# The Cost of Highway Limitations and Traffic Delay to Oregon's Economy

*Prepared for:*

**Oregon Business Council**
and
**Portland Business Alliance**

*In cooperation with:*

**Associated Oregon Industries**
**Port of Portland**
**Oregon Department of Transportation**
**Westside Economic Alliance**

*Prepared by:*

Economic Development RESEARCH GROUP

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Oregon DOT played a major role in providing travel demand and traffic forecasting analysis for areas of the state outside of the Portland area. Metro supplied travel demand and traffic forecasting for the Portland area, as part of an earlier companion study that focused just on the cost of congestion to that region.

The study was overseen and reviewed by a committee comprised of Marion Haynes representing the Oregon Business Council and Portland Business Alliance, Susie Lahsene of the Port of Portland and a team from Oregon Dept. of Transportation including: Brian Gregor and Becky Knudson.

The consultant team conducting this study and writing this report consisted of Glen Weisbrod, Susan Moses, Tyler Comings, Brian Baird and Rimon Rafiah. The study built on new transportation models and forecasts developed by ODOT's Travel Research and Modeling Services staff, especially Brian Gregor. The consultant team and review committee are also grateful to the many individuals and businesses who were interviewed and provided data for this report.

All findings and conclusions in this report are those of the study authors and are not necessarily the positions of the study sponsors. Any errors in this report are the responsibility of the consultant team.

# 1 INTRODUCTION

## 1.1 Motivation: Economic Competitiveness

As the state of Oregon moves further into the 21st century, it becomes important to understand the need for transportation facilities to keep up with changes occurring in the region's population and business base. The stakes can be high. Failure to provide a well-functioning transportation system can potentially reduce the quality of life for Oregon residents and reduce the competitiveness of the state for attracting business investment. Those factors directly affect future job growth and income for Oregon residents, as well as the income tax base to pay for other essential services.

To examine these issues, the Oregon Business Council sponsored this study in cooperation with the Portland Business Alliance, Port of Portland and Oregon Department of Transportation. This report examines the nature of overall traffic conditions and congestion within Oregon and how they are forecast to change over the next 25 years. It also assesses the impact that transportation infrastructure improvements (or lack thereof) can have on business productivity, competitiveness and growth.

This 2007 report, *The Cost of Highway Limitations and Traffic Delay to Oregon's Economy,* is a companion to the November 2005 report called *Cost of Congestion to the Economy of the Portland Region.* That earlier report examined how transportation congestion in the Portland region is affecting business operations and costs, and can ultimately limit the future competitive position of that region

The report seeks to address two questions:

- How do transportation infrastructure improvements, or lack of improvements, affect costs to Oregon residents and businesses, and the ability of existing Oregon businesses to compete nationally and globally?

- How do transportation infrastructure improvements, or lack of improvements, affect jobs and income generated in Oregon?

By addressing these questions, this report seeks to provide a context for better understanding the economic and jobs impact for the next generation of public investments in transportation system upgrades, and the risks associated with failure to make those investments.

## 1.2 Study Focus: Highway Travel Delay

At the outset, it should be clear that transportation involves a wide variety of modes, including pedestrian, bicycle, bus, light rail, train, car, truck, motorcycle, air and marine travel. These modes serve a broad range of purposes, including health and recreation, shopping and personal business, commuting, freight deliveries and business trips. All modes and purposes are important to consider in broad-based transportation planning. However, from the perspective of maintaining a vibrant and competitive state economy, it is appropriate to focus in on the most directly applicable and critical issues affecting business activity. This leads to two key observations:

- *Congestion and travel delay occurs when ground transportation system demand is high relative to its capacity, design and connectivity.* Traffic conditions can get worse over time as traffic levels grow to exceed road capacity, causing both slowdown and traffic incident delays. However, traffic problems can also grow due to limitations of existing road system features (such road curves and bridge weight limitations) that requires large buses and trucks to go long distances out of their way. In addition, the shifting location and shipping requirements of businesses can also make the current transportation system insufficient to meet the needs of emerging new shipping and travel patterns.

- *Highway traffic delays affect most all forms of passenger and freight vehicular movement.* Many means of motorized travel -- buses, streetcars, cars, trucks and motorcycles – depend directly on the state's system of roads and highways. Yet even for modes that do not drive on roads – such as light rail, trains, airplanes and ships – the passengers and freight that they carry require travel on the road system for access to and from a train terminal, intermodal rail transfer facility, airport or marine port. Therefore, travel by all modes is important to consider insofar as all modes are affected to some degree by sufficiency of the state's highway network.

  ***Congestion Effects are Broad***
  *Traffic conditions affect ground access for air, sea and rail transportation, as well as car, bus and truck movement.*

- *Not all modes are substitutes.* Where trains or buses are available, they can offer a substitute for cars in serving some commuting and personal travel (and sometimes even business travel), depending on the trip origins and destinations. However, for freight deliveries to homes and businesses, there is necessarily a reliance on trucks using the highway system. For businesses relying on materials from outside suppliers or delivering products to outside customers, there is also need to maintain good truck access to or through airports, marine ports, intermodal rail facilities and cross-state highway routes. Also, local business-related trips for sales and service delivery to Oregon residents typically require cars or light trucks, since they cannot rely on fixed route services for their dispersed travel.

The bottom line is that many forms of business-related travel are particularly dependent on the ability of the state's highway system to move vehicles. This report examines the nature of business dependence on the highway system, and the degree of vulnerability to current and future growth in travel times. It goes into particular depth to show how travel time affects the many facets of goods movement because that element of business impact is often less well understood by the general public. However, this additional focus on freight is not intended in any way to minimize the ways in which travel time also affects passenger movements, which are also covered.

## 1.3 Organization of the Report

The report is organized into five chapters:

- Chapter 1 has defined the objective and focus of this study.
- Chapter 2 examines how Oregon's economy is particularly dependent on transportation for serving broad markets, and thus vulnerable to travel time increases.
- Chapter 3 uses business interviews to lay out the many facets of impact that travel time increases has on local business costs, operations and growth strategies in Oregon.
- Chapter 4 uses transportation models to show the magnitude of the current problem and expected future travel conditions under alternative future scenarios.
- Chapter 5 uses economic models to show the implications of traffic and travel time growth for the state's economic future.

# 2 TRANSPORTATION ROLE IN THE STATE ECONOMY

Due to its geographical location, Oregon benefits from a diverse set of industries that depend on all modes of transportation. The state's international air and sea gateways, and location along major transcontinental highways and rail routes, make Oregon a center of activity for trucking, railroads, warehousing and distribution of products. The transportation network allows industries in all parts of the state to benefit from highway network connectivity and access to supplier and customer markets. Over 200,000 Oregon workers are employed in transportation-related industries.

