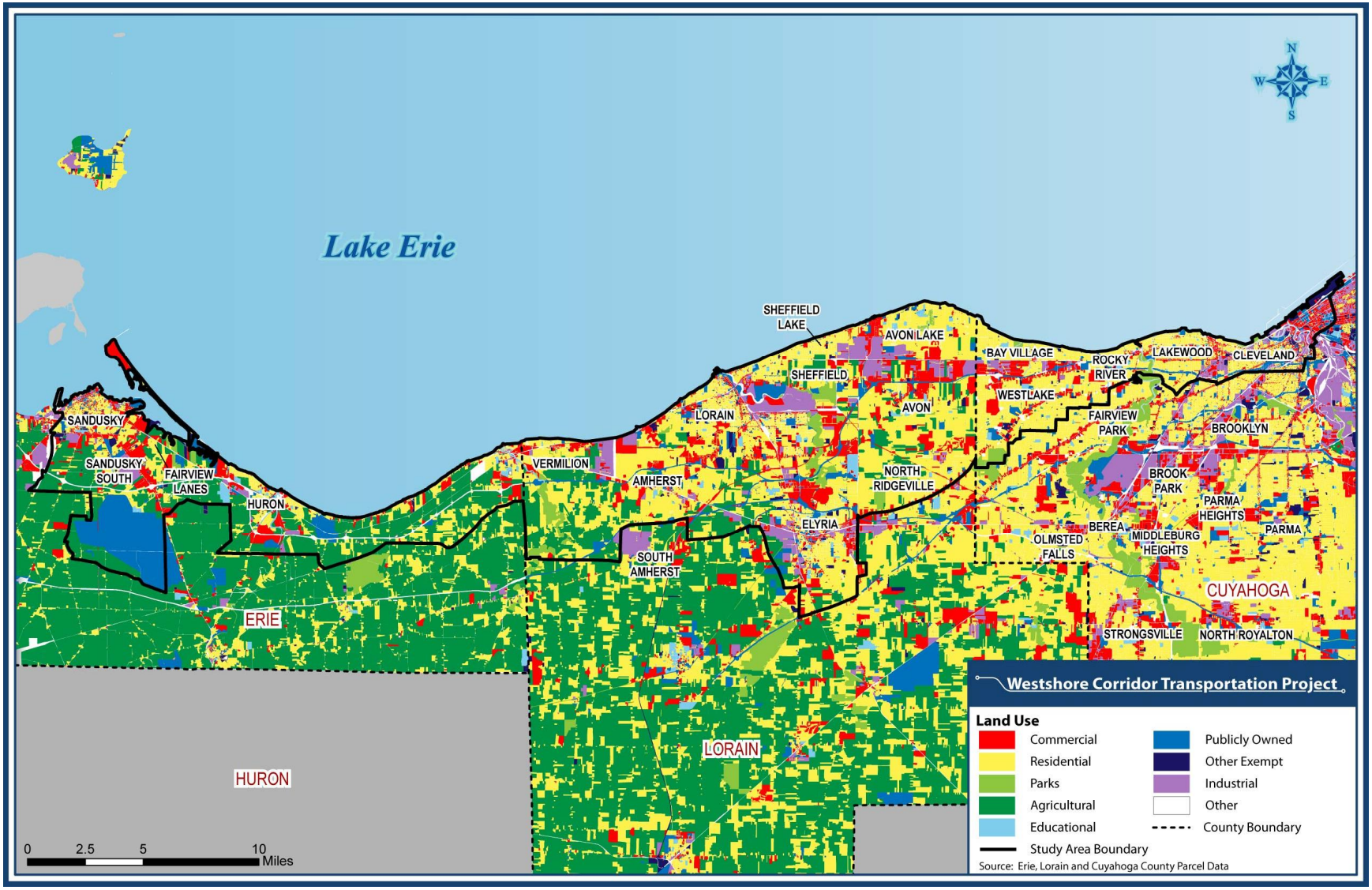
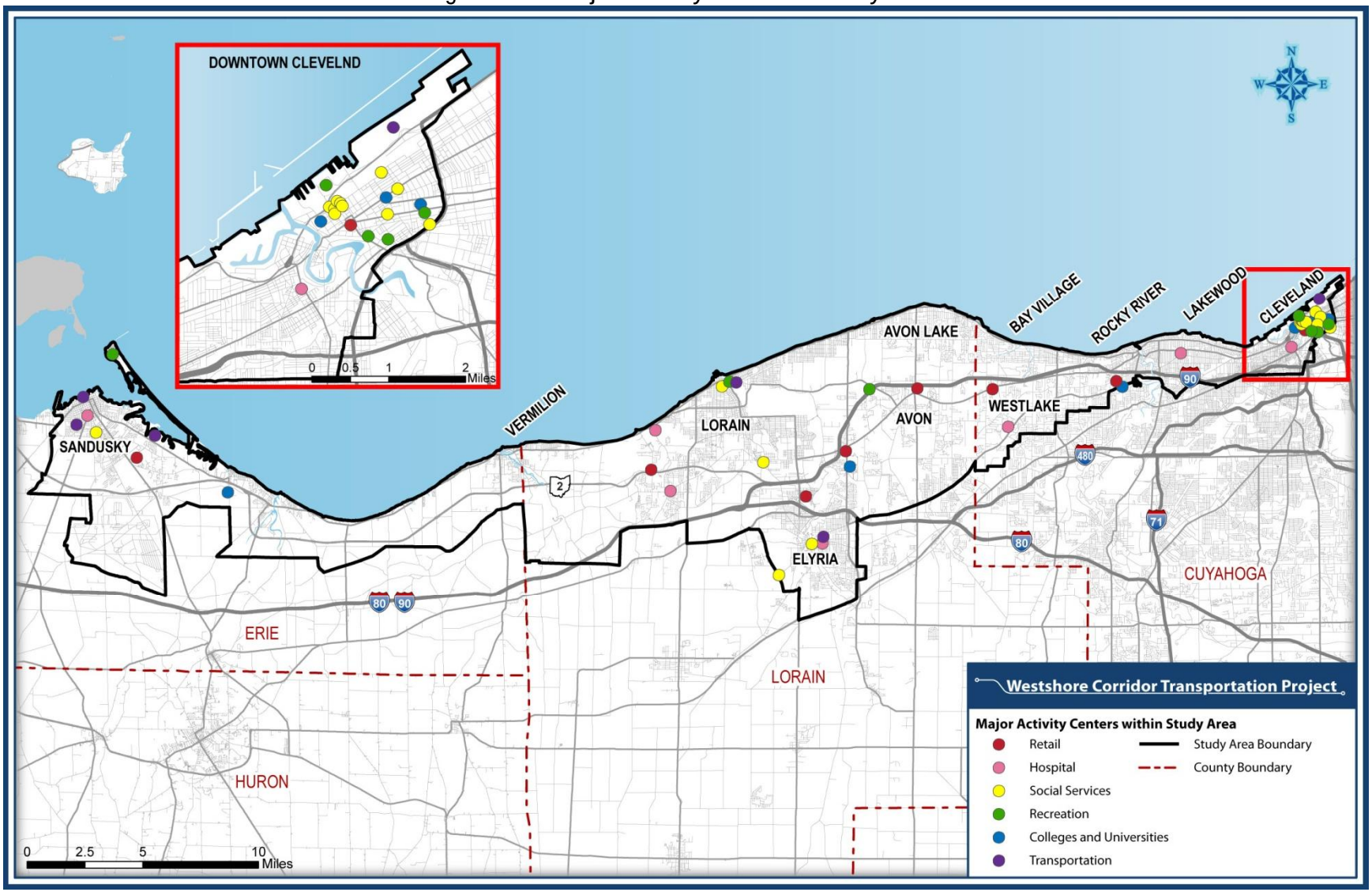


Figure 4.12: Major Activity Centers in Study Area



Transportation Infrastructure and Function

This section details the existing transportation infrastructure located within the Westshore Corridor study area, including roads and highways, public transit, park and ride lots, freight railroads, airports, transportation systems and funding. The information presented in this section confirms and documents the transportation problems identified in the purpose & need statement, and supports the need to meet the project goals and objectives.

Regional Travel Patterns

The location of our region on the shores of Lake Erie has resulted in a much of the development in Greater Cleveland orienting itself in an east-west development pattern along the lakeshore. This orientation results in the Westshore Corridor being one of Greater Cleveland's most important travel corridors. There are several freeways and arterials that provide east-west access in the corridor. In addition, the topography throughout the study area is gentle enough that there are many north-south links that cross the east-west travel corridors. As a result the entire study area is crisscrossed with a grid of roadways that make automobile travel relatively easy throughout the corridor during most times of day.

Regional Freeways, Roadways and Rail

Figure 4.13 shows the four major travel corridors identified within the study area. Major corridors identified include:

- I-90/OH-2 – between Sandusky and downtown Cleveland
- US 6 (Lake Road) – between Sandusky and downtown Cleveland
- Colorado Avenue/Detroit Road – between west side of Lorain and downtown Cleveland
- Center Ridge Road – between Elyria and Rocky River, extending along Hilliard Boulevard west from Wooster Road to access I-90 at Exit 162
- Norfolk Southern Rail – between Sandusky and downtown Cleveland

Not every corridor runs the entire length of the study area. In some cases, a travel corridor ends or begins at another corridor. For example, the Colorado Avenue/Detroit Road travel corridor starts on the west side of Lorain at US 6. Motorists also may use pieces of more than one travel corridor. Travelers may use Detroit Road for several miles, but the intent is really to access I-90 to make the long distance trip. The Norfolk Southern rail corridor provides freight movement in the same east-west pattern through the study area.

Table 4.2 shows several important pieces of information about the major roadway corridors, including the route designation, functional classification, average daily traffic and corridor congestion level of service. Traffic volumes and level of service are discussed below.

Roadway Traffic

Table 4.2 additionally shows annual average daily traffic (AADT) for each segment of each travel corridor. Overall, the statistics show traffic to be the heaviest in Cuyahoga County and along the portions of the corridor designated as "Interstate" or "Other Freeway and Expressway."

Figure 4.13: Major Travel Corridors through the Study Area

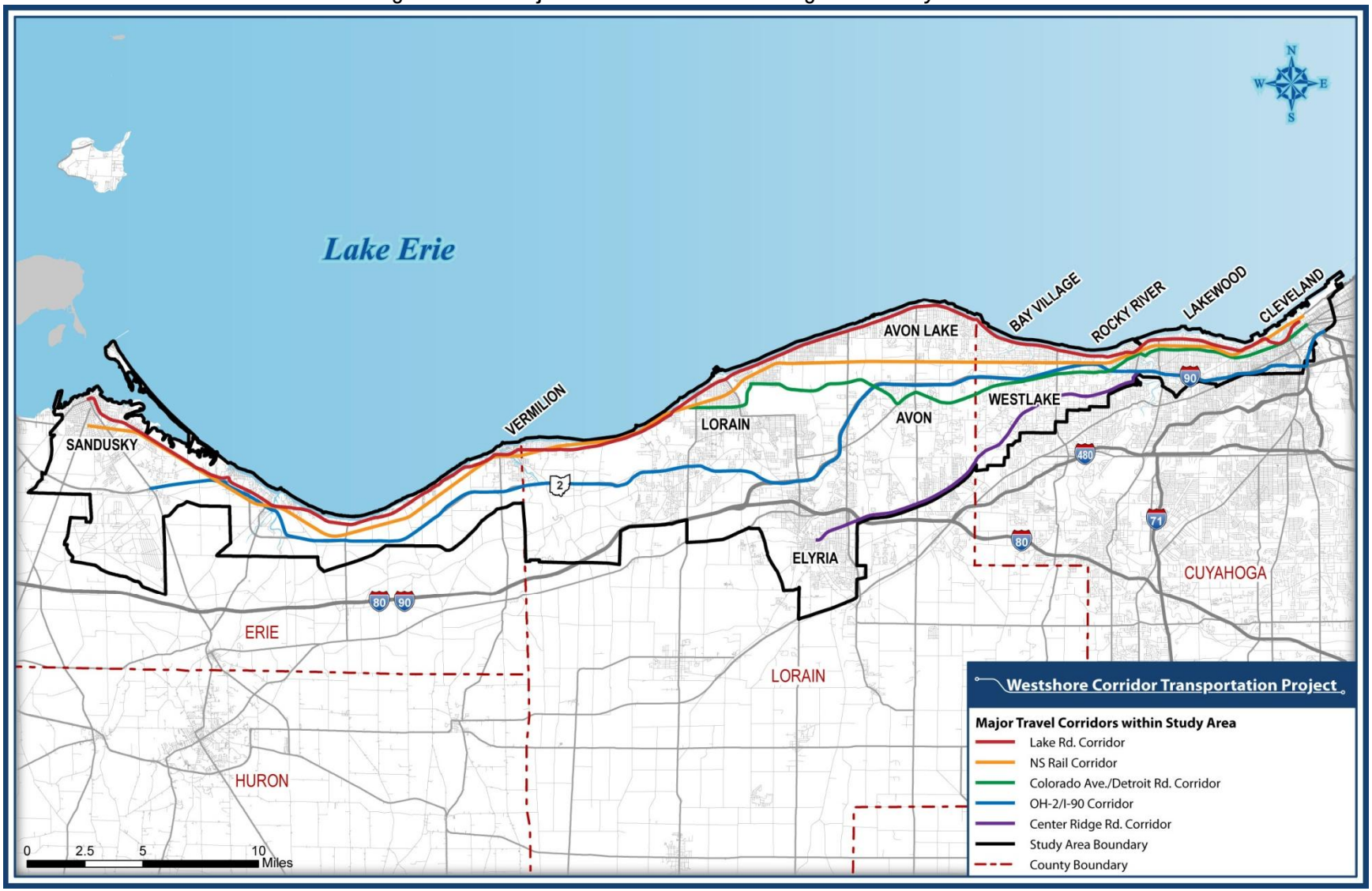


Table 4.2: Principal Roadways in the Study Area

Travel Corridor	Roadway	Limits	Route Designation	Functional Classification	ADT	Year	Source	Congested Segments*
OH-2/I-90 Corridor	OH-2	Milan Road (Sandusky) to Huron	OH-2	Other Freeway and Expressway	20,000	2009	Erie County RPC/ODOT	
	OH-2	Huron to OH-60	OH-2	Principal Arterial	20,000	2009	Erie County RPC/ODOT	
	OH-2	OH-60 to I-90	OH-2	Other Freeway and Expressway	45,000	2006-09	NOACA	
	I-90/OH-2	Ohio Turnpike to Detroit Road (Exit 161)	I-90/OH-2	Interstate	61,700	2006-09	NOACA	Between OH-2 and OH-57
	I-90	Detroit Road to E.9th Street	I-90	Interstate	118,000	2006-09	NOACA	
Lake Road Corridor	Cleveland Road	Washington Street (Sandusky) to Berlin Road (Huron)	US 6	Principal Arterial	10,000	2009	Erie County RPC/ODOT	
	Lake Road	Berlin Road (Huron) to Joppa Road (Vermilion)	US 6	Major Collector	3,900	2009	Erie County RPC/ODOT	
	Lake Road	Joppa Road to SR-60 (Vermilion)	US 6	Minor Arterial	4,300	2009	Erie County RPC/ODOT	
	Lake Road	SR-60 (Vermilion) to Lorain/Cuyahoga Line	US 6	Principal Arterial	7,000	2006-09	NOACA	
	Lake Road	Lorain/Cuyahoga Line to Marion Ramp (Rocky River)	US 6	Principal Arterial	11,000	2006-09	NOACA	
	Clifton Boulevard	Marion Ramp (Rocky River) to Shoreway	US 6	Principal Arterial	19,000	2006-09	NOACA	
	OH-2 (Shoreway)	Clifton Boulevard to Downtown Cleveland (E. 9th Street)	US 6/OH-2	Other Freeway and Expressway	40,000	2006-09	NOACA	
Colorado/Detroit Corridor	W 21st Street	Lake Road to Broadway Street	OH-611	Principal Arterial	9,300	2006-09	NOACA	
	Henderson Drive	Broadway Street to Colorado Avenue	OH-611	Principal Arterial	15,200	2006-09	NOACA	
	Colorado Avenue	Henderson Drive to Detroit Road	OH-611	Principal Arterial	12,900	2006-09	NOACA	
	Detroit Road	Colorado Avenue to I-90 Exit 161	OH-254	Minor Arterial	12,800	2006-09	NOACA	Between Crocker Road and Columbia Road (OH-252)
	Detroit Road	I-90 Exit 161 to West Clifton Boulevard	OH-2	Minor Arterial	12,300	2006-09	NOACA	
	Detroit Avenue	West Clifton Boulevard to Public Square		Minor Arterial	9,200	2006-09	NOACA	
Center Ridge Corridor	Center Ridge Road	Elyria to Bradley Road	US 20/SR 113	Principal Arterial	17,200	2006-09	NOACA	
	Center Ridge Road	Bradley Road to Columbia Road	US 20	Principal Arterial	15,700	2006-09	NOACA	
	Center Ridge Road	Columbia Road to Wooster Road	US 20	Minor Arterial	11,600	2006-09	NOACA	
	Wooster Road	Center Ridge Road to I-90 Exit 162	US 20	Minor Arterial	12,800	2006-09	NOACA	

** Congested segment for 2008 and 2030 No Build according to NOACA Congestion Management Technical Memo published August 2010*

The greater population of Cuyahoga County and the higher mobility of these roadways are why they have the highest AADT. The individual segment with the highest ADT is I-90 between Detroit Road and E. 9th Street, with 118,000 vehicles. Figure 4.14 maps roadway AADT within the study area.

The AADT drops in the western part of the study area, which is logical considering Erie County has a smaller year-round population than either Lorain or Cuyahoga counties. The individual segment with the lowest AADT is Lake Road between Berlin Road and Joppa Road, which has just 3,900 vehicles per day.

Roadway Congestion (Level of Service)

Congestion on freeways is measured as a ratio of volume to capacity (v/c) of the roadway. The closer a roadway comes to reaching its capacity, the higher the level of traffic congestion in the corridor. According to the Highway Capacity Manual (HCM), v/c ratios for freeways can be ranked using a level of service (LOS) letter, as shown in Table 4.3. In effect, roadway corridors are graded from A-F based on the amount of traffic congestion experienced by drivers, with A being the best and F being the worst. Congestion levels on other types of roadways can also be ranked using LOS letters, although the factors are instead based on travel time and delay.

Figure 4.15 shows identified roadway congestion within the study area. The map is based on congestion information from NOACA for Lorain and Cuyahoga counties and Erie County Regional Planning Commission in Erie County.

Table 4.3: Volume to Capacity Ratios for Freeways

Level of Service (LOS)	Freeway v/c
A	0.00 - 0.29
B	0.30 - 0.47
C	0.48 - 0.68
D	0.69 - 0.88
E	0.89 - 1.0
F	1.0+

Lorain County and Cuyahoga County Congestion

According to a Technical Memo completed by NOACA in August 2010, there are only two segments on the main Westshore travel corridors in Cuyahoga and Lorain counties that have a LOS of F during the peak period. Those are on I-90 between OH-2 and OH-57 in Lorain County and Detroit Road between Crocker Road and Columbia Road in Cuyahoga County. Each of these is expected to remain congested in 2030 for both the Build and No Build (meaning there are no improvements planned to address the congestion).

It should be noted that within the NOACA area, an LOS of D during the peak period is considered acceptable. For example, the new Innerbelt Twin bridges are designed to improve traffic operations to a projected LOS of D during the peak period.

Erie County Congestion

Erie County RPC conducted a congestion analysis as part of their 2035 Long Range Plan. The analysis included intersection and segment analysis for arterial roadways within the county. It did not, however, include OH-2. The modeling effort for the 2035 Long Range Plan included both an average spring day (with trips made by full-year residents) and an average summer day (with trips made by full-year residents and visitors). LOS was determined both for intersections (based on seconds of delay) and segments (based on ratio of predicted versus free-flow travel speed). The conclusion of the Long Range Plan was that several intersections had LOS of F, but there are no arterial segments with a LOS of F. The analysis also showed that the worst conditions occur during the summer, when the county has thousands of additional trips due to visitors.

Of course, congestion is a relative term that relates to local tolerance and the political climate. An acceptable level of congestion in Chicago may not be acceptable in Sandusky. Recurring LOS of C or better during the most congested periods is considered acceptable in all but the most extreme cases. Also of note, while the 2035 Long Range Plan did not include congestion analysis of the OH-2 freeway, the regional travel forecasting model shows OH-2 volume to capacity to be in the range of 0.5 – 0.6, which corresponds to LOS C.

Transportation System Management

Transportation system management refers to systems and infrastructure put in place to manage traffic information on freeways or arterial corridors. When these strategies use electronic communications or computer technology, they are sometimes referred to as Intelligent Transportation Systems (ITS).

In the Greater Cleveland region, ODOT, the Cuyahoga County Engineer, and local municipalities have deployed or planned a number of such systems within the study area.

At the freeway level, ODOT has implemented a number of new technologies in recent years to improve the traffic information available to the public on the I-90 corridor in western Cuyahoga County. ODOT's strategy includes closed-circuit television (CCT) cameras, speed monitors, and dynamic message signs. The CCT cameras allow ODOT to monitor and manage traffic incidents on the I-90 corridor. The speed monitors are used to report up to date speed information on a per-mile basis, which is then published on the ODOT website www.buckeyetraffic.com.

ODOT also has deployed two dynamic message signs for inbound traffic, one just east of Clague Road and another near Lorain Avenue in Cleveland. The signs will instantly report traffic conditions and travel speeds along the I-90 corridor. If and when traffic congestion delays travel, the signs will alert motorists to take other routes to their destination.

At the arterial level, coordinated signal systems are typically deployed in the form of interconnected signals with coordinated signal timings. In Ohio, this is made more difficult by home-rule cities that maintain jurisdiction over traffic signals, even on state-owned routes. ODOT maintains jurisdiction over signals in villages with populations of less than 5,000. This

means that coordinated signal systems are not simply deployed by ODOT, but must involve collaboration between ODOT and multiple municipalities.

In the Westshore Corridor study area, three major stretches of arterial roadway are programmed to receive federal funds through the NOACA TIP to upgrade traffic signal systems. Two improvements are in Lakewood, specifically along the Detroit Avenue and Clifton Boulevard corridors. The third is on Lake Road (US 6) in Avon Lake. In Erie County there is one traffic signal upgrade project in the TIP, along Perkins Avenue. Also, two intersections along US 250 to be constructed in State Fiscal Year 2013 will have signal upgrades. Additionally, ODOT District 3 is currently conducting a signal study of the US250 corridor which should result in additional signal upgrades.

Figure 4.14: Roadway Annual Average Daily Traffic for the Study Area

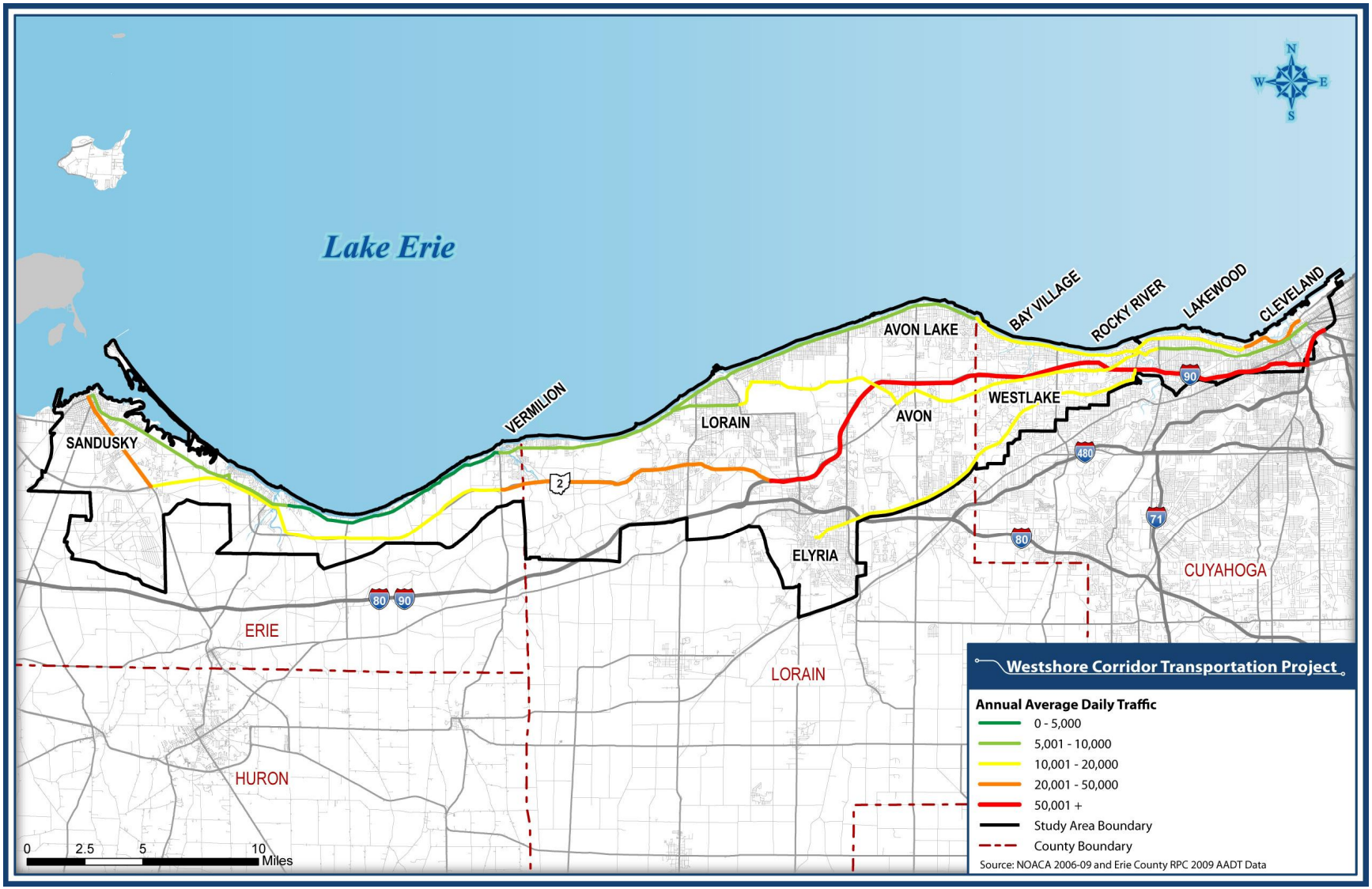
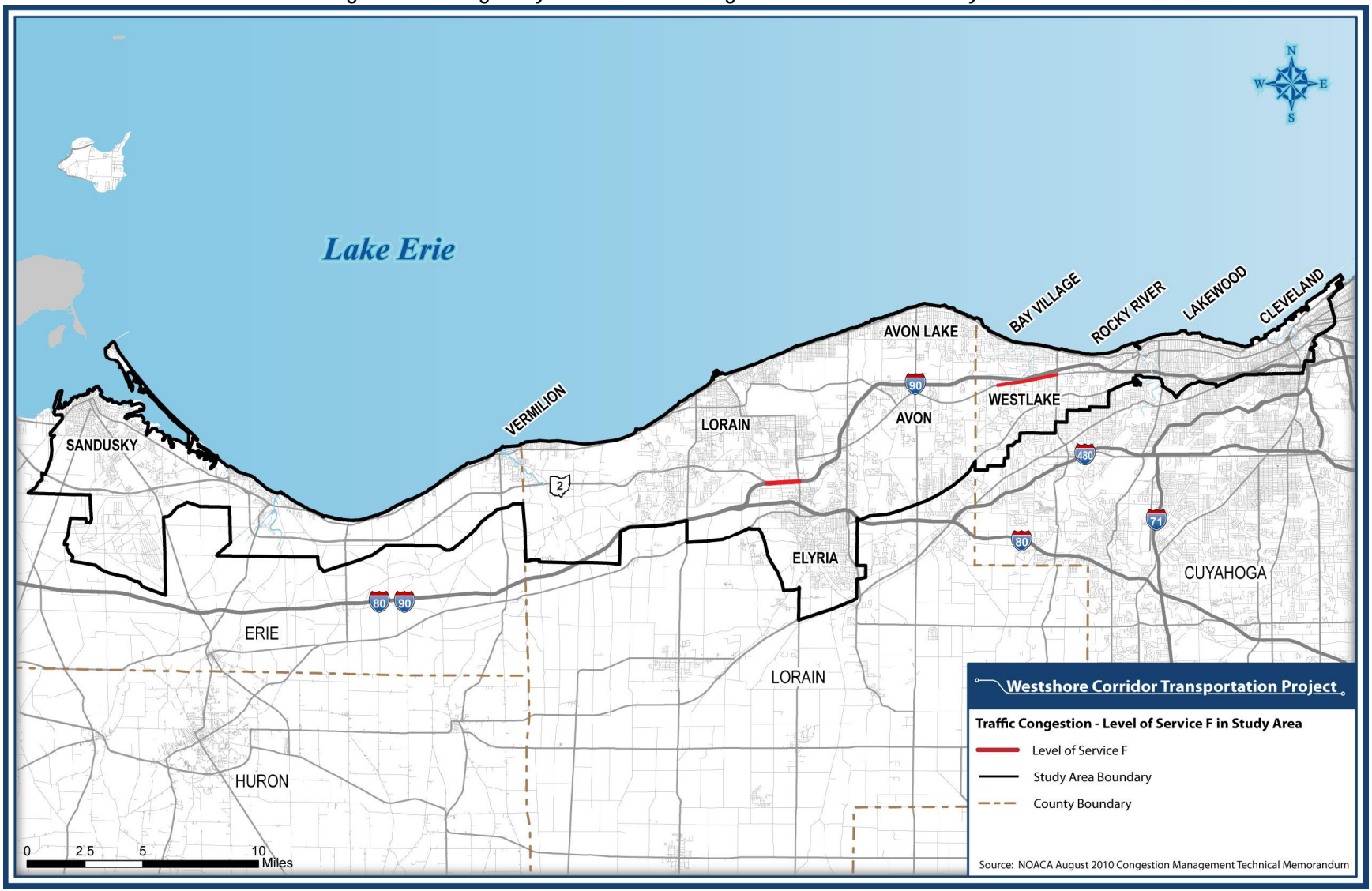


Figure 4.15: Highway and Arterial Congestion within the Study Area



Roadway Travel Times and Connectivity

Estimated travel times and average speed are shown in Table 4.4 for the four major travel corridors within the study area. The corridors are sorted by average travel speed. The fastest corridor travel speed, not surprisingly, occurs on the I-90/OH-2 corridor. Between the Milan Road interchange in Sandusky and Public Square in downtown Cleveland, a trip averages 56.7 mph. The Lake Road and Center Ridge corridors are estimated to have an average travel speed below 40 mph. The slowest corridor is the Colorado Avenue/Detroit Road corridor, which is estimated to have an average travel speed of just 28 mph.

Table 4.4: Travel Times and Speeds for Major Westshore Travel Corridors

Travel Corridor	Limits	Travel time	Distance (miles)	Range of Posted Speed	Average Speed
I-90/OH-2	Milan Road Interchange to Public Square	61 min	57.6	55-65	56.7
Lake Road	Washington/Huron (Sandusky) to Public Square	58 min	38.1	35-55	39.4
Center Ridge	Elyria to I-90 Exit 162	25 min	16.4	25-45	39.4
Colorado Ave/Detroit Road	Lake Road/W 21st Street (Lorain) to Public Square	64 min	30.1	25-45	28.2

Local Public Transportation

The public transportation services operating in the study area are shown in Figure 4.16. There is a general lack of public transit options within the Westshore Corridor, particularly outside Cuyahoga County, and there are no longer-distance, inter-county connections. This is due in part to the lower job and population densities outside of Cuyahoga County, but is also due to a lack of funding at the state and regional levels, particularly for inter-county service connections.

Greater Cleveland Regional Transit Authority (GCRTA)

The best-developed transit system in the study area is in Cuyahoga County, where the Greater Cleveland Regional Transit Authority (RTA) operates commuter bus, local and express bus, and rail service providing east-west travel options in the corridor. As Figure 4.16 shows, there are multiple bus routes that serve all portions of the study area within Cuyahoga County. The inner portion of the study area (between Lorain Avenue/W. 65th and Public Square) is served by the Red Line rapid transit.

As well-developed as RTA's bus network looks on the map, it actually hides the fact that RTA has cut almost 20% of its service over the period from 2008-2010. Cuts have been across the board, including reductions in frequency, weekday night hours, and weekend service. Routes in this area have been affected, with route alignments modified and service frequencies and spans reduced. The result is that, while it is still possible to use transit for most trip purposes in the portion of the corridor within Cuyahoga County, using transit will be more time-consuming and less convenient than it was before 2008.

Lorain County Transit

Figure 4.16 also shows the Lorain County Transit (LCT) system, which currently consists of four bus routes. The routes include two loops in Elyria (#51 and #52) and two north-south routes between Elyria and Lorain (#1 and #2).

At one time, the LCT was comprised of 14 fixed routes. However, as with RTA, LCT suffered severe budget cuts in 2009, which forced the agency to cut all but the four highest ridership routes. The budget cuts also affected connections to Cuyahoga County and RTA. Before 2009 LCT routes connected to both Cleveland Hopkins Airport and Westlake Park-n-Ride. LCT also provided funding for RTA to operate their route 55F along Lake Road to Avon Lake. Each of these services allowed Lorain County residents to connect to jobs and other activity centers in downtown Cleveland and the western Cuyahoga suburbs. With the budget cuts, Lorain County eliminated the payment to RTA, which discontinued the service. Before the cuts, the two transit agencies had a fare reciprocity agreement allowing passengers to transfer between systems without paying a second fare. While this agreement remains in effect, it is inoperative because the two systems no longer meet at a location where transfers might occur.

Sandusky Transit System

Within Erie County, the Sandusky Transit System (STS) provides advance-reservation, shared-ride transit service in the city of Sandusky, Perkins Township, and within the City of Huron. The service is a demand response, curb-to-curb system similar to paratransit, but is open to anyone who requests a ride.

In addition, the Sandusky Perkins Area Ride Connection (SPARC) provides two fixed-route loop services in the City of Sandusky. Figure 4.16 shows the location of these routes within Erie County.

Operational Characteristics

The operation characteristics for the LCT, RTA, and SPARC routes serving the study area are shown in Table 4.5. RTA operates nine bus routes and the Red Line rapid transit within the Cuyahoga portion of the study area. The routes with the best service frequency (beyond the Red Line) are routes 22 Lorain, 26 Detroit, and 55 Clifton. Each of these represents one of the main travel corridors on the west side of Cleveland. Only three of RTA's bus routes serving the study area operate on weekends, routes 22, 26, and 49. The only route that uses the I-90 for express purposes to downtown is 246, which originates at the Westlake Park-N-Ride Lot at Columbia Road.

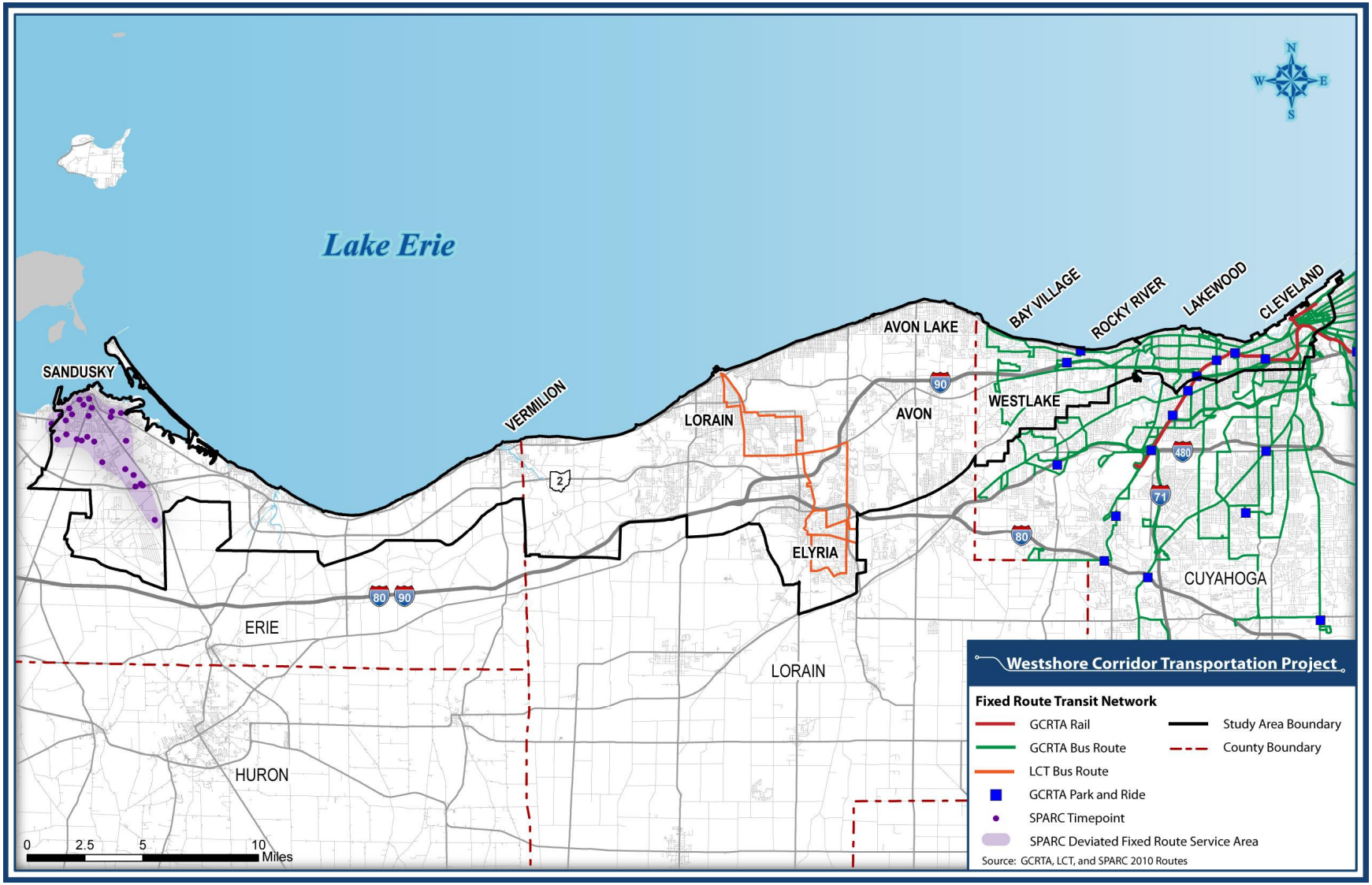
LCT operates four routes, each of which is interlined. Route 1 is interlined with route 51 and the route 2 is interlined with 52. The system is arranged so that routes 1 and 2 leave Elyria at the same time and arrive in Lorain at the same time. Once back in Elyria, each vehicle then turns into the loop route, and each of these also operate at the same time. This setup helps provide multiple transfer points for each pattern (north-south or loop).

SPARC operates two loop services, SPARC 1 and SPARC 2, each served by one van with hourly headways. SPARC 2 service was initiated in the summer of 2010. The two routes meet at four designated transfer points.

Table 4.5: Operational Summary of Bus Routes in Study Area

				Headway Summary					
				Weekday				Weekend	
Agency	Route	Designation	Regional Connection	AM Peak (min)	Midday (min)	PM Peak (min)	Night (min)	Sat (min)	Sun (min)
RTA	22 – Lorain	Local Radial	West Park Rapid Station to E. 13th/Payne	15 min	20 min	15 min	30 min	23 min	30 min
RTA	25 – Madison	Local Radial	Westgate Transit Center to W. 117th Rapid Station	30 min	60 min	30 min	-	-	-
RTA	26 – Detroit	Local Radial	Westgate Transit Center to E.13th/Payne	18 min	20 min	20 min	30 min	30 min	30 min
RTA	43 - Lake-Wolf	Crosstown/Feeders	Triskett Rapid Station to Cahoon/Wolf (Reverse Trip)	2 trips	-	2 trips	-	-	-
RTA	46 - Detroit-Wagar	Crosstown/Feeders	Crocker Park to Westgate Transit Center via Detroit	60 min	60 min	60 min	-	-	-
RTA	49 - Center Ridge	Crosstown/Feeders	Crocker Park to West Park Rapid Station via Center Ridge	60 min	60 min	60 min	60 min	60 min	60 min
RTA	55 – Clifton	Local Radial	Westgate Transit Center to STJ Transit Center via Clifton	16 min	60 min	18 min	60 min	-	-
RTA	55F - West Shore Flyer	Express Flyers	Cahoon/Wolf to STJ Transit Center via Shoreway (OH-2)	21 min	-	25 min	-	-	-
RTA	66 - Red Line	Heavy Rail	Hopkins Airport to Windermere Station	11 min	20 min	11 min	20 min	20 min	20 min
RTA	246 - Westlake Park and Ride	Express Flyers	Westlake Park and Ride to Public Square via I-90	15 min	-	16 min	-	-	-
LCT	1	Local	Lorain - Elyria via Washington	120 min	120 min	120 min	-	-	-
LCT	2	Local	Lorain - Elyria via Broadway	120 min	120 min	120 min	-	-	-
LCT	51	Loop	East Elyria Broad Street Loop	120 min	120 min	120 min	-	-	-
LCT	52	Loop	East Elyria Abbe Road Loop	120 min	120 min	120 min	-	-	-
SPARC	1	Loop	Fallen Timber Drive/Pioneer Trail to Meijers	60 min	60 min	60 min	60 min	60 min	-
-	2	Loop	Fallen Timber Drive/Pioneer Trail to Wal-Mart Plaza	60 min	60 min	60 min	60 min	60 min	-

Figure 4.6: Transit Networks in Study Area



Overall, Table 4.5 and Figure 4.16 show the lack of connections between the transit services, particularly between transit dependent populations and employment centers. As shown in the Community Structure section, the transit dependent populations located in Lorain, Elyria, and Sandusky have no way to connect to jobs in downtown Cleveland or in Westlake. Further, the transit dependent in Cleveland and Lakewood have no way to connect to jobs in Avon, Sheffield, or Elyria. Further job opportunities in Erie County connected to the tourism and recreation economy are also out of reach of transit dependent in Cuyahoga County.

Transit Connectivity and Travel Times

Table 4.6 shows information regarding connectivity and travel time for the RTA and LCT routes in the study area. Each route was measured for its travel time from a point within the study area to Tower City/Public square in downtown Cleveland. Many of RTA's routes have been truncated to feed into the Red Line. Because some routes do operate through the entire area, their travel times may seem short.

The route with the fastest trip relative to the length is route 246, the Westlake Park and Ride route, which has an end-to-end travel time of 40 minutes. The route with the slowest travel time is route 46, Detroit-Wagar. Originating at Crocker Park, route 46 takes 64 minutes to travel to Public Square and requires a transfer to route 55 at the Westgate Transit Center.

Table 4.6: Transit Travel Times to Downtown Cleveland

Agency	Route	Origin	Destination	Transfer	Transit Travel Time
RTA	66 - Red Line	Triskett Rapid Station	Tower City/ Public Square	No	15 min
RTA	25 - Madison	Westgate Transit Center	Tower City/ Public Square	To Red Line at W. 117th Rapid Station	36 min
RTA	246 - Westlake Park and Ride	Westlake Park and Ride	Tower City/ Public Square	No	40 min
RTA	55 - Clifton	Westgate Transit Center	Tower City/ Public Square	No	41 min
RTA	22 - Lorain	West Park Rapid Station	Tower City/ Public Square	No	43 min
RTA	26 - Detroit	Westgate Transit Center	Tower City/ Public Square	No	49 min
RTA	43 - Lake-Wolf	Cahoon/Wolf	Tower City/ Public Square	To Red Line at Triskett Rapid Station	50 min
RTA	55F - West Shore Flyer	Cahoon/Wolf	Tower City/ Public Square	No	52 min
RTA	49 - Center Ridge	Crocker Park	Tower City/ Public Square	To Red Line at West Park Rapid Station	61 min
RTA	46 - Detroit-Wagar	Crocker Park	Tower City/ Public Square	To #55 at Westgate Transit Center	64 min
LCT	#1, #2, $15 & #52	No connection between Elyria or Lorain and downtown Cleveland	N/A		
SPARC	SPARC 1 and SPARC 2	No connection between Sandusky and downtown Cleveland			N/A

The LCT and SPARC routes are listed in Table 6. As noted previously, LCT does not operate service to downtown Cleveland, nor does it provide connections to the RTA system. Travel from Sandusky to downtown Cleveland is also impossible using local public transportation.

Fare Structure

The RTA and LCT fare structures are detailed in Table 4.7. The RTA and LCT adult fares are very similar. RTA has a more stratified fare system than LCT. Due to the fact that inter-county trips on local transit are not available, the fare for a trip from Lorain or Elyria to Cleveland cannot be calculated.

Table 4.7: Fare Structure in the Study Area

Agency	Fare Type	Single Ride	All Day	7-day	5-ride	10-ride	Monthly
RTA	Bus/Rapid/BRT	$2.25	$5.00	$22.50	$11.25	-	$85.00
RTA	Park-N-Ride Bus	$2.50	$5.00	$25.00	$12.50	-	$95.00
RTA	Loop/Circulator	$1.50	-	-	$7.50	-	-
RTA	Senior/Disabled	$1.00	$2.50	$10.00	$5.00	-	$38.00
RTA	Paratransit	$2.25	-	-	-	-	-
RTA	Out-of-County	$3.50	-	-	-	-	-
LCT	Adult	$2.20	$5.00	-	-	$19.80	$88.00
LCT	Senior/Disabled/Children	$1.10	-	-	-	$9.90	$44.00
LCT	Paratransit (Adult)	$7.00	-	-	-	-	-
LCT	Paratransit (Senior/Disabled)	$3.50	-	-	-	-	-
SPARC	Fixed Route Bus – Adult/ Child over 5	$1.00	-	-	-	-	-
SPARC	Fixed Route Bus - Children 5 and under	Free	-	-	-	-	-
SPARC	Fixed Route Bus – Seniors	Free	-	-	-	-	-
STS	Demand-Response - – Adult/Child over 5	$2 ($3 to Perkins)	-	-	-	-	-
STS	Demand-Response - – Children 5 and under	Free	-	-	-	-	-
STS	Demand-Response - – Seniors/Disabled	$1 ($1.50 to Perkins)	-	-	-	-	-

Transit Ridership and Productivity

Route ridership and productivity are shown for RTA and LCT in Tables 4.8 and 4.9, respectively. In Table 4.8 RTA ridership and productivity by route are shown. The table is sorted to show riders per revenue hour from highest to lowest. Not surprisingly, RTA's routes 22 and 26—heavily used local routes on the City's west side that extend into adjacent suburbs — are the most productive routes within the study area. Routes 22 and 26 also have the highest service frequencies of the fixed bus routes in the study area.

Route 246 from the Westlake Park and Ride is third highest in terms of riders per revenue hour, at slightly more than 22. While route 246 only has eleven eastbound and eleven westbound trips a day, the high productivity means buses are leaving the Westlake Park and Ride lot full of riders. However, when considering riders per revenue mile, route 246 is significantly less productive than the routes 22, 26, 25 and 55, due to the relatively longer distance of the trip from Columbia Road to downtown Cleveland.

Table 4.8: RTA Ridership by Route

Agency	Route	Annual Ridership (2009)	Riders per revenue hour	Riders per revenue mile
RTA	22	1,752,594	43.97	4.35
RTA	26	1,791,219	40.37	3.60
RTA	246	220,223	22.05	0.92
RTA	25	396,736	21.33	1.81
RTA	55F	175,131	18.36	0.93
RTA	55	359,551	15.72	1.12
RTA	46	42,427	7.35	0.49
RTA	49	61,250	6.63	0.42
RTA	43	15,673	5.90	0.38

Table 4.9 shows ridership by month for the entire fixed-route system. The table shows that the system typically averages between 11 and 15 riders per revenue hour. This means the LCT system's productivity is on par with RTA's routes 55 and 55F.

Table 4.9: LCT Systemwide Ridership, January – August 2010

Agency	Month	Unlinked Trips	Riders per revenue hour	Riders per revenue mile
LCT	Jan 2010	18,122	8.16	0.56
LCT	Feb 2010	8,403	15.65	1.10
LCT	Mar 2010	8,744	14.19	1.00
LCT	Apr 2010	7,949	13.43	0.94
LCT	May 2010	7,088	13.35	0.92
LCT	Jun 2010	7,143	12.13	0.85
LCT	Jul 2010	6,545	11.17	0.78
LCT	Aug 2010	7,236	12.08	0.86

Currently there are three bus-based and four rail station-based park and ride locations in the Westshore Corridor, as shown in Table 4.10. Six of these are operated by RTA and one is operated by LCT. Figure 4.17 displays Park and Ride Locations within the Westshore Corridor study area.

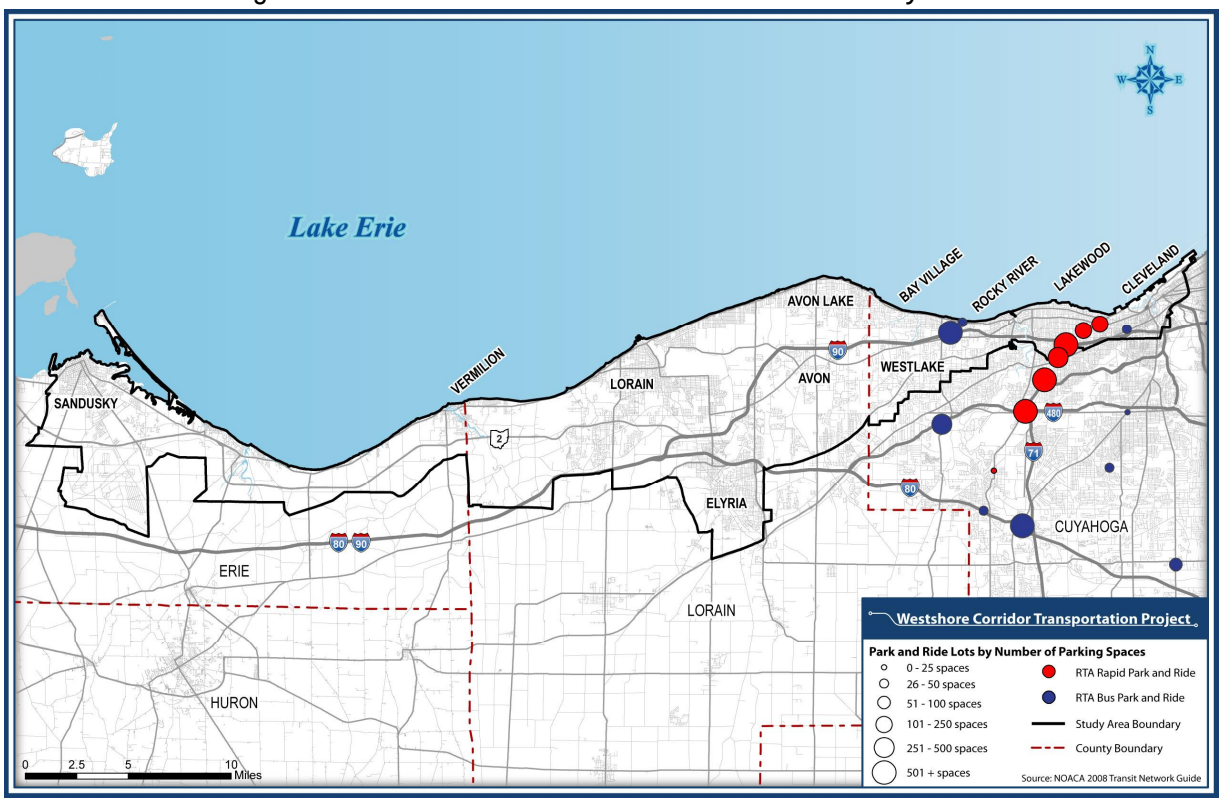
Table 4.10: Westshore Corridor Park and Ride Locations

Location	Spaces	Type	Relevant Routes
Westlake	562*	Bus	246, 43
Clague Road	40	Bus	43, 55F
Triskett	669	Rail Station	Red Line, 43, 46, 49
W. 117th-Madison	126	Rail Station	Red Line, 25
W. 98th-Detroit	112	Rail Station	Red Line, 26
W. 65th	30	Rail Station	Red Line

Note GCRTA is planning an expansion of approximately 250 additional spaces at the Westlake lot during 2011, to be funded by ODOT. In addition, a survey of vehicles at the Westlake lot in March 2011 revealed over 50% of vehicles with Lorain County license plates.

Lorain County Transit currently operates a small park and ride lot that is served by LCT route 52 East Elyria/Abbe Road Loop. Before LCT made its recent cutbacks, Midway Mall in Elyria operated as a park and ride lot for the system. Riders would park there and take LCT route 70 to the Westlake Park and Ride lot, where they would transfer to RTA routes.

Figure 4.4: Park and Ride Locations within the Study Area



Revenues and Costs

According to the National Transit Database, RTA's bus network operating cost was just under $166.6 million in 2009 (the latest year available). The agency collected $41.1 million in bus fares, which resulted in a farebox recovery of 25.3%. RTA operated 1,437,468 bus revenue hours, which averages out to a cost of $115.92 per revenue hour. RTA does not estimate costs for individual bus routes.

Lorain County Transit's bus operating cost in 2009 was reported in NTD to be $3.46 million, while the agency collected $411,137 in fares. LCT's farebox recovery is 11.9%. LCT operated 44,122 revenue hours, which calculates to an average cost of $78.37 per revenue hour.

The operating costs for Erie County SPARC routes were not reported in 2009, as the SPARC 1 route was introduced in March 2009 and SPARC 2 was introduced in Summer 2010.

Planned Service Improvements

RTA and LCT each have its own funding issues, but in general it is unlikely that either agency will be expanding service in the near future.

RTA is funded by a dedicated 1% sales tax in Cuyahoga County. The recession of 2008-2010 has severely reduced RTA's funding and the agency has cut a considerable amount of service in the last three years. While funding has stabilized, there is little money for service expansion. Increases in funding would be allocated to providing services where they would be most effective and productive, either to new services or restoration of services that had been cut during the 2007-2009 period.

LCT is funded through direct action of the Lorain County Commissioners, and as has been documented in other portions of this document, LCT funding was cut considerably for FY 2010. As a result, it is unlikely LCT will expand service and additional funding would likely go to reinstating cut services. However, the growth in population in Avon, Avon Lake, Sheffield Lake, and North Ridgeville may compel LCT to take a fresh look at route location if additional funding were dedicated to the agency.

Other Regional Commuter Programs

Management of regional commuter programs is handled primarily by NOACA under their Ohio Rideshare Commuter Services program. There are three programs of importance to regional commuting: Carpool Match Service, Vanpools, and Guaranteed Ride Home.

The Carpool Match Service is an online based service where commuters enter their travel information and the computer matches them with suitable carpool partners. Carpoolers take turns using their personal vehicle to make the trip. Unfortunately, NOACA does not track origins, destinations, or usage of this program. They are simply a facilitator of the program.

Vanpools provide a similar service but for groups of six to fourteen people headed to the same or nearby destination. Vanpools differ from carpools in that vanpools rent a van from Vanpool Services Incorporated (VPSI) and recruit a driver from among the members of the group.

Monthly fees paid by each rider cover the gas and maintenance of the vehicle. According to NOACA, as of January 2011 there are currently no vanpools that travel the Westshore corridor.

The Guaranteed Ride Home is a complimentary service to users of vanpools and carpools, and serves transit users as well. The program offers 80% reimbursement for transit or taxi fare for people to return home in the middle of the day. The program is only for valid emergencies, which are defined by the program and can be used up to four times in a calendar year.

A travel demand management program that is not covered by Ohio Rideshare is the JARC/New Freedom program. The Federal government provides funding through NOACA for the specific purpose of connecting low income residents to jobs on the fringes of the metropolitan area. In recent years, funding has been granted to regional transit authorities (including RTA and LCT), and social service non-profits to provide JARC/New Freedom trips, including service to and within the Lorain and Cuyahoga County portions of the study area. There is no parallel program in Erie County.

Intercity Passenger Rail

Passenger rail is provided within the Westshore corridor by Amtrak. Amtrak operates two trains that pass through the corridor, the Capitol Limited between Chicago and Washington, DC, and the Lake Shore Limited between Chicago and New York City.

Three Amtrak rail stations are served within the corridor: Sandusky, Elyria, and downtown Cleveland. Table 4.11 shows the departure times for trains in the eastbound and westbound directions. Due to Amtrak's desire to arrive and depart Chicago and the East Coast at convenient times (generally leaving in the early evening and arriving in the morning around the beginning of business hours), each train passes through the Cleveland area and the Westshore study area during the middle of the night. As a result, using Amtrak is an unrealistic option for travel within the corridor.

Table 4.11: Amtrak Schedule

Lake Shore Limited	EB	WB
Sandusky	12:40 AM	4:55 AM
Elyria	1:15 AM	4:18 AM
Cleveland	1:45 AM	3:45 AM

Capitol Limited	EB	WB
Sandusky	4:12 AM	4:02 AM
Elyria	4:51 AM	3:29 AM
Cleveland	5:35 AM	2:59 AM

Note: read EB top to bottom; read WB bottom to top

Fares for Amtrak travel within the Westshore corridor are shown in Table 4.12. Westbound trips on the Capitol Limited have higher fares than their Lake Shore Limited counterpart.

Table 4.12: Amtrak Fares

Lake Shore Limited Fares

		TO		
		Sandusky	Elyria	Cleveland
FROM	Sandusky		$9.50	$13.00
	Elyria	$7.50		$7.50
	Cleveland	$11.00	$6.00	

Capitol Limited Fares

		TO		
		Sandusky	Elyria	Cleveland
FROM	Sandusky		$9.50	$13.00
	Elyria	$12.00		$7.50
	Cleveland	$17.00	$9.50	

Passenger activity at each of the stations is shown in Table 4.13. Cleveland is the second-busiest of all Ohio Amtrak stations, second only to Toledo. Ridership increased at all stations between 2008 and 2009.

Table 4.13: Annual Amtrak Boardings and Alightings by Station

Station	2008	2009
Sandusky	5,832	6,513
Elyria	3,426	3,719
Cleveland	36,977	39,371

Intercity Bus Service

Intercity bus service is provided in the Westshore Corridor by Greyhound Bus Lines between Sandusky, Elyria and downtown Cleveland. Table 4.14 shows the daily schedule. Greyhound offers four eastbound and three westbound trips each day, with each trip taking between 80 and 85 minutes, depending on the time of day. Like Amtrak, the services within the corridor are links within longer trips such, such as New York to Chicago. Unlike Amtrak, however, the Greyhound service is robust enough to provide service at times that allows them to be used for some trip purposes within the corridor, including, potentially, for commuter service to downtown Cleveland from Sandusky or Elyria.

