Miami Valley Freight Movement Study May 2006

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MIAMI VALLEY
REGIONAL PLANNING COMMISSION
ONE REGION... ONE VISION... ONE FUTURE

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SUMMARY AND KEY FINDINGS

The Miami Valley Freight Movement Study was conducted to identify the trends in the freight industry, develop a regional freight transportation system profile and present the freight movement analysis. The Study takes an in-depth look at regional freight issues to assist decision makers in developing a freight infrastructure that enhances the efficiency, safety and security of freight movement in the Region and promotes economic development.

The study focuses on inventorying and characterizing existing freight transportation in the Miami Valley Region using capacity, performance and usage data. Associated with the Study, the Miami Valley Freight Movement Workshop was conducted to solicit input from regional freight transportation stakeholders on constraints and opportunities in moving freight in the Miami Valley. Research was also conducted through a review and synthesis of literature and available data at the local, state and national level; data analysis; and interpretation.

According to MVRPC's 2030 Long Range Transportation Plan, the population of the Region is expected to decline over the next 30 years. The decline is concentrated in Montgomery County, the largest county in the Region; Greene, Miami and cities in Warren County are expected to have moderate population gains. The Region's land use will continue to be characterized by less concentrated, low density development patterns, away from existing urban centers.

The service sector is the largest economic sector in the Miami Valley both in terms of the number of establishments as well as employment that primarily generates small-truck local freight rather than large inter-city shipments. Despite a 52% decline in employment between 1970 and 2000, manufacturing continues to be one of the basic economic sectors of the Region. Most industrial establishments in the Region have located along rail and freeway corridors and generate heavy freight activity.

Trucking is by far the dominant mode of freight transportation in the Miami Valley accounting for 94% of freight moving in, out and within the Region. Additionally, trucks link the Region's rail and air facilities to most of the Region's individual companies and all of its consumers. Trucks also provide the only link to water freight services located in Cincinnati at the Ohio River. The trucking industry relies on the Region's highway and road infrastructure to safely and efficiently deliver its cargo and serve its customers.

An analysis of the volume of annual average daily truck traffic on the Region's roadways affirms that the Region's two major highway corridors, I-75 and I-70, carry the maximum truck traffic in the Region. Most retailers have switched to 'just-in-time' stocking procedures, which eliminates in-store inventory, and demands reliable freight delivery (usually by truck). There are more than 300 major trucking, warehouse, and distribution facilities in the Region, the majority of which are located long the I-75 corridor, which also has the highest concentration of industrial zoning in the Region. Freight workshop participants have recommended some improvements to large volume truck corridors in the Region.

The Miami Valley Region is well served by other freight modes such as rail, air and pipelines. Two U.S. Class I rail companies, CSXT and Norfork Southern, operate in the Miami Valley area. The Region's supply of gas and oil is primarily met through the extensive underground pipeline network that links the Region to the entire Nation. Dayton International Airport is the focal point of the Region's air transportation with a large air cargo presence that includes a UPS hub as well as Federal Express and USPS cargo facilities. The freight workshop participants recommended a

coordinated effort by the airport authorities and regional leaders to fill the existing UPS facility since UPS is slated to close its heavy freight hub by summer of 2006.

Intermodal traffic (rail - truck) is the fastest growing sector of the national rail industry. The Miami Valley is currently served from rail intermodal terminals in Cincinnati and Columbus. Some respondents to the Miami Valley Freight Workshop indicated that local truck-rail intermodal facilities are needed. The feasibility of another intermodal connection (rail-air) from CSXT line to Dayton International Airport is currently being examined through the Dayton Intermodal Rail Feasibility Study.

The application of intelligent transportation system (ITS) applications related to commercial vehicle operations holds the promise of greater efficiency for truckers in the Region. Several workshop participants recommended implementation of ITS in the Region to improve traffic flow and manage the logistics of urban goods movement.

A commodity flow analysis was conducted for the Miami Valley Region based on the TRANSEARCH database obtained from Reebie Associates through the Ohio Department of Transportation. The data was used to study internal, inbound and outbound movements of freight in the Region by mode and origin/destination pair.

The commodity flow analysis also included a comparison of weight and value for freight commodities. There are several commodities hauled in the Region that have an inverse relationship between their value and tonnage, such as non metallic minerals, food and agricultural products that are high in tonnage and low in value per ton, as compared to durable manufacturing products and transportation equipment that have relatively low tonnage but a very high value per ton.

The following points summarize the commodity flow analysis results:

- In 2003, over 48 million tons of freight, worth over $136 billion was moved in, out and within the Miami Valley Region.
- The Miami Valley area was a net exporter by both weight (12.2 million tons) and value ($24.2 billion). In other words, the Region ships more goods than it receives annually (61% outbound vs. 36% inbound).
- Truck is the dominant mode of transportation for all freight flows in the Miami Valley, representing 94% by weight and 84% by value. Rail freight was only 5% by tonnage but 13% in value, primarily due to transporting a significant volume of transportation equipment from and to the Region.
- The top commodity groups by weight that the Region imports include warehousing, agricultural, clay-concrete-glass, and food products. The top commodity groups that the Region exports include non metallic minerals, food, and warehousing products. Durable manufacturing, transportation equipment and machinery constituted the bulk of the tonnage value for goods traded in the Region.
- Intra-regional freight traffic is strongly dominated by three categories: clay-concrete-glass, warehousing, and other minerals, i.e., rock, aggregate and gravel.
- The Miami Valley Region's number one trading partner is collectively other counties in Ohio for both inbound as well as outbound commodities.

MVRPC's truck model was used to estimate intra-regional truck flows for years 2000 and 2030. Both estimates show that truck origins and destinations are concentrated along the I-75 corridor as well as the urbanized areas of the Region. By 2030, increased commercial vehicle activity is expected to follow the regional population and employments trends of out-migration away from the Region's central core to the outlying areas of Montgomery, Greene and Miami Counties.

Given existing freight levels and consumption patterns, empirical data (presented in detail in the following chapters) confirms that by and large trucks are moving smoothly and safely through intersections and interchanges on Miami Valley's highways. A large contributor to this is the continued upgrade of design elements of older problem locations such as the I-70/I-75 interchange and the addition of a few key new highway facilities (Trotwood Connector, US 35 corridor extension in Greene County). While both freight and personal travel are projected to grow moderately in the future, proposed transportation improvements including the I-75 corridor reconstruction in downtown Dayton and on-going I-70 widening are expected to keep traffic flowing near the existing levels of service on the Region's major freight corridors.

Discussions with regional freight stakeholders, coupled with review of existing data, suggest the potential for growth in certain freight movement categories, including development of an intermodal facility in the Region, as well as the integration of rail freight and passenger movement to leverage support, funds and increased capacity.

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CHAPTER 1 — PURPOSE AND NEED

1.1 — INTRODUCTION

The Miami Valley Regional Planning Commission (MVRPC) recognizes the importance of freight transportation in contributing to the economic vitality of the Region. MVRPC is the Metropolitan Planning Organization (MPO) for the Dayton region that includes Greene, Miami and Montgomery Counties and the cities of Carlisle, Franklin and Springboro in Warren County in Ohio (see Figure 1.1). Responsible for transportation planning in the Region, MVRPC has made considerable efforts to advance its freight planning program. Several tools are employed, including truck modeling, route planning, and providing technical assistance for freight planning studies.

MVRPC conducted the 2005 Miami Valley Freight Movement Study to identify regional freight industry trends, share the regional freight transportation system profile and analyze freight movement in the Region. The 2005 study is an update to the 1999 Study that addressed the requirement of ISTEA/TEA-21 that the metropolitan planning process "*consider and analyze the enhancement of efficient freight movement*". The long-range planning process lays the groundwork for how an MPO incorporates freight interests and issues into its planning program. Therefore, the purpose of the 2005 study is to take an in-depth look at the freight issue in the Region and feed the recommendations of the study into MVRPC's next Long Range Transportation Plan (LRTP) update.

1.2 — HISTORY OF FREIGHT MOVEMENT IN THE MIAMI VALLEY

During the early settlement of the Region, the Great Miami River and the Miami & Erie Canal were the primary transportation modes. The railroads connected the Region to other parts of the Nation in the mid-1800s, greatly increasing the variety and volume of freight that could be moved and facilitating the development of a manufacturing-based economy. During the twentieth century, roads and trucks assumed the largest role in freight movement, providing greater flexibility and speed in the shipment of goods. Air transportation has also been increasing, providing a quick link to global markets for small high-value shipments.

In the new millennium, the significance of an efficient and effective transportation system for freight has increased in response to the demands of the global marketplace and business practices. Freight movement is important not only to the global and national economy but also to state and local economies.

1.3 — NATIONAL FREIGHT MOVEMENT PLANNING

The recognition of urban freight transportation as a national issue can be traced to the 1962 Federal Aid to Highways Act, which required the cities to plan using the "3C" (comprehensive, coordinated and continuing) process. With the enactment of the ISTEA (Intermodal Surface Transportation Efficiency Act of 1991), the role of freight in the transportation planning process changed dramatically. For the first time, freight was specifically mentioned ("enhancement of the efficient movement of freight") as one of the sixteen planning factors that required attention in the planning process. Freight transport and freight facility location were factors to be considered by metropolitan planning organizations (MPOs) as they developed their long- and short-range transportation plans and programs. The ISTEA planning factors also placed a new emphasis on the role of intermodalism and intermodal facilities as elements that should be considered when improving the overall transportation system. The importance of urban freight in the transportation planning process was reaffirmed when the U.S. Congress passed the Transportation Equity Act for the 21st Century (TEA-21).

Miami Valley Freight Movement Study

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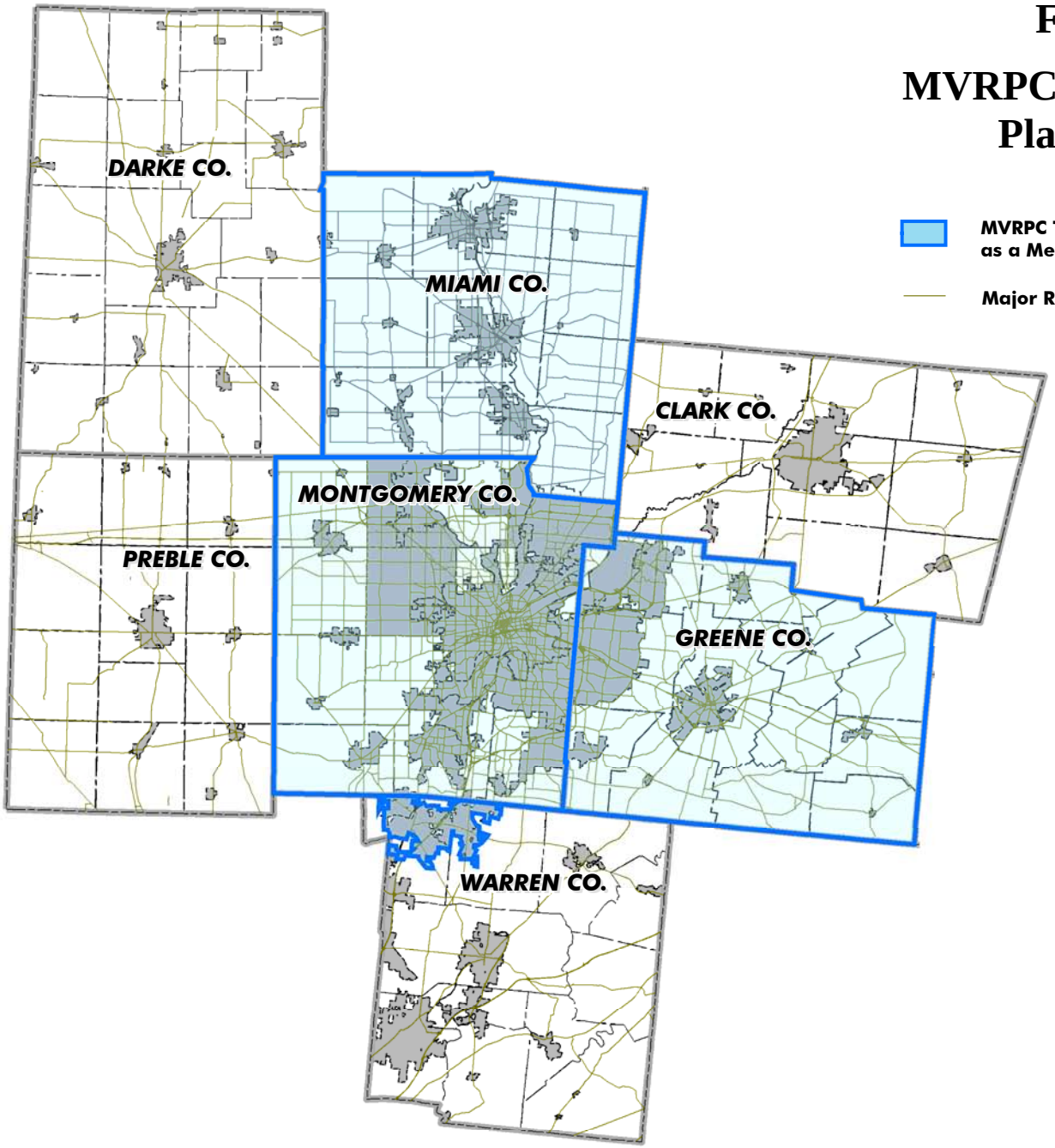

Figure 1.1

MVRPC Transportation Planning Area

MVRPC Transportation Planning Area as a Metropolitan Planning Organization

Major Roadways

Source: MVRPC

0 3 6 12 Miles

State of Ohio

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On August 10, 2005, the Federal Surface Transportation Act known as SAFETEA-LU (Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users) was signed into law. SAFETEA-LU builds on the strong foundation of ISTEA and TEA-21 in addressing freight issues:

- Increases funding to an average of $49 billion per year ($244 billion over 5 years) from an average of $33 billion per year in TEA-21 ($198 billion over 6 years).
- Contains many programs aimed at improving global connectivity, freight mobility and economic productivity.
- Encourages creativity and finding new ways to solve existing problems.

1.4 — FREIGHT MOVEMENT PLANNING AT MVRPC

Efficient freight movement has always been a part of the Transportation Planning Program at MVRPC. Continuing comprehensive metropolitan planning began in response to the 1962 Federal Highway Act. The majority of the freeway network was built during the 1950s and 1960s and numerous major surface streets have since been widened and/or connected. Specific highway improvements have been made to enhance access to manufacturing and warehouse facilities. Many physical road/rail grade separations and at-grade crossing improvements have also been made over the years and improvements to the Dayton International Airport have allowed growth in the air cargo business.

Urban Goods Movement Study (1982)

The 1982 Urban Goods Movement Study was completed in the early 1980s with a heavy emphasis on truck routes. Regional freight movement planning activity has also included monitoring railroad activity and abandonment, and local intermodal access improvement to airports. During the process of developing long range transportation planning goals for the Miami Valley Region in the early 1990s, issues related to the regional intermodal freight transportation system were raised.

Miami Valley Freight Movement Study (1999)

MVRPC completed the Miami Valley Freight Movement Study in July 1999 to address the requirement of ISTEA/TEA-21 that the metropolitan planning process "consider and analyze the enhancement of efficient freight movement." The study brought to focus all of the formerly scattered components significantly affecting freight movement in the area. Freight carrier companies were surveyed regarding their experience in moving freight within the Miami Valley Area. The respondents suggested various transportation system improvements to relieve congestion and to improve access. Most of the suggested improvements in the Region were on I-75, I-70, and US 35. The Miami Valley Freight Movement Study analyzed four major modes of commodity transportation:

- Rail
- Truck
- Air
- Pipeline

The study found that trucking is the most prevalent mode for freight movement in the Region. It is tied to many other modes and is a major customer for both the railroad and air freight industries. Two major freight movement corridors lie within the MPO boundaries, I-70 and I-75.

I-70 is one of the heaviest east-west freight movement corridors in the Nation. I-75 serves as an important north-south freight corridor and is positioned well in relation to the Canada-to-Mexico North American Free Trade Agreement Corridor.

In March 1998, as part of the freight movement study, approximately 250 freight carrier companies were surveyed regarding their experiences in moving freight within the Region. A response rate of approximately 23% (57 returns) was received. Below is a list of transportation system improvements recommended by survey respondents. A short description of how MVRPC's projects and initiatives address some of the recommendations follows and is also illustrated graphically in Figure 1.2.

Relieve congestion along the Interstate 75 Corridor, between Needmore Road and Nicholas Road

The North South Transportation Initiative and the Downtown Dayton Sub-Corridor studies have been completed. Several projects in the LRTP address congestion on the I-75 corridor. Some of the findings and recommendations of the North-South Transportation Initiative regarding freight included the following:

- The I-75 corridor is home to both the busiest north-south rail freight route east of the Mississippi and a major trucking corridor between Canada, the Midwest, and Southern United States.
- Truck traffic comprises between 15 and 30 percent of the total traffic on I-75.
- Between 100 and 110 trains per day pass through the study area.
- The diversion of some truck traffic to rail has the potential of improving the performance of the highway network, inter-modal shipments have the highest potential for diversion. In order to properly assess this potential a larger study area than that of the I-75 corridor needs to be evaluated.
- Consideration should be given to the development of a new inter-modal terminal in the corridor.
- Consideration should be given to participation in a coalition of regional or multi-state public-private initiative to further the maintenance and development of the Region's major transportation corridors.

Improve the I-70/75, I-75/SR 4 (Dayton Expressway), and I-75/US 35 interchanges to relieve congestion

- Improvements to the I-70/75 interchange are currently under construction. The I-75/SR 4 interchange in currently being designed and the construction phase is funded in the TIP starting in year 2008.

Widen and update the interstate system

- Several projects in the LRTP address mainline capacity and interchange improvements on the interstate roadway network.

Improve I-75 access at Dixie Drive/Central Avenue interchange in West Carrollton

- An Interchange Modification Study at this location has been completed, recommending the modification of the current interchange to a tight diamond interchange. The environmental and design phases of this project are funded in the TIP.

Improve access to Interstate 70 from the western part of the urbanized area

- Since the survey, the Trotwood Connector has been completed.

Improve US 35 east of Xenia

- Since the survey, the relocated US 35 has been completed.

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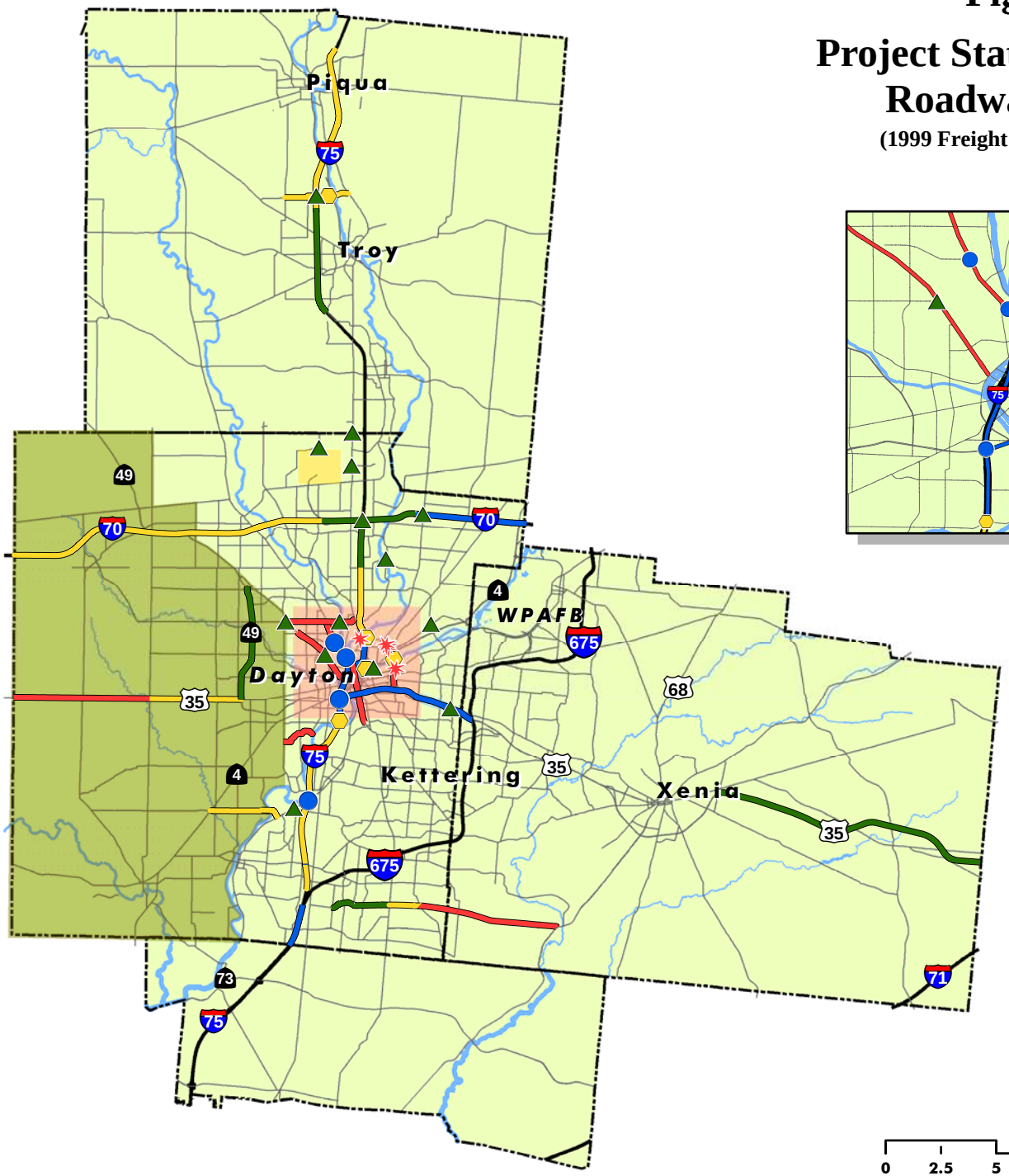
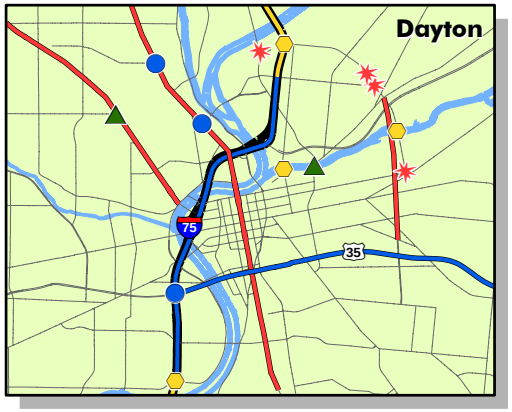
Figure 1.2

Project Status of Perceived Roadway Problems

(1999 Freight Study Survey Results)





Freight Projects Classification

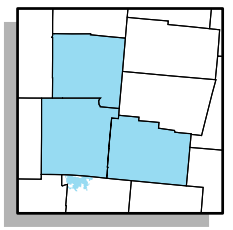
- Completed/Under Construction
- Funded/Partially Funded
- LRP Unfunded
- Not Addressed
- Study

Source: MVRPC

0 2.5 5 10 Miles

n

MPO Area



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Remove bridge restrictions at Spinning Road under US 35, Siebenthaler Avenue over the Stillwater River in Montgomery County, and Eldean Road under the CSXT spur in Miami County

- The Siebenthaler Avenue bridge replacement has been completed and the bridge restrictions at Spinning Road have also been removed. Project 110A in the LRTP addresses the bridge clearance at Eldean Road.

Improve links between US 35 and SR 4 east of Interstate 75

- Since the survey, the Keowee Bridge over the Mad River widening and replacement project and the Findley Street Bridge replacement projects have been completed; and Project 368 in the LRTP addresses the widening and replacement of the Webster Street Bridge over the Mad River.

Improve access from the cargo side of the Dayton International Airport to both Interstate 75 and Interstate 70

- An updated Master Plan for the Dayton International Airport has recently been submitted to FAA for review. Upon completion of FAA review, project 337 in the LRTP will be updated to reflect the latest recommendations for roadway access improvements by the Airport Master Plan.

Maintain traffic flow while construction work is being done

- MVRPC has taken a lead role in minimizing the impacts of construction-related incidents by promoting awareness of major construction projects through an extensive marketing campaign in conjunction with ODOT Districts and other member jurisdictions.

Other Studies

In addition to these freight planning studies and projects initiated by MVRPC, the Ohio Department of Transportation (ODOT) also sponsored a study on the *Freight Impacts on Ohio's Roadway System* in 2002. The study addressed Ohio's needs for information and tools to assess freight trends and impacts on Ohio's roadways. The study also included several case studies to analyze and recommend improvements to Ohio's freight corridors such as the I-75 corridor. As an example, the study identified bottlenecks on the I-75 corridor in Dayton north of US 35 that directly affected 6,000 freight trucks per day. The impact of this bottleneck was estimated to be felt on trucks traveling on I-75 south as far as the Kentucky border and on I-75 north as far as the Michigan border.

1.5 — SCOPE OF STUDY

This study provides a basic look at freight movement in the Miami Valley in the new millennium. The geographical location of the Miami Valley Region provides easy connectivity to major metropolitan areas of the Nation. Due to the Miami Valley's inland location and lack of a sufficiently navigable water connection to either the Ohio River or Lake Erie, the water mode is not discussed in any detail in this study. Freight transportation in the MVRPC metropolitan planning region takes place primarily via highways (truck), but also via rail, air, pipeline and intermodal modes. Chapter II highlights the importance of freight transportation to the Region's economy and a review of the national and state freight trends and issues. Chapter III provides information pertaining to specific freight transportation modes, while Chapter IV discusses the freight movement workshop conducted by MVRPC to seek public and private industry input regarding freight movement issues in the Miami Valley. Finally, Chapter V presents analysis of the impacts of freight movement in the Region. Chapter V also sketches the type of freight inter-relations the Miami Valley Region has with other regions through goods movement.

CHAPTER 2 — TRENDS IN THE FREIGHT INDUSTRY

2.1 — OVERVIEW

Information in this chapter reflects existing national and statewide literature about freight, but more directly builds on several local sources. Freight movement is not an end unto itself, but a physical reflection of global, national and local economic processes. An effective freight system must take into account the demands of freight movement (e.g., pickup and delivery, intermodal connections, and regional consolidation) in the context of urban passenger transportation issues such as congestion and accessibility.

More than ever before, decisions about where to locate businesses are based on how the transportation system functions. Congestion, an increasing transportation problem in urban areas, has implications for the urban economic base and national freight movement practices.

2.2 — REGIONAL DEMOGRAPHIC AND LAND USE TRENDS[*]

The Miami Valley MPO Region had a population of 834,468 according to the 2000 census. The majority of the population, 67%, lives in Montgomery County. Between 1990–2000, Montgomery County's population declined while Greene and Miami Counties have had modest gains in population. The trend of outward dispersal of population from the central core has continued since the 1970's, resulting in a lower overall regional density. According to MVRPC's 2030 Long Range Transportation plan (LRTP), the population of the Region is expected to decline over the next 30 years. Specifically, Miami and Greene counties are expected to gain 9% and 7% in population respectively, while Montgomery County population is expected to decline by 5%.

The Region was also home to nearly 448,000 jobs in 2000 according to the LRTP. Montgomery County had the highest employment share, with 69% of the Region's total employment, followed by Greene (17%), Miami (11%), and Warren[†] (3%) Counties. Overall, the Region is expected to grow in employment over the next 30 years by approximately 30%. While Greene and Miami Counties are expected to experience job increases by 19% and 8% respectively, Montgomery County is projected to experience a slight decline in employment (-0.3%) by 2030.

The regional land use pattern in the Miami Valley has experienced continued outward dispersal from the urban core over the last fifty-five years, resulting in a lower overall regional urban density. Since the 1999 Miami Valley Freight Movement Study, overall growth in the Region has continued to spread away from the central city and beyond the boundaries of inner ring suburbs.

Residential areas are spread evenly throughout the Region with high concentrations in the eastern part of Montgomery County, western part of Greene County, and along the I-75 corridor in Miami County. Commercial development in the Region is primarily concentrated around three suburban malls and, to a lesser extent, within the Dayton Central Business District. New commercial "big box" type retail development, along with strip shopping centers and neighborhood shopping districts, have sprung up along the major transportation routes and at the junctions of major roadways. Industrial development in the Region generally follows the I-75 corridor, which provides access to major factories and office clusters stretching from the City of

[*] US Census 2000 and 2030 Long Range Transportation Plan, MVRPC, May 2004

[†] Includes the cities of Carlisle, Franklin and Springboro only

Piqua at the northern edge of the Region to the southern Montgomery/Warren County border. The other important concentration of employment is located along the Greene/Montgomery County border near the intersection of I-70 with SR 4 and I-675.