The economy of Oregon also depends on core industries that have been attracted to the state because of its natural resources and location advantages for distribution. These industries include computer and electronic products, metal products, fisheries, lumber and wood paper products, paper and publishing, agriculture and food products. These are referred to as "traded" industries because they serve markets beyond Oregon, a factor that makes their existence and growth reliant on continued future performance of the state's transportation system. Another 200,000 Oregon workers are employed in these transportation-reliant "traded" industries.

Altogether, more than one in five jobs in Oregon (over 400,000 total) is either directly transportation-related or else strongly transportation-reliant (as traded industries). The stakes for maintaining a strong transportation infrastructure is even higher, since many other product assembly, retail and service jobs in Oregon are also indirectly dependent on the economic well-being of these transportation related and reliant industries, through supplier, delivery and income respending impacts.

## 2.1 Gateway and Transcontinental Facilities

Oregon's transportation facilities and business mix reflect the state's advantageous coastal location for overseas trade as well as its strategic location along major north-south and east-west transcontinental trade routes. Key elements of the state's transportation system include:

- Marine Ports and Sea Gateway. Oregon has 23 port districts, including nine with intermodal freight terminals. Ports along the Pacific coast and Columbia River provide deep draft marine facilities for ocean-going ships. Those ports located along the Columbia-Snake River System provide barge service that links upriver

sites to transloading facilities for ocean-going ships in Portland. The state's preeminent international marine gateway, the Port of Portland, provides Oregon businesses with overseas bulk and container shipping services. It is recognized among the major US ports as offering the shortest marine route from the US to Asian markets. Its largest imports by value are motor vehicles, iron and steel, office machines, petroleum, apparel and footwear. Its exports include cereals, chemicals, fertilizers, vegetables and fruits, paper and ores. While bulk cargo typically travels to and from the port by train, intermodal containers are often carried by trucks as well as trains. The Port's marine terminals handle over 2.5 million tons of intermodal containers.

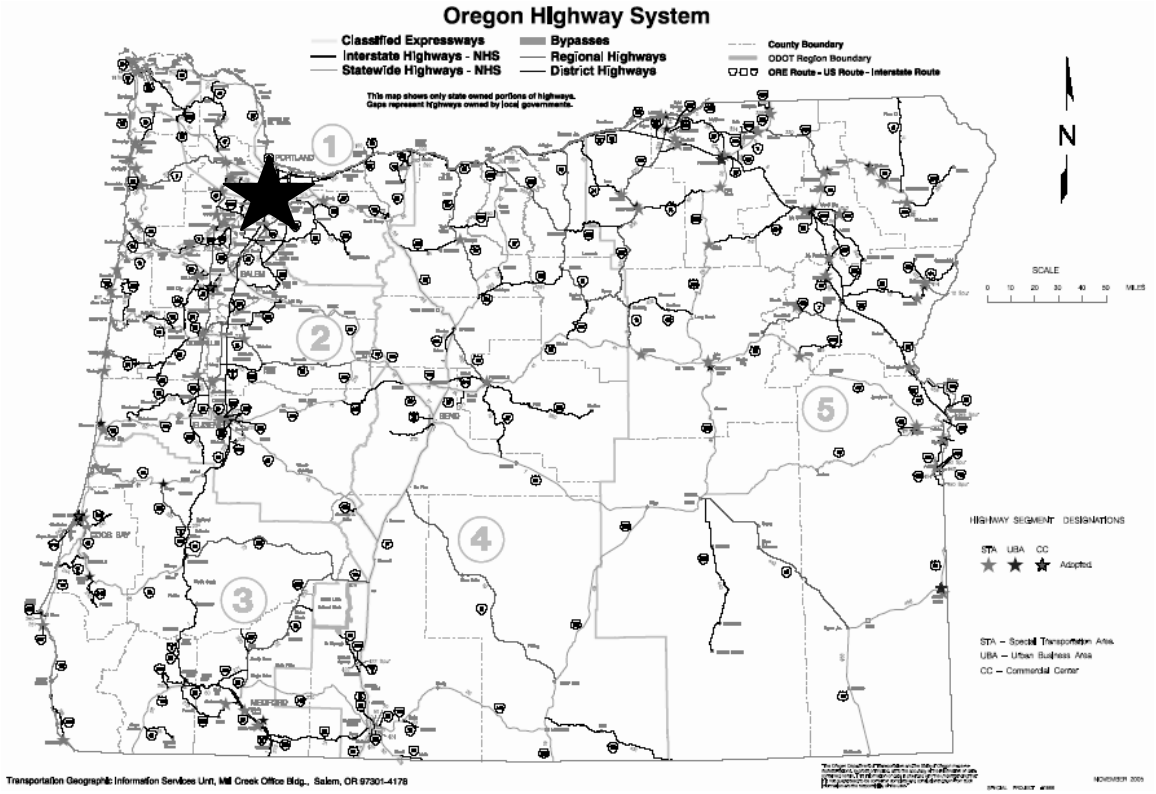
- Airports and Air Gateway. Oregon has 97 public use airports, including 7 with commercial airline service. The state's major air gateway, Portland International Airport (PDX), provides Oregon residents and businesses with direct cross-continental and overseas service for both passenger and cargo movement. It is particularly important for products that are high in value and low in weight, which covers the high-technology industries that are currently among the fastest growing sectors in the state. The largest air imports by value are office and computer equipment, electronic machinery, scientific instruments and telecom equipment. Air exports include transport equipment, chemical materials, vegetables and fruit, in addition to high-tech machinery, instruments and electronic equipment. Essentially all arriving or departing air cargo relies on truck for ground connections.

- Interstate and Transcontinental Highways intersect to make Oregon a hub for long-distance movements. The I-5 corridor is the major north-south spine for movement along the entire west coast from Mexico to Canada. The I-84 corridor is a major east-west spine for movement from Portland through the Cascades to the central and eastern parts of the US. Trucks account for a disproportionately high percentage of total vehicles on both highways, as they carry goods to and from Portland's airport and seaport facilities, as well as goods traveling directly between supplier and buyer locations both within and outside of Oregon. (Trucks account for under 5% of all vehicles on most highways, but they account for up to 15% of vehicles on parts of I-5 and 22% on parts of I-84.). The 7,400 mile network of paved state highways in Oregon also connects all of the cities in the state, and links them to the interstate highway system. (See Figure 2-1).