Table 4.14: Greyhound Bus Schedule

EB	Trip 1	Trip 2	Trip 3	Trip 4
Sandusky	6:05 AM	9:55 AM	2:10 PM	8:00 PM
Elyria	6:50 AM	10:40 AM	2:50 PM	8:40 PM
Cleveland	7:30 AM	11:20 AM	3:30 PM	9:20 PM

WB	Trip 1	Trip 2	Trip 3
Cleveland	7:50 AM	12:30 PM	5:45 PM
Elyria	8:30 AM	1:10 PM	6:25 PM
Sandusky	9:15 AM	1:55 PM	7:10 PM

Greyhound fares are shown in Table 4.15. Greyhound's fares are simpler than those of Amtrak, with the EB and WB portion of the trip costing the same. However, Amtrak fares are lower, which may be related to the fact that passenger rail is publically subsidized, while Greyhound service is not, or that the service operates overnight and generates little demand.

Table 4.15: Greyhound Bus Fares (One Way)

		TO		
		Sandusky	Elyria	Cleveland
FROM	Sandusky		$14.50	$22.00
	Elyria	$14.50		$10.00
	Cleveland	$22.00	$10.00	

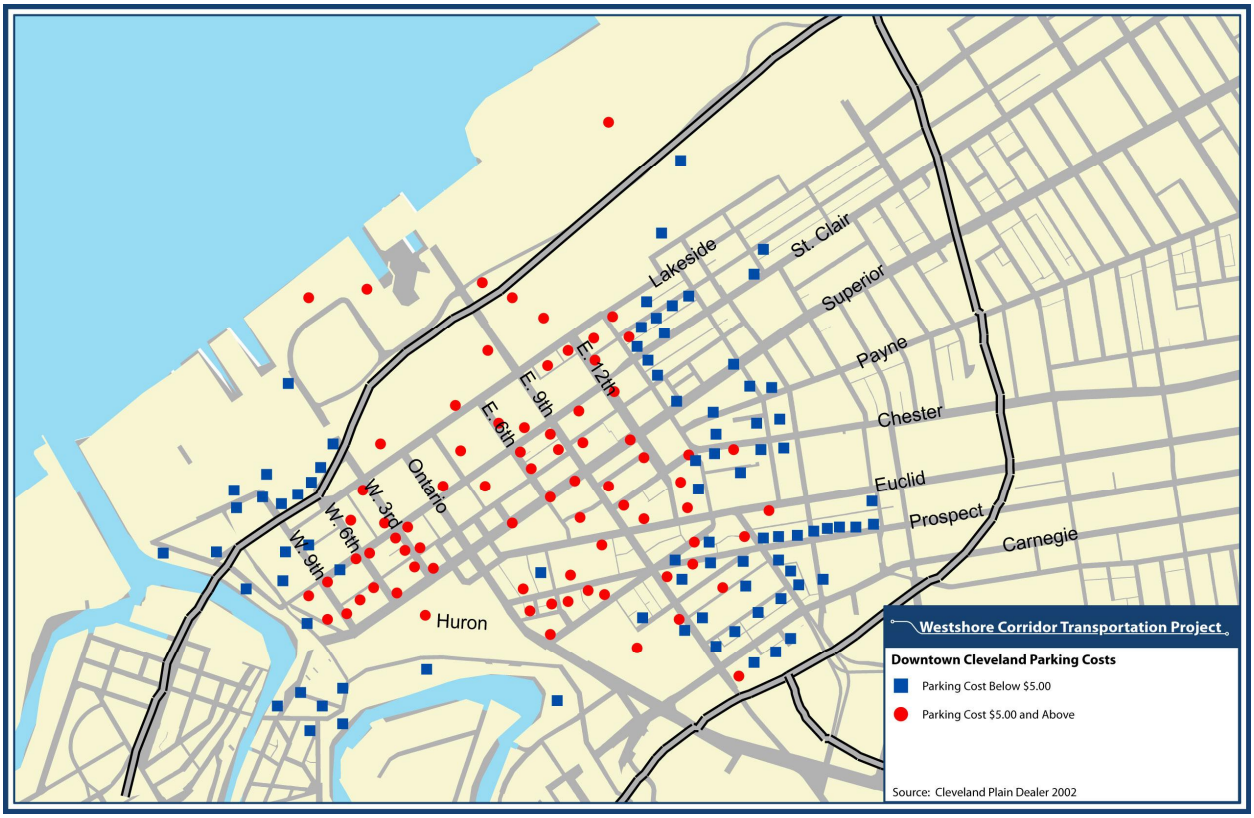
Parking

The availability of free parking is an important factor for many who are choosing which mode of transportation best suits their needs. When a potential transit user evaluates his/her transportation choices, parking cost is part of the equation in places where parking is charged. Some people may choose transit over driving because the transit fare is perceived to be less than the parking and operating cost of the vehicle. High parking costs induce transit use, while lower (or absence of) parking costs inhibit growth of transit ridership.

Figure 4.18 illustrates the cost of parking at various locations in downtown Cleveland in 2002 (unfortunately, the most recent date for which data has been collected). Note the highest cost for parking is in the center of downtown, while on the fringe the cost drops to below $5.00 per day. While parking costs may average $10 per day in the heart of downtown, in some peripheral parts of downtown all-day parking can be found for as little as $1.00.

Outside of downtown Cleveland, parking within the study area is largely unconstrained, which can compel travelers to use the automobile. This can be attributed in part to zoning regulations which require multiple spaces per employee or square foot of retail space. There are some suburban places that do charge for parking, including the Main Street of Crocker Park, Lakewood, and in the downtown areas of Elyria, Lorain, and Sandusky. These charges are usually on-street meters by the hour, not all day parking costs like in downtown Cleveland.

Figure 4.18: Parking Costs in Downtown Cleveland



Railroads

Figure 4.19 shows the active rail corridors that operate through all or part of the study area. There are two main active rail corridors that facilitate east-west movement through the study area. Each of these corridors is owned and operated by Norfolk Southern Railroad.

The more active corridor is the Dearborn Division Chicago Line, shown in Figure 4.19 in blue, which connects Sandusky and downtown Cleveland via Elyria. It is double tracked for the entire length between Cleveland and Sandusky. A capacity constraint on the Chicago Line is the Cuyahoga River drawbridge. During summer months the bridge is kept in an up position to allow water-borne traffic on the river to access Lake Erie, and must be lowered to allow rail traffic to pass. In winter months the bridge is kept in the down position because there is less water-borne traffic. The Chicago Line is also used by Amtrak for the Lake Shore Limited and Capitol Limited services.

The second east-west corridor in Figure 4.19 is the former Nickel Plate Line, which is part of Norfolk Southern's Dearborn Division, Lake Erie District (shown in red) and Lake Division, Cleveland District (shown in yellow). This corridor connects Erie County with Cleveland by way of Vermilion, Lorain, and Lakewood. The corridor is a single track for most of the way except for three sections. Two are short segments in Lorain County, including between Overlook Road and Leavitt Road on the west side of Lorain city and between Root Road and Avon Center Road

in Avon Lake. Each of these segments provides a second track to provide capacity to serve local freight customers in Lorain County.

Figure 4.19: Rail Corridors in the Study Area

The third double track segment is at W. 25th Street in Cleveland and continues east through the end of the study area. The double tracking occurs where the NS line interchanges with the CSX line to Berea. The double tracking provides access industrial uses in the Flats south of downtown Cleveland.

There are two points where the east-west NS corridors cross each other. The first is at W. 98th Street on the west side of Cleveland (adjacent to the RTA West Blvd.-Cudell Red Line Rapid Transit Station). Here the Chicago Line is grade separated from the Lake Erie District line, and there is no infrastructure to change tracks. The second point is in Vermilion, where the Chicago Line also is grade separated from the Cleveland District line, although there is a connector track located approximately 2.3 miles farther west.

Aviation

The study area includes two general aviation airports, Burke Lakefront Airport in Cleveland and Griffing-Sandusky Airport in Sandusky. According to the Federal Aviation Administration, Burke Lakefront had 69,174 operations in calendar year 2009. This places the airport 18th overall in the state of Ohio in terms of total operations, and 7th in the state in terms of general aviation operations.

Griffing-Sandusky had 112,100 operations in calendar year 2009, which places the airport third overall in the state and first in general aviation operations. Griffing is ranked this high due to the number of tourist destinations in Erie County, and because it provides air service to the Lake Erie Islands, which are isolated from the mainland during the winter months.

Neither airport in the study area has commercial service. Cleveland-Hopkins Airport in far southwest Cleveland is located just south of the study area. In calendar year 2009 Hopkins had 236,075 operations, which ranks it first in the state in both commercial and general aviation operations.

Hopkins-International is accessible from the study area using a number of transportation connections. From Erie County and western Lorain County, automobile traffic would use eastbound OH-2 to eastbound I-80 to eastbound I-480. From eastern Lorain County and western Cuyahoga County, motorists would use the local street network to access eastbound I-480 to the airport. Motorists in the eastern end of the study area would likely use the local street network to access I-71 southbound to the airport, or simply connect to the airport using local streets. RTA's Red Line rapid transit rail service connects the airport to downtown Cleveland and a number of intermediate stops on Cleveland's west side.

Market Analysis

This section analyzes the types of trips made within the study area. Data on trips between two particular points is typically difficult to come by and is often vague. In order to provide as much information as possible, two sources of data were used for this analysis: the 2008 Census Transportation Planning Package (CTPP) data and NOACA Regional Trip model.

2008 Census Transportation Planning Package (CTPP) Data

While the CTPP covers cities in all three counties in the study area, there are limitations to the data. The data is only available for cities that are part of the American Community Survey (ACS), which are communities with population of 20,000 or more. Further, the information is available only for work trips.

The 2008 CTPP data for links between study area communities is shown in Tables 4.16 through 4.18. Table 4.16 is CTPP data for Cuyahoga County communities, specifically Cleveland, Lakewood, and Westlake (other Cuyahoga County communities in the corridor had populations below 20,000). The data is sorted by origin community, with the destination community in the second column. Each entry with the city of Cleveland as destination is highlighted, since it is the largest community and major transportation attraction within the study area.

The Cuyahoga County data shows a number of important points. In Cleveland, the transit mode share for work trips is 15.5%, the highest for any origin-destination link in the study area. The mode share for travel from Lakewood to Cleveland is 12%, and mode share from Westlake to Cleveland is 8%. Each of these is higher than the regional transit mode share, which is about 4%.

Also noteworthy is the 11.9% of work trips by transit from Cleveland to Elyria and 14.8% of work trips by transit from Cleveland to Lorain. The data was taken when such a reverse trip was possible because of connections between RTA and Lorain County Transit. Cutbacks by LCT have made connections between Cuyahoga and Lorain County by transit impossible. However, this data from earlier in the decade indicates that a market exists for reverse-commute transit services to these communities in the middle of the corridor.

The Cuyahoga County CTPP data also shows that 50.0% of Lakewood work trips and 37.1% of Westlake work trips are destined for the City of Cleveland.

Table 4.16: Total Daily Work Trips Data with Cuyahoga County Origins

Origin Municipality	Destination Municipality	Total Trips	Transit Trips	Percent Drive Alone	Percent transit	Share of All Trips
Cleveland city, Ohio	Avon Lake city, Ohio	215	0	86.0%	0.0%	0.2%
Cleveland city, Ohio	Cleveland city, Ohio	87,890	13,625	63.5%	15.5%	75.7%
Cleveland city, Ohio	Elyria city, Ohio	335	40	70.1%	11.9%	0.3%
Cleveland city, Ohio	Lakewood city, Ohio	1,950	230	78.7%	11.8%	1.7%
Cleveland city, Ohio	Lorain city, Ohio	440	65	61.4%	14.8%	0.4%
Cleveland city, Ohio	Sandusky city, Ohio	80	0	100.0%	0.0%	0.1%
Cleveland city, Ohio	Westlake city, Ohio	1770	185	80.2%	10.5%	1.5%
Lakewood city, Ohio	Avon Lake city, Ohio	65	0	100.0%	0.0%	0.3%
Lakewood city, Ohio	Cleveland city, Ohio	10,775	1,310	75.3%	12.2%	50.0%
Lakewood city, Ohio	Elyria city, Ohio	265	0	94.3%	0.0%	1.2%
Lakewood city, Ohio	Lakewood city, Ohio	5,015	300	60.8%	6.0%	23.3%
Lakewood city, Ohio	Lorain city, Ohio	85	0	100.0%	0.0%	0.4%
Lakewood city, Ohio	Sandusky city, Ohio	25	0	100.0%	0.0%	0.1%
Lakewood city, Ohio	Westlake city, Ohio	1,965	95	87.0%	4.8%	9.1%
Westlake city, Ohio	Avon Lake city, Ohio	270	0	92.6%	0.0%	2.2%
Westlake city, Ohio	Cleveland city, Ohio	4,550	365	83.2%	8.0%	37.1%
Westlake city, Ohio	Elyria city, Ohio	275	0	90.9%	0.0%	2.2%
Westlake city, Ohio	Lakewood city, Ohio	605	0	96.7%	0.0%	4.9%
Westlake city, Ohio	Lorain city, Ohio	125	0	88.0%	0.0%	1.0%
Westlake city, Ohio	Sandusky city, Ohio	20	0	100.0%	0.0%	0.2%
Westlake city, Ohio	Westlake city, Ohio	4,485	0	79.0%	0.0%	36.5%

Similar data for the Lorain County communities of Lorain, Elyria, and Avon Lake are shown in Table 4.17. Comparing work trips destined for the city of Cleveland there is a dramatic difference between Avon Lake (32.6% of trips) and Lorain (10.4%) and Elyria (9.2%). This is in part due to Avon Lake being considered a suburb of Cleveland while Lorain and Elyria remain more independent from Cleveland and Cuyahoga County.

Also significant in the Lorain County data is the low transit mode share. The best transit share is for trips from Lorain to Elyria, 3.7%. While LCT still makes this connection, it is unknown how the reduction in service in 2009 affected these transit trips. The second best transit mode share is Avon Lake to Cleveland, 2.5%. This is likely due the close proximity of Avon Lake to park and ride opportunities in Westlake, especially the Westlake Park-and-Ride lot at Columbia Road. Most other connections from Lorain County communities show virtually no mode share for transit.

While the Lorain communities have a low transit mode share, they do not have a correspondingly high percentage that report driving alone. The connection between Lorain and Cleveland shows none uses transit and 81% drive alone. The other 18.6% are most likely carpooling or being dropped off by another driver. In Elyria the percentage not driving alone or taking transit is 9%. This speaks to a transportation market that is not driving alone because it is too expensive but cannot (or will not) use public transportation for their trip, due to lack of

available transit options, lack of knowledge of those options, or other factors. These are among the people who would potentially use a transit connection in the Westshore Corridor.

Data for Erie County is shown in Table 4.18. Sandusky is the only city in Erie County for which data is available as part of the ACS CTPP. The most important fact from the data is the 91.0% of work trips originating in Sandusky stay within Sandusky. This is indicative of a largely independent local economy and job market that lacks a strong commuter relationship to the nearby cities of Vermillion, Lorain, Elyria, and Cleveland (or to Toledo and its suburbs in the western direction). Also important is that no transit mode shares are indicated for any connection in the Sandusky area, since transit use is very low and the availability of transit service extremely limited in that city.

Figures 4.20 through 4.23 graphically represent the total daily work trips and transit mode share to CTPP communities within the study area.

Table 4.17: Total Daily Work Trips Data with Lorain County Origins

Origin Municipality	Destination Municipality	Total Trips	Transit Trips	Percent Drive Alone	Percent transit	Share of All Trips
Avon Lake city, Ohio	Avon Lake city, Ohio	1,925	0	69.4%	0.0%	25.8%
Avon Lake city, Ohio	Cleveland city, Ohio	2,430	60	88.5%	2.5%	32.6%
Avon Lake city, Ohio	Elyria city, Ohio	500	0	92.0%	0.0%	6.7%
Avon Lake city, Ohio	Lakewood city, Ohio	300	0	75.0%	0.0%	4.0%
Avon Lake city, Ohio	Lorain city, Ohio	385	0	90.9%	0.0%	5.2%
Avon Lake city, Ohio	Sandusky city, Ohio	20	0	100.0%	0.0%	0.3%
Avon Lake city, Ohio	Westlake city, Ohio	975	0	93.3%	0.0%	13.1%
Lorain city, Ohio	Avon Lake city, Ohio	1,320	0	90.9%	0.0%	7.0%
Lorain city, Ohio	Cleveland city, Ohio	1,975	0	81.3%	0.0%	10.4%
Lorain city, Ohio	Elyria city, Ohio	4,740	175	84.9%	3.7%	25.0%
Lorain city, Ohio	Lakewood city, Ohio	65	0	100.0%	0.0%	0.3%
Lorain city, Ohio	Lorain city, Ohio	8,595	90	80.0%	1.0%	45.4%
Lorain city, Ohio	Sandusky city, Ohio	50	0	60.0%	0.0%	0.3%
Lorain city, Ohio	Westlake city, Ohio	825	0	75.8%	0.0%	4.4%
Elyria city, Ohio	Avon Lake city, Ohio	630	0	82.5%	0.0%	3.5%
Elyria city, Ohio	Cleveland city, Ohio	1,660	20	89.8%	1.2%	9.2%
Elyria city, Ohio	Elyria city, Ohio	10,010	115	76.4%	1.1%	55.7%
Elyria city, Ohio	Lakewood city, Ohio	55	0	100.0%	0.0%	0.3%
Elyria city, Ohio	Lorain city, Ohio	1,610	20	85.1%	1.2%	9.0%
Elyria city, Ohio	Sandusky city, Ohio	80	0	100.0%	0.0%	0.4%
Elyria city, Ohio	Westlake city, Ohio	980	0	92.9%	0.0%	5.4%

Table 4.18: Total Daily Work Trips Data with Erie County Origins

Origin Municipality	Destination Municipality	Total Trips	Transit Trips	Percent Drive Alone	Percent transit	Market Share of Trips
Sandusky city, Ohio	Avon Lake city, Ohio	95	0	84.2%	0.0%	1.6%
Sandusky city, Ohio	Cleveland city, Ohio	120	0	100.0%	0.0%	2.0%
Sandusky city, Ohio	Elyria city, Ohio	60	0	25.0%	0.0%	1.0%
Sandusky city, Ohio	Lorain city, Ohio	30	0	50.0%	0.0%	0.5%
Sandusky city, Ohio	Sandusky city, Ohio	5,535	0	80.9%	0.0%	91.0%

Figure 4.20: Total Daily Work Trips and Transit Mode Share To/From Cleveland

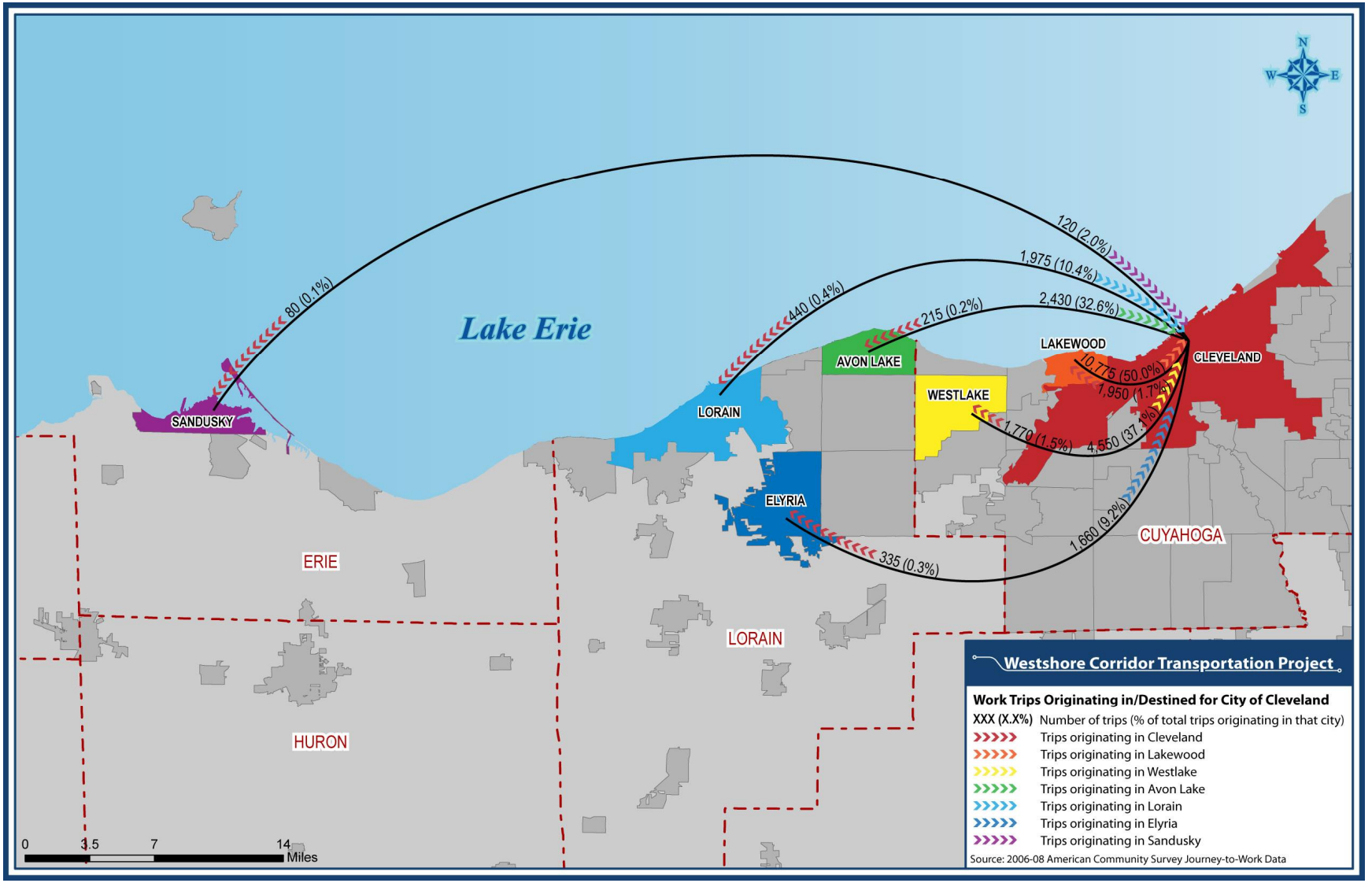


Figure 4.21: Total Daily Work Trips and Transit Mode Share To/From Lorain

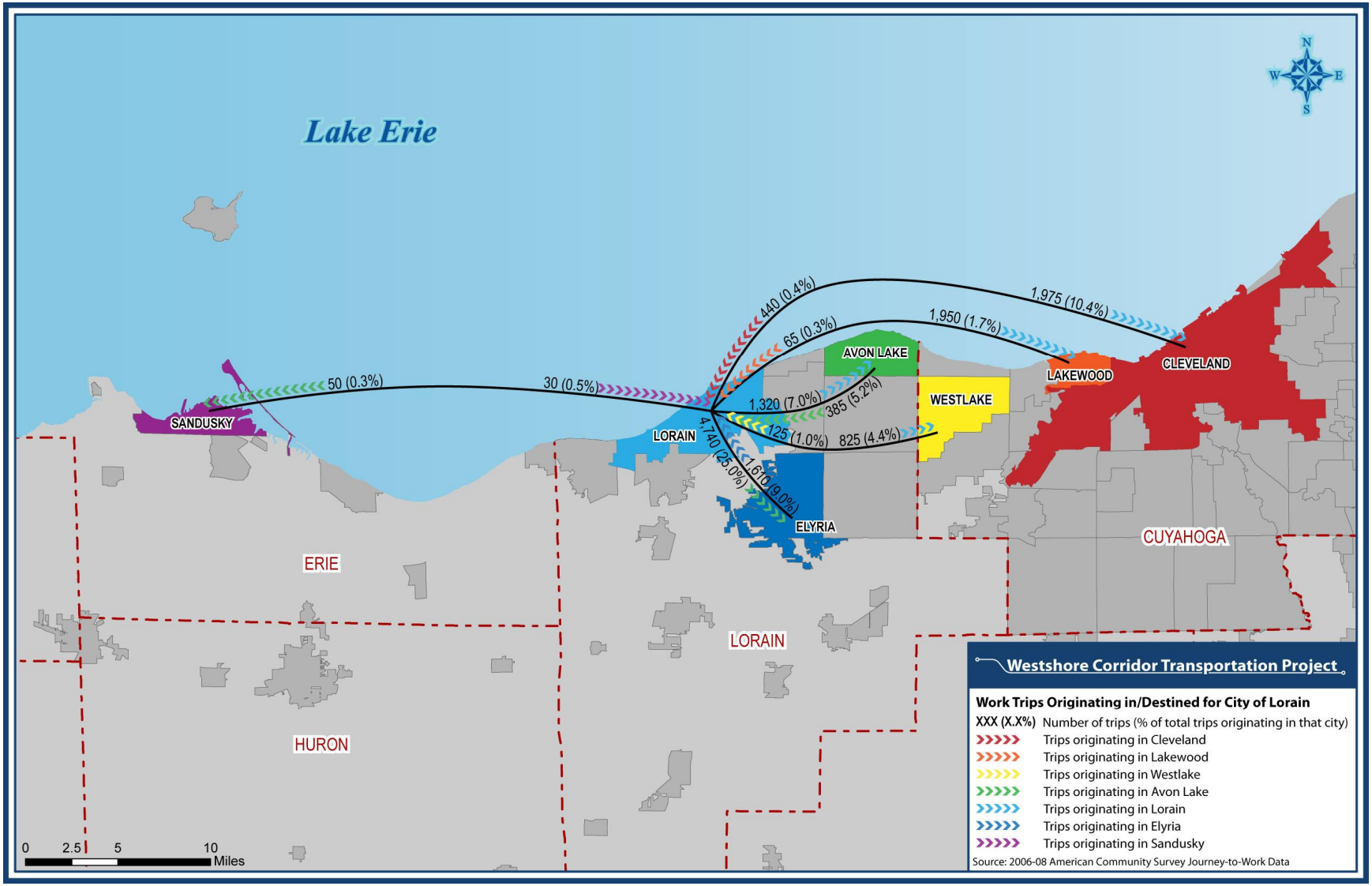


Figure 4.22: Total Daily Work Trips and Transit Mode Share To/From Elyria

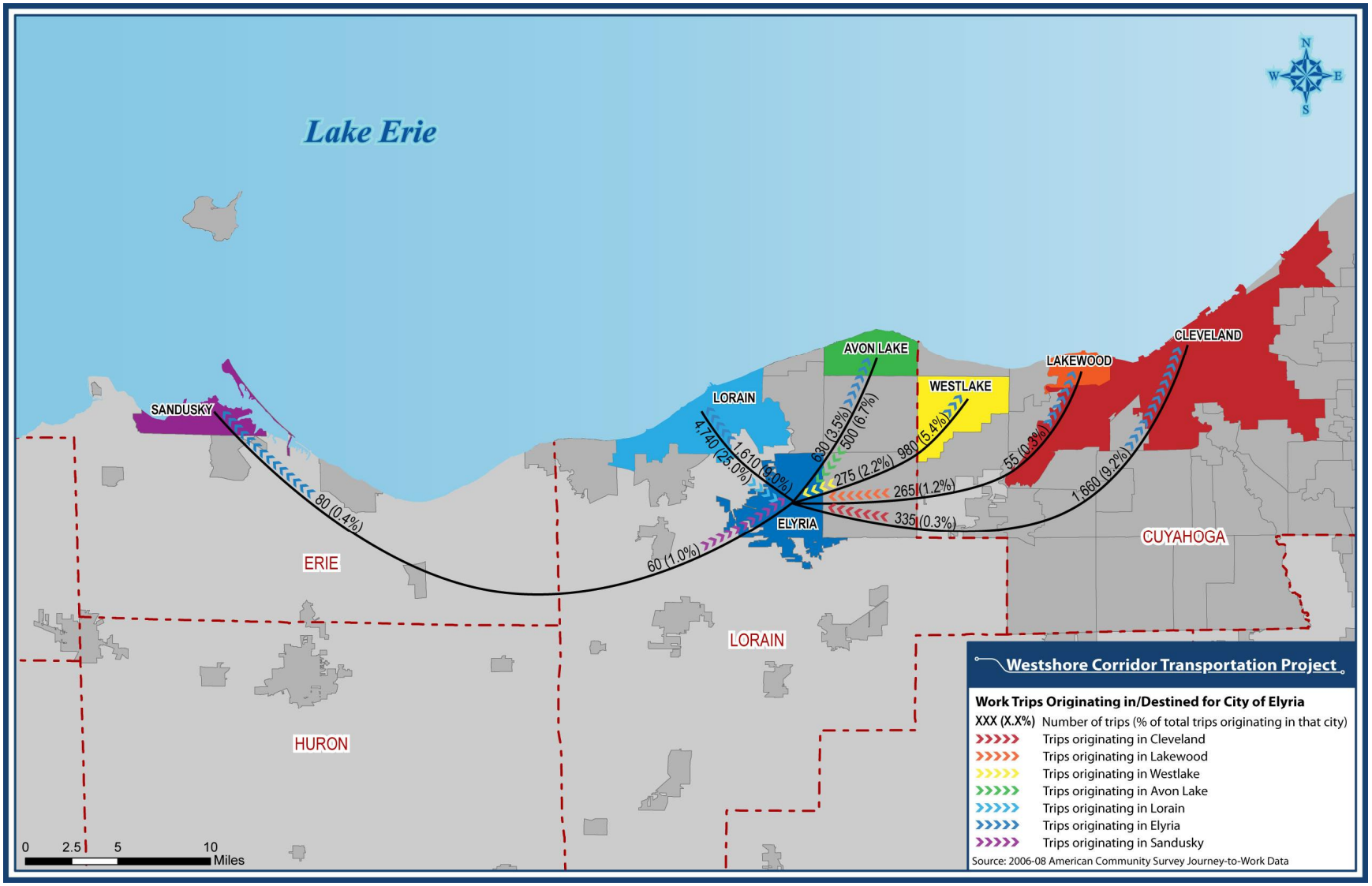
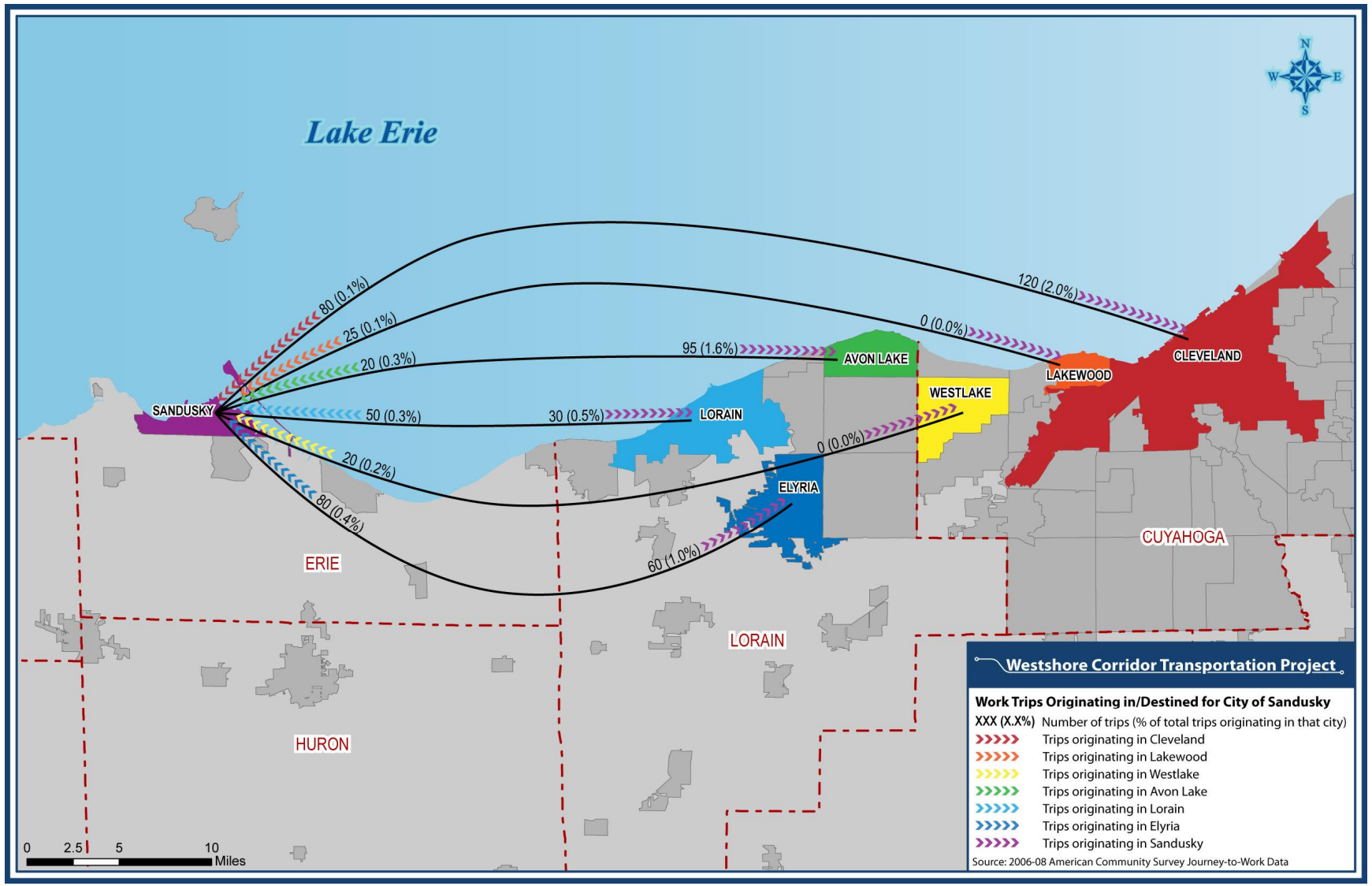


Figure 4.23: Total Daily Work Trips and Transit Mode Share To/From Sandusky



2005 NOACA Regional Trip Model

NOACA's regional travel forecasting model is another source to show estimated transportation trips by origin and destination zone. Because NOACA only includes Cuyahoga and Lorain counties (and not Erie County), this analysis includes only zones in those two counties. Fortunately, the majority of trips made within the corridor are within the NOACA region.

TAZs (traffic analysis zones) are the basic building block of a regional travel forecasting model. Each TAZ has associated demographic information, which allows the model to predict the number of trips destined to and from the zone to all other zones in the region. NOACA uses a four-step modeling process for every TAZ which includes determining number of origins, determining number of destinations, mode split, and network assignment.

The large number of TAZs in the Cleveland region makes a TAZ to TAZ analysis impractical. Instead, TAZs were aggregated into five districts which are better able to show origins and destinations along the Westshore corridor. The Westshore districts include:

- Central Business District, which covers downtown Cleveland
- Westside, which covers the west side of the city of Cleveland from the Cuyahoga River to W. 117th Street
- Lakewood/West Park/Rocky River, which covers the area between W. 117th Street and Wagar Road
- Westlake, which covers the suburbs of Westlake and Bay Village
- Lorain, which covers all of Lorain county

The model divides trips into a number of categories by origin site (Home based and Non-Home based), trip purpose (Work, Other, School, University), and period (Peak and Off-peak). This provides a good insight into how and where trips within the region are destined based on time of day and destination.

A number of these are of interest to the Westshore Corridor, including Total Trips shown in Table 4.19 and Peak Period Work Trips shown in Table 4.20. In terms of total trips, Table 4.20 in informative in a number of ways. First, the CBD attracts the most trips from the Westside district, with the number of trips reducing with each successive district to the west. Also interesting is that there are more trips between the Westside and Lakewood/West Park/Rocky River districts than between either of these districts and downtown Cleveland.

Table 4.21 shows percentage peak period work trips headed for the CBD. The results show the proportion of trips destined to the CBD go up the farther the distance from downtown. The percentage ranges from 22.2% in the Westside zone to 40.3% in Westlake. This indicates the strong potential for transit serving the CBD for peak period work trips, which is served in Cuyahoga County by a number of local and express bus routes.

The reverse commute market is also healthy, even if the percentage of peak period work trips is less than those destined for downtown. For trips headed to the Westlake zone, between 12

and 20 percent are peak period work trips. For trips headed to the Lorain zone, between 22 and 42 percent are peak period work trips. Each of these indicates a potential reverse commute market that could be served by transit improvement.

Table 4.19: NOACA Regional Trip Model Total Trips

		TO				
		CBD	Westside	Lakewood/ West Park	Westlake	Lorain
FROM	CBD	78,792	16,355	5,704	1,336	732
	Westside	60,590	213,415	61,647	10,203	3,404
	Lakewood/West Park	30,577	58,092	252,005	43,681	7,344
	Westlake	8,081	9,694	51,755	157,343	19,817
	Lorain	9,550	9,907	23,269	46,928	915,187

Table 4.20: NOACA Regional Trip Model Total Peak Period Work Trips

		TO				
		CBD	Westside	Lakewood/ West Park	Westlake	Lorain
FROM	CBD	10,288	1,708	801	261	314
	Westside	13,458	11,837	5,914	1,698	886
	Lakewood/West Park	11,144	8,216	16,976	5,483	2,090
	Westlake	3,260	2,289	5,902	10,867	4,493
	Lorain	3,718	2,597	4,856	8,535	95,703

Table 4.21: Percentage of Peak Period Work Trips versus Total Trips

		TO				
		CBD	Westside	Lakewood/ West Park	Westlake	Lorain
FROM	CBD	13.1%	10.4%	14.0%	19.5%	42.9%
	Westside	22.2%	5.5%	9.6%	16.6%	26.0%
	Lakewood/West Park	36.4%	14.1%	6.7%	12.6%	28.5%
	Westlake	40.3%	23.6%	11.4%	6.9%	22.7%
	Lorain	38.9%	26.2%	20.9%	18.2%	10.5%

Natural Environment

The natural environment of the Westshore corridor varies widely in the 60-mile linear length of the corridor. The development and transportation patterns in the study area have a tremendous impact on the natural environment of the region. Between downtown Cleveland and Crocker Road the entire study area is fully developed, and no major undeveloped parcels remain in their natural state, except in parks and other protected areas. The Cleveland portion of this area includes many industrial parcels (some currently in use, others abandoned) that have created significant impacts on the natural environment. Within the City of Cleveland portion of the corridor, there are many abandoned parcels, some of very significant size, which are ripe for redevelopment. However, environmental issues—some real, some perceived—related to past environmental pollution, remains a major stumbling block to potential redevelopment of these sites.

West of Cleveland the development is more suburban and auto-oriented, which has its own negative impacts on the environment. Between Crocker Road and Leavitt Road in western Lorain County most parcels have been developed, though there are some undeveloped parcels and many parcels in agricultural use in this area. This area includes mostly auto-oriented development, with the exception of the downtowns of Lorain and Elyria, which were developed before the advent of the automobile and feature traditional, higher-density development. The natural environment has been affected by both of these development patterns, both from heavy manufacturing in Lorain and Elyria and auto-oriented development in the suburbs in between.

West of Leavitt Road to the western limits of the study area in Sandusky the development is confined mostly to the cities of Vermilion, Huron, and Sandusky, and small belts of suburban development near these cities. In between these smaller urban areas are areas of mostly undeveloped land and land in agricultural use. .

Throughout the corridor, areas near the rail line are more likely to be, or have been, in industrial use than areas further away from the rail line. In some cases, the former and current industrial uses near the tracks concentrates potential environmental challenges in the areas near the tracks.

Air Quality

People traveling to and within the study area overwhelmingly rely on private vehicles, which have detrimental effects on air quality, particularly near the heavily congested freeways and arterials. All of Cuyahoga and Lorain counties are listed by the US EPA as a nonattainment zone for the 8-hour ozone standard and fine particulate matter standard set by the US EPA. Erie County air quality is considered to be safe by the US EPA. Automobiles are a significant, though not the only, source of these pollutants.

Watershed Protection

The east-west alignment of the Westshore Corridor along the shore of Lake Erie results in the study area intersecting a number of important watersheds in Northeast Ohio. Watersheds located in the study area include:

- Cuyahoga River
- Rocky River
- Black River
- Vermilion River
- Huron River

Historically, output from industrial development was extremely detrimental to water quality. The Cuyahoga River in Cleveland and the Black River in Lorain at one time suffered from output from heavy industry. The 1969 passing of the National Environmental Policy Act (NEPA), establishment of the US Environmental Protection Agency, and subsequent passing of the Clean Water Act has led to a reduction of point-source pollution along these rivers.

In modern times the threat to water quality comes from water runoff related to low-density development. Sprawling parking lots and widened roadways like those found in between Cleveland and Lorain/Elyria result in polluted water draining into these watersheds.

Watershed protection for the Cuyahoga, Rocky, and Black rivers is coordinated by NOACA. A Remedial Action Plan (RAP) has been published for both the Cuyahoga and Black rivers with the intent to protect the water quality of the river and restore it to a natural state. The Rocky River is protected both through the Rocky River Watershed Council and by the Cuyahoga County Metroparks.

Financial Conditions

Taxpayer funding for transportation projects at the Federal, state and local levels is limited and must be expended prudently. The Westshore Corridor Transportation Project must identify improvements that can achieve local consensus, meet state and Federal funding guidelines and demonstrate that they are an efficient use of taxpayer funds. The FTA Section 5309 New Starts Program Funding Process or other Federal Programs could provide up to 80% of the capital funding for design and construction of a qualified major transit project -- though funding at the 80% level is unusual under current Federal funding conditions. In most recent cases, Federal funds have not provided more than 50% of the capital and construction costs. The remainder of capital funds for a major transit investment, and all of the operating funding, must be generated at the local or state levels.

FTA must approve the project at various points throughout the planning process. The key to this approval is the development of a locally-preferred alternative (LPA) that represents the region's consensus on a project that best addresses this study's purpose and need statement and satisfies the region's overall transportation goals. The LPA must represent a local consensus and be capable of gaining support for the level of local funding required to build and maintain the project over the long term. For FTA to approve the project beyond the

alternatives analysis level, the project must demonstrably meet a significant transportation need as identified by the alternatives analysis study and meet various external measures of efficiency compared to other projects of its type from around the country. FTA is also increasingly requiring projects to demonstrate that they will be, or are already, supported by changes in regional land use patterns that help to ensure the long-term success of the transit investment.

Existing Conditions Conclusions

The introduction of this chapter stated that the Westshore Corridor study area is a vast and varied area within Greater Cleveland. This complexity and size makes travel by public transit difficult. Yet, this difficulty is also what presents an opportunity for improvement. The corridor's needs make it suitable for one or more transit improvements to complement automobile travel to and through the study area.

The existing conditions presented in this chapter have uncovered a number of important conclusions, summarized here and in Table 4.22.

Community Conclusions

- The Westshore Corridor is a major Ohio economic corridor representing 25% of the three counties' population (Cuyahoga, Lorain and Erie), 30% of its employment, and only 21% of its geographic area. Furthermore, the Westshore Corridor contains approximately 75% of Lorain County's population and jobs, yet only 29.1% of its land area. Erie County is similar, with the Corridor home to 71% of the population, 77% of the employment, and only 28% of the land area.
- Population continues to leave Cuyahoga County for newer development opportunities in Lorain (and in some cases Erie) County.
- The area between Cleveland and Lorain is morphing into a single continuous corridor of development.
- Much of the new development is in a low-density and sprawl oriented pattern, which tends to use a lot of natural resources per household.
- Cleveland and near-in suburban communities have adopted some Mixed Use zoning measures that are supportive of transit service.

Transportation Conclusions

- Transit service for inter-county trips is non-existent, despite thousands of daily inter-county work trips, because transit service operates within county borders and does not connect at the county line.
- Transit mode share for commute trips to Cleveland is higher than the regional average, likely due to the higher employment density of downtown Cleveland
- Funding reductions due largely to the economic recession have caused a significant reduction in transit services offered in GCRTA and LCT service areas.

Market Conclusions

- Most commuting trips from key study area cities are to the city of Cleveland
- The high transit mode share to downtown Cleveland is due in part to the transportation, time, and parking costs associated with the trip.
- Based on demographic indicators, there is a strong market potential for transit dependent riders outside of Cuyahoga County in the core cities of Lorain, Elyria, and Sandusky.
- The markets for future transit improvements include the following in order of importance:
  1. Work trips from outlying suburban areas into downtown Cleveland, including Westlake, Bay Village, Avon, Avon Lake, Sheffield, Lorain, and Elyria.
  2. Recreational/entertainment trips could be a viable market, including professional sporting events, the new Cleveland Convention Center and Medical Mart, the downtown casino, and other Special Events throughout the year. These trips have the potential to attract both visitors and employees bound for these destinations
  3. Reverse commute trips from high density neighborhoods with large transit dependent populations in the city of Cleveland to jobs in suburban locations like Crocker Park in Westlake, I-90/Lear-Nagle interchange in Avon, SR 83 in Avon, and Midway Mall in Elyria.

Table 4.22: Summary of Westshore Corridor Study Area Issues and Conclusions

Conclusion	Supporting Data	Further Information within document
A lack of transit connections between GCRTA LCT, and SPARC bus systems, which make inter-county transit travel between Cuyahoga, Lorain, and Erie counties impossible.	Maps showing lack of connectivity between the three county-based transit services	Figure 4.16
Reduced transit service in Lorain County makes intra-county transit travel difficult or impossible.	Service reduced from 10 routes to four routes in 2009. Frequency reduced from every 30 and 60 minutes to every 120 minutes	Figure 4.16
Minimal fixed-route transit service in Erie County makes intra-county transit travel difficult or impossible.		Figure 4.16
Land use patterns and densities in regional suburban growth areas that are generally unsupportive of transit	Transit Propensity map shows much of the study area has densities below 10 jobs+people per acre, which is a typical threshold for basic bus transit service.	Figure 4.8
A high percentage (20-40%) of all trips from Lorain County, Westlake, and Lakewood to downtown Cleveland are peak period work trips, indicating a market for commuting from these areas.	NOACA 2005 Regional Trip Model analysis	Tables4.19-4.21
The high transit mode share for travel from outer cities to the city of Cleveland is due in part to the transportation, time, and parking costs associated with making the trip.	Work trip data from the 2005-07 American Community Survey Parking cost information	Tables 4.16-4.18
The Westshore Corridor is a major Ohio economic corridor, representing more jobs and people than the proportional land area for the Greater Cleveland region.	The percentage of people (25%) and jobs (30%) relative to the land area (21%)	Table 4.1
Much of the new development is in a low-density and sprawl oriented pattern, which tends to use a lot of natural resources per household.	Land use map	Figure 4.9
Transit dependent populations exist in parts of the west side of Cleveland, Lakewood, Lorain, Elyria, and Sandusky.	Transit dependent population analysis, including Zero-car household map and household income map	Figures 4.9-4.10
Cleveland and near-in suburban communities have adopted some mixed use zoning measures that are supportive of transit service.	Planning and Zoning Review in Appendix A4	

Chapter 5 – Initial Screening of Alternatives

Introduction

This chapter describes the process through which initial alternatives were identified and screened for the Westshore Corridor Transportation Project (WCTP). The identification of alternatives has three major components: transit mode, travel route, and terminal location. Each alternative identified in this chapter consists of a combination of these three elements. The purpose of this initial screening is to eliminate, through largely qualitative measures and analysis, those modes and travel route combinations that are not the best options to meet the needs and goals of the project.

The process through which alternatives are considered in this initial screening is represented by a three dimensional matrix, with each dimension of the matrix comprising one component of an alternative. At the end of this chapter alternatives are identified and scored based on a number of criteria that best represents the needs of the study area. Criteria included in the initial screening include the WCTP study goals and objectives, the physical and economic feasibility of the routing, and the effect on the natural environment.

The result of the initial screening will be a set of alternatives that will be carried forward to the second screening phase, where more in depth analysis of each alternative will be conducted. The other alternatives will be eliminated from consideration in this phase.

Transit Modes

This section details transit modes to be considered for the Westshore Corridor Transportation Project. Modes summarized in this section include both rubber tire bus-based service and rail-based service.

Beyond vehicle and guideway type, transit modes are categorized in this section into two broad categories, Local Transit and Regional Transit. The Westshore study area includes both short-distance trips on local streets as well as long-distance trips on arterials and freeways. The review of existing conditions noted the significant gap in transit service that exists within the Westshore corridor. As a result, an initial finding of this study is that both local and regional transit services are needed within the Westshore corridor. Separating the transit modes into local and regional will help in the decision making process to determine the best overall transit improvement for the study area.

Local Transit Modes

The following modes support local travel by transit for a variety of trips.

Bus Transit

Buses are the dominant mode of public transportation in most parts of the world. This mode is typified by large, multi-passenger, rubber-tired vehicles operating on public roadways according to a fixed schedule.

After this unifying characteristic, however, bus service varies, with multiple types of operating schemes. This section includes the types of bus service that best provide local transit trips (under 10 miles in length) and includes a summary of local and limited stop bus services. Bus Rapid Transit is considered separate from bus service and is in a separate section. Table 5.1 summarizes bus services considered in this document.

Local Bus

Local on-street bus service is the most prevalent form of transit in the United States, including Greater Cleveland. Service within the Westshore corridor is provided by both GCRTA in Cuyahoga County and LCT in Lorain County, as shown in Figure 5.1.

Figure 5.1: GCRTA Local Bus

Local bus service operates in mixed traffic, making frequent stops and traveling at slow speeds. It is best used for short to medium length trips (less than 10 miles in length) within a metropolitan area. Local bus systems are typically set up to provide either grid service on major arterials or radial service from residential areas to activity centers such as downtown, hospitals, universities, shopping centers, and other regional attractions. Cross-town connecting service can also be provided by local bus.

Depending on the frequency of service, the density and development patterns of the alignment, local bus systems can serve light to heavy passenger volumes. Local bus service can employ flexible routing and scheduling since it operates on the existing street network. Local bus can be susceptible to delays due to increases in traffic volumes and congestion, which results in higher costs and longer service hours to maintain scheduled service.

Local bus service also can be used to provide feeder service to higher-speed fixed guideway systems (like commuter rail) that provide a longer distance trip. In this respect, local service can function as a collector system at the origin of the trip and as a distribution system at the destination of the trip. Because local bus systems operate on existing streets, the only direct capital costs are the vehicles, passenger amenities and maintenance facilities.

Limited Stop Bus

Limited stop bus shares many of the same characteristics as local bus, primarily operating in mixed traffic on existing streets, and requires little upgrade to existing stops. The difference is that a limited stop bus reduces the number of stops in order to expedite the overall trip. The number of stops served can vary from two (beginning and end) up to half (using a skip-stop strategy on the alignment).

Limited stop bus is typically used in places where the expedited trip is justified: where local bus routes experience extreme delays or where the end destination is a high density job center (like

downtown Cleveland). Some limited stop bus services have nicer vehicles and an overall marketing scheme, but do not style themselves or have the infrastructure improvements associated with bus rapid transit.

Table 5.1: Bus Summary (Local Travel)

	Local Bus	Limited Stop Bus
Passenger Volumes	Light to heavy	Light to heavy
Passenger Capacity	Up to 2,000 to 4,000 passengers per hour per lane one-way	Up to 2,000 to 4,000 passengers per hour per lane one-way
Speed	12-20 mph	20-25 mph
Type of Trips	Dense area-wide network useful for short to medium length trips	Serves expedited short to medium length trips
Stop Spacing	0.25-0.5 miles	1.0 mile or more
Capital Costs	Low	Low
Operations Costs	Medium	Medium
Maintenance Costs	High	High
Right-of-Way Requirements	Uses existing rights-of-way	Uses existing rights-of-way
Local Example	LCT and GCRTA bus routes	GCRTA #55F (Gold Coast Flyer)

Bus Rapid Transit

Bus rapid transit (BRT) is a system of improvements developed to simulate aspects of rail transit using bus technology. The primary goals of BRT are to reduce transit travel time, increase service reliability, and add capacity to a route through larger vehicles and/or increased service frequencies. This application concept is a flexible one that encompasses a range of physical, technological, operational and marketing improvements in response to traffic congestion, operational needs, opportunities, available capital funding, and market demand. The HealthLine operated by GCRTA is an example of a bus rapid transit in Northeast Ohio.

In this summary BRT service is presented as two levels of implementation: initial and full. Initial BRT is a basic set of amenities for BRT service. Full BRT is a developed system that applies the transit elements of initial BRT service, but adds more significant infrastructure improvements. For the purposes of this document, Initial and Full bus rapid transit

improvements are categorized into four distinct groups: vehicles, stations, service, and infrastructure. Table 5.2 summarizes the characteristics of bus rapid transit.

The implementation of BRT service within a transportation corridor is sometimes an evolutionary process in which transit amenities and infrastructure improvements are phased in over time as conditions and demand warrants them, and as funding becomes available.

Initial BRT Service

Initial BRT service prescribes minimal improvements for service to be considered bus rapid transit. Initial BRT includes a potential increase in service frequency, a decrease in transit travel time and the implementation of passenger amenities for the purposes of developing a distinct mode of transportation. The outer portion of the GCRTA HealthLine through East Cleveland is an example of Initial BRT.

Vehicles

In Initial BRT vehicle improvements range from a branding and color scheme different from existing conventional buses to purchasing new buses that are equipped to provide a more comfortable ride or specific passenger amenities.

Stations

Passenger stations for Initial BRT are typically upgraded to include curbside concrete hard stands with covered seating areas, upgraded lighting, highly visible signage coordinated with a BRT branding and color scheme, and route information. Heating is another amenity that can be added to station, and will be necessary in a region like Cleveland with a harsh winter climate.

Service

Initial BRT includes an increase in service frequencies from what previously existed in the corridor. This typically means operation of 10-15 minute peak period frequencies and 15-20 minute offpeak frequencies. This service frequency meets the requirements of FTA's Very Small Starts program.

Infrastructure

Initial BRT service operates in mixed traffic on urban or suburban streets with some level of preferential treatment for operations to expedite the trip. The type of preferential treatment for initial BRT service is achieved through a deployment of Intelligent Transportation Systems (ITS) technology such as signal prioritization. A signal prioritization system improves transit travel times by allowing buses to advance, prioritize, or pre-empt traffic lights when approaching a signalized intersection. The components of the system involve a bus-mounted transponder that utilizes an electronic signal to correspond with an intersection's traffic signalization system. A signal priority system allows an approaching bus and traffic to pass through an intersection without being interrupted by a stop signal. This improvement minimizes transit travel delays, improves reliability and allows buses to maintain schedule adherence. The installation of an enhanced signalization network may even reduce the number of buses required to operate on existing schedules, and thus reduces operating costs.

Full BRT Service

Full BRT service builds on the service improvements listed for Initial BRT, but also includes more infrastructure and technology improvements designed to increase travel speeds and reduce dwell times at stations, thus further improving transit travel times within a corridor. The portion of the GCRTA HealthLine from downtown Cleveland to University Circle is an example of Full BRT.

The four key improvements for Full BRT are listed below.

Vehicles

Vehicles for Full BRT are similar to Initial BRT. They typically include a branding and color scheme and comfort amenities to distinguish BRT from regular bus service. They may include wider and/or multiple doors that allow for faster boarding and alighting at stations.

Stations

Station amenities are similar to those found for Initial BRT, with further upgrades to lighting, shelters, signage, and benches. Additionally, Full BRT stations oftentimes include raised platforms which can reduce dwell times at stations. Signage and information system upgrades at Full BRT station typically utilize the deployment of ITS infrastructure such as passenger information systems to provide riders at bus stops with real-time route and schedule information. Off-board fare collection and ticketing systems are included to speed up passenger boarding and reduce dwell times.

Full BRT stations can also be located in the center of the roadway, where riders board in each direction from a single platform.

Service

Full BRT service is typically more frequent than Initial BRT and corresponds to the greater potential for higher ridership that corresponds to a higher capital investment. Full BRT includes 5-10 minute peak period frequencies and 10-15 minute offpeak frequencies.

Infrastructure

Full BRT includes many different upgrades to right-of-way, as addressed here. One area of improvement is streetscape and landscaping that facilitate connections to properties and land uses adjacent to stops. These improvements can help development and redevelopment of surrounding properties, which in turn supports the ridership of the service in the corridor.

Another major improvement for Full BRT is the construction of a bus-only lane, which reduces interference from automobile traffic and improves transit operational efficiency. This improvement can take the form of barrier or non-barrier separated lanes. Non-barrier lanes are like those on the GCRTA HealthLine. The pavement is dedicated for buses only, but there is no physical barrier between buses and other traffic. In some cases a non-barrier bus lane is designated only during peak travel periods. Barrier-separated bus lanes have a physical barrier, typically curb. Lanes with barriers are more costly and require more right-of-way to fit within a corridor.

Beyond the barrier or non-barrier design of the bus lane, the other issue is the location of a bus lane either in the median or curbside. Each corridor has its own characteristics which can affect this decision. Lanes located in the center median allow for an offset station design and can be designed narrower than curbside lanes. As a drawback, median lanes result in riders crossing roadway lanes when boarding and alighting from the station. Also problematic is left turning traffic at intersections. Special signals are usually installed to direct left turning auto traffic and through-routed transit vehicles.

Curbside lanes may require more right-of-way and directly interfere with on-street parking, which can be controversial in some communities. However, curbside lanes operate through intersections with less conflict than median lanes and also can reduce the amount of pedestrians crossing traffic lanes by stopping on the side of the corridor (as opposed to the median).

A further infrastructure improvement for Full BRT is the construction of queue jump lanes. These are typically employed on corridors which suffer from high amounts of traffic congestion but do not have enough right-of-way to complete a full bus lane. Queue jump lanes are constructed as non-barrier lanes at intersections, and allow vehicles to jump past automobile traffic waiting at the intersection by receiving a green signal before the rest of the waiting traffic. Discussion of queue jump lanes for a BRT improvement to the Westshore Corridor would occur during the Second Screening of Alternatives if this mode is carried forward in any of the alternatives.

Table 5.2: BRT Summary (Local Travel)

		Initial BRT	Full BRT
Passenger Volumes		Serves medium to high passenger volumes	Serves medium to high passenger volumes
Passenger Capacity		4,000 to 6,000 passengers per hr per lane one-way	4,000 to 6,000 passengers per hr per lane one-way
Trip Speed		12-15 mph	15-20 mph
Type of Trips		Serves medium to long trips	Serves medium to long trips
Stop Spacing		0.25-0.5 miles	0.25-0.5 miles
Capital Costs		Moderate	High
Operations Cost		Moderate operating costs per vehicle mile or passenger mile basis.	Moderate operating costs per vehicle mile or passenger mile basis.
Maintenance Costs		High vehicle maintenance costs.	High vehicle maintenance costs.
Right-of-Way Requirements		Uses existing ROW	May require new ROW depending on infrastructure chosen
Local Example		East Cleveland portion of GCRTA HealthLine	Cleveland portion of GCRTA HealthLine
Improvements specific to BRT			
Vehicles		Branding, color, and comfort improvements	Branding, color, and comfort improvements
Stations	Lighting	Y	Y
	Improved amenities	Y	Y
	Signage/branding	Y	Y
	Real-time passenger information	Sometimes	Y
	On-site fare vending machines	Sometimes	Y
	Heating	Y	Y
Service	Peak	10-15 min	5-10 min
	Offpeak	15-20 min	10-15 min
Infrastructure	ITS	Signal priority	Signal Priority
	Lanes	Operating in mixed traffic	Bus-only lanes operating with or without barriers
	Queue Jump Facilities	N	Sometimes
	Station Platforms	Curbside	Curbside or median

Rail Transit

Rail transit is the term used to describe conventional fixed guideway transit systems that use a dual rail track, as historically used by railroads, for both support and guidance. Rail transit systems have a sliding scale in terms of interaction with traffic, from operating in mixed traffic all the way to systems operating with complete separation from other traffic. Another characteristic is low platforms (where passengers must navigate steps to board the vehicle) and high platforms (which offer level boarding for faster embankments). These characteristics influence the capacity and travel time of the system. Table 5.3 summarizes the rail modes considered for this document.