According to the Region's 2030 LRTP, it is anticipated that much of the growth will continue to occur along the fringes of the I-675 corridor in both Greene and Montgomery Counties, the I-70 corridor in Montgomery County, the I-75 corridor in Miami County, and the southern portion of I-75 in Montgomery County. Thus, the future of the Region will be characterized by less concentrated, low density development patterns, away from existing urban centers and by fragmented land uses where complementary developments are not always in close proximity.

Rapid growth in population has made Warren County one of the fastest growing in Ohio. Among the constituents of the MVRPC MPO Region in northern Warren County, Franklin has long been a commercial center for the farming communities from the surrounding area. The City of Springboro has undergone dramatic development in recent years and continues to develop as an affluent suburban residential community. It is rapidly becoming a community of choice for many two-career families who work in Dayton and in the Cincinnati area. New housing is plentiful in the many new residential developments.

2.3 — THE REGIONAL ECONOMY

The private sector economy in the Miami Valley Region is led by the service sector. Between 1970 and 2000, manufacturing went from being the largest employer in the Region to the third largest in 2000 (Table 2.1). Manufacturing employment was surpassed by jobs in the service and retail trade industries. The growth in employment in the wholesale trade sector and the transportation and public utilities sector over the last 30 years is also notable. The shift from a manufacturing to a service economy, deregulation, and the advent of freight logistics have all resulted in changes in the nature and volumes of goods shipped and the origins and destinations of shipments. However, the Miami Valley Region continues to have a relatively high concentration of industries that traditionally generate heavy freight activity such as construction and manufacturing.

TABLE 2.1 — EMPLOYMENT BY INDUSTRY: 1970-2000

Industry Type[1]	1970		2000		%Change (1970-2000)
	Total	Share	Total	Share	
Farm	5,111	1.3%	3,691	0.7%	-38.5%
Agricultural services, forestry, fishing & other	1,116	0.3%	NA	NA	NA
Mining	600	0.2%	NA	NA	NA
Construction	16,113	4.1%	22,690	4.5%	29.0%
Manufacturing	127,552	32.8%	83,975	16.6%	-51.9%
Transportation and public utilities	13,542	3.5%	22,772	4.5%	40.5%
Wholesale trade	13,673	3.5%	21,293	4.2%	35.8%
Retail trade	57,677	14.8%	88,490	17.5%	34.8%
Finance, insurance, and real estate	19,507	5.0%	30,663	6.1%	36.4%
Services	61,433	15.8%	157,690	31.1%	61.0%
Government and government enterprises	72,323	18.6%	70,455	13.9%	-2.7%
Total Employment	**388,647**	**100.0%**	**506,512**	**100.0%**	**23.3%**

Note: Does not include data for cities in Warren County; [1]The Industry Type classification is based on SIC industry categories

Source: Regional Economic Information System

The Region experienced a steady increase in the number of business establishments between 1980 and 2000 and a slight decline from 2000 to 2003. The number of establishments between 1980 and 2003 increased by 25% in the Region from 14,409 to 18,023.[*] The Region was outpaced by the State (36%) as well as the Nation (60%) in percentage change in business establishments.

2.3.1 Miami Valley Key Industry Sectors

Services

As with most regions, the service sector is the largest economic sector in the Miami Valley. The numbers of businesses by the NAICS major industry sectors within the Region for 1998 and 2003 are summarized in Figure 2.1. The data reveals that service-based industries comprise a large portion of the Region's business environment. In 2003, 35% of the Region's businesses were engaged in professional, scientific and technical services, administrative, support, waste management and remediation services, accommodation and food services, and other services.

Other service industries' employment, such as education and health services employment, has grown steadily over the past 10 years and is a large component of the overall service employment in the Region. The Region is home to several institutions of higher learning, with new additions and branch campuses showing interest region-wide. On the health services side, the area's health care providers also have shown interest in expanding their facilities and services, in part due to aging of the population and technology improvements.

Comparing business establishments in 1998 and 2003 revealed similar industry composition. In both cases, service-based industries led the Region's business composition, followed by retail, construction, and manufacturing businesses.

Most of these establishments require delivery of office goods and other small-scale items in relatively small trucks rather than large inter-city shipments. However, certain large institutions such as hospitals and universities generate significant amounts of such local freight traffic.

Manufacturing

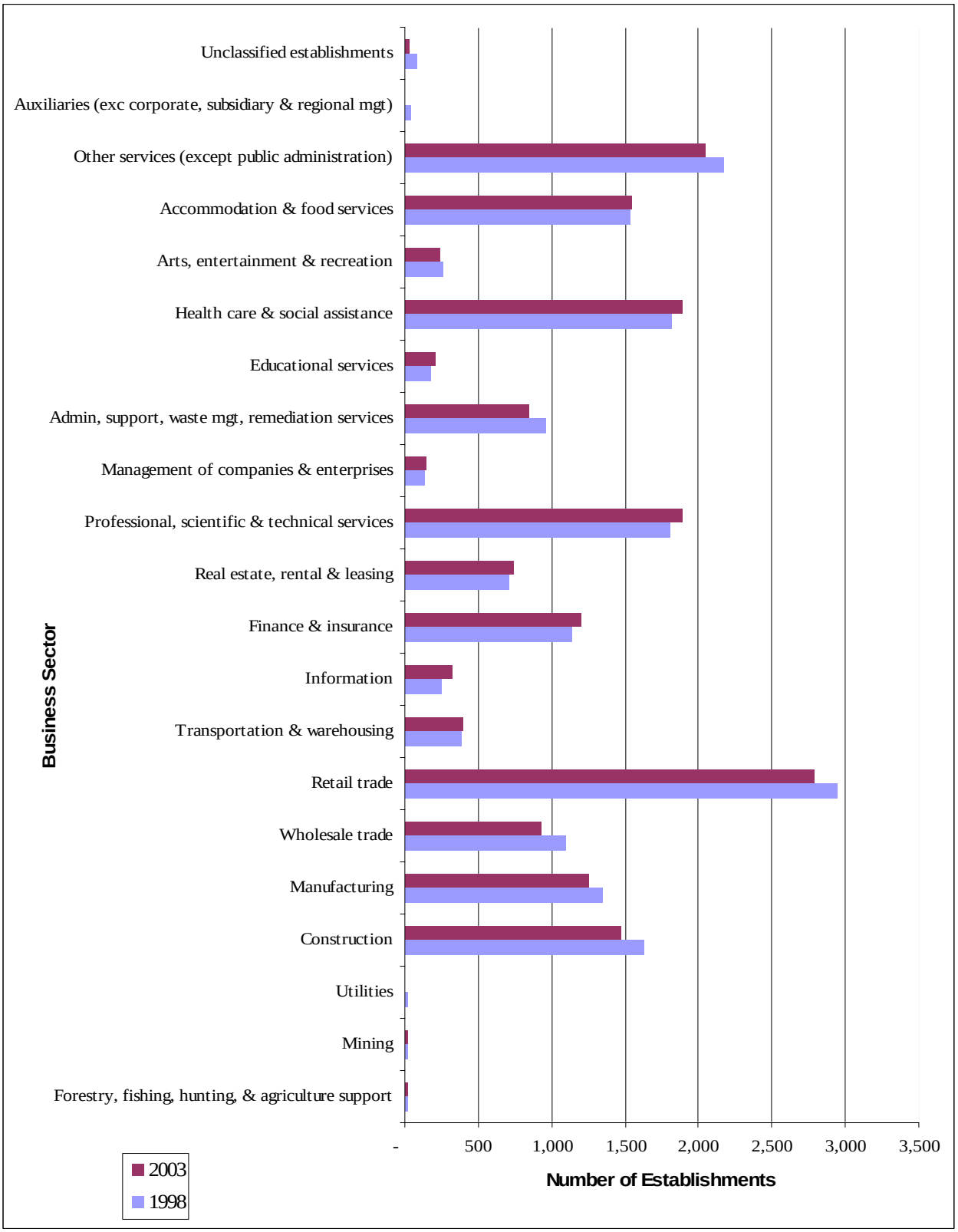
The manufacturing sector is one of the basic economic sectors of the Miami Valley Region. Establishments within the manufacturing sector depend upon cost-effective and timely delivery of a variety of input materials and good transportation links to markets for a variety of products. Most industrial establishments in the Region have located along rail and freeway corridors to take advantage of the access they provide.

Dayton's long history of automotive manufacturing and its location at the intersection of Interstates 70 and 75 make this Region a very attractive location for the automotive industry. In 2001, Montgomery County had 16,223 auto manufacturing workers[†] — far more than any other county in Ohio. The Region's economic landscape reveals the significance of this industry, with the proliferation of many small and medium-sized enterprises dedicated to providing support services and component parts to the large-scale, anchor operations in the Region. While many large operations continue their legacies in Dayton, the Region is dotted with new firms tapping into the vast network of component parts manufacturers and service suppliers. These

[*] County Business Patterns (NAICS)

[†] Dayton Area Chamber of Commerce, Industry Snapshots, www.daytonchamber.org

FIGURE 2.1 — BUSINESS ESTABLISHMENTS BY MAJOR INDUSTRY



Note: The Business Sector Classification is based on NAICS industry categories

Source: County Business Patterns

establishments make use of production methods similar to those of other machinery manufacturing establishments, including bending, forming, welding, machining, and assembling metal and plastic parts into components and finished products. Most firms in this sector provide services and components to the automotive industry and to a lesser extent the aerospace industry.

Some of the large automotive companies in the Region include Delphi and General Motors in Moraine. Delphi Automotive Systems, with 8,700 employees in the area, is now a separate company, having been spun off from General Motors in early 1999. Delphi Automotive Systems designs and builds high-tech products in Dayton such as air bags, anti-lock disc brakes, and suspension systems. General Motors employs about 4,200 people in the Dayton area assembling sport utility vehicles and engines. Behr, a German manufacturer of auto air conditioning units, employs 2,400 in the Region. DMAX, a General Motors-Isuzu joint venture has operations for a new truck diesel engine plant in Dayton. Honda of America has two automotive assembly plants and an engine plant all less than one hour's drive of Dayton. More than one-third of all the Japanese plant locations in Ohio are within a 50-mile radius of Dayton and most of these are auto-related. Due to the presence of a large automotive industry in the Region, a significant amount of high-value freight in the form of transportation equipment is carried to and from the Region by trucks and rail.

The Dayton Region is also one of North America's largest centers for tooling and machining technology. More than 800 companies employing 26,000[*] people provide service to a diverse client base – from automotive to aerospace, from the computer industry to the growing medical industry. Strategically located, tooling and machining firms in the Region are able to serve a geographically dispersed customer base, serving globally, yet working locally. In addition to trucks and rail, some lightweight, high-value durable manufacturing parts and products are transported to and out of the Region as air freight.

A major catalyst for growth in the Dayton area has been and continues to be Wright-Patterson Air Force Base. The largest single-site employer in Ohio with 22,000 military and civilian employees, the Base is headquarters for the Air Force Materiel Command and the Aeronautical Systems Center (ASC) — the foremost aeronautical acquisition center in the U.S. Air Force.

In recent years, fierce global competition, declining domestic automobile production, increase in offshoring and the recent recession has had an impact on the Region, which relies on manufacturing exports as a source of monetary inflow. The biggest red flags are also the futures of some of the Region's largest employers in this sector, including Delphi Automotive Systems and General Motors that collectively employ more than 10,000 people.

Retail Trade

The retail trade sector in the Miami Valley Region consists of a few large concentrated shopping areas, numerous smaller shopping centers, and a large number of independently located establishments along the major thoroughfares. Eclipsed only by the service sector, the retail trade sector has a large number of establishments in the Region. The total number of retail establishments decreased by about 5.5% between 1998 and 2003. The major factor affecting the overall decline in the number of retail establishments was the move towards larger multi-purpose stores known as "big box" retail.

[*] Dayton Area Chamber of Commerce, Industry Snapshots, www.daytonchamber.org

The retail sector requires periodic truck shipments to maintain an in-store inventory of goods. The overall decline in the number of retail establishments does not imply decline in the number of freight delivery shipments. Instead, they have been shifting from declining older retail areas to the growing newer retail areas.

Construction

The number of establishments in the construction sector decreased by about 10% between 1998 and 2003, attributed in part to fewer new housing starts and less new commercial and industrial construction. Since 2004 however, the Region has been witnessing quite a bit of construction activity. In 2004, the total number of housing permits issued for new privately owned units in the Dayton metropolitan area grew faster than the State and the Nation, with single-family units comprising the largest part of that growth.[*] Retail construction announcements include significant expansion/investment at the Dayton Mall in southern Montgomery County, the redevelopment of a new town center in northwestern Montgomery County, and a new retail center in western Greene County. Also a number of high profile highway projects are currently being implemented in the Region, including improvements on I-75 north of downtown Dayton and the overhaul of the interchange at I-75 and I-70.

The construction sector requires transportation of heavy freight materials from sand, gravel, and limestone deposits to building sites. Most construction materials are transported by trucks. Red flags for the construction industry include the threat of rising prices for raw materials, particularly steel, lumber and petroleum, and an increase in interest rates.

Transportation & Warehousing and Utilities

The Miami Valley Region has a strong transportation sector due to its location at the crossroads of two major interstate freeways — I-70 & I-75, and the presence of the UPS (formerly Menlo Logistics) air cargo facility at the Dayton International Airport. There was a slight increase in the number of establishments in the transportation and warehousing sector. Public utilities keep the Region supplied with water, sanitary services, power and fuel. These facilities require periodic delivery of materials for treating water, transportation of waste material to disposable sites, fuel for generating electricity and steam, and fuel for powering transportation vehicles, running industrial processes, and heating buildings.

Wholesale Trade

Miami Valley's wholesale trade sector is identified as strong and growing in comparison to the US economy as part of the shift-share analysis conducted in the *Miami Valley Economic Base Assessment Study, 2005*. The wholesale trade sector provides a link between production sites and the retail sector and is primarily made up of distribution centers and bulk terminals. Some distribution centers within the Region are intermodal transfer points, such as the pipeline-supplied bulk terminals providing fuel to the various gasoline stations in the Region. Others include distribution centers for chains of retail operations such as the Meijer regional distribution center located in Tipp City in Miami County.

Though the number of establishments decreased between 1998-2003, there has been growth in this sector with expansion of existing distribution facilities. Distribution facilities in the Dayton Region are on the increase because of the area's strategic location and the accessibility Dayton has built into its transportation systems. Nearly 5 million square feet of warehouse and

[*] Dayton Area Chamber of Commerce, Industry Snapshots, www.daytonchamber.org

distribution space has been added in the Region during the past ten years.[*] Between 1970–2000, employment in the wholesale trade sector increased by 118%.[†] However, there was a moderate reduction in employment in 2004[*], symptomatic of the reduction in durable goods production locally.

Mining

Most of the mining sector establishments within the Miami Valley Region are related to sand, gravel, and limestone extractions. These operations supply materials to a regional market due to the heavy weight of the materials. Good links are necessary between such operations and construction areas, which vary through time and are not fixed to certain areas.

Government

At the end of 2004, government employment remained strong at over 71,000 employees in the Region.[*] The Wright Patterson Air Force Base (WPAFB) has been Dayton's largest, most influential employer, with more than 22,000 civilian and enlisted personnel.

Government facilities generate various levels of freight traffic, depending upon their size and type of service. Significant government facilities in relation to freight traffic include the post office, military facilities such as the WPAFB, and public service facilities.

Agriculture

The Miami Valley Region is located within a strong agricultural production area within Ohio and the United States. The agricultural sector requires strong freight movement links that allow farms to obtain inputs such as seeds, fertilizers, and chemicals, and to export grain and livestock products to wholesalers and manufacturing operations. Much of the freight movement associated with this sector utilizes the truck mode; however, grain is also shipped via rail.

2.4 — NATIONAL AND STATE FREIGHT MOVEMENT TRENDS

2.4.1 Mode Choices for Freight Movement

Several factors, including cargo value, volume and distance, affect choices for freight movement as shown in Table 2.2. The table illustrates that trucks generally carry freight of a mid-value and size, traveling a medium distance. Freight having a higher value and smaller size, traveling a longer distance, is more appropriate for air transport, while rail freight concentrates on bulky goods with lower value.

Trucks transport the "tangible" goods portion of the economy, which is nearly everything consumed by households and businesses. However, trucking also plays a critical role in keeping costs down throughout the business community. Specifically, for businesses that produce high-value, low-weight goods, inventory carrying costs can be considerable. But, many of these producers now count on trucks to deliver products efficiently and in a timely manner so that they can keep stocks as low as possible. In fact, inventory-to-sales ratios continue to fall, indicating

[*] Dayton Area Chamber of Commerce, Industry Snapshots, www.daytonchamber.org

[†] Miami Valley Economic Base Assessment Study, MVRPC, 2005; Based on SIC Industry Classification system since NAICS data is unavailable for 1970.

that motor carriers and their customers are working well together in this area, saving the economy billions of dollars in costs.[*]

TABLE 2.2 — FREIGHT MOVEMENT CHOICES FOR MODES

Mode	Cargo Value	Cargo Volume	Distance
Air	High	Small, Often <100 lbs.	Average >1,300 Miles
Truck	Moderate to High	Loads < 50,000 lbs	100 - 400 miles
Rail	Moderate to Low	No weight restrictions	670 – 800 miles. Short lines less

Air freight is most attractive to producers and distributors of high value goods, such as semiconductors or industrial diamonds, or products that rapidly lose value after a certain time, such as cut flowers, fresh seafood or fashion apparel. Air freight is fast and reliable but it is also expensive. Long haul air freight rates, by weight, are typically 5 to 10 times higher than ocean-going transportation rates. Offsetting the higher cost of transportation is the emphasis, by air freight shippers and industry analysts, on minimizing logistical costs (total distribution costs - TDC) and maximizing economic value added (EVA). TDC represents all costs incurred in the process of making, storing and distributing a product to the end customer, while EVA reflects the benefits of a well-functioning distribution system and the cost of *not* having the right goods in the right place at the right time.

Pipelines are one of the most efficient and productive means of transporting liquids or gases. They possess the ability to economically transport high-volume, bulk commodities over long distances in a secure, continuous manner. Pipeline transport is also safer than highway or rail transport. Furthermore, freight pipelines buried underground would have little environmental impact on surroundings once installed. These systems can be fully automated and do not interfere with human movement. Pipeline systems are closed and can thus be operated regardless of weather conditions.

2.4.2 Freight Infrastructure Classifications

Truck Types[†]

Straight Truck: A straight truck typically has two axles and carries smaller and lighter freight, than the larger tractor trailer. These types of trucks are utilized mainly by local food and beverage distributors as well as short distance deliveries by package delivery companies such as UPS, Fed-Ex, etc.

Straight Flatbed Truck: A straight flatbed truck is used to carry specialized freight such as large machinery, modular housing, work equipment, tubing and pipes and any other freight that is too large or awkward for the standard 48-foot trailer.

Twin Trailer Truck: A twin trailer truck typically has a 2 or 3-axle tractor, and two short single axle trailers, coupled by a single-axle dolly. Each trailer is typically 28 feet long and the entire outfit boasts 5-6 axles.

Three-Axle Tractor Semi-trailer: A smaller version of the common five-axle tractor semi-trailer. These units carry less freight per load than their larger cousins, but are used almost as frequently.

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[*] American Trucking Trends 2004. Alexandria, VA: American Trucking Associations, Inc.

[†] Miami Valley Freight Movement Study, 1999, MVRPC

Five-Axle Tractor Semi-trailer: The most common type of freight transporter. The front of the trailer has no axle, but rests on a horizontal plate mounted over the tractor. The most common semi-trailer is an enclosed box. However, other types of trailers, like the flatbed and the tank, are used for specialized carrying.

Classification of Railroads[*]

The classification of U.S. railroads as Class I, II, or III was started by the Interstate Commerce Commission in the 1930s. Initially Class I railroads were defined as railroads with operating revenue of at least $1 million. There were 132 Class I railroads in 1939. The $1 million figure was used until 1956 (at which time there were 113); however, since that time, it has increased faster than inflation. In 1956 it was increased to $3 million. By 1963 the number of Class I railroads had dropped to 102. By 1965 the cut-off had increased to $5 million, to $10 million in 1976 and to $50 million in 1978, at which point only 41 railroads were still Class I. The Class III category was dropped in 1956, but reinstated in 1978. In 1979 all switching and terminal railroads, even those with Class I or Class II revenues, were redesignated as Class III.

Today, the Class II and Class III designations are rarely used. The Association of American Railroads instead splits non-Class I companies into three categories — regional, local and switching and terminal carriers. The Surface Transportation Board continues to use Class II and Class III categories, as labor regulations are different for the two classes.

As of the end of 2004, 558 common freight carrier freight railroads were operating in the United States. Each of the seven Class I railroads had revenue of atleast $289.4 million in 2004. Class I carriers comprise just 1 percent of freight railroads, but they account for 70 percent of the industry's mileage operated, 89 percent of its employees, and 93 percent of its freight revenue. Ranging in size from just over 3,000 to nearly 33,000 miles operated and from 2,600 to more than 49,500 employees, Class I railroads typically operate in many different states and concentrate largely (though not exclusively) on long haul, high-density intercity traffic lanes.

Regional railroads are linehaul railroads with at least 350 route miles and/or revenue of between $40 million and the Class I threshold. There were 31 regional railroads in 2004. Regional railroads typically operate 400 to 650 miles in two to four states. Most regional railroads employ between 75 and 500 workers; a few have more than 600 employees.

Local linehaul carriers operate less than 350 miles and earn less than $40 million per year. In 2004, there were 314 local linehaul carriers. They generally perform point-to-point service over short distances. Most operate less than 50 miles of road (approximately 20 percent operate 15 or fewer miles) and serve a single state.

Switching and terminal (S&T) carriers are railroads, regardless of revenue, that primarily provide switching and/or terminal services. Rather than point-to-point transportation, they perform pick up and delivery services within a specified area for one or more connecting linehaul carriers, often in exchange for a flat per-car fee. In 2004, there were 204 S&T carriers. The largest S&T carriers handle hundreds of thousands of carloads per year and earn tens of millions of dollars in revenue.

[*] Association of American Railroads (AAR) and Surface Transportation Board (STB)

Airport Categories[*]

The Federal Aviation Administration (FAA) defines airports by categories of airport activities, including commercial service, primary, cargo service, reliever, and general aviation airports. Categories are defined as follows:

Commercial Service Airports are publicly owned airports that have at least 2,500 passenger boardings each calendar year and receive scheduled passenger service. Passenger boardings refer to revenue passenger boardings on an aircraft in service in air commerce whether or not in scheduled service. The definition also includes passengers who continue on an aircraft in international flight that stops at an airport in any of the 50 States for a non-traffic purpose, such as refueling or aircraft maintenance rather than passenger activity. Passenger boardings at airports that receive scheduled passenger service are also referred to as Enplanements.

- Nonprimary Commercial Service Airports are Commercial Service Airports that have at least 2,500 and no more than 10,000 passenger boardings each year.
- Primary Airports are Commercial Service Airports that have more than 10,000 passenger boardings each year. Hub categories for Primary Airports are defined as a percentage of total passenger boardings within the United States in the most current calendar year ending before the start of the current fiscal year.

Cargo Service Airports are airports that, in addition to any other air transportation services that may be available, are served by aircraft providing air transportation of only cargo with a total annual landed weight of more than 100 million pounds. "Landed weight" means the weight of aircraft transporting only cargo in intrastate, interstate, and foreign air transportation. An airport may be both a commercial service and a cargo service airport.

Reliever Airports are airports designated by the FAA to relieve congestion at Commercial Service Airports and to provide improved general aviation access to the overall community. These may be publicly or privately-owned.

The remaining airports, while not specifically defined by FAA, are commonly described as General Aviation Airports. This airport type is the largest single group of airports in the U.S. system. The category also includes privately owned, public use airports that enplane 2,500 or more passengers annually and receive scheduled airline service.

Pipeline Classification

The Department of Transportation (Office of Pipeline Safety, OPS) is the main regulatory agency responsible for regulating the operation and maintenance of jurisdictional natural gas pipelines under 49 CFR (Code of Federal Regulations) Part 192. Pipelines are usually classified as[†]:

- Gathering Pipelines: carry products from production fields;
- Transmission Pipelines: transport products to terminals and refineries; or
- Distribution pipelines: carry products to final markets and consumption points.

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[*] Federal Aviation Administration

[†] Freight In America: A New National Picture, January 2006, USDOT – Bureau of Transportation Statistics (BTS), p. 29

2.4.3 Freight Transportation System

Within the US, freight is carried via an extensive network of roads, railroad, waterways, and pipelines. Road infrastructure increased slowly over the past two decades despite a large increase in the volume of traffic. Between 1980 and 2003, route miles of public roads increased by 3% , compared with an 89% increase in vehicle miles traveled (VMT). Over the same period, miles of railroad dropped by more than 20 percent, while rail shipments measured in ton-miles increased by 69 percent (see Table 2.3).

TABLE 2.3 — INFRASTRUCTURE BY TRANSPORTATION MODE

Infrastructure	1980	1990	2000	2003	% Change (1980 -2003)	Ohio (2003)
Public Roads, miles	3,859,837	3,866,926	3,951,101	3,989,847	3.4	124,752
National Highway System	N	N	161,189	161,801	N	
Interstates	41,120	45,074	46,673	46,769	13.7	1,574
Other NHS	N	N	114,516	115,032	N	NA
Freight Intermodal Connectors[1]	N	N	N	1,853	N	NA
Other	N	N	3,789,912	3,828,047	N	NA
Railroad, miles	[2]183,077	175,909	170,512	140,939	(23.0)	6,519
Class I	NA	133,189	120,597	98,944	NA	4,510
Regional	NA	18,375	20,978	15,648	NA	561
Local	NA	24,337	28,937	26,347	NA	1,043
Inland Waterways, miles						
Navigable Channels	11,000	11,000	11,000	11,000	0.0	444
Great Lakes - St. Lawrence Seaway	2,342	2,342	2,342	2,342	0.0	N
Air						
Public Use Airports	NA	NA	NA	5,286	NA	NA
Pipelines, miles						
Oil	218,393	208,752	176,996	160,868	(26.3)	NA
Gas	1,051,774	1,189,200	1,369,300	1,424,200	35.4	NA

Note: N = not applicable; NA = Not Available; [1]excludes intermodal connectors serving intercity bus, Amtrak and public transit facilities; [2]excludes Class III railroads

Source: Freight Facts and Figures 2005, Office of Freight Management and Operations, FHWA p. 23; State Transportation Statistics, December 2005, Bureau of Transportation Statistics.

2.4.4 Freight Flows

An analysis of freight shipments in the US is presented in Table 2.4. According to the estimates by the Bureau of Transportation Statistics (BTS) of the U.S. Department of Transportation's Research and Innovative Technology Administration (RITA) and the Federal Highway Administration (FHWA), over 19 billion tons of freight, valued at $13 trillion, was carried over 4.4 trillion ton-miles in the United States in 2002. This means that on a typical day in the United States in 2002, about 53 million tons of goods valued at over $36 billion moved nearly 12 billion ton-miles on the Nation's multimodal transportation network.

Furthermore, according to these estimates, trucking as a single mode was the most frequently used mode, accounting for an estimated 70 percent of the total value, 60 percent of the weight, and 34 percent of the ton-miles. In 2002, the trucking industry, both for-hire and private own-use,

transported over $9 trillion worth of shipments, weighing over 11 billion tons and generating about 1.5 trillion ton-miles. Measured by ton-miles, trucking was followed by rail at 31%, pipeline by 16% and water with 11%. In general, trucking dominated shipment distances of less than 500 miles while rail dominated the longer distance shipments.

TABLE 2.4 — TOTAL US FREIGHT SHIPMENTS: 2002

Mode	Tons (millions)	Value ($ billions)	Ton-Miles (billions)
Total	19,487 (100%)	13,052 (100%)	4,409 (100%)
Truck	11,712 (60%)	9,075 (70%)	1,515 (34%)
Rail	1,979 (10%)	392 (3%)	1,372 (31%)
Water	1,668 (9%)	673 (5%)	485 (11%)
Air (including truck and air)	6 (0.03%)	563 (4%)	13 (0.3%)
Pipeline	3,529 (18%)	896 (7%)	688 (16%)
Parcel, USPS or courier	27 (0.1%)	1,022 (8%)	21 (0.5%)
Other multiple and unknown modes	567 (2.9%)	430 (3%)	315 (7%)

Source: Freight Facts and Figures 2005, Office of Freight Management and Operations, FHWA p. 9

Rail as a single mode carried about 3% of the Nation's freight shipments, measured by value, and 10% of the weight. Rail's share of ton-miles reflects the high weight and the longer length of haul of the products moved by rail.