- Local and Interstate Railroads. Oregon has 23 railroads, including the high capacity transcontinental main lines of both western Class 1 railroads -- Union Pacific (UP) and BNSF. The fast intermodal service and advantageous rail line routing make these Oregon routes a quicker alternative to the upper Midwest than rail routes from other west coast ports. These rail lines are particularly important for bulk commodity shipments of agricultural and mineral products from Oregon to outside buyers. In addition to the freight service, Amtrak operates passenger trains along the UP tracks that connect Oregon with Washington and California.

- Public Transportation. Oregon has 230 local public transportation providers, including four large transit systems serving the Portland, Eugene/Springfield, Rogue Valley and Salem/Keizer metropolitan areas. These systems play an important role in supporting worker commuting and personal travel in the largest labor and consumer markets, and they also help to reduce traffic congestion in those urban areas.

**Figure 2-1:**
**Oregon Statewide Highway System and its Relationship to the Portland International Air and Sea Gateways**




Demand for use of major transportation facilities (spanning all modes) will continue to grow in the future. As noted in the Oregon Transportation Plan (September 2006), the state is forecast to experience a 41% increase in population by 2030, an 80% increase in freight tonnage (moving mostly by truck), and a 147% real increase in the value of freight moving in the state. Of course, these forecasts of growth are based on an assumption that the state's transportation facilities can indeed be upgraded as needed to accommodate that growth.

## 2.2 Jobs in Transportation-Related Industries

Approximately 200,000 people in Oregon work in jobs directly involved in the movement of people and goods. That includes jobs in businesses providing transportation services, wholesaling and warehousing activities, and the manufacturing and sales of motor vehicles. It also includes jobs operating and maintaining in-house motor vehicle fleets in other manufacturing and service industries. Altogether, these transportation-related business activities represent 11% of the state's total employment base. A breakdown of these jobs is shown in Table 2-1.

**Table 2-1:**
**Oregon Statewide Employment in Transportation-Related Activities**

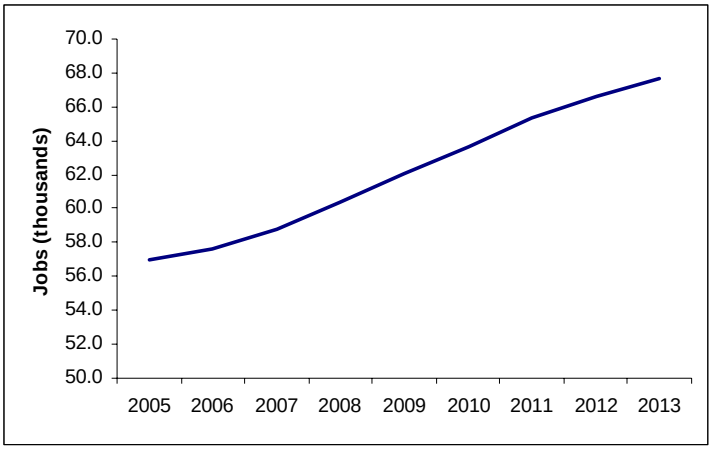
| | | |
|---|---|---|
| **Transportation and Warehousing** | **53,800** | |
| Air transportation | 3,500 | |
| Truck transportation | 20,000 | |
| Couriers and messengers | 7,100 | |
| Warehousing and storage | 7,500 | |
| Water Transportation | 1,588 | (a) |
| Transit and Ground Passenger | 5,793 | (a) |
| Pipeline Transportation | 72 | (a) |
| Scenic and sightseeing transportation | 245 | (a) |
| Support activities for transportation | 8,001 | (a) |
| **Wholesale Trade** | **80,200** | |
| Wholesaling of merchant goods | 48,200 | |
| Electronic markets, agents and brokers | 12,000 | |
| **Transportation Equipment Manufacturing** | **18,700** | |
| **Retail: Motor Vehicle and Parts Dealers** | **27,900** | |
| **In-house Vehicle Fleet Operation** | **20,000** | (b) |
| **Total Direct Transportation-Related Jobs** | **200,000** | |

*Source: Oregon Employment Dept., OLMIS (Oregon Labor Market Information System), Dec. 2006*
*(a) The breakout of the OLMIS "Other Transportation" category into further details was estimated by EDR Group using more detailed County Business Patterns data for most recent year (2004)*
*(b) The category of "in-house fleet operations" refers to transportation-related jobs (truck drivers, mechanics, etc.) associated with local distribution fleets, owned and operated by non-transportation businesses such as agriculture, retail and service industries. Jobs were estimated by EDR Group based on US BEA "Transportation Satellite Accounts.*

Among the categories shown in Table 2-1, the transportation/warehousing and wholesale trade groups are of particular note because their growth is directly tied to the movement of people and goods to, from and within Oregon. Key elements of these two groups are discussed next.

***Transportation and Warehousing Jobs.*** The distribution and logistics industry handles a large share of the state's economic activity. It is supported by infrastructure that has developed around it, particularly trucking services, export packing, and maintenance and repair operations. In Oregon, this industry now employs 53,800 people, and this number is expected to grow in the near future. Figure 2-2 shows the predicted increase in employment from 2005 to 2013. Within these eight years, the employment in this industry is expected to increase by 18%. Logistics jobs (along with manufacturing jobs) are particularly desirable because they provide relatively high wages for blue collar workers.

**Figure 2-2. Forecast of Oregon Employment in Transportation and Warehousing Industry**




*Source: Oregon Economic and Revenue Forecast, December 2006, State of Oregon, Office of Economic Analysis.*

The expected substantial growth of transportation jobs in Oregon is matched by expectations of equally substantial growth in commodity shipments to, from and within Oregon in future years. Table 2-2 shows that the value of all shipments in Oregon is expected to grow 25% in ten years, and by 147% over 30 years, rising from $530 billion in 2000 to $1.3 trillion by the year 2030. These forecasts also show that the economic importance of trucks will be increasing as the truck mode grows from 79% in 2000 to 85% of total commodity value by 2030. However, these forecasts implicitly assume that the state's highway system will not decline and will remain as efficient in moving traffic in the future as it is today.