Streetcars (Light Rail in Mixed Traffic)

Streetcar systems are defined by their operation on rails embedded in the street pavement, powered electrically by overhead catenary wires, as shown in Figure 5.2. Boarding almost always occurs at low platform, curbside stations. These systems can also be defined as light rail system in mixed traffic. The vehicles used in streetcar systems are generally shorter and narrower, and have lower passenger capacities than vehicles used in other light rail systems.

Streetcars are gaining in appeal as a means to offer the high quality transit experience often associated with guideway-separated rail systems, while using existing right-of-way and having a lower capital cost. Streetcar systems typically integrate into existing neighborhoods with compact development patterns.

Average operating speeds on streetcar systems are typically 12 to 15 miles per hour, with stops spaced 0.25 to 0.5 miles apart. Generally, streetcar systems are used for shorter distance trips or distribution in a downtown area. The Portland Streetcar in Oregon and the South Lake Union Streetcar in Seattle are examples of streetcar systems constructed recently in the US.

Light Rail Transit (LRT)

Light Rail systems are those that operate on rails on exclusive right-of-way, powered by overhead catenary wire. The exclusive lane for Light Rail systems is typically not grade separated, so there is some interaction between the system and local traffic. GCRTA's Blue and Green Lines are examples of a Light Rail system.

Figure 5.2: GCRTA Blue/Green Line

These types of systems typically have larger stations, with either high or low platforms. The platform height is dependent on the type of vehicle used, with lane separation aiding the potential for high boarding platforms.

LRT Separated systems, with a potential

top speed of 55 mph, tend to operate faster than streetcar systems because there is less interaction between transit and auto traffic. Stations tend to be spaced between 0.25 and 0.5 miles. While light rail can facilitate longer trips than streetcars, most trips are still local. The typical light rail trip distance is between 5 and 15 miles in length. For example, the entire length of the GCRTA Blue Line between Shaker Heights and Tower City is 9.5 miles.

The capital cost of a light rail system is higher than a streetcar system, but still relatively low compared to other rail modes. Upgrades to barrier separated right-of-way and station improvements can drive up capital costs. Operations and maintenance costs are considered medium, and light rail can be very cost effective in corridors where transit demand is high.

Heavy Rail Transit (HRT)

Heavy rail transit (HRT) systems are those that operate on rails and exclusive right-of-way that is completely grade separated from other traffic. This grade separation allows for heavy rail systems to operate much faster than LRT systems. These systems are referred around the country as rapid rail, metro, or subway. In Northeast Ohio the GCRTA Red Line is an example of a heavy rail system, shown in Figure 5.3.

Heavy Rail is characterized by a high passenger carrying capacity and a maximum operating speed of 70 miles per hour. Heavy rail systems are best suited for service in high density corridors that connect city neighborhoods and suburbs to the central city area of large metropolitan areas, with station spacing ranging from one to two miles. A heavy rail system facilitates both local and commuter trips depending on corridor, but average trip lengths are usually between 5 to 15 miles.

Figure 5.3: GCRTA Red Line

The initial capital cost for a heavy rail system is high and is at the upper end of the cost range for urban transport systems. This is largely the result of the exclusive and grade-separated right-of-way infrastructure requirements. Cost effectiveness for heavy rail systems may be lower than those for bus or LRT alternatives when measured on a cost per passenger or per passenger mile basis, if the passenger demand on the system is very high.

Monorail-Automated Guideway Transit (AGT)

Automated guideway transit (AGT), refers to a fixed guideway rail system where the most prominent feature is automatic train operation. This type of system is always entirely grade separated, powered by a third rail, and completely automated (i.e., driverless). Monorail is a

type of AGT that uses a single rail or straddle-beam technology. Other types of AGT use more conventional two or more rail schemes.

The electrically powered automated system allows AGT trains to accelerate very quickly, with a top speed of 55 mph. These types of systems are typically employed in airports or as downtown distributors. The average trip distance is usually short, with stations spaced closely together (0.25 miles or less).

The automated feature requires a complete grade separation and many safety features, which results in a very high capital cost. Maintenance costs can also be high, stemming mainly from a lack of experience in these types of systems in the United States. Operations costs are considered medium because the automated feature reduces the need for operator labor, but increases costs for skilled engineers and technicians required to keep the system in safe working order.

Personal Rapid Transit (PRT)

Personal rapid transit is an idea that has been discussed for many years but has had extremely limited exposure in the United States. A personal rapid transit system would include an elevated guideway and an automated system similar to a monorail. The key difference is that personal rapid transit cars would be much smaller (seating only 1-5 passengers) and there are more of them available in the system. As requested by the rider, the personal rapid transit system would perform point to point travel between any two stations in the system. By only providing point to point trips requested (as opposed to making all stops on the corridor), a personal rapid transit system would be faster and more time efficient for individual travelers than other transit modes.

Figure 5.4: West Virginia University PRT

The drawbacks to a PRT system are the high capital costs for automation along with the smaller capacities of the car, which makes it the return on investment very low. Indeed, the only PRT system constructed in the United States is a Federal demonstration project at West Virginia University. That system, constructed in the late 1960s, includes five stations and cars seating up to 8 people, as shown in Figure 5.4. It was constructed to connect the three university campuses, and is used exclusively by students, faculty, and staff at West Virginia University.

Table 5.3: Rail Summary (Local Travel)

		Streetcar	Light Rail	Heavy Rail	Monorail	PRT
Passenger Volume		Medium	Medium	High	Medium	Medium
Capacity		3,600 - 22,000 per hour one-way	3,600 - 22,000 per hour one-way	42,000 - 60,000 per hour one-way	5,000 to 15,000 per hour one-way	500-1,000 per hour one-way
Operating Speed		12-15 mph	55 mph	70 mph	55 mph	45 mph
Average trip distance		0 - 5 miles	5 - 10 miles	10 - 15 miles	0 - 3 miles	0-5 miles
Station Spacing		0.5 - 1 miles	0.5 - 1 miles	1 - 2 miles	0.25 - 0.5 miles	0.5 – 1 miles
Capital Costs		Medium	Medium	High	High	High
Operations Cost		Medium	Medium	High	Medium	Medium
Maintenance Costs		Medium	Medium	Medium	High	High
Lanes	Barrier Separated	N	Y	Y	Y	Y
	Right-of-Way Requirements	At-grade	At-grade	Grade separated	Grade separated	Grade separated
Platform boarding		Low	Low or High	High	High	High
Service Frequencies		5-15 min	5-15 min	5-15 min	5-10 min	N/A
Power system		Overhead catenary	Overhead catenary	Overhead catenary or third rail	Third rail	Third rail
Local Example		None	GCRTA Blue and Green Lines	GCRTA Red Line	None	None

Regional Transit Modes

The following modes support longer distance regional travel by transit, typically for work trips, but also for educational or recreational trips. Table 5.4 summarizes the regional transit modes considered for this document.

Commuter Bus

Commuter or express bus service is geared primarily to riders traveling during peak periods for work. Commuter buses typically travel for distances greater than 15 miles and at speeds faster than that of local bus service. Commuter buses usually collect passengers on local streets or at a park-and-ride facility at one end of a route and then operate on limited access freeways for most or their entire trip until they reach their destination. In many locations, commuter service operates from the outer suburbs to the central business district, with multiple stops at each end of the route. In Greater Cleveland, GCRTA, Akron Metro, Laketran, and PARTA provide commuter bus service into downtown Cleveland, as shown in Figure 5.5.

For the purposes of this document, commuter bus is considered bus service that originates at a park and ride lot and operates in mixed traffic on freeways to reach the final downtown destinations. While operating in mixed traffic on already built freeways can reduce the capital cost of this mode, it also means that commuter buses must deal with the same traffic issues as single occupancy automobiles.

Figure 5.5: GCRTA Commuter Bus

Commuter bus routes typically use special buses that provide amenities such as cushioned seats, individual reading lights, and tray tables. More recently, Wi-Fi internet has been offered on some commuter bus services. These amenities provide a higher level of comfort to better accommodate passengers and make the service more attractive when compared to driving for long commute trips.

Highway HOV Bus

Highway HOV bus service is similar to commuter bus, with the difference being that it operates on special HOV lanes on limited access freeways. HOV lanes can reduce travel time, but are expensive to construct. They are usually implemented when the freeway is initially planned, and are much more difficult to insert once the freeway is constructed. No HOV lanes exist within the study area.

Commuter Rail

Commuter rail is generally applied to longer distance regional rail trips. Typically these systems are operated by railroads, under agreement with a transit agency, on their own tracks or

through a leased track usage agreement. A major advantage of commuter rail is its ability to use existing tracks in conjunction with freight trains or Amtrak service.

Due to federal regulations that require an automatic train control system for speeds in excess of 79 miles per hour, commuter rail generally operates below this speed. Due to the slower acceleration and longer braking distances compared to the other rail technologies, commuter rail is best suited to longer distance trips. Stations tend to be located 3 to 5 miles apart because of the distance required for acceleration/deceleration.

There are a number of commuter rail propulsion technologies available for service. The most traditional type of commuter rail includes a locomotive that pushes/pulls passenger cars. The locomotive can be diesel powered (like the Metra Union Pacific Northwest line in Chicago) or electric (like the Metro North Railroad's New Haven Line in New York). The electric propulsion can be further classified by location, either by overhead catenary wire or in some cases, by third rail.

More recently, some startup services have reduced their capital costs by purchasing DMU (diesel multiple unit) or EMU (electric multiple unit) railcars where the propulsion and passenger seating are built into the same vehicle. Further commuter rail choices include the use of high or low platform boarding.

Initial capital costs for commuter rail can be moderate depending on the availability of an existing rail corridor that can be used for the service. The cost and capacity of trains, along with the peak ridership pattern, means commuter rail trains typically operate every 30 to 60 minutes during peak periods. Due to the high passenger capacity potential and the long distances traveled, the operation and maintenance cost per passenger mile for commuter rail is in the middle range for rail transit alternatives.

Table 5.4: Transit Summary (Regional Travel)

	Commuter Bus	Highway HOV Bus	Commuter Rail
Service Frequencies	Typically 1-2 trips per hour; can be more during peak periods	Typically 1-2 trips per hour; can be more during peak periods	Typically 1-2 trips per hour; can be more during peak periods
Passenger Volumes	Medium to high	Medium to high	High
Passenger Capacity*	1,000 to 1,500 passengers per hour per lane one-way	1,000 to 1,500 passengers per hour per lane one-way	2,000 to 3,000 per hour one-way
Speed	45-60 mph	50+ mph	Up to 79 mph
Type of Trips	Serves medium to long trips	Serves medium to long trips	Serves medium to long trips
Stop Spacing	Typically less frequent stops or point-to-point service; often uses limited access freeways	Typically less frequent stops or point-to-point service; uses HOV lanes on limited access freeways	3-5 miles
Capital Costs	Low if using existing infrastructure, Medium if park and ride facilities included	High	Low to high depending on use of existing railroad corridor
Operations Costs	Medium	Medium	Medium
Maintenance Costs	Medium	Medium	Medium
Right-of-Way Requirements	Uses existing rights-of-way, with the exception of new park-and-ride lots	New right-of-way is necessary for park and ride lots and HOV lanes	New ROW is necessary for stations
Local Example	GCRTA #200-series	None	None

** Passenger capacity is defined as the top number of passengers per direction per hour that can reasonably accommodated by the mode.*

Transit Modes to be Considered

Not all of the modes discussed in this section are suitable for providing improved transit service in the Westshore study area, nor would they meet the goals and objectives of the study and address the specific transportation issues in the study area. The scale of the study area, existing and future development patterns, population and employment densities, and number and type of trips all must be considered in determining which modes would be most appropriate for the Westshore Corridor Transportation Project.

Table 5.5 lists each mode with the primary considerations for applicability to the WCTP. Considerations of each mode focused on a number of characteristics and how they apply to the study area:

Travel Type – any considered mode must be able to facilitate longer distance trips that are typical within the Westshore corridor.

Service Frequency – selected mode must provide an appropriate number of trips for travel demand market within the Westshore corridor. Some modes have an expectation of higher frequencies which would be too expensive to operate over a long distance.

Station Spacing – selected mode should have spacing of ½ mile or greater. Too many stations can increase capital costs while reducing travel speed on the operation.

Capital Cost per Mile – transit mode must be able to be implemented cost-effectively within the Westshore corridor

Commuter Amenities (Vehicle) – selected mode must be able to provide on-vehicle amenities to make the trip competitive with automobile travel

Commuter Amenities (Station) – selected mode must provide in-station amenities to make the trip competitive with automobile travel

Eliminated modes are those that would not be suitable for further investigation. Considered Modes are those that would be suitable to serve as the *main transit mode* as part of an alternative. Support modes are those that could be considered to distribute passengers to and from stations/stops of the main transit mode within an alternative.

<u>Eliminated Modes</u>
- BRT - Mixed Traffic
- BRT - Separated
- Streetcar
- Light Rail
- Heavy Rail
- Monorail
- Personal Rapid Transit
- Highway HOV Bus

<u>Considered Modes:</u>
- Limited Stop Bus
- Commuter Bus
- Commuter Rail

<u>Support Modes</u>
- Local Bus

BRT (Mixed Traffic) – a bus rapid transit mode in mixed traffic would operate too slowly to provide an efficient trip over the 35-60 mile distance of the Westshore corridor. Further, BRT vehicles typically do not have the type of commuter amenities to make a long distance trip competitive with the automobile.

BRT (Separated) – a bus rapid transit mode operating in its own right-of-way over part or all of the way could potentially be fast enough to provide an efficient transit trip. However, the capital funding required for right-of-way and the numerous stations to be constructed over a 35-60 mile corridor makes this mode too expensive to be considered.

Streetcar – a streetcar would operate too slowly and have too many local stations to provide an efficient trip over the 35-60 mile distance in the Westshore corridor. There are also too few commuter amenities (on-vehicle and at stations) associated with this mode.

Light Rail – a light rail mode operating in its own right-of-way would be too expensive to implement in a new alignment, but could potentially be operated on Norfolk Southern's Nickel Plate Line. LRT vehicles are not FRA crash-worthy and if constructed to be compatible with GCRTA vehicles would require overhead catenary wire. This means any operation the Nickel Plate line likely would require the purchase of the freight line from Norfolk Southern.

This mode would likely be very expensive to construct to serve a 35 to 60 mile corridor, and therefore is not recommended for further consideration.

Heavy Rail – a heavy rail mode would require its own right-of-way, which means it could be considered for operation on the NS Nickel Plate Line. As a result, a heavy rail mode as new branch of the GCRTA Red Line is possible. There are a number of technical issues, however, that would be very expensive to overcome. A new heavy rail service would have FRA crash-worthiness issues, so the Nickel Plate Line likely would need to be purchased from Norfolk Southern to allow for this operation.

Most importantly, heavy rail by definition includes complete grade-separation, which would be prohibitively expensive given the large number of at-grade crossings in Cleveland, Lakewood, Rocky River, and Bay Village.

Monorail – this mode requires a grade separated elevated structure in order to be fully automated. As a result the capital cost would be prohibitively expensive over the 35-60 miles for the Westshore corridor. Monorail services also typically have very frequent service (6-8 trips per hour) which would be expensive to operate over the long distances in the corridor.

Personal Rapid Transit – this mode becomes unaffordable when considered for regional trips in the Westshore corridor. The capital cost for a grade-separated guideway will increase capital costs while the built in near-instant response of PRT will increase operation and maintenance cost beyond reasonable levels.

Highway HOV Bus – They key reason for eliminating Highway HOV bus is that I-90 currently lacks HOV lanes for operation of this mode and implementing such lanes would increase capital costs to construct this mode beyond reasonable levels.

Table 5.5: Consideration of Transit Modes

Mode	Travel Type	Typical Trip Frequency	Station spacing	Capital Cost/mile	Guideway type	Commuter Amenities (Vehicle)	Commuter Amenities (Stations)	Typical Travel Speed	Carry Forward?
Local Bus	Local	4-6/hr	1/4 mile	Low	Pavement	Low	Low	12 mph	Support Mode
Limited Stop Bus	Local	4-6/hr	1/4 mile	Low	Pavement	Moderate	Low	20 mph	Main Mode
BRT - Mixed Traffic	Local	4-6/hr	1/2 mile	Mid	Pavement	Low	Moderate	15 mph	No
BRT - Separated	Local	4-6/hr	1/2 mile	Mid	Pavement	Low	Moderate	18 mph	No
Streetcar	Local	4-6/hr	1/2 mile	Mid	Rail	Low	Moderate	15 mph	No
Light Rail	Local	4-6/hr	1/2 mile	Mid	Rail	Low	Moderate	18 mph	No
Heavy Rail	Local	6-8/hr	1 mile	High	Rail	Low	Moderate	40 mph	No
Monorail	Local	6-12/hr	1/4 mile	High	Rail	Low	Low	22 mph	No
Personal Rapid Transit	Local	N/A	1/2 mile	High	Rail	Low	Low	22 mph	No
Commuter Bus	Regional	1-2/hr (peak only)	N/A	Low	Pavement	High	Moderate	35 mph	Main Mode
Highway HOV	Regional	1-2/hr (peak only)	N/A	High	Pavement	High	Moderate	40 mph	No
Commuter Rail	Regional	1-2/hr	5-7 miles	Mid to High	Rail	High	High	40 mph	Main Mode

Note1: Red cells indicate characteristics that limit the mode's ability to meet the needs of the corridor and the study goals and objectives.

Note2: The typical travel speed is defined as the speed with dwell time from boarding and alighting passengers

Travel Routes

This section describes the potential travel routes for transit travel within the Westshore corridor. The routes listed here are diverse, including one limited access freeway, two regional arterials, and one rail line. While each functions in a different way (and connects different destinations), they all provide excellent east-west access for travel through the Westshore study area.

Route 1: Lake Road/Clifton Boulevard/Shoreway Alignment

The *Lake Road/Clifton Boulevard/Shoreway* alignment is a regional arterial that connects Sandusky to downtown Cleveland by way of Lorain and Lakewood. The roadway is the northernmost of the four alignments considered, paralleling the shoreline of Lake Erie for much of its distance.

From west to east, this travel route starts in downtown Sandusky and uses Warren Street and Cleveland Road, each designated as US Route 6, to leave the city. At Rye Beach Road in Huron, Cleveland Road interchanges with the OH-2 freeway. Cleveland Road and OH-2 share a 0.5 mile section of roadway before OH-2 diverges to the south and Cleveland Road continues through the eastern portion of Erie County. The route in this area has some roadside development, although the surrounding area is less intensely developed.

In Vermilion, Cleveland Road continues as Lake Road. In downtown Vermilion the roadway crosses the Vermilion River and then a little farther east it crosses into Lorain County. In Lorain County the roadway hugs the shore of Lake Erie through Lorain, Sheffield Lake, and Avon Lake. Because the shore does not run directly east-west, Lake Road actually travels northeast and then southeast as it makes its way through Lorain County. While western Lorain County is fairly undeveloped, the development along Lake Road intensifies as the routing moves east, with commercial buildings in downtown Lorain and suburban residential and commercial development in Sheffield Lake and Avon Lake.

Just east of Lear Road, Lake Road crosses into Cuyahoga County. In western Cuyahoga County Lake Road runs through suburban residential development in Bay Village and Rocky River. The roadway interchanges with the Marion Ramp in Rocky River (where the travel route picks up the OH-2 designation going eastbound) and then crosses the town's namesake river and valley. On the east side of the Rocky River Lake Road becomes Clifton Boulevard and enters the city of Lakewood.

Through Lakewood, Clifton Boulevard is almost exclusively residential, with the exception of commercial property at the corner of Clifton and W. 117th Street. It is also at this intersection that Clifton Boulevard passes into the City of Cleveland. Clifton runs through a mix of commercial and residential development for approximately 1.3 miles before it turns into the Cleveland Memorial Shoreway. The Shoreway is a limited access freeway that runs parallel to the shore of Lake Erie. After 2.5 miles running through the west side of Cleveland, the Shoreway uses the high-level Main Avenue Bridge to cross over the Cuyahoga River. The

service using this route would likely exit at Lakeside Avenue/W. 6th Street or E. 9th Street in order to provide access to downtown Cleveland.

Figure 5.6 shows the general routing for the *Lake Road/Clifton Boulevard/Shoreway* alignment.

Figure 5.6: Lake Road/Clifton Boulevard/Shoreway Alignment

Route 2: Lake Road/Colorado Avenue/Detroit Road Alignment

The *Lake Road/Colorado Avenue/Detroit Road* alignment is a routing that connects Sandusky to downtown Cleveland, similar to the Lake Road travel route described above. The key differences are that this routing is not a single, continuous alignment, but instead is a combination of four different roadways.

From west to east, this travel route starts in downtown Sandusky and uses Warren Street and Cleveland Road, each designated as US Route 6, to leave the city. At Rye Beach Road in Huron, Cleveland Road interchanges with the OH-2 freeway. Cleveland Road and OH-2 share a 0.5 mile section of roadway before OH-2 diverges to the south and Cleveland Road continues through the eastern portion of Erie County. Lake Road in this section has some roadside development, although the surrounding area is less intensely developed. In Vermilion Cleveland Road becomes Lake Road. In downtown Vermilion the roadway crosses the Vermilion River and then a little farther east it crosses into Lorain County.

Seven miles east of Vermilion the alignment turns from Lake Road onto 21st Street (OH-611). The travel route follows 21st Street for 3 miles through the west side of the city of Lorain. At Elyria Avenue, south of downtown Lorain, the street name changes to Henderson Drive but the route remains continuous.

After another 1.2 miles on Henderson Drive, which includes a crossing of the Black River, the route turns onto Colorado Avenue. The designation remains OH-611 as the route travels Colorado Avenue through the east side of Lorain, interchanges with I-90, and then intersects Detroit Road in the city of Avon. In this area the route is actually fairly undeveloped, as suburban development has not reached the area between Lorain and Avon, although that is likely to change in the near future.

In Avon the route turns onto Detroit Road (OH-254), which it follows the rest of the way to downtown Cleveland. The character of development on Detroit Road changes as the route moves east, first in a newer suburban pattern in the cities of Avon and Westlake, and then a denser (older suburban) pattern as the route moves into Rocky River and Lakewood. In Westlake the route passes Columbia Road, which could provide access to GCRTA's Westlake Park-n-Ride lot.

Moving east, In the City of Rocky River Detroit Road interchanges with the Marion Ramp (which provides connections to Clifton Boulevard) and crosses over the steep Rocky River and valley into Lakewood. In Lakewood the route remains Detroit Road, but must make a 90° turn in the west end of Lakewood. The development is dense through Lakewood, with apartment buildings and retail buildings fronting the roadway.

At W. 117th Street the route passes into the city of Cleveland. The development is similar to Lakewood in density, although is older in age. At the intersection of West Boulevard and Detroit Road in Cleveland is the GCRTA West Blvd-Cudell Rapid Station, which provides connections to GCRTA's bus and rail network. Moving farther east the route passes through the west side of Cleveland and then over the Detroit-Superior Bridge into downtown Cleveland. At this point the route becomes Superior Avenue. Access to Public Square is 1/3 of a mile to the east, as Superior Avenue is one of the main roadways through Public Square.

Figure 5.7 shows the general routing for the *Lake Road/Colorado Avenue/Detroit Road* alignment.

Route 3: I-90/OH-2 Alignment

The *I-90/OH-2* alignment is the only route detailed in this section that is primarily a limited access freeway for the length of the travel route. While the route parallels the Lake Erie shoreline, it runs east-west anywhere from one to three miles inland from the Lake.

Starting in Sandusky, the route is designated OH-2. It is a limited access freeway that skirts around the south side of Sandusky. Moving east the freeway provides access (but is not directly routed through) the cities of Huron and Vermilion in eastern Erie County. Development

Figure 5.7: Lake Road/Colorado Avenue/Detroit Road Alignment

Figure 5.8: I-90/OH-2 Alignment

at interchanges is built up with tourist destinations in Sandusky, but is otherwise fairly rural in this portion of the route.

In Lorain County, the OH-2 freeway passes between the cities of Lorain and Elyria. Just east of Middle Ridge Road OH-2 meets up with Interstate 90. Also important in this area is the interchange with OH-57, which provides access to Lorain, Elyria, and Midway Mall.

Further east of this point, development begins to intensify. Interchanges have commercial development around them and suburban housing developments line the route. The I-90/OH-2 route crosses the Black River in eastern Lorain County. Moving east into Cuyahoga County the route has an interchange with Columbia Road, where drivers exit to access GCRTA's Westlake Park and Ride facility.

The OH-2 designation drops at the interchange with Detroit Road in the city of Rocky River. East of this point the route crosses the Rocky River and the final seven miles of the route are through the west side of the city of Cleveland towards downtown. During this stretch the route passes the GCRTA Triskett Rapid Station, which provides access to the Red Line rapid, although there is not direct access to the station from I-90. The route also has an interchange with W. 117th, which provides further potential to access GCRTA's Red Line at their W. 117th Station.

While the route has a continuous I-90 designation from Lorain County eastbound to downtown Cleveland, drivers must pass through a stack interchange with I-71/I-490 southwest of downtown. In order to stay on I-90, drivers must use a flyover ramp to join I-71. At this point, the route crosses the Cuyahoga River on the high-level Innerbelt Bridge. Access to Public Square is provided approximately one mile to the east at the Ontario Street interchange. A multi-phase project to construct a new Innerbelt bridge and rehabilitate the old bridge and adjacent interchanges will complicate driving in this travel route for the next ten to 15 years, with a more straightforward interchange being in place once the Innerbelt project is completed.

Figure 5.8 shows the general routing for the *I-90/OH-2* alignment.

Route 4: Norfolk Southern Alignment

Rail access in the Westshore Corridor is primarily from the *Norfolk Southern Alignment,* which consists of two rail lines owned by Norfolk Southern (NS), the Chicago Line and the Nickel Plate Line. The lines cross twice, once in Vermilion and again at West Boulevard in Cleveland. Between these two points, the Nickel Plate Line is the northern of the two, while the Chicago Line takes a southern route. Figure 5.9 shows the two rail routings that could be used for rail service in the Westshore corridor.

Between Sandusky and Vermilion, rail service would use the Chicago Line. While the Chicago Line does connect population centers in Sandusky, Huron, and Vermilion, much of the area in between is undeveloped land. Freight traffic on the Chicago Line is quite high, as this is the primary rail connection used by NS between Cleveland, Toledo, and Chicago.

In Vermilion, commuter rail trains would switch to the Nickel Plate Line. The Nickel Plate Line has less freight traffic than the Chicago Line, although traffic is still a consideration. Commuter rail service would use the Nickel Plate between Vermilion and West Boulevard on the west side of Cleveland.

The commuter rail route east of West Boulevard depends on the selected eastern terminus in downtown Cleveland. A rail service terminating at Lakefront Station would connect back to the NS Chicago Line and use that alignment to travel the remaining 4 miles into downtown Cleveland. Commuter rail terminating at Tower City would continue east on the Nickel Plate Line and then connect to tracks to access Tower City either from the west via the GCRTA Red Line alignment near W. 25th Street or by crossing the Cuyahoga River Valley and entering Tower City from the east on reinstated tracks.

Further technical details about a commuter rail service are presented at the end of this chapter in the Commuter Rail Issues section.

Figure 5.9: Norfolk Southern Alignment

Terminal Locations

Terminal locations are a vital component for considering an alternative because they contribute significantly to the ridership potential of each alternative. A location near major destinations or employment centers could make the difference between whether a traveler uses transit or drives a private automobile. As this project progresses, selection of a strong terminal at both ends of the Westshore corridor will be vital to the success of the final alternative selected.

This section has two subsections, Potential Western Terminals and Potential Eastern Terminals. The eastern terminals are all locations that would help Westshore travelers access downtown Cleveland and all (except for one) is located within the city of Cleveland itself. The western terminals are more varied and consider the number of potential anchors at the western end of the study area. The consistent theme for all terminals is access. Access to jobs and population is a key consideration for ridership projections, and this is what will most likely eliminate or further consider any of the alternatives listed at the end of this chapter.

Western Terminals

Potential western terminals must offer a mix of both their own attractions and destinations to facilitate some westbound trips, along with easy access so that the local population can use the service to travel eastward to downtown Cleveland.

Three terminal locations have been identified.

Sandusky

Sandusky is important both because of its year-round population and its recreational attractions. It is the largest city in Erie County, which has a county-wide population of 79,551. So there is a potential market for residents to make eastbound trips to Lorain and Cuyahoga counties to access jobs and cultural attractions.

Further, Sandusky would also serve well as an anchor for westbound trips. The location of Cedar Point and a ferry terminal to access Lake Erie Shores and Islands means that tourists from Cuyahoga and Lorain counties travel west in the Westshore corridor to access these areas.

Two locations have been identified for terminals, each dependent on the transit mode selected.

Downtown Sandusky
Alternatives that have a limited stop bus transit mode would be able to directly serve downtown Sandusky.

Sandusky Amtrak Station
Rail alternatives would likely use the existing Sandusky Amtrak station, which is located on the southwest side of the city, approximately 1.25 miles from downtown.

Vermilion

Vermilion is another population center for a western terminal. Because Vermilion is the westernmost community in Lorain County, it could anchor an alternative while keeping operations within Lorain and Cuyahoga counties. Strategically, this may simplify the capital and operations funding structure of a transit improvement.

Vermilion also is strategic because it is where the Nickel Plate Line interchanges with the Chicago Line. Any rail service to the west of Vermilion would have to use the more heavily trafficked Chicago Line to reach Sandusky, which could require capacity improvements. Thus, Vermilion is as far west as the Nickel Plate Line travels through the identified study area.

Lorain

The city of Lorain, with a population of 66,849, is the largest municipality in Lorain County. The city would serve as a good western anchor both for commuters bound for Cleveland as well as reverse commuters who could use a transit alternative to access Lorain for work and recreation.

All alternatives terminating in Lorain would do so at the Black River Landing site. This site is set up to facilitate park and ride, as well as accommodate either a rail alternative with a station and platforms, or bus alternative with room to install bus bays.

Eastern Terminals

As noted in the introduction to this section, potential eastern terminals are a bit more nuanced, as there are more of them than there are western terminals, and they are mostly concentrated in or adjacent to downtown Cleveland. All potential transit improvements will be graded by how successfully they connect potential riders to desired destinations in downtown Cleveland. Therefore, it is imperative to connect people using the improvement to the most destinations and opportunities as possible.

The nuance of the choices listed here is in how well they connect to destinations. In reality, there are two ways for riders to connect to destinations – by walking or by connecting to another transit service to access their final destination. Each of these alternative eastern terminal sites has tradeoffs relative to their cost and convenience.

Public Square/Stephanie Tubbs Jones Transit Center

An eastern terminus at Public Square would be served by all roadway based transit alternatives. The location is the center of downtown Cleveland, with the three tallest buildings in the city (Key Tower, 200 Public Square, and Terminal Tower) each situated on the square. As a result there are many downtown jobs within walking distance of this location.

Public Square also is strategic because it is the meeting point for many of GCRTA's bus routes, including the Healthline, and its light rail and heavy rail network, which has Tower City as its

downtown station. Therefore, any proposed transit service terminating at Public Square would allow passengers to quickly and conveniently access other parts of Cleveland through the GCRTA bus and rail network.

Connections to GCRTA could also be furnished by extending the alternative to the Stephanie Tubbs Jones Transit Center, located at E. 21st Street and Prospect Avenue across from the CSU Wolstein Center. GCRTA terminates several west side routes at the transit center, so this would be a logical extension and would provide more commuters with more transfer opportunities. An extension to this area would also provide a one-seat ride for CSU students, faculty, staff, and visitors.

Tower City Center

An eastern terminus at Tower City Center refers to the rail tracks that run underneath the tower. Therefore, only rail alternatives would be able to use this site as a terminus. Tower City is adjacent to Public Square, so access to downtown jobs would be similar to what was stated for the Public Square terminus above. Other potential access from this site includes walkways to the Federal Courthouse, Quicken Loans Arena/Progressive Field, and a connection to the temporary Cleveland Casino in the former Higbee Building.

One distinct difference with a Tower City location (as opposed to Public Square) is the access to GCRTA rail. A transit alternative directly serving Tower City would allow commuters to simply walk across the platform to access GCRTA Red, Blue, and Green rail lines. There is also the nostalgic factor of using Tower City for commuter rail, as intercity passenger services was one of the original uses of the site when it was completed in 1930.

Less convenient with this site would be transfers to GCRTA's bus network (including downtown trolley circulators), as debarking passengers would have to walk through Tower City to reach those bus connections.

Lakefront Station

A Lakefront Station terminus could actually be two different sites, both in the same vicinity. It could first refer to the small Amtrak station that sits between the Cleveland Memorial Shoreway and the Norfolk Southern Railroad tracks. It could also refer to the planned Intermodal Hub that has been proposed at the end of Mall C in downtown Cleveland. A regional planning process conducted in the late 1990s identified the Intermodal Hub site at the Lakefront as a good location for a downtown station for intercity and commuter rail, largely because of the regional attractions nearby, and because it most easily facilitated commuter rail connections to downtown on multiple alignments coming in from east, west and south of the city.

The location benefits of this site are two-fold. First, it is adjacent to GCRTA's Waterfront Line, which will allow distribution of passengers to Tower City and all other destinations in that area of downtown. Second, it is within walking distance of a number of cultural and recreational

destinations, including Cleveland Browns Stadium, Great Lakes Science Center, the Rock and Roll Hall of Fame, and the Cuyahoga County Justice Center.

GCRTA connections to the existing Amtrak station are non-existent because the existing intercity train service stops overnight in Cleveland, and there is little demand for passengers to connect to/from the station. The Intermodal Hub idea would be for a new station to be constructed at the same site with a number of multimodal transportation options. Along with platforms for intercity train service, the Intermodal Hub could also include bicycle and pedestrian connections to local destinations, bays for GCRTA buses, and platforms for the Waterfront Line.

GCRTA Red Line

Rather than serving downtown Cleveland directly, alternatives could instead connect to the GCRTA Red Line on the west side of Cleveland. This option is a consideration because capital costs may be too high for an alternative to connect directly to downtown Cleveland. The benefit of terminating an alternative at a Red Line station is that it would allow passengers to directly access GCRTA's rail network for trips to Tower City and University Circle, something that is not as easily accomplished from other proposed terminals listed here.

There are three potential stations for terminating an alternative. Each of these is located on the west side of Cleveland, adjacent to one of the four travel routes under consideration (Clifton, Detroit, Nickel Plate, and I-90).

Triskett Station

Triskett Rapid Transit Station is located on the border between Lakewood and Cleveland, with the station house located at eye level to motorist on the adjacent elevated portion of I-90. Therefore, this station would be best suited for commuter bus alternatives using the I-90/OH-2 route.

The existing roadway network is not set up to provide easy access to the station for commuters. As a result a roadway based alternative terminating at Triskett would exit the interstate at Warren Road and then travel east on South Marginal Drive before turning south on West 140th Street and east on Triskett Road to reach the station. The off-highway portion of this trip could be more than five minutes. This station may also be a candidate to construct a new bus only ramp to provide direct access to/from the station, although more detailed analysis would be required to determine the feasibility and potential cost of such a ramp.

West 117th Station

The West 117th Rapid Transit Station is located on the border between Lakewood and Cleveland, approximately ½ mile north of the West 117th interchange with I-90. This station could be a terminal for commuter bus operating on I-90/OH-2 and limited stop bus operating on Clifton Boulevard or Detroit Avenue. The West 117th Station offers relatively easy connections to I-90, Detroit Road or Clifton/OH-2, though the trip from I-90 could take up to five minutes.

West 117th Station is among the most recently reconstructed on the Red Line, having reopened after reconstruction in 2008. In addition, its location in the southeast corner of the West117th-Madison Avenue intersection allows for easy access for northbound buses coming from I-90.

West Boulevard-Cudell Station

The West Boulevard-Cudell Rapid Transit Station is located at the corner of Detroit Avenue and West Boulevard in the city of Cleveland. The station would be a natural interceptor for limited stop bus service operating on Detroit Avenue or for a commuter rail alternative operating on the Nickel Plate Line. Services terminating at the station would allow commuters to transfer to Red Line trains for a short 12 minute trip downtown. Commuters also could opt for two existing GCRTA bus routes that serve the west side of Cleveland and provide another connection to downtown.

GCRTA Westlake Park-n-Ride Lot

The Westlake Park-n-Ride lot is an eastern terminal option for bus-based alternatives operating on the I-90/OH-2 alignment or the Detroit Road alignment. The lot provides connections to downtown Cleveland via GCRTA's #246 commuter bus route along with connections to western Cuyahoga County suburbs via GCRTA's local #46 route. This lot was expanded in 2007 to more than 500 spaces, with a further expansion planned for 2011 that would bring the lot to more than 750 spaces.

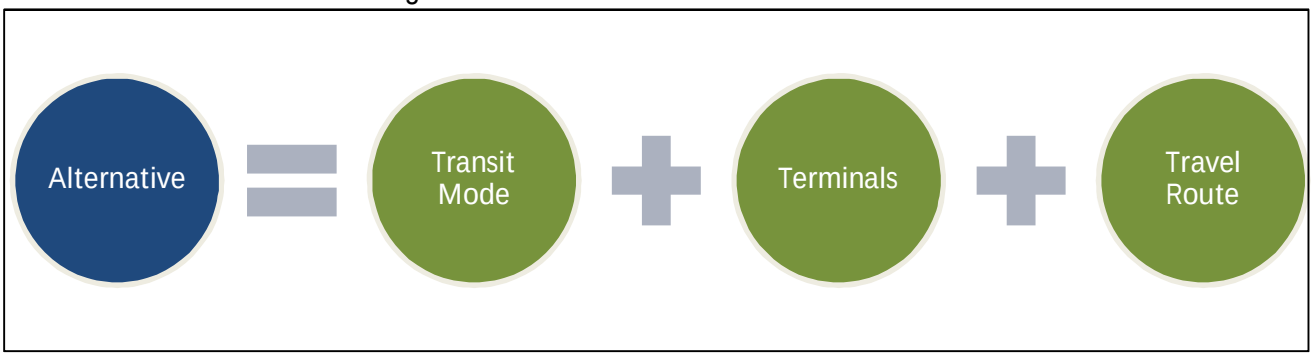
Initial Screening of Alternatives

This section describes the alternatives considered and the methodology used to conduct the initial screening of these alternatives.

Alternatives Considered

Alternatives considered for this initial screening were comprised of the three main components detailed in the previous portion of this chapter. Specifically, an alternative consists of a transit mode, terminal locations, and a travel routes. This equation is illustrated in Figure 5.10.

Figure 5.10: Alternatives Considered



In all, 32 alternatives were considered for this initial screening, shown in Table 5.6. The alternatives are also shown in Figures 5.11 through 5.13 for Limited Stop Bus, Commuter Bus, and Commuter Rail alternatives, respectively.

Screening Methodology

Alternatives were screened by quantifying the characteristics of each alternative as they relate to the goals and objectives of the study. Points were assigned for each characteristic and can be positive or negative depending on the characteristics. The largest number of points was available in under the transportation improvement, accounting for approximately 2/3 of the total points available.

Goal 1: Transportation Improvement (Up to 44 points)

- Commuter amenities (Up to 3 points)
- Speed of trip (Up to 5 points)
- Park and Ride potential (Up to 5 points)
- Diversity of Transit Options (Up to 2 points)
- Zero Vehicle Households (Up to 5 points)
- Minority Households (Up to 3 points)
- Low Income Households (Up to 3 points)
- Access to downtown Cleveland (Up to 5 points)
- Access to downtown Lakewood (Up to 2 points)
- Access to Rocky River (Up to 1 point)
- Access to Bay Village (Up to 1 point)
- Access to downtown Lorain (Up to 3 points)
- Access to downtown Vermilion (Up to 1 point)
- Access to downtown Sandusky (Up to 3 points)
- Reverse Commute Potential (Up to 2 points)

Goal 2: Transit Oriented Land Use (Up to 7 points)

- TOD Potential by Mode (Up to 5 points)
- TOD Potential by Municipality (Up to 2 points per municipality)

Goal 3: Cost Effectiveness (Up to 10 points)

- Population Density (Up to 5 points)
- Employment Density (Up to 5 points)
- Expected Capital Cost (Up to -12 points)

Goal 4: Fiscal Responsibility (Up to 0 points)

- Right-of-Way Costs (Up to -10 points)
- Operating Costs (Up to -2 points)
- Cross-jurisdictional partnership (Up to -2 points)

Goal 5: Environmental Impact (Up to 5 points)

- Environmental Impact (Up to 5 points)

Table 5.6: Initial Alternatives Considered

Corridor Number	Western Terminal	Eastern Terminal	Travel	Alignment	Mode
1	Downtown Sandusky	Lakefront Station*	Local	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus
2	Downtown Sandusky	Lakefront Station*	Local	Lake Road/Clifton Blvd/Shoreway	Limited Stop Bus
3	Downtown Sandusky	Public Square/STJ Transit Center	Local	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus
4	Downtown Sandusky	Public Square/STJ Transit Center	Local	Lake Road/Clifton Blvd/Shoreway	Limited Stop Bus
5	Lorain (Black River Landing)	Public Square/STJ Transit Center	Local	Lake Road/Clifton Blvd/Shoreway	Limited Stop Bus
6	Downtown Sandusky	W. 117th Rapid	Local	Lake Road/Clifton Blvd/Shoreway	Limited Stop Bus
7	Downtown Sandusky	West Blvd-Cudell Rapid	Local	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus
8	Downtown Sandusky	Westlake Park-n-Ride	Local	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus
9	Lorain (Black River Landing)	Westlake Park-n-Ride	Local	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus
10	Downtown Sandusky	Public Square/STJ Transit Center	Regional	OH-2/I-90/W. 25th/Superior	Commuter Bus
11	Lorain (Black River Landing)	Public Square/STJ Transit Center	Regional	OH-2/I-90/W. 25th/Superior	Commuter Bus
12	Downtown Sandusky	Lakefront Station*	Regional	OH-2/I-90/W. 117th/Clifton/Shoreway	Commuter Bus
13	Lorain (Black River Landing)	Lakefront Station*	Regional	OH-2/I-90/W. 117th/Clifton/Shoreway	Commuter Bus
14	Downtown Sandusky	Triskett Rapid	Regional	OH-2/I-90/Warren/Triskett	Commuter Bus
15	Downtown Sandusky	W. 117th Rapid	Regional	OH-2/I-90/W. 117th	Commuter Bus
16	Downtown Sandusky	West Blvd-Cudell Rapid	Regional	OH-2/I-90/W. 117th/Detroit	Commuter Bus
17	Downtown Sandusky	Westlake Park-n-Ride	Regional	OH-2/I-90	Commuter Bus
18	Lorain (Black River Landing)	Westlake Park-n-Ride	Regional	OH-2/I-90	Commuter Bus
19	Lorain (Black River Landing)	Triskett Rapid	Regional	OH-2/I-90/Warren/Triskett	Commuter Bus
20	Lorain (Black River Landing)	W. 117th Rapid	Regional	OH-2/I-90/W. 117th	Commuter Bus
21	Lorain (Black River Landing)	West Blvd-Cudell Rapid	Regional	OH-2/I-90/W. 117th/Detroit	Commuter Bus
22	Vermilion	West Blvd-Cudell Rapid	Regional	Nickel Plate Line	Commuter Bus
23	Lorain (Black River Landing)	West Blvd-Cudell Rapid	Regional	Nickel Plate Line	Commuter Bus
24	Sandusky Amtrak	Lakefront Station*	Regional	Nickel Plate Line	Commuter Rail
25	Vermilion	Lakefront Station*	Regional	Nickel Plate Line	Commuter Rail
26	Lorain (Black River Landing)	Lakefront Station*	Regional	Nickel Plate Line	Commuter Rail
27	Sandusky Amtrak	Tower City Center	Regional	Nickel Plate Line	Commuter Rail
28	Vermilion	Tower City Center	Regional	Nickel Plate Line	Commuter Rail
29	Lorain (Black River Landing)	Tower City Center	Regional	Nickel Plate Line	Commuter Rail
30	Sandusky Amtrak	West Blvd-Cudell Rapid	Regional	Nickel Plate Line	Commuter Rail
31	Vermilion	West Blvd-Cudell Rapid	Regional	Nickel Plate Line	Commuter Rail
32	Lorain (Black River Landing)	West Blvd-Cudell Rapid	Regional	Nickel Plate Line	Commuter Rail

Figure 5.11: Limited Stop Bus Alternatives

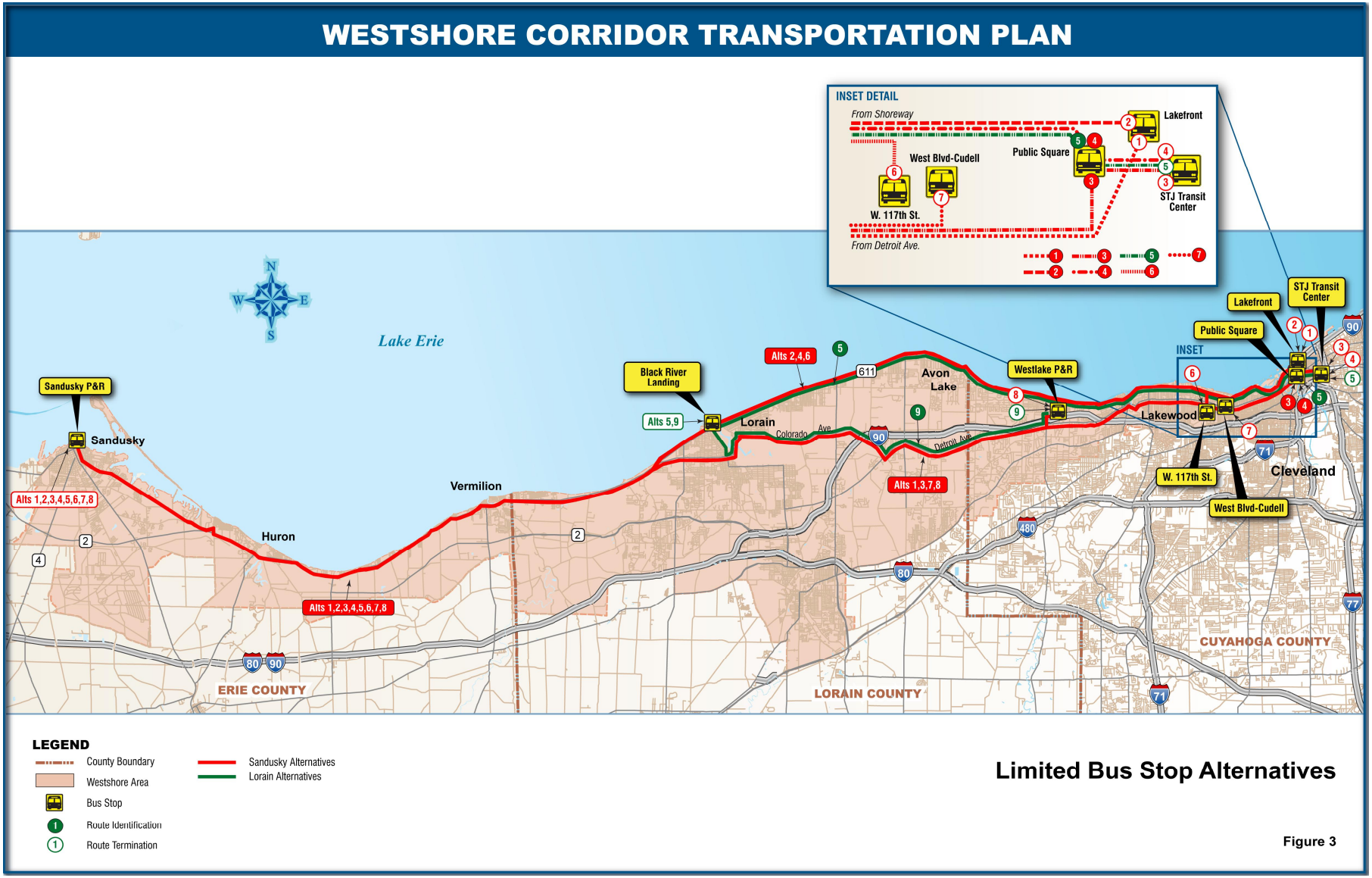


Figure 5.12: Commuter Bus Alternatives

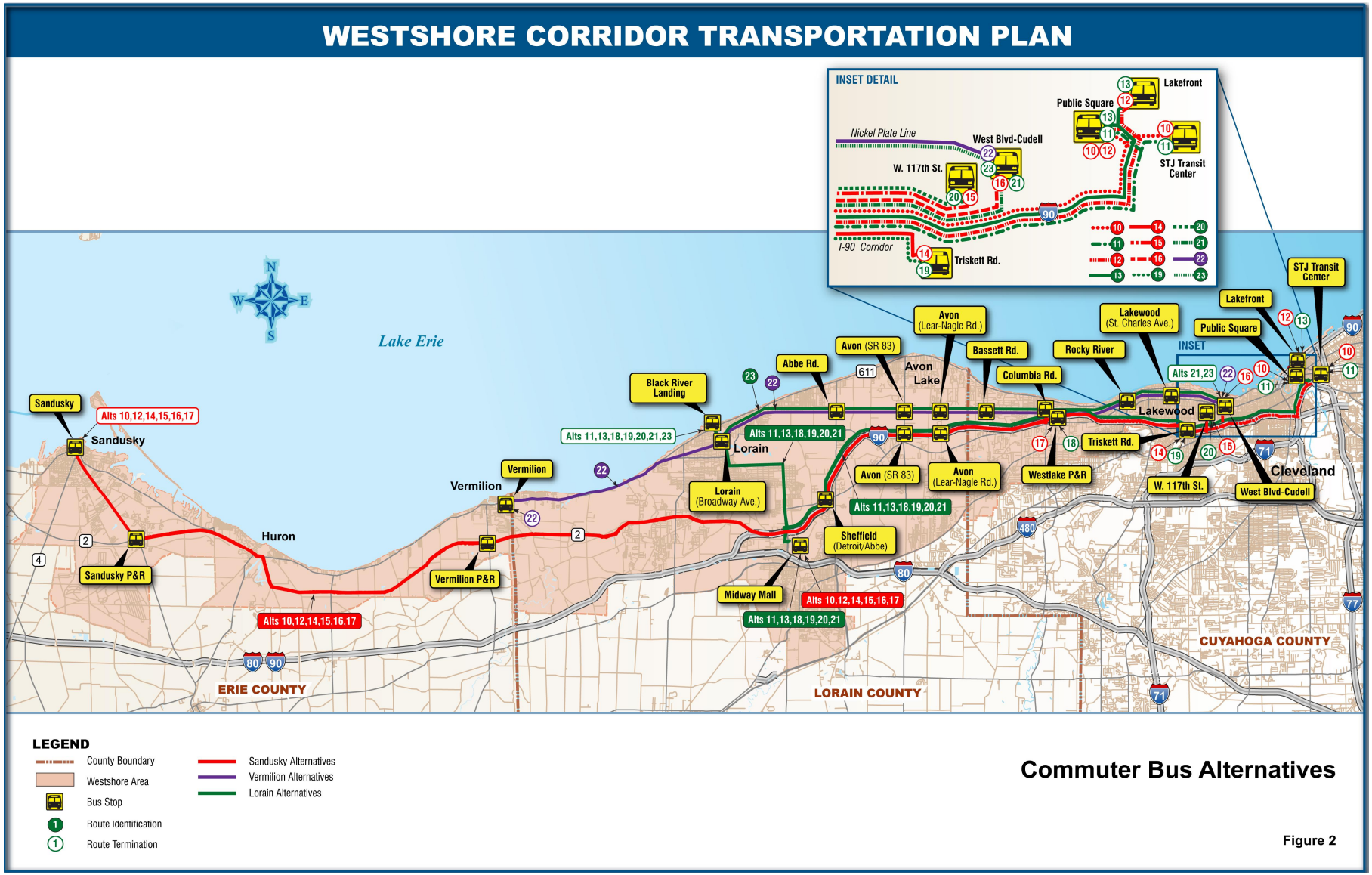
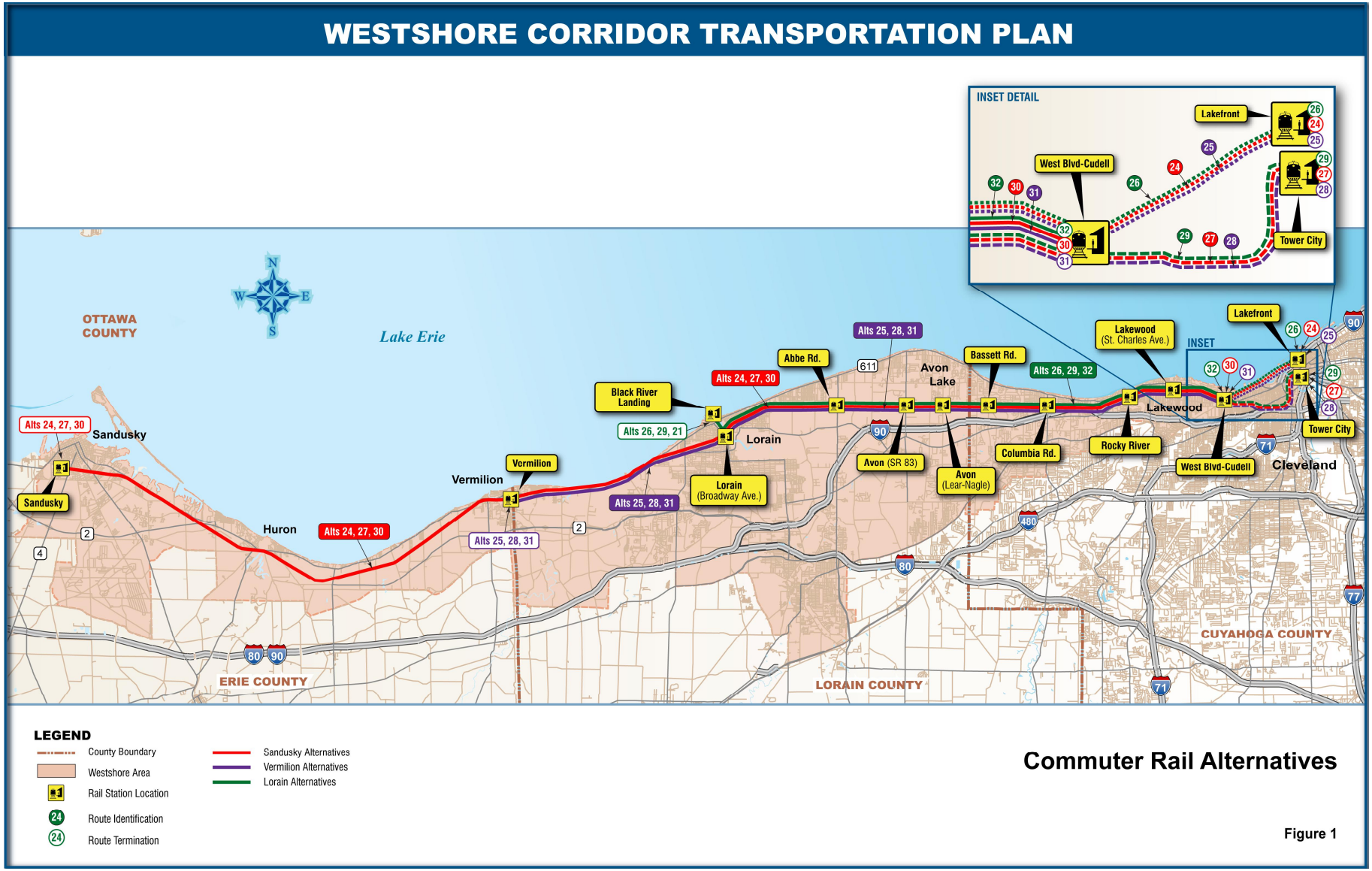


Figure 5.13: Commuter Rail Alternatives



Goal 1: Transportation Improvement

Commuter amenities (Up to 3 points)

The more commuter amenities provided by the transit mode, the more likely it will be considered by commuters for inter-county trips. Commuter Rail alternatives received 5 points, Commuter Bus received 3 points, and Limited Stop Bus received zero points.

Speed of trip (Up to 5 points)

The faster the travel speed, the more likely the transit mode will be considered for longer distance, inter-county trips. Commuter rail, with an average travel speed of 40 mph, is the fastest mode considered, assuming that track connections can be developed that will minimize delays. Commuter bus potentially could operate at an average travel speed of up to 35 mph, but will be hindered by traffic on I-90 near downtown Cleveland. Limited Stop Bus is by far the slowest mode considered, with travel speeds of 20 mph along its route. Commuter Rail alternatives received 5 points, Commuter Bus received 2 points, and Limited Stop Bus received 0 points.

Park and Ride potential (Up to 5 points)

The better the park and ride options, the more likely that commuters would use the transit mode to travel to downtown Cleveland. The I-90/OH-2 route received 5 points for excellent opportunities for development of park and ride services. The Nickel Plate travel route received 3 points, because some locations, such as Lorain, will offer smaller and less convenient park-and-ride options. The Lake or Detroit Road routings, which offer very poor prospects for park-and-ride lot development due to the existing development pattern in those routings, received one point each.

Diversity of Transit Options (Up to 2 points)

A new transit mode would likely draw more travel interest than a transit mode that is already offered within the alignment. Commuter Rail received 2 points as it is a mode that does not now operate in the Westshore corridor or the region. Commuter Bus, a mode that is in operation in a portion of the Westshore corridor, received 1 point, and Limited Stop Bus service, which is similar to the local bus services operating in several parts of the Westshore corridor, received zero points.

Zero Vehicle Households (Up to 5 points)

Measuring the percentage of households that lack access to a vehicle in an area served by transit is an important consideration for how well an alternative can attract low-income riders to the mode. Each alternative was evaluated based on the number of zero vehicle households within ½-mile of station locations, since this is the farthest someone could be expected to walk to access the station.

Alternatives were ranked 1 through 32, then assigned points based on their ranking. The top five alternatives received five points; the next five received four points, and so on. The last seven alternatives that serve the fewest zero car households received zero points in this category.

Minority Households (Up to 3 points)

Measuring the percentage of minority households within ½-mile of a potential station location is an important consideration for how well a transit alternative is available to all sectors of the population.