Air freight has been the fastest growing segment of the American cargo industry according to a report released by the U.S. Department of Transportation's Bureau of Transportation Statistics. The report, titled *Freight Shipments in America*, shows that the total value of air freight moved in the United States doubled from 1993 to 2002 and now totals $2.7 billion a day, growth that was faster than any other segment of the cargo industry. Driving this growth trend is the globalization of the world economy and lean-inventory strategies, including just-in-time and make-to-order freight deliveries to the end customer.

Similar estimates for the State of Ohio in Table 2.5 show that trucks carried 77% of the weight and 82% of the total value of products within the State. In terms of shipments originating or terminating in the State, truck tonnage is followed by rail shipments which comprise 21% and 19% of the total inbound and outbound freight tonnage.

TABLE 2.5 — OHIO FREIGHT SHIPMENTS BY MODE: 2002

Mode	Tons (millions)					
	Within State		From State		To State	
	Number	Percent	Number	Percent	Number	Percent
Total	446	100	284	100	329	100
Truck	344	77	152	53	141	43
Rail	19	4	55	19	69	21
Water	13	3	13	5	35	11
Air, air and truck	<0.1	<1	0	<1	0	<1
Truck and rail	<0.1	<1	2	<1	0	<1
Other intermodal	2	<1	4	1	21	6
Pipeline and unknown	69	15	58	21	63	19

Mode	Value ($ millions)					
	Within State		From State		To State	
	Number	Percent	Number	Percent	Number	Percent
Total	233,030	100	345,558	100	299,613	100
Truck	190,813	82	254,900	74	210,050	70
Rail	2,794	1	30,648	9	21,653	7
Water	259	<1	988	<1	3,816	1
Air, air and truck	198	<1	2,552	<1	7,950	3
Truck and rail	<0.1	<1	3,242	<1	301	<1
Other intermodal	9,191	4	34,313	10	35,570	12
Pipeline and unknown	29,774	13	18,915	5	20,273	7

Source: Data extracted from Freight Analysis Framework 2 (FAF2), Office of Freight Management and Operations, FHWA

Since freight forecasts for the new Freight Analysis Framework 2 (FAF 2) data are currently unavailable, the 1998 FAF forecasts were used to determine estimated average annual truck traffic on Ohio roads in 2020. In 1998, excluding commodities transported by pipeline, trucks moved 71 percent of total tonnage and 80 percent of the total value of U.S. shipments. By 2020, trucks are expected to haul about three quarters (75%) of total tonnage, followed by rail (14%), water (7%), and air (less than 1%).

Truck traffic is expected to grow throughout the state of Ohio over the next 20 years. Much of the growth will occur in urban areas and on the Interstate Highway System (see Figures 2.2 and 2.3).

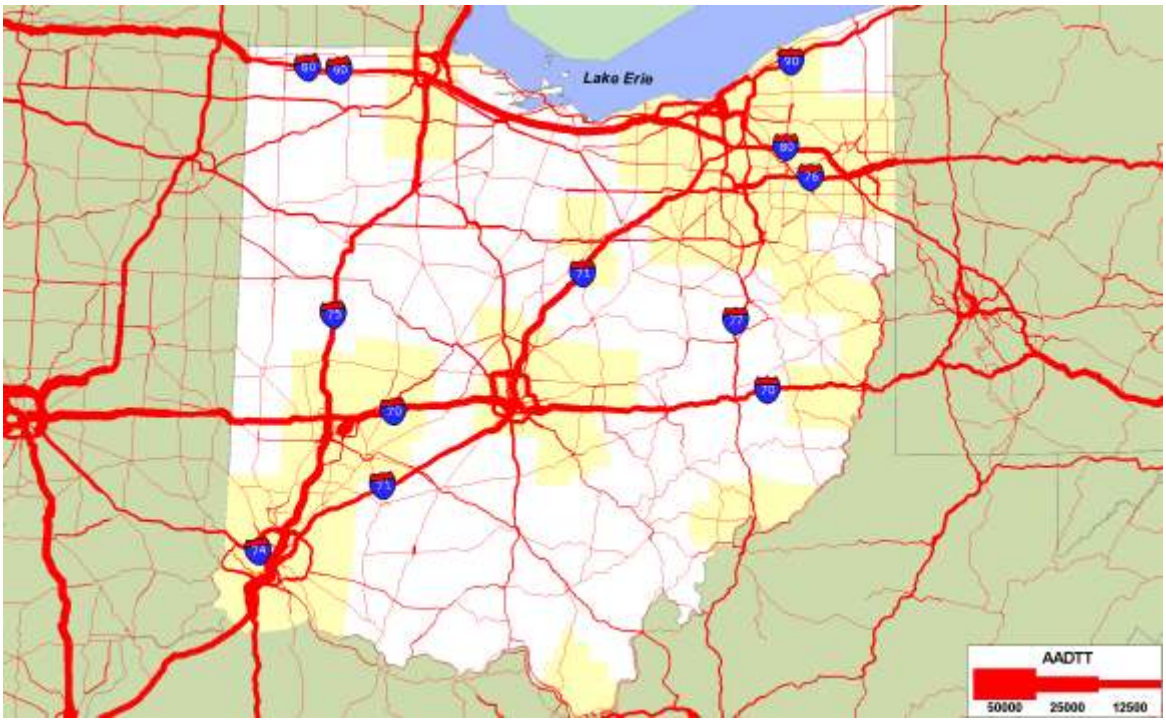
Nationally, commercial truck traffic has doubled over the past two decades, about the same as highway travel as a whole. However, despite doubling over the past two decades, truck traffic remains a relatively small share of highway traffic as a whole. This is primarily because travel by all highway vehicles, including passenger cars, buses, and light trucks (e.g., pickup trucks, sports utility vehicles, and minivans) also grew at a similar pace. In 2003, commercial trucks accounted for about 7 percent of highway vehicle miles traveled (VMT). Truck VMT is comprised of 64% combination truck and 36% single unit truck[*].

Truck traffic moving to and from Ohio accounted for 14% of the average annual daily truck traffic on the national FAF road network. The FAF road network is derived from the National Highway Planning Network (NHPN), Version 3, which is a 1:100,000 scale network database that contains road features representing just over 450,000 miles of current and planned highways in the U.S. The NHPN consists of interstates, principal arterials, and rural minor arterials.†

[*] Freight Facts and Figures 2005, Office of Freight Management and Operations, FHWA p. 10

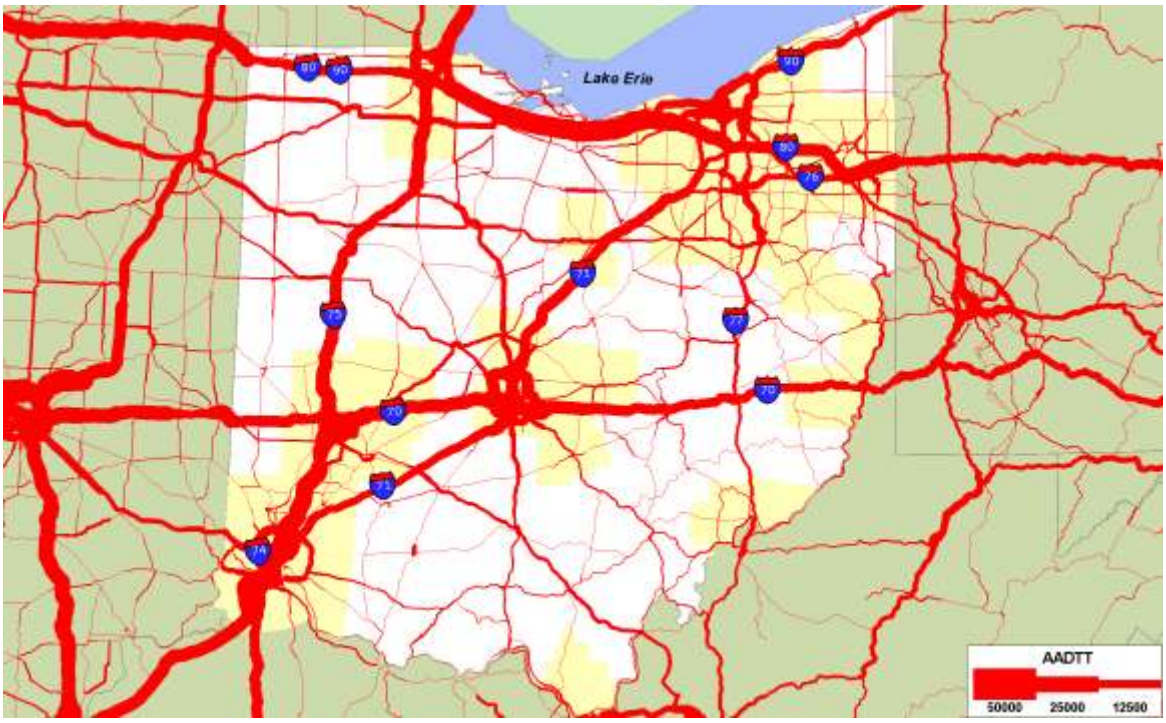
[†] Office of Freight Management and Operations, FHWA

FIGURE 2.2 — ESTIMATED AVERAGE ANNUAL DAILY TRUCK TRAFFIC IN OHIO: 1998



Source: Data extracted from Freight Analysis Framework (FAF), 1998-2020, FHWA

FIGURE 2.3 — ESTIMATED AVERAGE ANNUAL DAILY TRUCK TRAFFIC IN OHIO: 2020



Source: Data extracted from Freight Analysis Framework (FAF), 1998-2020, FHWA

2.4.5 Commodities Shipped

In 2004, Class I railroads in the United States transported the highest originating tonnage ever, 1.8 billion tons. Coal is the most important single commodity carried by rail. In 2004, it accounted for 43 percent of tonnage and 20 percent of the revenue for Class I railroads. Coal was followed by chemicals and related products (9%), and farm products and non-metallic products (8% each)][*].

Pipelines carry a wide variety of energy commodities, from different grades of crude petroleum and refined petroleum products such as aviation fuels, diesel, and heating oils, as well as natural gas. In 2003, U.S. pipeline movement of crude oil, petroleum products, and natural gas produced 868 billion total ton-miles. These estimates include shipments by natural gas liquids, which accounted for about one-third of the pipeline total[*].

Because commodities that move by air tend to be high in value, US international air cargo averaged $82,000 per ton in 2004. And because it is so high in value, air cargo accounted for a much larger proportion of the value (27%) than the weight (less than 1%) of overall US international merchandise trade[*].

Table 2.6 shows the top five commodity groups shipped to, from, and within Ohio by all modes according to the 2002 Commodity Flow Survey (CFS) data. The top commodities by weight are bulk products, such as coal and minerals, and secondary traffic. By value, the top commodities are transportation equipment and secondary traffic. Secondary traffic is defined as freight flows to and from distribution centers or through intermodal facilities.

TABLE 2.6 — OHIO TOP COMMODITIES: 2002

Tons (millions) Within State		Tons (millions) From State		Tons (millions) To State	
Total	**446**	**Total**	**284**	**Total**	**329**
Gravel	89	Coal, n.e.c.	50	Coal, n.e.c.	55
Gasoline	39	Cereal grains	29	Coal	45
Waste/scrap	34	Base metals	20	Base metals	30
Nonmetal mineral products	30	Motorized vehicles	17	Metallic ores	19
Cereal grains	26	Nonmetal mineral products	14	Gasoline	17
Value ($ millions) Within State		**Value ($ millions) From State**		**Value ($ millions) To State**	
Total	**233,030**	**Total**	**345,558**	**Total**	**299,613**
Machinery	34,699	Motorized vehicles	72,234	Motorized vehicles	35,125
Motorized vehicles	32,171	Machinery	37,065	Machinery	29,463
Mixed freight	16,469	Electronics	35,580	Electronics	25,737
Electronics	13,297	Chemical prods.	16,153	Textiles/leather	20,824
Gasoline	10,228	Articles-base metal	16,002	Misc. mfg. prods.	18,873

Source: Data extracted from Freight Analysis Framework 2 (FAF2), Office of Freight Management and Operations, FHWA

2.4.6 The Freight Transportation Industry

Before the motor carrier industry was initially deregulated by the Motor Carrier Act of 1980, there were fewer than 20,000 interstate motor carriers in the U.S. By July 2004, there were more than 524,000 U.S. carriers on file with the U.S. Department of Transportation, including for-hire,

[*] Freight In America: A New National Picture, January 2006, USDOT – Bureau of Transportation Statistics (BTS), p. 25-33

private fleets, and owner-operators[*]. While this is a significant number of trucking companies, the vast majority of them are small businesses. Nearly 96% operate 20 or fewer trucks and more than 87% operate six trucks or less. As a consequence, the trucking industry is a highly fragmented industry, resulting in intense competition (both price and non-price competition) and low profit margins.

The trucking industry is a major employer in the US; across all industries, more than 8.6 million people were employed in trucking-related jobs in 2003. Over 3 million of these people were truck drivers. In comparison, US freight railroads employ approximately 177,000 workers, the vast majority of whom are unionized. With an average salary in 2004 of nearly $89,000, freight railroading is among the Nation's most-highly compensated industries.

Table 2.7 shows the economic characteristics of transportation and warehousing in freight dominated modes according to the North American Industry Classification System (NAICS). There were about 200,000 transportation and warehousing establishments in 2002, with more than half of those primarily engaged in trucking. Trucking revenue accounts for about 40% of the transportation and warehousing sector. According to the 2002 CFS data, there were about 7,400 transportation and warehousing establishments in Ohio in 2002, 63% of which were engaged in trucking.

TABLE 2.7 — TRANSPORTATION AND WAREHOUSING ESTABLISHMENTS AND EMPLOYMENT: 2003

USA	Establishments	Revenue ($ '000s)	Payroll ($ '000s)	Paid Employees
Transportation and Warehousing	**200,421**	**394,456,801**	**118,251,681**	**3,757,426**
Rail Transportation	NA	NA	NA	NA
Water Transportation	1,924	23,124,300	3,031,880	65,326
Truck Transportation	112,698	165,561,328	47,833,733	1,437,259
Pipeline Transportation	2,512	27,641,362	3,082,558	46,556
Support Activities for Transportation	34,223	62,315,569	16,558,036	478,166
Couriers and Messengers	12,754	59,373,155	17,431,848	578,257
Warehousing and Storage	12,637	17,924,787	18,689,122	639,174
Ohio	**Establishments**	**Revenue ($ '000s)**	**Payroll ($ '000s)**	**Paid Employees**
Transportation	**7,412**	**NA**	**5,621,387**	**162,304**
Air Transportation	118	NA	489,682	11,159
Water Transportation	47	NA	103,526	1,684
Truck Transportation	4,657	NA	2,381,887	66,187
Pipeline Transportation	71	NA	112,566	1,743

Note: NA = Not Available

Source: Freight Facts and Figures 2005, Office of Freight Management and Operations, FHWA p. 31;

2.4.7 Safety Consequences of Freight Transportation

Growing demand for freight transportation nationwide heightens concerns about its safety consequences. Nearly 5,200 people died in crashes involving large trucks in 2004, of which 761 were large truck occupants. Fatalities involving large trucks are about 12% of all highway

[*] American Trucking Trends 2004. American Trucking Associations, Inc.

fatalities, while trucks account for about 7% of highway VMT. Despite a doubling of large truck travel between 1980 and 2004, the number of fatalities involving large trucks declined 13% over this period.

Large trucks were involved in about 7% of all highway crashes in 2004. The estimated number of crashes in 2004 is up by about 12% since 1990, a good deal less than the roughly 50% increase in truck miles driven over the same period (see Table 2.8).

TABLE 2.8 — TRANSPORTATION ACCIDENTS BY FREIGHT TRANSPORTATION MODE

Mode	1980	1990	2000	2003	2004
Highway (passenger and freight)	**NA**	**6,471,000**	**6,394,000**	**6,328,000**	**6,181,000**
Large truck	NA	372,000	438,000	436,000	416,000
Large truck (% of total)	NA	5.7	6.9	6.9	6.7
Rail (passenger and freight)					
Highway-rail grade crossing	10,796	5,715	3502	2,966	3,050
Railroad	8,205	2,879	2,983	2,991	3,179
Waterborne (passenger and freight)					
Vessel-related	4,624	3,613	5,403	5,163	4,962
Pipeline					
Hazardous liquid pipeline	246	180	146	129	140
Gas pipeline	1,524	198	234	244	292

Source: Freight Facts and Figures 2005, Office of Freight Management and Operations, FHWA p. 37; State Transportation Statistics, December 2005, Bureau of Transportation Statistics p. F-1.

2.4.8 Intermodal Freight Connections

The major advantage in intermodalism is the use of combined modes (rail and truck, air and truck, pipeline and truck) which maximizes the efficiency of both modes. For example, rail-truck intermodalism combines the flexibility and nearly unlimited access to industrial and commercial freight locations of trucks and the railroads' greater economy in long-haul transportation. Typically, in delivery to a destination of more than 300-500 miles it would be more cost effective to use rail as a mode of shipment. Intermodal traffic has become the second largest rail serving component.

In 2002, according to CFS over $1 trillion worth of goods were transported multimodally, including[*]:

- Parcel, U.S. Postal Service, and courier,
- Truck and rail
- Truck and water, and
- Rail and water

In 2002, according to the CFS, over $986 billion worth of goods shipped by US busineses were transported by the parcel, postal and courier services. Goods moved by this industry, such as electronics, pharmaceuticals, textiles, and auto parts, are typically higher in value relative to their weight and averaged over $38,000 per ton in 2002.

[*] Freight In America: A New National Picture, January 2006, USDOT – Bureau of Transportation Statistics (BTS), p. 33-34

Over the past ten years, intermodal traffic (the movement of truck trailers or containers by rail and at least one other mode of transportation, usually trucks and/or ocean-going vessels) has been the fastest growing rail traffic segment. Rail intermodal traffic has tripled in just over 20 years, rising from 3.1 million trailers and containers in 1980 to 11.7 million trailers and containers in 2005. In 2003, intermodal surpassed coal for the first time ever in terms of revenue for US Class I railroads. Intermodal today accounts for some 23 percent of revenue for Class I carriers.

Air freight is carried by passenger aircraft, freighters or integrated carriers, such as Federal Express, which combines trucking with air transportation to give the shipper a door-to-door delivery system. Although air's share of the tonnage and ton-miles is relatively small, growth in air freight creates demand for more truck and intermodal services because almost all air cargo shipments begin and end their journey by truck.

2.4.9 Technology

Technological innovation is one of the most exciting aspects of freight movement. All modes have had significant changes to their technologies. Intelligent Transportation Systems (ITS) play an increasingly important role in improving traffic flow and managing the logistics of urban goods movement. The use of global positioning systems (GPS) for tracing and communication will continue to expand in the future. Trucking firms and package delivery companies already use GPS to track vehicles and parcel flow. Other technologies that will enhance freight transport within and through cities include automated vehicle location, automated bills of landing, and electronic vehicle tagging. Technological improvements are also expected to play an increasing role in maintaining and improving the safety and security of the transportation system, particularly in relation to freight movement.

CHAPTER 3 — MIAMI VALLEY FREIGHT TRANSPORTATION SYSTEMS PROFILE

3.1 — OVERVIEW

Freight movement in the Miami Valley Region occurs over a number of transportation modes, including truck, rail, air, and pipeline. Figure 3.1 illustrates the multi-modal freight infrastructure and facilities located in the Region. Networks of railroads, pipelines, and roadways along with facilities such as the Dayton International Airport, truck terminals and rail yards support the efficient movement of raw materials and finished goods throughout the Region.

The freight profile in this chapter provides an assessment of current freight practices in the Miami Valley, including highway, railway, and air infrastructure; pipelines, intermodal connectors and facilities; principal manufacturing facilities; warehouses and distribution centers; the principal transportation providers; and the nature of services provided. The inventory includes an overview of how the existing local and regional freight systems are part of the larger statewide, national, and international freight transportation systems.

3.2 — TRUCKING

3.2.1 Trucking Companies

Using the ES202 business inventory data for years 2000 and 2002 for the MPO Region, a list of approximately 306 major trucking, warehouse, and distribution facilities was compiled. The database obtained from these lists was verified for existence and correct address information using the Yellow Pages and other establishment listings on the internet. Figure 3.2 shows the location of the major freight–related establishments in the Region by employment size.

As illustrated on the map, areas with significant trucking, warehouses and distribution enterprises are found generally along the freeway corridors, specifically along the entire length of the I-75 corridor through the Region, which has the greatest concentration of industrial zoning in the Region. The other major corridors with significant freight-related establishments include I-70, I-675 in Montgomery County, SR 4 and US 35 in Greene County.

Some of the companies shown in Figure 3.2 are designated as terminal facilities. Terminal facilities sort incoming freight shipments and reload them onto other trucks after distributing the loads according to destination. The following paragraphs summarize the operations of the companies with the largest terminals in the Miami Valley Area.

- ABF Freight System, Incorporated has grown to become the fourth largest Less Than Truckload (LTL) motor carrier in the United States, from the forty-eighth largest in 1965. ABF concentrates on long-haul transportation of general commodity freight, involving primarily LTL shipments. General commodities are defined as all freight except hazardous waste, dangerous explosives, commodities of exceptionally high value, commodities in bulk and those requiring special equipment. The company operates a fleet of approximately 19,633 trucks, tractors and trailers. The company has terminal facilities around the country, including the facility in Huber Heights, Ohio, which is one of nine national distribution centers.
- Yellow Worldwide Transportation Services is the largest LTL motor carrier in the United States. Yellow Freight has various terminals throughout the country, including one in Huber Heights.

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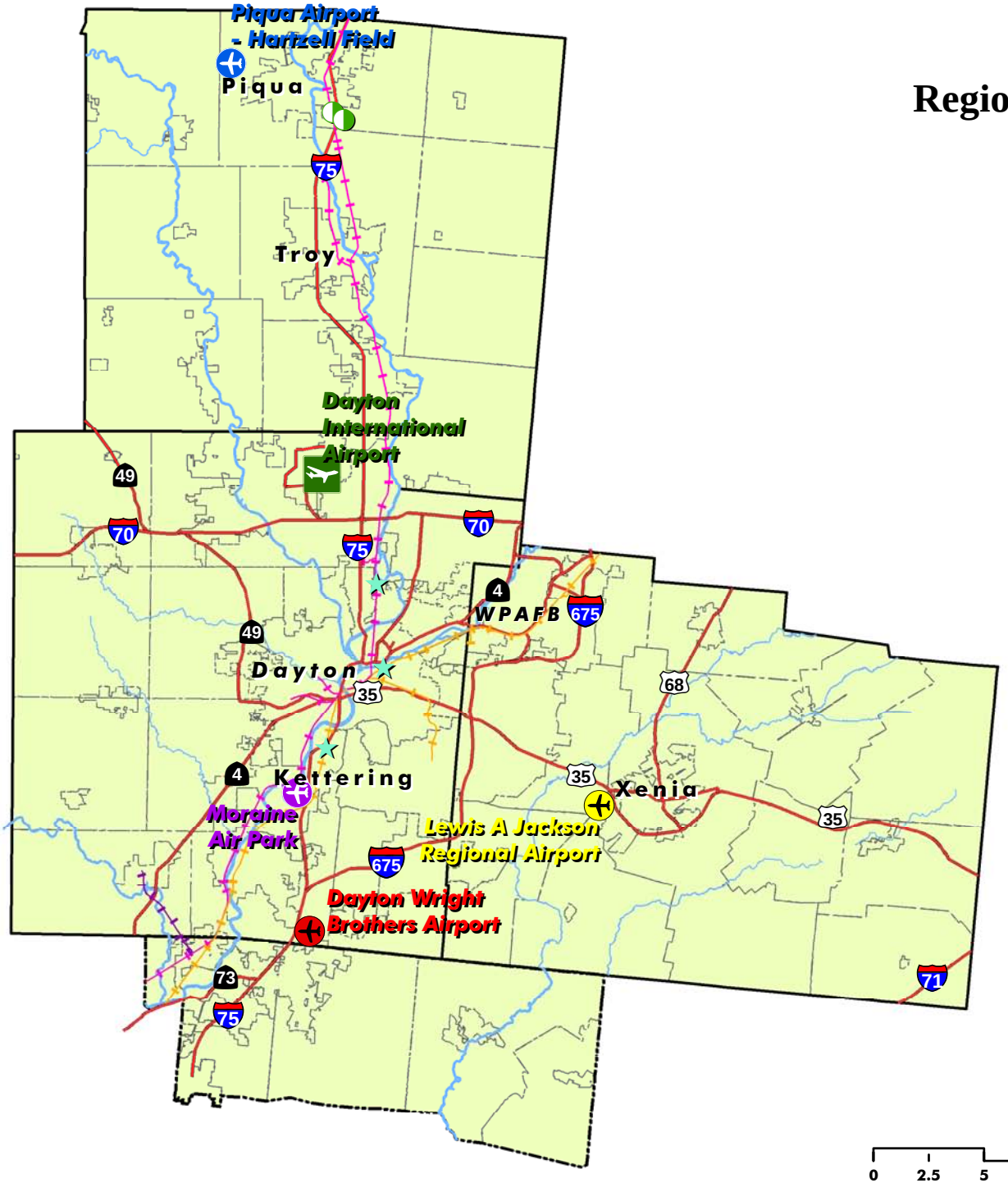

Figure 3.1
Miami Valley Regional Freight Facilities

Airports

- Dayton International Airport
- Dayton Wright Brothers Airport
- Lewis A Jackson Regional Airport
- Moraine Air Park
- Piqua Airport - Hartzell Field

Railroads

- CSX Transportation, Inc.
- Germantown Rail Siding Company
- Norfolk Southern Corporation
- Railyards