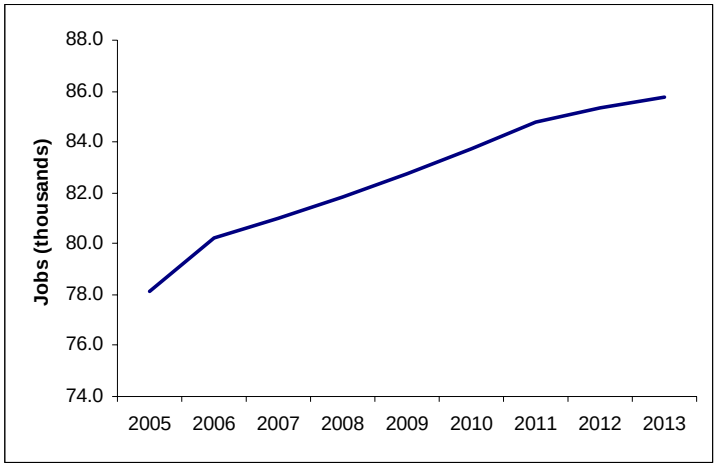
**Table 2-2.**
**Forecast of Oregon Annual Commodity Flow Value**
***(in millions of constant year 2000 dollars)***

| Mode | 2000 | 2010 | 2020 | 2030 | Change 2000-2030 |
|---|---|---|---|---|---|
| **Truck** | 419,364 | 533,997 | 738,927 | 1,114,936 | 166% |
| **Rail** | 72,889 | 87,313 | 107,768 | 138,403 | 90% |
| **Water** | 31,091 | 33,538 | 37,058 | 40,023 | 29% |
| **Air** | 3,316 | 4,054 | 5,720 | 10,536 | 218% |
| **Pipeline** | 3,816 | 3,816 | 3,816 | 3,816 | 0% |
| **Total** | 530,477 | 662,718 | 893,290 | 1,307,715 | 147% |

*Source: Oregon Commodity Flow Forecast, April 2005, by Global Insight for the Oregon Dept. of Transportation.*

***Wholesale Trade Jobs.*** The existence of significant international and domestic trade through sea ports, airports, rail and highway connections have made Oregon a major distribution center for goods flowing throughout northern and western states. This trade has supported a high level of wholesale activity in Oregon. The wholesaling industry employs approximately 80,200 Oregon residents (as of December 2006). As the commodity flows are forecast to continue growing in the future, so too will jobs in wholesaling. Total employment in this industry is expected to grow by over 10% in the next eight years, as shown in Figure 2-3.

**Figure 2-3. Forecast of Oregon Employment in Wholesaling**




*Source: Oregon Economic and Revenue Forecast, December 2006, State of Oregon, Office of Economic Analysis.*

## 2.3 Jobs in Transport-Reliant "Traded Industries"

***Core Industries.*** A foundation of Oregon's economy is its *traded industries*. These are the industries that have greater relative concentration in Oregon than in the rest of the country. A higher than average concentration occurs when an industry produces more than is needed locally and "exports" its products to other parts of the country and abroad. For such industries, Oregon provides a competitive and desirable environment for doing business. These industries are a foundation of Oregon's economy, as they bring money into the state from outside customers, support additional industrial suppliers and generate worker income that is re-spent on consumer purchases.

Oregon's key traded industries are computer and electronic products, metal products manufacturing, fisheries, agriculture, lumber and wood products, paper and publishing. Table 2-3 shows those industries (by 3 digit NAICS code) that have the highest relative concentration of employment in Oregon compared to the US average. Together, these 204,000 jobs account for 11% of total statewide jobs. There are additional jobs in wholesaling and manufacturing of transportation equipment that are also classified as "traded industries" but are not counted here, since they were previously counted among the transportation-related jobs.

The table below has shows three columns of numbers. The first one shows the extent to which Oregon is above the national average in its share of these industry jobs. The second shows the total statewide jobs in each industry. The third shows the estimated portion of those jobs that are due to shipping products out of state.

**Table 2-3:**
**Oregon Statewide Employment in Transportation-Reliant "Traded Industries"**

| Industry | Relative Concentration (a) | Total Jobs (b) | Est. Jobs due to shipping out of state (c) |
|---|---|---|---|
| Lumber and Wood Products | 3.5 | 67,232 | 48,023 |
| Fisheries | 2.4 | 4,073 | 2,376 |
| Computer & Electronic Products | 2.3 | 39,352 | 22,515 |
| Agriculture | 2.2 | 47,822 | 26,211 |
| Primary metal mfg | 1.3 | 7,624 | 1,641 |
| Publishing industries | 1.2 | 15,327 | 2,598 |
| Food products | 1.1 | 22,984 | 2,459 |
| **Total** | | **204,414** | **105,822** |

*(a) This is the Location Quotient (LQ), and is calculated as the share of Oregon jobs in these industries divided by the share of national jobs in these industries. (For example, it shows that Oregon's share of jobs in these industries is 2.3 times the national average.)*
*(b) Source: IMPLAN Model estimates based on US Bureau of Economic Analysis, 2004 data*
*(c) This number represents the portion of total jobs in the industry that are in excess of what would be expected if Oregon had the national average share of jobs in these industries. That excess is interpreted as the jobs associated with production of goods shipped to out of state customers.*

***Trucking in Traded Industries.*** Table 2-4 shows the portion of freight in these traded industries moved by truck in Oregon. These represent the amount carried *only* by truck; therefore they do not include movement for multiple modes. Since trucks are useful for movement between modes these figures understate their importance.

**Table 2-4.**
**Percentage of Freight Value and Weight Moved by Truck for "Traded Industries"**

| Traded Industry | % of value | % of weight |
|---|---|---|
| Computer & Electronic Products | 52 | 77 |
| Primary Metal Mfg | 71 | 58 |
| Publishing/Printed Products | 57 | 78 |
| Lumber and Wood Products | 77 | 74 |
| Agriculture | 50 | 11 |
| Food Products | 85 | 85 |

*Source: Commodity Flow Survey, Oregon, 1997. U.S. Department of Transportation and U.S. Department of Commerce.*

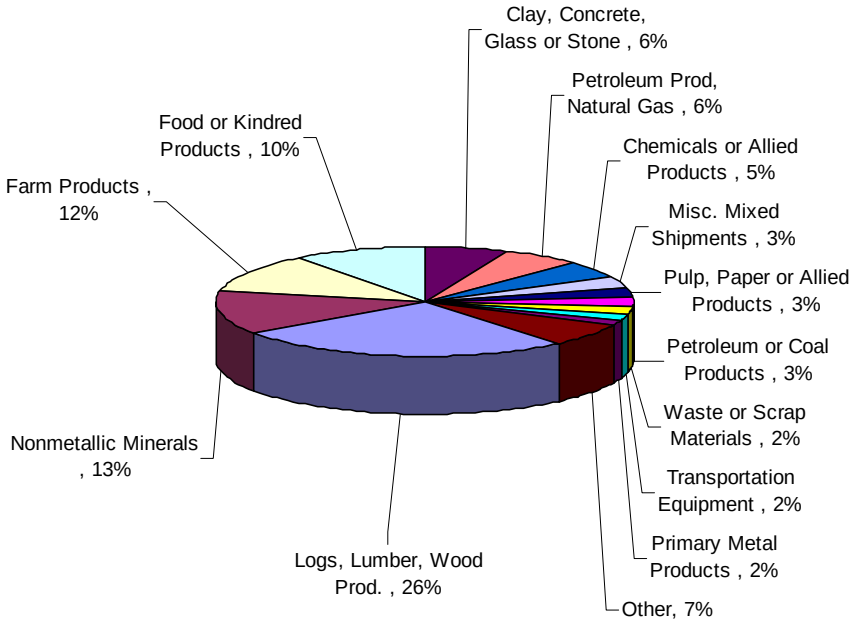
***Reliance on Traded Industries.*** In general, the industries with a high relative concentration in Oregon are those that serve markets broader than just Oregon. For that reason, access to wholesale distribution facilities, seaports and airports are essential for both their products. Some of these industries rely on Oregon's natural resources, while others utilize Oregon's workforce skills and location advantages, bringing in parts that are assembled in Oregon, thus contributing value-added of the economy. However, all of the traded industries sell and ship goods to outside customers who then generate income flowing into the state. These export industries also tend to be most cost sensitive since they are often competing in global markets.