Alternatives were ranked 1 through32 then assigned points based on their ranking in terms of the percentage of minority households they serve. The top seven alternatives received three points; the next seven received two points, and so on. The eleven alternatives with the lowest percentage of minority households received zero points.

Low Income Households (Up to 3 points)

Measuring the percentage of low income households is important both for low-income riders as well as ensuring this transit alternative is open to all members of the population within the study area. Each alternative was measured for low income households within ½-mile of potential station locations.

Alternatives were ranked 1 through32 then assigned points based on their ranking. The top seven alternatives received three points; the next seven received two points, and so on. The eleven alternatives that served the lowest percentage of low income households received zero points.

Access to downtown Cleveland (Up to 5 points)

Downtown Cleveland is by far the most important location for each alternative to serve. For the purposes of this study, the center of downtown was considered to be Public Square. Therefore, alternatives ending at Tower City or Public Square were assigned 5 points because they effectively serve the "center" of downtown Cleveland. Lakefront Station is adjacent to downtown, but is a long walk to many jobs, and transit connectivity will need to be improved to support commuter services that terminate in that area. Connections to Lakefront Station were given 3 points. All other alternatives end at GCRTA facilities (either a Red Line station or Park-n-Ride lot). While GCRTA will then provide a trip to downtown Cleveland, these alternatives were assigned zero points to account for the need to transfer that is likely to discourage many potential users of the service.

Access to downtown Lakewood (Up to 2 points)

Lakewood is the second largest Cuyahoga County municipality within the Westshore study area, and providing access to its downtown will be important both for potential riders and access to jobs. Points were assigned based on how well each alternative would serve Lakewood's

downtown. The Detroit Road and Nickel Plate Line travel routes were each given two points for Lakewood access. The Lake Road and I-90/OH-2 travel routes were each assigned zero points, as they would not serve downtown Lakewood directly.

Access to Rocky River (Up to 1 point)

Access to Rocky River is another important consideration for each alternative. Alternatives that use the Nickel Plate Line and Detroit Road were each assigned 1 point, as they provide access to Rocky River's commercial district. Alternatives operating on Lake Road and I-90/OH-2 were assigned zero points.

Access to Bay Village (Up to 1 point)

Access to Bay Village was also considered for each alternative. The center of Bay Village is along Dover Center Road. Only the Nickel Plate Line is adjacent to this area. Therefore, alternatives using the Nickel Plate Line were assigned 1 point. Alternatives using Lake Road, Detroit Road, and I-90/OH-2 were each assigned zero points.

Access to downtown Lorain (Up to 3 points)

Lorain is the second largest city by population within the study area, and access to downtown Lorain earns an alternative the second highest number of potential points behind downtown Cleveland. Alternatives using the Lake Road travel route were assigned 3 points because the alignment provides the access to Broadway in downtown Lorain. In addition, alternatives terminating in Lorain were also assigned 3 points because it was assumed any bus or rail based alternative would terminate at Black River Landing, which also provides excellent access to Broadway.

Rail alternatives continuing to the west were assumed to not use Black River Landing, but instead stay on the main Nickel Plate Line. These alternatives would provide good access (but not as good as Black River Landing), and thus were assigned 1 point. Alternatives using Colorado Avenue or I-90/OH-2 were assigned zero points, as neither of these alternatives provides easy walking access to downtown Lorain.

Access to downtown Vermilion (Up to 1 point)

Access to downtown Vermilion is an important consideration for transit alternatives because of the jobs and people located in this area. Alternatives that would provide access, including those on the Nickel Plate Line and those using Lake Road, were given 1 point. Alternatives that use OH-2, as well as alternatives that are not proposed to go as far west as Vermilion, were awarded zero points.

Access to downtown Sandusky (Up to 3 points)

While not every alternative is proposed to serve downtown Sandusky, those that do will provide inter-county transit access to this important population and job center. Alternatives

proposed to use Lake Road can provide direct access to downtown Sandusky, and these were given 3 points. Alternatives using the Nickel Plate Line are assumed to terminate at the existing Sandusky Amtrak Station, which is approximately 1.25 miles from downtown Sandusky and would necessitate a transfer to local transit service. Nickel Plate alternatives were given 1 point. Alternatives operating along the OH-2 travel route would likely terminate at a park and ride lot located more than 2 miles from downtown Sandusky, and as a result received zero points under this scoring category.

Reverse Commute Potential (Up to 2 points)
While access to downtown Cleveland (eastbound in the AM, westbound in the PM) is the primary focus of these transit alternatives, there is also the need to consider reverse commute potential. Not all transit modes are well suited to provide reverse commute service. A startup commuter rail service would likely not be able to provide reverse commute trips because of equipment limitations, and as a result is awarded zero points under this category.

Commuter bus would likely be able to provide some reverse commute trips since bus vehicles are easier and more flexible to turn around and make a reverse commute trip. The drawback to commuter bus is that access would mostly be provided at park and ride locations along the I-90/OH-2 freeway. As a result, commuter bus is given 1 point for reverse commute potential.

Limited stop bus has the best potential for reverse commute. Buses would be able to very quickly turn around and serve the reverse market. More importantly, limited stop bus provides direct access to cities and neighborhoods where residents may want to make the reverse commute trip to Lorain or Erie counties.

<u>Goal 2: Transit Oriented Land Use</u>

TOD Potential by Mode (Up to 5 points)

Some transit modes generate potential for transit oriented development more, or differently, than others. Rail typically promotes TOD better than bus modes. Commuter rail received 5 points under this category, while Limited Stop Bus and Commuter Bus each received zero points.

TOD Potential by Municipality (Up to 2 points per municipality)

Having a statute in place allowing transit oriented, mixed use development is vital to encouraging dense, transit friendly development adjacent to potential transit station locations. These ratings were only applied to commuter rail alternatives because, as noted in the previous measure, of the alternatives under consideration only commuter rail is considered to be able to significantly affect development patterns.

- TOD in Lakewood – up to 2 points
- TOD in Rocky River – up to 1 point
- TOD in Bay Village – up to 1 point

- TOD in Lorain – up to 2 points
- TOD in Vermilion – up to 1 point
- TOD in Sandusky – up to 2 points

Goal 3: Cost Effectiveness

Population Density (Up to 5 points)

Population density is an important component when rating alternatives for cost effectiveness because it approximates potential ridership. Each alternative was assessed based on the potential population density within its commute-shed based on its mode and routing. For example, each commuter bus alternative considered potential station locations and assessed population density within a 3-mile commute-shed of the station. A limited stop bus alternative considered all population within ¼-mile of the alignment since stops will be much more frequent, but will not draw from as large an area as commuter rail.

Alternatives were ranked 1 through 32, and then assigned points based on their ranking. The top five alternatives received five points; the next five received four points, and so on. The last seven alternatives with the lowest population density within the commute shed received zero points.

Employment Density (Up to 5 points)

Employment density is the best measure of how well an alternative provides connections to jobs. Each alternative was assessed based on its mode and routing, similar to the measure for population density. The key difference is in the distance from each station the employment was considered. For all alternatives, employment was considered only within ¼-mile of the station location, since this is the farthest employees will likely walk to reach their employment destination when considering whether to drive or take transit to their jobs.

Alternatives were ranked 1 through 32 then assigned points based on their ranking. The top five alternatives received five points; the next five received four points, and so on. The last seven alternatives, those that had the lowest employment density, received zero points.

Expected Capital Cost (Up to -12 points)
Capital cost is important to cost effectiveness, since an alternative with potential for high ridership may be eliminated due to excessive costs. While population density is rated as a positive, costs were rated as a negative since they take away from the effectiveness of the alternative.

Capital costs were approached as a "menu," with different alternatives scoring cumulatively based on their alignment and potential improvement. For example, commuter rail operating between Vermilion and Sandusky was rated as a – (negative) 6 because it would require the addition of another track the entire distance between the two cities. Bus alternatives for the most part were rated as zero across the board due to the large difference between rail and bus

capital costs. The one exception to this is the commuter bus alternative on the Nickel Plate Line, which has a capital cost associated with removing the rail and installing stations.

- Sandusky to Vermilion Rail = -6 pts
- Vermilion to West Blvd Rail = -2 pts
- West Blvd to Tower City Rail = -4 pts
- West Blvd to Lakefront Station = -4 pts
- Pave over the Nickel Plate Line = -4 pts
- Connection from Nickel Plate to Black River Landing = -2 pts
- Lake Road route = 0 pt
- Detroit route = 0 pt
- I-90/OH-2 route = 0 pts

Goal 4: Fiscal Responsibility

Right-of-Way Costs (Up to -10 points)

Right-of-way acquisition is another cost that can be detrimental to the cost effectiveness rating of an alternative. These costs were approached the same way as capital costs, with a menu of negative ratings and each alternative cumulatively receiving a score based on the alignment and terminal involved.

- Vermilion to Sandusky Rail = -5 pts
- Vermilion to West Blvd Rail = -2
- West Blvd to Tower City Rail = -2 pts
- West Blvd to Lakefront Station Rail = -3 pts
- Lake Road route = 0 pt
- Detroit route = 0 pt
- I-90/OH-2 route = 0 pts

Operating Costs (Up to -2 points)
Operation and maintenance costs can also affect cost effectiveness, although potentially less so than capital costs. Commuter rail, as a new mode in the region and one that is typically more costly to operate than bus service on a per-hour and mile of service basis, was assigned a rating of -2 points. Bus-based alternatives were assigned a rating of zero points since bus is already operated within the region and because of its lower operation cost relative to rail.

Cross-jurisdictional partnership (Up to -2 points)
Because the NOACA region includes both Cuyahoga and Lorain counties, a transit alternative constructed and operated in just these two counties is considerably easier to manage than one that crosses into Erie County. Therefore, alternatives that would require a cross-jurisdictional partnership by operating in Erie County were deducted 2 points.

Goal 5: Environmental Impact

Environmental Impact (Up to 5 points)
All of the alternatives considered are to operate in already existing alignments, so there is little concern for negative environmental impact. Instead, alternatives were rated on their positive environmental impact, that is, on the number of auto trips each alternative is likely to replace. While the expected number of trips is unknown at this phase of the study, it is logical to think that commuter rail would replace the largest number of trips. Therefore, commuter rail alternatives were awarded 5 points, commuter bus was awarded 2 points, and limited stop bus was awarded 1 point.

Scoring of Alternatives

The final score and rank of the alternatives is shown in Table 5.7. A detailed scoring matrix showing each goal and scoring category is shown in Appendix A5.

The results contain a number of important points about the alternatives.

- Commuter rail and commuter bus alternatives take the top 16 slots in the matrix, while the first limited stop bus alternative is ranked 17th overall. This indicates that limited stop bus operating in the Westshore Corridor will not likely meet the goals and objectives identified for this study.

- The top two alternatives are commuter rail from Lorain to Tower City, but slots 3, 4, 5, 7, 8, 9 and 10 are commuter bus alternatives. This indicates that commuter rail could potentially be a viable solution, but only in the right circumstances with a balance between capital costs, operating costs, and markets served.

- Five of the first six alternatives have a western terminus in Lorain, while alternatives ranked 7-10 have a terminus in Sandusky. This indicates that service between Lorain and Sandusky may potentially not be cost effective enough or provide other benefits to justify a transit alternative extending beyond Lorain.

- There is little stratification between the top twelve alternatives, which are only separated by eight points. Thus, while the scoring matrix does its job in ranking the alternatives, the nuance between the alternatives is small enough that further testing is warranted.

Table 5.7: Initial Alternatives Sorted by Score

Corridor Number	Western Terminal	Eastern Terminal	Alignment	Mode	Transfer to Red Line	Total Score	Rank
29	Lorain (Black River Landing)	Tower City Center	Nickel Plate Line	Commuter Rail		43	1
31	Vermilion	West Blvd-Cudell Rapid	Nickel Plate Line	Commuter Rail	Y	40	2
11	Lorain (Black River Landing)	Public Square/STJ Transit Center	OH-2/I-90/W. 25th/Superior	Commuter Bus		38	3
13	Lorain (Black River Landing)	Lakefront Station*	OH-2/I-90/W. 117th/Clifton/Shoreway	Commuter Bus		38	4
18	Lorain (Black River Landing)	Westlake Park-n-Ride	OH-2/I-90	Commuter Bus		38	5
32	Lorain (Black River Landing)	West Blvd-Cudell Rapid	Nickel Plate Line	Commuter Rail	Y	38	6
12	Downtown Sandusky	Lakefront Station*	OH-2/I-90/W. 117th/Clifton/Shoreway	Commuter Bus		37	7
15	Downtown Sandusky	W. 117th Rapid	OH-2/I-90/W. 117th	Commuter Bus	Y	36	8
17	Downtown Sandusky	Westlake Park-n-Ride	OH-2/I-90	Commuter Bus		36	9
10	Downtown Sandusky	Public Square/STJ Transit Center	OH-2/I-90/W. 25th/Superior	Commuter Bus		35	10
26	Lorain (Black River Landing)	Lakefront Station*	Nickel Plate Line	Commuter Rail		34	11
14	Downtown Sandusky	Triskett Rapid	OH-2/I-90/Warren/Triskett	Commuter Bus	Y	33	12
16	Downtown Sandusky	West Blvd-Cudell Rapid	OH-2/I-90/W. 117th/Detroit	Commuter Bus	Y	32	13
25	Vermilion	Lakefront Station*	Nickel Plate Line	Commuter Rail		32	14
28	Vermilion	Tower City Center	Nickel Plate Line	Commuter Rail		31	15
30	Sandusky Amtrak	West Blvd-Cudell Rapid	Nickel Plate Line	Commuter Rail	Y	29	16
3	Downtown Sandusky	Public Square/STJ Transit Center	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus		26	17
5	Lorain (Black River Landing)	Public Square/STJ Transit Center	Lake Road/Clifton Blvd/Shoreway	Limited Stop Bus		26	18
21	Lorain (Black River Landing)	West Blvd-Cudell Rapid	OH-2/I-90/W. 117th/Detroit	Commuter Bus	Y	25	19
20	Lorain (Black River Landing)	W. 117th Rapid	OH-2/I-90/W. 117th	Commuter Bus	Y	23	20
22	Vermilion	West Blvd-Cudell Rapid	Nickel Plate Line	Commuter Bus	Y	21	21
24	Sandusky Amtrak	Lakefront Station*	Nickel Plate Line	Commuter Rail		21	22
1	Downtown Sandusky	Lakefront Station*	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus		20	23
4	Downtown Sandusky	Public Square/STJ Transit Center	Lake Road/Clifton Blvd/Shoreway	Limited Stop Bus		20	24
19	Lorain (Black River Landing)	Triskett Rapid	OH-2/I-90/Warren/Triskett	Commuter Bus	Y	20	25
27	Sandusky Amtrak	Tower City Center	Nickel Plate Line	Commuter Rail		18	26
23	Lorain (Black River Landing)	West Blvd-Cudell Rapid	Nickel Plate Line	Commuter Bus	Y	17	27
2	Downtown Sandusky	Lakefront Station*	Lake Road/Clifton Blvd/Shoreway	Limited Stop Bus		14	28
9	Lorain (Black River Landing)	Westlake Park-n-Ride	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus		11	29
8	Downtown Sandusky	Westlake Park-n-Ride	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus		10	30
6	Downtown Sandusky	W. 117th Rapid	Lake Road/Clifton Blvd/Shoreway	Limited Stop Bus	Y	8	31
7	Downtown Sandusky	West Blvd-Cudell Rapid	Lake Road/21st Street/Colorado Ave/Detroit Road	Limited Stop Bus	Y	8	32

Alternatives to Carry Forward

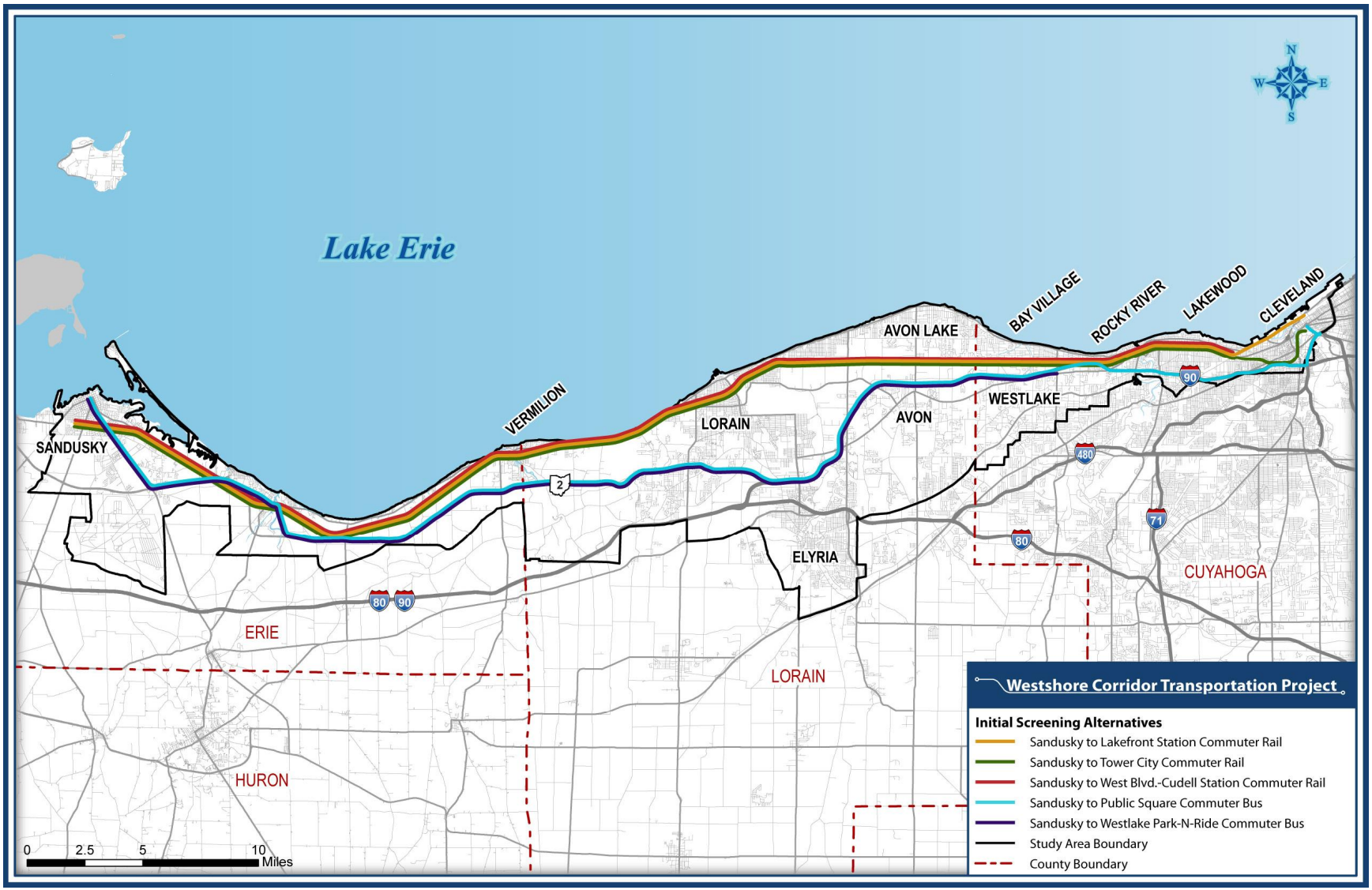
In a typical initial screening a small number of alternatives are identified as providing the best possible transit solution and these are carried forward into a more detailed screening with station ridership and capital cost estimates. The screening for the WCTP is unusual in how closely each of the alternatives scored at the top of the matrix, which indicates that there is not much difference in the initial impression of many of the travel routes and terminal locations. It could be argued that many of the alternatives deserve to be considered for a second screening. However, the number of alternatives to undergo detailed analysis must be reduced to a reasonable number to allow sufficient resources to be expended on analyzing each alternative. Therefore, the study team used its professional judgment to further reduce the list of alternatives to the following five, which will be carried forward into detailed screening:

- Sandusky to Lakefront Station Commuter Rail
- Sandusky to Tower City Commuter Rail
- Sandusky to West Boulevard-Cudell Rapid Station Commuter Rail
- Sandusky to Public Square Commuter Bus
- Sandusky to Westlake Park-n-Ride Commuter Bus

Each of these alternatives contains the routes and stations of the shorter Lorain alternatives, and the service plan created for each alternative in the second screening could include Lorain to downtown Cleveland service as part of the transit service. This will allow the study team to better determine the alternative(s) that provide the best cost effective solution for transit service in the Westshore Corridor.

Figure 5.14 shows the five alternatives to carry forward.

Figure 5.14: Alternatives for Further Consideration



Commuter Rail Issues

Unlike bus-based alternatives, which would use the existing roadway network and require significantly less infrastructure, any commuter rail alternative will likely need extensive and costly infrastructure improvements in order to provide service on existing railroads in the Westshore study area. During the initial screening process detailed in this chapter rail infrastructure issues were acknowledged as a detriment, but not used to completely eliminate any commuter rail alternative.

Of course, there *are* technical issues with potential commuter rail service that need to be addressed when going forward in the alternatives screening process. A technical review was performed in order to identify these issues so they are known as early as possible and to allow the study team to make an informed decision in this alternatives analysis.

Cleveland Rail Issues

Figure 5.15 presents rail infrastructure issues for access into Cleveland, listed one through seven. Issues 1 and 2 refer to commuter rail alternatives serving Lakefront Station. Issues 3 through 7 refer to commuter rail alternatives serving Tower City.

Issue 1 Cuyahoga River Crossing Capacity Issues – the double track railroad lift bridge over the Cuyahoga River is part of Norfolk Southern's busy Chicago Line. While the exact number of freight trains crossing the span are not known, it is likely there are already capacity constraints on this bridge that will limit how many and when commuter rail trains would be able to cross the river.

Issue 2 Nickel Plate to Chicago Line Connection at West Boulevard – currently the Nickel Plate Line passes underneath the Chicago Line at West Boulevard with no connection between the two lines. Commuter rail service would need a connection to be constructed at that location in order for commuter rail to serve a Lakefront Station. The connection would involve changing grades from the Chicago Line to the Nickel Plate likely requiring earthwork and approximately 2,000 feet of new track, along with changes to signals, switches and other rail infrastructure.

Issue 3 Access to Tower City Constrained by Federal Courthouse – The best access to Tower City would be for trains to use an RTA-compliant vehicle, which would allow them to directly enter the station and use the same platforms used by GCRTA rapid transit.

However if RTA-compliant vehicles are not used, access to Tower City could be physically constrained by the footprint of the Federal Courthouse (constructed in 2002), which may restrict expansion of the track into Tower City. Based on aerial images, one possible solution would be to run the commuter rail line on the south side of the Courthouse and construct a new commuter rail station on the south side of Tower City. This would require passengers transferring to GCRTA's red line to walk about 500 feet through the Tower City shopping center.

Issue 4 Access to Tower City Constrained by Proposed Cleveland Casino –The permanent Cleveland Casino building has been proposed for the south side of Huron Road, south of Tower City, in the footprint of the possible commuter rail station described above. This could preclude a commuter rail terminal in this location. It should also be pointed out that a stub end track in this area along with a Casino could potentially preclude any further extension of commuter rail to the east side of Cleveland.

Issue 5 GCRTA Rapid Bridge Capacity Issues – GCRTA Red Line Trains leaving West 25th Street Station enter Tower City by way of an elevated viaduct after crossing over the Cuyahoga River. Commuter rail service that is proposed to enter Tower City from the west would use the same structure. Currently the GCRTA is using the entire 4-track width of this structure with two running tracks and two storage tracks. While this bridge is wide enough for both rapid transit and commuter rail tracks, it does not have enough capacity in its current configuration for operation of both. New commuter rail service using non-RTA compliant vehicles would require the GCRTA to reduce its two storage tracks to one and shift the inbound running track in order to fit a new track on the viaduct.

Issue 6 Nickel Plate to Tower City Connection – access to Tower City can be provided two ways. A Westshore service using vehicles similar in size to current RTA Red Line vehicles would be able to directly access the current Tower City station by using RTA track between West Boulevard and Tower City. Use of GCRTA track would likely require negotiation in order to ensure capacity remains for existing Red Line operations.

A second option would be to construct a parallel track between the Nickel Plate Line and Tower City. A parallel track must be constructed to allow trains to exit and enter the Nickel Plate Line at West 25th Street. Right-of-way for this connection in this area is available because the Nickel Plate to Tower City connection previously existed before it was removed.

Issue 7 Nickel Plate to Randall Secondary Connection – a third option for commuter rail trains to reach Tower City via east side access that was previously provided for the Randall Secondary. Commuter rail trains from the west would continue east on the Nickel Plate from West 25th Street across the Cuyahoga River valley. Just south of the I-90/I-77/E.9th Street interchange, the Nickel Plate line would need a connection to this east side routing, which runs parallel to GCRTA's rapid transit tracks. This would allow commuter rail trains to enter the Tower City station area from the east, rather than the west. It would also facilitate connections to potential future east side commuter rail options.

Note that this potential routing is 0.7 miles longer than the option to enter Tower City from the west, and the connection to the east side access would be on a tight curve, slowing speeds. These factors would mean that this option would add extra time to the schedule, which could make the commuter rail service less attractive. There could be an issue with the commuter rail station interfering with the footprint of the proposed Cleveland Casino, but it is less likely than with options entering the area from the west.

Lorain/Vermilion Rail Issues

Figure 5.16 presents the two rail issues identified with potential commuter rail service on the western portion of the alignment.

Issue 1 Nickel Plate to Chicago Line Connection (Vermilion) – in order for commuter rail trains to operate west of Vermilion they would need to switch from the Nickel Plate Line to the Chicago Line (the Nickel Plate line continues west from Vermilion; however, it operates far south of the population centers in Erie County). A connection would need to be constructed to facilitate this movement, either at the point the tracks cross in Vermilion or to the west where there is more space to construct a more gentle curve with faster operating speeds. Operation on the Chicago Line would put commuter rail traffic onto an already heavily-used line, making it likely that the railroad would require additional capacity, up to and including a possible additional track, in order to restore the capacity that the commuter rail service would use during times when it is in operation.

Issue 2 Nickel Plate to Black River Landing Connection (Lorain) – commuter rail alternatives terminating in Lorain are proposed to end at the Black River Landing site. New track and a connection from the Nickel Plate Line to Black River Landing would need to be constructed in order to facilitate this movement.

Figure 5.15: Cleveland Rail Issues

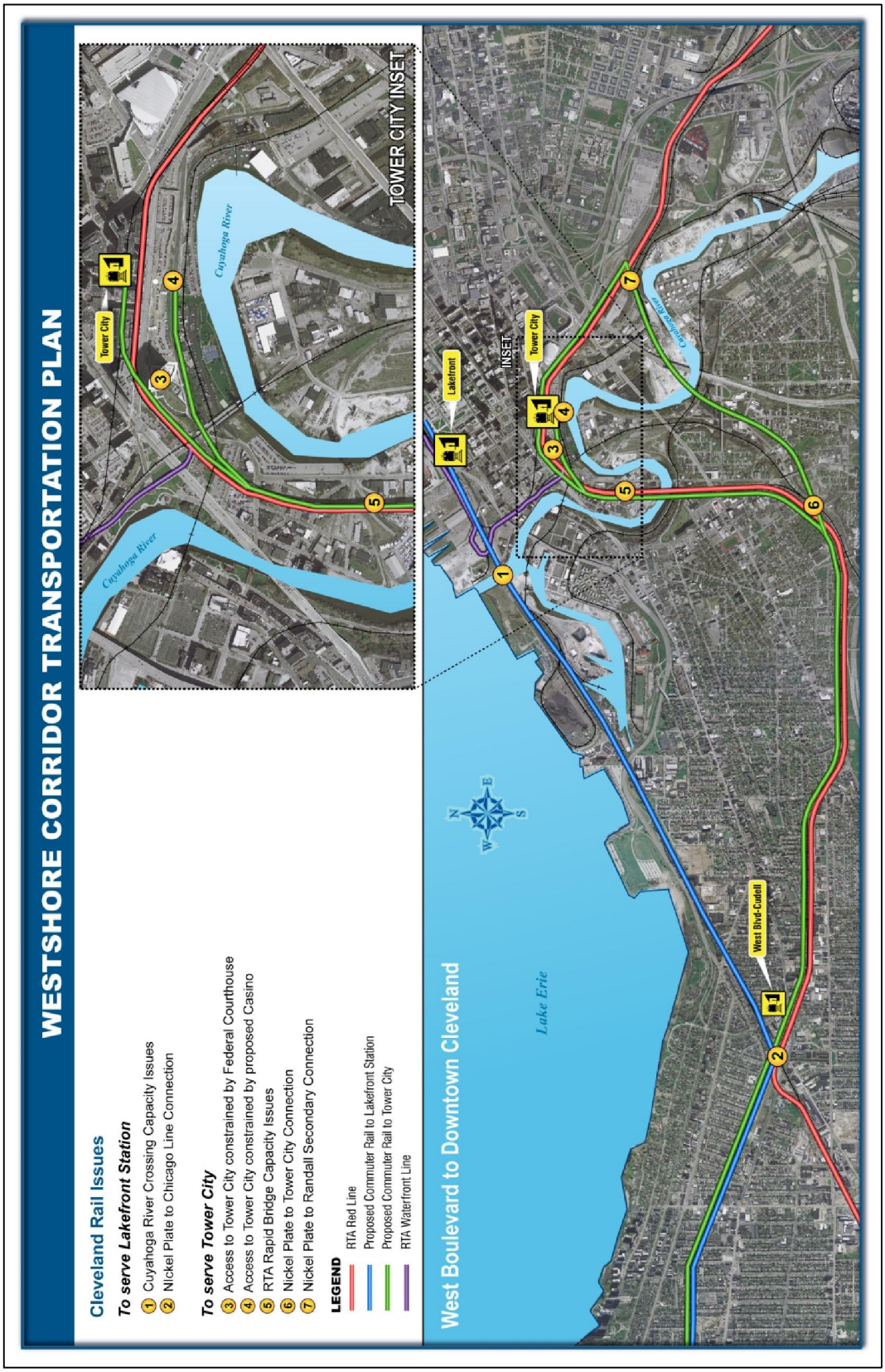
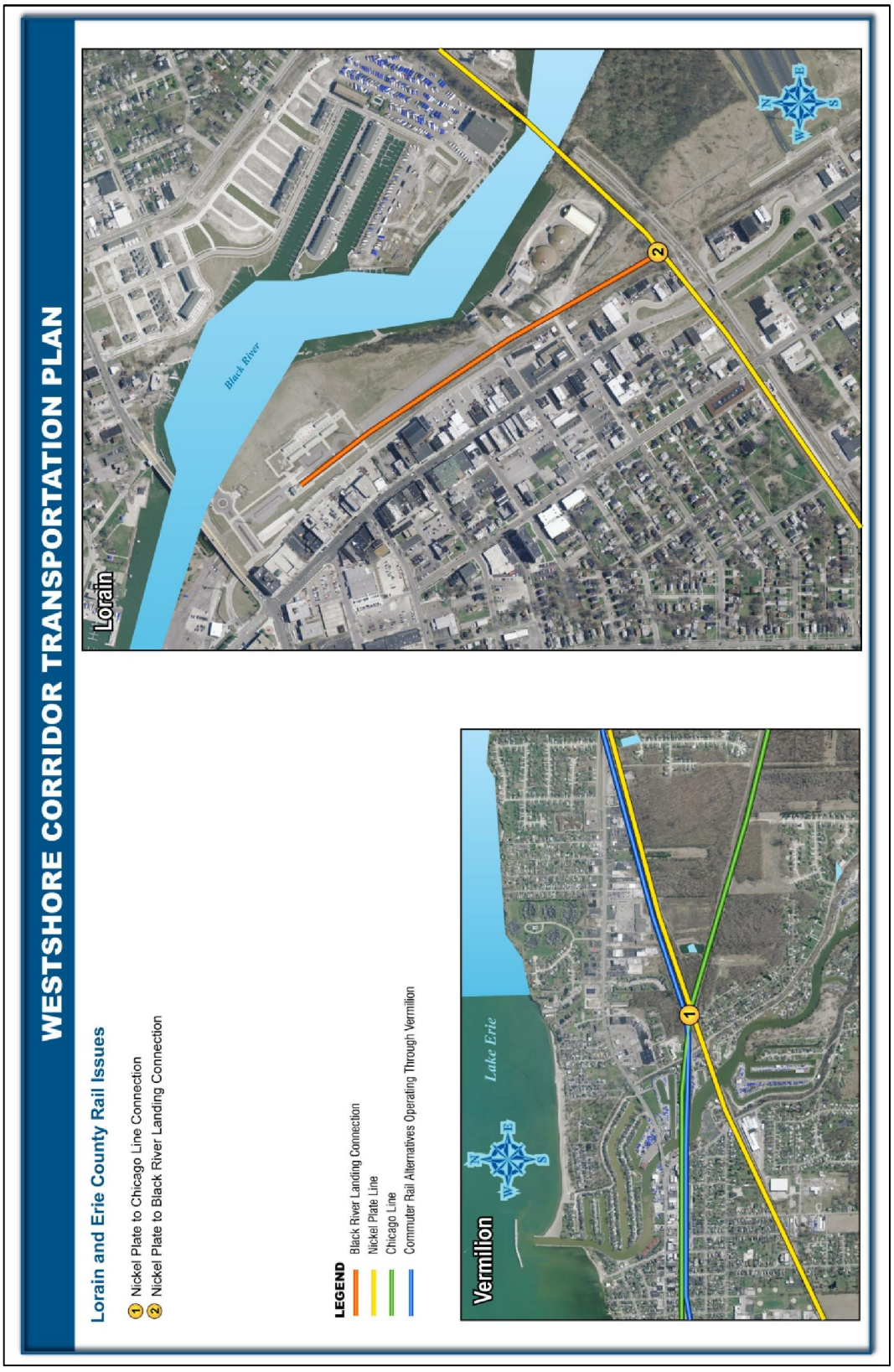


Figure 5.16: Lorain and Vermilion Rail Issues



Conclusions and Next Steps

As stated at the beginning of this chapter, the purpose of this initial screening is to eliminate those modes and alignment combinations that are not the best options to meet the needs and goals of the project. The counterpart to eliminating alternatives is that it leaves the project with alternatives that are worthy of further consideration. In all twelve transit modes, four travel routes, five western terminals, and seven eastern terminals were considered in this screening. These resulted in 32 distinct alternatives, including 9 limited stop bus, 14 commuter bus, and 9 commuter rail alternatives.

After this initial screening, five alternatives are recommended to carry forward in the study:

- Sandusky to Lakefront Station Commuter Rail
- Sandusky to Tower City Commuter Rail
- Sandusky to West Boulevard-Cudell Rapid Station Commuter Rail
- Sandusky to Public Square Commuter Bus
- Sandusky to Westlake Park-n-Ride Commuter Bus

The next step in this process is a detailed screening of the six alternatives above, along with a no-build alternative and TSM alternative. This screening will include more specific pieces of information tied to the FTA New Starts grant program, including developing capital costs, operation and maintenance costs, and station-specific ridership projections. This information will allow the study team to determine a cost effectiveness of the alternatives and, ultimately, to identify or develop a locally preferred alternative for addressing the transportation needs of the Westshore corridor.

Chapter 6 – Description of Detailed Alternatives

Introduction

This Westshore Corridor Transportation Project was initiated because of a need for an inter-county transit solution linking the major population centers between Cuyahoga, Lorain, and Erie counties. Findings in earlier chapters of this document indicated two major points:

1) There is a market for trips from the Westshore Corridor to downtown Cleveland, including both commuter and recreational trips.
2) There is a lack of transit options to make this trip outside of Cuyahoga County.

During the initial screening of alternatives 32 transit alternatives were identified and screened in order to meet the identified need of the study, a process documented in *Chapter 5 Initial Screening of Alternatives*. From the initial screening a total of ten alternatives were identified as being worthwhile to carry forward in the study.

This chapter details these ten alternatives, including a No Build option, the Transportation System Management (TSM) alternative, six commuter rail build alternatives and two commuter bus build alternatives. The text here includes the detailed descriptions of the transit service proposed each alternative, including routes proposed, service characteristics, station locations, station amenities, and fare structure. The details listed in this chapter will be used to conduct the Second Tier Screening of the alternatives, which will ultimately result in the selection of a Locally Preferred Alternative.

Assumptions for All Build Alternatives

This section lists a number of assumptions that were applied across all alternatives so that they are not repeated across all alternatives.

Market Served

Findings in *Chapter 4 Existing Conditions* indicate the most important trip market in the Westshore Corridor is to downtown Cleveland. As a result, the main transit service proposed in each build alternative is limited to peak period directional service to/from downtown Cleveland.

Each alternative was designed to include five commuter trips in each direction in the Westshore Corridor. Three of these trips are designed to occur during peak periods and peak direction (eastbound in the AM, westbound in the PM). The other trips are proposed for offpeak periods and direction. Individual schedules can be found in Appendix A6 at the end of this chapter.

Erie County Tourism Market

Discussions with stakeholders in Erie County, including Kalahari Resort and Cedar Point, have identified a number of potential services that could be operated in the short term, probably by private operators. Attractions like Cedar Point have identified a need to reach lower-income families with children in the Cleveland area, who may not have access to a car or for whom

Sandusky is too expensive. Private bus operators in Michigan provide long-distance service to Cedar Point from several cities, offering combined park and bus tickets for day trips to the park. Similar service could be developed, privately, to serve trips between Cleveland and Sandusky to access Cedar Point and other attractions in the Sandusky area.

Kalahari and other attractions in the Sandusky area have identified the need for access to a larger pool of service workers. Service workers are unlikely to be able to conveniently or economically travel from Cleveland to Sandusky; however, Elyria and Lorain are near enough to Sandusky to allow for an economical and short (under one hour in each direction) trip to a jobsite. A private operator, Erie County or Lorain County transit are possible future operators of these services, which could potentially be provided by Van Pool or other shared-ride mechanism.

Service between Sandusky and its attractions and the Cleveland Hopkins Airport also has been discussed. Several of the attractions in the area offer (rarely used) private car services between the airport and Sandusky, often at prices of $80 or more in each direction, and taxis also will deliver passengers between Sandusky and the airport at similar rates. A bus service, perhaps privately operated, perhaps subsidized by one or more of the counties, would provide a regular and permanent and economical connection between the airport and Sandusky's attractions.

These services would serve important transportation needs that have been identified by the study. However, these initiatives (with the exception of the Hopkins to Sandusky service) are assumed to be outside the scope of the proposed alternatives, and their costs and benefits would not be considered as part of the alternatives under consideration.

Fare Policy

Fares would be collected on-board the vehicle for all services proposed in this chapter. Off-board ticket vending machines would be available at each stop served by the service, which would allow passengers to purchase single and multi-trip tickets. The cost of the ticket vending machines is reflected in the capital costs detailed in Chapter 7.

The fare structure for the regional transit services proposed in the build alternatives is detailed in Tables 6.1 and 6.2. The structure for any such service would be zonal, with outer zones paying more because they are located farther from downtown Cleveland. The fare for travel in Zone A (Cuyahoga County) would match the cost of a similar trip using RTA's commuter services, currently $2.50 per one-way trip.

Table 6.1: Zone Structure

Zone	Cities Served
A	Cleveland, Lakewood, Rocky River, Westlake, Bay Village
B	Avon, Sheffield
C	Lorain, Elyria
D	Vermilion
E	Huron, Sandusky

Table 6.2: One-way Fare Structure by Zone

		DESTINATION ZONE				
	Zone	A	B	C	D	E
ORIGIN ZONE	A	$2.50	-	-	-	-
	B	$3.50	$2.50	-	-	-
	C	$4.50	$3.50	$2.50	-	-
	D	$5.50	$4.50	$3.50	$2.50	-
	E	$6.50	$5.50	$4.50	$3.50	$2.50

Vehicles

The mode(s) proposed in each of the detailed alternatives are expected to use the same type of vehicles across all alternatives. For commuter bus this means all proposed routes would use 40-ft coaches with high back chairs and Wifi, similar to those employed by GCRTA and Akron Metro on their commuter routes. For commuter rail the type of vehicle was not designated at this stage of the study because the physical envelope of the type of vehicle will ultimately influence access to Tower City.

Lorain County Transit Improvements

This study assumes that Lorain County Transit (LCT) will reinstate bus network and service levels to pre-2010 conditions with construction of any of the build alternatives. Currently Lorain County operates four routes (#1, #2, #51, #52), each with a 120 minute headway. These are the last vestiges of the former system. The service characteristics proposed for the reinstated system are shown in Table 3. Cells highlighted in green under start time are changes to routes to help deliver passengers to the proposed commuter service. Cells highlighted in gold under frequency are improvements to routes #1, 2, 51, and 52 in order to match pre-2010 service levels.

Lorain County improvements are shown in Figure 6.1 and Table 6.3.

Sandusky Transit System Improvements

This study assumes the Sandusky Transit System (STS) would operate two new fixed bus routes to deliver passengers to a commuter service as well as provide general transit connectivity in Sandusky. Shuttle Route 1 would connect the Sandusky Amtrak Station to downtown and Cedar Point. Shuttle Route 2 would connect the Kalahari Resort and the US 250 corridor to the Sandusky Amtrak Station.

Each of these routes would provide connectivity to proposed stops/stations in each of the build alternatives in this chapter. Sandusky Transit System improvements are shown in Figure 6.1 and Table 6.4.

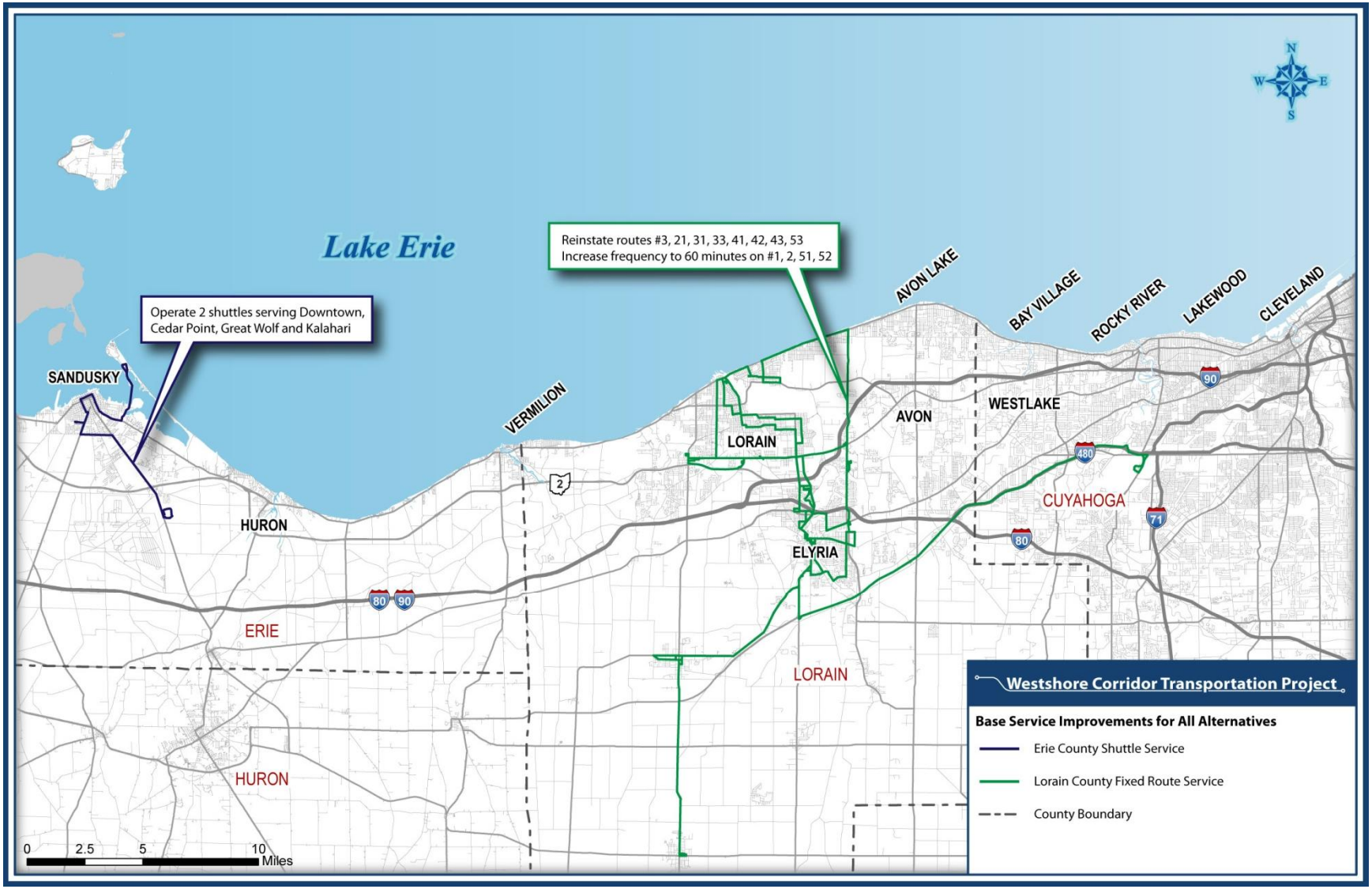
Table 6.3: Proposed Lorain County Transit Service

PROPOSED LCT SYSTEM (BASED ON PRE-2010 SYSTEM)												
	Weekday						Weekends					
Route	Start Time	End Time	Cycle Time	Freq	Daily Rev Hours	Days of Operation	Start Time	End Time	Cycle Time	Freq	Daily Rev Hours	Days of Operation
LCT #1	4:30	20:30	60	60	16.0	255	8:00	17:00	60	60	9.0	110
LCT #2	4:30	20:00	60	60	15.5	255	8:30	17:00	60	60	8.5	110
LCT #3	4:30	20:00	120	60	31.0	255	8:30	17:30	120	120	9.0	110
LCT #11	6:30	19:30	60	60	13.0	255						
LCT #21	5:30	21:30	60	60	16.0	255	8:30	15:45	120	120	7.3	110
LCT #31	5:00	21:30	60	60	16.5	255	8:30	17:00	60	60	8.5	110
LCT #33	7:30	20:15	75	75	12.8	255						
LCT #41/#42	5:00	21:30	120	60	33.0	255	8:00	16:30	60	60	8.5	110
LCT #43	4:30	19:00	60	60	14.5	255						
LCT #51	4:30	21:30	60	60	17.0	255	8:30	16:30	60	60	8.0	110
LCT #52	4:30	21:30	60	60	17.0	255	8:30	16:30	60	60	8.0	110
LCT #53	4:30	22:30	60	60	18.0	255	8:30	16:30	60	60	8.0	110
LCT #70					5.0	255						

Table 6.4: Proposed Sandusky Transit System Service

Proposed STS System									
Route	Assumed travel speed (mph)	Distance (miles)	One-way Travel time (min)	Cycle Time (min)	Freq (min)	Vehicles	Service Span (hrs)	Days of operation	Annual Revenue Hours
Shuttle 1 Downtown + Cedar Point	18	6.8	22.5	55.0	60	1	16	255	4,080
Shuttle 2 Great Wolf + Kalahari	18	7.5	25.0	60.0	60	1	16	255	4,080

Figure 6.1: Proposed Lorain County and Erie County Background Transit Improvements



Alternatives Considered

A total of ten alternatives are detailed in this section.

No Build Alternative

The No Build Alternative assumes that no new transit improvements would be made to the transportation system in the Westshore study area other than those that are currently in local and regional transportation plans and that have identified funds for implementation by 2035. Thus it consists of the transit service levels and highway networks that have been adopted in the Long Range Plans prepared by NOACA for the Greater Cleveland region and Erie County Regional Planning Commission for Erie County.

The No Build Alternative includes the following changes:

Highway Improvements

1. Innerbelt Reconstruction and Capacity Improvements

   The Innerbelt project (for Interstate Routes 71 and 90) includes several improvements, including two major bridge construction projects. The bridge construction includes:

   PID 82380 – Construct new Innerbelt bridge (for I-90 WB)

   PID 82119 – New structure to replace existing Innerbelt bridge (for I-90 EB).

2. I-90/Nagel Road interchange (PID 83607)

   Construction of a new interchange at I-90/Nagel Road.

3. Abbe Road sidewalk project (PID 83456)

   Addition of sidewalks on the east and west sides of Abbe Road between Antioch Drive and Detroit Road (SR 254).

Transit Improvements

1. No changes to the existing Greater Cleveland RTA system
2. No changes to the existing Lorain County Transit systems.
3. No changes to the existing Sandusky Transit System.

Transportation System Management (TSM) Alternative

The FTA New Starts analysis process requires development and evaluation of a TSM alternative, defined as the "best" that can be done to address the corridor's transit problems without implementing a new fixed guideway for transit. The TSM alternative is to be a real, low cost investment option. It may also become the basis for a New Starts Baseline alternative against which the Locally Preferred Alternative will be compared when addressing FTA's New Starts Criteria.

The TSM Baseline Alternative detailed here fulfills that requirement and provides a good comparison of baseline service against which to test each of the eight build alternatives.

Proposed Commuter Service

The TSM Baseline alternative is proposed to include a single bus route operating ten daily weekday trips (five in each direction), as shown in Figure 6.2 and Table 6.5. A proposed schedule for this service can be found in Appendix A6.

Table 6.5: Proposed Routes for TSM Baseline Alternative

Route	Serving	Mode	Daily Trips	Days of Operation
#TSM-1 (EB)	Sandusky to Public Square	IC Bus	5	255
#TSM-2 WB)	Public Square to Sandusky	IC Bus	5	255

Note: IC Bus means Inter-county Bus

Proposed TSM Stations

The stations proposed for the TSM Baseline alternative are shown in Table 6.6. Stations are proposed in the same location as commuter rail station found in Alternatives 1-3. The table lists stations by the type of amenity proposed, which was used to help determine capital costs for each alternative.

Station Types include:

- Station Type A – minor bus station amenities, including signage and ticket vending machine
- Station Type C – major bus station with 100 space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type E – major bus station with 200 space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.

Table 6.6: Proposed TSM Supporting Service

County	Station Name	TSM Station Type
Cuyahoga	Public Square	A
Cuyahoga	West Blvd Station	A
Cuyahoga	Lakewood Station	A
Cuyahoga	Rocky River Station	A
Cuyahoga	Westlake P&R/Columbia Road Station	A
Cuyahoga	Bassett Road Station	C
Lorain	Lear-Nagle Road Station	C
Lorain	SR 83 Station	C
Lorain	Abbe Road Station	C
Lorain	Lorain (Black River Landing) Station	E
Erie	Vermilion Station	C
Erie	Huron Station	C
Erie	Sandusky Amtrak Station	C

Supporting Transit Services

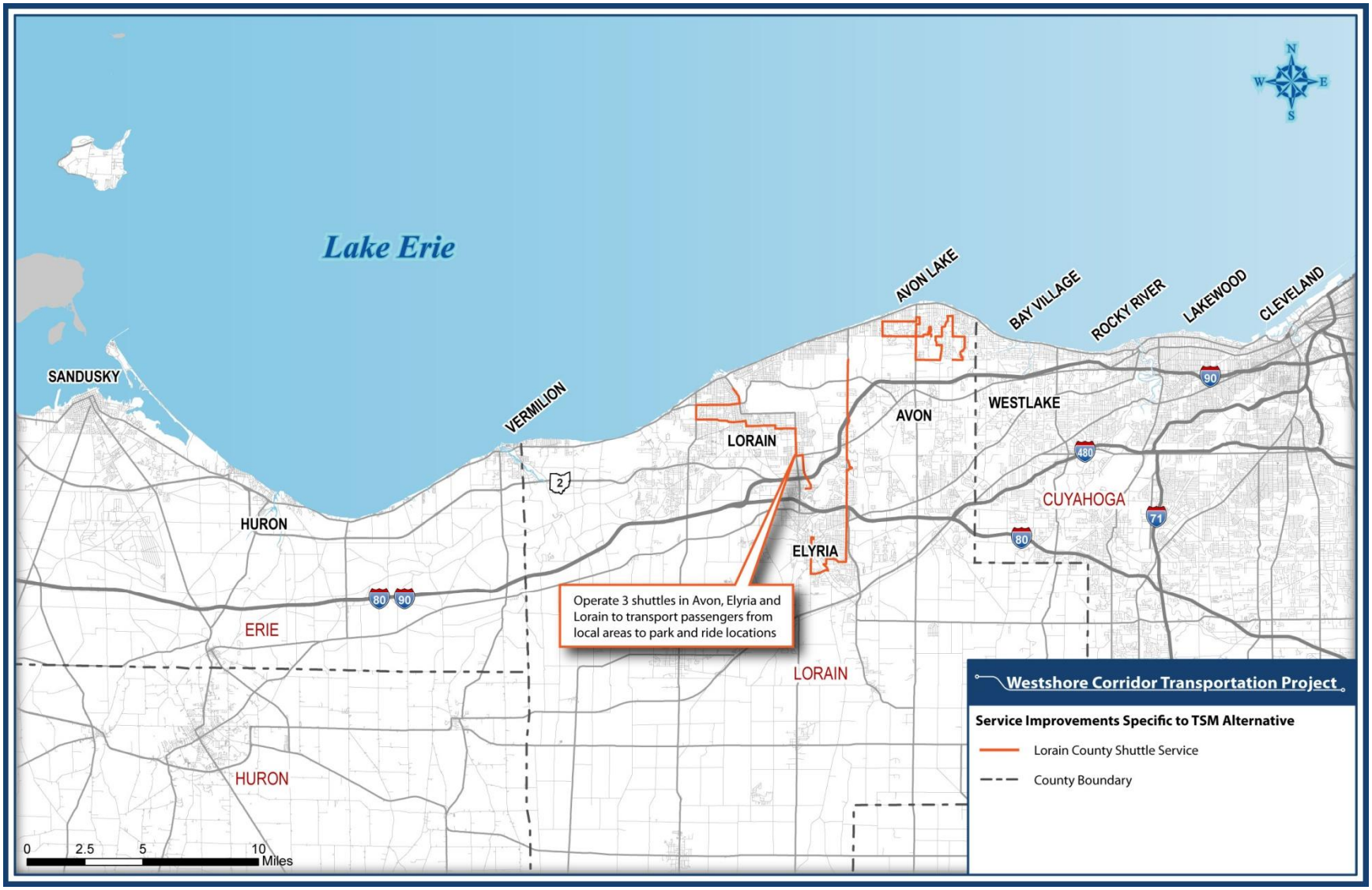
Lorain County Transit Improvements

In Lorain County a series of three shuttles are proposed to take passengers to/from TSM stations at the beginning and end of their trip, as shown in Figure 6.3. The three shuttles include:

- Avon Shuttle serving Avon-Belding and Lear-Nagle stations
- Elyria Shuttle serving Abbe Road Station
- Lorain Shuttle serving Lorain (Broadway) Station

Figure 6.2: Main Service for TSM Alternative

Figure 6.3: Supporting Transit Service for TSM Alternative



Alternative 1A - Sandusky to Lakefront Station Commuter Rail

Proposed Commuter Service

Alternative 1A proposes five commuter trips each weekday in each direction within the Westshore Corridor. Three of these trips are proposed with commuter rail and two with the TSM bus route. The commuter rail service is proposed to operate between the Sandusky Amtrak Station and Lakefront Station in downtown Cleveland, as shown in Figure 6.4 and Table 6.7.

- Route #100/101 is a commuter rail service connecting Sandusky to Lakefront Station with six daily weekday trips. A sample schedule for this route, developed for the purposes of cost estimating, can be found in Appendix A6.
- Route #102/103 is an inter-county bus service connecting Cleveland-Hopkins Airport to recreational and business destinations in Erie County during weekdays and weekends.
- Route TSM #1/2 is supplemental bus service to provide off-peak connectivity in the commuter rail corridor.

Table 6.7: Routes Proposed for Alternative 1A

Route	Serving	Mode	Daily Trips	Days of Operation
#100 (EB)	Sandusky to Lakefront Station	CR	3	255
#101 (WB)	Lakefront Station to Sandusky	CR	3	255
#102 (EB)	Cedar Point/Kalahari to Hopkins Airport	IC Bus	13	365
#103 (WB)	Hopkins Airport to Cedar Point/Kalahari	IC Bus	13	365
#TSM-1 (EB)	Sandusky to Public Square	IC Bus	2	255
#TSM-2 (WB)	Public Square to Sandusky	IC Bus	2	255

Modes: CR = Commuter Rail, IC Bus = Inter-county Bus.
Service on 255 days corresponds to weekday (Monday-Friday) Service.

Downtown Cleveland Access

Once arriving at Lakefront Station, commuter rail passengers in Alternative 1A would be able to access downtown destinations three ways: via Waterfront Line light rail to Tower City, via walking, or via the #47 Muni Lot-Public Square Loop route.

Proposed Stations

The stations proposed for Alternative 1A are shown in Table 6.8. The table lists stations by the type of amenity proposed, which was used to help determine capital costs for each alternative.

Station Types include:

- Station Type A – minor bus station amenities, including signage and ticket vending machine
- Station Type B – minor rail station because station and platforms already exist. New amenities will include signage and ticket vending machines.
- Station Type C – major bus station with 100-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.

- Station Type D – major rail station with 100-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.
- Station Type E – major bus station with 200-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type F – major rail station with 200-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.

Table 6.8: Proposed Alternative 1A Stations

		Alt 1A	
County	Station Name	IC Bus	CR
Cuyahoga	Lakefront Station	-	B
Cuyahoga	West Blvd Station	-	B
Cuyahoga	Lakewood Station	-	F
Cuyahoga	Rocky River Station	-	B
Cuyahoga	Westlake P&R/Columbia Road Station	-	B
Cuyahoga	Bassett Road Station	-	D
Cuyahoga	Hopkins Airport	A	-
Lorain	Lear-Nagle Road Station	-	D
Lorain	Avon-Belding Road Station	-	D
Lorain	Abbe Road Station	-	D
Lorain	Lorain (Broadway) Station	-	F
Erie	Vermilion Station	-	D
Erie	Huron Station	-	D
Erie	Downtown Sandusky	A	-
Erie	Kalahari Resort	A	-
Erie	Cedar Point	A	-
Erie	Sandusky Amtrak Station	-	D

Supporting Transit Services

Supporting transit was designed to deliver passengers to/from commuter rail stations. Therefore, the services detailed here are applicable to all commuter rail alternatives (1A, 1C, 2A, 2C, 3A, 3C). These services are mapped in Figure 6.5.

Cuyahoga County Improvements

Improvements to GCRTA routes in Cuyahoga County include the following changes:

- RTA #46 Bassett Branch – add three additional EB and three additional WB trips to Bassett Branch in order to collect and distribute passengers at the Bassett Road Stations.
- RTA #55 – deviate three EB trips and three WB trips during AM and PM periods at Rocky River Station in order to serve commuter rail passengers.
- RTA #83 – reroute on Belle Avenue in Lakewood instead of Warren Road in order to serve commuter rail passengers at Lakewood Station.