- National Highway System
- Truck Rest Areas

Source: MVRPC

0 2.5 5 10 Miles

N

MPO Area

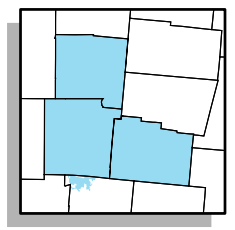

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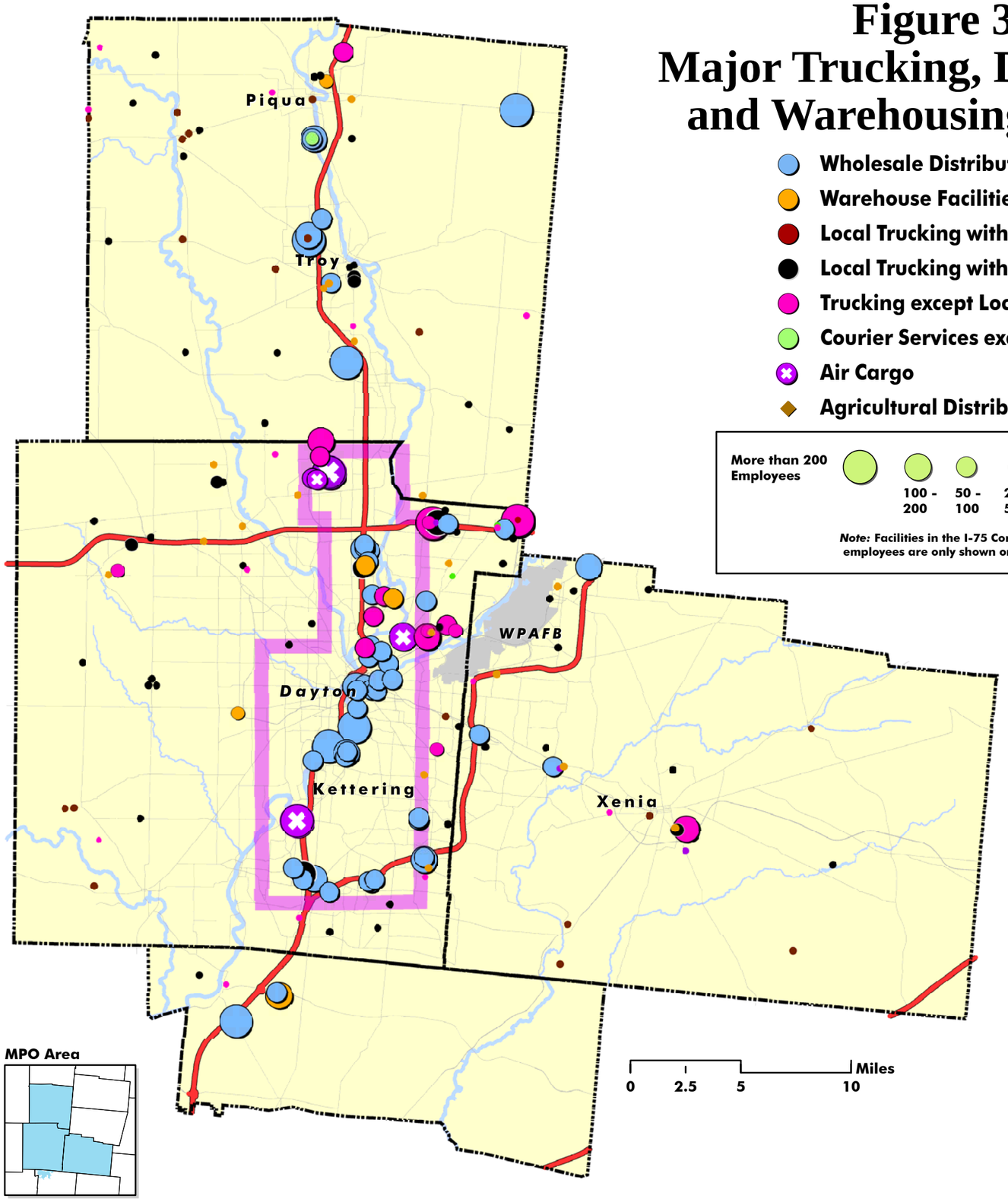
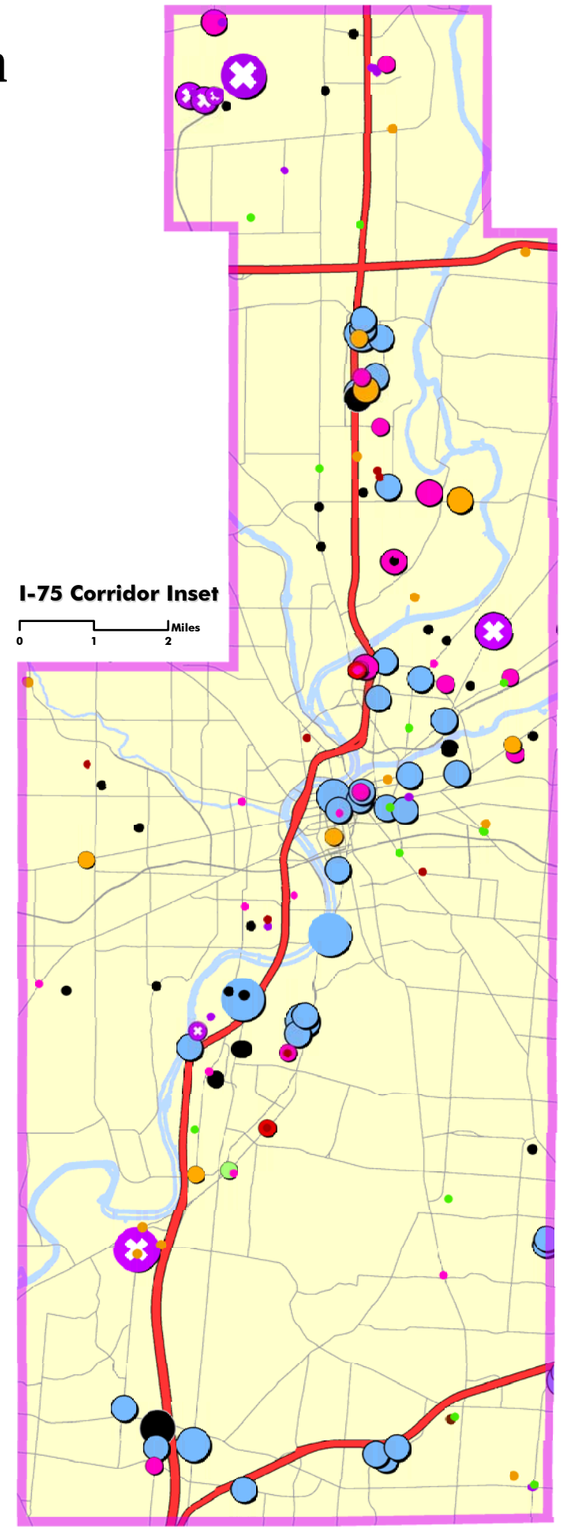
Figure 3.2
Major Trucking, Distribution and Warehousing Facilities

- Wholesale Distribution Facilities
- Warehouse Facilities
- Local Trucking with Storage
- Local Trucking without Storage
- Trucking except Local
- Courier Services except Air
- Air Cargo
- Agricultural Distribution

More than 200 Employees | 100 - 200 | 50 - 100 | 20 - 50 | Less than 20 Employees

Note: Facilities in the I-75 Corridor area with less than 50 employees are only shown on the inset map to the right.





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- Roadway Express is an LTL motor carrier company with terminals around the country and abroad, including a terminal in Riverside. Its primary service is LTL transportation on 2-day and longer trips within North America, and on international trips to and from North America.
- USF Holland was founded in 1929 and in 1984 became part of the US Freightways family of regional carriers. Focusing on extensive next-day service, it has become one of the Nation's largest LTL carriers. The terminal for USF Holland is located in Dayton on Valley Pike.

3.2.2 Regional Road Network

The Region's roadway networks includes three interstates (I-70, I-75 and I-675), freeways, and principal arterials, including the intersection of I-70/I-75, a major focal point for intermodal traffic. The Region has approximately 5,260 miles of roads, of which about 2,200 miles comprise the regional network roadway miles.

The national and state transportation agencies have established a hierarchy of highways. The federal government developed a National Highway System (NHS) intended to include the most significant highways for moving people and freight. The NHS is a federal transportation system designated by Congress that includes 160,000 miles (256,000 kilometers) of nationally significant interstate highways and roads for interstate travel, national defense, intermodal connections, and international commerce. The NHS includes the following subsystems of roadways (note that a specific highway route may be on more than one subsystem):

- Interstate Roadway System
- Other Principal Arterials: Highways in rural and urban areas that provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility.
- Strategic Highway Network (STRAHNET): A system of public highways that provide access, continuity, and emergency transportation of personnel and equipment in times of peace and war. The STRAHNET system is comprised of approximately 47,000 miles of Interstate and defense highways and 16,000 miles of other public highways.
- STRAHNET Connectors: STRAHNET is complemented by about 1,700 miles of connectors – additional highway routes linking more than 200 military installations and ports to the network. Two STRAHNET connectors (SR 844 and a portion of SR 444) are located in the Miami Valley Region linking the Wright Patterson Air Force Base to the STRAHNET system.
- Intermodal Connectors: Highways that provide access between major intermodal facilities and the other four subsystems making up the NHS.

Figure 3.3 shows the NHS network within the Miami Valley Area, as well as STRAHNET Connectors and Intermodal Connectors as designated by the FHWA.

In addition to the NHS system, MVRPC recognizes six basic roadway classifications based on the FHWA classification scheme:

- Principal Arterial — Interstate
- Principal Arterial — Freeway and Expressway
- Principal Arterial — Other Urban and Rural
- Minor Arterial

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Figure 3.3
Miami Valley
National Highway System

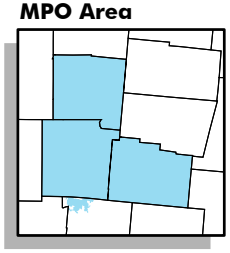
National Highway System
Highway Type
- Interstate
- STRAHNET Connector
- Other NHS
- Intermodal Connector

Existing Land Use
- Public/Institutional
- Residential
- Industrial
- Open Space
- Agriculture
- Commercial

Source: MVRPC

0 2.5 5 10 Miles

MPO Area



- Collector — Urban and Major Rural
- Collector — Minor Rural

3.2.3 Truck Routes

Truck routes are designated roads for trucks through jurisdictions to avoid unnecessarily clogging and deteriorating streets used by non-truck traffic. US Routes and State Routes are all considered truck routes; therefore, most jurisdictions do not go to the expense of signing these routes. However, secondary roads should be signed as a truck route or with a prohibitory sign. Some jurisdictions in the area only install truck route or prohibitory signs on a complaint basis. The following incorporated areas designate truck routes — Englewood, Huber Heights, Dayton, Centerville, Bellbrook, Moraine, Miamisburg, and Riverside.[*] There have been various changes in the truck routes from 1999 to 2006. The most notable additions include — Trotwood Connector (SR 49) through Trotwood and the extension of US 35 Bypass east of Xenia.

3.2.4 Bridge Restrictions

Figure 3.4 shows bridge restrictions within the Miami Valley Area on the Interstate, US and State and Routes based on data obtained from ODOT. The legend is coded utilizing the following restrictions — height, weight and width. The bridges are also identified based on low sufficiency ratings (below 0.5) as graded by ODOT based on several criteria. A bridge sufficiency rating of 1.00 (or 100%) is considered optimal. Bridges with sufficiency ratings below 0.8 are eligible for federal rehabilitation funds while those with ratings below 0.5 (2% of the Region's bridges) are eligible for federal replacement funds.

There were no bridges with weight restriction (bridges with a load rating of less than 100%) or width restrictions (bridges with widths of less than 24 feet that could obstruct the convenient simultaneous crossings of two large trucks in opposite directions) in the Region's State system. Around 11 bridges were found to have vertical restrictions, the majority of which are located in Montgomery County. Bridges were deemed to be vertically restricted for large truck movements using standards from the ODOT Location and Design Manual based on the functional classification of the roadway on which the structure was located and whether travel was on or under the bridge. For roadways, where travel was on the bridge, a bridge was classified as restricted if the minimum vertical clearance on the state freeway/arterial system of routes was less than 16 feet. If travel occurred under the bridge, then a minimum vertical clearance of 16 feet was required for unrestricted truck travel if the intersecting highway feature had a functional class of arterial and above, and 14 feet for roads that were classified as collectors or local.

3.2.5 Ancillary Roadway Facilities

Truck Weigh and Inspection Stations

Truck weigh and inspection stations, owned by ODOT and operated by the Ohio State Highway Patrol Facilities Management, are located at entry points into Ohio on the interstate highway system. Enforcement at these stations is intended to ensure that trucks do not exceed the prescribed legal size and weight limits. Weigh and inspection stations also ensure that commercial vehicles are in safe operating condition, and that drivers are complying with regulations such as hours of service and driver credentials.

[*] Miami Valley Freight Movement Study, 1999, MVRPC

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Freight Movement Study

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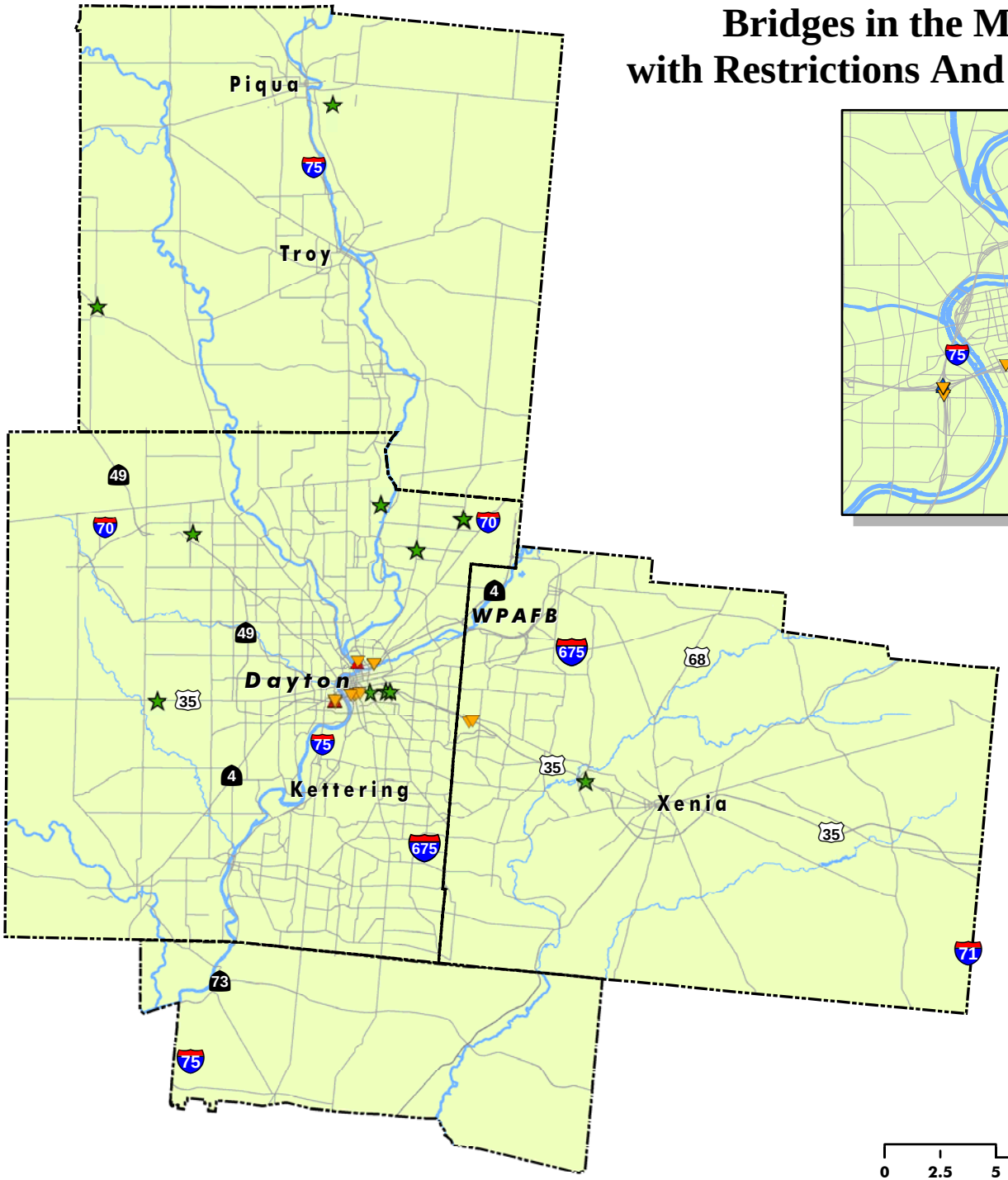
Figure 3.4
Bridges in the Miami Valley Region with Restrictions And Low Sufficiency Ratings



Bridge Restrictions

- Height Restrictions for Bridges 'Travel is Under the Bridge'
- Height Restrictions for Bridges 'Travel is On the Bridge'

Bridge Sufficiency Rating

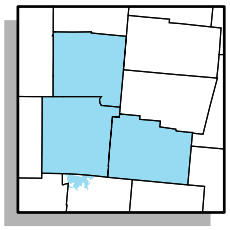
- Eligible for Replacement Funds (0.0 - 50.0)

Source: Ohio Department of Transportation (ODOT) and MVRPC

0 2.5 5 10 Miles

n

MPO Area



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There are no truck weigh and inspection stations located in the Miami Valley Region. The closest truck weigh and inspection facility outside the Region is located on I-71 north and south of US 68 in Clinton County.

Rest Areas

Another important category of highway support facilities is rest areas suitable for commercial vehicles. An adequate system of rest areas is critical to highway safety. Due to the safety concerns identified by USDOT and other agencies, regulations and rules regarding driver hours of operation have been recently strengthened. The new regulations underscore the importance of having enough high-capacity truck rest areas for long-haul freight carriers. Figure 3.1 shows the locations of the two safety rest areas maintained by ODOT in the Miami Valley that can accommodate commercial vehicles. Both rest areas are located near Piqua in Miami County on I-75 northbound and southbound directions. In addition, there are two rest areas located off of I-70 on either side of the Region in Clark and Preble counties.

3.3 — RAIL

Two U.S. Class I rail companies (CSX Transportation and Norfolk Southern) operate in the Miami Valley area. CSXT owns and operates a north-south line within the study area between Warren County and Shelby County as shown in Figure 3.1. Norfolk Southern owns and operates a northeast-southwest line within the study area between Warren County and Clark County.

Over the years, many Class I railroads have merged to stave off bankruptcy or simply to increase profits. In 1998, Conrail's main operations were divided between CSXT Transportation and Norfolk Southern; Conrail continues as a CSX-NS joint venture for switching purposes.

There are no Regional railroads operating in the Region, but one local, private, linehaul railroad (the Germantown Rail Siding Company) connects Germantown to the CSXT line in Carlisle.

3.3.1 Railyards In The Region[*]

The Miami Valley has three railyards in the Region as shown in Figure 3.1. Norfolk Southern has two yards and CSXT has one yard in the Miami Valley Area. These yards fall into two functional categories: classification yards and industrial support yards. Classification yards are for the purpose of sorting rail cars according to their destination and placement on the train. Industrial support yards hold freight cars used by local industries.

Norfolk Southern: One of Norfolk Southern's railyards is located in an area bounded by East First Street, East Monument Avenue, Keowee Street, and Findlay Street. This railyard is no longer an active classification yard, and is used as a storage facility. A portion of the yard is leased to the Laidlaw Company for storage.

The other Norfolk Southern railyard is located in an area bounded by Dorothy Lane, I-75, Dryden Road, and Springboro Pike. This railyard is an industrial support yard, serving approximately 16 businesses, including General Motors. Part of the yard also serves as a classification yard, having 14 classification tracks and a 500-car capacity (this only represents switching capacity).

[*] Miami Valley Freight Movement Study, 1999

CSXT Corporation: The only yard that CSXT operates in the Miami Valley Area is located between Wagner Ford Road and Webster Street south of Needmore Road. This yard is also categorized as both an industrial support and classification yard. A list of the businesses served by the yard is unavailable. This yard has a capacity of 1,000 cars.

In addition to railyards, CSXT offers other services that contribute to the efficient flow of freight through the Region. One of these services is called TransFlo, which is broken down into the following elements:

- Freight storage is a major part of freight transportation, and CSXT has created the Warehouse Group to address the storage issue. The Warehouse Group is an integrated network of public distribution centers and common carrier delivery operations. Two facilities in Dayton, Ohio are a part of the CSXT Warehouse Group—Peerless Transportation (located on Miami Chapel Road) and The Terminal Cold Storage Company, Inc. (located on Eaker Street).
- The other service is called Hi-Rail facilities, which are mainly used to lift heavy items onto railcars. CSXT's Hi-Rail features a network of over 20 terminals across CSXT's 18,000 mile system. Each facility must maintain stringent requirements for quality and customer satisfaction set by CSXT. The Hi-Rail facilities are capable of handling most metal products, including coils, pipes, rod, slabs, sheet, beams, structurals, bar, and plate. Dayton's Hi-Rail facility is located at Ferrolux Metals on McCall Street.

3.3.2 Railroad Crossings

The Public Utilities Commission of Ohio (PUCO) maintains a database of all at-grade crossings in the State of Ohio. For the Miami Valley Area, the database list 161 at-grade rail crossings, as shown in Figure 3.5.

In the Miami Valley Area there are six geographic areas where a cluster of railroad crossings can be found: Troy, Tipp City, Dayton, Miamisburg, Germantown and Carlisle. Where a cluster of railroad crossing exists, the potential for accidents is increased. The problem is exacerbated in areas like Miamisburg and West Carrollton where the speed limit on the tracks is higher than in other areas. A potential problem for moving freight by truck over grade crossings is illustrated by several crossings in Tipp City where the grade of the road is steep.

According to data maintained by the Federal Railroad Administration (FRA), 10 of the Region's crossings had a total of 16 accidents between 1999 and 2002. While the details of the accidents are unknown, all crossings where accidents occurred are at present adequately signed/protected by crossbucks, lights, and gates.

3.4 — PIPELINES

Pipelines within the Miami Valley are used to transport natural gas, and petroleum products such as gasoline, kerosene, diesel fuel or jet fuel to terminals within the Region. Some pipelines that pass through the Region transport crude oil to refineries in Lima and Toledo. Although the Miami Valley is not a producer of gas and oil, its reliance upon them is enormous. This Region depends on an extensive underground pipeline network to supply its fuel. The establishment of this pipeline network has linked this Region to the entire Nation and provided it with easy access to oil and gas for its energy needs. Pipelines are not discussed in detail in the report due to security concerns that preclude identification of certain facilities (Figure 3.6).

At least nine companies operate major pipelines within the Miami Valley Region: Allegheny

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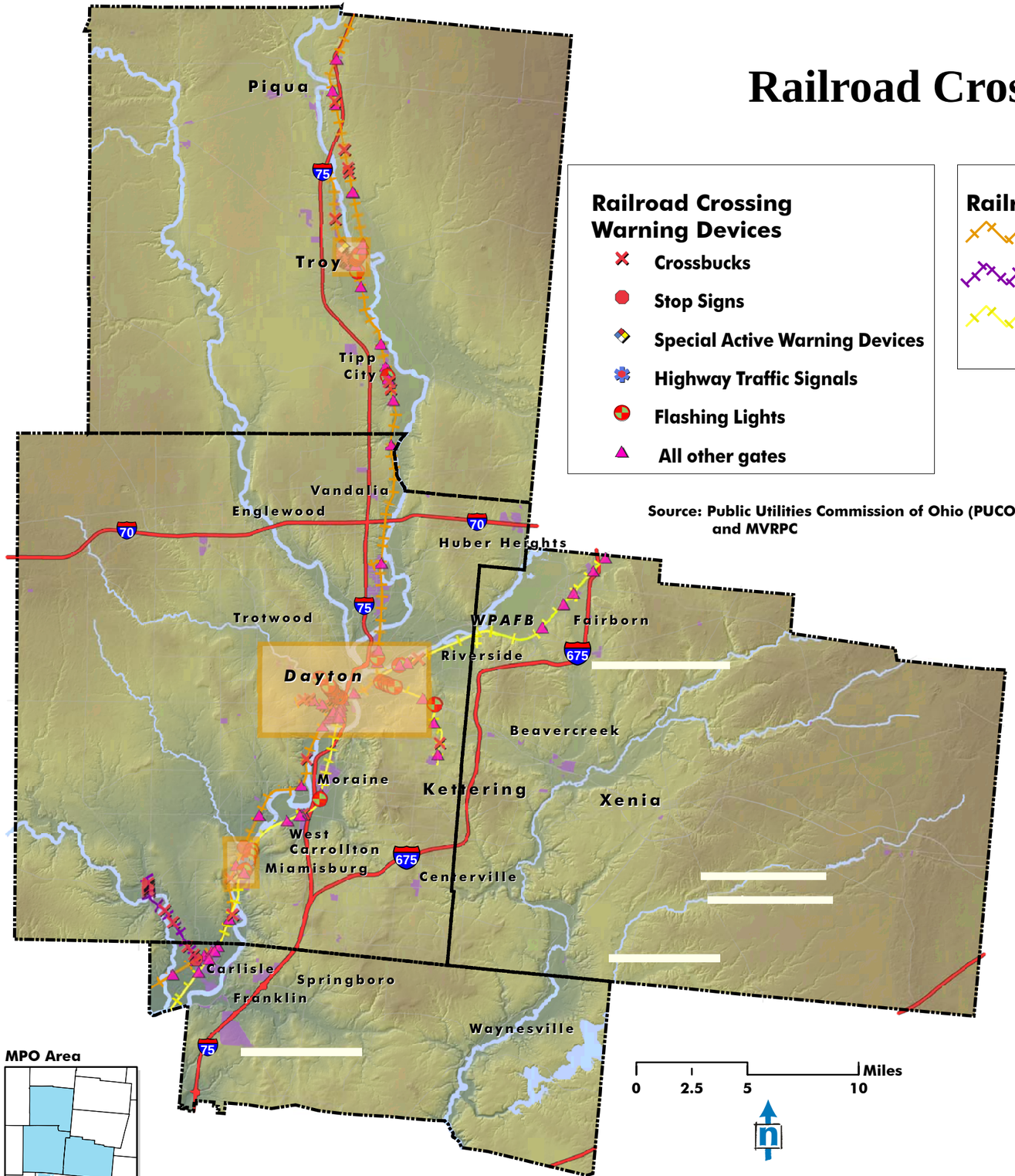
Figure 3.5
Railroad Crossings and Warning Devices



Railroad Crossing Warning Devices

- Crossbucks
- Stop Signs
- Special Active Warning Devices
- Highway Traffic Signals
- Flashing Lights
- All other gates

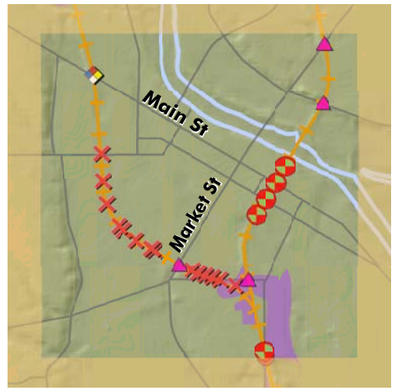
Railroad Owners

- CSX Transportation, Inc.
- Germantown Rail Siding Company
- Norfolk Southern Corporation

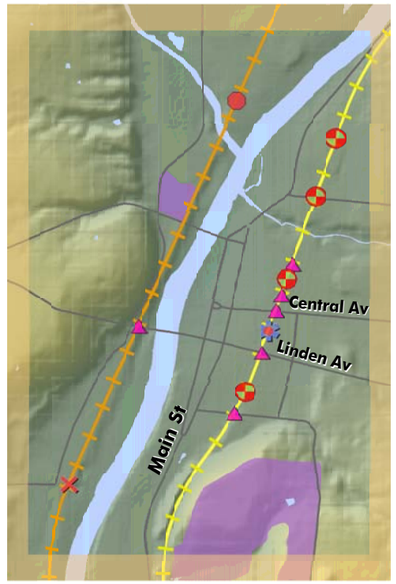
Source: Public Utilities Commission of Ohio (PUCO) and MVRPC

MPO Area

0 2.5 5 10 Miles

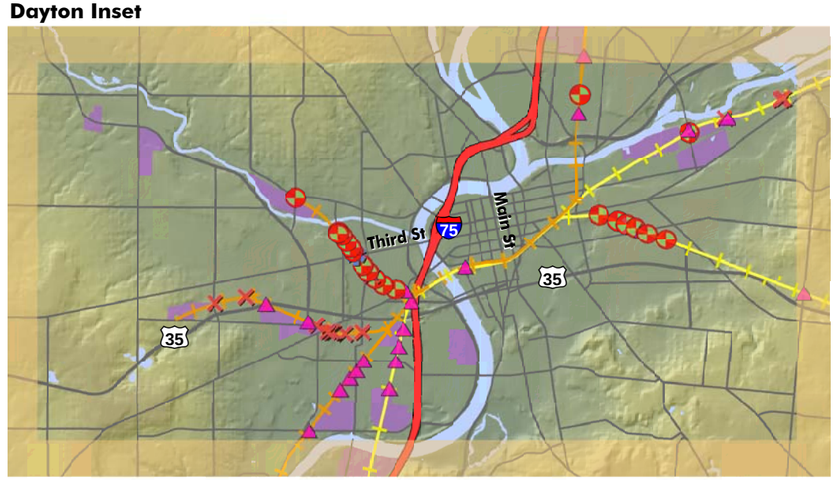


Troy Inset



Miamisburg Inset

Dayton Inset



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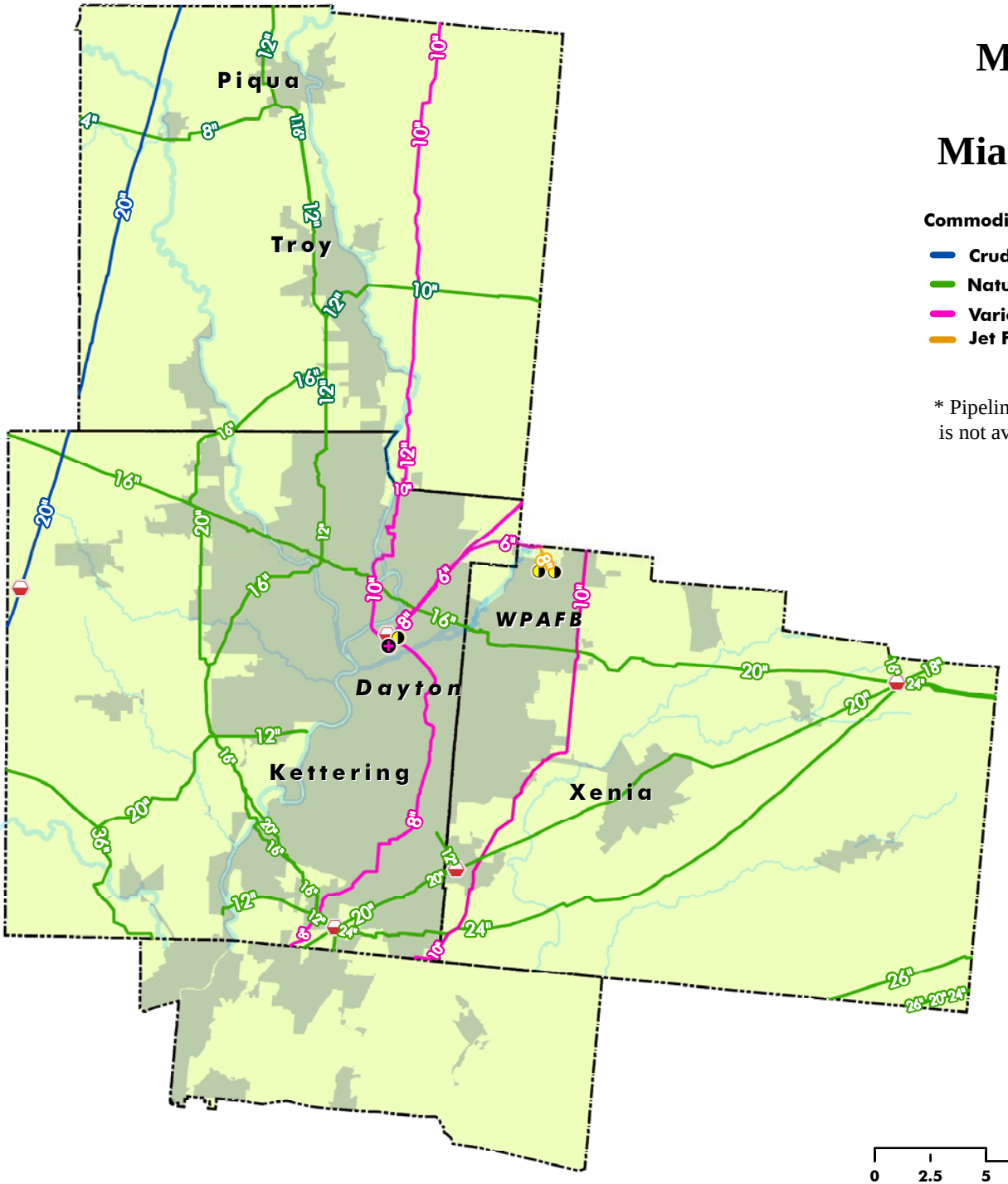

Figure 3.6

Major Pipelines in the Miami Valley Region

Commodity

- Crude Oil
- Natural Gas
- Various Products
- Jet Fuel

Pipeline Services

- Intermodal Terminal
- Pump Station
- Tank

* Pipeline Data for cities in Warren County is not available

Source: Miami Valley Freight Movement Study, MVRPC, 1999

0 2.5 5 10 Miles

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Pipeline Company, British Petroleum Company, Columbia Gas Transmission Company, Consolidated Natural Gas Transmission Corporation, Dayton Power and Light, Marathon Ashland Petroleum LLC, Mid-Valley Pipeline Company, Texas Eastern Products Pipeline Company and Texas Eastern Transmission Corporation.