The industry with the highest relative concentration in Oregon is lumber and wood products, of which Oregon is a major exporter domestically and internationally. Much of this product travels by rail and ship. The paper and publishing industries are also dependent on wood products for supply, but many of these finished products are shipped by truck.

Computer and electronic products are also highly concentrated in Oregon. This reflects the key role of Oregon as a location for manufacturing of integrated computer chips and specialized electronic components and products. These products have a high value/weight ratio and are often delivered on a just-in-time basis via truck to airports for shipping overseas. Computer and electronic products is one of the industries in which Oregon businesses compete with the rest of North America and the rest of the world in an increasingly integrated global economy. Their delivery schedule, reliability and cost sensitivity makes these traded industries particularly sensitive to congestion and infrastructure adequacy concerns.

***Composition of Oregon Commodity Shipments.*** Not surprisingly, Oregon's major traded industries also generate a lion's share of total commodity shipments in the state. Figure 2-4 shows that the largest quantity of Oregon's commodity shipment by weight (including shipments into, out of and within the state) are lumber and wood, agriculture and food products, paper products, transportation equipment and minerals. The products with a high value/weight ratio do not show up in the pie chart because they account for a relatively small portion of total tons shipped, though they do account for a more significant portion of total dollar value shipped.

**Figure 2-4. Profile of Oregon Commodity Shipments**
***(percentage of total tons, year 2000)***




*Source: Oregon Commodity Flow Forecast, April 2005, by Global Insight for the Oregon Dept. of Transportation.*

## 2.4 Key Findings from Oregon Business Profile

Oregon's geographic location, along major north-south and east-west highway and rail routes, makes transportation and traded industries an important element of the state's employment base. Traded industries, which serve local and broader markets, rely on efficient transportation for import of supplies and export of goods both domestically and internationally. Since these industries are more globally competitive, increased travel times could challenge their strength and capability. Oregon's natural assets, including its gateway location and aesthetic beauty, are part of the reason for its

success. However, it has also provided a fertile environment for doing business through past investments in the state's multi-modal infrastructure. Recognition of the sensitivity to increasing travel times is vitally important for Oregon to continue to grow its economy and jobs base. As a result of these many factors, more than one in five jobs in Oregon (over 400,000 jobs) is either directly transportation-related or else strongly transportation-reliant (as traded industries).

# 3 BUSINESS INTERVIEWS

This chapter describes findings from interviews of major businesses and industries located in Oregon. They illustrate how the state's economy and jobs depend on the transportation system, and how those relationships are changing with increased national and global competition as well as technology advances. Most importantly, the interviews provide insight into the ways that deficiencies in the state's transportation system are already increasing business costs and reducing business competitiveness.

These issues can be classified into four key categories:

- Congestion caused by traffic levels exceeding road capacity, causing both slowdown and traffic incident delays;
- Deficiencies in inter-modal connections between the road system and rail, air and marine terminals;
- Limitations of the existing road infrastructure characteristics that cause network access limitations; and
- Shifting location and shipping requirements of businesses that cannot be met due to existing transportation network limitations.

The findings provide a foundation for the empirical analysis of ground transportation system needs and impacts in the next chapter.

## 3.1 Introduction to Business Interviews

Through sixteen in-depth business interviews, the 2005 report, *Cost of Congestion to the Economy of the Portland Region,* documents how transportation congestion in the Portland region is affecting business operations and costs, and ultimately limiting the competitive position of the region in national and global markets. The business interviews identified the already critical problem of afternoon congestion on the transportation system, causing businesses to restructure shipping patterns, change employee deployment and shifts, and alter warehousing, production and inventory practices. Businesses stressed that current non-congested windows of time in which transportation deliveries and logistics functions are operating may diminish to levels that further increase costs and impede business operations. Increased costs due to congestion will both increase the costs to consumers of local services, and cause some trade-oriented businesses to move their operations elsewhere.

Findings of the Portland study raised concerns about how well the statewide transportation system is serving Oregon businesses located outside the Portland region. Are these businesses also facing increased costs as a result of congestion and highway deficiencies throughout the state? Are there additional transportation issues

that impede the competitiveness of these businesses? What kinds of transportation investments will best meet the needs of businesses throughout the state?

To help answer these questions, a range of businesses throughout the state were interviewed between December 2006 and February 2007, and those findings were supplemented by interviews from the earlier Portland study. The businesses represent a variety of economic sectors, geographic diversity, a mix of regional and national firms, and a range of transportation needs. These interviews provide insight into how businesses currently use the state's transportation system, how transportation needs are changing in response to both technological advances and increased national and global competition, and how deficiencies within the state's transportation system result in increased business costs and reductions in business competitiveness.

Table 1 on the next page lists the businesses interviewed for this study, plus two Portland-based businesses from the previous study. Figure 1 below shows the locations of these businesses.