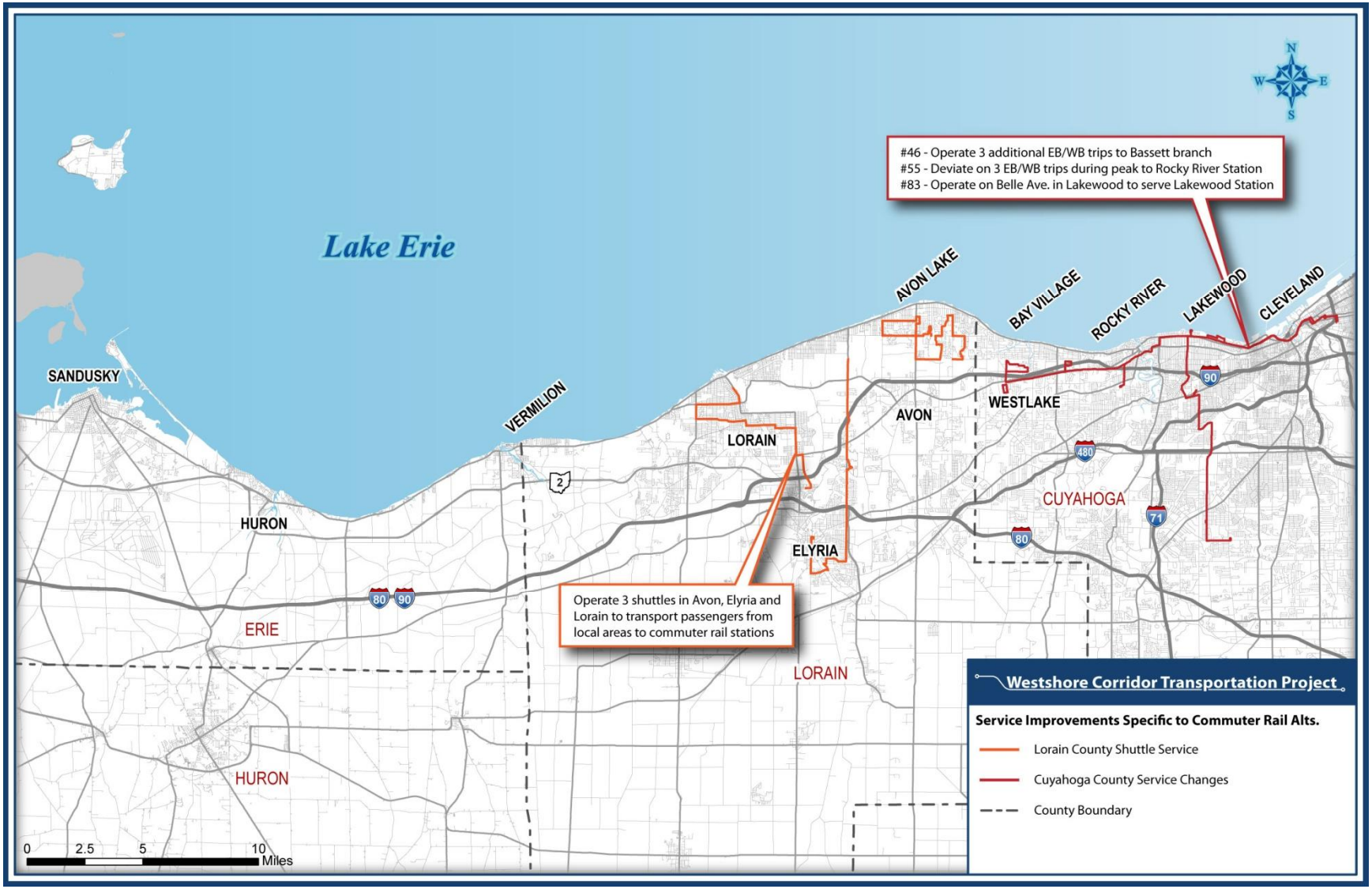
Lorain County Transit Improvements

In Lorain County a series of three shuttles are proposed to take passengers to/from commuter rail stations at the beginning and end of their trip. The three shuttles include:

- Avon Shuttle serving Avon-Belding and Lear-Nagle stations
- Elyria Shuttle serving Abbe Road Station
- Lorain Shuttle serving Lorain (Broadway) Station

Figure 6.4: Main Service for Alternative 1A

Figure 6.5: Supporting Transit Service for Alternatives 1A, 1C, 2A, 2C, 3A, 3C



Alternative 1C - Lorain to Lakefront Station Commuter Rail

Proposed Commuter Service

Alternative 1C proposes five commuter trips each weekday in each direction within the Westshore Corridor. Three of these trips are proposed with commuter bus between Sandusky and Lorain and commuter rail between Lorain and Lakefront Station in downtown Cleveland. The other two trips are proposed to occur with the TSM bus route. The proposed services for Alternative 1C are shown in Figure 6.6 and Table 6.9.

- Route #100/101 is a commuter rail service connecting Lorain to Lakefront Station with six daily weekday trips. A sample schedule for this route, developed for the purposes of cost estimating, can be found in Appendix A6.
- Route #102/103 is an inter-county bus service connecting Cleveland-Hopkins Airport to recreational and business destinations in Erie County during weekdays and weekends.
- Route #104/105 is an inter-county bus service connecting downtown Sandusky to Lorain (Black River Landing) Station.
- Route TSM #1/2 is supplemental bus service to provide off-peak connectivity in the commuter rail corridor.

Table 6.9: Routes Proposed for Alternative 1C

Route	Serving	Mode	Daily Trips	Days of Operation
#100 (EB)	Lorain to Lakefront Station	CR	3	255
#101 (WB)	Lakefront Station to Lorain	CR	3	255
#102 (EB)	Cedar Point/Kalahari to Hopkins Airport	IC Bus	13	365
#103 (WB)	Hopkins Airport to Cedar Point/Kalahari	IC Bus	13	365
#104 (EB)	Sandusky to Lorain	IC Bus	3	255
#105 (WB)	Lorain to Sandusky	IC Bus	3	255
#TSM-1 (EB)	Sandusky to Public Square	IC Bus	2	255
#TSM-2 (WB)	Public Square to Sandusky	IC Bus	2	255

Modes: CR = Commuter Rail, IC Bus = Inter-county Bus.
Service on 255 days corresponds to weekday (Monday-Friday) Service.

Downtown Cleveland Access

Once arriving at Lakefront Station, commuter rail passengers in Alternative 1C would be able to access downtown destinations three ways: via Waterfront Line light rail to Tower City, via walking, or via the #47 Muni Lot-Public Square Loop route.

Proposed Stations

The stations proposed for Alternative 1C are shown in Table 6.10. The table lists stations by the type of amenity proposed, which was used to help determine capital costs for each alternative.

Station Types include:

- Station Type A – minor bus station amenities, including signage and ticket vending machine

- Station Type B – minor rail station because station and platforms already exist. New amenities will include signage and ticket vending machines.
- Station Type C – major bus station with 100 space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type D – major rail station with 100 space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.
- Station Type E – major bus station with 200 space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type F – major rail station with 200 space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.

Table 6.10: Proposed Alternative 1C Stations

		Alt 1C	
County	Station Name	IC Bus	CR
Cuyahoga	Lakefront Station	-	B
Cuyahoga	West Blvd Station	-	B
Cuyahoga	Lakewood Station	-	F
Cuyahoga	Rocky River Station	-	B
Cuyahoga	Westlake P&R/Columbia Road Station	-	B
Cuyahoga	Bassett Road Station	-	D
Cuyahoga	Hopkins Airport	A	-
Lorain	Lear-Nagle Road Station	-	D
Lorain	Avon-Belding Road Station	-	D
Lorain	Abbe Road Station	-	D
Lorain	Lorain (Black River Landing) Station	-	F
Erie	Vermilion P&R	C	-
Erie	Huron P&R	C	-
Erie	US 250 P&R	C	-
Erie	Downtown Sandusky	A	-
Erie	Kalahari Resort	A	-
Erie	Cedar Point	A	-
Erie	Sandusky Amtrak Station	-	D

Supporting Transit Services

Supporting transit service for Alternative 1C is the same as that detailed for Alternative 1A.

Figure 6.6: Main Service for Alternative 1C

Alternative 2A - Sandusky to Tower City Commuter Rail

Proposed Commuter Service

Alternative 2A proposes five commuter trips each weekday in each direction within the Westshore Corridor. Three of these trips are proposed with commuter rail and two with the TSM bus route. The commuter rail service is proposed to operate between the Sandusky Amtrak Station and Tower City in downtown Cleveland, as shown in Figure 6.7 and Table 6.11.

- Route #200/201 is a commuter rail service connecting Sandusky to Tower City with six daily weekday trips. A sample schedule for this route, developed for the purposes of cost estimating, can be found in Appendix A6.
- Route #202/203 is an inter-county bus service connecting Cleveland-Hopkins Airport to recreational and business destinations in Erie County during weekdays and weekends.
- Route TSM #1/2 is supplemental bus service to provide off-peak connectivity in the commuter rail corridor.

Table 6.11: Routes Proposed for Alternative 2A

Route	Serving	Mode	Daily Trips	Days of Operation
#200 (EB)	Sandusky to Tower City	CR	3	255
#201 (WB)	Tower City to Sandusky	CR	3	255
#202 (EB)	Cedar Point/Kalahari to Hopkins Airport	IC Bus	13	365
#203 (WB)	Hopkins Airport to Cedar Point/Kalahari	IC Bus	13	365
#TSM-1 (EB)	Sandusky to Public Square	IC Bus	2	255
#TSM-2 (WB)	Public Square to Sandusky	IC Bus	2	255

Modes: CR = Commuter Rail, IC Bus = Inter-county Bus.
Service on 255 days corresponds to weekday (Monday-Friday) Service.

Downtown Cleveland Access

Once arriving at Tower City, commuter rail passengers in Alternative 2A would be able to access downtown destinations four ways: via walking, via RTA Waterfront Line (Blue and Green lines), via HealthLine bus rapid transit, or via trolley bus routes #61 and #62.

Proposed Stations

The stations proposed for Alternative 2A are shown in Table 6.12. The table lists stations by the type of amenity proposed, which was used to help determine capital costs for each alternative.

Station Types include:

- Station Type A – minor bus station amenities, including signage and ticket vending machine
- Station Type B – minor rail station because station and platforms already exist. New amenities will include signage and ticket vending machines.
- Station Type C – major bus station with 100-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.

- Station Type D – major rail station with 100-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.
- Station Type E – major bus station with 200-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type F – major rail station with 200-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.

Table 6.12: Proposed Alternative 2A Stations

		Alt 2A	
County	Station Name	IC Bus	CR
Cuyahoga	Tower City Station	-	B
Cuyahoga	West Blvd Station	-	B
Cuyahoga	Lakewood Station	-	F
Cuyahoga	Rocky River Station	-	B
Cuyahoga	Westlake P&R/Columbia Road Station	-	B
Cuyahoga	Bassett Road Station	-	D
Cuyahoga	Hopkins Airport	A	-
Lorain	Lear-Nagle Road Station	-	D
Lorain	Avon-Belding Road Station	-	D
Lorain	Abbe Road Station	-	D
Lorain	Lorain (Broadway) Station	-	F
Erie	Vermilion Station	-	D
Erie	Huron Station	-	D
Erie	Downtown Sandusky	A	-
Erie	Kalahari Resort	A	-
Erie	Cedar Point	A	-
Erie	Sandusky Amtrak Station	-	D

Supporting Transit Services

Supporting transit service for Alternative 2A is the same as that detailed for Alternative 1A.

Figure 6.7: Main Service for Alternative 2A

Alternative 2C - Lorain to Tower City Commuter Rail

Proposed Commuter Service

Alternative 2C proposes five commuter trips each weekday in each direction within the Westshore Corridor. Three of these trips are proposed with commuter bus between Sandusky and Lorain and commuter rail between Lorain and Tower City in downtown Cleveland. The other two trips are proposed to occur with the TSM bus route. The proposed services for Alternative 2C are shown in Figure 6.8 and Table 6.13.

- Route #200/201 is a commuter rail service connecting Lorain to Tower City with six daily weekday trips. A sample schedule for this route, developed for the purposes of cost estimating, can be found in Appendix A6.
- Route #202/203 is an inter-county bus service connecting Cleveland-Hopkins Airport to recreational and business destinations in Erie County during weekdays and weekends.
- Route #204/205 is an inter-county bus service connecting downtown Sandusky to Lorain (Black River Landing) Station.
- Route TSM #1/2 is supplemental bus service to provide off-peak connectivity in the commuter rail corridor.

Table 6.13: Routes Proposed for Alternative 2C

Route	Serving	Mode	Daily Trips	Days of Operation
#200 (EB)	Lorain to Tower City	CR	3	255
#201 (WB)	Tower City to Lorain	CR	3	255
#202 (EB)	Cedar Point/Kalahari to Hopkins Airport	IC Bus	13	365
#203 (WB)	Hopkins Airport to Cedar Point/Kalahari	IC Bus	13	365
#204 (EB)	Sandusky to Lorain	IC Bus	3	255
#205 (WB)	Lorain to Sandusky	IC Bus	3	255
#TSM-1 (EB)	Sandusky to Public Square	IC Bus	2	255
#TSM-2 (WB)	Public Square to Sandusky	IC Bus	2	255

Modes: CR = Commuter Rail, IC Bus = Inter-county Bus.
Service on 255 days corresponds to weekday (Monday-Friday) Service.

Downtown Cleveland Access

Once arriving at Tower City, commuter rail passengers in Alternative 2C would be able to access downtown destinations four ways: via walking, via RTA Waterfront Line (Blue and Green lines), via Healthline bus rapid transit, or via trolley bus routes #61 and #62.

Proposed Stations

The stations proposed for Alternative 2C are shown in Table 6.14. The table lists stations by the type of amenity proposed, which was used to help determine capital costs for each alternative.

Station Types include:

- Station Type A – minor bus station amenities, including signage and ticket vending machine

- Station Type B – minor rail station because station and platforms already exist. New amenities will include signage and ticket vending machines.
- Station Type C – major bus station with 100-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type D – major rail station with 100-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.
- Station Type E – major bus station with 200-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type F – major rail station with 200-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.

Table 6.14: Proposed Alternative 2C Stations

		Alt 2C	
County	Station Name	IC Bus	CR
Cuyahoga	Lakefront Station	-	B
Cuyahoga	West Blvd Station	-	B
Cuyahoga	Lakewood Station	-	F
Cuyahoga	Rocky River Station	-	B
Cuyahoga	Westlake P&R/Columbia Road Station	-	B
Cuyahoga	Bassett Road Station	-	D
Cuyahoga	Hopkins Airport	A	-
Lorain	Lear-Nagle Road Station	-	D
Lorain	Avon-Belding Road Station	-	D
Lorain	Abbe Road Station	-	D
Lorain	Lorain (Black River Landing) Station	-	F
Erie	Vermilion P&R	C	-
Erie	Huron P&R	C	-
Erie	US 250 P&R	C	-
Erie	Downtown Sandusky	A	-
Erie	Kalahari Resort	A	-
Erie	Cedar Point	A	-
Erie	Sandusky Amtrak Station	-	D

Supporting Transit Services

Supporting transit service for Alternative 2C is the same as that detailed for Alternative.

Figure 6.8: Main Service for Alternative 2C

Alternative 3A - Sandusky to West Blvd Commuter Rail

Proposed Commuter Service

Alternative 3A proposes a total of five commuter trips each weekday in each direction within the Westshore Corridor. Three trips are proposed with commuter rail between the Sandusky Amtrak Station and West Boulevard on the west side of Cleveland (with a connecting bus route between West Boulevard and downtown Cleveland). These services are shown in Figure 6.9 and Table 6.15.

- Route #300/301 is a commuter rail service connecting Sandusky to Tower City with six daily weekday trips. A sample schedule for this route, developed for the purposes of cost estimating, can be found in Appendix A6.
- Route #302/303 is an inter-county bus service connecting Cleveland-Hopkins Airport to recreational and business destinations in Erie County during weekdays and weekends.
- Route #304/305 is a bus service connecting the West Boulevard commuter rail station to Public Square in downtown Cleveland.
- Route TSM #1/2 is supplemental bus service to provide off-peak connectivity in the commuter rail corridor.

Table 6.15: Routes Proposed for Alternative 3A

Route	Serving	Mode	Daily Trips	Days of Operation
#300 (EB)	Sandusky to West Blvd	CR	3	255
#301 (WB)	West Blvd to Sandusky	CR	3	255
#302 (EB)	Cedar Point/Kalahari to Hopkins Airport	IC Bus	13	365
#303 (WB)	Hopkins Airport to Cedar Point/Kalahari	IC Bus	13	365
#304 (EB)	West Blvd to Public Square	IC Bus	3	255
#305 (WB)	Public Square to West Blvd	IC Bus	3	255
#TSM-1 EB	Sandusky to Public Square	IC Bus	2	255
#TSM-2 WB	Public Square to Sandusky	IC Bus	2	255

Modes: CR = Commuter Rail, IC Bus = Inter-county Bus
Service on 255 days corresponds to weekday (Monday-Friday) Service.

Downtown Cleveland Access

Once arriving at West Blvd Station, commuter rail passengers in Alternative 3A would be able to access downtown destinations three ways: via proposed Route #304 express bus to Public Square, via RTA Red Line rapid transit to Tower City, or via RTA #26 Detroit local bus to Public Square.

Proposed Stations

The stations proposed for Alternative 3A are shown in Table 6.16. The table lists stations by the type of amenity proposed, which was used to help determine capital costs for each alternative.

Station Types include:

- Station Type A – minor bus station amenities, including signage and ticket vending machine
- Station Type B – minor rail station because station and platforms already exist. New amenities will include signage and ticket vending machines.
- Station Type C – major bus station with 100-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type D – major rail station with 100-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.
- Station Type E – major bus station with 200-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type F – major rail station with 200-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.

Table 6.16: Proposed Alternative 3A Stations

		Alt 3A	
County	Station Name	IC Bus	CR
Cuyahoga	Public Square	A	-
Cuyahoga	West Blvd Station	A	B
Cuyahoga	Lakewood Station	-	F
Cuyahoga	Rocky River Station	-	B
Cuyahoga	Westlake P&R/Columbia Road Station	-	B
Cuyahoga	Bassett Road Station	-	D
Cuyahoga	Hopkins Airport	A	-
Lorain	Lear-Nagle Road Station	-	D
Lorain	Avon-Belding Road Station	-	D
Lorain	Abbe Road Station	-	D
Lorain	Lorain (Broadway) Station	-	F
Erie	Vermilion Station	-	D
Erie	Huron Station	-	D
Erie	Downtown Sandusky	A	-
Erie	Kalahari Resort	A	-
Erie	Cedar Point	A	-
Erie	Sandusky Amtrak Station	-	D

Supporting Transit Services

Supporting transit service for Alternative 3A is the same as that detailed for Alternative 1A.

Figure 6.9: Main Service for Alternative 3A

Alternative 3C - Lorain to West Blvd Commuter Rail

Proposed Commuter Service

Alternative 3C proposes a total of five commuter trips each weekday in each direction within the Westshore Corridor. Three of these trips are proposed with a combination of peak period commuter bus and commuter rail. These trips include the following service segments:

- Bus service between Sandusky and Lorain (Black River Landing)
- Commuter Rail service between Lorain (Black River Landing) and West Boulevard
- Bus service between West Boulevard and Public Square

Two additional trips are proposed with the TSM bus route. All of the proposed services are shown in Figure 6.10 and Table 6.17.

- Route #300/301 is a commuter rail service connecting Lorain to West Blvd with six daily weekday trips. A proposed schedule for this route can be found in Appendix A6.
- Route #302/303 is an inter-county bus service connecting Cleveland-Hopkins Airport to recreational and business destinations in Erie County during weekdays and weekends.
- Route #304/305 is a bus route providing a timed transfer for commuter rail passengers at West Blvd, connecting to Public Square in downtown Cleveland. This service matches the same number of trips and days as the commuter rail.
- Route #306/307 is an inter-county bus service connecting Erie County to the commuter rail in Lorain, and has the same number of trips, service span, and days of operation as the rail.
- Route TSM #1/2 is supplemental bus service to provide offpeak connectivity in the commuter rail corridor.

Table 6.17: Routes Proposed for Alternative 3C

Route	Serving	Mode	Daily Trips	Days of Operation
#300 (EB)	Lorain to West Blvd	CR	3	255
#301 (WB)	West Blvd to Lorain	CR	3	255
#302 (EB)	Cedar Point/Kalahari to Hopkins Airport	IC Bus	13	365
#303 (WB)	Hopkins Airport to Cedar Point/Kalahari	IC Bus	13	365
#304 (EB)	West Blvd to Public Square	IC Bus	3	255
#305 (WB)	Public Square to West Blvd	IC Bus	3	255
#306 (EB)	Sandusky to Lorain	IC Bus	3	255
#307 (WB)	Lorain to Sandusky	IC Bus	3	255
#TSM-1 EB	Sandusky to Public Square	IC Bus	2	255
#TSM-2 WB	Public Square to Sandusky	IC Bus	2	255

Modes: CR = Commuter Rail, IC Bus = Inter-county Bus
Service on 255 days corresponds to weekday (Monday-Friday) Service.

Downtown Cleveland Access

Once arriving at West Blvd Station, commuter rail passengers in Alternative 3C would be able to access downtown destinations three ways: via proposed Route #304 express bus to Public

Square, via RTA Red Line rapid transit to Tower City, or via RTA #26 Detroit local bus to Public Square.

Proposed Stations

The stations proposed for Alternative 3C are shown in Table 6.18. The table lists stations by the type of amenity proposed, which was used to help determine capital costs for each alternative.

Station Types include:

- Station Type A – minor bus station amenities, including signage and ticket vending machine
- Station Type B – minor rail station because station and platforms already exist. New amenities will include signage and ticket vending machines.
- Station Type C – major bus station with 100-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type D – major rail station with 100-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.
- Station Type E – major bus station with 200-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type F – major rail station with 200-space park-and-ride facility. Amenities include platforms, benches, trash can, schedule information, and ticket vending machines.

Table 6.18: Proposed Alternative 3C Stations

		Alt 3C	
County	Station Name	IC Bus	CR
Cuyahoga	Public Square	A	-
Cuyahoga	West Blvd Station	A	B
Cuyahoga	Lakewood Station	-	F
Cuyahoga	Rocky River Station	-	B
Cuyahoga	Westlake P&R/Columbia Road Station	-	B
Cuyahoga	Bassett Road Station	-	D
Cuyahoga	Hopkins Airport	A	-
Lorain	Lear-Nagle Road Station	-	D
Lorain	Avon-Belding Road Station	-	D
Lorain	Abbe Road Station	-	D
Lorain	Lorain (Broadway) Station	-	F
Erie	Vermilion Station	C	-
Erie	Huron Station	C	-
Erie	US 250 P&R	C	-
Erie	Downtown Sandusky	A	-
Erie	Kalahari Resort	A	-
Erie	Cedar Point	A	-
Erie	Sandusky Amtrak Station	-	D

Supporting Transit Services

Supporting transit service for Alternative 3C is the same as that detailed for Alternative 1A.

Figure 6.10: Main Service for Alternative 3C

Alternative 4 - Sandusky to Public Square Commuter Bus

Proposed Commuter Service

Alternative 4 proposes a total of five commuter trips each weekday in each direction within the Westshore Corridor. Three of these trips will occur with express commuter bus during peak periods. This service is considered express because routes will serve three exclusive zones, thus providing a faster trip. The other two trips will be provided by an all stop bus route.

All of the service is shown in Figure 6.11 and Table 6.19.

- Route #400/401 is an inter-county bus service connecting Sandusky to Public Square in downtown Cleveland. This route will stop at all park and ride locations within the corridor. It is proposed to include a single westbound trip during the midday period to provide riders with the ability to make the return trip during the day. A proposed schedule for this route can be found in Appendix A6.
- Route #402/403 is an inter-county bus service connecting Sandusky, Huron, and Vermilion park and ride locations to Public Square in downtown Cleveland. A proposed schedule for this route can be found in Appendix A6.
- Route #404/405 is an inter-county bus service connecting Lorain and Midway Mall park and ride locations to Public Square in downtown Cleveland. A proposed schedule for this route can be found in Appendix A6.
- Route #406/407 is an inter-county bus service connecting Sheffield and Avon park-and-ride locations to Public Square in downtown Cleveland. A proposed schedule for this route can be found in Appendix A6.
- Route #408/409 is an inter-county bus service connecting Cleveland-Hopkins Airport to recreational and business destinations in Erie County during weekdays and weekends.

Table 6.19: Routes Proposed for Alternative 4

Route	Serving	Mode	Daily Trips	Days of Operation
#400 (EB)	Sandusky to Public Square (all stops)	IC Bus	2	255
#401 (WB)	Public Square to Sandusky (all stops)	IC Bus	2	255
#402 (EB)	Sandusky to Public Square (Erie County Zone)	IC Bus	3	255
#403 (WB)	Public Square to Sandusky (Erie County Zone)	IC Bus	3	255
#404 (EB)	Lorain to Public Square (Lorain/Elyria Zone)	IC Bus	3	255
#405 (WB)	Public Square to Lorain (Lorain/Elyria Zone)	IC Bus	3	255
#406 (EB)	Sheffield to Public Square (Sheffield/Avon Zone)	IC Bus	3	255
#407 (WB)	Public Square to Sheffield (Sheffield/Avon Zone)	IC Bus	3	255
#408 (EB)	Hopkins Airport to Cedar Point/Kalahari	IC Bus	13	365
#409 (WB)	Hopkins Airport to Cedar Point/Kalahari	IC Bus	13	365

Modes: CR = Commuter Rail, IC Bus = Inter-county Bus
Service on 255 days corresponds to weekday (Monday-Friday) Service.

Downtown Cleveland Access

Once arriving at Public Square commuter bus passengers in Alternative 4 would be able to access downtown destinations four ways: via walking, via RTA Waterfront Line (Blue and Green lines), via HealthLine bus rapid transit, or via RTA trolley bus routes #61 and #62.

Proposed Stations

The stations proposed for Alternative 4 are shown in Table 6.20. The table lists stations by the type of amenity proposed, which was used to help determine capital costs for each alternative.

Station Types include:

- Station Type A – minor bus station amenities, including signage and ticket vending machine
- Station Type C – major bus station with 100-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type E – major bus station with 200-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.

Table 6.20: Proposed Alternative 4 Stations

		Alt 4
County	Station Name	IC Bus
Cuyahoga	Public Square	A
Cuyahoga	Crocker Park P&R	C
Cuyahoga	Hopkins Airport	A
Lorain	Lear-Nagle Road P&R	C
Lorain	SR 83 P&R	C
Lorain	Abbe Road P&R	C
Lorain	Midway Mall P&R	A
Lorain	Lorain (Black River Landing) Station	E
Erie	Vermilion P&R	C
Erie	Huron P&R	C
Erie	Sandusky (US 250)	C
Erie	Downtown Sandusky	A
Erie	Kalahari Resort	A
Erie	Cedar Point	A

Supporting Transit Services

Supporting transit was designed to deliver passengers to/from park and ride locations. Therefore, the services detailed here are applicable to commuter bus alternatives 4 and 5. These services are mapped in Figure 6.12.

Cuyahoga County Improvements

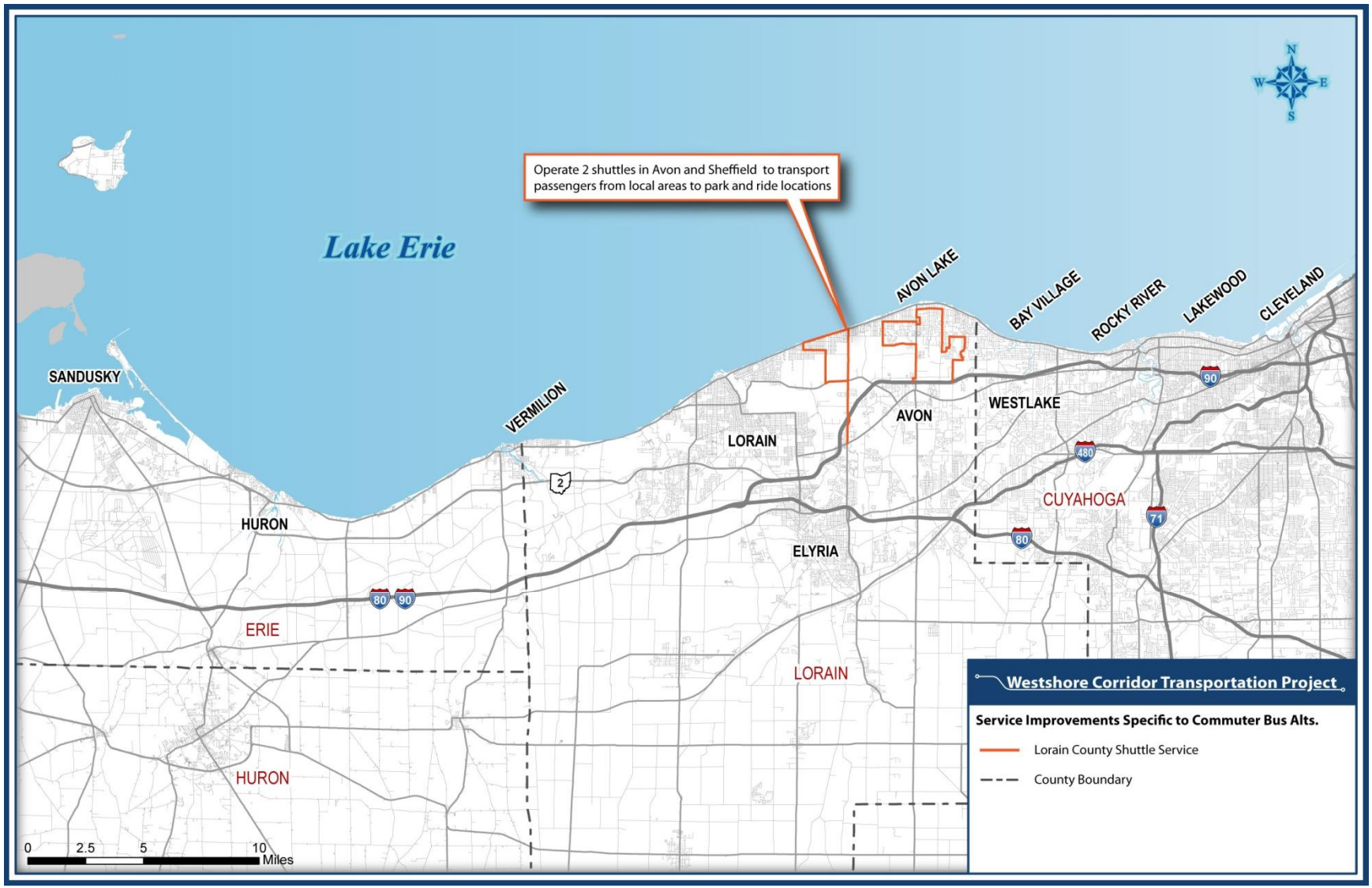
There are no improvements proposed for RTA in Cuyahoga County.

Lorain County Transit Improvements

- Two commuter bus shuttles to take passengers from local areas to park and ride stations. Shuttles include:
    - Avon Shuttle serving SR 83 and Lear-Nagle park and ride stations
    - Sheffield Shuttle serving Abbe Road park and ride station

Figure 6.11: Main Service for Alternative 4

Figure 6.12: Supporting Transit Service for Alternatives 4 and 5



Alternative 5 - Sandusky to Westlake Park-n-Ride Commuter Bus

Proposed Commuter Service

Alternative 5 proposes a total of five commuter trips each weekday in each direction within the Westshore Corridor. Three of these trips will occur with express commuter bus during peak periods. This service is considered express because routes will serve three exclusive zones, thus providing a faster trip. The other two trips will be provided by an all stop bus route.

In Alternative 5 peak period trips are destined for the Westlake Park and Ride lot in order to connect to the RTA #246 for the trip to downtown Cleveland. Offpeak trips will serve downtown Cleveland directly.

All of the service is shown in Figure 6.13 and Table 6.21.

- Route #500/501 is an inter-county bus service connecting Sandusky to Public Square in downtown Cleveland. This route will stop at all park and ride locations within the corridor. It is proposed to include a single westbound trip during the midday period to provide riders with the ability to make the return trip during the day. A proposed schedule for this route can be found in Appendix A6.
- Route #502/503 is an inter-county bus service connecting Sandusky, Huron, and Vermilion park-and-ride locations to the Westlake Park-n-Ride. A proposed schedule for this route can be found in Appendix A6.
- Route #504/505 is an inter-county bus service connecting Lorain and Midway Mall park-and-ride locations to the Westlake Park-n-Ride. A proposed schedule for this route can be found in Appendix A6.
- Route #506/507 is an inter-county bus service connecting Sheffield and Avon park-and-ride locations to the Westlake Park-n-Ride. A proposed schedule for this route can be found in Appendix A6.
- Route #508/509 is an inter-county bus service connecting Cleveland-Hopkins Airport to recreational and business destinations in Erie County during weekdays and weekends.

Table 6.21: Routes Proposed for Alternative 5

Route	Serving	Mode	Daily Trips	Days of Operation
#500 (EB)	Sandusky to Public Square (all stops)	IC Bus	2	255
#501 (WB)	Public Square to Sandusky (all stops)	IC Bus	2	255
#502 (EB)	Sandusky to Westlake Park and Ride (Erie County Zone)	IC Bus	3	255
#503 (WB)	Westlake Park and Ride to Sandusky (Erie County Zone)	IC Bus	3	255
#504 (EB)	Lorain to Westlake Park and Ride (Lorain/Elyria Zone)	IC Bus	3	255
#505 (WB)	Westlake Park and Ride to Lorain (Lorain/Elyria Zone)	IC Bus	3	255
#506 (EB)	Sheffield to Westlake Park and Ride (Sheffield/Avon Zone)	IC Bus	3	255
#507 (WB)	Westlake Park and Ride to Sheffield (Sheffield/Avon Zone)	IC Bus	3	255
#508 (EB)	Cedar Point/Kalahari to Hopkins Airport	IC Bus	13	365
#509 (WB)	Hopkins Airport to Cedar Point/Kalahari	IC Bus	13	365

Modes: IC Bus = Inter-county Bus
Service on 255 days corresponds to weekday (Monday-Friday) Service.

Downtown Cleveland Access

Once arriving at Westlake Park and Ride, commuter bus passengers in Alternative 5 would be able to access downtown via RTA routes #246. RTA provides a total of eleven EB AM and eleven WB PM #246 trips. The nine peak period express bus trips proposed in Alternative 5 (3 trips x 3 zones) would each have a timed transfer to a distinctive #246 trip in order to spread out the number of passengers transferring to the RTA route.

Proposed Stations

The stations proposed for Alternative 5 are shown in Table 6.22. The table lists stations by the type of amenity proposed, which was used to help determine capital costs for each alternative.

Station Types include:

- Station Type A – minor bus station amenities, including signage and ticket vending machine
- Station Type C – major bus station with 100-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.
- Station Type E – major bus station with 200-space park-and-ride facility. Amenities include shelters, benches, trash can, schedule information, and ticket vending machines.

Table 6.22: Proposed Alternative 5 Stations

		Alt 5
County	Station Name	IC Bus
Cuyahoga	Westlake Park and Ride	A
Cuyahoga	Crocker Park P&R	C
Cuyahoga	Hopkins Airport	A
Lorain	Lear-Nagle Road P&R	C
Lorain	SR 83 P&R	C
Lorain	Abbe Road P&R	C
Lorain	Midway Mall P&R	A
Lorain	Lorain (Black River Landing) Station	E
Erie	Vermilion P&R	C
Erie	Huron P&R	C
Erie	Sandusky (US 250)	C
Erie	Downtown Sandusky	A
Erie	Kalahari Resort	A
Erie	Cedar Point	A

Supporting Transit Services

Supporting transit service for Alternative 5 is the same as that detailed for Alternative 4.

Figure 6.13: Main Service for Alternative 5

Chapter 7 – Capital Costs

Introduction

This chapter presents capital cost estimates at a conceptual engineering level for the nine alternatives considered in the detailed screening phase of the Alternatives Analysis. Each cost estimate was prepared using uniform assumptions and unit costs in order to provide a consistent comparison of the alternatives. Costs were formatted into Standard Cost Categories (SCC) as required by the Federal Transit Administration's New Starts Funding Program.

Assumptions Used for All Alternatives

In developing the capital cost estimates, it was necessary to make certain assumptions to address engineering issues that have a significant impact on capital costs. Assumptions were made regarding design matters that have yet to be developed beyond the conceptual engineering level, which is commensurate with this phase of an alternatives analysis. The various assumptions are described in the sections below.

Identified Base Year and Inflation

2010 was identified as the base year for capital costs, largely due to the existence of other recent cost estimates that were developed for projects in the region in 2010 dollars.

For unit costs that were not given in 2010 dollars, an inflation rate was applied to adjust the costs to the identified base year. Construction inflation rates specific to the Cleveland-Akron metropolitan area, published by Engineering News Record, were used to update unit costs. The construction inflation rates are shown in Table 7.1.

Table 7.1: Construction Cost Inflation Rates for Cleveland-Akron Metropolitan Area

			END YEAR										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		CCI	6734	6921	7067	7229	7567	7861	8157	8513	9703	9950	10065
START YEAR	2000	6734	0.0%	2.8%	4.9%	7.4%	12.4%	16.7%	21.1%	26.4%	44.1%	47.8%	49.5%
	2001	6921		0.0%	2.1%	4.5%	9.3%	13.6%	17.9%	23.0%	40.2%	43.8%	45.4%
	2002	7067			0.0%	2.3%	7.1%	11.2%	15.4%	20.5%	37.3%	40.8%	42.4%
	2003	7229				0.0%	4.7%	8.7%	12.8%	17.8%	34.2%	37.6%	39.2%
	2004	7567					0.0%	3.9%	7.8%	12.5%	28.2%	31.5%	33.0%
	2005	7861						0.0%	3.8%	8.3%	23.4%	26.6%	28.0%
	2006	8157							0.0%	4.4%	19.0%	22.0%	23.4%
	2007	8513								0.0%	14.0%	16.9%	18.2%
	2008	9703									0.0%	2.5%	3.7%
	2009	9950										0.0%	1.1%
	2010	10065											0.0%

Unit Costs

Wherever possible, unit costs were derived from recent cost estimates prepared for other projects. In cases where a comparable line item unit cost could not be derived from a recent project, past projects were referenced and inflation rates were applied to adjust the unit costs.

In the few cases where unit costs could not be verified, engineering assumptions, professional judgment and construction experience were used to estimate the costs.

Contingency

Given the conceptual nature of these cost estimates, a 30% contingency was added to the final cost of construction and design services to account for the possibility of unexpected costs and changes during further development of the alternatives. Possibilities may include changes to the cost of materials, construction costs, or other findings that are made in the field.

Commuter Rail Layover and Maintenance Facilities

For all commuter rail alternatives, it was assumed that each train would layover in the city of Cleveland (near Lakefront Station, Tower City, or West Blvd) during the day and return to the outer terminal each evening. Therefore, each commuter rail alternative assumes a small layover facility with a few storage tracks that would allow minor servicing such as interior cleaning.

At the outer terminal of the commuter rail line—either Sandusky or Lorain—a more substantial facility will be needed in order to service trainsets. It was assumed that this yard would be similar to the daytime layover facility but would include a maintenance building, car washer, and offices/welfare areas for crew and administrative staff.

Commuter Rail Vehicles

Trainsets for commuter rail alternatives were assumed to include one locomotive, two trailer cars, and one cab control car (a passenger car that is used to operate the locomotive). Three trainsets would be purchased for the operation of each commuter rail alternative, plus one spare set, for a total of four trainsets. Each trainset is estimated to cost $9.8M.

Commuter Bus Vehicles

For the TSM and commuter bus alternatives, it was assumed that service would be provided using 40-ft commuter coaches. The number of required vehicles for each alternative is provided in a subsequent section of this chapter. Each commuter coach is estimated to cost $800,000.

Local Bus Vehicles

The TSM and all build alternatives include shuttle bus improvements in Lorain and Erie counties to transport passengers to the main commuter service. This service would require the purchase of smaller buses in order to collect and distribute local passengers. Feeder buses for this local service were included in each alternative at an estimated cost of $400,000 per vehicle.

Station Types

Station costs were simplified by assuming that all stations would conform to one of six general station types. Three station types of progressively larger size and cost were developed for both commuter bus and commuter rail alternatives. The larger stations include costs for park-and-ride lots and facilities.

Estimated costs for each station type are listed below. These costs do not include contingency or design fees; these are included in the contingency and design costs for the total project.

Commuter Bus Station Types

Station Type A – Minor bus station amenities, including signage and ticket vending machine. The estimated cost is $170,000.

Station Type C – Major bus station with a 100-space park-and-ride facility. Amenities include shelters, benches, trash cans, am information kiosk, and ticket vending machines. The estimated cost is $1,100,000.

Station Type E – Major bus station with a 200-space park-and-ride facility. Amenities include shelters, benches, trash cans, an information kiosk, and ticket vending machines. The estimated cost is $1,500,000.

Commuter Rail Station Types

Station Type B – Minor rail station/upgrade to existing station facilities. New amenities will include signage and ticket vending machines. The estimated cost is $500,000.

Station Type D – Major rail station with a 100-space park-and-ride facility. Amenities include platforms, benches, trash cans, an information kiosk, and ticket vending machines. The estimated cost is $1,200,000.

Station Type F – Major rail station with a 200-space park-and-ride facility, either structured or surface parking. Amenities include platforms, benches, trash cans, an information kiosk, and ticket vending machines. The estimated cost is $1,600,000.

In some cases more specific costs were used in place of the archetypal station costs, in particular for the commuter rail stations where locations were better defined than for the commuter bus stations. For example, the proposed commuter rail station site in Lakewood is highly constrained. As a result, the cost for this station was estimated to include a 200-space parking garage, which would exceed the estimated cost for a Type F station listed above. Although the cost for the Lakewood station is assumed to be greater than the Type F estimated cost, the station is counted as a Type F station in order to reflect the appropriate level of amenities associated with the station.

Right of Way Acquisition

Right of way (ROW) acquisition will require interaction and coordination with numerous individual property owners. As a result, the cost of ROW acquisition can be highly variable. The conceptual nature of the design in the alternatives analysis phase and the existence of multiple site options for park-and-ride and station developments further obscures cost estimates for ROW acquisition. Consequently, multiple conservative assumptions were used to estimate costs for ROW acquisition in order to account for the worst-case scenario.

ROW acquisition costs were estimated by first assuming that all takings would be partial and would not involve any relocation. The next step in the cost estimation was to differentiate between takings of constrained and unconstrained properties. A taking of an unconstrained property, generally considered to be a greenfield or undeveloped property, was assumed to cost significantly less than a constrained property because it would not affect the use of the property. Costs of takings on unconstrained properties were estimated based on the following assumptions:

- The cost of the taking is $100,000 per acre.
- There are no relocation costs.
- A 40% contingency was added to the cost of acquisition.

A taking of a constrained or developed property was assumed to cost significantly more, not only because the land value is higher, but because it may affect the use of the property. Costs of takings on constrained properties were estimated based on the following assumptions:

- The cost of the taking is $330,000 per acre.
- There are no relocation costs.
- A 40% contingency was added to the cost of acquisition.

Capital Costs by Alternative

The following section describes the conceptual engineering development of each alternative and the associated capital cost estimates. Table 7.2 provides a summary of total capital costs by alternative for the TSM Baseline and eight build alternatives. The alternatives are described in greater detail and illustrated with maps and diagrams in Chapter 6 of this document.

The detailed line item summary of each alternative can be found in Appendix A7 to this chapter.

Table 7.2: Capital Cost Summary (2010 $)

	Estimated Capital Cost (in millions)
TSM Baseline	$23.7
Alternative 1A	$378.0
Alternative 1C	$193.1
Alternative 2A	$371.4
Alternative 2C	$186.6
Alternative 3A	$339.4
Alternative 3C	$157.2
Alternative 4	$35.3
Alternative 5	$35.3

TSM Baseline Alternative

The capital cost estimate for the TSM Baseline alternative includes construction of proposed park-and-ride stations as well as the cost of vehicles to operate the proposed TSM bus service.

Stations

The station capital costs include four Type A stations, seven Type C stations, and one Type E station.

Vehicle Improvements

The vehicles used to operate the TSM service were assumed to be 40-ft. commuter coaches at $800,000 per bus. A total of six vehicles (five in peak operation and one spare) would be required to operate this service.

Seven additional buses would be required for local bus improvements, including three in Erie County (two in service and one spare) and four in Lorain County (three in service and one spare).

Total Cost of TSM Baseline Alternative: $23.7M (2010$)

A more detailed capital cost summary for the TSM Alternative can be found in Appendix A7.

Alternative 1A – Sandusky to Lakefront Station Commuter Rail

The capital cost estimate for Alternative 1A includes development of commuter rail between Lakefront Station in Cleveland and the Amtrak station in Sandusky, along with supplemental bus service during offpeak periods.

Commuter rail would be operated on segments of three railroad subdivisions. From the Lakefront station to West Blvd. the service would be operated on the Norfolk Southern (NS) Chicago Line. This is a heavily used freight corridor that would likely require infrastructure improvements to prevent any capacity impacts to freight and passenger operations. Improvements included in the capital cost estimate are roughly three miles of new track, crossovers, bridge work, and signaling.

From West Blvd. to Vermilion the service would be operated on the NS-owned Nickel Plate railroad. This corridor is not as heavily used as the Chicago Line, but does have some freight traffic. Improvements needed to operate passenger service on this segment include upgrades to the signal system and railroad crossings.

From Vermilion to Sandusky the service would again be operated on the NS Chicago Line. Similar to the Lakefront-West Blvd. segment, necessary improvements include a new (third)

track, crossovers, bridge work, and signaling. This segment would also require crossing improvements.

Alternative 1A would also require connections that allow movement between the Chicago Line and Nickel Plate. These improvements are largely track and signal related.

Stations

The capital cost estimates for commuter rail stations include four Type B stations, seven Type D stations, and two Type F stations. The cost estimates also include four Type A stations for the supplemental bus service.

Vehicle Improvements

Four trainsets would be required to operate the commuter rail service (three in peak operation and one spare). The supplemental commuter bus service would require five commuter bus coaches (four in operation and one spare). Seven additional buses would be required for local bus improvements, including three in Erie County (two in service and one spare) and four in Lorain County (three in service and one spare).

Total cost of Alternative 1A: $378.0M (2010$)

A more detailed capital cost summary for Alternative 1A can be found in Appendix A7.

Alternative 1C – Lorain to Lakefront Station Commuter Rail

The capital cost estimate for Alternative 1Cincludes development of commuter rail between Lakefront Station in Cleveland and Black River Landing in Lorain, as well as supplemental bus service operating between Sandusky and Lorain during peak periods and the entire corridor during offpeak periods.

The cost estimate for Alternative 1C is similar to Alternative 1A, but does not include the rail improvements on the Sandusky-Lorain segment. Commuter bus amenities between Sandusky and Lorain are included instead.

Stations

The capital cost estimates for commuter rail stations include four Type B stations, four Type D stations and two Type F stations. The cost estimates also include five Type A stations and three Type C stations related to the supplemental bus service.

Vehicle Improvements

Four trainsets would be required to operate the commuter rail service (three in peak operation and one spare). The supplemental commuter bus service would require six commuter bus

coaches (five in peak operation and one spare). Seven additional buses would be required for local bus improvements, including three in Erie County (two in service and one spare) and four in Lorain (three in service and one spare).

Alternative 2A –Sandusky to Tower City Commuter Rail

The capital cost estimate for Alternative 2A includes development of commuter rail between Tower City in Cleveland and the Amtrak station in Sandusky, along with supplemental bus service during offpeak periods.

Commuter rail improvements between Sandusky and West Boulevard would be the same as those described for Alternative 1A. To the east of West Blvd., capital costs for Alternatives 1A and 2A diverge due to differing alignment. From West Blvd. to Tower City, commuter rail would be operated on the NS-owned Nickel Plate railroad and then on RTA-owned right of way, including a viaduct over the Cuyahoga River Valley. There are no longer tracks on portions of this alignment, so new tracks would need to be constructed. Furthermore, sections of RTA track would need to be reconfigured to make space available for commuter rail tracks. The station at Tower City also poses an infrastructural challenge, as the tracks would need to be elevated along Canal Street to reach the potential station location.

Stations

The capital cost estimates for commuter rail stations include four Type B station, seven Type D stations, and two Type F stations. The cost estimates also include four Type A stations for the supplemental bus service.

Vehicle Improvements

Four trainsets would be required to operate the commuter rail service (three in peak operation and one spare). The supplemental commuter bus service would require five commuter bus coaches (four in peak operation and one spare). Seven additional buses would be required for local bus improvements, including three in Erie County (two in service and one spare) and four in Lorain (three in service and one spare).

Total cost of Alternative 2A: $371.4M (2010$)

A more detailed capital cost summary for Alternative 2A can be found in Appendix A7.

Alternative 2C – Lorain to Tower City Commuter Rail

The capital cost estimate for Alternative 2C includes development of commuter rail between Tower City in Cleveland and Black River Landing in Lorain, along with supplemental bus service between Sandusky and Lorain during peak periods and the entire corridor during offpeak periods.

The cost estimate for Alternative 2C is similar to Alternative 2A, but does not include the rail improvements on the Sandusky-Lorain segment. Commuter bus amenities between Sandusky and Lorain are included instead.

Stations

The capital cost estimates for commuter rail stations include four Type B stations, four Type D stations, and two Type F stations. The cost estimates also include five Type A stations and three Type C stations related to the supplemental bus service.

Vehicle Improvements

Four trainsets would be required to operate the commuter rail service (three in peak operation and one spare). The supplemental commuter bus service would require six commuter bus coaches (five in peak operation and one spare). Seven additional buses would be required for local bus improvements, including three in Erie County (two in service and one spare) and four in Lorain (three in service and one spare).

Total cost of alternative 2C: $186.6M (2010$)

A more detailed capital cost summary for Alternative 2C can be found in Appendix A7.

Alternative 3A – Sandusky to West Blvd Commuter Rail

The capital cost estimate for Alternative 3A includes development of commuter rail between West Blvd. in Cleveland and the Amtrak station in Sandusky, along with supplemental bus service between West Blvd. and downtown Cleveland during peak periods. Bus service is also proposed to serve the entire corridor during offpeak periods.

Commuter trains would be operated on the NS-owned Nickel Plate railroad from West Blvd. to Vermilion. This corridor is not heavily used by freight traffic, but would require some upgrades and improvements to accommodate passenger rail service. Improvements include upgrades to the signal system and railroad crossings.

From Vermilion to Sandusky, the commuter rail service would be operated on the NS Chicago Line. Improvements to this segment would include a new (third) track, crossovers, bridge work, and signaling. This segment would also require crossing improvements.

Alternative 3A would require a connection that allows movement between the Chicago Line and Nickel Plate in Vermilion. These improvements would be largely track and signal related.

Stations

The capital cost estimates for commuter rail stations include three Type B stations, seven Type D stations and two Type F stations. The cost estimates also include six Type A stations related to the supplemental bus service.

Vehicle Improvements

Four trainsets would be required to operate the commuter rail service (three in peak operation and one spare). The supplemental commuter bus service would require six commuter bus coaches (five in peak operation and one spare). Seven additional buses would be required for local bus improvements, including three in Erie County (two in service and one spare) and four in Lorain (three in service and one spare).

Total cost of Alternative 3A: $339.4M (2010$)

A more detailed capital cost summary for Alternative 3A can be found in Appendix A7.

Alternative 3C –Lorain to West Blvd Commuter Rail

The capital cost estimate for Alternative 3C includes development of commuter rail between West Blvd. in Cleveland and Black River Landing in Lorain, along with supplemental bus service connecting Sandusky to Lorain and West Blvd. to Public Square during peak periods. Bus service is also proposed to serve the entire corridor during offpeak periods.

The cost estimate for Alternative 3C is similar to Alternative 3A, but does not include the rail improvements on the Sandusky-Lorain segment. Commuter bus amenities between Sandusky and Lorain are included instead.

Stations

The capital cost estimates for commuter rail stations include three Type B stations, four Type D stations and two Type F stations. The cost estimates also include seven Type A stations and three Type C stations related to the supplemental bus service.

Vehicle Improvements

Four trainsets would be required to operate the commuter rail service (three in peak operation and one spare). The supplemental commuter bus service would require ten commuter bus coaches (eight in peak operation and two spares). Seven additional buses would be required for local bus improvements, including three in Erie County (two in service and one spare) and four in Lorain (three in service and one spare).

Total cost of alternative 3C: $157.2M (2010$)

A more detailed capital cost summary for Alternative 3C can be found in Appendix A7.

Alternatives 4 and 5

The capital cost estimates for Alternatives 4 and 5 are identical because these alternatives only differ with respect to their eastern terminals, Public Square and Westlake Park-N-Ride, neither of which would require capital improvements.

The capital cost estimates for Alternatives 4 and 5 each include construction of proposed commuter bus park-and-ride stations as well as the cost of vehicles to operate the proposed bus service.

Stations

The station capital costs included six Type A stations, seven Type C stations and one Type E station.

Vehicle Improvements

For Alternatives 4 and 5, the commuter bus services would require 13 commuter bus coaches (eleven in peak operation and two spares). The local bus improvements would require seven additional buses, including three in Erie County (two in service and one spare) and four in Lorain (three in service and one spare).

Total cost of Alternatives 4 and 5: $35.3M (2010$)

A more detailed capital cost summary for the Alternatives 4 and 5 can be found in Appendix A7.

Chapter 8 – Operations and Maintenance Costs

Introduction

This chapter presents the estimated operation and maintenance (O&M) costs for the nine alternatives considered in the detailed screening phase of the Westshore Corridor Transportation Project alternatives analysis. The chapter has two sections, Cost Models and Forecast Results. The first section, Cost Models, explains the cost variables determined for the five transit modes considered in the detailed alternatives: inter-county commuter rail, GCRTA local bus, inter-county commuter bus, LCT local bus, and Sandusky local bus. The second section, Forecast Results, applies the cost variables to the specific service levels estimated for each alternative.

Each cost estimate was prepared using uniform assumptions and unit costs in order to provide a consistent comparison of the alternatives. The result is an estimated O&M cost for each alternative, including the cost of operating inter-county transit service and local supporting service.

Cost Models

The Cost Models section describes the process used to determine cost variables applied for each of the transit modes considered in the detailed alternatives. The methodology for each cost model varies and is mostly dependent on whether the mode exists within the Cleveland region and how the local agency pays for the service. For example, the costs for GCRTA local bus were estimated using FTA's cost allocation model for O&M costs because GCRTA's costs are paid out and reported directly by the agency. Thus, data was readily available. In contrast, the model for commuter rail was estimated based on O&M costs in other regions because commuter rail is not operated in Northeast Ohio.

Inter-county Commuter Rail

Commuter rail is not currently operated within the Cleveland region so the preferred methodology to estimate O&M costs would be to use a comparable system within the US. However, most comparable agencies contract their service to private operators and the details of these private agreements difficult to obtain and even then may not be applicable to commuter rail operated in Northeast Ohio.

The cost model for inter-county commuter rail uses a four variable methodology for O&M costs as determined from a number of sources. Variables include:

- Cost per passenger car revenue miles – a cost of $10.00 per passenger car revenue mile was used to represent the negotiated rate of a third-party operating commuter rail in the Westshore corridor. This amount is similar to costs used in for a commuter rail study in Detroit[2].

[2] Detroit-Ann Arbor Alternatives Analysis, Operations and Maintenance Cost Methodology, May 2006

- Cost per peak passenger car – a cost of $90,000 per peak passenger car was used to estimate the cost of vehicle maintenance. This cost is based on a negotiated rate to a third-party instead of a commuter rail agency maintaining vehicles themselves. This amount is similar to costs used for a commuter rail study in Detroit.

- Administrative cost – an annual cost of $4,000,000 per year was assigned for the administration of the inter-county rail agency. This cost would include managing a private operator, managing all stations, and coordination with all levels of government. The administrative cost was assumed to be consistent an inter-county agency in all bus and rail alternatives in order to objectively compare alternatives.

- Station Costs – a cost of $215,000 per station was estimated to maintain commuter rail stations. The cost includes general maintenance, ticket vending machine maintenance, security, and utilities, as shown in Table 8.1.

Table 8.1: Commuter Rail Station Costs

	No. of workers	*Rate*	*Fringe*	*Annual Hours*	*Cost*	*Supplies*	*TOTAL COST*	*Stations Covered*	*Cost per station*
Maintenance	1	$24.00	$11.52	2205	$78,314	$25,000	$103,314	1	$105,000
Ticket Vending Machines	2	$27.00	$12.96	2205	$176,208	$50,000	$226,208	5	$46,000
Security	2	$24.00	$11.52	2205	$156,629	$0	$156,629	4	$40,000
	Kw-hr	*Rate*			*Cost*			*Stations Covered*	*Cost per station*
Utilities	150000	0.16			$24,000		$24,000	1	$24,000
ESTIMATED TOTAL									$215,000

GCRTA Local Bus

This section explains the methodology of the operations and maintenance cost estimates for GCRTA local bus components used in the TSM and all eight Build Alternatives. The methodology described herein generally follows the FTA Guidance on O&M cost estimation[3].

The following steps were used to develop the model.

Step 1: Selection of Key Driving Supply Variables

The GCRTA local bus operations and maintenance costs were estimated using a resource build-up model in which labor and materials costs are calculated as a function of supply variables.

For GCRTA local bus, the following supply variables were assigned:

- Vehicle Revenue Hours – driven by costs associated with vehicle operations labor
- Vehicle Revenue Miles – driven by costs associated with materials and supplies for vehicle operations, along with labor, materials, and supplies for vehicle and non-vehicle maintenance
- Peak Vehicles – driven by costs associated with general administration

Several assumptions were made regarding the assignment of supply variables:

- Vehicle operations, which include bus operators, management, and services, were calculated as a function of the number of vehicle hours operated.
- Most of the costs of bus operations, like fuel, tires, utilities and insurance, were calculated as a function of the number of revenue miles. Taxes, miscellaneous expenses, and expense transfers for vehicle operations were calculated as a function of the number of peak vehicles because these costs are more aligned with the size of an organization than the level of service.
- All vehicle maintenance costs, including labor, and all other materials and supplies, were calculated as a function of vehicle miles. This is because maintenance requirements increase with the number of miles of service operated. The only exception was taxes and expense transfers, which were calculated as a function of the number of peak vehicles.
- All non-vehicle maintenance costs, including labor, materials and supplies, were calculated as a function of the number of peak vehicles. These costs are more aligned with the size of

[3] Procedures and Technical Methods for Transit Project Planning – Chapter 4: Estimation of Operation and Maintenance Costs (April 2008 Draft) , Federal Transit Administration, http://www.fta.dot.gov/printer_friendly/planning_environment_2396.html

an organization than the level of service. The only exception was casualty and liability, which was calculated as a function of the number of revenue miles.