3.4.1 Pipeline Terminals

The four pipeline terminals[*] within the Region are located in a cluster approximately two miles north of downtown Dayton. This cluster of facilities forms an intermodal terminal for the Region's supply of gasoline, kerosene, diesel fuel and jet fuel. From this cluster of terminals, most of the fuel for local airports and service stations is distributed. The four terminals are as follows:

- British Petroleum — 621 Brandt Pike, Dayton, Ohio 45404 with an average daily distribution of 60,000 barrels.
- Citgo Petroleum Corporation — 621 Brandt Pike, Dayton, Ohio 45404 with an average daily distribution of 5,500 barrels.
- Equilon — 801 Brandt Pike, Dayton, Ohio 45404 (formerly Shell Oil Co.) with an average daily distribution of 15,000 barrels.

This Equilon facility services the entire southwest part of Ohio, including the Cincinnati market. According to Equilon officials, only about 30-40% of all deliveries are made to the three-county area. Jet fuel delivery is also provided to the Dayton International Airport.

- Sunoco — 1708 Farr Drive, Dayton, Ohio 45404

3.4.2 Major Pipelines

Table 3.1 briefly describes the major pipelines within the Miami Valley Region. They are organized by pipeline owner.

TABLE 3.1 — MAJOR PIPELINES IN THE MIAMI VALLEY

Owner	Diameter	Location	Origin	Terminus	Commodity	Flow
Allegheny Pipeline Company, Greene County	8"	Southeastern corner of Greene County, south of I-71	Lebanon, OH	New Jersey	NA	NA
Brtish Petroleum Oil Products	12"	Eastern Miami County to northeartern Montgomery County	Lima, OH	BP Terminal, Dayton, OH	Various Refined Fuel Products	Approx. 60,000 Barrels/Day
	6"	Northeastern Montgomery County	Lima, OH	BP Terminal, Dayton, OH	NA	Abandoned
	8"	Northeastern Montgomery County	Lima, OH	BP Terminal, Dayton, OH	Various Refined Fuel Products (especially fuel oils)	Approx. 21,600 Barrels/Day

[*] Miami Valley Freight Movement Study, 1999

Owner	Diameter	Location	Origin	Terminus	Commodity	Flow
	8"	Northwestern corner of Greene County	Offshoot line from 8" pipeline above	WPAFB	Jet Fuel	Approx. 21,600 Barrels/Day
	8"	Eastern Montgomery County (east of Huber Heights) extending south from Dayton, OH	BP Terminal, Dayton, OH	Middletown, OH	Various Refined Fuel Products	Approx. 44,400 Barrels / Day
Columbia Gas Transmission Company	16" (2 lines)	Northeastern corner of Greene County	Cedarville, OH	Springfield, OH	Natural Gas	NA
	18"	Northeastern corner of Greene County	Fairfield & Hocking Counties, OH	Cedarville, OH	Natural Gas	NA
	16" (2 lines)	Northeastern corner of Greene County	Cedarville, OH	Springfield, OH	Natural Gas	NA
	24"	Northeastern Greene County extending into southeastern Montgomery County	Cedarville, OH	Southern Montgomery County;	Natural Gas	NA
Consolidated Natural Gas Transmission Corp.	26"	Southeastern corner of Greene County	NA	NA	Natural Gas	NA
Dayton Power and Light	4", 8", 10", 12", 16", and 20"	Several Locations within the Region	Centerville, Hollansburg	Cedarville, Hardin, N. Hampton, Tipp City, & Dayton	Natural Gas	Varies
Marathon Ashland Petroleum	6"	Northeastern Montgomery County; northwestern corner of Greene County	Dayton, OH	Columbus, OH	Various Fuel Products	NA
Mid-Valley Pipeline Company	20"	Northwestern corner of Montgomery County; western edge of Miami County	Longview, Texas	Lima, OH	Crude Oil	Approx. 150,000 to 250,000 Barrels/ Day
Texas Eastern Products Pipeline (subsidiary of Duke-Energy)	10"	Southeastern corner of Montgomery County to western half of Greene County	Lebanon, OH	Lima, OH	Various Fuel Products	Approx. 48,000 Barrels/Day
Texas Eastern Transmission (subsidiary of Duke-Energy)	20"	Southeastern corner of Greene County, south of I-71	Lebanon, OH	Five Points, OH	Natural Gas	Approx. 787 lbs. of pressure
	24"	Southeastern corner of Greene County, south of I-71	Lebanon, OH	Five Points, OH	Purged and Out of Service	NA
	26"	Southeastern corner of Greene County, south of I-71	Lebanon, OH	Five Points, OH	Various Fuel Products	Approx. 800 lbs. of pressure
	36"	Southeastern corner of Montgomery County	Gas City, Indiana	Lebanon, OH	Natural Gas	Approx. 500 to 600 lbs. of pressure

Source: Miami Valley Freight Movement Study, 1999, MVRPC

3.5 — AIR FREIGHT

The Miami Valley has a long aviation history since the ideas of two young bicycle shop owners became a reality with the first flight of the Wright-B Flyer in 1903. This tradition is continued today at Wright-Patterson Air Force Base, one of the premier aviation research and development centers in the world and also at the Dayton International Airport, the United States' top 90-minute air market. In addition to the Dayton International Airport, the Dayton Urbanized Area is served by four general aviation airports eligible for funding by the ODOT (see Figure 3.1). The Dayton International Airport is the focal point of the Region's air transportation network, including freight. The other airports in the Region are mainly general aviation airports that serve small private planes for personal and agricultural uses.

3.5.1 Dayton International Airport

The James M. Cox Dayton International Airport (airport code DAY) serves as a primary commercial service airport for the MVRPC Region. Dayton Airport is located approximately 11 miles north of downtown Dayton in northern Montgomery County on a 3,870 acres tract of land. Dayton Airport is less than five minutes from the I-70/I-75 interchange. The Airport has three runways: 10,900 foot primary, 7,000 foot parallel, with operations on a parallel runway when necessary, and an 8,500 foot crosswind runway. The dual runway system allows simultaneous operations on parallel runways, with landings and departures on the crosswind runway. There are more than 85 passenger flights a day, with nonstop service to 17 major domestic markets carrying 2 million passengers annually.

Air Cargo Facilities

Owned and operated by the city of Dayton since 1936, the Dayton Airport was the North American hub for Emery Worldwide till 2001 and one of the ten busiest cargo airports in the country. Emery was operated by Menlo from 2001 to 2005, when the facility was acquired by UPS as part of the company's purchase of Menlo's air freight division.

The cargo facilities at the Airport include[*]:

- Warehouse 18,600 m² (200,208sq ft),
- 78 x 747 Freighter Docks,
- Bonded Warehouse,
- Free Port/Foreign Trade Zone,
- Aircraft Maintenance,
- Mechanical Handling,
- Heated Storage,
- Air-Conditioned Storage,
- Deep Freeze Storage,
- Livestock Handling,
- Health Officials,

[*] Dayton International Airport

- X-Ray Equipment,
- Security for Valuables,
- Fumigation Equipment,
- Dangerous Goods,
- Radioactive Goods,
- Very Large/Heavy Cargo,
- Express/Courier Centre

UPS Cargo Hub

The UPS air cargo area is located on the northwest side of the airfield with access from Old Springfield Road. The UPS complex consists of an over 5 million square-foot ramp, a 1 million square foot sort facility, a four million gallon fuel farm, employee parking, offices, and maintenance support buildings. In 2005, UPS operated about 33 flights daily from the cargo hub in addition to delivery and transportation through approximately 80 trucks per day.

In early 2005, United Parcel Service (UPS) acquired Menlo Logistics and announced plans to relocate its heavyweight operations. The City of Dayton, the Greater Dayton Area Chamber of Commerce and UPS are developing strategies that will continue to utilize the air freight hub at the Dayton International Airport. According to airport authorities, the strategic assets at the airport, the interstate highway system and cargo demographics assure that there will be a large air freight presence at the Dayton International Airport well into the future.

United Parcel Service Inc. is slated to close its heavy freight hub and cut 1,400 employees by summer of 2006. When the UPS hub closes, the city will lose about $1 million a year in income tax, and the airport will lose $5.5 million in revenue from landing fees and other expenses, according to the airport engineer's office. The City, working with other regional development groups, hired Arlington, Virginia-based MergeGlobal Inc. in August, 2005 to seek a viable reuse for the hub.

Dayton International Airport Expansion Plan[*]

Dayton International Airport is the subject of a complex expansion plan which would see the expansion of several of its runways, the construction of a new Air Traffic Control Tower and TRACON facility, a cargo hub expansion, the construction of an air cargo access road, the rerouting of a highway, and the acquisition of areas of land around the airport.

The proposed expansion will enhance airfield and ground transportation capacity and meet the forecast projection for passenger and cargo operations. According to the long-range forecasts of traffic at the Dayton International Airport, passenger demand is expected to increase from 1.1 million enplanements in 1998 to 1.5 million enplanements in 2018, resulting in a 1.9% average annual compound growth rate. The number of aircraft operations that will transport passengers, cargo and private individuals is expected to grow over the 20-year forecast period.

The City of Dayton recently submitted to the Federal Aviation Administration a revised Airport Layout Plan for Dayton International Airport. It depicted three runway extensions. The south

[*] 2030 Long Range Transportation Plan, May 2004, MVRPC

parallel runway had been proposed to be 11,000 feet in length. It is now proposed to be 9,500 feet in length. The north-south runway extension remains as it was recommended in 1999. The third parallel runway, which was envisioned to be beyond the 20-year planning timeframe, has been removed from the plan. A possible extension to the primary runway is included. The airport expansion plans are currently under a Federal Aviation Administration (FAA) review. The plan has been split into three separate phases to run consecutively during the twenty-year timescale of the project.

3.5.2 Greene County Lewis A. Jackson Airport

The Greene County Lewis A. Jackson Regional Airport is situated 8 miles east of Dayton in Beavercreek Township. The Greene County Regional Airport Authority owns the airport and is comprised of seven members of the community. Though currently operating as a general aviation airport, the airport authorities are planning to introduce specialized freight handling at the airport (primarily medical and pharmaceutical cargo) in the near future, contingent upon availability of funds. Airport authorities believe there is demand for such cargo handling, with several medical and pharmaceutical facilities located near the Airport.

The 3,975 foot paved runway at the Airport was recently extended to 4,500 feet with FAA and local funding. Currently the FAA estimates there are 20,000 aircraft movements annually. There are 61 corporate and private aircraft based at the field. Space is available for parking up to 60 transient aircraft during fly-ins, in addition to the 68 based aircraft on the field.

3.5.3 Other Air Cargo Carriers

Other major air cargo carriers at the Dayton International Airport include Federal Express and USPS with facilities located north of Terminal Drive in the terminal area. This cargo area consists of five cargo buildings. The United States Postal Service (USPS) building is located west of the public auto parking lot and has approximately 42,500 square feet. It is used by USPS and several other air carriers. Federal Express (FedEx) is located in two buildings east of the USPS building. FedEx operates two Boeing 727-227s daily with service to the airport and maintains 40,000 square feet of space. The other two buildings in the cargo complex are multi-tenant cargo buildings. Mail and other small packages are shipped via passenger service planes. Northwest, Delta, Continental and United Airlines provide small package delivery service to and from the Dayton International Airport. Air cargo, other than UPS, was projected to increase at an annual rate of 5% from 1998 – 2018 (from 11,888 tons to 37,500 tons), based on the October 1998/Boeing 1998/1999 World Air Cargo Forecast.

3.5.4 Other Cargo Airports

There are various other airports within close proximity of Dayton that have an impact on the surrounding space. Wright-Patterson Air Force Base is located 6 miles southeast of the Dayton Airport. Other cargo airports in the surrounding area include Indianapolis, 111 miles west; Toledo, 142 miles north; Wilmington, 34 miles southeast; Rickenbacker and Port Columbus, 76 miles east, Cincinnati, 63 miles south; and Louisville, 156 miles southwest. Indianapolis is a hub for FedEx and the United States Postal Service (USPS) and an airline maintenance base for United Airlines. Toledo is a hub for BAX Global (formerly Burlington Air Express). Wilmington is a hub for DHL. Rickenbacker is the cargo airport for Columbus and a hub for FedEx. Cincinnati is a hub for Delta and Comair, and Louisville is a hub for UPS. Dayton Wright-Brothers Airport, located approximately 19 miles south of Dayton Airport is one of Dayton's general aviation reliever airports.

3.6 — INTERMODAL CONNECTIONS

Within the Miami Valley Area there are various intermodal facilities, where one mode of transportation connects with another.

3.6.1 Pipeline-Truck

The most prevalent intermodal connection in the Region is the pipeline-to-truck transfer used to deliver gasoline, kerosene, diesel fuel and aviation fuel to the Miami Valley. Four terminals are found in northeast Dayton between Troy Street and Brandt Pike north of Stanley Avenue. These terminals receive petroleum products from both the north and south via pipeline, and transfer the products to trucks for delivery to dispensing facilities and airports throughout a wide area of west-central and southwest Ohio. Each of the four terminals generated between 140-200 truck trips daily in 1998[*], most utilizing Stanley Avenue, Troy Street and Brandt Pike. Stanley Avenue and the connecting portions of Troy Street and Brandt Pike have been designated recommended intermodal connectors on the National Highway System.

3.6.2 Air-Truck

Another significant intermodal connection within the Miami Valley Region involves the air-truck connections associated with the UPS facility at the Dayton International Airport. Approximately 50 to 60 trucks ferry cargo to and from the UPS facility during night hours while another 20 trucks access the facility during the day. US Route 40, Dog Leg Road, and Old Springfield Road have been designated intermodal connectors on the National Highway System. Due to the departure of UPS from the Airport facility in Summer of 2006, a decision on the re-use of the facility is awaited before it can be determined if direct truck access from I-75 and I-70 is needed at the Airport in the future.

3.6.3 Rail – Truck

There are no rail-truck intermodal facilities within Greene, Miami, and Montgomery Counties. In Cincinnati, about 50 miles to the south of Dayton via I-75, both CSXT and Norfolk Southern have intermodal facilities. Both CSX and Norfolk Southern also have an intermodal terminal in Columbus, about 70 miles to the east via I-70. Some respondents to the Miami Valley Freight Workshop indicated local truck-rail intermodal facilities are needed. They indicated that currently access to intermodal facilities is only gained via Cincinnati, Columbus or Chicago.

3.6.4 Water-Truck

Although there are no direct water transportation connections within the MPO Region, water-truck connections are possible approximately 50 miles to the south. The Cincinnati area possesses such connections via the Ohio River.

3.6.5 Pipeline-Air

The only pipeline-air connection currently existing within the three-county study area is a fuel pipeline serving Wright-Patterson Air Force Base. This pipeline serves a fuel storage area.

[*] Miami Valley Freight Movement Study, 1999, MVRPC

3.6.6 Other Intermodal Connections

There are no direct air-rail or pipeline-rail or water-rail intermodal connections in the Miami Valley area.

However, funding is currently being sought to determine the feasibility of establishing rail service from the CSXT mainline to Dayton International Airport as part of a SAFETEA-LU earmark project — Dayton Airport Intermodal Rail Feasibility Study. The Feasibility Study will evaluate alternative routes, design and construction costs necessary to provide rail access from the CSX mainline to assist existing and future tenants of the Dayton International Airport. The Study is important for its potential to add rail freight access to the Dayton International Airport, which will assist the full utilization of the Airport and enhance the economic development competitiveness of the Region. The intermodal connection will also enhance the economic environment of Ohio and the Nation.

CHAPTER 4 — FREIGHT WORKSHOP

4.1 — OVERVIEW

Associated with the Freight Movement Study, MVRPC conducted a freight workshop on November 15, 2005 at the United Way Center in Dayton for representatives of public and private stakeholders involved in the freight and goods movement industry in the Miami Valley Region. The purpose of the freight workshop was to solicit input from these stakeholders on regional freight challenges and opportunities, to begin the process of prioritizing those challenges and opportunities and to identify ways to keep stakeholders informed of the status of major projects in the Region. This information would also be used to identify potential improvements to MVRPC's roadway and freight infrastructure. This chapter summarizes the results of the freight workshop.

4.2 — METHODOLOGY

While organizing the workshop, it was necessary to first identify the types of companies and organizations that should participate, and then the actual companies/organizations to invite. It was determined that the workshop needed representation from the following groups: large trucking companies, parcel services, produce distributors, manufacturing companies, construction companies, cement companies, pipeline companies, state agencies such as the Ohio Department of Transportation and the Ohio Rail Development Commission, CSXT and Norfolk Southern railroads, the Dayton International and Greene County Airports, county economic development directors from each of the MPO counties and economic development representatives from the Chambers of Commerce. To obtain commitment from the key professionals in these organizations, MVRPC staff sent letters of invitation and flyers advertising and promoting the event. Staff followed up on these initial communications with phone calls and e-mails to key individuals. MVRPC staff's industry contacts also facilitated the completion of the effort within a timely framework.

A total of twelve interested freight representatives and six staff members from MVRPC attended the workshop. A list of the workshop participants is presented in Appendix A.

A facilitated group format was established for the workshop, using three separate groups. A member of the MVRPC staff was appointed facilitator to conduct the workshop. The participants were seated at three roundtables in three groups and the group composition was structured to provide a mix of private and public members. Each of the three groups also included one or two staff members from MVRPC to assist with the proceedings and record the discussions at the table.

The workshop began with self introductions and a brief presentation by MVRPC staff on the integration of freight into the transportation planning process at MVRPC. The presentation also described what steps MVRPC had taken to address challenges and recommendations that arose out of the 1999 Freight Study. The facilitator then took over the proceedings and described the purpose of the workshop. The workshop participants would be surveyed regarding their experience in moving freight within the Miami Valley area. The workshop, however, was not

intended to discuss the details of current highway projects or other freight concerns that can not be addressed as part of the transportation planning process, e.g., rising fuel prices.

The facilitator then asked each of the groups to discuss and identify critical challenges that arose while moving freight in the Miami Valley area for each freight mode. The participants were asked to be as specific as possible while describing these challenges. The challenges could be with respect to access issues, network conditions, capacity concerns, local regulation impediments or other transportation infrastructure problems. The facilitator provided them with examples to illustrate the level of specificity while describing transportation infrastructure issues, such as

- Low Clearance Bridge at the intersection of Road A with Road B (Network Conditions)
- Lack of Direct Connection between Town A and Town B (Access / Connectivity)
- Inadequate truck parking capacity at Rest Area A (Facilities)
- Limit Interstate closures during construction to night time hours (Regulatory)

Based on the group's discussions, the group recorder noted the critical challenges on index cards and handed it to the facilitator. The facilitator then posted the index cards for each mode under that mode's column heading on a board. For example, challenges for the trucking industry were placed under the "Critical Challenges for the Trucking Industry" column on the board and so on for the rail, air and pipeline industry. This provided each of the groups an opportunity to view the concerns and issues identified as critical by other groups. Once critical challenges for individual modes were identified, the participants were asked to identify critical challenges with respect to intermodal freight movement in the Miami Valley Region.

Each of the groups was asked to repeat the above exercise to identify freight transport issues that constrain economic development in the Region as well as challenges faced by large businesses (such as construction companies, manufacturing companies, wholesale producers and distributors) in the Region that rely on efficient freight movement for receiving and supplying goods. Public officials, chambers of commerce and private industry members were all asked to discuss and identify critical freight transportation constraints that hinder economic development and business location and operations in the Miami Valley area.

4.3 — IDENTIFICATION OF CRITICAL CHALLENGES

The following seven sections highlight critical issues identified by the participants.

Critical freight challenges for the trucking industry include:

- There is a need to examine the impact of "hours of service" rules on the trucking industry — specifically, with respect to rest areas and parking. Current federal hours-of-service rules are very specific about the number of hours that truck drivers may operate a vehicle before they must rest. Most truck drivers depend on parking facilities, at both commercial truck stops and travel plazas and public rest areas, to obtain needed rest. However, it is not clear that an adequate number of parking spaces exist in the Region or along the high truck volume corridors.
- The freeway management system technology needs to be improved so that it is capable of providing travel time information in real-time.
- Address construction delays and road closures at I-70 between SR 48 and SR 235
- Address delays on I-75 through downtown area during rush hours during both preconstruction and construction.
- Need to improve capacity at I-675 & Indian Ripple Rd. / Dorothy Lane and I-75 & Needmore Road interchanges.
- There is inadequate turning radius on Northwood Boulevard at the intersection with North Dixie Drive.
- There are problems merging on I-75 southbound mainline from SR 4 for trucks due to congestion and the short weaving distance where the inside merge lane quickly becomes an exit-only ramp to Grand Avenue.
- Lack of truck facilities in Montgomery County – rest areas and truck stops
- Address delays and accidents at US 35 at Factory, Orchard and Valley Roads; need to upgrade the at-grade intersections to interchanges.
- Address congestion at the I-75 and State Route 41 interchange in Troy; an additional interchange or a better route to an alternate interchange is needed.
- Make effort to fill the old Emery Hub upon exit of UPS from the facility.
- Improve access from Dayton International Airport to highways.
- Improve vehicle movement through the Findlay Avenue bridge.
- Extend Experiment Farm Rd. to provide better access to the new Honda plant in Miami County.
- Address lack of berms on secondary roads, which cause a rollover safety problem for large trucks. The lack of berms or guardrails present a hazard particularly during inclement weather when trucks could be expected to rollover and/or slide and potentially become involved in accidents.
- Improve Driver Public Education through examples and concepts such as "Share the Road" and "No-Zone" that teach motorists to drive safely along large trucks.
- Ensure law enforcement visibility on roadways, specifically with respect to driving speed and following too closely.

- After the workshop a letter was received, via ODOT, stating a need for improvements and/or additional ramps at the SR 4/SR 444/Valley interchange to improve access to Valley Street.

Critical freight challenges for the air transport industry include:

- Address residential encroachment on airport through easements. Residential areas are encroaching on the Greene County Airport, limiting its ability to expand in the future; additional easements are necessary to protect land surrounding the airport from residential development.
- Greene County Commissioners need to re-instate the Airport Zoning Commission, which is already on the books.
- Help share/mitigate/resolve the cost burden on airports owing to directives requiring compliance with new TSA security requirements.

Critical freight challenges for the rail industry include:

- No local access to rail intermodal facilities in the Region.
- Address lack of railroad branch lines to industrial areas.
- Preserve access to abandoned railroad rights-of-way.
- Undeveloped lands need rail connection – consider providing a rail spur to Dayton International Airport.
- Inadequate rail capacity is limiting movement of freight in the Region.
- Add capacity by completing main line from Toledo; such a project would require public-private partnership.
- Address congestion on CSXT line and lack of access to rail in Miami County.
- There is a lack of funds to increase railroad capacity.
- State not addressing issues of incompatible land uses.
- Address noise complaints due to trains traveling at night (typical time of rail movement).

Critical freight challenges for the pipeline industry include:

- Difficulty in obtaining new right-of-way.
- Maintain pipeline infrastructure for safety purposes.

Critical freight challenges for intermodal operations include:

- Reinvest in bringing railroads back in the Dayton area along with rail yard facilities for intermodal operations.
- Railroads don't make as much money on intermodal service but future growth opportunities are related to intermodal traffic.
- Dayton needs to find a niche industry or product (industry / hauling method / bulk transfer) for an intermodal facility because of the facilities already existing in surrounding communities of Cincinnati, Columbus, Toledo and Indianapolis. This niche may be filled by an "intermodal" type facility, for example, interconnecting air service with passenger rail to surrounding communities.

Critical freight challenges for regional economic development include:

- No large scale industrial sites in State (in excess of 1000 acres).
- Require coordinated effort to fill existing UPS facility at the Dayton International Airport.
- Need to develop transportation infrastructure as a component of support for economic development.
- Need more cooperation and partnering between the government and the private sector.
- Lack of State funding for development.
- Lack of warehousing facility availability in the Dayton area.
- No focus on mega-industrial development (lack of political motivation) in the Region.

Critical freight challenges for regional business / industry include:

- Need suitable high-volume cross-dock capacity in the Region
- Provide capacity / ability to tap into global container / freight network
- Reduce "leakage" of bottom line funds by coordinating locally — connections need to be made with other regional business firms to reduce freight traffic and costs

4.4 — IDENTIFICATION OF OPPORTUNITIES

After identifying critical challenges, the participants were asked to brainstorm on transportation improvements and provide input on opportunities and recommendations for addressing freight challenges in the Region. Participants were also asked for their input on ranking and prioritizing projects. While improvements which could be translated into transportation projects were the intended focus of this exercise, all recommendations were documented. The following list documents the suggested opportunities or recommendations by the participants.

Opportunities for the regional freight movement industry include:

- Integrate regional ITS (intelligent transportation systems) with freight management and movement.
- Invest more in energy infrastructure.
- Utilize information technology (ITS) to keep drivers informed of traffic conditions, including construction delays.
- Globalization – creating freight movement partnerships.
- Government-managed communications infrastructure – need the government to better regulate spatial gaps in wireless communication network.
- Integrating rail freight and passenger movement in future to leverage support, funds and increased capacity.
- Keep ahead of the curve in keeping I-675 traffic flowing smoothly.

Finally, the participants were asked if they would like to receive updates on the Study and what the best method would be to keep them informed and involved in the metropolitan planning process. All the participants preferred to receive e-mails, with links to specific information on MVRPC's web site.

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CHAPTER 5 — FREIGHT MOVEMENT ANALYSIS

5.1 — OVERVIEW

This chapter identifies key freight characteristics and impacts of freight movement in the Miami Valley Region. Review of existing highway data and truck counts was done to examine system-level impediments to the flow of freight. Because railroads, air carriers and pipeline companies are privately owned, less information on their operations is publicly available.