**Figure 1**
**Locations of the Businesses Interviewed**

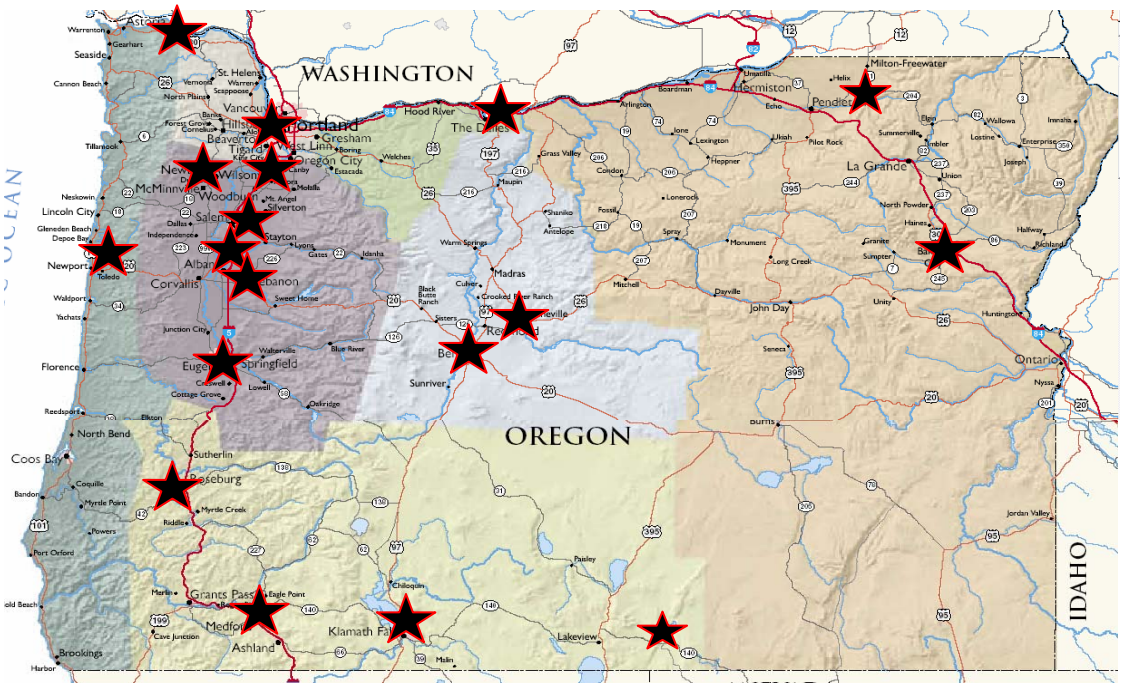


**Table 1**
**Businesses Interviewed**

| Firm | Line of Business | Location |
|---|---|---|
| Anderson Hay and Grain, Inc. | International supplier of hay and grain | Aurora |
| Gary Smith Trucking | Independent trucking firm | Baker City |
| Georgia-Pacific Corp. | Manufacturer of tissue, paper, packaging, pulp, building materials | Toledo, Wauna, and other sites |
| Harry and David Holdings, Inc. | Grower, manufacturer, distributor and retailer of gourmet foods | Medford |
| Jeld-Wen Windows and Doors | Manufacturer of windows and doors | Klamath Falls (HQ), Stayton, Bend |
| Les Schwab Tire Centers | Tire dealer and retailer | Prineville |
| Monrovia Nursery | Grower of ornamental plants in containers | Dayton |
| Roseburg Forest Products | Manufacturer of building products and specialty wood products | Dillard |
| Smith Frozen Foods, Inc. | Processor and packager of frozen vegetables | Weston |
| Weyerhaeuser Company | Manufacturer of forest products | Portland, Beaverton, Stayton, Dallas, Albany, Lebanon, Eugene |
| Intel | Manufacturer of microchips, computing, and communications products | Portland |
| Powell's Book Stores | Internet and Store retailer of books | Portland |

## 3.2 Interview Synopses

Each of the firms interviewed provided candid information about their transportation costs and concerns. This section provides, for each firm, a short description of the business, how it uses the transportation system, and its transportation challenges.

### *(A) Anderson Hay and Grain, Inc.*

**The Company.** Anderson Hay and Grain, Inc. is a straw export business with locations in Oregon and Washington. The Oregon site is located in Aurora, about 40 minutes south of Portland on Interstate 5. The Oregon operation buys straw from growers in Oregon and ships baled straw to clients primarily located in Korea and Japan.

**Transportation system usage.** The straw is transported to the Aurora plant by truck. The product is processed (compressed for shipping overseas) at the Aurora facility and then shipped via truck to the Ports of Portland and Tacoma. Some of the product shipped to the Port of Portland is then loaded onto rail and shipped to Seattle for shipment overseas. The company ships 12-20 truckloads/day to Portland (including loads then transported by rail to Seattle) and 5-15 truckloads/day to Tacoma. The firm uses its own trucks and drivers for deliveries to Portland, and uses a private trucking company for shipments to Tacoma.

**Transportation Issues and Concerns.** Congestion on I-5 south of Aurora (in the Albany and Tangent areas) can prevent supplies from reaching the Aurora facility on time. Supplies are scheduled to arrive throughout the day, starting at 6 a.m. When congestion delays shipments needed for processing, it can result in "rolling a booking" (i.e., not making a cut date for shipping the product overseas.) This requires that shipments be rescheduled, resulting in both monetary costs and poor customer relations.

Shipments bound for the Ports of Portland and Tacoma are scheduled to leave the Aurora facility to arrive before 4 p.m. when the ports close their gates. If congestion, construction, or weather causes a truck to arrive late, the shipment is put one week behind schedule while it awaits the next available shipping vessel. Missed shipments generally must be returned to Aurora, resulting in costs associated with hauling the product back and storing it. Occasionally, the port will allow for the product to be stored until the next vessel leaves, but will impose a storage fee.

The cost of a missed shipment may be borne by either Anderson Hay or the trucking firm. If a missed production schedule at the Aurora facility caused the delay, then Anderson Hay absorbs the cost. Conversely, if congestion, weather or construction causes the delay after the shipment leaves Aurora, then the trucking company incurs the cost. Approximately 15-20% of shipments from the Aurora facility result in

missed delivery windows. A major point of congestion delay is Marine Drive near the Port of Portland.

Anderson Hay has adjusted its operations in response to increased congestion. In the past, production workers arrived at work at 6 a.m. Now production starts at 4 a.m. to ensure shipments avoid congestion. Trucks previously left Aurora for Portland and Tacoma at 6 a.m. Now trucks leave the facility by 4 a.m. Company-owned trucks used for shipping to Portland make three to four runs per day. The earlier start time is designed to avoid congestion-related delays for the second and third shipments. It is often impossible to complete a fourth shipment in one day when shipments are delayed. Delays with shipments of hay to Aurora may require shifts in production schedules so that the processed hay can be sent out on time. In addition, the firm may need to schedule more drivers to make sure the product gets to the ports on schedule.

Congestion has been an issue for workers who arrive at the Aurora facility at 8 a.m. from the south. This is an inconvenience to workers, though the cost to the firm varies depending on the job of the individuals affected. The company did change the schedule of some workers to start at 6 a.m. to avoid congestion.

## *(B) Gary Smith Trucking*

**The Company.** Gary Smith Trucking is a Baker City trucking firm serving the Pacific Northwest (Idaho, Washington and Oregon.)

**Transportation system usage.** The firm has a fleet of nine 90-foot flatbed trucks, and primarily transports lumber and livestock equipment. The company uses major highways throughout the Pacific Northwest. It sometimes picks up shipments from the railroads for delivery to retail customers.