- All general administration costs, including labor, materials, and supplies, were calculated as a function of the number of peak vehicles. This is because general administration costs are more closely aligned with the size of an organization than the level of service. The only exception was casualty and liability, which was calculated as a function of the number of revenue miles.

Step 2: Data Assembled

Financial data for the local bus cost model is from the GCRTA's National Transit Database (NTD) submittal for Fiscal Year (FY) 2009, as this is the most current data available for use within this O&M model. The NTD submittal data is consistent with GCRTA's internal costs as submitted each year to NTD. This fulfills the requirements of the FTA's guidance on O&M cost models, that they must be based on the agency's financial data, while ensuring that the data is presented in the cost categories that fit the O&M cost model, which is based on the general cost categories presented in the NTD.

Disaggregation of Union and Management Wages
One limitation of using NTD data is that the line items include some aggregation, meaning that they can have many costs combined under one general category. This can be an issue for management and union wages, which sometimes are aggregated within the various NTD cost categories. In this case, GCRTA's wages for union represented employees are included in the Vehicle Operations, Vehicle Maintenance, and Non-Vehicle Maintenance cost categories. GCRTA's Management wages are found almost entirely within the General Administration (GA) cost category, with less than 1% of GA wages representing the non-management workforce.

Disaggregating the costs associated with each line item makes the information more transparent and easier to understand the overall construction of the model.

Allocation of Local Bus and Bus Rapid Transit Costs
GCRTA's NTD data for the motor bus (MB) mode includes both local bus and HealthLine BRT costs. As a result, the total MB costs need to be accurately allocated between the two modes.

The allocation was based on the ratio of revenue miles operated by the HealthLine to total bus revenue miles operated by the NTD MB mode. GCRTA operated 768,043 BRT revenue miles in FY 2009 (as reported to NTD in form FFA-10). GCRTA operated 17,042,385 revenue miles for the total MB mode in FY 2009. This means that BRT accounted for approximately 4.51% of the motor bus costs, while the local bus system accounted for the 95.49% of motor bus costs. These percentages were used to account for costs in all NTD cost categories for this Local Bus O&M Model as well as the BRT O&M model found later in this chapter. Table 8.2 shows the allocation of total MB costs to local bus and BRT modes.

Table 8.2: Allocation of Total Motor Bus Costs into Local Bus and BRT Modes

	Total MB Cost	Local Bus Network	Healthline BRT
Vehicle Operations Labor			
Operator Salaries and Wages	42,422,601	40,510,757	1,911,844
Other Salaries and Wages	10,461,095	9,989,649	471,446
Fringe Benefits	28,366,465	27,088,084	1,278,381
Services	898,317	857,833	40,484
Vehicle Operations Materials and Supplies			
Fuel and Lubricants	16,272,527	15,539,179	733,348
Tires and Tubes	881,985	842,237	39,748
Other Materials/Supplies	178,859	170,798	8,061
Utilities	-	-	-
Casualty and Liability	-	-	-
Taxes	-	-	-
Miscellaneous	33,262	31,763	1,499
Expense Transfers	-	-	-
Vehicle Maintenance Labor			
Other Salaries and Wages	14,247,054	13,604,987	642,067
Fringe Benefits	8,487,831	8,105,313	382,518
Services	401,764	383,658	18,106
Vehicle Maintenance Materials and Supplies			
Fuel and Lubricants	234,780	224,199	10,581
Tires and Tubes	97,985	93,569	4,416
Other Materials/Supplies	5,833,758	5,570,850	262,908
Utilities	-	-	-
Casualty & Liability	916,400	875,101	41,299
Taxes	1,270,950	1,213,673	57,277
Miscellaneous	1,070	1,022	48
Expense Transfer	-	-	-
Non-Vehicle Maintenance Labor			
Other Salaries and Wages	2,895,829	2,765,324	130,505
Fringe Benefits	1,715,512	1,638,200	77,312
Services	949,728	906,927	42,801
Non-Vehicle Maintenance Materials and Supplies			
Fuel and Lubricants	-	-	-
Tires and Tubes	-	-	-
Other Materials/Supplies	486,253	464,339	21,914
Utilities	-	-	-
Casualty & Liability	985,986	941,551	44,435
Taxes	-	-	-
Miscellaneous	1,638	1,564	74
Expense Transfer	-	-	-
General Administration			
Other Salaries and Wages	10,911,192	10,419,461	491,731
Fringe Benefits	7,273,885	6,946,075	327,810
Services	3,604,832	3,442,374	162,458
Fuel and Lubricants	-	-	-
Tires and Tubes	-	-	-
Other Materials and Supplies	273,220	260,907	12,313
Utilities	4,205,363	4,015,841	189,522
Casualty and Liability	1,633,548	1,559,929	73,619
Taxes	211,949	202,397	9,552
Miscellaneous Expense	476,678	455,196	21,482
Expense Transfers	-	-	-
TOTAL	$166,632,316	$159,122,758	$7,509,558

Step 3: Assignment of Expense Items to Key Driving Variables

Once the FY 2009 cost data was assembled, the costs were assigned to the various cost supply variables as identified in Step 1. Table 8.3 details the categories to which each cost was assigned, revenue hours, revenue miles, or peak vehicles.

Step 4: Calculation of Unit Costs and Productivity Ratios

The base year model is calculated by dividing each line item cost by the base year supply units. For this local bus model the base year is FY 2009 since this is the only year of operating data used in the model.

Productivity ratios are defined as the ratio of resource variables to supply variables.

The methodology for calculating the productivity ratios included:

1. Determining a resource variable for each line item. In many cases the resource variable may be the same as the supply unit variable.

2. Calculating the resource to supply ratio for each line item.

3. Determining the cost per resource unit

Table 8.3: Assignment of Expense Items for GCRTA Local Bus Cost Model

	Annual Expense	Assignment of Expense Items		
		Revenue Hours	Revenue Miles	Peak Vehicles
Vehicle Operations Labor				
Operator Salaries and Wages	40,510,757	X		
Other Salaries and Wages	9,989,649	X		
Fringe Benefits	27,088,084	X		
Services	857,833	X		
Vehicle Operations Materials and Supplies				
Fuel and Lubricants	15,539,179		X	
Tires and Tubes	842,237		X	
Other Materials/Supplies	170,798		X	
Utilities	-		X	
Casualty and Liability	-		X	
Taxes	-			X
Miscellaneous	31,763			X
Expense Transfers	-			X
Vehicle Maintenance Labor				
Other Salaries and Wages	13,604,987		X	
Fringe Benefits	8,105,313		X	
Services	383,658		X	
Vehicle Maintenance Materials and Supplies				
Fuel and Lubricants	224,199		X	
Tires and Tubes	93,569		X	
Other Materials/Supplies	5,570,850		X	
Utilities	-		X	
Casualty & Liability	875,101		X	
Taxes	1,213,673			X
Miscellaneous	1,022		X	
Expense Transfer	-			X
Non-Vehicle Maintenance Labor				
Other Salaries and Wages	2,765,324			X
Fringe Benefits	1,638,200			X
Services	906,927			X
Non-Vehicle Maintenance Materials and Supplies				
Fuel and Lubricants	-			X
Tires and Tubes	-			X
Other Materials/Supplies	464,339			X
Utilities	-			X
Casualty & Liability	941,551		X	
Taxes	-			X
Miscellaneous	1,564			X
Expense Transfer	-			X
General Administration				
Other Salaries and Wages	10,419,461			X
Fringe Benefits	6,946,075			X
Services	3,442,374			X
Fuel and Lubricants	-			X
Tires and Tubes	-			X
Other Materials and Supplies	260,907			X
Utilities	4,015,841			X
Casualty and Liability	1,559,929		X	
Taxes	202,397			X
Miscellaneous Expense	455,196			X
Expense Transfers	-			X

After the cost per resource unit was calculated, it was then checked in order to determine if the number is reasonable. For example, the cost per work hour for bus vehicle operations labor is calculated to be $22.89. This number was multiplied by 2,080 work hours in a year in order to estimate the annual salary for a bus operator. In this case, GCRTA pays an average operator salary of $47,611. Average salaries and wages for GCRTA management were also reviewed for reasonableness. The estimated General Administration management wage of $31.71 calculates to an average annual salary of $65,956, which appears reasonable when considering it accounts for all local bus management staff at GCRTA.

Based on proposed changes to the mode, the productivity ratios within the cost model are sometimes adjusted in order to account for changes to a specific line item cost. For this GCRTA Local Bus cost model, the productivity ratios were not modified, i.e., it was assumed that the productivities of the future local bus system will be the same as productivities of the existing local bus system.

Table 8.4 shows the calculation of the base year model and the productivity ratios.

Step 5: Apply Inflation

Inflation was then applied to the line item costs of the bus model in order to show costs in 2010 dollars, shown in Table 8.5. The inflation rate applied to most line items was based on the annual increase in the Consumer Price Index for the Cleveland-Akron Metropolitan area between 2009 and 2010, which is 2.04 percent.

Beyond CPI, a separate inflation rate was calculated for fuel and lubricant based since this line item has the most potential for volatility of all bus cost model line items. The fuel and lubricant inflation rate was calculated on the 2007-2010 CAGR for diesel fuel rates as supplied by the Energy Information Administration. This inflation rate is 1.23 percent.

Step 6: Calculation of Local Bus Unit Costs

The three supply unit costs were then calculated by summing the individual line item costs for their respective supply unit (e.g., cost per revenue hour included the line item cost for vehicle operations operator salaries and wages, fringe benefits, etc.). Table 8.6 shows this calculation as well as the resulting unit costs.

The three supply unit costs (in 2010 dollars) were as follows:

- $3.00 X number of annual vehicle miles
- $58.31 X number of annual vehicle revenue hours
- $82,549 X number of buses operated during peak

Table 8.4: Base Year (FY2009) Fully Allocated Local Bus Cost Model and Productivity Ratios

		Supply Variable Unit Cost Rate			Productivity Ratio				
	Annual Expense	Revenue Hours	Revenue Miles	Peak Vehicles	Supply Value	Resource Variable	Resource Value	Resource/ Supply	Resource Unit Cost
Vehicle Operations Labor									
Operator Salaries and Wages	40,510,757	$29.51			1,372,686	VO Work Hours	1,769,947	1.2894	$22.89
Other Salaries and Wages	9,989,649	$7.28			1,372,686	VO Work Hours	436,456	0.3180	$22.89
Fringe Benefits	27,088,084	$19.73			1,372,686	VO Work Hours	2,206,402	1.6074	$12.28
Services	857,833	$0.62			1,372,686	Revenue Hours	1,372,686	1.0000	$0.62
Vehicle Operations Materials and Supplies									
Fuel and Lubricants	15,539,179		$0.95		16,274,342	Gallons	4,720,505	0.2901	$3.29
Tires and Tubes	842,237		$0.05		16,274,342	Revenue Miles	16,274,342	1.0000	$0.05
Other Materials/Supplies	170,798		$0.01		16,274,342	Revenue Miles	16,274,342	1.0000	$0.0105
Utilities	-		$0.00		16,274,342	Revenue Miles	16,274,342	1.0000	$0.00
Casualty and Liability	-		$0.00		16,274,342	Revenue Miles	16,274,342	1.0000	$0.00
Taxes	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
Miscellaneous	31,763			$78.43	405	Peak Vehicles	405	1.0000	$78.43
Expense Transfers	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
Vehicle Maintenance Labor									
Union Salaries and Wages	13,604,987		$0.84		16,274,342	VM Work Hours	563,034	0.0346	$24.16
Fringe Benefits	8,105,313		$0.50		16,274,342	VM Work Hours	563,034	0.0346	$14.40
Services	383,658		$0.02		16,274,342	Revenue Miles	16,274,342	1.0000	$0.02
Vehicle Maintenance Materials and Supplies									
Fuel and Lubricants	224,199		$0.01		16,274,342	Revenue Miles	16,274,342	1.0000	$0.01
Tires and Tubes	93,569		$0.01		16,274,342	Revenue Miles	16,274,342	1.0000	$0.01
Other Materials/Supplies	5,570,850		$0.34		16,274,342	Revenue Miles	16,274,342	1.0000	$0.34
Utilities	-		$0.00		16,274,342	Revenue Miles	16,274,342	1.0000	$0.00
Casualty & Liability	875,101		$0.05		16,274,342	Revenue Miles	16,274,342	1.0000	$0.05
Taxes	1,213,673			$2,996.72	405	Peak Vehicles	405	1.0000	$2,996.72
Miscellaneous	1,022		$0.00		16,274,342	Revenue Miles	16,274,342	1.0000	$0.00
Expense Transfer	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
Non-Vehicle Maintenance Labor									
Union Salaries and Wages	2,765,324			$6,827.96	405	NVM Work Hours	125,525	309.9384	$22.03
Fringe Benefits	1,638,200			$4,044.94	405	NVM Work Hours	125,525	309.9384	$13.05
Services	906,927			$2,239.33	405	Peak Vehicles	405	1.0000	$2,239.33
Non-Vehicle Maintenance Materials and Supplies									
Fuel and Lubricants	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
Tires and Tubes	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
Other Materials/Supplies	464,339			$1,146.52	405	Peak Vehicles	405	1.0000	$1,146.52
Utilities	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
Casualty & Liability	941,551		$0.06		16,274,342	Revenue Miles	16,274,342	1.0000	$0.06
Taxes	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
Miscellaneous	1,564			$3.86	405	Peak Vehicles	405	1.0000	$3.86
Expense Transfer	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
General Administration									
Management Salaries and Wages	10,419,461			$25,727.06	405	GA Work Hours	328,614	811.3916	$31.71
Fringe Benefits	6,946,075			$17,150.80	405	GA Work Hours	328,614	811.3916	$21.14
Services	3,442,374			$8,499.69	405	Peak Vehicles	405	1.0000	$8,499.69
Fuel and Lubricants	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
Tires and Tubes	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00
Other Materials and Supplies	260,907			$644.21	405	Peak Vehicles	405	1.0000	$644.21
Utilities	4,015,841			$9,915.66	405	Peak Vehicles	405	1.0000	$9,915.66
Casualty and Liability	1,559,929		$0.10		16,274,342	Revenue Miles	16,274,342	1.0000	$0.10
Taxes	202,397			$499.75	405	Peak Vehicles	405	1.0000	$499.75
Miscellaneous Expense	455,196			$1,123.94	405	Peak Vehicles	405	1.0000	$1,123.94
Expense Transfers	-			$0.00	405	Peak Vehicles	405	1.0000	$0.00

	Units
Revenue Hours	1,372,686
Revenue Miles	16,274,342
Peak Vehicles	405
Gallons	4,720,505
Vehicle Operations - Work Hours	2,206,402
Vehicle Maintenance - Work Hours	563,034
Non-Vehicle Maintenance - Work Hours	125,525
GA - Work Hours	328,614

Cost per Revenue Hour	$57.15
Cost per Revenue Mile	$2.94
Cost per Peak Vehicle	$80,899

Table 8.5: Bus Cost Model Inflation Rates for 2009-2010

Vehicle Operations Labor	Inflation Rate	Source
Operator Salaries and Wages	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Other Salaries and Wages	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Fringe Benefits	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Services	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Vehicle Operations Materials and Supplies		
Fuel and Lubricants	**1.23%**	2007-2010 CGAR Type 2 Diesel (from EIA)
Tires and Tubes	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Other Materials/Supplies	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Utilities	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Casualty and Liability	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Taxes	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Miscellaneous	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Expense Transfers	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Vehicle Maintenance Labor		
Other Salaries and Wages	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Fringe Benefits	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Services	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Vehicle Maintenance Materials and Supplies		
Fuel and Lubricants	**1.23%**	2007-2010 CGAR Type 2 Diesel (from EIA)
Tires and Tubes	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Other Materials/Supplies	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Utilities	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Casualty & Liability	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Taxes	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Miscellaneous	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Expense Transfer	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Non-Vehicle Maintenance Labor		
Other Salaries and Wages	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Fringe Benefits	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Services	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Non-Vehicle Maintenance Materials and Supplies		
Fuel and Lubricants	**1.23%**	2007-2010 CGAR Type 2 Diesel (from EIA)
Tires and Tubes	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Other Materials/Supplies	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Utilities	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Casualty & Liability	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Taxes	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Miscellaneous	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Expense Transfer	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
General Administration		
Other Salaries and Wages	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Fringe Benefits	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Services	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Fuel and Lubricants	**1.23%**	2007-2010 CGAR Type 2 Diesel (from EIA)
Tires and Tubes	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Other Materials and Supplies	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Utilities	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Casualty and Liability	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Taxes	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Miscellaneous Expense	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area
Expense Transfers	**2.04%**	2009-10 CPI for Cleveland-Akron Metro Area

Table 8.6: GCRTA Local Bus Cost Model (in 2010$)

	Expense Category	Productivity Ratio: Resource Variable	Productivity Ratio: Resource Value	Productivity Ratio: Resource/ Supply	Resource Unit Cost (2009$)	2009 Supply Unit Cost	2009-2010 Inflation	2010 Supply Unit Cost
Vehicle Operations Labor								
Operator Salaries and Wages	Revenue Hours	Work Hours	1,769,947	1.29	$22.89	$29.51	2.04%	$30.11
Other Salaries and Wages	Revenue Hours	Work Hours	436,456	0.32	$22.89	$7.28	2.04%	$7.43
Fringe Benefits	Revenue Hours	Work Hours	2,206,402	1.61	$12.28	$19.73	2.04%	$20.14
Services	Revenue Hours	Revenue Hours	1,372,686	1.00	$0.62	$0.62	2.04%	$0.64
Vehicle Operations Materials and Supplies								
Fuel and Lubricants	Revenue Miles	Revenue Miles	4,720,505	0.29	$3.29	$0.95	1.23%	$0.97
Tires and Tubes	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.05	$0.05	2.04%	$0.05
Other Materials/Supplies	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.01	$0.01	2.04%	$0.01
Utilities	Revenue Miles	kw-Hr	16,274,342	1.00	$0.00	$0.00	2.04%	$0.00
Casualty and Liability	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.00	$0.00	2.04%	$0.00
Taxes	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	2.04%	$0.00
Miscellaneous	Peak Vehicles	Peak Vehicles	405	1.00	$78.43	$78.43	2.04%	$80.03
Expense Transfers	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	2.04%	$0.00
Vehicle Maintenance Labor								
Other Salaries and Wages	Revenue Miles	Work Hours	563,034	0.03	$24.16	$0.84	2.04%	$0.85
Fringe Benefits	Revenue Miles	Work Hours	563,034	0.03	$14.40	$0.50	2.04%	$0.51
Services	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.02	$0.02	2.04%	$0.02
Vehicle Maintenance Materials and Supplies								
Fuel and Lubricants	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.01	$0.01	1.23%	$0.01
Tires and Tubes	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.01	$0.01	2.04%	$0.01
Other Materials and Supplies	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.34	$0.34	2.04%	$0.35
Utilities	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.00	$0.00	2.04%	$0.00
Casualty & Liability	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.05	$0.05	2.04%	$0.05
Taxes	Peak Vehicles	Peak Vehicles	405	1.00	$2,996.72	$2,996.72	2.04%	$3,057.86
Miscellaneous	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.00	$0.00	2.04%	$0.00
Expense Transfer	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	2.04%	$0.00
Non-Vehicle Maintenance Labor								
Other Salaries and Wages	Peak Vehicles	Work Hours	125,525	309.94	$22.03	$6,827.96	2.04%	$6,967.25
Fringe Benefits	Peak Vehicles	Work Hours	125,525	309.94	$13.05	$4,044.94	2.04%	$4,127.45
Services	Peak Vehicles	Peak Vehicles	405	1.00	$2,239.33	$2,239.33	2.04%	$2,285.01
Non-Vehicle Maintenance Materials and Supplies								
Fuel and Lubricants	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	1.23%	$0.00
Tires and Tubes	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	2.04%	$0.00
Other Materials and Supplies	Peak Vehicles	Peak Vehicles	405	1.00	$1,146.52	$1,146.52	2.04%	$1,169.91
Utilities	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	2.04%	$0.00
Casualty & Liability	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.06	$0.06	2.04%	$0.06
Taxes	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	2.04%	$0.00
Miscellaneous	Peak Vehicles	Peak Vehicles	405	1.00	$3.86	$3.86	2.04%	$3.94
Expense Transfer	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	2.04%	$0.00
General Administration								
Other Salaries and Wages	Peak Vehicles	Work Hours	328,614	811.39	$31.71	$25,727.06	2.04%	$26,251.90
Fringe Benefits	Peak Vehicles	Work Hours	328,614	811.39	$21.14	$17,150.80	2.04%	$17,500.68
Services	Peak Vehicles	Peak Vehicles	405	1.00	$8,499.69	$8,499.69	2.04%	$8,673.08
Fuel and Lubricants	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	1.23%	$0.00
Tires and Tubes	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	2.04%	$0.00
Other Materials and Supplies	Peak Vehicles	Peak Vehicles	405	1.00	$644.21	$644.21	2.04%	$657.36
Utilities	Peak Vehicles	Peak Vehicles	405	1.00	$9,915.66	$9,915.66	2.04%	$10,117.94
Casualty and Liability	Revenue Miles	Revenue Miles	16,274,342	1.00	$0.10	$0.10	2.04%	$0.10
Taxes	Peak Vehicles	Peak Vehicles	405	1.00	$499.75	$499.75	2.04%	$509.94
Miscellaneous Expense	Peak Vehicles	Peak Vehicles	405	1.00	$1,123.94	$1,123.94	2.04%	$1,146.87
Expense Transfers	Peak Vehicles	Peak Vehicles	405	1.00	$0.00	$0.00	2.04%	$0.00

	2009	2010
Cost per Revenue Hour	$57.15	$58.31
Cost per Revenue Mile	$2.94	$3.00
Cost per Peak Vehicle	$80,899	$82,549

Inter-county Commuter Bus

The O&M costs for inter-county commuter bus were assumed to be based on the GCRTA cost variables for their bus network. While there is potential a third-party private operator could be contracted to operate the inter-county commuter bus service, the costs of such a contract are uncertain. On the other hand, GCRTA's bus network costs are grounded in the actual operation of buses by a transit agency in Northeast Ohio. Therefore, GCRTA's costs were used to estimate the cost of operating inter-county commuter bus service.

Lorain County Transit Local Bus

Lorain County Transit currently contracts with First Transit to provide bus services within the county. The contract with First Transit includes two variables:

- Cost per revenue hour – a cost of $45.88 is paid to First Transit per revenue hour of service operated.
- Management cost – a fixed annual cost of $708,000 per year ($59,000 per month) is paid in management costs.

However, according to Pam Novak, CFO of Lorain County Transit, the variables listed above are subject to change based on the amount of service to be operated. Prior to 2010 the fixed management cost was much higher and the cost per revenue hour much lower because First Transit was operating ten times the number of revenue hours on behalf of LCT.

This study assumes Lorain County Transit would increase their revenue hours in all alternatives back close to pre-2010 levels. However, there is ambiguity on whether LCT would also operate inter-county bus, would operate in conjunction with another agency in Northeast Ohio, or continue to operate independently. As a result, the First Transit costs listed are perceived as uncertain. GCRTA's bus network costs are considered more accurate because they are grounded in the operation of a bus network by a large transit agency in Northeast Ohio. Therefore, GCRTA's cost model was used to estimate the cost of operating LCT service.

Sandusky Local Bus

The cost model for local bus operated in Sandusky was assumed to use GCRTA's cost variables for their bus network. While there is potential for a third-party to operate this service, the costs involved with a contract are uncertain. Because GCRTA's bus network costs are grounded in the actual operation of buses by a transit agency in Northeast Ohio, GCRTA's costs were selected to estimate the cost of operating local buses in Sandusky.

O&M Forecast Results by Alternative

The Forecast Results section uses the cost models for each mode and applies service statistics to determine the estimated O&M cost by mode and by alternative. The service statistics were calculated using a spreadsheet model based on the proposed service improvements listed in *Chapter 6 Description of Detailed Alternatives*. Tables 8.7-8.15 detail the O&M results of the TSM and eight build alternatives considered.

TSM Alternative

The O&M cost for the TSM alternative includes a new inter-county bus service and background improvements to Erie County and Lorain County transit systems. It is forecast to cost $9.8 million annually.

Table 8.7: TSM Alternative O&M Forecast Results

	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	6,900	$58.31	$402,358
Annual Vehicle Revenue Miles	170,434	$3.00	$511,302
Peak Vehicles	3	$82,549	$247,647
Inter-county Commuter Bus Total			$1,161,307
Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
LCT Total			$7,623,864
GCRTA Improvements			
Add'l Annual Vehicle Revenue Hours	0	$58.31	$0
Add'l Annual Vehicle Revenue Miles	0	$3.00	$0
Add'l Peak Vehicles	0	$82,549	$0
GCRTA Total			$0
TSM TOTAL COSTS			$9,774,919

Alternative 1A Sandusky to Lakefront Station Commuter Rail

The O&M cost for Alternative 1A includes a new inter-county rail and bus service and background improvements to GCRTA, Lorain County, and Erie County transit systems. It is forecast to cost $21.9 million annually.

Table 8.8: Alternative 1A O&M Forecast Results

	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Rail			
Annual Passenger Car Revenue Miles	253,368	$10	$2,533,680
Peak Passenger Cars	9	$90,000	$810,000
Stations	13	$215,000	$2,795,000
Administration	1	$4,000,000	$4,000,000
Inter-county Commuter Rail Total			$10,138,680
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	14,634	$58.31	$853,279
Annual Vehicle Revenue Miles	599,882	$3.00	$1,799,646
Peak Vehicles	4	$82,549	$330,196
Inter-county Commuter Bus Total			$2,983,121
Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
LCT Costs			$7,623,864
GCRTA Improvements			
Add'l Annual Vehicle Revenue Hours	1,347	$58.31	$78,558
Add'l Annual Vehicle Revenue Miles	17,493	$3.00	$52,479
Add'l Peak Vehicles	0	$82,549	$0
GCRTA Costs			$131,037
Alt 1A TOTAL COSTS			$21,866,450

Alternative 1C Lorain to Lakefront Station Commuter Rail

The O&M cost for Alternative 1C includes a new inter-county rail and bus service and background improvements to GCRTA, Lorain County, and Erie County transit systems. It is forecast to cost $20.2 million annually.

Table 8.9: Alternative 1C O&M Forecast Results

	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Rail			
Annual Passenger Car Revenue Miles	112,914	$10	$1,129,140
Peak Passenger Cars	9	$90,000	$810,000
Stations	10	$215,000	$2,150,000
Administration	1	$4,000,000	$4,000,000
Inter-county Commuter Rail Total			$8,089,140
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	16,368	$58.31	$954,389
Annual Vehicle Revenue Miles	650,678	$3.00	$1,952,034
Peak Vehicles	5	$82,549	$412,745
Inter-county Bus Costs			$3,319,168
Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
LCT Costs			$7,623,864
GCRTA Improvements			
Add'l Annual Vehicle Revenue Hours	1,347	$58.31	$78,558
Add'l Annual Vehicle Revenue Miles	17,493	$3.00	$52,479
Add'l Peak Vehicles	1	$82,549	$82,549
GCRTA Costs			$213,586
Alt 1C TOTAL COST			$20,235,506

Alternative 2A Sandusky to Tower City Commuter Rail

The O&M cost for Alternative 2A includes a new inter-county rail and bus service and background improvements to GCRTA, Lorain County, and Erie County transit systems. It is forecast to cost $21.9 million annually.

Table 8.10: Alternative 2A O&M Forecast Results

	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Rail			
Annual Passenger Car Revenue Miles	261,630	$10	$2,616,300
Peak Passenger Cars	9	$90,000	$810,000
Stations	13	$215,000	$2,795,000
Administration	1	$4,000,000	$4,000,000
Inter-county Commuter Rail Total			$10,221,300
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	14,634	$58.31	$853,279
Annual Vehicle Revenue Miles	599,882	$3.00	$1,799,646
Peak Vehicles	4	$82,549	$330,196
Inter-county Bus Costs			$2,983,121
Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
			$7,623,864
GCRTA Improvements			
Add'l Annual Vehicle Revenue Hours	1,347	$58.31	$78,558
Add'l Annual Vehicle Revenue Miles	17,493	$3.00	$52,479
Add'l Peak Vehicles	0	$82,549	$0
			$131,037
Alt 2A TOTAL COST			$21,949,070

Alternative 2C Lorain to Tower City Commuter Rail

The O&M cost for Alternative 2C includes a new inter-county rail and bus service and background improvements to GCRTA, Lorain County, and Erie County transit systems. It is forecast to cost $19.7 million annually.

Table 8.11: Alternative 2C O&M Forecast Results

	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Rail			
Annual Passenger Car Revenue Miles	121,176	$10	$1,211,760
Peak Passenger Cars	9	$90,000	$810,000
Stations	10	$215,000	$2,150,000
Administration	1	$4,000,000	$4,000,000
Inter-county Commuter Rail Total			$8,171,760
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	13,541	$58.31	$789,547
Annual Vehicle Revenue Miles	512,430	$3.00	$1,537,290
Peak Vehicles	5	$82,549	$412,745
Inter-county Bus Costs			$2,739,582
Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
			$7,623,864
GCRTA Improvements			
Add'l Annual Vehicle Revenue Hours	1,347	$58.31	$78,558
Add'l Annual Vehicle Revenue Miles	17,493	$3.00	$52,479
Add'l Peak Vehicles	1	$82,549	$82,549
			$213,586
Alt 2C TOTAL COST			$19,738,539

Alternative 3A Sandusky to West Blvd Commuter Rail

The O&M cost for Alternative 3A includes a new inter-county rail and bus service and background improvements to GCRTA, Lorain County, and Erie County transit systems. It is forecast to cost $21.7 million annually.

Table 8.12: Alternative 3A O&M Forecast Results

	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Rail			
Annual Passenger Car Revenue Miles	242,811	$10	$2,428,110
Peak Passenger Cars	9	$90,000	$810,000
Stations	12	$215,000	$2,580,000
Administration	1	$4,000,000	$4,000,000
Inter-county Commuter Rail Total			$9,818,110
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	15,016	$58.31	$875,583
Annual Vehicle Revenue Miles	606,461	$3.00	$1,819,383
Peak Vehicles	5	$82,549	$412,745
Inter-county Commuter Bus Total			$3,107,711
Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
			$7,623,864
GCRTA Improvements			
Add'l Annual Vehicle Revenue Hours	1,347	$58.31	$78,558
Add'l Annual Vehicle Revenue Miles	17,493	$3.00	$52,479
Add'l Peak Vehicles	0	$82,549	$0
			$131,037
Alt 3A TOTAL COST			$21,670,470

Alternative 3C Lorain to West Blvd Commuter Rail

The O&M cost for Alternative 3C includes a new inter-county rail and bus service and background improvements to GCRTA, Lorain County, and Erie County transit systems. It is forecast to cost $20.2 million annually.

Table 8.13: Alternative 3C O&M Forecast Results

	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Rail			
Annual Passenger Car Revenue Miles	102,357	$10	$1,023,570
Peak Passenger Cars	9	$90,000	$810,000
Stations	9	$215,000	$1,935,000
Administration	1	$4,000,000	$4,000,000
Inter-county Commuter Rail Total			$7,768,570
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	16,750	$58.31	$976,693
Annual Vehicle Revenue Miles	657,257	$3.00	$1,971,771
Peak Vehicles	8	$82,549	$660,392
Inter-county Commuter Bus Total			$3,608,856
Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
			$7,623,864
GCRTA Improvements			
Add'l Annual Vehicle Revenue Hours	1,347	$58.31	$78,558
Add'l Annual Vehicle Revenue Miles	17,493	$3.00	$52,479
Add'l Peak Vehicles	1	$82,549	$82,549
			$213,586
Alt 3C TOTAL COST			$20,204,623

Alternative 4 Sandusky to Public Square Commuter Bus

The O&M cost for Alternative 4 includes a new inter-county bus service and background improvements to Lorain and Erie County transit systems. It is forecast to cost $13.0 million annually.

Table 8.14: Alternative 4 O&M Forecast Results

	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	19,547	$58.31	$1,139,756
Annual Vehicle Revenue Miles	795,977	$3.00	$2,387,931
Peak Vehicles	11	$82,549	$908,039
Inter-county Commuter Bus Total			$4,435,726

Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748

LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
			$7,623,864

GCRTA Improvements	Stats	Unit Costs	Line Item Costs
Add'l Annual Vehicle Revenue Hours	0	$58.31	$0
Add'l Annual Vehicle Revenue Miles	0	$3.00	$0
Add'l Peak Vehicles	0	$82,549	$0
			$0

Alt 4 TOTAL COST	$13,049,338

Alternative 5 Sandusky to Westlake P&R Commuter Bus

The O&M cost for Alternative 5 includes a new inter-county bus service and background improvements to Lorain and Erie County transit systems. It is forecast to cost $12.8 million annually.

Table 8.15: Alternative 5 O&M Forecast Results

	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	17,915	$58.31	$1,044,594
Annual Vehicle Revenue Miles	742,223	$3.00	$2,226,669
Peak Vehicles	11	$82,549	$908,039
Inter-county Commuter Bus Total			$4,179,302

Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748

LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
			$7,623,864

GCRTA Improvements	Stats	Unit Costs	Line Item Costs
Add'l Annual Vehicle Revenue Hours	0	$58.31	$0
Add'l Annual Vehicle Revenue Miles	0	$3.00	$0
Add'l Peak Vehicles	0	$82,549	$0
			$0

Alt 5 TOTAL COST	$12,792,914

Analysis of O&M Costs

This section is a discussion of O&M costs for the nine alternatives evaluated. The costs range between $9.8 and $21.9 million. The TSM Baseline has the lowest operating cost, which seems logical since it includes only a single inter-county bus line and background transit improvements. The build alternatives vary between $12.8 million (for Alternative 5 commuter bus) and $21.9 million (for Alternative 2A commuter rail).

Table 8.16: Summary of Costs by Alternative (2010 $)

	Total Cost
No Build	0
TSM	$9,774,919
Alt 1A Sandusky to Lakefront CR	$21,866,450
Alt 1C Lorain to Lakefront CR	$20,235,506
Alt 2A Sandusky to Tower City CR	$21,949,070
Alt 2C Lorain to Tower City CR	$19,738,539
Alt 3A Sandusky to West Blvd CR	$21,670,470
Alt 3C Lorain to West Blvd CR	$20,204,623
Alt 4 Sandusky to Public Square CB	$13,049,338
Alt 5 Sandusky to Westlake P&R CB	$12,792,914

Analysis of Cost per Revenue Hour and Revenue Mile

Analysis of the cost per revenue hour and cost per revenue mile can help assess the efficiency of each alternative. The alternatives are summarized in Table 8.17.

Table 8.17: Summary of Cost per Revenue Hour and Cost per Revenue Mile

	Total Revenue Hours	Cost per Revenue Hour	Increase over TSM	Total Revenue Miles	Cost per Revenue Mile	Increase over TSM
No Build	0	$0.00	N/A	0	$0.00	N/A
TSM	81,334	$120.18	N/A	1,099,595	$8.89	N/A
Alt 1A Sandusky to Lakefront CR	92,506	$236.38	97%	1,799,904	$12.15	37%
Alt 1C Lorain to Lakefront CR	93,245	$217.01	81%	1,710,246	$11.83	33%
Alt 2A Sandusky to Tower City CR	92,531	$237.21	97%	1,808,166	$12.14	37%
Alt 2C Lorain to Tower City CR	90,444	$218.24	82%	1,580,260	$12.49	41%
Alt 3A Sandusky to West Blvd CR	92,735	$233.68	94%	1,795,926	$12.07	36%
Alt 3C Lorain to West Blvd CR	93,475	$216.15	80%	1,706,268	$11.84	33%
Alt 4 Sandusky to Public Square CB	93,981	$138.85	16%	1,725,138	$7.56	-15%
Alt 5 Sandusky to Westlake P&R CB	92,349	$138.53	15%	1,671,384	$7.65	-14%

Cost per revenue hour ranges between $120.18 and $237.21, with the TSM alternative having the lowest total cost and the lowest cost per revenue hour. The commuter rail alternatives

range from $216.15 to $237.21 per revenue hour. The higher cost is to be expected due to the relatively greater amount of labor and maintenance costs required to operate commuter rail when compared to commuter bus. As a result, commuter rail has a higher overall cost, but the revenue hours are relatively small.

Table 8.17 also shows the cost per revenue mile. Costs range between $7.56 and $12.49 per revenue mile depending on the alternative. The cost per revenue mile actually decreases 14-15 percent with alternatives 4 and 5 when compared to the TSM alternative. This indicates costs using the GCRTA bus cost model are driven more by revenue hours than revenue miles, which is logical considering the amount of labor costs wrapped up in the cost per revenue hour variable. The alternatives with commuter rail all increase over the TSM, which is because commuter rail is a more costly mode than local bus regardless of the number of hours and miles operated.

The overall conclusion drawn from this analysis is what one would expect when comparing O&M costs for inter-county bus and commuter rail services. The bus-based services are significantly less costly and provide a more efficient cost per revenue hour of service operated. Commuter rail, on the other hand, is more expensive with fewer revenue hours operated. Of course, commuter rail provides benefits to go along with the larger costs. The consideration of these costs and benefits are discussed in greater detail in *Chapter 11 Screening of Detailed Alternatives.*

Commuter Rail Peer Comparison

A peer comparison was conducted in order to compare results from the commuter rail O&M estimated in this chapter with actual agencies operating commuter rail across the United States. Commuter rail service in alternatives 1A-3C is expected to operate between 1,000 and 2,000 annual revenue hours and between 100,000 and 250,000 annual revenue miles.

Commuter rail peers were identified based on these service levels. Peers include Tri-Met in Portland, Puget Sound RTA in Seattle, Connecticut DOT, Nashville RTA, Metro Transit in Minneapolis-St Paul, NCTD in San Diego, and Altamont Commuter Express in northern California.

Data from these peers was gathered using the National Transit Database and shown in Table 8.18. This data shows peer commuter rail agencies typically spend between $3 and $34 million dollars to operate commuter rail. By comparison, Alternatives 1A-3C were estimated to cost between $7 and $10 million dollars annually. The comparison shows the costs estimated for inter-county commuter rail in Northeast Ohio are comparable to other commuter rail agencies around the US.

Table 8.18: Peer Agency Comparison

NTD Code	Agency	Commuter Rail Service	Annual Agency (or mode) Cost	Fuel Type	2009 Revenue Miles	2009 Revenue Hours	Operator
0008	Tri-Met	Westside Express Service	$3,165,285	Diesel	48,000	1,484	Portland & Western RR
0040	Puget Sound RTA	Sounder	$34,020,024	Diesel	245,000	6,419	BNSF
1102	Connecticut DOT	Short Line East	$20,065,016	Electric	262,000	5,899	Amtrak
4159	Nashville RTA	Music City Star	$4,072,168	Diesel	97,000	1,778	
5027	Metro Transit	Northstar	$4,977,709	Diesel	17,000	382	BNSF/Met Council
9030	North Coast Transportation District	Coaster	$16,439,884	Diesel	257,000	6,399	Transit America
9182	Altamont Commuter Express	ACE	$12,413,122	Diesel	126,000	4,284	Herzog

Chapter 9 – Ridership Forecast

Introduction

A ridership forecast is typically performed during an alternatives analysis to determine the potential market response of transportation users to the various transit improvements proposed within the detailed alternatives. Ridership forecasts can be used to highlight the differences in benefit between alternatives and along with cost estimates can show the cost-benefit relationship of each alternative.

For this Westshore Corridor alternatives analysis potential riders were estimated for the TSM and eight build alternatives. This chapter has two sections. The first section, Ridership Models, describes the ridership methodology used to estimate riders. The second section, Ridership Forecast Results, details the results of the modeling effort for each alternative.

Ridership Models

This section details the methodology used for transit ridership forecasting for the Westshore Corridor Alternatives Analysis. Two distinct methods were used, detailed in the Bus Based and Rail Based sections, respectively.

Bus Based Model

This section describes the steps used to estimate riders for bus-based alternatives (TSM, Alternative 4, and Alternative 5). The Northeast Ohio Areawide Coordinating Agency (NOACA) travel forecasting model was utilized in evaluating these express bus service alternatives. The validated 2000 year model was chosen for this analysis because the demographic data most closely matches what was available to the commuter rail model. This allowed the ridership results for bus and rail alternatives to be compared against each other.

The model divides the region into TAZs (traffic analysis zones) and then uses demographics to determine origin and destination trips to/from each zone. The NOACA regional trip model was programmed to include the new transit service proposed in the three bus based alternatives, detailed in *Chapter 6 Detailed Description of Alternatives*. This essentially means changing the model files to reflect the addition of new the transit stops and bus service for services proposed in each of the bus based alternatives. The model was subsequently run and the expected users for each transit route reported in order to determine the number of forecasted riders for each alternative.

Limitations

There are a number of limitations to the bus based model. Most notably, after the services were programmed and the model was run, the results were reported for the individual routes associated with each bus based alternative. Modelers typically warn that specific results for bus routes in regional trip models should be considered approximations with potential for error. After all, a single bus route represents a small percentage of all trips in a large five-county metropolitan area like Greater Cleveland.

A second notable limitation of the bus based models is that Erie County is not part the of the model extent and hence was not included in the bus based ridership forecasts. The addition of Erie County work trips would result in a higher number of estimated boardings, but it is believed the number of additional riders would be small. The potential market for Erie County is discussed in *Chapter 4 Existing Conditions*.

Finally, bus service for each bus-based alternative was coded during AM Peak and Midday period only to estimate total one-way trips. Daily boardings can be obtained by doubling the estimated one-way boardings, and it was assumed that virtually all of the passengers making the one-way trip would return using the same service.

Rail Based Model

The NOACA regional trip model was not available to estimate commuter rail ridership because this mode does not exist within the trip model. In its place this study used the Aggregate Rail Ridership Forecasting Model (ARRF) 2.0. The ARRF model was developed by FTA for instances where rail mode is not available locally in order to help provide rail ridership forecasts.

It is important to understand that the ARRF is intended for order-of-magnitude estimates of ridership for "new" New Starts, meaning, new rail lines in metropolitan areas where no fixed guideway currently exists. Heavy and light rail lines operated by GCRTA do exist within the region which may result in some questioning the applicability of the ARRF process for the project. However, given the Westshore project location on the far western edge of the region and the fact that only bus transit serves this travel shed, the application of this sketch estimation approach makes logical sense. Additionally, no travel model encompasses the entire 60 mile project corridor so producing forecasts from an existing model would not be economically feasible.

The approach taken to produce the ARRF for these projects is discussed later in the report. The remainder of this section gives a brief overview of the ARRF model, how it was developed and the datasets needed to apply the model.

The ARRF model was developed using data from cities like Portland, San Diego, Salt Lake, Denver and Baltimore because these light rail systems were in operation for a short period of time and resemble the characteristics of typical "new" New Starts projects. The ARRF model estimates total unlinked rail transit trips for light rail and commuter rail systems by applying a series of expected rail shares to the amount of total (all mode) travel to work occurring within the rail corridor as recorded in the Year 2000 Census Transportation Planning Package (CTPP). Ridership is adjusted up or down to account for the level-of-service (speed and frequency) of the modeled rail line as compared to the baseline values for the rail lines used to calibrate the model. A second condition requires the closest station to home to be different from the closest station to the workplace to qualify as a corridor trip. This prevents the model from considering trips where the rail line is unlikely to serve a transportation function.

Various data elements and model formulations were tested before the decision to use Census Transportation Planning Package (CTPP) year 2000 journey to work flow data, employment density and rail station locations to produce the ridership forecast[4].

The model distinguishes work and non work trips by mode of access and location of the destination. The model considers access modes of walk, feeder bus, or kiss and ride (KNR) trips to any station on the system as well as park-and-ride (PNR) trips to any station offering parking. Therefore, potential transfers from customers on bus are considered in the ridership estimates.

The drive access trips are defined as the home location within 6 miles of a park-n-ride (PNR) station location and the work end of the trip within 1 mile of a rail station. The Non-drive access trips are typically defined as the home location within 2 miles of a rail station and the work location within 1 mile of a rail station. Rail trips are computed using the following formula:

Rail Weekday Unlinked Trips=

Walk/Bus/KNR Access to Work Trips for destinations with <50,000 jobs/sq mile +

Walk/Bus/KNR Access to Work Trips for destinations with >50,000 jobs/sq mile +

PNR Access to Work Trips for destinations with <50,000 jobs/sq mile +

PNR Access to Work Trips for destinations with >50,000 jobs/sq mile +

Walk/Bus/KNR Access to Non-Work Trips for destinations with <50,000 jobs/sq mile +

Walk/Bus/KNR Access to Non-Work Trips for destinations with >50,000 jobs/sq mile +

PNR Access to Non-Work Trips for destinations with <50,000 jobs/sq mile +

PNR Access to Non-Work Trips for destinations with >50,000 jobs/sq mile

CTPP worker data at varying levels (tract, block group, TAZ) is used as input into the ARRF model. The data is compiled into three basic files:

1. A file that uses Part 2 worker data to create potential ridership sheds. Shown in Table 9.1.
2. A file that gives the proportion of each geographic area that is within specified distance thresholds to all rail stations and PNR stations. Shown in Table 9.2.
3. Journey to Work Flow data from Part 3 of the CTPP in its standard format. Tables 302, 308 & 314 are used specifically.

[4] For more details on the ARRF model calibration see *CTPP-Based Aggregate Rail Ridership Forecasting Model Part III*", FTA and AECOM, 2009.

These input files are used in conjunction with the Rail Market program to produce rail market stratified by employment density at the attraction-end, by auto ownership, by mode. These flows are then entered into a spreadsheet to estimate the rail ridership on the proposed system.

Table 9.1: Socioeconomic File Format

Field	Column(s)	Format	Description
1	1-6	a6	FIPS code (state and county code)
2	8-14	a7	TAZ/BG/Tract code (alpha-numeric)
3	16-25	i10	Total employment
4	26-35	i10	Total number of people who worked at home

Table 9.2: Geographic Buffer File Format

Field	Column(s)	Format	Description
1	1-6	i6	FIPS code (state and county code)
2	9-15	a7	TAZ/BG/Tract code (alpha-numeric)
3	16-18	i3	CTPP Part 3 file number; each state has separate CTPP Part 3 file
4	19-28	f10.4	Land area of the TAZ/BG/Tract in sq mile
5	29-36	f8.2	Proportion of TAZ/BG/Tract covered within 1.0 mile buffers around all stations
6	37-44	f8.2	Proportion of TAZ/BG/Tract covered within 2.0 miles buffers around all stations
7	45-52	f8.2	Proportion of TAZ/BG/Tract covered within 6.0 miles buffers around PNR stations only
8	53-72	*	X-coordinate of the centroid of the TAZ/BG/Tract in State Plane Coordinate System**
9	73-92	*	Y-coordinate of the centroid of the TAZ/BG/Tract in State Plane Coordinate System**

ARRF Application for Alternatives 1A-3C

The ARRF model provides year 2000 ridership estimates. A station location file in GIS format was created for each scenario for the Westshore Corridor. Each file includes all of the rail stations that exist and a separate designation of stations that have park and ride access.

The ARRF uses "buffers" around each station to determine the employment density and proportion of geographical area that can be reached by transit users. Buffers for varying distances around the existing stations were created and used as input to the model as specified in Table 9.2. Figure 9.1 shows an example of the buffers created for the Westshore corridor.

Since the corridor covered an MPO and additional areas outside of the MPO, census tract data was used in the ARRF analysis.

As described previously, the ARRF is a sketch planning application and that application of the model needs to occur with adjustments to account for Level of Service characteristics. These adjustments, typically for commuter rail, are made to various submarkets to account for infrequent service, very long distances, or are structured to service a suburban-central city market rather than service within the central city.

Two adjustments of particular interest were made:

- Infrequent Trains per Day Max Elasticity

  "For rail lines with fewer than 52 trains per day, utilize 55 percent of the reduction in the elasticity effect rather than the full computed reduction. This adjustment applies only to work-related trips and accounts for the fact that services with fewer than 52 trains per day typically concentrate those trains in time periods when work travel is most common. Non-work travel is computed using the full frequency effect without this adjustment."

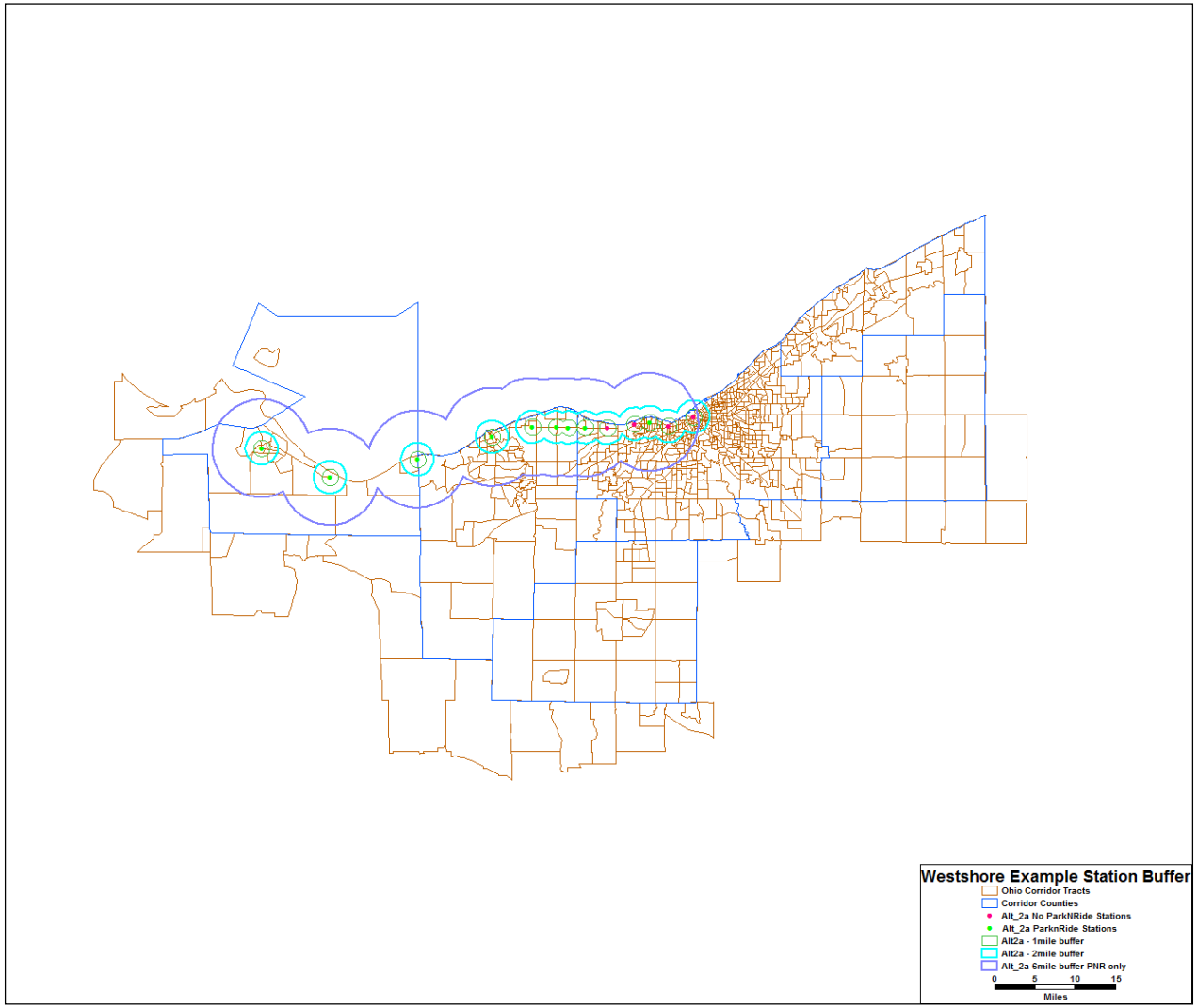
- Non-Work Demand Adjustment for Long Corridors

  "Account for the fact that the ratio of non-work to work trips is less for long trips than for short trips. This is accomplished by implementing an adjustment factor that is structured as a logit type curve centered on 140 trains per day. The logit coefficient of 0.05 results in a maximum sensitivity of 2.5 percent fewer non-work trips for every added train and the entire function is constrained so that the minimum factor (for very long systems is 0.55 while the maximum factor is 1.0. "

These two adjustments allowed for ridership estimation to fall within anticipated ranges for commuter rail service over such a long corridor. The NOACA model could not be used for this analysis since it did not cover the entire corridor and was deemed to need re-calibration of the mode choice model to properly account for the proper modes in the choice nest.

Appendix A9 shows the detailed ridership calculations for each of the rail based alternatives.

Figure 9.1: Westshore Alternative 2A Station Buffer Example



Ridership Forecast Results

The results of the bus based and rail based models are summarized below. Each alternative shows the total number of *one-way* riders and the distribution of those riders to stations within that alternative. The station distribution was estimated based on a gravity model (essentially a calculation of the ridership market based on overall population and the number of travelers to downtown Cleveland). The distribution was altered slightly to reflect demographic changes between 2000 and 2010. In addition, the distribution was also changed for alternatives ending at Lorain, with the Lorain County stations increasing their distribution percentage to reflect the fact that they will likely have more park and riders from Erie County.

TSM

The TSM alternative is estimated to attract 110 one-way riders. The distribution of these riders is shown in Table 9.3. Note that the distribution includes Erie County stops despite the fact the bus based model does not include Erie County. Erie County stops only account for approximately 7% of the corridor, which is likely within the margin of error for bus ridership estimation. Therefore, Erie County is shown in the distribution.

Table 9.3: TSM Ridership and Distribution

TSM Alternative			
Total riders	Station Distribution	Station	Riders
110	5.0%	Sandusky	6
	2.0%	Huron	3
	2.0%	Vermilion	3
	15.0%	Lorain (Black River Landing)	17
	5.0%	Abbe Road	6
	5.0%	Avon (SR 83)	6
	6.0%	Avon (Lear-Nagle)	7
	12.0%	Bassett Road	14
	15.0%	Westlake P&R	17
	12.0%	Rocky River	14
	16.0%	Lakewood	18
	5.0%	West Blvd	6

Alternative 1A Sandusky to Lakefront Station Commuter Rail

Alternative 1A is estimated to attract 1,176 one-way riders. The distribution of these riders is shown in Table 9.4.

Alternative 1C Lorain to Lakefront Station Commuter Rail

Alternative 1C is estimated to attract 1,088 one-way riders, a drop of 88 from Alternative 1A. These 88 riders can be attributed to the segment between Lorain and Sandusky. The distribution of these riders is shown in Table 9.5.

Alternative 2A Sandusky to Tower City Commuter Rail

Alternative 2A is estimated to attract 1,285 one-way riders, 109 more than Alternative 1A. These 109 riders can be attributed to the alternative service Tower City instead of the more remotely located Lakefront Station. The distribution of these riders is shown in Table 9.6.

Alternative 2C Lorain to Tower City Commuter Rail

Alternative 2C is estimated to attract 1210 one-way riders, a drop of 65 from Alternative 2A. These 65 riders can be attributed to the segment between Lorain and Sandusky. The distribution of these riders is shown in Table 9.7.

Table 9.4: Alternative 1A Ridership and Distribution

Alternative 1A			
Total riders	Station Distribution	Station	Riders
1176	5.0%	Sandusky	59
	2.0%	Huron	24
	2.0%	Vermilion	24
	15.0%	Lorain (Black River Landing)	177
	5.0%	Abbe Road	59
	5.0%	Avon (SR 83)	59
	6.0%	Avon (Lear-Nagle)	71
	12.0%	Bassett Road	142
	15.0%	Westlake P&R	177
	12.0%	Rocky River	142
	16.0%	Lakewood	189
	5.0%	West Blvd	59

Table 9.5: Alternative 1C Ridership and Distribution

Alternative 1C			
Total riders	Station Distribution	Station	Riders
1088	0.0%	Sandusky	0
	0.0%	Huron	0
	0.0%	Vermilion	0
	18.0%	Lorain (Black River Landing)	196
	6.0%	Abbe Road	66
	6.0%	Avon (SR 83)	66
	7.0%	Avon (Lear-Nagle)	77
	12.0%	Bassett Road	131
	16.0%	Westlake P&R	175
	12.0%	Rocky River	131
	17.0%	Lakewood	185
	6.0%	West Blvd	66

Table 9.6: Alternative 2A Ridership and Distribution

Alternative 2A			
Total riders	Station Distribution	Station	Riders
1285	5.0%	Sandusky	65
	2.0%	Huron	26
	2.0%	Vermilion	26
	15.0%	Lorain (Black River Landing)	193
	5.0%	Abbe Road	65
	5.0%	Avon (SR 83)	65
	6.0%	Avon (Lear-Nagle)	78
	12.0%	Bassett Road	155
	15.0%	Westlake P&R	193
	12.0%	Rocky River	155
	16.0%	Lakewood	206
	5.0%	West Blvd	65

Table 9.7: Alternative 2C Ridership and Distribution

Alternative 2C			
Total riders	Station Distribution	Station	Riders
1210	0.0%	Sandusky	0
	0.0%	Huron	0
	0.0%	Vermilion	0
	18.0%	Lorain (Black River Landing)	218
	6.0%	Abbe Road	73
	6.0%	Avon (SR 83)	73
	7.0%	Avon (Lear-Nagle)	85
	12.0%	Bassett Road	146
	16.0%	Westlake P&R	194
	12.0%	Rocky River	146
	17.0%	Lakewood	206
	6.0%	West Blvd	73

Alternative 3A Sandusky to West Boulevard Commuter Rail

Alternative 3A is estimated to attract 677 one-way riders, a significant drop from the alternatives serving downtown Cleveland. These results show the "penalty" riders will perceive by having to transfer to GCRTA services at West Blvd. The distribution of these riders is shown in Table 9.8.

Alternative 3C Lorain to West Boulevard Commuter Rail

Alternative 3C is estimated to attract 579 one-way riders, a drop of 98 from Alternative 3A. These 98 riders can be attributed to the segment between Lorain and Sandusky. The distribution of these riders is shown in Table 9.9.

Table 9.8: Alternative 3A Ridership and Distribution

Alternative 3A			
Total riders	Station Distribution	Station	Riders
677	5.0%	Sandusky	34
	2.0%	Huron	14
	2.0%	Vermilion	14
	15.0%	Lorain (Black River Landing)	102
	5.0%	Abbe Road	34
	5.0%	Avon (SR 83)	34
	6.0%	Avon (Lear-Nagle)	41
	12.0%	Bassett Road	82
	15.0%	Westlake P&R	102
	12.0%	Rocky River	82
	16.0%	Lakewood	109
	5.0%	West Blvd	34

Table 9.9: Alternative 3C Ridership and Distribution

Alternative 3C			
Total riders	Station Distribution	Station	Riders
579	0.0%	Sandusky	0
	0.0%	Huron	0
	0.0%	Vermilion	0
	18.0%	Lorain (Black River Landing)	105
	6.0%	Abbe Road	35
	6.0%	Avon (SR 83)	35
	7.0%	Avon (Lear-Nagle)	41
	12.0%	Bassett Road	70
	16.0%	Westlake P&R	93
	12.0%	Rocky River	70
	17.0%	Lakewood	99

Alternative 4 Sandusky to Public Square Commuter Bus

Alternative 4 is estimated to have 274 total riders distributed among the four routes proposed for the alternative. This is significantly less than the commuter rail alternatives, but is reflective of the fact that bus is a less attractive transit mode than rail and thus will attract fewer riders from the Westshore corridor. The distribution for Crocker Park is unique in that all zonal routes (listed on the left) are proposed to serve that station.