A critical step in evaluating the impact of freight movements on Miami Valley's transportation infrastructure is to develop an understanding of the commodity flow patterns within the Region. A quantitative commodity flow analysis provides the means to better understand freight movements into, out of, within, and through the Region by identifying the volumes and types of commodities moving in the Region, the modes on which those commodities are traveling, and the origins and destinations between which they are transported. A commodity flow analysis was conducted for the Miami Valley area to develop an understanding of what types of goods are moving, how they are moving, where they are moving to and from, and why they are moving the way they are. This chapter also includes results from using MVRPC's truck model to provide additional information and visualization of intra-regional truck flows for the Miami Valley area.

5.2 — TRUCK VOLUME

Truck volume is the number of trucks that are observed at a given location for a given amount of time. Figure 5.1 shows the percentages and volume of annual average daily truck traffic on roadways in the Region based on 1998 to 2002 ODOT classified traffic counts. According to the ODOT counts, the state averages for truck volume on Interstates is 16.6 percent, on US Routes is 10.6 percent and on State Routes is 6 percent.

Truck volumes patterns are heavily affected by local economic activity. They are also heavily influenced by the presence or absence of large through-freight movements. For example, a high percentage of through trucks on a road tends to result in higher weekend truck traffic and higher nighttime truck traffic than would otherwise be expected. Similarly, the lower the volume of through-traffic, the lower the volume of trucks in the evening, and the more heavily oriented truck travel is to weekdays. As expected, I-70 and I-75 carry the maximum truck traffic in the Region. High-volume corridors of major roadways with higher-than-average truck volumes include:

- I-70 through Montgomery County
- I-75 through Miami, Montgomery and Warren County
- I-71 through Greene County
- State Route 4 north of State Route 444
- US 35 east of Xenia and around Xenia

The segment of I-75 between Tipp City and downtown Dayton has a high percentage of truck traffic because it serves as a connection between I-70 and both the Dayton International Airport and the cluster of industrial operations in the northern part of the urbanized area. Other components of the major road network having higher-than-average truck volumes also include segments of the freeway network that are not part of the principal commuting corridors.

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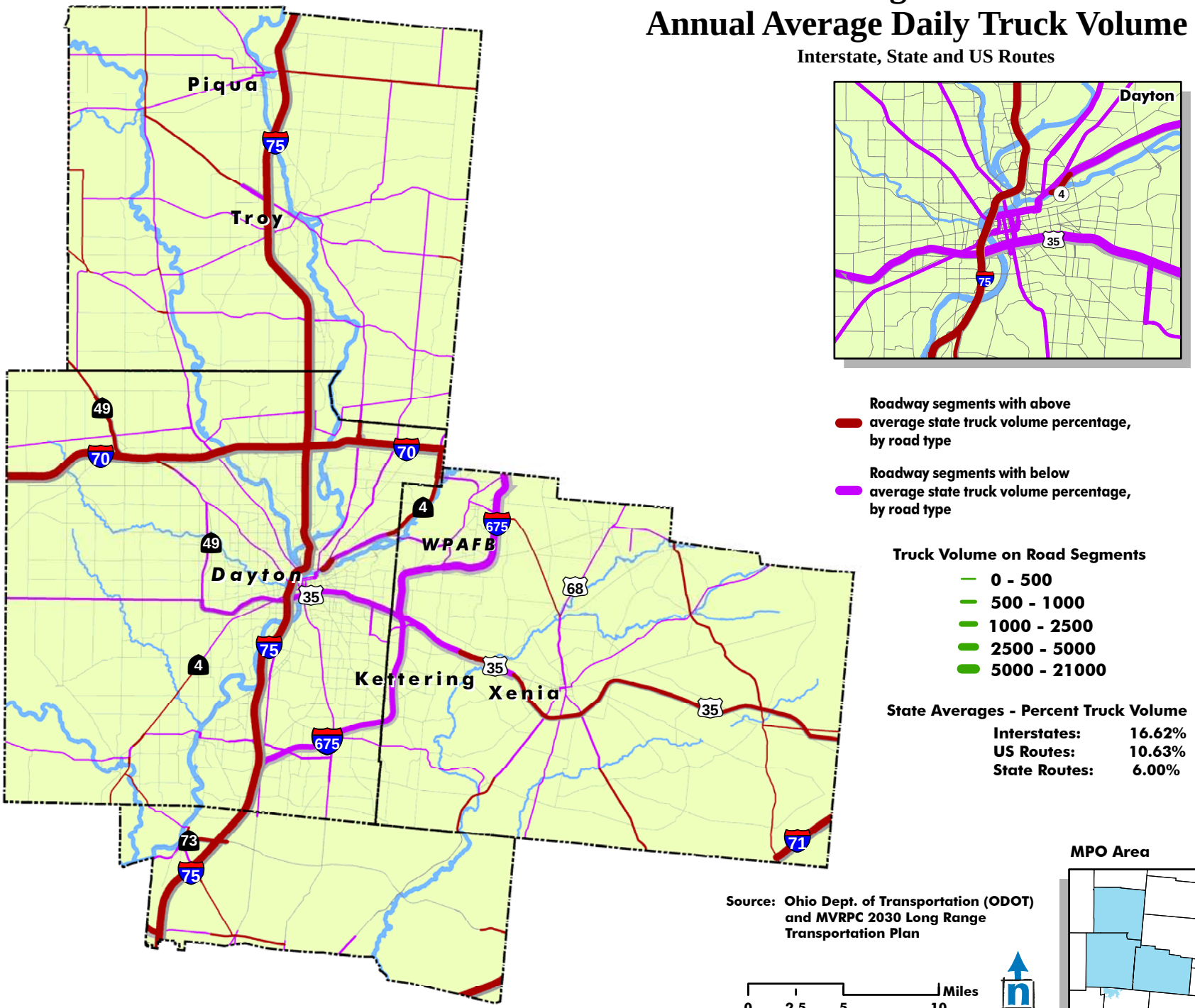
Miami Valley
Freight Movement Study

MAY 2006

Figure 5.1
Annual Average Daily Truck Volume

Interstate, State and US Routes



Roadway segments with above average state truck volume percentage, by road type

Roadway segments with below average state truck volume percentage, by road type

Truck Volume on Road Segments

- 0 - 500
- 500 - 1000
- 1000 - 2500
- 2500 - 5000
- 5000 - 21000

State Averages - Percent Truck Volume

Interstates:	16.62%
US Routes:	10.63%
State Routes:	6.00%

Source: Ohio Dept. of Transportation (ODOT) and MVRPC 2030 Long Range Transportation Plan

0 2.5 5 10 Miles

MPO Area

Miami Valley
Regional Planning Commission
One Dayton Centre
One South Main Street Suite 260
Dayton, OH 45402
Phone - (937) 223 - 6323
Fax - (937) 223-9750
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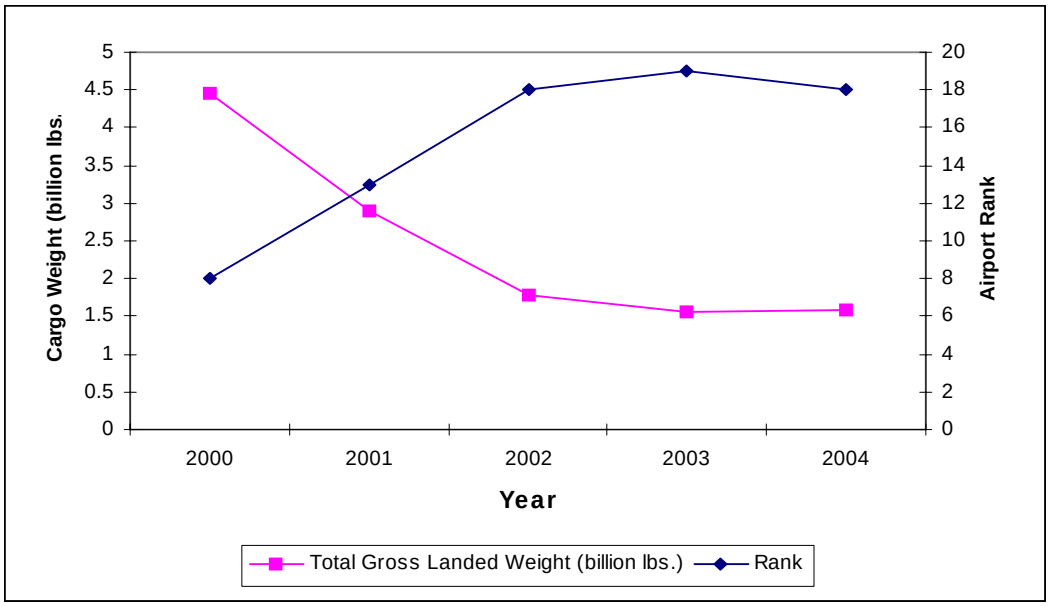
Interstate and other limited-access roadways with less than average truck volume percentages include I-675 and US 35 through downtown Dayton.

Accident statistics obtained from the Ohio Department of Public Safety (ODPS) for years 2002-2004 indicate that approximately 3.3% of the Region's accidents involve straight and tractor trailer trucks.

5.3 — AIR CARGO TRENDS

While most domestic and international air cargo forecasts project increases of 3.5 and 5.9 percent respectively, shipments through the air freight hub continue to be lower than previous years due to changed methods of operations within the company. Cargo operations out of the former Menlo Logistics air freight hub continue at the same rate as 2002-2004 and experience departure delays during peak arrival and departure periods. Figure 5.2 shows the trend in total landed weight of all-cargo operations at the Dayton International Airport from 2000 to 2004. All-cargo operations are operations dedicated to the exclusive transportation of cargo. This does not include aircraft carrying passengers that may also be carrying cargo. Aircraft landed weight is the certified maximum gross landed weight of the aircraft as specified by the aircraft manufacturers. The Federal Aviation Administration (FAA) reports that the Dayton Airport's ranking as an all-cargo airport has continued to slide from 2000 to 2003 as the gross landed weight of cargo handled at the airport has declined over the same period.

FIGURE 5.2 — LANDED WEIGHT OF ALL-CARGO OPERATIONS AT DAYTON AIRPORT: 2000-2004



Note: All-cargo operations are operations dedicated to the exclusive transportation of cargo. This does not include aircraft carrying passengers that may also be carrying cargo. Aircraft landed weight is the certificated maximum gross landed weight of the aircraft as specified by the aircraft manufacturers.

Source: Federal Aviation Administration

5.4 — COMMODITY FLOW ANALYSIS

In the MVRPC Region, as is the case in all other regions of the country, information on freight movements lacks significantly in terms of both availability and quality of data compared with the

information available about personal trips. A critical part of this study of freight transportation in the Miami Valley is an understanding of commodities that move in, out, within and through the Region. A commodity flow analysis helps to evaluate the impacts of freight movements on the Region's infrastructure. For instance, an analysis of commodities' weight is important in developing an understanding of the way in which freight vehicles affect roads and highway infrastructure through pavement consumption and bridge stress.

An understanding of freight movement, whether it travels in- or outbound, internal to the region or through it, is critical when addressing such factors as congestion, capacity, infrastructure, investment, economic development and quality of life. An evaluation of the type and value of freight, in particular in- and outbound freight, leads to a better understanding of the regional economy and an appreciation the role of transportation within it.

The transportation network of the Miami Valley includes major national and state highways, an international airport, major railroad and pipeline service. These networks serve the Region's as well as the State's economy by efficiently moving all manner of freight in, out, through and within the Region. An understanding of which specific commodities travel the Region's transportation network and by what mode is vital to any transportation planning effort. For instance, information regarding commodity types and tonnages helps to identify current and potential maintenance needs of transportation networks. Identifying regional commodity movements highlights the importance transportation networks play in the development of the regional economy, as well as points to the role the Miami Valley MPO area serves in the larger state transportation system. Thus, commodity flow data is required to analyze both economic development and demand related perspectives in the Region.

Economic Development

- Finding area's 'niche' in economic activities
- Truck traffic along major corridors
- Truck traffic at specific intersections and road segments
- Freight terminal location/access (intermodal connectors)

Demand Related Data Needs:

- Commodity flows in/out of MPO area
- Truck flows along major corridors including through trips
- Truck traffic volumes at specific locations

To analyze the Region's commodity flow data, several data sources were examined.

5.4.1 Data Sources

Commodity flow data is available through several different sources in the United States. However, current methods of freight flow estimation have many disadvantages mostly due to lack of data that is appropriate, accessible and reliable. Ideally, one would like to have accurate data on commodity flows by industry sector, mode, origin and destination at a geographic scale sufficiently fine to identify flows on specific routes or at specific locations. Such a comprehensive data source does not exist. Reliance on conventional secondary data sources has its own problems. Metro level analysis requires detailed geography; most existing data is at regional scale or higher. With respect to commodities, there are various classification systems;

units (dollars, tons, ton-miles); varying levels of aggregation; more information on import/export flows, less information on intra-regional shipments, more data on port, air import/export, and less data on truck, rail imports/exports.

There are also problems associated with how to account for: empty trucks; warehouse/secondary processing activities; intermodal exchanges within any region; and data collected at different times and time intervals.

FHWA Freight Analysis Framework (FAF) 2 and BTS Commodity Flow Survey (CFS) 2002

These two free, government published sets of commodity flow data include FHWA's new version of the Freight Analysis Framework — FAF 2 and the Bureau of Transportation Statistics' Commodity Flow Survey Data 2002.

The FAF 2 database is available from FHWA's web site and allows users to summarize inbound, outbound, internal, and through flows of domestic and international commodities on four modes for 50 States, with commodities classified using the Standard Classification of Transported Goods (SCTG) codes.

The CFS 2002 database provides commodities flows on six modes originating in the 50 states and the District of Columbia. Commodities are also identified using the Standard Classification of Transported Goods (SCTG) system.

However, these sets of data were not used for Miami Valley's commodity flow analysis because the data is reported by the Combined Statistical Area (CSA) of Dayton-Springfield-Greenville, which is much larger than the MPO Region.

Reebie TRANSEARCH Database

To provide Metropolitan Planning Organizations (MPO's) with much-needed detailed commodity flow information, the Ohio Department of Transportation (ODOT) purchased the commercial 2003 TRANSEARCH database developed and maintained by Reebie Associates. This purchase enables all the MPO's in Ohio to utilize the database for their freight planning programs. It provides data on the volume of freight moving between U.S. origins and destinations at the county level, by commodity type, and by mode. It is based on a combination of public data, proprietary data, and modeled traffic assignments. The goods are defined by commodity, with volumes in terms of loads and tonnage.

Because the TRANSEARCH database is at the county level, disaggregation of the data is not necessary. The 2003 TRANSEARCH database contains: freight movements by water, air, and truck from manufacturing plants; truck movements of coal; and inland truck movements of imports. The data includes freight tonnage and loads (number of modal units, e.g., trucks) for each mode by origin and destination and for each commodity by 4-digit level STCC (Standard Transportation Commodity Classification) code. The data also includes highway routes, broken down by segments to spatially locate and present truck freight flows and number of trucks on the Region's highway network map. The data does not include shipments by pipeline, mail or small package shipments, and secondary truck shipments involving warehouses.

Due to heightened security, since 2003, the rail freight portion of the TRANSERCH database is not directly provided to the MPO's in the State. This is primarily because of the confidential

nature of the rail waybill data that is the source of the rail flows in the TRANSEARCH database. MVRPC obtained the rail database by making a special request for the data from ODOT.

The rail waybill data is collected by the Association of American Railroads (AAR), which provides information on rail traffic, commodity, revenue, and routing characteristics for railroads that carry at least 4,500 carloads per year over the past 3 years or carry at least 5 % of an individual state's rail traffic. The annual Rail Waybill sample contains shipment data from a stratified sample of Rail Waybills submitted by freight railroads to the Surface Transportation Board (STB). The data is based on the Carload Waybill Sample, which is proprietary. All Waybills are submitted by Class I Railroads to the Surface Transportation Board.

This data is obtained and masked by Reebie so that the final rail flows in the TRANSEARCH database contain public-use, non-confidential information. The data contains origins and destinations, type of commodity, number of carloads (or the number of cars) and intermodal units (i.e., number of trailers and containers), carload tons and intermodal tons, and railroad routes to spatially locate rail freight flows on the Region's railroad map.

Although TRANSEARCH database has the advantage of having the county level data (making development of disaggregation methodology un necessary), the database still has several limitations.

- Since the database is built from many different databases, different classifications on commodities may cause problems. (The conversion from one classification to another may lead to some data being put in a wrong category or left unreported).
- The levels of reporting accuracy among different companies may affect the accuracy of the database.
- Models based on the TRANSEARCH database will require regular purchases of data to update the model.

Despite these limitations, it is assumed to be the best commodity flow database currently available at a detailed geographic level.

5.4.2 TRANSEARCH Database Application

The 2003 TRANSEARCH database offers good opportunities to determine the following:

- The origin and destination of commodities within the Region by mode.
- The destination (Counties/States) of commodities produced by the Region by mode.
- The origin (Counties/States) of commodities consumed by the Region by mode.
- Commodities that do not have an origin or destination in the Region (through traffic) by mode

The origin, destination, and distribution of different commodities for the MVRPC Region (at the three county level) were determined from the database. The following four flow components were studied:

- "Internal": Flows originate and terminate in the Region;
- "Inbound": Flows originate in other states or regions and terminate in the Region;
- "Outbound": Flows originate in the Region and terminate in other states or regions;

- "Through": Flows originate and terminate in other states or regions that pass through the Region.

This section presents analysis of the 2003 Ohio Transearch Database by mode, by commodity type, and by movement (through, inbound, outbound, and internal). Commodity flows are measured by tonnage and value. Tonnage is a proxy for physical volume, which provides a sense of the demands on and needs of existing transportation networks. Commodity value, on the other hand, describes how commodities fit into the trade balance of the Region. For instance, the Miami Valley MPO area is a net exporter both by weight and by value of commodities. Otherwise stated, the Region as a whole trades relatively highly-processed, higher-value goods for resource-rich, primary goods.

Commodity Groups

The TRANSEARCH commodity database includes 39 separate classifications of commodities by STCC codes at the two-digit level and 516 separate classifications at the four-digit level. While this level of detail is useful in being able to identify specific commodity movements, this number of commodity classifications is in excess of the number of commodity groupings that can be analyzed and reported conveniently. In order to reduce the commodity groups to a more manageable level, the methodology for identifying commodity groups in the 2002 report on the *Freight Impacts on Ohio's Roadway System* was followed. Fourteen commodities at the two-digit level STCC codes were assigned a single commodity group for analysis. The remaining commodities were assigned to groups in the following categories — agricultural products, other non-durable manufactured products, other durable manufactured products, minerals and miscellaneous freight. Two four-digit STCC commodities — air freight drayage and rail intermodal drayage were also assigned a single commodity group to analyze movement of intermodal freight traffic through the Region.

The commodity groupings are shown in Table 5.1. These commodity Ggroups, organized in numeric STCC code order, serve as the basis for reporting in the accompanying tables.

TABLE 5.1 — STCC COMMODITY GROUPINGS

Commodity Group Code	Commodity Group Name	STCC Codes in Commodity Group
1	Agriculture	1, 7, 8, 9
2	Metallic Ores	10
3	Coal	11
4	Other Minerals	13, 14, 19
5	Food	20
6	Non-durable Manufacturing	21, 22, 23, 25, 27
7	Lumber	24
8	Paper	26
9	Chemicals	28
10	Petroleum	29
11	Rubber / Plastics	30
12	Durable Manufacturing	31, 36, 38, 39
13	Clay, Concrete, Glass	32
14	Primary Metals	33
15	Fabricated Metal Products	34
16	Transportation Equipment	37

Commodity Group Code	Commodity Group Name	STCC Codes in Commodity Group
17	Miscellaneous Freight	40-48
18	Warehousing	5010
19	Hazardous Materials	49
20	Machinery	35
22	Rail Intermodal Drayage	5020
23	Air Freight Drayage	5030

Source: Freight Impacts on Ohio's Roadway System, 2002, ODOT

Conversion of Tonnage Into Value

Factors to convert annual tonnage into annual value were developed from the Commodity Flow Survey (CFS) conducted by the U.S. Bureau of the Census and the U.S. Department of Transportation. The 1993 CFS, which reports commodities by STCC mode, was chosen in order to be consistent with TRANSEARCH. The 1997 and 2002 CFS reported commodities by the newer Standard Classification of Transported Goods (SCTG) codes, which are not directly transferable to STCC at a two digit level. The values per ton were converted to 2003 dollars using the Consumer Price Index. The values per ton are reported in Table 5.2.

TABLE 5.2 — VALUE PER TON FOR STCC COMMODITIES

STCC Code	Description	Value Per Ton (2003 Dollars)
01	Farm Products	$1,296
08	Forest Products	$45
09	Fresh Fish or Marine Products	$45
10	Metallic Ores	$57
11	Coal	$27
13	Crude Petroleum or Natural Gas	$35
14	Nonmetallic Minerals	$21
19	Ordnance or Accessories	$13,097
20	Food or Kindred Products	$1,591
21	Tobacco Products	$36,849
22	Textile Mill Products	$7,611
23	Apparel or Related Products	$29,077
24	Lumber or Wood Products	$2,670
25	Furniture or Fixtures	$6,175
26	Pulp, Paper or Allied Products	$1,506
27	Printed Matter	$3,451
28	Chemicals or Allied Products	$2,332
29	Petroleum or Coal Products	$270
30	Rubber or Miscellaneous Plastics	$8,238
31	Leather or Leather Products	$33,073
32	Clay, Concrete, Glass or Stone Products	$232
33	Primary Metal Products	$1,438
34	Fabricated Metal Products	$4,005
35	Machinery	$24,837
36	Electrical Equipment	$32,458
37	Transportation Equipment	$15,712

STCC Code	Description	Value Per Ton (2003 Dollars)
38	Instruments, Photo Equipment, Optical Equipment	$44,458
39	Miscellaneous Manufacturing Products	$12,735
40	Waste or Scrap Materials	$29
41	Miscellaneous Freight Shipments	$5,382
42	Shipping Containers	$1,266
43	Mail or Contract Traffic	$1,506
44	Freight Traffic	$1,815
45	Shipper Association Traffic	$1,815
46	Miscellaneous Mixed Shipments	$1,815
47	Small Packaged Freight Shipments	$1,815
49	Hazardous Materials	$2,332
50	Secondary Traffic	$1,815
60	Unclassified	$10,076

Source: Freight Impacts on Ohio's Roadway System, 2002, ODOT, Consumer Price Index (Inflation calculator) and MVRPC

5.4.3 Commodity Flow Analysis Results

The Region's commodity flow data was examined for three counties, Greene, Miami, and Montgomery, using data from the TRANSEARCH database. The cities of Franklin, Carlisle, and Springoro in Warren County were excluded from this analysis due to the fact that detailed "place level" data is currently unavailable in the TRANSEARCH database.

Also excluded from the analysis was the through tonnage and truck load data of the TRANSEARCH database for the Miami Valley Region. Preliminary calculations of daily trucks for the four movements — internal, inbound, outbound and through — from the TRANSEARCH database were compared with daily trucks from MVRPC's truck model and were found to be significantly different in some cases, especially the number of through and internal trucks (Table 5.3). A short description of the MVRPC truck model component of the Regional Travel Demand Model is provided in Appendix B. Based on a comparison of TRANSEARCH daily trucks to MVRPC truck model multi-unit trucks, it was determined that the TRANSEARCH database severely underreports on intra-region truck units and overreports on through truck units. Since the validity of the through movement data from the TRANSEARCH database became questionable, it was decided to completely exclude it from the commodity flow analysis.

TABLE 5.3 — TRUCK LOAD COMPARISON: TRANSEARCH VS. MVRPC TRUCK MODEL

Transearch Database				MVRPC Truck Model Data (Daily Trucks)			
Movements	Annual Trucks	Daily Trucks	% Share	Single Unit Trucks	Multiple Unit Trucks	Total	% Share
Outbound	1,336,004	4,453	8%	5,745	11,924	17,669	17%
Inbound	798,574	2,662	4%	5,571	11,452	17,023	16%
Internal	74,388	248	0%	37,096	18,510	55,606	52%
Through	15,580,395	51,935	88%	3,471*	12,333*	15,804*	15%
Total	17,789,361	59,298	100%	51,883	54,219	106,102	100%

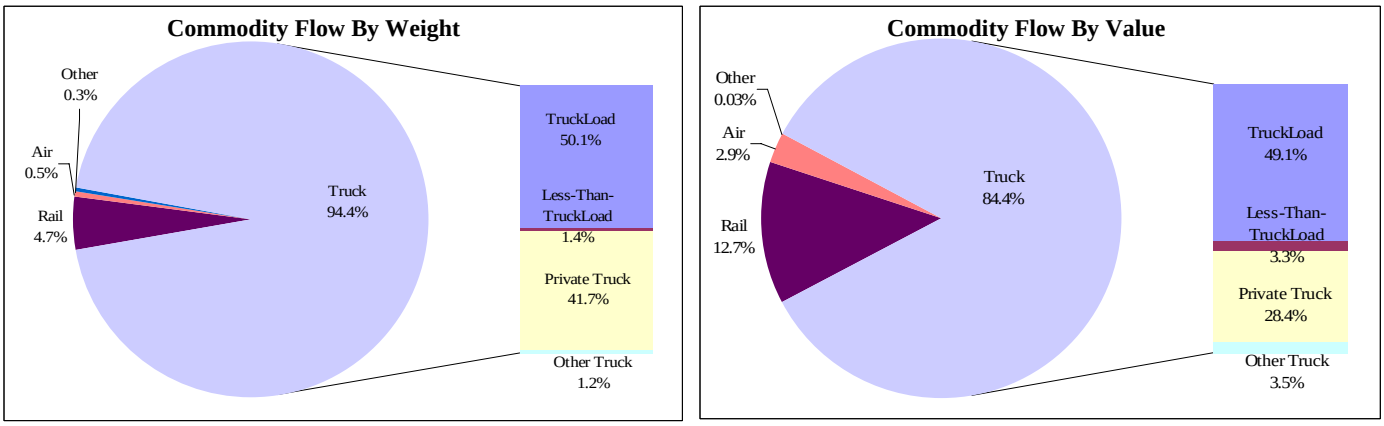
Note: * The MVRPC truck model does not include the I-71 corridor in Greene County. According to 2000 ODOT counts, truck volume on I-71 is 12,650 trucks - all deemed through flows.

Source: MVRPC

Overall Totals

In 2003, over 48 million tons of freight, worth over $136 billion, was moved in, out, and within the Miami Valley Region. In terms of both tonnage and value, most freight was moved by trucks, 94% and 84%, respectively. Figure 5.3 shows the breakdown of these flows by mode.

FIGURE 5.3 — MIAMI VALLEY COMMODITY FLOWS BY WEIGHT AND VALUE

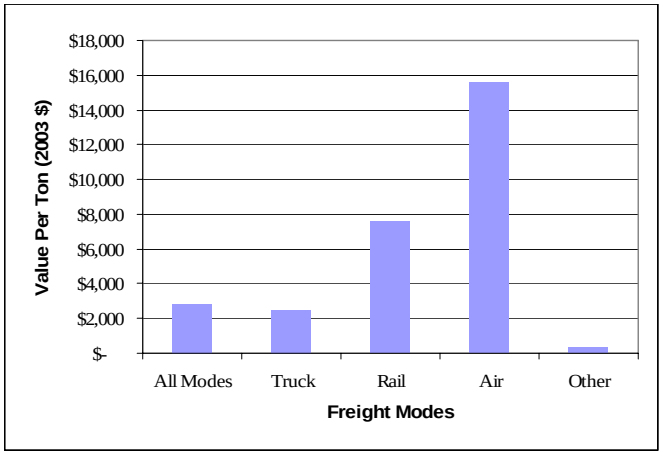


Source: TRANSEARCH Database for Ohio, 2003

For domestic flows (within the United States), truck volumes are distinguished at truckload, less-than-truckload (LTL), and private trucking. The total truck tonnage equals the tonnage carried by truckload carriers, LTL carriers and private trucking fleets for domestic flows. As shown in Figure 5.3, truckload carriers and private trucking carried the maximum truck tonnage both by weight and by value. Other truck volume refers to international flows to and from Canada and Mexico. International truck shipments accounted for a little over 1% of the total freight tonnage in the Region by weight and 3.5% by value.

Overall, the value of transported freight in the Region in 2003 dollars was $2,834 per ton, but value-by-ton rates varied considerably by mode (see Figure 5.4).