**Transportation issues and concerns.** Congestion-related delays in urban areas can result in missed delivery windows and increased costs for both the trucking firm and its customers. Congestion in the Portland area usually occurs on Highway 26 and Highway 217, and the latter is avoided even though it costs the company more to use alternative routes. When Highway 26 is congested, traffic is rerouted to old Highway 30. Gary Smith Trucking relies on ODOT's internet site to identify congested roadways, and reroutes shipments already en route based on that information. This is a new practice started within the past two to three years.

The company pays its truck drivers $20/hour, and must incur the cost of extra time spent on the road as a result of congestion. It charges customers $2.00/mile for deliveries, and customers incur the cost of any added mileage resulting from congestion-related detours. Each month, congestion affects approximately 15 of the firm's shipments to the Portland area.

Gary Smith Trucking tries to schedule deliveries in the Portland area for mid-day, although some retailers have specified delivery windows. When the shipment misses

the delivery window, the truck may need to stay in Portland overnight for delivery the next day. Gary Smith bears the cost of a missed delivery window, and the delay puts delivery schedules for the affected truck at least ½ day behind schedule. This happens two to three times per month.

## *(C) Georgia-Pacific Corp.*

**The Company.** Georgia-Pacific (GP) is an international manufacturer and marketer of tissue, packaging, pulp, paper, building products and related chemicals. The company has over 300 locations world-wide with over 55,000 employees. GP has thirteen manufacturing facilities, two wood and fiber supply offices, and one sales office in Oregon. These sixteen operations generated approximately $165 million in taxable wages in 2006. The Oregon manufacturing facilities produce consumer tissue products, business paper, corrugated packaging, building products and chemicals. GP is the largest paper manufacturer in Oregon. Interview participants represented the linerboard and containerboard plant in Toledo (420 employees) located in the southwestern part of the state eight miles inland from Newport, and the consumer products and business paper plant in Wauna (993 employees) located 70 miles west of Portland along the Columbia River.

**Transportation system usage.** Many of the manufacturing facilities are sited in rural locations close to the forest products, which comprise production inputs. Because much of GP's product is bulky and heavy (e.g., lumber and baled paper), the firm ships predominantly by railroad, but also uses trucks for both importing supplies and shipping product. Barges are used when possible. Rail service is provided by the Portland and Western and the Union Pacific. At the Toledo facility, rail is used for just under 80 percent of shipments, with trucks transporting the remainder of the plant's products. Seventy percent of product from the Wauna plant is shipped via barge to Portland on the Columbia River, where it is reloaded on trucks for distribution. The remainder of product leaving this plant is shipped by truck or rail.

**Transportation issues and concerns.** Because GP's manufacturing facilities are located in remote, rural areas, the firm's transportation issues are not focused on congestion. Rather, transportation concerns center on 1) changes in vehicle size which cannot be accommodated by the existing transportation infrastructure, 2) response to major incidents such as railroad tunnel collapses, construction, and weather, any of which can disrupt shipments for days or months, and 3) interface with tourist/RV traffic along two lane roads.

Semi trucks have increased in length from 48 feet to 53 feet. These longer trucks cannot negotiate turns within the travel lanes on some rural roads, such as unimproved portions of Highway 20 between the Toledo plant and I-5, and are now banned from using this road. As a result, trucks leaving the Toledo plant must travel eight miles west to US 101, north to Lincoln City to Highway 18, and west on Highway 18 to I-5. This affects 400 truck trips per day (200 coming to the plant and 200 leaving the plant, including raw materials, finished product, suppliers, and

vendors), and adds approximately 100 extra miles to shipments headed to or coming from the south. Since GP pays freight shipping based on a per mile cost, this represents a substantial economic burden. Longer trucks are also banned from Highway 35.

A recent rail tunnel collapse along the rail spur serving the Toledo plant eliminated rail shipments for two months. All shipments were diverted to trucks, creating a significant logistical problem and expense for the Toledo Mill. Railroad bridge outages have resulted in similar problems. Weather-related disruptions are also a problem because of the limited options for routing shipments from the coast to I-5. In 1999, landslides blocked Highway 101 in both directions from Newport and also blocked Highway 20. This eliminated all truck shipments until the roads could be cleared or repaired. Limited route options and questions about the future stability and capacity of the existing transportation infrastructure are of significant concern for GP.

The inability to use Highway 20 for truck shipments has increased the interface between summer tourist traffic along Highway 101 and the semi-trailers hauling GP's product. Slow-moving tourist traffic, including many RVs, increase travel time for truck shipments, adding to shipping costs.

GP is experimenting with intermodal shipments, which can reduce shipping costs. However, because rail is not always dependable, the firm does have concerns about its ability to make on-time deliveries using intermodal transport. Changes in production schedules and increases in inventories will be required if the firm decides to use intermodal transportation options for more of its shipments.

## *(D) Harry and David Holdings, Inc.*

**The Company.** Harry and David is a gourmet food company specializing in Royal Riviera Pears. The firm is vertically integrated, including horticulture (the growing of pears), manufacturing (including the making of candy and bakery products for inclusion in gift baskets), wholesale, and retail (136 stores throughout the country.) The company manufacturers or grows 70% of its own product. A large portion of the firm's business is done through catalogue and internet sales. Year-round, Harry & David employs around 3,000 people (with 1800-2000 in Medford). During the peak season (September through December), employment increases to around 10,000.

The company is headquartered in Medford, where it has thousands of acres of orchards, manufacturing facilities (including the assembly of most gift baskets) and a distribution center. The firm has a distribution center outside of Columbus, OH, where some assembly of gift baskets also takes place, and three 500-seat call centers. Two of these (one each in Medford and Columbus) operate year-round. A third seasonal center (September through December) is in Eugene. The firm also has four additional seasonal distribution centers in suburban Philadelphia; Carthage, Missouri; Exeter, California; and Charlotte, NC.

**Transportation system usage.** Harry and David receives supplies from all over the world, including packaging materials, gift boxes, corrugated product, and ingredients for confections. It receives some goods through the Port of Seattle, which are line-hauled by truck to the Port of Portland for distribution to Medford. Harry & David ships about 2,000 truckloads from the Medford plant between September and the end of December, and about 1,200 truckloads throughout the remainder of the year. The company uses air freight through the Medford, Portland, and Ontario, CA airports for many shipments. The firm is the largest cargo shipper out of the Medford airport during the holiday season. Until 12 years ago, the firm sometimes used rail for shipments, but stopped because rail is too unreliable for shipping perishable, time sensitive products.