Note that the distribution includes Erie County stops despite the fact the bus based model does not include Erie County. Erie County stops only account for approximately 7% of the corridor, which is likely within the margin of error for bus ridership estimation. Therefore, Erie County is shown in the distribution.

Table 9.10: Alternative 4 Ridership and Distribution

Alt 4												
Route	Total Riders	Station	Station Distribution	Riders	Current Westlake P&R Riders*	Percent Westlake P&R riders shifting to new mode	Percent New Riders for Inbound	Estimated New Riders	Route	Total Riders	Station	Station Distributio n
402/403	20	Downtown Sandusky	5.0%	1			100%	1	400/401	49	Downtown	1%
		US 250 P&R	40.0%	8			100%	8			US 250 P&F	15%
		Huron	5.0%	1			100%	1			Huron	1%
		Vermilion P&R	15.0%	3			100%	3			Vermilion F	6%
404/405	143	Lorain (Black River Landing)	33.0%	48	33	100%		15			Lorain (Bla	18%
		Midway Mall	33.0%	48	33	100%		15			Midway Ma	18%
406/407	62	Abbe Road	19.0%	12	33	100%		0			Abbe Road	5%
		Avon (SR 83)	19.0%	12	33	100%		0			Avon (SR 83	5%
		Avon (Lear-Nagle)	23.0%	15	33	80%		0			Avon (Lear-	7%
		Crocker Park		79	81	20%		63			Crocker Pa	24%

Alternative 5 Sandusky to Westlake P&R Commuter Bus

Alternative 5 is estimated to have 193 total riders among the four routes, a drop of 82 from Alternative 4. These riders can be attributed to the fact that Alternative 5 feeds into GCRTA route #246 at the Westlake P&R lot instead of serving downtown Cleveland directly.

Note that the distribution includes Erie County stops despite the fact the bus based model does not include Erie County. Erie County stops only account for approximately 7% of the corridor, which is likely within the margin of error for bus ridership estimation. Therefore, Erie County is shown in the distribution.

Table 9.11: Alternative 5 Ridership and Distribution

Alt 5

Route	Total Riders	Station	Station Distribution	Riders	Current Westlake P&R Riders*	Percent Westlake P&R riders shifting to new mode	Percent New Riders for Inbound	Estimated New Riders	Route	Total Riders	Station	Station Distribution
502/503	8	Downtown Sandusky	10.0%	1			100%	1	500/501	33	Downtown	1%
		US 250 P&R	55.0%	5			100%	5			US 250 P&F	15%
		Huron	10.0%	1			100%	1			Huron	1%
		Vermilion P&R	15.0%	2			100%	2			Vermilion F	6%
504/505	111	Lorain (Black River Landing)	45.0%	50	33	50%		34			Lorain (Bla	18%
		Midway Mall	45.0%	50	33	50%		34			Midway Ma	18%
506/507	41	Abbe Road	29.0%	12	33	50%		0			Abbe Road	5%
		Avon (SR 83)	29.0%	12	33	50%		0			Avon (SR 83	5%
		Avon (Lear-Nagle)	32.0%	14	33	75%		0			Avon (Lear-	7%
		Crocker Park		16	81	90%		0			Crocker Par	24%

Environmental Overview of Detailed Alternatives

This chapter is an overview of potential environmental issues within the project areas for each of the detailed alternatives. It is important to avoid environmental impacts where possible, and to minimize or mitigate the impacts where impacts are unavoidable. The environmental constraints, as illustrated in Figure 10.1, are considered as each alternative is analyzed for it feasibility. A brief summary of potential issues for each alternative is discussed below.

TSM Baseline

This alternative consists of a local bus route operating between Sandusky and downtown Cleveland with service on regional arterials within the study area. Proposed stops are in the same locations as commuter rail stops.

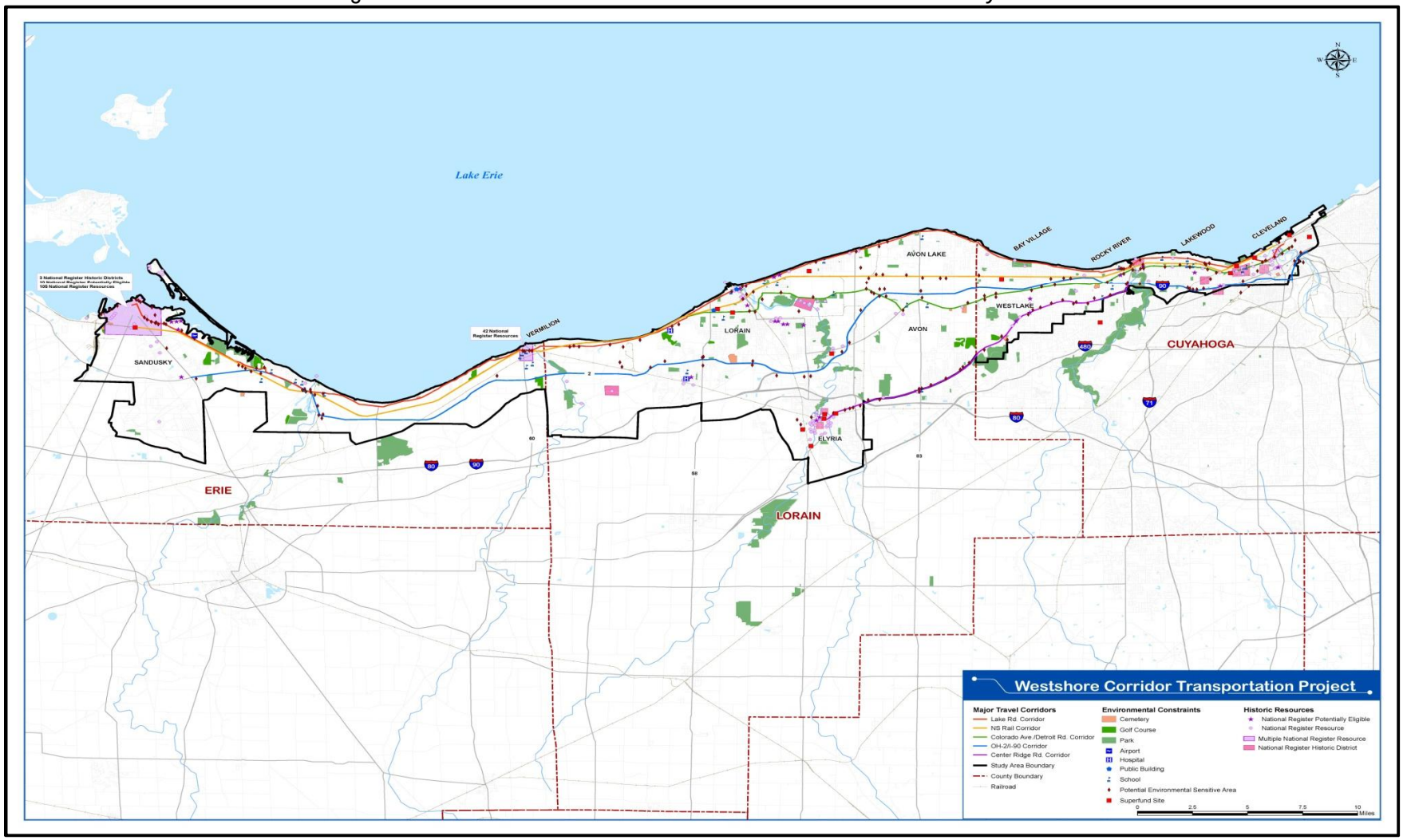
Potential Environmental Involvement: Potential environmental involvement is anticipated to be minimal, if the existing stops are utilized and no new or expanded park-and-rides are constructed.

Alternative 1A: Sandusky to Lakefront Station Commuter Rail

This alternative consists of a commuter rail service operating between Sandusky and the Lakefront Station in downtown Cleveland, traveling via the existing Norfolk Southern/Nickel Plate Line. Service is proposed to be directional, providing eastbound service during the AM peak and westbound service during the PM peak.

Potential Environmental Involvement: The highest potential for environmental involvement will occur in areas where park-and-rides may be constructed or expanded and/or new track is constructed. Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near the stream, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Hazardous materials may be involved through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges. Environmental Justice Populations may be present in the urban areas and they may be negatively impacted as a result of development/relocation, or they may be positively impacted as a result of the capability for increased mobility. There is a potential increase in noise levels near sensitive receptors, especially near urban areas, parks, and recreational areas.

Figure 10.1: Environmental Constraints in the Westshore Study Area



Alternative 1C: Lorain to Lakefront Station Commuter Rail

This alternative consists of a commuter rail service operating between Lorain and the Lakefront Station in downtown Cleveland, traveling via the existing Norfolk Southern/Nickel Plate Line. Service is proposed to be directional, providing eastbound service during the AM peak and westbound service during the PM peak. Express bus service would connect Erie County park-and-ride lots with the commuter rail service in Lorain, matching the direction and frequency of the commuter rail.

Potential Environmental Involvement: The highest potential for environmental involvement will occur in areas where park-and-ride lots would be constructed or expanded, and/or where new track would be constructed. Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near the stream, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Hazardous materials may be involved through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges. Environmental Justice Populations may be present in the urban areas and they may be negatively impacted as a result of development/relocation, or they may be positively impacted as a result of the capability for increased mobility. There is a potential increase in noise levels near sensitive receptors, especially near urban areas, parks, and recreational areas.

Alternative 2A: Sandusky to Tower City Commuter Rail

This alternative consists of commuter rail service operating between Sandusky and Tower City in downtown Cleveland, traveling primarily via the existing Norfolk Southern/Nickel Plate Line. Service is proposed to be directional, providing eastbound service during the AM peak and westbound service during the PM peak.

Potential Environmental Involvement: The highest potential for environmental involvement will occur in areas where park-and-rides would be constructed or expanded, and/or where new track would be constructed. Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near the stream, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Hazardous materials may be involved through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges. Environmental Justice Populations may be present in the urban areas and they may be negatively impacted as a result of development/relocation, or they may be positively impacted as a result of the capability for increased mobility. There is a potential increase in noise levels near sensitive receptors especially near urban areas, parks, and recreational areas.

Alternative 2C: Lorain to Tower City Commuter Rail

This alternative consists of commuter rail service operating between Lorain and Tower City in downtown Cleveland, traveling primarily via the existing Norfolk Southern/Nickel Plate Line. Service is proposed to be directional, providing eastbound service during the AM peak and westbound service during the PM peak. Express bus service would connect Erie County park-and-ride lots with the commuter rail service in Lorain, matching the direction and frequency of the commuter rail.

Potential Environmental Involvement: The highest potential for environmental involvement will occur in areas where park-and-ride lots would be constructed or expanded, and/or where new track would be constructed. Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near the stream, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Hazardous materials may be involved through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges. Environmental Justice Populations may be present in the urban areas and they may be negatively impacted as a result of development/relocation, or they may be positively impacted as a result of the capability for increased mobility. There is a potential increase in noise levels near sensitive receptors especially near urban areas, parks, and recreational areas.

Alternative 3A: Sandusky to West Boulevard Commuter Rail

This alternative consists of commuter rail service operating between Sandusky and the RTA West Boulevard Rapid Station on the west side of Cleveland, traveling via the existing Norfolk Southern/Nickel Plate Line. Service is proposed to be directional, providing eastbound service during the AM peak and westbound service during the PM peak. An express bus route is proposed to make the connection between West Boulevard and downtown Cleveland. This route would match the direction and frequency of the commuter rail service.

Potential Environmental Involvement: The highest potential for environmental involvement will occur in areas where park-and-ride lots would be constructed or expanded, or where new track would be constructed. Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near the stream, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Hazardous materials may be involved through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges. Environmental Justice Populations may be present in the urban areas and they may be negatively impacted as a result of development/relocation, or they may be positively impacted as a result of the capability for increased mobility. There is a potential increase in noise levels near sensitive receptors especially near urban areas, parks, and recreational areas.

Alternative 3C: Lorain to Tower City Commuter Rail

This alternative consists of commuter rail service operating between Lorain and the RTA West Boulevard Rapid Station on the west side of Cleveland, traveling via the existing Norfolk Southern/Nickel Plate Line. Service is proposed to be directional, providing eastbound service during the AM peak and westbound service during the PM peak. Two express bus routes would operate at each terminal station. In the west, express bus service would connect Erie County park-and-ride lots with the commuter rail service in Lorain. In the east express bus service would connect the West Boulevard terminal with Public Square in downtown Cleveland. Each route would match the frequency and direction of the connecting commuter rail service.

Potential Environmental Involvement: The highest potential for environmental involvement will occur in areas where park-and-ride lots would be constructed or expanded, or where new track would be constructed. Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near the stream, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Hazardous materials may be involved through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges. Environmental Justice Populations may be present in the urban areas and they may be negatively impacted as a result of development/relocation, or they may be positively impacted as a result of the capability for increased mobility. There is a potential increase in noise levels near sensitive receptors especially near urban areas, parks, and recreational areas.

Alternative 4: Sandusky to Public Square Commuter Bus

This alternative consists of a proposed system of commuter bus routes that provide service along the Westshore corridor. This alternative includes three routes, each serving a distinct "zone" of park-and-ride lots. Route 402 would serve the Erie County zone, Route 404 would serve the Lorain and Elyria zone, and Route 406 would serve the Sheffield and Avon zone. After picking up passengers in each zone, each bus route would then provide express service via the OH-2/I-90 freeway. Each route would make two final stops: Crocker Park in Westlake and Public Square in downtown Cleveland. During the PM peak, routes 403, 405, and 407 would provide reverse westbound service.

Potential Environmental Involvement: If existing bus stops are used and no new or expanded park-and-ride lots are constructed, potential environmental involvement is expected to be minimal. The highest potential for environmental involvement would occur in areas where park-and-ride lots may be constructed or expanded. Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near the stream, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Hazardous materials may be involved through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges. Environmental Justice Populations may be present in the

urban areas and they may be negatively impacted as a result of development/relocation, or they may be positively impacted as a result of the capability for increased mobility. There is a potential increase in noise levels near sensitive receptors especially near urban areas, parks, and recreational areas.

Alternative 5: Sandusky to Westlake Park-and-Ride Commuter Bus

This alternative consists of a proposed system of commuter bus routes that provide service along the Westshore corridor. This alternative includes three routes, each serving a distinct "zone" of park-and-ride lots. Route 502 would serve the Erie County zone, Route 504 would serve the Lorain and Elyria zone, and Route 506 would serve the Sheffield and Avon zone. After picking up passengers in each zone, each bus route would then provide express service via the OH-2/I-90 freeway. Each route would make two final stops: Crocker Park and the Westlake park-and-ride, both in Westlake. The routes would be structured to provide a timed transfer to RTA's #246 bus route to provide express service to downtown Cleveland. During the PM, peak routes 503, 505, and 507 would provide reverse westbound service, also with the timed transfer from RTA #246.

Potential Environmental Involvement: If existing bus stops are used and no new or expanded park-and-ride lots are constructed, potential environmental involvement is expected to be minimal. The highest potential for environmental involvement would occur in areas where park-and-ride lots may be constructed or expanded. Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near the stream, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Hazardous materials may be involved through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges. Environmental Justice Populations may be present in the urban areas and they may be negatively impacted as a result of development/relocation, or they may be positively impacted as a result of the capability for increased mobility. There is a potential increase in noise levels near sensitive receptors especially near urban areas, parks, and recreational areas.

Alternative 6: Sandusky to Westlake Park-and-Ride Commuter Bus with Westlake to Tower City Light Rail

This alternative includes two distinct modes of transit service. A commuter bus network would operate between Sandusky and the Westlake Park-and-Ride, exactly as proposed in Alternative 5. Additionally, light rail service would operate between the Westlake Park-and-Ride and downtown Cleveland. The light rail service would use the existing Nickel Plate Line between Westlake and West Boulevard, transferring to RTA's Red Line corridor between West Boulevard and Tower City.

Potential Environmental Involvement: The highest potential for environmental involvement would occur in areas where park-and-ride lots may be constructed or expanded and/or where

new track would be constructed. Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near the stream, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Hazardous materials may be involved through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges. Environmental Justice Populations may be present in the urban areas and they may be negatively impacted as a result of development/relocation, or they may be positively impacted as a result of the capability for increased mobility. There is a potential increase in noise levels near sensitive receptors especially near urban areas, parks, and recreational areas.

Chapter 11 – Detailed Screening of Alternatives

Introduction

This chapter presents the screening analysis of the TSM and eight build alternatives considered in the Second Tier, or Detailed Screening phase of this Alternatives Analysis. The purpose of the detailed screening is to identify the alternative, or elements of each of the alternatives, that might be recommended as the locally preferred alternative for the study, or to support the rejection of the TSM or build alternatives in favor of the No Build option.

As with the initial screening process, a set of screening criteria was used to evaluate and compare the detailed alternatives. The detailed screening criteria are based on the goals and objectives established at the outset of the project. The detailed screening differs from the initial screening in the level of detail and quantity of information that has been developed to evaluate the alternatives. Chapters 6 through 10 of this document describe the service concept (Chapter 6), development of capital cost estimates (Chapter 7), operations and maintenance cost estimates (Chapter 8), ridership forecast (Chapter 9), and preliminary environmental analysis (Chapter 10) associated with each alternative. All of these pieces of information factor into the detailed screening criteria that were used to evaluate and compare the nine alternatives.

Review of Alternatives

Eight build alternatives, a TSM and a no-build alternative were evaluated in the detailed screening:

- No-Build
- TSM Alternative
- Alterative 1A Sandusky to Lakefront Station Commuter Rail
- Alterative 1C Lorain to Lakefront Station Commuter Rail
- Alternative 2A Sandusky to Tower City Commuter Rail
- Alternative 2C Lorain to Tower City Commuter Rail
- Alternative 3A Sandusky to West Boulevard Commuter Rail
- Alternative 3C Lorain to Tower City Commuter Rail
- Alternative 4 Sandusky to Public Square Commuter Bus
- Alternative 5 Sandusky to Westlake Park-and-Ride Commuter Bus

These alternatives are briefly described below, and are described in greater detail in Chapter 6, the Detailed Description of Alternatives.

Transportation System Management (TSM)

The WCTP TSM alternative consists of a limited stop bus route that operates on regional arterials between Sandusky and downtown Cleveland within the study area. Stops are proposed to be in the same location as commuter rail stops.

Alternative 1A Sandusky to Lakefront Station Commuter Rail

This alternative consists of a commuter rail route operating between Sandusky and Lakefront Station in downtown Cleveland via the Nickel Plate Line. Service is proposed to be directional, operating eastbound in the AM peak and westbound in the PM peak.

Alternative 1C Lorain to Lakefront Station Commuter Rail

This alternative consists of a commuter rail route operating between Lorain and Lakefront Station in downtown Cleveland via the Nickel Plate Line. Service is proposed to be directional, operating eastbound in the AM peak and westbound in the PM peak.

Express bus service would connect Erie County park-and-ride lots to the commuter rail service in Lorain, matching the direction and frequency of the commuter rail.

Alternative 2A Sandusky to Tower City Commuter Rail

This alternative consists of a commuter rail route operating between Sandusky and Tower City in downtown Cleveland via the Nickel Plate Line. Service is proposed to be directional, operating eastbound in the AM peak and westbound in the PM peak.

Alternative 2C Lorain to Tower City Commuter Rail

This alternative consists of a commuter rail route operating between Lorain and Tower City in downtown Cleveland via the Nickel Plate Line. Service is proposed to be directional, operating eastbound in the AM peak and westbound in the PM peak.

Express bus service would connect Erie County park and ride lots to the commuter rail service in Lorain, matching the direction and frequency of the commuter rail.

Alternative 3A Sandusky to West Boulevard Commuter Rail

This alternative consists of a commuter rail route operating between Sandusky and the RTA West Boulevard Rapid Station on the west side of Cleveland via the Nickel Plate Line. Service is proposed to be directional, operating eastbound in the AM peak and westbound in the PM peak.

An express bus route is proposed to make the connection between West Boulevard and downtown Cleveland. This route would match the direction and frequency of the commuter rail service.

Alternative 3C Lorain to Tower City Commuter Rail

This alternative consists of a commuter rail route operating between Lorain and the RTA West Boulevard Rapid Station on the west side of Cleveland via the Nickel Plate Line. Service is

proposed to be directional, operating eastbound in the AM peak and westbound in the PM peak.

Two express routes would operate at each terminal station. In the west, an express bus service would connect Erie County park-and-ride lots to the commuter rail service in Lorain. In the east, an express bus service would connect the West Boulevard terminal to Public Square in downtown Cleveland. Each route would match the frequency and direction of the commuter rail.

Alternative 4 Sandusky to Public Square Commuter Bus

This alternative is a proposed system of commuter bus routes to provide service in the Westshore corridor. The alternative includes three routes, each serving a distinct "zone" of park and ride lots. Route 402 would serve the Erie County zone, Route 404 would serve the Lorain and Elyria zone, and Route 406 would serve the Sheffield and Avon zone.

After picking up in the park and ride zone each route would operate as an express or "flyer" route using the OH-2/I-90 freeway. Each route would make two final stops: Crocker Park and Public Square in downtown Cleveland. During the PM peak period, routes 403, 405, and 407 would provide westbound service.

Alternative 5 Sandusky to Westlake P&R Commuter Bus

This alternative is a proposed system of commuter bus routes to provide service in the Westshore corridor. The alternative includes three routes, each serving a distinct "zone" of park and ride lots. Route 502 would serve the Erie County zone, Route 504 would serve the Lorain and Elyria zone, and Route 506 would serve the Sheffield and Avon zone.

After picking up in the park and ride zone each route would operate as an express or "flyer" route using the OH-2/I-90 freeway. Each route would make two final stops: Crocker Park and Westlake P&R. The routes will be structured to provide a timed transfer to RTA's #246 bus route to provide express service to complete the commute trip to downtown Cleveland. In the PM peak routes 503, 505, and 507 would operate westbound service, again meeting RTA #246 in a timed transfer.

Detailed Screening

The detailed screening criteria are based on the goals and objectives established at the outset of the project, which in turn were based on input from local officials, stakeholders and members of the public, and on the FTA's Section 5309 New Starts criteria. In this chapter the detailed screening is structured as a list of each goal's objectives, followed by an explanation of the screening criteria associated with the objective, and a comparison of the alternatives' performance under the screening criteria. A summary table which includes the objectives, screening criteria, and alternative evaluation is included at the end of each goal section.

Goal 1: Transportation Improvement

Improve the mobility, connectivity and accessibility within the Westshore Corridor.

Objective 1.1: Expand park-and-ride opportunities for inter-county transit trips in the corridor.

The first objective of the project's accessibility and mobility goal is to expand park and ride opportunities for people making inter-county trips within the Westshore Corridor. The only current opportunity that Westshore Corridor travelers in Lorain and Erie Counties have to access transit via park and ride is to drive to GCRTA's Westlake Park-n-Ride at I-90 and Columbia Road. Recent license plate surveys conducted at this lot indicate that nearly 50% of users of that park-and-ride lot are residents of Lorain and Erie Counties. The other users of that lot are presumably originating from portions of the corridor in Cuyahoga County. Many of these Cuyahoga County residents also are presumably originating from areas west of Crocker-Bassett Road and would benefit from a park-and-ride lot located closer to their homes.

All of the alternatives will expand park and ride opportunities for inter-county transit trips in the corridor, with the park and ride opportunity being effectively the same across all alternatives. Park and ride station locations and service frequencies are the same or similar in all alternatives, with the only major differentiating factor being the mode of travel (bus or rail).

Objective 1.2: Increase transit ridership and market share for travelers in the Westshore corridor.

The capacity to Increase transit ridership and market share for travelers in the Westshore Corridor was measured by the number of new riders using the service for each alternative. Because the ridership forecast (described in Chapter 9) was not the result of a traditional regional travel demand forecasting model, the calculation of new riders was performed using spreadsheet-based -estimating techniques. The methodology for calculating transit ridership and market share is detailed in Appendix A11. Tables 11.1 and 11.2 show a comparison of the number of new riders by station projected for each alternative.

Table 11.1: Total New Riders by Station for TSM and Alternatives 1A-3C

	TSM	Alt 1A Sandusky-Lakefront Rail	Alt 1C Lorain-Lakefront Rail	Alt 2A Sandusky-Tower City Rail	Alt 2C Lorain-Tower City Rail	Alt 3A Sandusky-West Blvd Rail	Alt 3C Lorain-West Blvd Rail
Sandusky	6	59	0	65	0	34	0
Huron	3	24	0	26	0	14	0
Vermilion	3	24	0	26	0	14	0
Lorain (Black River Landing)	11	112	131	128	153	86	89
Abbe Road	3	26	33	32	40	26	27
Avon (SR 83)	3	26	33	32	40	26	27
Avon (Lear-Nagle)	4	38	44	45	52	33	33
Bassett Road	10	102	91	115	106	74	62
Westlake P&R	13	137	135	153	154	94	85
Rocky River	5	50	46	55	52	29	25
Lakewood	2	19	19	21	21	11	10
West Blvd	1	6	7	7	8	4	4
TOTAL	64	623	539	705	626	445	362

Table 11.2: Total New Riders by Station for Alternatives 4 and 5

	Alt 4 Sandusky-Public Sq Commuter Bus	Alt 5 Sandusky-Westlake P&R Commuter Bus
Downtown Sandusky	2	2
US 250 P&R	16	10
Huron	2	2
Vermilion P&R	6	4
Lorain (Black River Landing)	24	40
Midway Mall	24	40
Sheffield (Detroit-Abbe)	3	2
Avon (SR 83)	3	2
Avon (Lear-Nagle)	4	3
Crocker Park	75	8
Total	159	113

As shown in Tables 11.1 and 11.2 above, rail-based alternatives are forecasted to attract more new riders than the bus-based alternatives. The TSM Alternative will attract the fewest new riders, with only 64 new riders projected to use the service each day. The inter-county commuter bus alternatives, 4 and 5, perform slightly better, with 159 and 113 new daily riders, respectively (given the imprecision of the estimating techniques used to develop these estimates, the estimates should be assumed to have a margin of error of ±50%).

The commuter rail mode is projected to have a significant impact on new ridership, with even the lowest performing commuter rail alternative (Alt 3C Lorain to West Blvd.) having more than twice the number of new riders as the best performing commuter bus alternative. The alternative with the highest number of new riders is Alternative 2A Sandusky to Tower City, with 705 new daily riders. However, this ridership figure is low compared to other starter commuter rail lines in the United States like Nashville's Music City Star[5]. As the discussion of capital and operating costs below will indicate, however, the costs of commuter rail may not be justified by the number of new riders that the service is expected to generate, at least in the short to medium term.

Notably, the alternatives that originate in Sandusky do not perform appreciably better than their counterparts that originate in Lorain. In other words, the extension of commuter rail service west of Lorain (at a significant capital cost) does not greatly increase the number of new riders using the service. On average, the commuter rail alternatives originating in Sandusky attract only 82 additional new riders than the corresponding alternative originating in Lorain.

Objective 1.3: Improve transit quality for travelers within the Westshore Corridor.

The quality of transit service can be based on many factors, including transit waiting environments, amenities, speed, access, on time performance, reliability of the service, and comfort of the transit mode. Given the subjective nature of many of these factors, as well as the unknowns associated with measuring amenities at stations that do not yet exist (presumably all alternatives would be equal in this respect), the quality of the transit service was estimated based on two factors which could be easily quantified: number of transfers required to make the trip and total in-vehicle travel time during peak periods.

Considering only the trip from Sandusky to downtown Cleveland, the rail-based Alternatives 1A and 2A and the bus-based TSM Alternative and Alternative 4 all provide a one seat ride. Alternatives 1C, 2C, 3A and 5 would all require a single transfer to travel from Sandusky to downtown Cleveland, while Alternative 3C would require two transfers to complete the trip.

Alternative 2A provides the fastest trip (as measured by in-vehicle travel time) from Sandusky to Cleveland, at 83 minutes, followed closely by Alternative 5 at 85 minutes. The longest travel time is provided by the TSM Alternative at 151 minutes.

The trip from Lorain to downtown Cleveland could be completed without a transfer on the TSM Alternative and Alternatives 1A, 1C, 2A, 2C and 4. Alternatives 3A, 3C and 5 would all require a single transfer to travel from Lorain to downtown Cleveland.

The rail-based alternatives that terminate in downtown Cleveland at Tower City (2A and 2C) provide the fastest trip from Lorain to Cleveland at 43 minutes. Alternatives 1A and 1C have a similar in-vehicle travel time to Lakefront Station, but most passengers would have a longer

[5] Music City Star average daily ridership in 2011 Q1 was ~1,000 riders per day with six trains per day in each direction

walk time in downtown, or may need to transfer to GCRTA bus or rail services, in order to reach their final destinations. The bus-based Alternative 4 also provides a competitive travel time of 47 minutes, with Alternative 5 taking longer due to the transfer to RTA services at Westlake. The longest trip is provided by the TSM Alternative at 77 minutes.

Objective 1.4: Improve the diversity of transportation options in the corridor

Diversity of transportation options was measured as the number of new services introduced in the corridor for each alternative. Given that there is no inter-county commuter bus service currently operated in the corridor, all alternatives would provide at least one new service. However, several of the rail-based alternatives (1C, 2C, 3A and 3C) would introduce both inter-county commuter bus and commuter rail in a corridor in which neither currently operates, thereby further increasing the diversity of transportation options.

Objective 1.5: Improve travel times for travelers in the corridor.

Improved travel times were measured as estimated travel time savings for trips between core cities in the Westshore Corridor, including Sandusky, Lorain, Westlake, Lorain and Cleveland. Transit travel times were compared to estimated travel times by automobile during peak periods using driving directions on Google Maps. The TSM Alternative and bus based Alternatives 4 and 5 offer no travel time savings, as is to be expected for a vehicle operated in mixed traffic.

The commuter rail alternatives that originate in Sandusky offer a travel time savings of seven minutes between Sandusky and Lorain, but offer no time savings for trips that terminate in Westlake, Lakewood or Cleveland. All of the commuter rail alternatives provide a travel time savings of three minutes between Lorain and Westlake and one minute between Lorain and Lakewood, but only the alternatives that terminate at Lakefront Station (1A and 1C) are competitive with driving for the Lorain to Cleveland trip—with the caveat that the Lakefront alternatives may require longer walk distances or transfers to other transit services for some commuters to downtown Cleveland.

Objective 1.6: Maximize reverse-commute opportunities from lower-income areas of the corridor to job opportunities in other portions of the corridor.

This objective was established in the goal setting for the project, but it was quickly determined that providing service for the smaller, reverse-commute market would be prohibitively expensive, particularly for commuter rail options. For this reason, the detailed alternatives were developed to serve the predominant commuting pattern of the corridor, transporting passengers from the outer counties to Cuyahoga County in the morning peak period and making the reverse trip in the afternoon peak. As such, none of the proposed alternatives offers a viable reverse-commute option for corridor residents. All alternatives include a midday return trip from downtown Cleveland to Sandusky, but the intent and likely use of this service is as an "in case of emergency" way to get back home during the offpeak period and not as a reverse-commute option.

Objective 1.7: Promote the use of transit for recreational trips within the Westshore Corridor.

Because the ridership forecast (described in Chapter 9) was not based on estimates generated from the regional travel forecasting model, ridership estimates were not disaggregated by trip purpose. As such, it was not possible to estimate the number of riders using the proposed service for recreational trips as opposed to those generated by other trip purposes. Further analysis in a subsequent phase of work will be necessary to definitively determine the number of recreational trips to be served by the various services.

Table 11.3: Summary of Detailed Screening Criteria for Goal 1

	GOAL 1 TRANSPORTATION IMPROVEMENT Improve the mobility, connectivity, and accessibility within the Westshore corridor	Goal 1 Screening Criteria	TSM	Alternative 1A: Commuter Rail from Sandusky to Lakefront Station
OBJECTIVES	Objective 1.1: Expand park and ride opportunities for inter-county transit trips in the corridor.	Availability/constraint of proposed park and ride locations.	Constrained P&R sites in Lakewood, Rocky River, Lorain, Sandusky	Constrained P&R sites in Lakewood, Rocky River, Lorain, Sandusky
	Objective 1.2: Increase transit ridership and market share for travelers in the Westshore corridor.	Estimated increase in ridership (new riders)	64 new riders	623 new riders
	Objective 1.3: Improve transit quality for travelers within the Westshore corridor	Number of transfers required to travel from Sandusky to downtown Cleveland. Number of transfers required to travel from Lorain to downtown Cleveland. Total in-vehicle travel time for peak period travel from Sandusky to downtown Cleveland. Total in-vehicle travel time for peak period travel from Lorain to downtown Cleveland.	Commuter bus travel time Sandusky to Cleveland: 151 minutes (0 transfers) Commuter bus travel time Lorain to Cleveland: 77 minutes (0 transfers)	Commuter rail travel time Sandusky to Cleveland: 82 minutes (0 transfers) Commuter rail travel time Lorain to Cleveland: 43 minutes (0 transfers)
	Objective 1.4: Improve the diversity of transportation options in the corridor	Introduction of new service to the corridor.	New commuter bus service	New commuter rail service
	Objective 1.5: Improve travel times for travelers in the corridor.	Estimated travel times between core cities within Westshore corridor.	No travel time savings.	Sandusky to Lorain: 46 minutes by car; 39 minutes by commuter rail. Sandusky to Westlake: 57 minutes by car; 62 minutes by commuter rail. Sandusky to Lakewood: 62 minutes by car; 72 minutes by commuter rail. Sandusky to Cleveland: 75 minutes by car; 82 minutes by commuter rail. Lorain to Westlake: 26 minutes by car; 23 minutes by commuter rail Lorain to Lakewood: 34 minutes by car; 33 minutes by commuter rail. Lorain to Cleveland: 45 minutes by car, 43 minutes by commuter rail.
	Objective 1.6: Maximize reverse-commute opportunities from lower-income areas of the corridor to job opportunities in other portions of the corridor.	Estimated increase in reverse direction ridership (new riders) and transit mode share for each alternative.	N/A	N/A
	Objective 1.7: Promote the use of transit for recreational trips within the Westshore corridor	Estimated number of riders using transit improvement for recreational trips	TBD after LPA selection.	TBD after LPA selection.

Alternative 1C: Commuter Rail from Lorain to Lakefront Station	Alternative 2A: Commuter Rail from Sandusky to Tower City	Alternative 2C: Commuter Rail from Lorain to Tower City	Alternative 3A: Commuter Rail from Sandusky to West Blvd.
Constrained P&R sites for commuter rail in Lakewood, Rocky River, Lorain. Constrained sites for commuter bus at US 250.	Constrained P&R sites in Lakewood, Rocky River, Lorain, Sandusky	Constrained P&R sites in Lakewood, Rocky River, Lorain. Constrained sites for commuter bus at US 250.	Constrained P&R sites in Lakewood, Rocky River, Lorain, Sandusky
539 new riders	705 new riders	626 new riders	445 new riders
Commuter bus and commuter rail travel time Sandusky to Cleveland: 120 minutes (1 transfer) Commuter rail travel time Lorain to Cleveland: 43 minutes (0 transfers)	Commuter rail travel time Sandusky to Cleveland: 83 minutes (0 transfers) Commuter rail travel time Lorain to Cleveland: 44 minutes (0 transfers)	Commuter bus and commuter rail travel time Sandusky to Cleveland: 121 minutes (1 transfer) Commuter rail travel time Lorain to Cleveland: 44 minutes (0 transfers)	Commuter rail and shuttle travel time Sandusky to Cleveland: 91 minutes (1 transfer) Commuter rail and shuttle travel time Lorain to Cleveland: 52 minutes (1 transfer)
New commuter rail and commuter bus service	New commuter rail service	New commuter rail and commuter bus service	New commuter rail and commuter bus service
No travel time savings from Sandusky. Lorain to Westlake: 26 minutes by car; 23 minutes by commuter rail. Lorain to Lakewood: 34 minutes by car; 33 minutes by commuter rail. Lorain to Cleveland: 45 minutes by car, 43 minutes by commuter rail.	Sandusky to Lorain: 46 minutes by car; 39 minutes by commuter rail. Sandusky to Westlake: 57 minutes by car; 62 minutes by commuter rail. Sandusky to Lakewood: 62 minutes by car; 72 minutes by commuter rail. Sandusky to Cleveland: 71 minutes by car; 83 minutes by commuter rail. Lorain to Westlake: 26 minutes by car; 23 minutes by commuter rail. Lorain to Lakewood: 34 minutes by car; 33 minutes by commuter rail. Lorain to Cleveland: 41 minutes by car, 44 minutes by commuter rail.	No travel time savings from Sandusky. Lorain to Westlake: 26 minutes by car; 23 minutes by commuter rail. Lorain to Lakewood: 34 minutes by car; 33 minutes by commuter rail. Lorain to Cleveland: 41 minutes by car, 44 minutes by commuter rail.	Sandusky to Lorain: 46 minutes by car; 39 minutes by commuter rail. Sandusky to Westlake: 57 minutes by car; 62 minutes by commuter rail. Sandusky to Lakewood: 62 minutes by car; 72 minutes by commuter rail. Sandusky to West Blvd.: 67 minutes by car; 76 minutes by commuter rail. Lorain to Westlake: 26 minutes by car; 23 minutes by commuter rail. Lorain to Lakewood: 34 minutes by car; 33 minutes by commuter rail. Lorain to West Blvd.: 36 minutes by car; 37 minutes by commuter rail.
N/A	N/A	N/A	N/A
TBD after LPA selection.	TBD after LPA selection.	TBD after LPA selection.	TBD after LPA selection.

Alternative 3C: Commuter Rail from Lorain to West Blvd.	Alternative 4: Commuter Bus to Public Square	Alternative 5: Commuter Bus to Westlake Park and Ride	LPA Phase 1
Constrained P&R sites in Lakewood, Rocky River, and Lorain. Constrained sites for commuter bus at US 250.	Constrained P&R sites at US 250, Abbe Road, Avon (SR 83), Crocker Park	Constrained P&R sites at US 250, Abbe Road, Avon (SR 83), Crocker Park	No Park and Ride constraints for commuter bus.
362 new riders	159 new riders	113 new riders	Unknown, but assumed to be higher for commuter rail than commuter bus based on difference in ridership between the alternatives.
Commuter bus, commuter rail and shuttle travel time Sandusky to Cleveland: 129 minutes (2 transfers) Commuter rail and shuttle travel time Lorain to Cleveland: 52 minutes (1 transfer)	Commuter bus travel time Sandusky to Cleveland: 100 minutes (0 transfer) Commuter bus travel time Lorain to Cleveland: 62 minutes (0 transfer)	Commuter bus travel time Sandusky to Cleveland: 117 minutes (1 transfer) Commuter bus travel time Lorain to Cleveland: 79 minutes (1 transfer)	No option for travel from Sandusky to Cleveland. Commuter bus travel time Lorain to Cleveland: 94 minutes (0 transfers)
New commuter rail and commuter bus service	New commuter bus service	New commuter bus service	New commuter bus service
No travel time savings from Sandusky. Lorain to Westlake: 26 minutes by car; 23 minutes by commuter rail Lorain to Lakewood: 34 minutes by car; 33 minutes by commuter rail. Lorain to West Blvd.: 36 minutes by car; 37 minutes by commuter rail.	No travel time savings.	No travel time savings.	No travel time savings.
N/A	N/A	N/A	N/A
TBD after LPA selection.	TBD after LPA selection.	TBD after LPA selection.	TBD

LPA Phase 2	LPA Phase 3	LPA Phase 4
Contstrained P&R site at US 250 for commuter bus.	Constrained P&R site at US 250 for commuter bus. Constrained P&R sites at Bassett Rd., Rocky River and Lakewood commuter rail stations.	Constrained P&R sites at Sandusky Amtrak, Lorain (Broadway), Bassett Rd., Rocky River, and Lakewood commuter rail stations.
Unknown, but assumed to be higher for commuter rail than commuter bus based on difference in ridership between the alternatives.	Unknown, but assumed to be higher for commuter rail than commuter bus based on difference in ridership between the alternatives.	Unknown, but assumed to be higher for commuter rail than commuter bus based on difference in ridership between the alternatives.
Commuter bus travel time Sandusky to Cleveland: 95 minutes (0 transfers) Commuter bus travel time Lorain to Cleveland: 55 minutes (0 transfers)	Commuter bus travel time Sandusky to Cleveland: 95 minutes (0 transfers) Commuter rail travel time Lorain to Cleveland: 44 minutes (0 transfers)	Commuter rail travel time Sandusky to Cleveland: 83 minutes (0 transfers) Commuter rail travel time Lorain to Cleveland: 44 minutes (0 transfers)
New commuter bus service	New commuter rail and commuter bus service	New commuter rail service
No travel time savings.	No travel time savings from Sandusky. Lorain to Westlake: 26 minutes by car; 23 minutes by commuter rail. Lorain to Lakewood: 34 minutes by car; 33 minutes by commuter rail. Lorain to Cleveland: 41 minutes by car, 44 minutes by commuter rail.	Sandusky to Lorain: 46 minutes by car; 39 minutes by commuter rail. Sandusky to Westlake: 57 minutes by car; 62 minutes by commuter rail. Sandusky to Lakewood: 62 minutes by car; 72 minutes by commuter rail. Sandusky to Cleveland: 71 minutes by car; 83 minutes by commuter rail. Lorain to Westlake: 26 minutes by car; 23 minutes by commuter rail. Lorain to Lakewood: 34 minutes by car; 33 minutes by commuter rail. Lorain to Cleveland: 41 minutes by car, 44 minutes by commuter rail.
N/A	N/A	N/A
TBD	TBD	TBD

Goal 2: Transit Oriented Land Use

Develop a transportation solution that encourages both sustainable, transit-friendly development in new areas and revitalization and repopulation of existing core areas within the corridor including Lorain, Sandusky, Vermilion, Lakewood and Cleveland.

Objective 2.1: Redevelop and improve city cores within the Westshore Corridor, including Lakewood, Rocky River, Lorain, Vermilion and Sandusky.

Typically, land use changes are agreed upon by local communities before new transit service is introduced. Apart from older communities such as Lorain and Lakewood, communities in the Westshore Corridor have shown limited interest in changing zoning to accommodate compact development. This has required this study to be more creative about measuring the potential benefits of land use changes. It is believed that a market of new riders will spur communities to make changes to land use policy around station/stop areas, which will result in more compact, transit oriented development. Therefore, an alternative's potential to aid in redeveloping or improving core urban areas within the Westshore Corridor was measured by the expected number of new riders since there is a connection between the number of new riders electing to use the service and its impact on the community. New riders were measured in five "core areas": Sandusky, Vermilion, Lorain, Rocky River and Lakewood.

The basic principle of the analysis is that rail service is more likely than bus service to spur redevelopment in communities along the corridor. Developers tend to favor building near rail stations to take advantage of the access to the station and because the large investment in infrastructure is an indication of local commitment that service will not be discontinued, at least through the useful life of the investment . Potential residents and businesses also tend to cluster around rail stations for the same reasons. As shown in Table 4, Alternatives 1A and 2A would have the greatest impact on the cities of Sandusky and Vermillion. Conversely, the rail-based alternatives that originate in Lorain (1C, 2C and 3C) and all of the bus-based alternatives (TSM, 4 and 5) would have very little impact on Sandusky and Vermilion.

Lorain would be impacted by all of the rail-based alternatives. The alternatives that originate at Black River Landing (1C, 2C, and 3C) would have more of an impact on development in Lorain since they would draw riders both from the local Lorain area and also potential riders from points west who may park and ride at the Black River Landing Station. In general, bus based alternatives TSM, Alternative 4, and Alternative 5 would each have very little impact on development in Lorain.

Lakewood and Rocky River would incur no benefits from Alternatives 4 and 5, which do not serve these communities, and the TSM alternative also would have no impact on these communities. The rail-based Alternatives 1A, 1C, 2A and 2C are likely to have a very positive impact on development in Lakewood and Rocky River by attracting riders to their downtown

cores in order to use the transit service, which may in turn induce increased development density and, potentially, redevelopment in the station areas in those communities.

Objective 2.2: Promote use and redevelopment of downtown Cleveland.

An alternative's capacity to promote use and redevelopment in downtown Cleveland was measured by the number of jobs located within ½ mile of the downtown Cleveland terminal station. Increased occupancy, redevelopment and reuse of under-utilized downtown Cleveland area properties are more likely to occur if riders are arriving downtown and then traversing the city as pedestrians. In the case of Alternatives 3A, 3C and 5, there is no terminal station in downtown Cleveland. Although passengers could access downtown Cleveland by transferring to the Red Line or to an express or local bus at the RTA West Boulevard Rapid Station, or to RTA's route 246 at the Westlake Park and Ride Lot, , these alternatives are likely to have the least impact on the use and redevelopment of downtown Cleveland.

The alternatives that terminate at Public Square (TSM Alternative and Alternative 4) perform best under this criterion due to the large number of jobs located within ½ mile of this location. Furthermore, these bus-based alternatives have the additional capacity to distribute passengers throughout the downtown Cleveland employment district.

The rail-based alternatives that terminate at Lakefront Station or Tower City (Alternatives 1A, 1C, 2A and 2C) are indistinguishable from each other under this criterion, due to the similar number of jobs located within ½ mile of both stations.

Objective 2.3: Serve existing activity centers in the Westshore Corridor.

An alternative's capacity to serve existing activity centers in the Westshore Corridor was measured by the average distance from each of the proposed stations to the nearest identified major activity center and the number of major activity centers located within ½ mile of the proposed stations.

Alternative 4 has the greatest number of major activity centers located within ½ mile of its proposed stops, and Alternative 5 had the fewest. This is reasonable considering that Alternative 4 terminates in the center of the greatest concentration of activity centers in the region, downtown Cleveland, while Alternative 5 terminates twelve miles to the west of downtown Cleveland at the Westlake Park-N-Ride. The rail alternatives are in between Alternative 4 and Alternative 5. They benefit from serving multiple core cities and (for alternatives 1A-2C) downtown directly. However, the location of the Nickel Plate Line, a varying distance from I-90, results in the rail alternatives being farther away from the activity centers that have developed at the many of the I-90 interchanges in the Westshore Corridor.

Objective 2.4: Attract developers to new development and redevelopment opportunities through expanded transit service.

An alternative's capacity to attract developers to create new development and redevelopment opportunities through expanded transit service was measured by three criteria: the permanence of the guideway, the number of acres available for redevelopment within 1/2 mile of proposed station locations, and the number of acres available for greenfield development within 1/2 mile of proposed station locations.

Obviously the rail-based alternatives have guideway and station facilities that are considerably more "permanent" than the bus-based alternatives. This permanence is a significant asset for developers, and for the potential to attract development and redevelopment, because it provides a sense of security that their investment will continue to be served by high quality transit service through the useful life of the transit facilities.

All of the rail-based alternatives performed well under the availability of land for redevelopment criterion, with more than 500 acres available within ½ mile of the proposed station locations. The bus-based alternatives offer fewer redevelopment opportunities, with stops located near interchanges, surrounded by existing development or greenfield parcels. Still, with greater than 200 acres within ½ mile of the proposed stops, the bus-based alternatives offer significant redevelopment opportunities.

The alternatives that perform best under the availability of land for new development criterion are the bus-based Alternatives 4 and 5, as well as the rail-based alternatives that originate in Lorain but include a bus route that originates in Sandusky. This is due to the large amount of undeveloped land located near the proposed park and ride lots in Erie County. The rail alternatives that originate in Sandusky have relatively fewer large parcels of undeveloped land near their proposed station sites due to the industrial nature of the land surrounding the rail corridor.

Table 11.4: Summary of Detailed Screening Criteria for Goal 2

	GOAL 2 TRANSIT ORIENTED LAND USE Develop a transportation solution that encourages both sustainable, transit-friendly development in new areas and revitalization and repopulation of existing core areas within the corridor including Lorain, Sandusky, Vermilion, Lakewood and Cleveland;	Goal 2 Screening Criteria	TSM	Alternative 1A: Commuter Rail from Sandusky to Lakefront Station	Alternative 1C: Commuter Rail from Lorain to Lakefront Station
OBJECTIVES	Objective 2.1: Redevelop and Improve city cores within the Westshore corridor, including Lakewood, Rocky River, Lorain, Vermilion, and Sandusky	Number of new riders at Sandusky Number of new riders at Vermilion Number of new riders at Lorain Number of new riders at Rocky River Number of new riders at Lakewood	Sandusky: 6 new riders Vermilion: 3 new riders Lorain: 11 new riders Rocky River: 5 new riders Lakewood: 2 new riders	Sandusky: 59 new riders Vermilion: 24 new riders Lorain: 112 new riders Rocky River: 50 new riders Lakewood: 19 new riders	Sandusky: 0 new riders Vermilion: 0 new riders Lorain: 131 new riders Rocky River: 46 new riders Lakewood: 19 new riders
	Objective 2.2: Promote use and redevelopment of downtown Cleveland	Employment within 1/2 mile of downtown Cleveland terminal station	Jobs within 1/2 mile of Public Square: 77,016	Jobs within 1/2 mile of Lakefront: 57,562	Jobs within 1/2 mile of Lakefront: 57,562
	Objective 2.3: Serve existing activity centers in the Westshore corridor	Average distance from proposed stations to nearest activity center Activity centers within 1/2 mile of proposed stations	Average distance from station to nearest activity center: 1.47 miles Activity centers with 1/2 mile of stations: 18	Average distance from station to nearest activity center: 1.33 miles Activity centers with 1/2 mile of stations: 16	Average distance from station to nearest activity center: 1.35 miles Activity centers with 1/2 mile of stations: 16
	Objective 2.4: Attract developers to new development and redevelopment opportunities through expanded transit service.	Acres available for redevelopment within 1/2 mile of proposed station locations Acres available for greenfield development within 1/2 mile of proposed station locations Permanence of guideway for each alternative	Land for redevelopment: 238.3 acres Land for greenfield development: 1096.9 acres Non-permanent guideway	Land for redevelopment: 531.9 acres Land for greenfield development: 972.3 acres Permanent guideway	Land for redevelopment: 531.9 acres Land for greenfield development: 1410.8 acres Permanent guideway
	Promote the transportation and development goals of the region as identified in the NOACA Long Range Transportation Plan and other regional planning documents.	Degree to which each of the alternatives is consistent with NOACA Long Range Transportation Plan goals and those of other relevant regional planning documents.			

Alternative 2A: Commuter Rail from Sandusky to Tower City	Alternative 2C: Commuter Rail from Lorain to Tower City	Alternative 3A: Commuter Rail from Sandusky to West Blvd.	Alternative 3C: Commuter Rail from Lorain to West Blvd.	Alternative 4: Commuter Bus to Public Square	Alternative 5: Commuter Bus to Westlake Park and Ride
Sandusky: 65 new riders Vermilion: 26 new riders Lorain: 128 new riders Rocky River: 55 new riders Lakewood: 21 new riders	Sandusky: 0 new riders Vermilion: 0 new riders Lorain: 153 new riders Rocky River: 52 new riders Lakewood: 21 new riders	Sandusky: 34 new riders Vermilion: 14 new riders Lorain: 86 new riders Rocky River: 29 new riders Lakewood: 11 new riders	Sandusky: 0 new riders Vermilion: 0 new riders Lorain: 89 new riders Rocky River: 25 new riders Lakewood: 10 new riders	Sandusky: 18 new riders Vermilion: 6 new riders Lorain: 24 new riders Rocky River: N/A Lakewood: N/A	Sandusky: 12 new riders Vermilion: 4 new riders Lorain: 40 new riders Rocky River: N/A Lakewood: N/A
Jobs within 1/2 mile of Tower City: 58,204	Jobs within 1/2 mile of Tower City: 58,204	N/A	N/A	Jobs within 1/2 mile of Public Square: 77,016	N/A
Average distance from station to nearest activity center: 1.32 miles Activity centers with 1/2 mile of stations: 17	Average distance from station to nearest activity center: 1.34 miles Activity centers with 1/2 mile of stations: 17	Average distance from station to nearest activity center: 1.32 miles Activity centers with 1/2 mile of stations: 18	Average distance from station to nearest activity center: 1.35 miles Activity centers with 1/2 mile of stations: 18	Average distance from station to nearest activity center: 1.02 miles Activity centers with 1/2 mile of stations: 21	Average distance from station to nearest activity center: 1.19 miles Activity centers with 1/2 mile of stations: 11
Land for redevelopment: 563.6 acres Land for greenfield development: 972.3 acres Permanent guideway	Land for redevelopment: 563.6 acres Land for greenfield development: 1410.8 acres Permanent guideway	Land for redevelopment: 536.4 acres Land for greenfield development: 972.3 acres Permanent guideway	Land for redevelopment: 536.4 acres Land for greenfield development: 1410.8 acres Permanent guideway	Land for redevelopment: 250.5 acres Land for greenfield development: 1339.8 acres Non-permanent guideway	Land for redevelopment: 257.6 acres Land for greenfield development: 1361.6 acres Non-permanent guideway

LPA Phase 1	LPA Phase 2	LPA Phase 3	LPA Phase 4
Sandusky: 0 new riders Vermilion: 0 new riders Lorain: 15 new riders Rocky River: N/A Lakewood: N/A	Sandusky: 6 new riders Vermilion: 2 new riders Lorain: 8 new riders Rocky River: N/A Lakewood: N/A	Sandusky: 0 new riders Vermilion: 0 new riders Lorain: 107 new riders Rocky River: 52 new riders Lakewood: 21 new riders	Sandusky: 59 new riders Vermilion: 24 new riders Lorain: 0 new riders Rocky River: 0 new riders Lakewood: 0 new riders
Jobs within 1/2 mile of Public Square: 77,018	Jobs within 1/2 mile of Public Square: 77,019	Jobs within 1/2 mile of Tower City: 58,204	Jobs within 1/2 mile of Tower City: 58,204
Average distance from station to nearest activity center: 0.70 miles Activity centers with 1/2 mile of stations: 14	Average distance from station to nearest activity center: 1.57 miles Activity centers with 1/2 mile of stations: 15	Average distance from station to nearest activity center: 1.56 miles Activity centers with 1/2 mile of stations: 16	Average distance from station to nearest activity center: 1.71 miles Activity centers with 1/2 mile of stations: 15
Land for redevelopment: 170.2 acres Land for greenfield development: 356.5 acres Non-permanent guideway	Land for redevelopment: 458.1 acres Land for greenfield development: 653.6 acres Non-permanent guideway	Land for redevelopment: 554.5 acres Land for greenfield development: 795.1 acres Permanent guideway	Land for redevelopment: 490.2 acres Land for greenfield development: 730.2 acres Permanent guideway

Goal 3: Cost Effectiveness

Develop a transportation solution that is an efficient and cost effective use of the region's transit funding.

Objective 3.1: Maximize user benefits for the transit improvement.

Given the limited financial capacity of the region and transit funding available through local, state, and federal sources, it is imperative that the selected transportation solution be fiscally efficient and cost effective. Cost effectiveness is one of the key criteria that FTA uses to identify projects to recommend for discretionary New Starts and Small Starts funds. The measure that FTA currently uses to determine the level of cost effectiveness of an alternative is the cost per hour of user benefit. The calculation of this measure is described below.

New Rider Benefit Calculation

The FTA methodology for calculating cost per hour of user benefit uses output from the regional travel forecasting model to estimate ridership changes and user benefits for the entire region, considering both new and existing riders. As noted above, budgetary and technical constraints prevented the study team from using the NOACA regional travel forecasting model to estimate ridership and user benefits (technical constraints include the lack of a recent transit origin-destination survey to support the model, and the absence of Erie County in the regional travel forecasting model) for this study an off-model spreadsheet calculation was employed to estimate ridership at individual stations. Therefore, an approach to estimate user benefits, focusing on the estimate of new riders generated by the alternative, was used to estimate future user benefit.

The basic formula used for this calculation is:

Cost per hour of new rider benefit = Incremental Annualized Cost / New User Benefit Hours

Incremental Annualized Cost

The incremental annualized cost is the cost difference between the TSM alternative (used as the baseline) and each of the build alternatives. The annualized cost is comprised of the annualized capital cost (detailed in Chapter 7) and the annual operations and maintenance cost (detailed in Chapter 8).

New Riders Benefit Hours

The calculation of new user benefit hours focused on two areas, actual time savings and equivalent hours of benefit by automobile miles not driven. The actual time savings was a calculation of the incremental hours saved comparing the TSM as a baseline to each of the build alternatives (the TSM alternative had such a circuitous route that it was assumed to generate no time savings for the 64 riders who were estimated to be daily users of it). For each alternative, the hours saved between the TSM and build alternative were estimated for each station. This number was multiplied by the estimated number of new riders at that station and then summed for the alternative. The number of new riders was estimated based on the known

market share of existing riders using current RTA services. This process is explained in detail in Appendix A11.

The hours of benefit by automobiles not driven also relied on the estimate of new riders. The number of automobile miles from each station to downtown Cleveland was measured and multiplied by the number of new riders originating at that station in order to determine the total miles saved for each alternative. The number of miles saved was then multiplied by $0.51 per mile, the official US government cost per mile, to convert it into a cost savings for the new user trips. This cost savings was then divided by an average wage rate for the Cleveland region of $16.73 per hour[6] in order to convert cost savings into a number of hours of benefit.

The two calculations, actual time savings and equivalent hours of benefit for reduced automobile miles, were added together in order to estimate the number of new user benefit hours for each alternative.

[6] The most recent average median wage rate for Cleveland-Elyria-Mentor region available from the Bureau of Labor Statistics (BLS) is $16.00 per hour for May 2009. BLS also reports an inflation rate between May 2009 and March 2011 of 4.58%, which inflates average median wage rate to $16.73 per hour.

Table 11.5: Calculation of New Rider Benefit

Alternative	Annualization Factor	Daily Average Time Savings (hrs)	Calculation of Hour Benefit from Miles Saved				Daily total hours saved	Annual total hours saved
			Average Miles Saved	Cost per mile	Average Cost per hour of time	Daily Average Hours Saved (from mileage)		
Alt 1A Sandusky-Lakefront Commuter Rail	255	484	11,294	$0.51	$16.73	344	828	211,213
Alt 1C Lorain-Lakefront Commuter Rail	255	294	6,733	$0.51	$16.73	205	500	127,421
Alt 2A Sandusky-Tower City Commuter Rail	255	545	12,876	$0.51	$16.73	393	938	239,066
Alt 2C Lorain-Tower City Commuter Rail	255	345	8,086	$0.51	$16.73	246	591	150,830
Alt 3A Sandusky-West Blvd Commuter Rail	255	335	7,399	$0.51	$16.73	226	561	142,969
Alt 3C Lorain-West Blvd Commuter Rail	255	206	4,231	$0.51	$16.73	129	335	85,325
Alt 4 Sandusky-Public Sq Commuter Bus	255	119	3,460	$0.51	$16.73	105	224	57,224
Alt 5 Sandusky-Westlake P&R Commuter Bus	255	58	2,751	$0.51	$16.73	84	142	36,104

Cost per Hour of New Rider Benefit

The cost per hour of new rider benefit was calculated by dividing the incremental annualized cost by the new user benefit hours. This number represents the level of financial resources that the project will require versus the benefit that it will provide for new transit users. Therefore, the lower the number, the more benefit per cost of the project. Table 11.6 details the cost per hour of new rider benefit by alternative.