FIGURE 5.4 — TOTAL COMMODITY VALUE PER TON: COMPARISON OF MODES (2003)



Source: MVRPC

Air freight was characterized by high-value, low-weight commodities whose value per ton was five times the overall rate. Rail freight also had a high value per ton, primarily due to transporting

a significant volume of transportation equipment from and to the Region. Volumes to and from Canada and Mexico where the mode could not be identified are shown as other tonnage.

For the purpose of commodity flow analysis, the three-county study area is treated as a single origin/destination trade unit. Typically, the rest of Ohio accounts for most of the total tonnage, both in aggregate and truck mode. The Rockies, New England, and Mid-Central Regions have the weakest trade links within the Region, both inbound and outbound.

Inbound and Outbound Freight Movement

Figures 5.5 and 5.6 capture the movement of freight into and out of the Miami Valley Region, respectively. Looking at the regional "trade balance" of only in- and out-bound freight, over 61% of freight tonnage was shipped out of the Region, accounting for 58% of freight value. Dominant commodities by weight were minerals, warehousing and food products, and by value were transportation equipment, warehousing and durable manufacturing goods.

Inbound freight transportss commodities to the local area for final uses to households or as intermediate inputs to industrial production that is either consumed in or exported from the Region. Key inbound commodities by tonnage included warehousing products, agricultural goods, clay, concrete and glass, and food. Transportation equipment, durable manufacturing and warehousing commodities accounted for 50% of the inbound tonnage value. In terms of both weight and value, the majority of the commodities were shipped to the Region from within Ohio.

Conversely, the majority of tonnage shipped out of the Region was also destined to the other counties in Ohio. In terms of a regional trade balance, the Miami Valley area was a net exporter by both weight (12.2 million tons) and value ($24.2 billion). Otherwise stated, the Region exported relatively higher-weight, higher-value goods than it imported. Non-metallic minerals comprised nearly 30% of outbound tonnage, while transportation equipment constituted 33% of outbound tonnage value.

Trucks

In the Miami Valley Region, trucks are the predominant freight mode and moved the maximum amount of freight in terms of both tonnage and value. The weight and value shares of truck freight by movement direction, top commodities and major trade regions is presented in Table 5.4. Trucks transported virtually all commodities by all measures of movement.

About two-thirds of truck freight tonnage was shipped out of the Region while a third was shipped in. However, in terms of value, the gap narrowed down indicating that the Region was importing relatively high-value goods.

For both inbound and outbound truck freight, the major place of origin and destination, of commodities by both weight and value was other counties in Ohio. Thus, the Miami Valley Region has very strong trade links with the rest of Ohio in terms of freight movement.

Internal freight truck traffic is strongly dominated by three categories — clay-concrete-glass, warehousing, and "other minerals" i.e., rock, aggregate, gravel etc. As mentioned in Chapter 2, most of the mining sector establishments within the Miami Valley Region are related to sand, gravel, and limestone extraction. Significant internal truck movement is generated because of transporting these materials from the mining areas to the construction areas in the Region. Internal freight movement thus is characterized by the trucking of heavy materials, which puts

heavy wear on local road surfaces, and points to the importance of planning for efficient, low-impact truck routes.

Due to the Miami Valley's juxtaposition at the crossroads of two major Interstate freeways (I-70 and I-75) and the location of the UPS facility at the Dayton International Airport, significant truck freight traffic is carried through the Region on both interstates.

TABLE 5.4 — TRUCK COMMODITY TONNAGE AND VALUE

Freight Flow Direction	Weight	% Share	Value	% Share
Inbound	16,037,232	35.3%	$47,580,438,175	41.3%
Outbound	27,988,598	61.6%	$65,762,788,058	57.1%
Internal	1,445,457	3.2%	$1,793,440,374	1.6%
Top Commodities By Weight		**Top Commodities By Value**		
Warehousing	22.3%	Transportation Equipment		19.1%
Other Minerals	21.0%	Warehousing		16.0%
Food	8.6%	Durable Manufacturing		16.0%
Clay, Concrete, Glass	8.5%	Machinery		11.8%
Chemicals	6.8%	Chemicals		6.3%
Agriculture	6.1%	Non-durable Manufacturing		5.8%
Top Outbound Trade Regions By Weight		**Top Outbound Trade Regions By Value**		
Ohio - Rest of State	52.0%	Ohio - Rest of State		35.2%
South Atlantic Region	8.0%	South Atlantic Region		11.8%
Indiana	5.5%	West South Central Region		7.9%
Top Inbound Trade Regions By Weight		**Top Inbound Trade Regions By Value**		
Ohio - Rest of State	51.2%	Ohio - Rest of State		30.1%
South Atlantic Region	6.3%	South Atlantic Region		12.7%
Pennsylvania	6.3%	West Pacific Region		10.5%

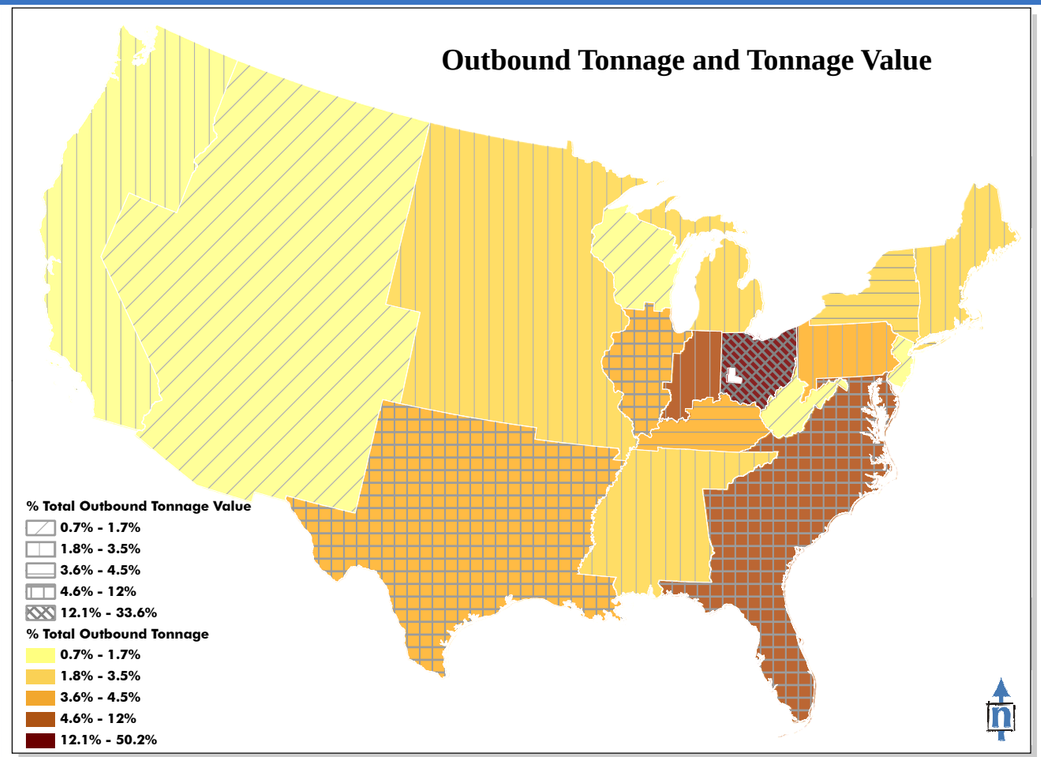
Source: TRANSEARCH Database for Ohio, 2003

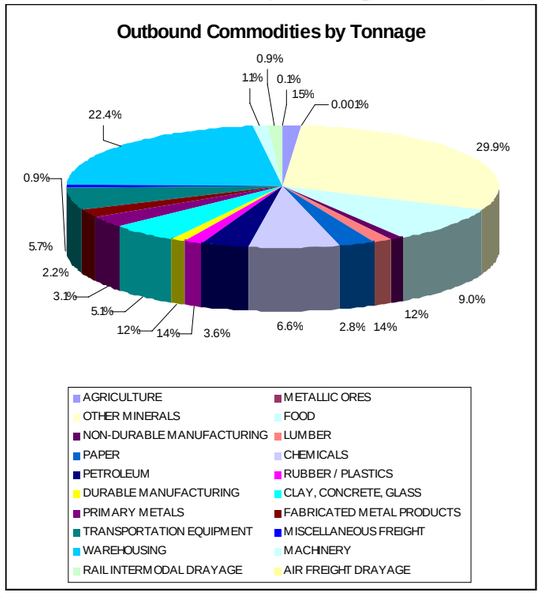
Rail

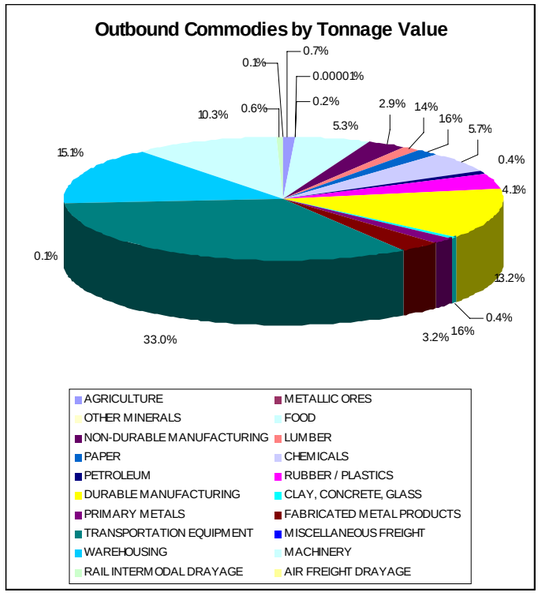
In the Miami Valley MPO area, rail carloads moved 2.2 million tons, valued at $17 billion in, out and within the Region (Table 5.5). Since the Miami Valley Region does not have a rail intermodal facility, there was no rail intermodal volume carried in, out or within the Region. Transportation equipment was the key commodity carried by rail in the Miami Valley area. It constituted 44% of the tonnage and a decisive 91% of the rail freight value. Because of the high value per ton for transportation equipment, the overall share of rail freight tonnage value increased to nearly 13%, even though rail freight comprised only 7% of the overall freight tonnage.

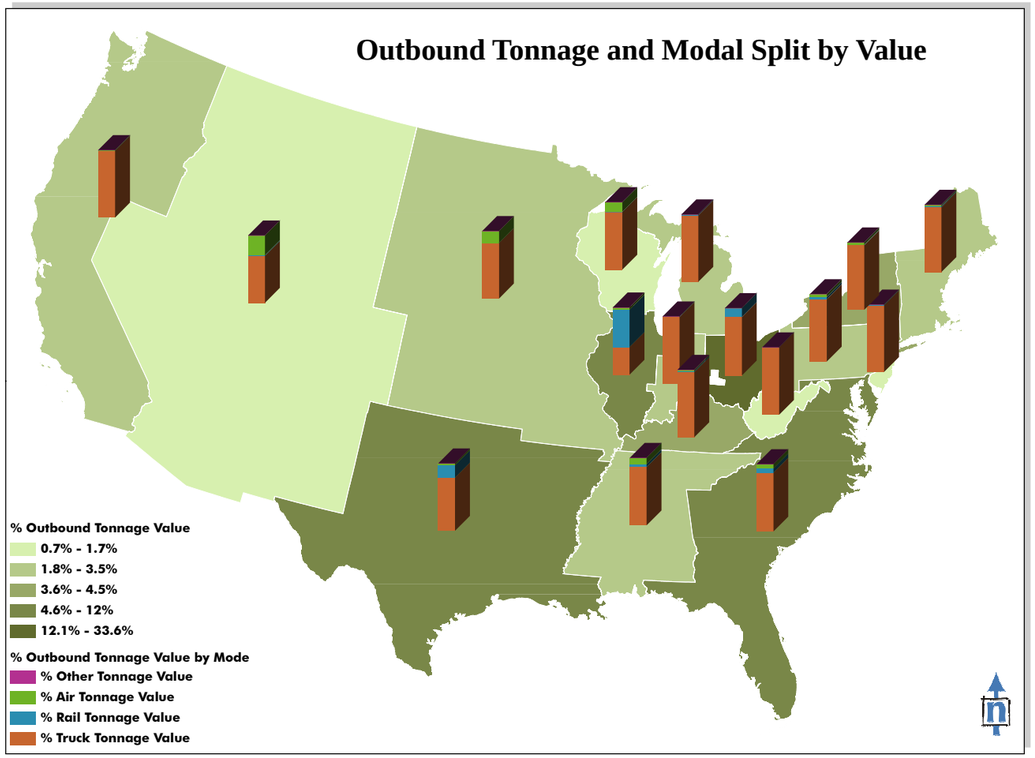
Rail freight commodities such as clay-concrete-glass, petroleum, coal, paper products, lumber and other minerals are all shipped into the Region. Agriculture commodities constitute an example of a commodity shipped out of the Region by rail. The major destinations for outbound freight tonnage are Illinois and other counties within Ohio, excluding the Region.

Figure 5.6
Outbound Freight Movement In The Miami Valley Region by Place of Destination









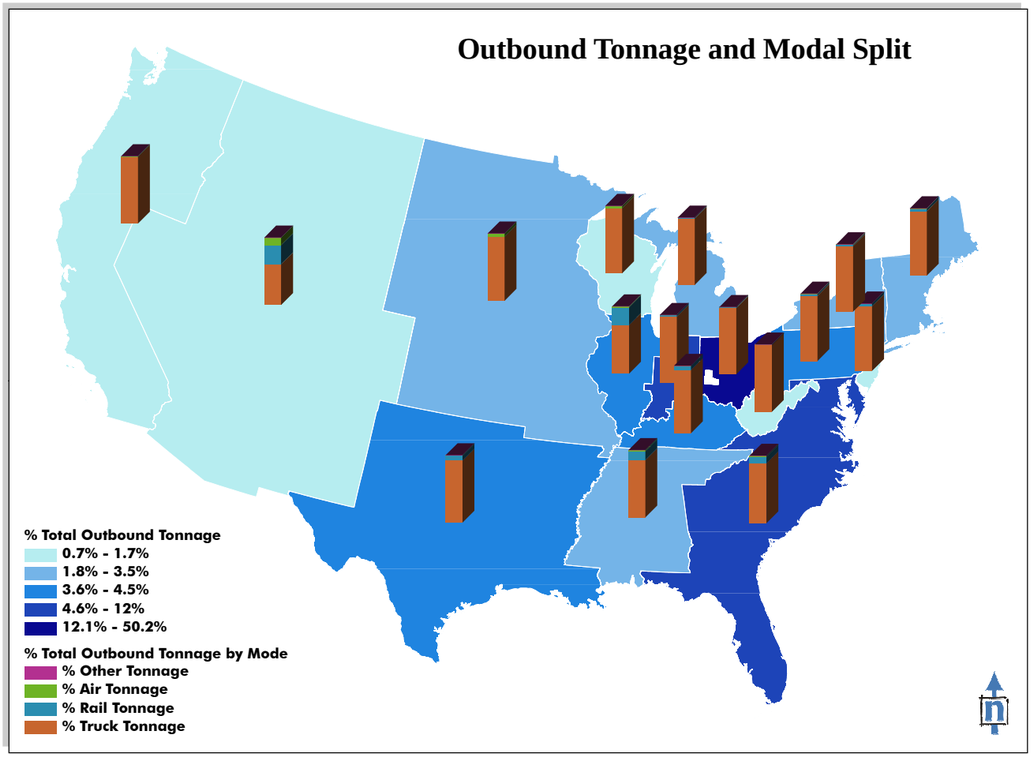


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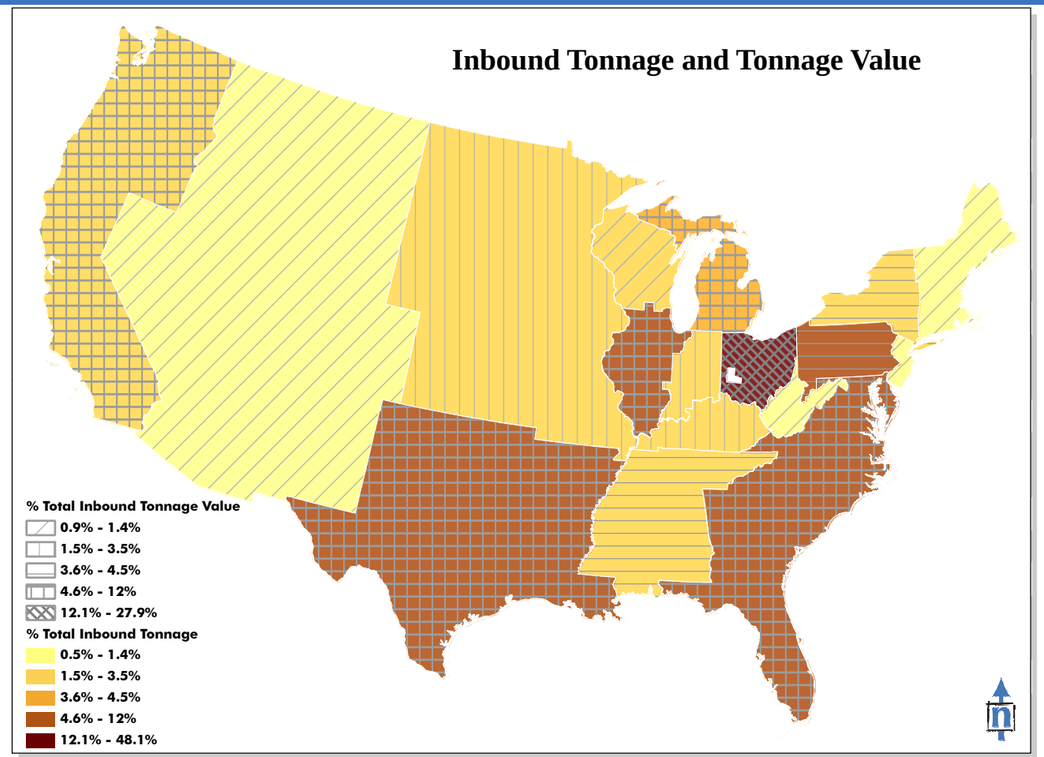
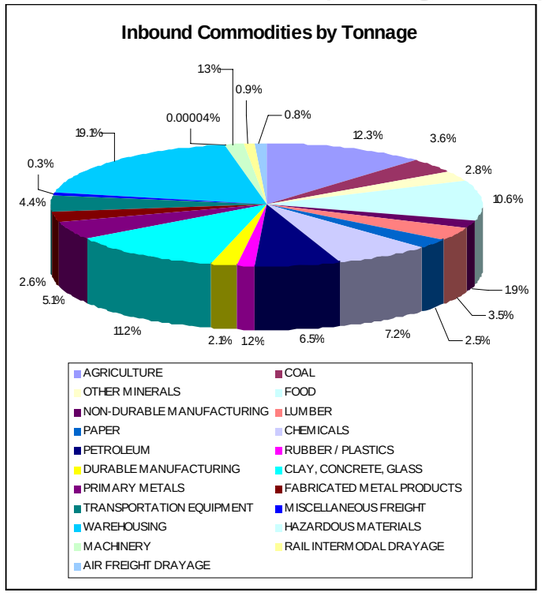
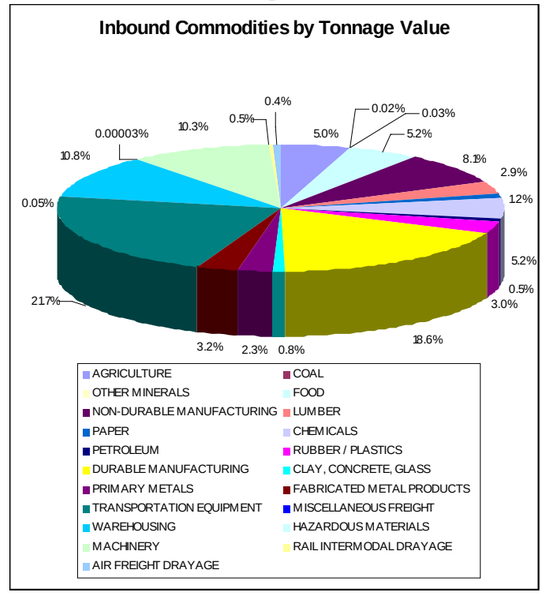
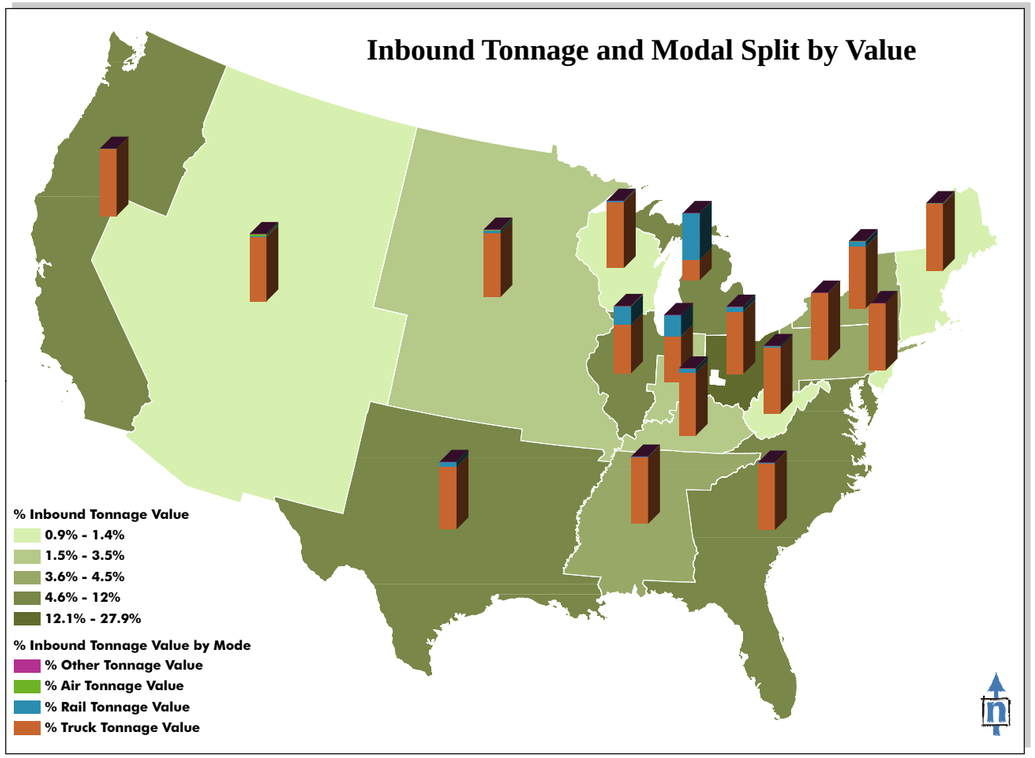
Figure 5.5
Inbound Freight Movement In The Miami Valley Region by Place of Origin









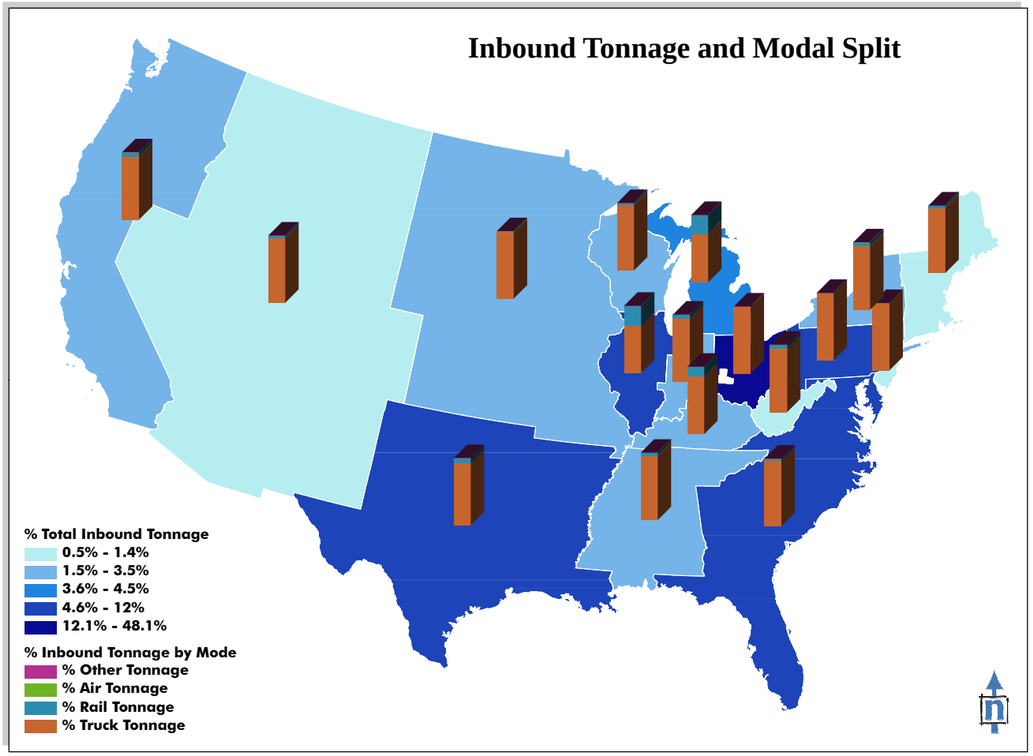


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TABLE 5.5 — RAIL COMMODITY TONNAGE AND VALUE

Freight Flow Direction	Weight	% Share	Value	% Share
Inbound	1,029,386	45.0%	$7,440,301,641	42.9%
Outbound	1,251,167	54.7%	$9,895,952,850	57.1%
Internal	5,202	0.2%	$7,922,674	0.05%
Top Commodities By Weight		**Top Commodities By Value**		
Transportation Equipment	44.0%	Transportation Equipment		91.1%
Food	26.2%	Food		5.5%
Miscellaneous Freight	12.4%	Chemicals		1.2%
Top Outbound Trade Regions By Weight		**Top Outbound Trade Regions By Value**		
Illinois	27.1%	Illinois		42.7%
Ohio - Rest of State	20.5%	Ohio - Rest of State		35.5%
South Atlantic Region	18.4%	West South Central Region		12.1%
Top Inbound Trade Regions By Weight		**Top Inbound Trade Regions By Value**		
Illinois	29.9%	Michigan		32.6%
Michigan	19.9%	Ontario , Canada		18.4%
Ontario, Canada	10.2%	Illinois		16.0%

Source: TRANSEARCH Database for Ohio, 2003

Air

Shipping freight by air is generally reserved for relatively high-value, low-weight products, often destined to national or international locations. In 2003, 263,163 tons of cargo, valued at $3.9 billion, virtually all (over 90%) of which was transported out of the area to the South Atlantic Region, the Quebec Province of Canada and the Midwest Region, was transported through the Dayton International Airport (Table 5.6). Durable manufacturing products was the leading commodity group transported by air, comprising 27% of air freight tonnage and 60% of its value.

TABLE 5.6 — AIR COMMODITY TONNAGE AND VALUE

Freight Flow Direction	Weight	% Share	Value	% Share
Inbound	15,763	6.2%	$172,163,239	4.4%
Outbound	237,400	93.8%	$3,773,103,764	95.6%
Internal	7	0.003%	$25,607	0.001%
Top Commodities By Weight		**Top Commodities By Value**		
Durable Manufacturing	27.1%	Durable Manufacturing		59.6%
Non-Durable Manufacturing	15.2%	Machinery		15.6%
Transportation Equipment	14.0%	Transportation Equipment		14.2%
Top Outbound Trade Regions By Weight		**Top Outbound Trade Regions By Value**		
South Atlantic Region	19.8%	Quebec, Canada		32.1%
Quebec, Canada	17.8%	South Atlantic Region		15.1%
Midwest Region	13.5%	Midwest Region		12.4%
Top Inbound Trade Regions By Weight		**Top Inbound Trade Regions By Value**		
South Atlantic Region	19.4%	Illinois		21.1%
Midwest Region	18.4%	South Atlantic Region		17.7%
West South Central Region	11.3%	Midwest Region		12.9%

Source: TRANSEARCH Database for Ohio, 2003

5.5 — INTRA-REGIONAL TRUCK FLOWS

MVRPC truck model forecasts for Year 2000 and 2030 runs are used to depict intra-regional truck movements — truck flows with an origin and destination in Greene, Miami, and Montgomery Counties. As discussed in Section 5.4.3, these forecasts were made after it was determined that the TRANSEARCH database underestimates intra- county truck flows.

An overview of the MVRPC truck model is provided in Appendix B. Internal (intra-regional) truck flows are estimated following the methods and procedures described in the 1996 Quick Response Freight Manual (QRFM) prepared by US DOT. The basic premise of the QRFM methodology is that truck trip generation and distribution are proportional to the amount of commercial activity generated by households and businesses. One advantage of the QRFM method over the TRANSEARCH database is that QRFM estimates commercial vehicle traffic, such as delivery of household goods and local service trucks, that is not included in the TRANSEARCH database. One obvious disadvantage is that information about transported commodities is not available when using QRFM since the methodology estimates trucks directly.

The MVRPC truck model estimates commercial vehicles as single and multi-unit trucks. Single unit trucks are defined as 6 or more tire trucks typically used in the delivery of goods and provision of services over short distances. Multi-unit trucks are defined as 3 or more axle trucks and tractor trailer combinations that typically travel longer distances.

Figures 5.7 and 5.8 show total trucks (single and multi-unit trucks) for Base Year 2000 and Future Year 2030 model runs aggregated to the district level for Greene, Miami and Montgomery counties. For the purpose of this analysis, Carlisle, Franklin and Springboro in Warren County were considered as a single district. Both figures show that truck origins and destinations are concentrated along the I-75 corridor as well as the urbanized areas of the Region. Most districts are evenly balanced, producing and attracting a similar amount of commercial vehicle activity. When comparing commercial vehicle activity in 2030 to the 2000 base, several districts along the outlying areas of Montgomery County, as well as Greene and Miami Counties, show an increase in total trucks. This increase is consistent with the regional population and employment forecasts and on-going migration of residential and commercial activity away from the Region's central core.

Figure 5.9 illustrates the origins and destination of trucks for a few selected districts with high concentrations of commercial vehicle activity. The same information is available from MVRPC for all districts in the Region.

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Miami Valley Freight Movement Study

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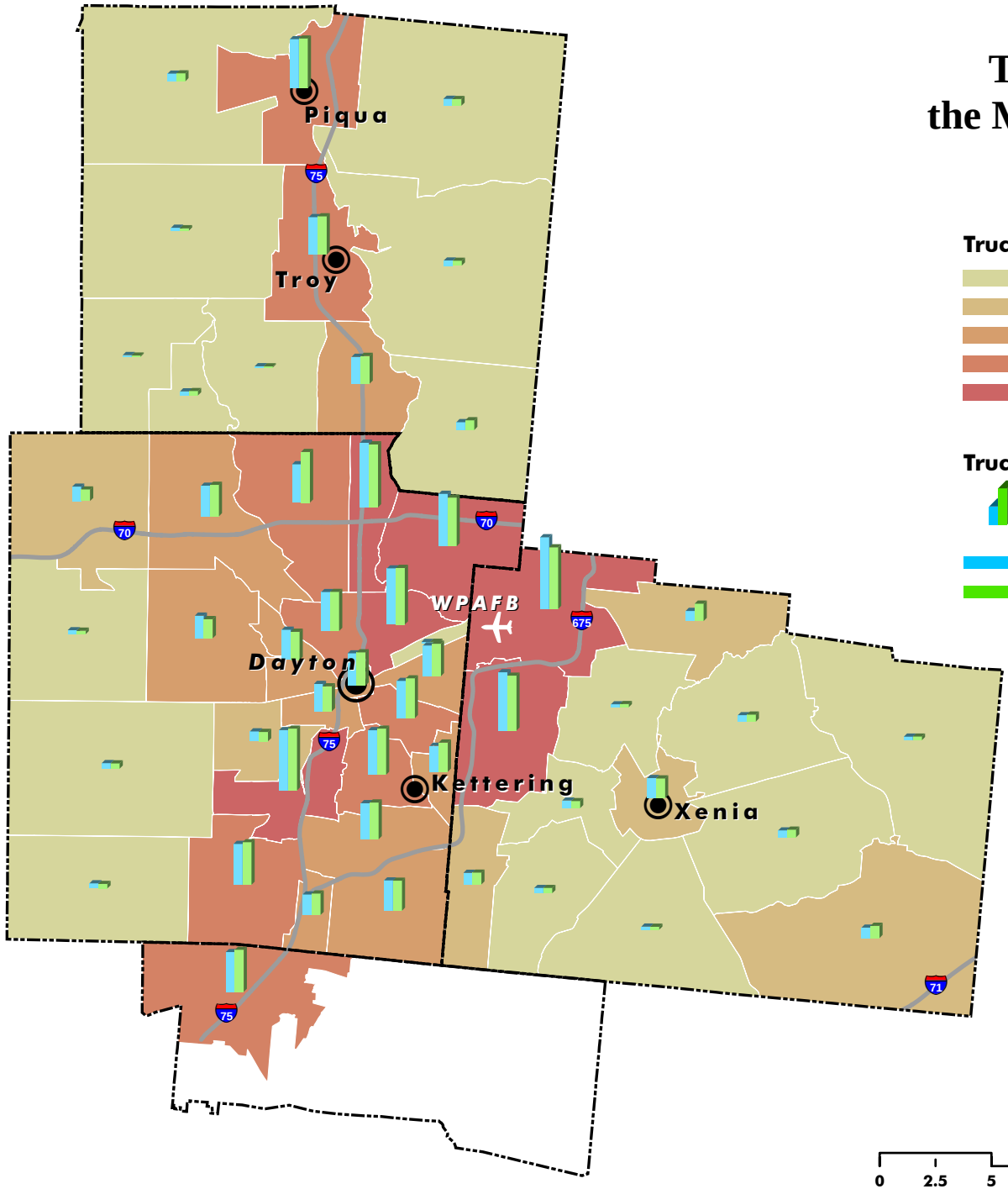

Figure 5.8
Truck Activity in the Miami Valley Region in Year 2030

Truck Trips in 2030

- 161 - 1,181
- 1,182 - 2,613
- 2,614 - 4,827
- 4,828 - 6,429
- 6,430 - 8,691

Truck Trips By Origin and Destination

2,200

- Origin Trips
- Destination Trips

Source: MVRPC

0 2.5 5 10 Miles

MPO Area

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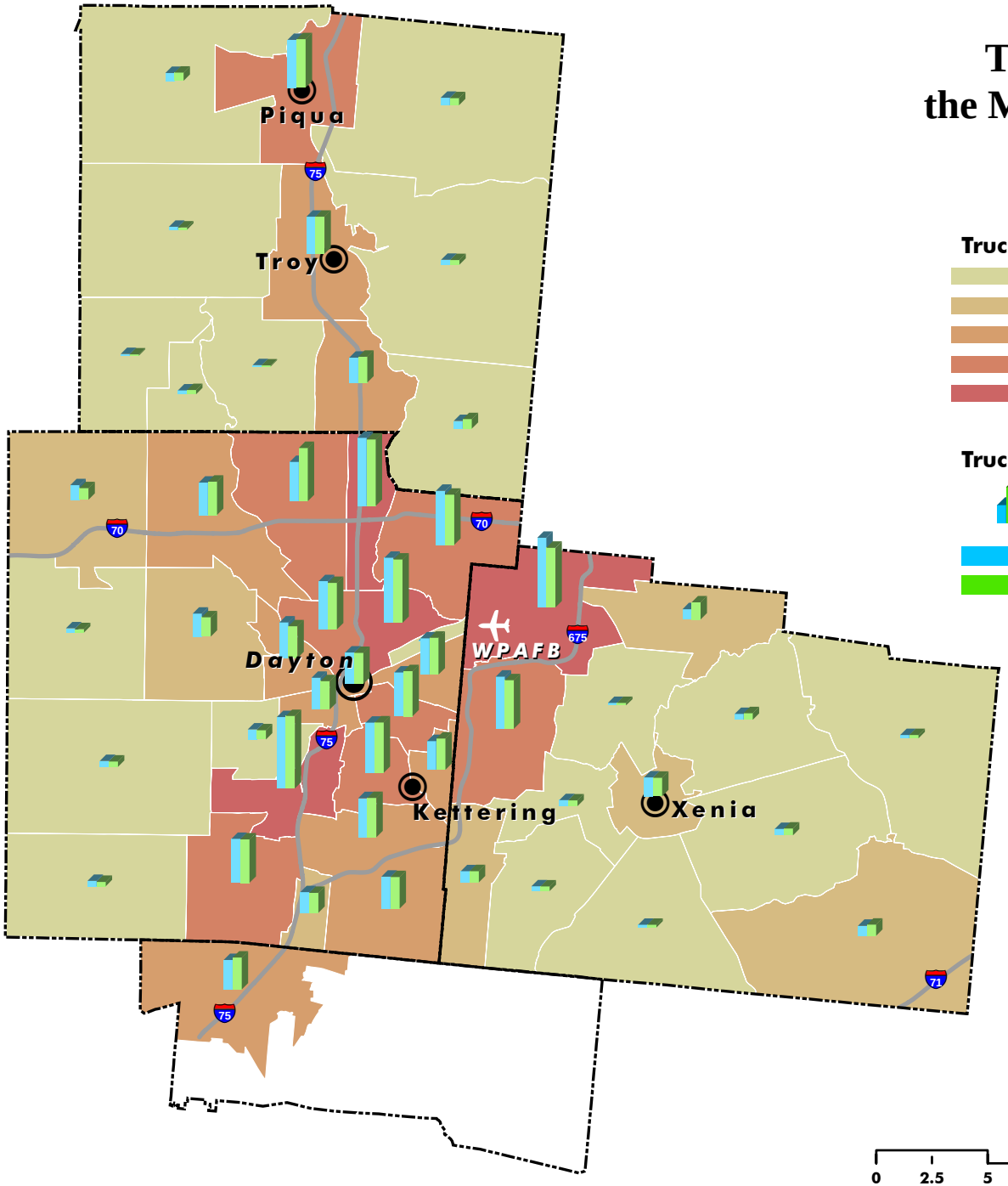

Figure 5.7
Truck Activity in the Miami Valley Region in Year 2000

Truck Trips in 2000

- 148 - 1,181
- 1,182 - 2,613
- 2,614 - 4,827
- 4,828 - 6,429
- 6,430 - 8,875

Truck Trips By Origin and Destination

2,200

- Origin Trips
- Destination Trips

Source: MVRPC

MPO Area

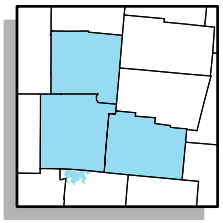

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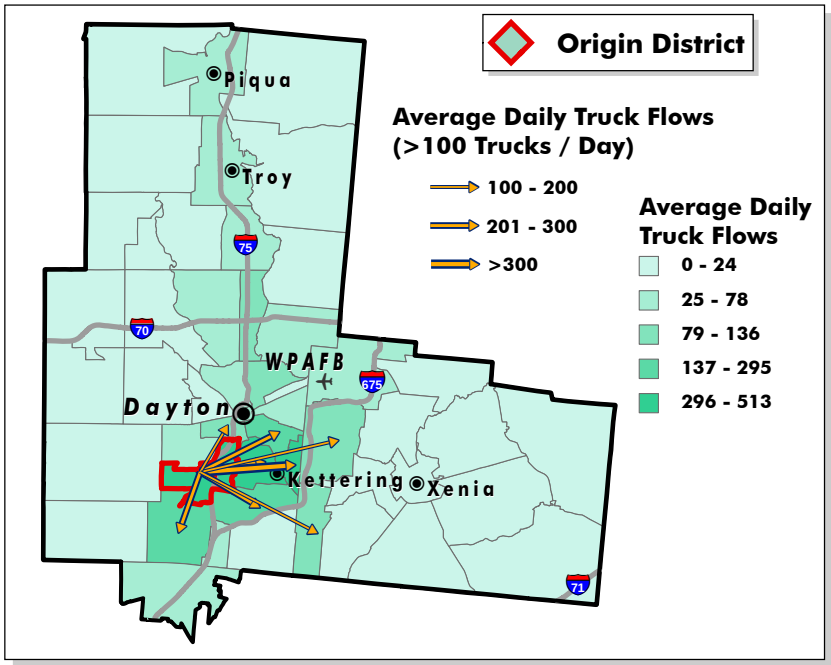
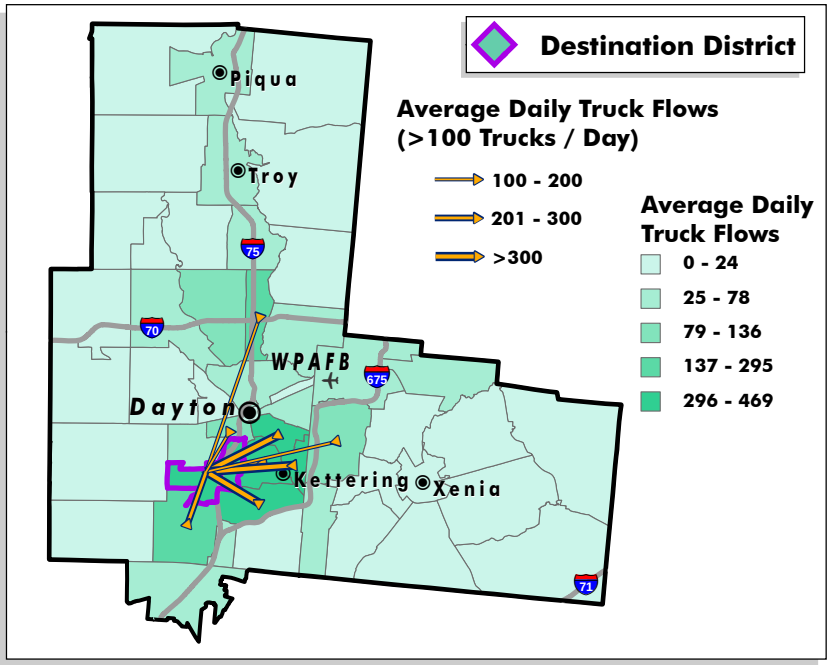
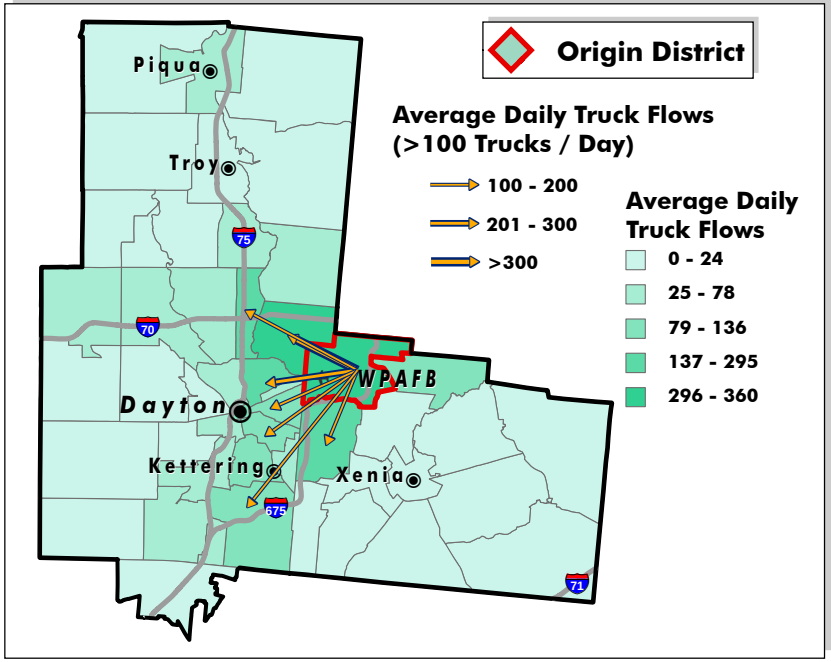
Figure 5.9 - Examples of High Volume Truck Flows in the Region In Year 2000: Origins and Destinations

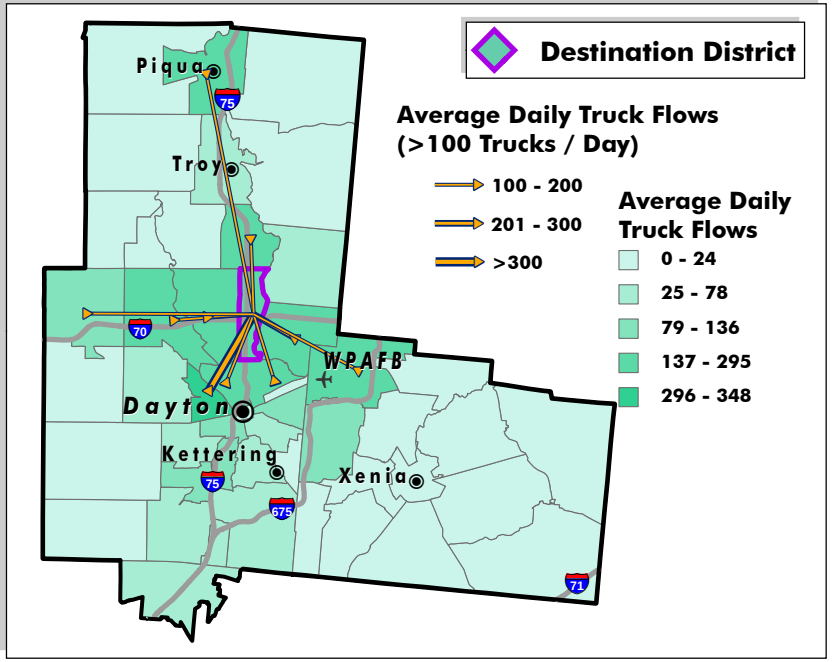
Source: MVRPC

MPO Area









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APPENDIX A – MIAMI VALLEY FREIGHT WORKSHOP PARTICIPANTS

Organization

- ODOT District 7
- City of Dayton, Aviation (Dayton International and Dayton Wright-Brothers Airports)
- Greene County Regional Airport
- Phillips Companies
- Miami County Economic Development
- Jet Express
- Ohio Rail Development Commission
- CSX Corporation
- ABF Freight Systems
- Dayton Area Chamber of Commerce
- UPS / Emery
- Delphi Corporation
- MVRPC

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APPENDIX B – MIAMI VALLEY TRUCK MODEL DESCRIPTION

Overview

The truck model developed for the consolidated travel model and described below is a set of procedures that produces truck trip tables for use in a multi-class traffic assignment. The consolidated truck model includes the combined regions of OKI (the Cincinnati MPO)/MVRPC (Cincinnati/Dayton). The methodology is not behaviorally-based, however, due to the non-availability of survey data for commercial vehicle movements. In the absence of such data from which to calibrate truck trip generation and distribution models, synthetic matrix estimation is used to produce trip tables for the base year. The resulting trip tables represent commercial truck origin-destination (O-D) flows that reflect likely truck trip productions and attractions and are consistent with observed truck counts for the regional highway network.

The truck model produces truck trip tables for two types of commercial vehicles: single-unit (six-tire trucks) and multi-unit (three-plus axle combination trucks). Single-unit (SU) and multi-unit (MU) trucks can be identified with reasonable accuracy by automatic traffic recorders, based on the number of axles and distance between them. Generally, SU trucks have six or more tires and are thus differentiated from smaller commercial vehicles, so-called light trucks such as pickups, vans and mini-vans. In terms of behavioral characteristics, SU truck trips are generated at greater rates than MU truck trips; however, MU trucks tend to have substantially greater average trip lengths because they dominate the long-haul trucking market.

The structure of the truck modeling process is illustrated in Figure B-1. The base year is 1995.

Internal-Internal Trips

The generation of daily truck trips for each vehicle type assumes that businesses of different types have a propensity to produce and attract single-unit (SU) and multi-unit (MU) truck trips at rates proportional to the amount of commercial activity being generated by the business. It is further assumed that employment totals are good indicators of the amount of commercial activity being generated by businesses. Likewise, households generate some amount of commercial vehicle traffic for the pick up and delivery of goods and provision of services. These assumptions are implemented in the truck model at an aggregate level by applying truck trip generation equations to the zonal totals for households and employees, by industry grouping, to estimate SU and MU truck trip ends. Lacking commercial vehicle survey data for calibration, the trip generation equations and gravity model impedance functions use modified versions of parameters published in the *Quick Response Freight Manual* (USDOT 1996) to produce initial estimates of SU and MU truck trip tables (see Table B-1). Since the expanded ODOT external station survey was to be used for the external truck trip ends, it was necessary to adjust the trip generation coefficients to reflect rates appropriate for the generation of internal-internal trips only.

External Trips

To produce estimates of truck flows with external trip ends, the ODOT 1995 External Station Survey was expanded and tabulated, resulting in a set of external-external (EE), internal-external (IE) and external-internal (EI) truck trip tables. The expanded data were classified into SU and MU categories by applying the proportions shown in Table B-2, based on the average distribution of SU versus MU trucks for roadways of certain functional classes. The final expanded data were aggregated across origin-destination pairs to produce EE, IE and EI estimates for separate SU and MU vehicle classes.

FIGURE B-1 — TRUCK MODEL DEVELOPMENT AND APPLICATION

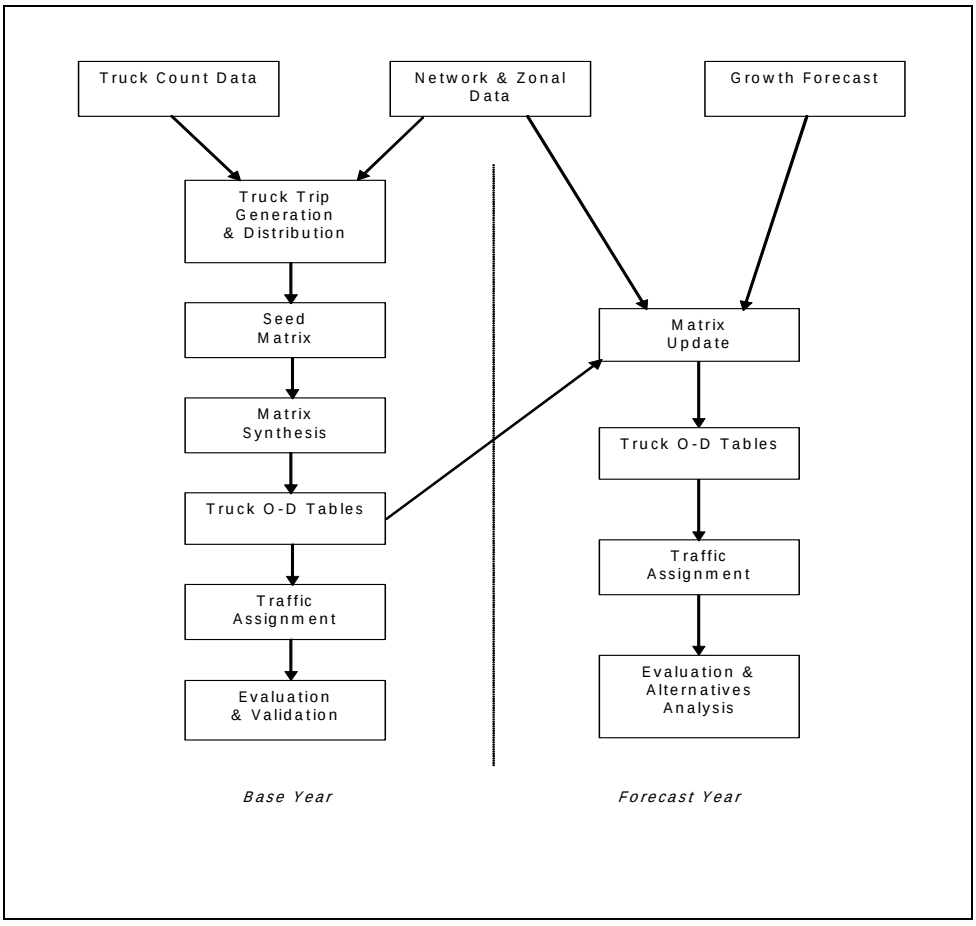

TABLE B-1 — ADJUSTED DAILY TRUCK TRIP GENERATION RATES (ORIGINS OR DESTINATIONS PER UNIT)

Employment Category	Single-Unit Trucks	Multi-Unit Trucks
Agriculture, Mining and Construction (SIC 1-19)	0.275	0.119
Manufacturing, Transportation, Communications, Utilities and Wholesale Trade (SIC 20-51)	0.230	0.071
Retail Trade (SIC 52-59)	0.241	0.044
Offices and Service (SIC 60-88)	0.065	0.006
Households	0.094	0.026

Source: Rates based on *Quick Response Freight Manual*, USDOT, 1996, p. 4-4, multiplied by factors of 0.952 for single-unit trucks and 0.683 for multi-unit trucks to produce internal-internal flows.

TABLE B-2 — EXPECTED PROPORTIONS OF MULTI-UNIT TRUCK TYPES

Functional Class		Factor
Rural	Interstate	0.81
	Other Principal Arterials	0.60
	Minor Arterial, Collector, Local	0.42
Urban	Interstate	0.71
	Other Freeways and Expressways	0.57
	Other Principal Arterials	0.56
	Minor Arterials	0.47
	Collectors	0.45
	Local	0.30

Source: Derived from Table 4.2 "Percent Distribution of Traffic by Vehicle," *Quick Response Freight Manual*, USDOT, 1996, p. 4-13.

Synthetic Matrix Estimation

The truck model is then calibrated using a synthetic matrix estimation (SME) method. SME uses the initial trip table estimate as a "seed matrix," which is then adjusted such that assignment of the table to the highway network results in truck trip flows that come close to matching observed truck traffic counts, through successive iterations. SME adjusts not only the flow pattern, but also the number of trips produced, effectively calibrating both trip generation and distribution stages simultaneously. ODOT, MVRPC, OKI and the Kentucky Transportation Cabinet contributed available truck traffic counts.

Synthetic matrix estimation procedures attempt to adjust the interchange values in a trip table through an iterative process of assigning the table to the network, calculating deviations from coded traffic counts, and using this information to re-factor the trip table. Since the traffic counts coded to the network represent daily link flows that include both trips with both internal and external origins and destinations, the seed matrix used to initiate the process should also include both internal and external origins and destinations.

Initial development of the truck model using the SME procedure in TransCAD was based on a seed matrix in which the internal-internal trip tables generated through the Quick Response truck trip generation and distribution processes were combined with the EE/EI truck trip tables that were formed from the ODOT external station survey.

Truck Forecasting

The procedure used to forecast future truck trips involves factoring the 1995 base year daily trip table estimates, accounting for growth in zonal employment and households as well as expected increases in industrial productivity. Four principal steps are included in this process:

- Forecasting zonal employment by industry grouping for future year
- Calculation of industry-sector productivity deflation factors (Table B-3)
- Calculation of TAZ truck trip growth factors and trip ends
- Two-dimensional matrix balancing (Fratar)

TABLE B-3 — INDUSTRY SECTOR DEFLATION, 1995 TO 2030

Industry Sector	Ratio: 2030 / 1995 Output per Worker
Durable Manufacturing	2.650
Non-durable Manufacturing	1.900
Wholesale Trade	1.806
Finance, Insurance & Real Estate (FIRE)	1.593
Mining	1.472
Transportation, Communications & Utilities	1.421
Services	1.215
Retail Trade	1.203
Construction	1.176
Agriculture, Fishing & Forestry	1.000

Base Year Results

A total of 890 truck traffic counts were available for comparison with assigned daily truck volumes. Comparisons were made for total two-way truck volumes, rather than by SU and MU truck types. ADT counts that were split between pairs of one-way freeway links were matched and comparisons made on the basis of the sum of the truck volumes loaded on the pair of links.

A comparison of observed and estimated daily truck volumes by link functional class is shown in Table 4. The root mean squared error (RMSE) measurements for these facilities reflect the size of the average link-flow error, while the percent root mean squared error (PRMSE) expresses this error relative to the average truck count volume for the classification. The PRMSE statistics for Interstates in general, and I-75 in particular, are very good. The link-flow error measurements on other facilities are not quite as good; however, daily truck flows on arterials, collectors and ramps represent a relatively small proportion of total daily vehicle flows. The ratios of estimated-to-observed traffic indicate that the assigned truck volumes tend to be on the high side for interstates and arterials and on the low side for major collectors, ramps and expressways.

TABLE B-4 — ESTIMATED VS. OBSERVED DAILY TRUCK VOLUMES BY FUNCTIONAL CLASS

Functional Class	Daily Truck Volume		Number of Observations	Root Mean Squared Error	Percent RMSE	Est./Obs.
	Estimated	Observed				
1. Interstates	1,799,116	1,656,772	210	2,250	28.52	1.09
I-75 Mainline	1,126,287	1,031,196	94	2,911	26.53	1.09
2. Major Arterials	192,787	155,172	203	557	72.86	1.24
3. Minor Arterials	141,456	121,721	156	628	80.54	1.16
4. Major Collectors	37,951	41,202	103	346	86.49	0.92
5. Minor Collectors	56	18	1	NA*	NA*	3.11
8. Ramps	93,931	123,975	179	524	75.63	0.76
9. Expressways	68,794	86,236	38	1,279	56.37	0.80
Total Observations	2,334,091	2,185,096	890	1,211	49.32	1.07

* Root mean squared error (RMSE) is not calculable for just one observation.