Table 11.6: Cost per Hour of New Rider Benefit

	Alt Annual O&M	Alt Annual Capital Cost	TSM Annual O&M	TSM Capital Cost	Incremental Annual Cost	User Benefit Hours	Cost per hour of new rider benefit
Alt 1A Sandusky-Lakefront Commuter Rail	$21.9	$30.3	$9.8	$2.4	40.0	211,213	$189.38
Alt 1C Lorain-Lakefront Commuter Rail	$20.2	$15.7	$9.8	$2.4	23.7	127,421	$186.00
Alt 2A Sandusky-Tower City Commuter Rail	$21.9	$29.8	$9.8	$2.4	39.5	239,066	$165.23
Alt 2C Lorain-Tower City Commuter Rail	$19.7	$15.2	$9.8	$2.4	22.7	150,830	$150.50
Alt 3A Sandusky-West Blvd Commuter Rail	$21.7	$27.3	$9.8	$2.4	36.8	142,969	$257.40
Alt 3C Lorain-West Blvd Commuter Rail	$20.2	$13.1	$9.8	$2.4	21.1	85,325	$247.29
Alt 4 Sandusky-Public Sq Commuter Bus	$13.0	$3.5	$9.8	$2.4	4.3	57,224	$75.14
Alt 5 Sandusky-Westlake P&R Commuter Bus	$12.8	$3.5	$9.8	$2.4	4.1	36,104	$113.56

As shown in Table 11.6, Alternative 4 is estimated to have the best (i.e., lowest) cost per hour of new rider benefit. At $75.14 per hour, this cost per hour of new rider benefit would still only garner Alternative 4 with a low cost effectiveness rating from FTA. Alternatives 3A and 3C perform worst under this criterion, with costs per hour of new rider benefit of $257.40 and $247.29, respectively. Of the rail-based alternatives, Alternative 2C performs best, with a cost per hour of new rider benefit of $150.50.

Table 11.7: Summary of Detailed Screening Criteria for Goal 3

	GOAL 3 COST EFFECTIVENESS Develop a transportation solution that is an efficient and cost effective use of the region's transit funding.	Goal 3 Screening Criteria	TSM	Alternative 1A: Commuter Rail from Sandusky to Lakefront Station	Alternative 1C: Commuter Rail from Lorain to Lakefront Station	Alternative 2A: Commuter Rail from Sandusky to Tower City	Alternative 2C: Commuter Rail from Lorain to Tower City
OBJECTIVE	Objective 3.1: Maximize user benefits for the transit improvement	Cost per hour of transportation system user benefits (Annualized cost per new rider)	N/A	$189.38 (Low Cost Effectiveness Rating)	$186.00 (Low Cost Effectiveness Rating)	$165.23 (Low Cost Effectiveness Rating)	$150.50 (Low Cost Effectiveness Rating)

Alternative 3A: Commuter Rail from Sandusky to West Blvd.	Alternative 3C: Commuter Rail from Lorain to West Blvd.	Alternative 4: Commuter Bus to Public Square	Alternative 5: Commuter Bus to Westlake Park and Ride	LPA Phase 1	LPA Phase 2	LPA Phase 3	LPA Phase 4
$257.40 (Low Cost Effectiveness Rating)	$247.29 (Low Cost Effectiveness Rating)	$75.14 (Low Cost Effectiveness Rating)	$113.56 (Low Cost Effectiveness Rating)	Low Cost Effectiveness Rating	Low Cost Effectiveness Rating	Low Cost Effectiveness Rating	Low Cost Effectiveness Rating

Goal 4: Fiscal Responsibility

Develop a transit improvement that can realistically be funded by local and county governments in the Westshore Corridor.

Objective 4.1: Promote a transit solution that is competitive for an FTA New Starts grant.

At the alternatives analysis level the FTA New Starts grant process results in a project justification rating. This rating is a compilation of six different areas of potential improvement:

Economic Development – 20%
There has been little interest in changing the land use patterns in the corridor in order to stimulate economic development. Thus, it is likely that all alternatives would receive a low rating in terms of economic development potential.

Mobility Improvements – 20%
Mobility improvements are best with alternatives 2A, 2C, and 4. Each of these provides the fastest travel time and most direct service to downtown Cleveland. It is possible that these alternatives could score well for the mobility improvements that they provide to the Westshore Corridor.

Environmental Benefits – 10%
All alternatives provide about the same level of environmental benefits and impacts. The rail alternatives produce more new riders and thus produce greater air quality benefits. The alternatives provide similar impacts in terms of the development of stations and park-and-ride lots.

Operating Efficiencies – 20%
Operating efficiency is best rated based on operating cost per passenger mile, but an estimation of passenger miles was unavailable for use in this study. Ridership potential was highest in the rail alternatives, but these alternatives also have the highest operating cost, indicating lower operating efficiency. The bus alternatives, despite generating fewer new riders, are significantly cheaper to operate. Bus alternatives might be expected to receive a medium rating in this category, while rail alternatives likely to receive a low rating. However, more analysis is required to fully support an FTA rating on this criterion.

Cost Effectiveness – 20%
Cost effectiveness was calculated for Goal 3, with all of the alternatives considered in the detailed screening receiving a "low" rating for cost effectiveness. The alternatives all have high cost relative to the anticipated number of new riders they would generate, although further analysis using NOACA's regional travel forecasting model would be required to formally assess the alternatives' cost effectiveness using FTA's New Starts criteria.

Land Use – 20%

The existing land use within the corridor is very dense at the eastern end (Cleveland and inner suburbs), and then transitions to newer suburban and then rural densities as the corridor proceeds east.

Overall, it is unlikely that the TSM or any of the build alternatives considered here would qualify for anything other than a low project justification rating. While the rail alternatives perform well in some categories (mobility benefits for example), they perform poorly in others (land use, economic development). Similarly, the bus alternatives perform well in some respects but poorly in others. Therefore, a low project justification rating should be expected for any of the alternatives in the study.

Objective 4.2: Consider the annual impact to local and county government budgets for Westshore communities.

The annual impact to local and county government budgets was measured by the expected annual operations and maintenance (O&M) cost, annualized capital cost, total annual cost and total capital cost of each alternative. These cost estimates are described in detail in *Chapter 7 Capital Cost Estimates* and *Chapter 8 Operations and Maintenance Cost Estimates*.

As shown in Table 8, the TSM Alternative would have the least impact on local and county government budgets. At an annual cost of $12.2 million ($9.8 million for annual O&M and $2.4 million for annualized capital cost), the TSM Alternative would be the least expensive alternative to operate and maintain.

On the other end of the spectrum, Alternatives 1A, 2A, and 3A are estimated to have the greatest impact on local and county government budgets, with combined O&M and annualized capital costs between $49.0 and $52.2 million. Much of this cost can be attributed to the extension of commuter rail service to Sandusky. The other three commuter rail alternatives (each terminating in Lorain) range between $33.3 and $35.9 million for combined O&M and annualized capital costs.

Table 11.8: Summary of Detailed Screening Criteria for Goal 4

	GOAL 4 FISCAL RESPONSIBILITY Develop a transit improvement that can realistically be funded by local and county governments in the Westshore corridor	Goal 4 Screening Criteria	TSM	Alternative 1A: Commuter Rail from Sandusky to Lakefront Station	Alternative 1C: Commuter Rail from Lorain to Lakefront Station	Alternative 2A: Commuter Rail from Sandusky to Tower City	Alternative 2C: Commuter Rail from Lorain to Tower City
OBJECTIVES	Objective 4.1: Promote a transit solution that is competitive for an FTA New Starts grant	Estimated cost-benefit rating for each alternative	N/A	$189.38 (Low Cost Effectiveness Rating)	$186.00 (Low Cost Effectiveness Rating)	$165.23 (Low Cost Effectiveness Rating)	$150.50 (Low Cost Effectiveness Rating)
	Objective 4.2: Consider the annual impact to local and county government budgets for Westshore communities	Expected annual O&M cost Expected annualized capital cost Total estimated annual cost Expected total capital cost	Annual O&M Cost: $9.8 million Annualized Capital Cost: $2.4 million Total Estimated Annual Cost: $12.2 million Total Capital Cost: $23.7 million (2010 $)	Annual O&M Cost: $21.9 million Annualized Capital Cost: $30.3 million Total Estimated Annual Cost: $52.2 million Total Capital Cost: $378.0 million (2010 $)	Annual O&M Cost: $20.2 million Annualized Capital Cost: $15.7 million Total Estimated Annual Cost: $35.9 million Total Capital Cost: $193.1 million (2010 $)	Annual O&M Cost: $21.9 million Annualized Capital Cost: $29.8 million Total Estimated Annual Cost: $51.7 million Total Capital Cost: $371.4 million (2010 $)	Annual O&M Cost: $19.7 million Annualized Capital Cost: $15.2 million Total Estimated Annual Cost: $34.9 million Total Capital Cost: $186.6 million (2010 $)

Alternative 3A: Commuter Rail from Sandusky to West Blvd.	Alternative 3C: Commuter Rail from Lorain to West Blvd.	Alternative 4: Commuter Bus to Public Square	Alternative 5: Commuter Bus to Westlake Park and Ride	LPA Phase 1	LPA Phase 2	LPA Phase 3	LPA Phase 4
$257.40 (Low Cost Effectiveness Rating)	$247.29 (Low Cost Effectiveness Rating)	$75.14 (Low Cost Effectiveness Rating)	$113.56 (Low Cost Effectiveness Rating)	Low Cost Effectiveness Rating	Low Cost Effectiveness Rating	Low Cost Effectiveness Rating	Low Cost Effectiveness Rating
Annual O&M Cost: $21.7 million Annualized Capital Cost: $27.3 million Total Estimated Annual Cost: $49.0 million Total Capital Cost: $339.4 million (2010 $)	Annual O&M Cost: $20.2 million Annualized Capital Cost: $13.1 million Total Estimated Annual Cost: $33.3 million Total Capital Cost: $157.2 million (2010 $)	Annual O&M Cost: $13.0 million Annualized Capital Cost: $3.5 million Total Estimated Annual Cost: $16.5 million Total Capital Cost: $35.3 million (2010 $)	Annual O&M Cost: $12.8 million Annualized Capital Cost: $3.5 million Total Estimated Annual Cost: $16.3 million Total Capital Cost: $35.3 million (2010 $)	Annual O&M Cost: $8.3 million Total Capital Cost: $11.2 million (2010 $)	Annual O&M Cost: $10.4 million Total Capital Cost: $15.8 million (2010 $)	Annual O&M Cost: $16.9 million Total Capital Cost: $159.3 million (2010$)	Annual O&M Cost: $18.3 million Total Capital Cost: $221.8 million (2010 $)

Goal 5: Environmental Impact

Develop transportation solution that conserves resources, improves air quality and promotes environmental sustainability and social and environmental justice.

The objectives in Goal 5 were assessed using the Environmental Overview completed for the detailed screening phase of the analysis. The Environmental Overview is presented in Chapter 10 of this document.

Objective 5.1: Improve air quality within the Westshore Corridor.

Air quality improvement was measured by the estimated number of new riders using the service. Presuming that these new riders would otherwise have made the trip in a single-occupancy vehicle, the daily automobile miles that would be reduced as a result of using the service were calculated. As discussed above in Objective 1.2, the number of new riders was determined for each alternative. Alternative 2A was forecasted to have the greatest number of new riders (705), and likewise would result in the greatest reduction in number of automobile miles driven (14,195 miles). Of the four alternatives with the greatest reduction in miles driven, three are the rail-based alternatives with a western terminus at the Sandusky Amtrak station (Alternatives 1A, 2A and 3A). The fourth is Alternative 2C commuter rail from Lorain to Tower City. The strong performance of the Sandusky-Cleveland rail-based alternatives is due to the long distance of trips originating in Sandusky; even a small increase in new riders originating in Sandusky results in a relatively large number of automobile miles reduced. The TSM Alternative performs the worst under these criteria, with only 64 new riders and a daily automobile mile reduction of 1,319 miles.

Objective 5.2: Minimize the amount of needed right-of-way for corridor and stop/station improvements in the study area.

Right-of-way needed for corridor and stop/station improvements was estimated based on the number and type of improvements included in the alternative (as described in *Chapter 7 Capital Cost Estimate*) and the amount of land that would need to be acquired for development of park and ride lots. As Chapter 10 notes, the construction of a park and ride lot, even a small one, will result in an environmental impact to the corridor. The bus-based alternatives, which require no corridor improvements and relatively smaller park and ride lots due to smaller demand, perform best under this criterion. The TSM Alternative is estimated to require no additional right-of-way, as all stops will be within existing right-of-way on arterial streets. Of the build alternatives, 4 and 5 require 12.8 acres. The rail-based Alternatives 1A and 3A are each estimated to require the greatest amount of right-of-way, at 41.1 acres.

Objective 5.3: Consider impacts to existing adjacent land uses.

Impacts to existing adjacent land uses were measured as the number of houses and businesses impacted by each alternative. At this phase in the alternatives analysis, it is assumed that no houses or businesses would be physically impacted by any of the alternatives. All corridor

improvements and station/park and ride development could be completed within existing right-of-way or on undeveloped land. This assumption is, of course, subject to change depending on park and ride site selection and development that may occur between now and implementation of the project.

Objective 5.4: Minimize impacts to historic and potentially historic sites and structures in the corridor.

Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky. However, it is anticipated that no historic or potentially historic sites and structures would be impacted by any of the alternatives.

Objective 5.6: Avoid or identify mitigation strategies and funding for locations with ecologically sensitive areas and hazardous materials sites.

Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. This would primarily be an issue along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries.

Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail corridors. A further discussion of this topic for each alternative can be found in Chapter 10 Environmental Overview of Detailed Alternatives.

Objective 5.7: Minimize transportation-related noise impacts.

Rail corridors and bus routes have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas. Impacts are most likely in the denser inner part of the Westshore corridor through Cleveland and Lakewood. Specific to train noise and vibration, Lakewood has instituted a quiet zone for trains using the Nickel Plate Line. While noise and vibration impacts are discussed in a general sense in Chapter 10, a further analysis of this issue would need to be undertaken if a transportation improvement project is developed further.

Objective 5.8: Protect and, where possible, enhance environmentally sensitive areas (parks, public buildings, schools cemeteries, hospitals, low income/minority neighborhoods, etc.)

As Chapter 10 states, the highest potential for environmental impacts, either positive or negative will occur in areas where park and ride and bus and rail stations may be constructed or expanded, or new track is constructed.

Objective 5.9: Ensure that impacts are minimized and benefits are fairly provided to low income, minority and other environmental justice communities.

Environmental justice populations are present in the many areas of the corridor and may be negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. Environmental justice populations are a large presence in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky.

As mentioned previously, it is assumed that none of the alternatives would physically impact any houses or businesses. Therefore it is unlikely that there would be an impact on environmental justice communities as a result of relocation.

There is potential for other negative impacts to occur, such as increased noise levels, as well as positive impacts of increased mobility and accessibility to employment and other activity centers in the corridor. Potential for both negative and positive impacts on environmental justice communities were measured by the percent minority population and percent population under the poverty level within ½ mile of the proposed station/stop locations for each alternative. Overall, the percentage of minority and low income populations does not differ much among the nine alternatives. Alternative 5 has the lowest percentage of minority and low income populations within ½ mile of the proposed stop locations, with a 13.1% minority population and 14.8% of the population below the poverty level. The relatively lower percentage of low income and minority populations is not unexpected, as Alternative 5 does not directly serve the areas with the largest environmental justice populations in Cleveland and Lakewood. Alternative 3A has the highest percentage of minority residents within ½ mile of its proposed stations (19.7%), while the TSM has the highest percentage of residents with income below the poverty level within ½ mile of its proposed stops (19.1%).

While each of the alternatives has a similar level of impact to environmental justice communities, the environmental overview described in Chapter 10 did not consider whether those impacts are adverse and whether mitigation might be required in order to alleviate those impacts. This issue should be revisited if a transportation improvement project is developed as an outcome of this study.

Table 11.9: Summary of Detailed Screening Criteria for Goal 5

OBJECTIVES

GOAL 5 ENVIRONMENTAL IMPACT Develop transportation solution that conserves resources, improves air quality and promotes environmental sustainability and social and environmental justice.	Goal 5 Screening Criteria	TSM
Objective 5.1: Improve air quality within the Westshore corridor	Number of net new riders Number of automobile miles reduced with new alternative	64 new riders Daily miles reduced : 1,319
Objective 5.2: Minimize the amount of needed right-of-way for corridor and stop/station improvements in the study area	Acres of right-of-way required for each alternative	11.3 acres
Objective 5.3: Consider impacts to existing adjacent land uses.	Number of houses impacted by alternative Number of businesses impacted by alternative	No houses impacted by alternative. No businesses impacted by alternative.
Objective 5.4: Minimize impacts to historic and potentially historic sites and structures in the corridor.	Number of historic and potentially historic sites and structures affected by each alternative	Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.
Promote environmentally sustainable land use patterns and LEED certified buildings as part of development and redevelopment efforts within the study area.	Expected changes to plans and policies within the corridor	
Objective 5.5: Avoid or identify mitigation strategies and funding for locations with ecologically sensitive areas and hazardous materials sites.	Number of sites identified with ecologically sensitive areas Number of sites identified with hazardous material sites	Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail corridors.
Objective 5.6: Minimize transportation-related noise impacts.	Number of environmentally sensitive areas (parks, public buildings, schools cemeteries, hospitals, low income/minority neighborhoods, etc.) adjacent to alternative	Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Bus stops have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.
Objective 5.7: Protect and, where possible, enhance environmentally sensitive areas (parks, public buildings, schools cemeteries, hospitals, low income/minority neighborhoods, etc.).	Assessment of how alternatives will affect the environmentally sensitive areas along the alignment.	The highest potential for environmental involvement will occur in areas where park-and-ride and bus stations may be constructed or expanded.
Objective 5.8: Ensure that impacts are minimized and benefits are fairly provided to low income, minority and other environmental justice communities.	Number of jobs, minority households and low-income households displaced by each alternative. Percent minority population within 1/2 mile of stations Percent population below poverty level within 1/2 mile of stations	No displacement of households or jobs anticipated. Percent minority population: 17.8% Percent population with income under the poverty level: 19.1%

Alternative 1A: Commuter Rail from Sandusky to Lakefront Station	Alternative 1C: Commuter Rail from Lorain to Lakefront Station	Alternative 2A: Commuter Rail from Sandusky to Tower City
623 new riders Daily miles reduced: 12,613	539 new riders Daily miles reduced: 8,052	705 new riders Daily miles reduced : 14,195
41.1 acres	32.6 acres	36.7 acres
No houses impacted by alternative. No businesses impacted by alternative.	No houses impacted by alternative. No businesses impacted by alternative.	No houses impacted by alternative. No businesses impacted by alternative.
Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.	Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.	Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.
Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail corridors.	Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail corridors.	Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail and RTA's Red-line corridors.
Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Rail and bus routes have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.	Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Rail and bus routes have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.	Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Rail and bus routes have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.
The highest potential for environmental involvement will occur in areas where park-and-ride, bus and rail stations may be constructed or expanded, or new track is constructed.	The highest potential for environmental involvement will occur in areas where park-and-ride, bus and rail stations may be constructed or expanded, or new track is constructed.	The highest potential for environmental involvement will occur in areas where park-and-ride, bus and rail stations may be constructed or expanded, or new track is constructed.
No displacement of households or jobs anticipated. Percent minority population: 19.5% Percent population with income under the poverty level: 18.3%	No displacement of households or jobs anticipated. Percent minority population: 16.3% Percent population with income under the poverty level: 17.2%	No displacement of households or jobs anticipated. Percent minority population: 19.1% Percent population with income under the poverty level: 18.8%

Alternative 2C: Commuter Rail from Lorain to Tower City	Alternative 3A: Commuter Rail from Sandusky to West Blvd.	Alternative 3C: Commuter Rail from Lorain to West Blvd.
626 new riders Daily miles reduced : 9,405	445 new riders Daily miles reduced : 8,718	362 new riders Daily miles reduced: 5,550
28.2 acres	41.1 acres	32.6 acres
No houses impacted by alternative. No businesses impacted by alternative.	No houses impacted by alternative. No businesses impacted by alternative.	No houses impacted by alternative. No businesses impacted by alternative.
Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.	Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.	Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.
Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail and RTA's Red-line corridors.	Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail corridors.	Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail corridors.
Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Rail and bus routes have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.	Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Rail and bus routes have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.	Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Rail and bus routes have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.
The highest potential for environmental involvement will occur in areas where park-and-ride, bus and rail stations may be constructed or expanded, or new track is constructed.	The highest potential for environmental involvement will occur in areas where park-and-ride, bus and rail stations may be constructed or expanded, or new track is constructed.	The highest potential for environmental involvement will occur in areas where park-and-ride and bus stations may be constructed or expanded.
No displacement of households or jobs anticipated. Percent minority population: 15.8% Percent population with income under the poverty level: 17.7%	No displacement of households or jobs anticipated. Percent minority population: 19.7% Percent population with income under the poverty level: 18.8%	No displacement of households or jobs anticipated. Percent minority population: 16.5% Percent population with income under the poverty level: 17.8%

Alternative 4: Commuter Bus to Public Square	Alternative 5: Commuter Bus to Westlake Park and Ride	LPA Phase 1
159 new riders Daily miles reduced: 4,779	113 new riders Daily miles reduced: 4,069	30 new riders Incremental daily miles reduced by Phase 1: 985
12.8 acres	12.8 acres	3.0 acres
No houses impacted by alternative. No businesses impacted by alternative.	No houses impacted by alternative. No businesses impacted by alternative.	No houses impacted by alternative. No businesses impacted by alternative.
Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.	Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.	Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.
Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and local roadway drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along the interstate.	Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and local roadway drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along the interstate.	Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and local roadway drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along the interstate.
Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Bus stops have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.	Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Bus stops have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.	Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Bus stops have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.
The highest potential for environmental involvement will occur in areas where park-and-ride and bus stations may be constructed or expanded.	The highest potential for environmental involvement will occur in areas where park-and-ride and bus stations may be constructed or expanded.	The highest potential for environmental involvement will occur in areas where park-and-ride and bus stations may be constructed or expanded.
No displacement of households or jobs anticipated. Percent minority population: 19.0% Percent population with income under the poverty level: 17.1%	No displacement of households or jobs anticipated. Percent minority population: 13.1% Percent population with income under the poverty level: 14.8%	No displacement of households or jobs anticipated. Percent minority population: 30.2% Percent population with income under the poverty level: 26.7%

LPA Phase 2	LPA Phase 3	LPA Phase 4
43 new riders Incremental daily miles reduced by Phase 2: 1,463	553 new riders Incremental daily miles reduced by Phase 3: 8,002	79 new riders Incremental daily miles reduced by Phase 4: 5,222
6.0 acres	17.0 acres	20.2
No houses impacted by alternative. No businesses impacted by alternative.	No houses impacted by alternative. No businesses impacted by alternative.	No houses impacted by alternative. No businesses impacted by alternative.
Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.	Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.	Historic sites and resources are more prevalent in the developed urban areas of Cleveland, Lakewood, Rocky River, Lorain, Vermilion and Sandusky.
Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and local roadway drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along the interstate.	Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail and RTA's Red-line corridors.	Ecological issues may include potential wetland and stream involvement in more rural or suburban areas near streams, rivers, lakes, and adjacent transportation systems, such as interstate, highway and railroad drainage ditches. Most notably along the Rocky River, Black River, Vermilion River, the Huron River, and their tributaries. Hazardous materials involvement may occur through the presence of industrial, commercial, and small waste generators such as gas stations, dry cleaners, and auto repair facilities, which are often present in areas near interchanges, urban and developed areas, and in the industrial areas along existing rail and RTA's Red-line corridors.
Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Bus stops have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.	Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Rail and bus routes have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.	Environmental Justice (EJ) Populations may be present in the urban areas and maybe negatively impacted as a result of development/relocation; or positively impacted as a result of the ability for increased mobility. EJ populations are likely present in the cities of Cleveland, Lakewood, Lorain, Vermilion, Huron, and Sandusky. Rail and bus routes have the potential to increase in noise levels near sensitive receptors especially near urban areas, parks, hospitals, schools, cemeteries, and recreational areas.
The highest potential for environmental involvement will occur in areas where park-and-ride and bus stations may be constructed or expanded.	The highest potential for environmental involvement will occur in areas where park-and-ride and bus stations may be constructed or expanded.	The highest potential for environmental involvement will occur in areas where park-and-ride and bus stations may be constructed or expanded.
No displacement of households or jobs anticipated. Percent minority population: 22.3% Percent population with income under the poverty level: 20.3%	No displacement of households or jobs anticipated. Percent minority population: 18.9% Percent population with income under the poverty level: 19.1%	No displacement of households or jobs anticipated. Percent minority population: 19.9% Percent population with income under the poverty level: 19.4%

Detailed Screening Conclusions

This study has resulted in a number of conclusions:

Goal 1: Transportation Improvement

In terms of improving overall transportation mobility and accessibility, the commuter rail alternatives outperform the bus-based alternatives. Commuter rail provides a faster trip to downtown Cleveland than commuter bus and has the greatest projected number of total and new riders. Of the commuter rail alternatives, 2A performs the best. It serves the entire corridor, from downtown Cleveland to Sandusky. Further, it ends in the heart of downtown Cleveland at Tower City, which provides the most accessibility of the three proposed eastern terminal for commuter rail (Lakefront Station, Tower City, and West Blvd).

Goal 2: Transit Oriented Land Use

Based on the screening, commuter rail alternatives are best for transit oriented land use. While the bus-based alternatives considered do a number of things better than rail, including better distribution of riders to downtown Cleveland jobs and stations located closer to suburban activity centers, commuter rail is the better overall choice because it has the best potential to influence future land use changes at stations. The commuter rail alternatives also receive positive marks because the NS (former Nickel Plate) rail alignment serves more downtown cores (in Lakewood, Rocky River and Lorain) than the commuter bus alternatives.

There is little differentiation for land use among the six commuter rail alternatives other than the fact 1A, 2A, and 3A extend to Sandusky and thus will influence land use in Erie County while 1C, 2C, and 3C, terminating in Lorain, will not.

Goal 3: Cost Effectiveness

All of the alternatives rate low in terms of cost effectiveness. However, commuter bus alternatives 4 and 5 rate better in cost effectiveness than commuter rail alternatives. This is because while these alternatives have significantly fewer user benefits, they also cost much less. Because cost effectiveness is so low, significant improvement to user benefit will be needed in order to improve the project justification rating in this area. Improvement of the overall project justification rating is key to qualifying for FTA funding for a selected improvement.

It is important to note that the ridership and user-benefit estimates on which the cost effectiveness is being calculated are not based on travel forecasting model results, and are very imprecise relative to estimates developed using a regional forecasting model. Improved ridership and user benefit estimates should be prepared before final conclusions are made related to the cost effectiveness of the proposed alternatives.

Goal 4: Fiscal Responsibility

Fiscal Responsibility is another goal in which commuter bus alternatives 4 and 5 outperform the commuter rail alternatives. As noted above, commuter bus alternatives cost significantly less to construct and less to operate and maintain. Annual cost of commuter bus alternatives is estimated to be $16-34 million less than commuter rail. Therefore, alternatives 4 and 5 rate best for fiscal responsibility.

Goal 5: Environmental Impact

All of the alternatives will provide a positive environmental impact as they reduce the number of automobile miles traveled (and thus carbon and other emissions and fuel use) for a significant number of users. The commuter rail alternatives perform better by virtue of having many more estimated new riders than the commuter bus alternatives. Required right-of-way could negatively affect each alternative except the TSM, but this aspect is essentially a tie among all alternatives since the travel corridor exists for both the Nickel Plate Railroad and I-90. Therefore, right-of-way is significant for station location, which can be flexible in its location.

Another environmental issue is potential for noise and safety issues for the rail alternatives, especially in the denser inner part of the Westshore corridor.

Overall Conclusion

Based on the evaluation of each goal, the transit alternatives can be summarized as

1. There is a demonstrated need for transit service within the Westshore Corridor.
2. The greatest benefit occurs when transit directly serves Tower City/Public Square.
3. Commuter rail would provide the best benefit in terms of transportation, economic development, and land use, but the cost of a commuter rail line outweighs this benefit.
4. While commuter bus is less impactful than commuter rail, it is more cost effective on a user benefit per dollar spent.

Based on points 1 and 4, commuter bus is the best alternative. Based on point 2, commuter bus should serve downtown Cleveland directly instead of transferring to RTA services in Westlake.

Chapter 12 – Locally Preferred Alternative

Introduction

The proposed Locally Preferred Alternative (LPA) for the Westshore Corridor Transportation Project Alternatives Analysis is a plan to address the inter-county mobility and public transit needs of the study area. The proposed LPA would be implemented in four phases in order to begin addressing the transportation needs of the corridor while building a market for future commuter rail service to be implemented at a later date.

Proposed Locally Preferred Alternative

Chapter 11 Detailed Screening of Alternatives recommends Alternative 4, Sandusky to Public Square Commuter Bus, as the most effective transit solution to the problems in the Westshore Corridor. However, as the term "Locally Preferred Alternative" suggests, the preferences of the local community are just as important as the technical recommendation. In this case the local community prefers to include commuter rail in the LPA.

Therefore the LPA is recommended to be implemented in four phases. This will allow for a low cost transit service appropriate to the existing demand to be provided in the near-term while simultaneously building a ridership market, changing land use patterns and developing future commuter rail service. Phases 1 and 2, described in greater detail below, include commuter bus service that would provide immediate benefits to travelers in the corridor. Commuter bus stations would be located along the rail corridor at the sites of future rail stations, which will help local municipalities to encourage development at these locations. As jobs and people cluster at these stations, the cost to benefit ratio of commuter rail will decrease, thereby justifying the expense of commuter rail construction. Phases 3 and 4 of the LPA are dedicated to the construction of commuter rail and transition from bus to rail transit within the corridor.

LPA Phase 1

LPA Phase 1 includes the following service:

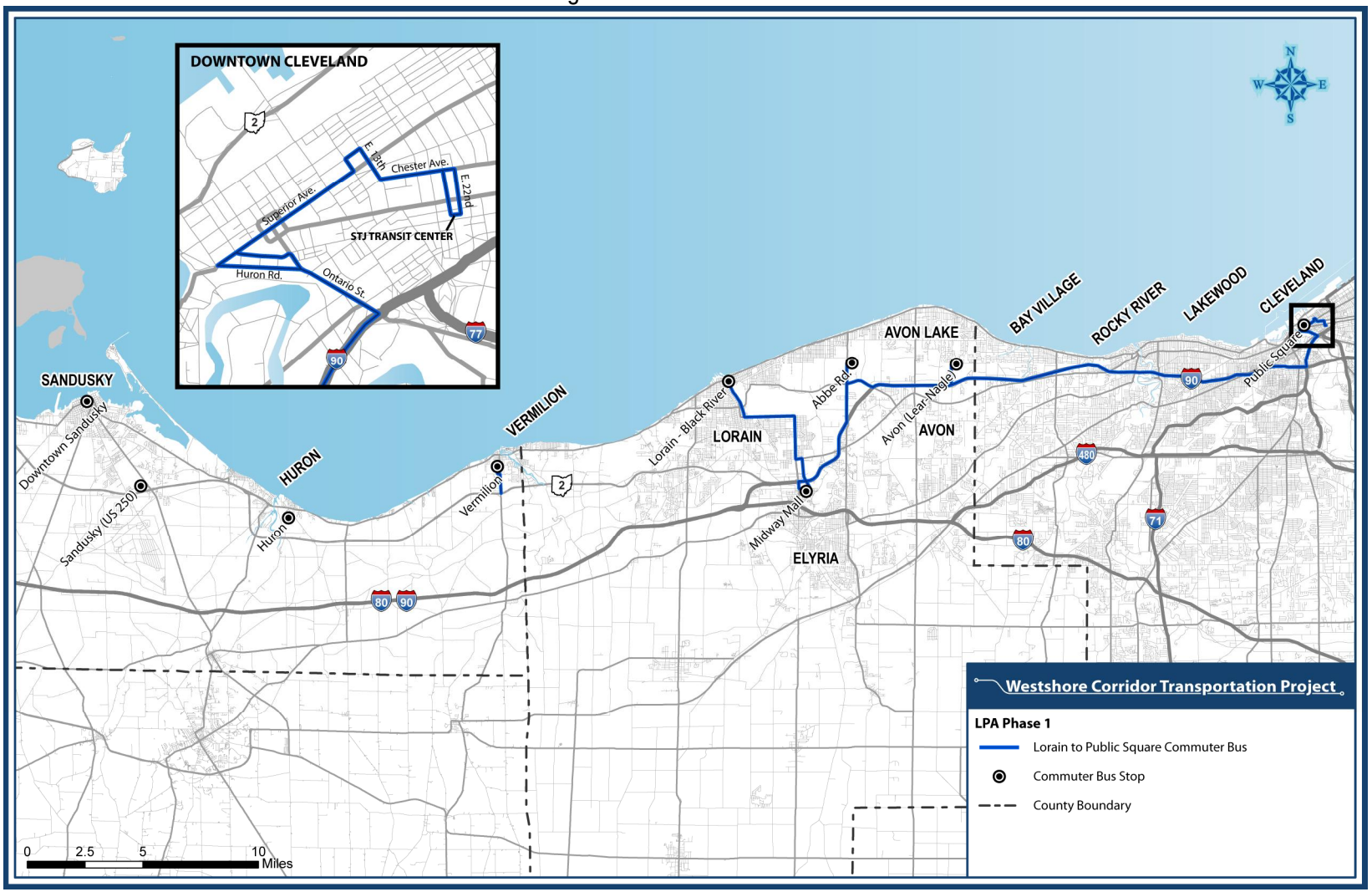
- A single commuter bus route to be operated between Lorain County and downtown Cleveland

The proposed service for LPA Phase 1 route is shown in Table 12.1 and Figure 12.1.

Table 12.1: LPA Phase 1 Service

	Mode	AM Peak	Midday	PM Peak
LPA 101/102 Lorain County Zone	Commuter Bus	3 EB Trips	1 WB Trip	3 WB Trips

Figure 12.1: LPA Phase 1



Phase 1 would provide a single commuter bus route serving Lorain County. This route would provide the best transit service for Lorain County riders, as it would serve four park and ride locations:

- Black River Landing (200 space P&R)
- Midway Mall (P&R spaces already available; connections to LCT local bus routes)
- Abbe Road (100 space P&R)
- Avon SR 83 (100 space P&R)

Additionally, it would not stop at the Westlake P&R, thus providing a faster connection once the route accesses I-90. The park and ride locations for would be located at future commuter rail sites, which will lay the groundwork for future commuter rail service at those locations.

Proposed Improvements to Local Services

- Reinstatement of most of the pre-2010 Lorain County Transit system, as detailed in Chapter 6
- Operation of three shuttles in Lorain County to deliver passengers from local neighborhoods to station locations

LPA Phase 2

LPA Phase 2 is a proposed expansion of the commuter bus network that is recommended. Phase 2 is similar to Alternative 4 Sandusky to Public Square Commuter Bus described in *Chapter 6 Detailed Description of Alternatives*. The major difference is that LPA Phase 2 locates many of the park and ride stations at the sites future commuter rail stations instead of along I-90. LPA Phase 12.2 is shown in Figure 12.2.

Four commuter bus routes are proposed for this phase. Three of the four routes serve the Erie County Zone, the Lorain/Elyria Zone, or the Sheffield/Avon Zone. Dividing the corridor into three service zones will provide a faster, more direct trip for commuters in the AM and PM peaks. The fourth route is an all-stops route for commuters who need to return at midday. Table 12.2 describes the proposed service for Phase 2.

Table 12.2: LPA Phase 2 Service

	Mode	AM Peak	Midday	PM Peak
LPA 201/202 Erie County Zone	Commuter Bus	3 EB Trips		3 WB Trips
LPA 203/204 Lorain/Elyria Zone	Commuter Bus	3 EB Trips		3 WB Trips
LPA 205/206 Sheffield/Avon Zone	Commuter Bus	3 EB Trips		3 WB Trips
LPA 207 All Stops	Commuter Bus		1 WB Trip	

The proposed Erie County Zone stops are:

- Downtown Sandusky
- OH-2/US 250 (100 space P&R)
- Huron (50 space P&R)
- Vermilion (50 space P&R)

The proposed Lorain/Elyria Zone stops are:

- Black River Landing (200 Space P&R)
- Midway Mall (P&R spaces already available; connections to LCT local bus routes)

The proposed Sheffield/Avon Zone stops are:

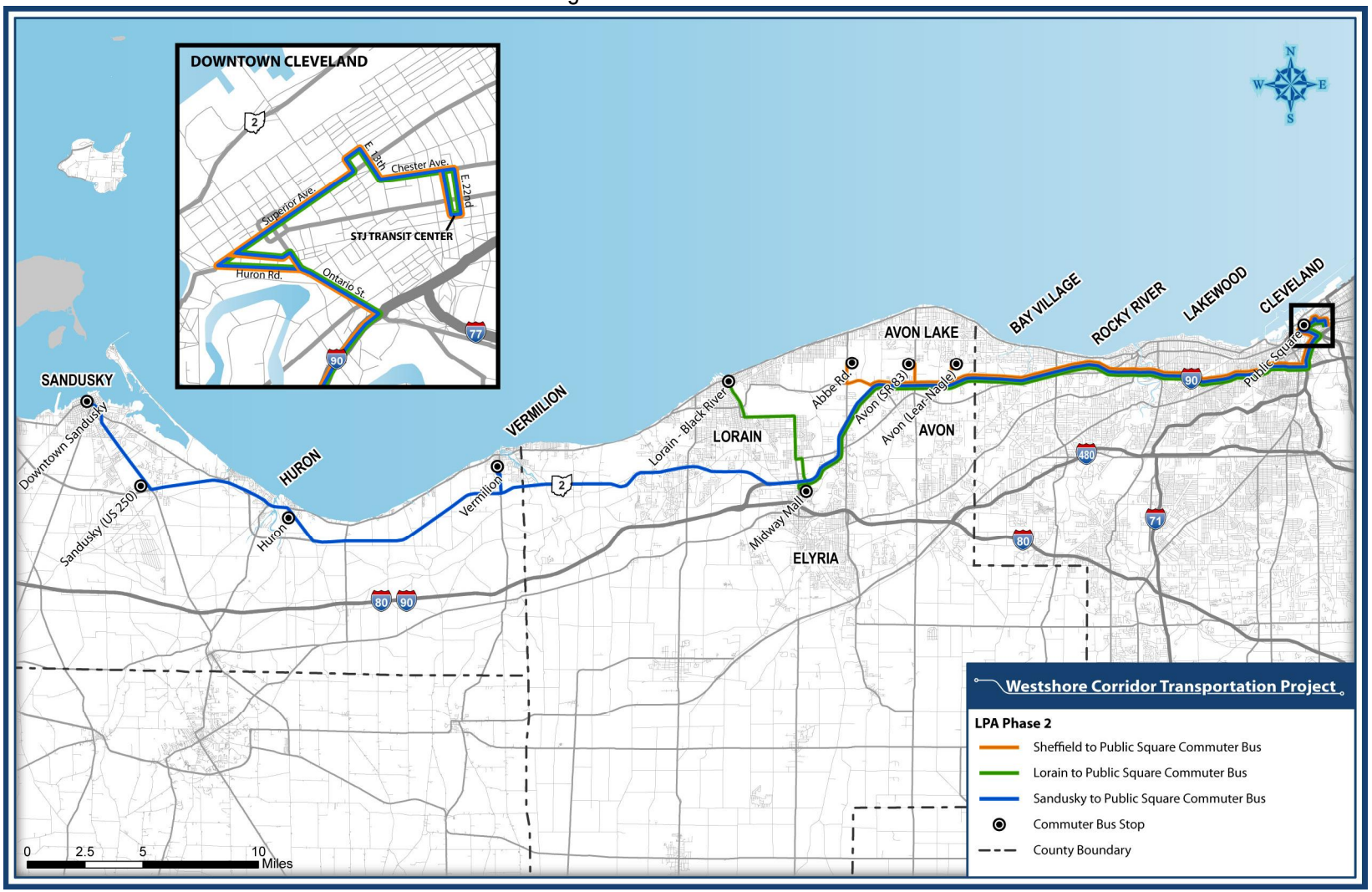
- Abbe Road (100 space P&R)
- Avon SR 83 (100 space P&R)
- Avon Lear-Nagle (100 space P&R)

Commuter buses arriving and departing downtown Cleveland would use the same pick up/drop off routing described in LPA Phase 1.

Proposed Improvements to Local Services

- Discontinuation of extended GCRTA #246 if this option is used for Phase 1
- Two new fixed route bus lines in Erie County

Figure 12.2: LPA Phase 2



LPA Phase 3

LPA Phase 3 is a transitional phase between commuter rail and commuter bus service, and is similar to Alternative 2C described in Chapter *6 Detailed Description of Alternatives*. In this phase commuter rail service would be operated on the Nickel Plate corridor between Black River Landing in Lorain and Tower City in downtown Cleveland. Unlike Alternative 2C, commuter bus service would be operated between the Erie County Zone and downtown Cleveland (instead of transferring passengers to commuter rail in Lorain). This route will offer a faster, more direct trip to downtown Cleveland for Erie County travelers. An all-stops bus route would be operated during the midday to provide an emergency return trip for commuter rail and bus passengers. The details of LPA Phase 3 are shown in Figure 12.3 and Table 12.3.

Table 12.3: LPA Phase 3 Service

	Mode	AM Peak	Midday	PM Peak
LPA 301/302 Lorain to Tower City	Commuter Rail	3 EB Trips		3 WB Trips
LPA 303/304 Erie County Zone	Commuter Bus	3 EB Trips		3 WB Trips
LPA 305 All Stops	Commuter Bus		1 WB Trip	

The proposed commuter rail stops are:

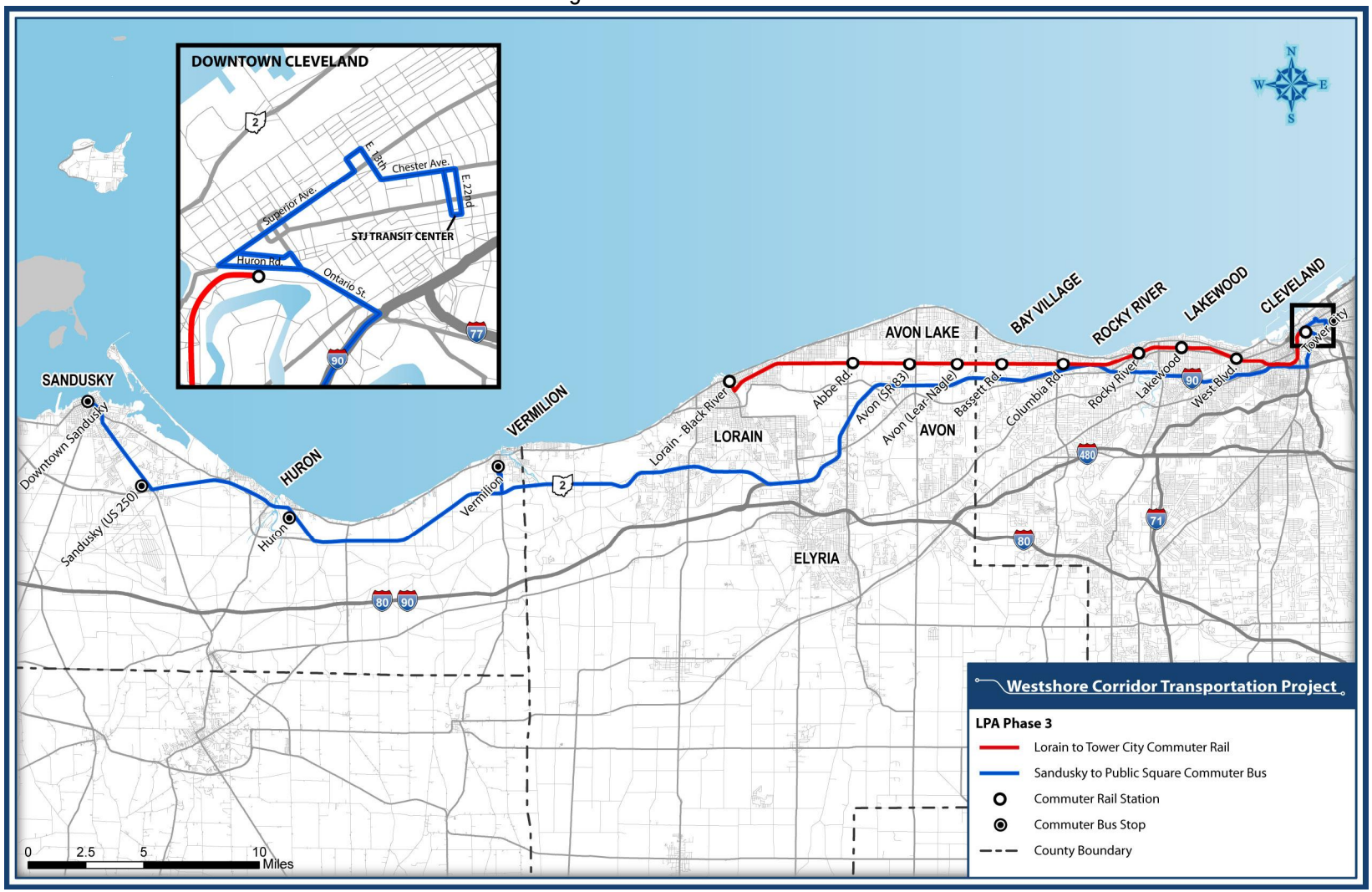
- Lorain (Black River Landing)
- Abbe Road Station
- Avon SR 83 Station
- Avon Lear-Nagle Station
- Bassett Road Station
- Columbia Road Station
- Rocky River Station
- Lakewood Station
- West Blvd Station
- Tower City

The commuter bus route serving Erie County is the same as proposed in Phase 2.

Proposed Improvements to Local Services

- All Phase 1 and Phase 2 Improvements
- Discontinuation of GCRTA Route #246 from the Westlake P&R to downtown Cleveland

Figure 12.3: LPA Phase 3



LPA Phase 4

LPA Phase 4 includes a fully constructed commuter rail corridor between Tower City in downtown Cleveland and the Amtrak station in Sandusky. An all-stops bus route would be operated during the midday to provide an emergency return trip for commuter rail passengers. The details of LPA Phase 4 are shown in Figure 12.4 and Table 12.4.

Table 12.4: LPA Phase 4 Service

	Mode	AM Peak	Midday	PM Peak
LPA 401/402 Sandusky to Tower City	Commuter Rail	3 EB Trips		3 WB Trips
LPA 403 All Stops	Commuter Bus		1 WB Trip	

The proposed commuter rail stops are:

- Sandusky Amtrak
- Huron Station
- Vermilion Station
- Lorain (Black River Landing)
- Abbe Road Station
- Avon SR 83 Station
- Avon Lear-Nagle Station
- Bassett Road Station
- Columbia Road Station
- Rocky River Station
- Lakewood Station
- West Blvd Station
- Tower City

Proposed Improvements to Local Services

- All Phases 1, 2 and 3 Improvements

Figure 12.4: LPA Phase 4

LPA Operation and Maintenance Costs

The operation and maintenance (O&M) costs for the four phases of the proposed LPA were estimated based on the cost model methodology described in *Chapter 8 Operations and Maintenance Costs*. Service units for revenue hours, miles, etc. were calculated based on the service plan outlined in the preceding part of this chapter. These service statistics calculations can be found in Appendix A12 of this document.

While no operator is designated in this chapter for any of the services proposed, bus costs were estimated using Greater Cleveland RTA annual O&M costs in order to approximate costs for a public operator in the Cleveland region. Commuter rail costs were estimated based on a survey of private operator agreements for passenger rail services which are common in commuter rail systems across the United States.

Table 12.5 shows the total and incremental O&M costs for the four phases of the LPA.

Table 12.5: LPA O&M Cost Summary (2010 $)

	Total O&M Cost (in millions)	Incremental Cost (in millions)
LPA Phase 1	$8.3	-
LPA Phase 2	$10.4	$2.1
LPA Phase 3	$16.9	$6.5
LPA Phase 4	$18.3	$1.4

LPA Phase 1

LPA Phase 1 is estimated to have an annual O&M cost between $7.8 and $8.3 million depending on which option is selected. The summarized O&M cost is shown in Table 12.6.

Table 12.6: LPA Phase 1 O&M Cost

LPA Phase 1	Operating Statistics	Unit Costs	Line Item Cost
Erie County Bus			
Annual Vehicle Revenue Hours	0	$58.31	$0
Annual Vehicle Revenue Miles	0	$3.00	$0
Peak Vehicles	0	$82,549	$0
Erie County Total			$0
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
LCT Total			$7,623,864
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	2,797	$58.31	$163,064
Annual Vehicle Revenue Miles	75,684	$3.00	$227,052
Peak Vehicles	3	$82,549	$247,647
Inter-county Commuter Bus Total			$637,763
LPA Phase 1 TOTAL COSTS			$8,261,627

LPA Phase 2

LPA Phase 2 is estimated to have an annual O&M cost of $10.4 million. The summarized O&M cost is shown in Table 12.7.

Table 12.7: LPA Phase 2 O&M Cost

LPA Phase 2	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	6,035	$58.31	$351,901
Annual Vehicle Revenue Miles	217,260	$3.00	$651,780
Peak Vehicles	9	$82,549	$742,941
Inter-county Commuter Bus Total			$1,746,622

Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748

LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
LCT Costs			$7,623,864

GCRTA Improvements	Stats	Unit Costs	Line Item Costs
Add'l Annual Vehicle Revenue Hours	0	$58.31	$0
Add'l Annual Vehicle Revenue Miles	0	$3.00	$0
Add'l Peak Vehicles	0	$82,549	$0
GCRTA Costs			$0

LPA Phase 2 TOTAL COSTS	$10,360,233

LPA Phase 3

LPA Phase 3 is estimated to have an annual O&M cost of $16.9 million. The summarized O&M cost is shown in Table 12.8.

Table 12.8: LPA Phase 3 O&M Cost

LPA Phase 3	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Rail			
Annual Passenger Car Revenue Miles	121,176	$10	$1,211,760
Peak Passenger Cars	9	$90,000	$810,000
Stations	9	$215,000	$1,935,000
Administration	1	$4,000,000	$4,000,000
Inter-county Commuter Rail Total			$7,956,760
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	3,239	$58.31	$188,837
Annual Vehicle Revenue Miles	119,238	$3.00	$357,714
Peak Vehicles	3	$82,549	$247,647
Inter-county Bus Costs			$794,198
Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
LCT Costs			$7,623,864
GCRTA Improvements			
Add'l Annual Vehicle Revenue Hours	-3,413	$58.31	-$198,997
Add'l Annual Vehicle Revenue Miles	-89,199	$3.00	-$267,597
Add'l Peak Vehicles	0	$82,549	$0
GCRTA Costs			-$466,594
LPA Phase 3 TOTAL COST			$16,897,975

LPA Phase 4

LPA Phase 4 is estimated to have an annual O&M cost of $18.3 million. The summarized O&M cost is shown in Table 12.9.

Table 12.9: LPA Phase 4 O&M Costs

LPA Phase 4	Operating Statistics	Unit Costs	Line Item Cost
Inter-county Commuter Rail			
Annual Passenger Car Revenue Miles	261,630	$10	$2,616,300
Peak Passenger Cars	9	$90,000	$810,000
Stations	12	$215,000	$2,580,000
Administration	1	$4,000,000	$4,000,000
Inter-county Commuter Rail Total			$10,006,300
Inter-county Commuter Bus			
Annual Vehicle Revenue Hours	791	$58.31	$46,094
Annual Vehicle Revenue Miles	18,513	$3.00	$55,539
Peak Vehicles	1	$82,549	$82,549
Inter-county Bus Costs			$184,182
Erie County Bus			
Annual Vehicle Revenue Hours	8,160	$58.31	$475,810
Annual Vehicle Revenue Miles	116,280	$3.00	$348,840
Peak Vehicles	2	$82,549	$165,098
Erie County Total			$989,748
LCT Improvements			
Annual Vehicle Revenue Hours	66,274	$58.31	$3,864,437
Annual Vehicle Revenue Miles	812,881	$3.00	$2,438,643
Peak Vehicles	16	$82,549	$1,320,784
			$7,623,864
GCRTA Improvements			
Add'l Annual Vehicle Revenue Hours	-3,413	$58.31	-$198,997
Add'l Annual Vehicle Revenue Miles	-89,199	$3.00	-$267,597
Add'l Peak Vehicles	0	$82,549	$0
			-$466,594
LPA Phase 4 TOTAL COST			$18,337,499

LPA Capital Costs

The capital cost estimates for the four phases of the proposed LPA are summarized in Table 12.10 and described below. The detailed line item summaries for each phase, presented in Standard Cost Category (SCC) Workbooks, can be found in Appendix A12 of this document.

Table 12.10: LPA Capital Cost Summary (2010 $)

	Estimated Capital Cost (in millions)
LPA Phase 1	$11.2
LPA Phase 2	$16.3
LPA Phase 3	$154.7
LPA Phase 4	$220.7

LPA Phase 1

The capital cost estimate for LPA Phase 1 is for the new commuter bus service.

The capital costs for the new commuter bus service includes the construction of proposed park and ride stations as well as the cost of vehicles to operate the proposed bus service. A capital cost for restoration of Lorain County Transit services is not anticipated, as buses were recently purchased in 2009 and now currently shuttered.

Commuter Bus Infrastructure

No guideway or other commuter bus infrastructure is planned for LPA Phase 1. Commuter buses would be operated in mixed traffic on local arterials and I-90.

Stations

Station capital costs include the acquisition of right-of-way, the construction of surface parking lots, concrete bus bays, shelters, benches, and ticket vending machines. Phase 1 capital costs include two Type A stations, two Type C stations, and one Type E station. Further information on station types can be found in *Chapter 7 Capital Costs*.

Vehicle Improvements

The vehicles used to provide the Phase 1 service are assumed to be 40-ft. commuter coaches at $800,000 per bus. The capital cost does not include any purchase of buses for use by LCT. A total of 29 vehicles are needed to operate a reinstated LCT system (13 for fixed route services, three for new shuttle services, eight paratransit vehicles, and five spares). It was assumed between LCT's current fleet of 22 18-ft "cutaway" buses and spare 40-ft GCRTA buses there are enough vehicles to reinstate the system.

Total Cost of LPA Phase 1: $11.2M (2010$)

A more detailed capital cost summary for LPA Phase 1 can be found in Appendix A12.

LPA Phase 2

The capital cost estimate for LPA Phase 2 includes construction of additional park and ride stations that were not constructed in Phase 1, as well as the cost of vehicles for the bus service added in this phase.

Commuter Bus Infrastructure

No guideway or other commuter bus infrastructure is planned for LPA Phase 2. Commuter buses would be operated in mixed traffic on local arterials and I-90.

Stations

The station capital costs include the acquisition of right-of-way, the construction of surface parking lots, concrete bus bays, shelters, benches, and ticket vending machines. Phase 2 capital costs include the addition of one Type A station and four Type C stations.

Vehicle Improvements

The commuter bus service proposed for Phase 2 would require eleven vehicles (nine in operation and two spares). After accounting for the four vehicles purchased in Phase 1, there is a need to purchase seven vehicles in Phase 2. These vehicles are assumed to be 40-ft. commuter coaches at $800,000 per bus. In addition, new fixed route service in Sandusky is proposed in Phase 2. This service requires three 18-ft "cutaway" vehicles (2 in operation and one spare). The 18-ft vehicles are assumed to cost $400,000 per bus.

Total Cost of LPA Phase 2: $16.3M (2010$)

A more detailed capital cost summary for LPA Phase 2 can be found in Appendix A12.

LPA Phase 3

The capital cost estimate for LPA Phase 3 includes construction of proposed commuter rail infrastructure, maintenance and storage facilities, and stations between Black River Landing in Lorain and Tower City in downtown Cleveland.

Commuter Rail Infrastructure

The proposed commuter rail service would be operated between Lorain and downtown Cleveland. From Lorain to approximately W. 25th St. in Cleveland, the commuter rail would be operated on the NS-owned Nickel Plate railroad. From W. 25th to Tower City, the service would be operated on RTA-owned right of way. Further explanation of rail infrastructure improvements to these sections can be found in *Chapter 7 Capital Costs*.

Stations

Some of the commuter rail station locations between Lorain and downtown Cleveland will have already been developed in Phases 1 and 2 as part of the commuter bus service. Some upgrades to these stations will be necessary in Phase 3, such as constructing commuter rail platforms. The capital cost estimate for Phase 3 also includes the construction of new commuter rail stations within Cuyahoga County at Bassett Rd., Columbia Rd., Rocky River, Lakewood and West Blvd. The commuter bus service operated in Phases 1 and 2 would not serve these locations, therefore these stations entail new construction costs.

Vehicle Improvements

Phase 3 capital costs include the purchase of four trainsets (three in operation and one spare) for the operation of commuter rail.

Total Cost of LPA Phase 3: $154.7M (2010$)

A more detailed capital cost summary for LPA Phase 3 can be found in Appendix A12.

LPA Phase 4

The capital cost estimate for LPA Phase 4 includes construction of proposed commuter rail infrastructure and stations between Sandusky and Lorain.

Commuter Rail Infrastructure

Extending commuter rail service west of Lorain to Sandusky will require operating on two different rail segments, each of which will require their own set of guideway improvements. From Lorain to Vermilion, the commuter rail service would continue to be operated on the NS-owned Nickel Plate railroad. From Vermilion to Sandusky, the service would be operated on the NS-owned Chicago Line. The Chicago Line, with a large number of interstate freight trains, will require the construction of a third track in order to allow freight and commuter rail service to be operated without delays. Further explanation of improvements to these sections can be found in *Chapter 7 Capital Costs*.

Stations

Improvements to stations in LPA Phase 4 will include upgrades to existing commuter bus stations in Vermilion and Huron to make them serviceable for commuter rail. In addition, commuter rail signage and amenities will be provided at the Sandusky Amtrak station, the westernmost stop on the line.

Vehicle Improvements

Phase 4 capital costs do not include any additional vehicle purchases.

Total Cost of LPA Phase 4: $220.7M (2010$)

A more detailed capital cost summary for LPA Phase 4 can be found in Appendix A12.