**Transportation issues and concerns.** The most significant transportation issue facing Harry and David is the difficulty of securing enough trucks to ship its product, particularly during the peak holiday season. The firm uses private trucking companies for shipping, and pays a premium because trucks must deadhead to Medford to pick up shipments. There are not enough businesses in Medford receiving regular shipments by truck to provide backhauling opportunities for Harry and David shipments. As Harry and David continues to grow, the firm plans to increase capacity for manufacturing and distribution at the Columbus, OH site. The firm considered expanding its Medford facilities, but due to the difficulty in securing trucks to meet its shipping needs at the facility, and the limited labor pool available in Medford to meet its employment needs, it chose to expand elsewhere.

Major reasons for missed shipment schedules are congestion and weather. Whether shipping through Portland (north) or Ontario, CA (south), trucks using I-5 must go over mountain passes, and inclement weather often prevents shipments from meeting delivery schedules.

The firm has changed some operations to accommodate the response of trucking firms to congestion in the Portland area. Until recently, trucking firms required five hours of travel time from Medford to make air freight flights leaving the Portland airport. Due to the uncertainty of congestion in the Portland region, the trucking firms now require 6 ½ hours of on-road travel time to ensure they can reach the airport in time to load air freight. In response, Harry and David changed production and distribution schedules to accommodate an earlier shipping time. Now all shipments must leave the plant by approximately 1 pm. Shift schedules have been moved to earlier in the day, and planning is needed to make sure there is a crew available for loading the shipment until 1 pm. The company has realized some additional costs associated with these changes. When overnight shipment schedules are not met, regardless of the cause, "customer failure" occurs, and the company refunds the customer for the cost of the shipment.

## *(E) Intel Corporation*

**The Company.** Intel is a world leader in the development and manufacturing of semiconductors, microchips, computing and communications products. Its customers include original equipment manufacturers, PC and network communication products users, and manufacturers of industrial and communications equipment.

**Transportation system usage.** The company relies on the highway system for shipping between its local manufacturing facilities. Most of its product is shipped by truck to the Portland airport for shipment throughout the world. Its chips are typically used as a component in computer equipment that is assembled elsewhere. The firm's Portland employees rely on both the highway system and the transit system for access to work.

**Transportation issues and concerns.** In the study *Costs of Congestion to the Economy of the Portland Region*, researchers found that congestion is affecting most manufacturing firms in the region, including Intel, in five ways.

- First, firms have adopted earlier start time for shift workers, constraining the ability of these workers to use alternatives to the automobile for commuting.
- Second, firms are experiencing more conflicts between their trucks and non-commercial traffic as residential development is encroaching on industrial areas, and commuting periods start earlier and extend later in the day.
- Third, firms are scheduling delivery and shipment schedules to earlier in the day. Intel has moved their last shipment departure time to 3:30 p.m. from 5.30 p.m. for outbound shipments through PDX to ensure that cargo flights are not missed. A missed flight means loss of inventory and production at the receiving location.
- Fourth, increased variations in delivery times has forced firms to increase inventories, cutting into efficiencies gained in the 1990s as firms reduced inventories through just-in-time delivery methods.
- Fifth, delayed deliveries affects production at plants throughout the U.S. and the world. Delayed or missed shipments from Intel's Portland facilities can shut down production as far away as Costa Rica, China, or the Philippines. These produce a ripple effect at testing and production facilities world-wide. These delays may also result in inventory surcharges and other penalties tied to delays.

## *(F) Jeld-Wen Windows and Doors*

**The company.** Jeld-Wen manufacturers doors and windows. It employs 30,000 people worldwide, with 20,000 at 85 facilities in the US. They have six facilities in Oregon located in Stayton, Bend (2) Klamath Falls (2 including the headquarters) and Chiloquin. Its Oregon facilities are in close proximity to the forest products used in production.

**Transportation system usage.** The company receives shipments from throughout the world. Some of their overseas supplies (including wood and metal fixtures) are shipped through ports on the east coast, the Gulf of Mexico, and Southern California. The firm uses intermodal facilities for shipments throughout the US. It seldom uses the Port of Portland because the carriers serving the port do not serve their markets. The firm generally relies on truck transport because truck shipments travel faster and are more reliable. While trucks can reach Jeld-Wen's facilities throughout the country in two to three days, rail shipments can take ten to fifteen days.

Jen-Wed uses a range of modes for shipping products including LTL (less-than-truckload shipments), home delivery trucks, and 53 foot vans. It uses Fed Ex for small package delivery. The firm ships between 50 and 70 truckloads (mostly 53' vans) per day from their Oregon facilities. Jeld-Wen owns only a small portion of the trucks it uses for deliveries. The company only uses its own vehicles for shipments to destinations within 250 miles of their plants because there are no back haul opportunities for the return trip.

**Transportation issues and concerns.** Between September and December, the firm finds it difficult to get the trucks it needs in the Pacific Northwest due to competition from firms shipping Christmas orders. Trucking firms can command a premium during this period. Jeld-Wen is at a competitive disadvantage because its facilities are located 250-300 miles from Portland and trucks often need to deadhead to pick up its shipments.

The firm's transportation team is evaluated on how well it meets delivery windows and lead times, and its ability to provide the best service at a competitive price. Failure to meet delivery windows can mean lost sales. Congestion in urban areas has caused them to miss a delivery window. The worst congestion is in the southern California area, but it occurs in all metropolitan areas, and is taken into account at the local level. In the Pacific Northwest, congestion on I-5 in both Portland and Seattle and I-205 in Portland can be problematic.

The company has not changed how they deliver product due to congestion, although the transportation team does put more time into planning for shipments to urban areas. When shipping to retailers in large cities, the firm sometimes allows over an hour more time for deliveries than it expects to need. Many of its deliveries (particularly to large home improvement stores) occur during the middle of the night when congestion is minimal. At the same time, some customers give a specific delivery time for receiving shipments, and are not flexible about missed delivery schedules.

## *(G) Les Schwab Tire Centers*

**The Company.** Les Schwab Tire was founded in Prineville in 1952, expanding from a single shop to include 406 stores with more than 7,000 employees in seven states

(OR, ID, WA, CA, MO, NV, UT). The Prineville location remains the company headquarters and includes a retread plant and a 2 million square foot distribution center. The firm's main business is the retail sale of tires although the company also sells some front end vehicle parts. The company sells tires from a number of different manufacturers (domestic and foreign).

**Transportation system usage.** Tires are shipped to Les Schwab via freighters that deliver through the Ports of Portland (primarily) and Tacoma. The company also receives a limited amount of shipments by rail. Tires delivered to the Port of Tacoma are typically shipped to the Port of Portland via rail, which takes 3 to 10 days. Shipping through the ports can be difficult because of variability with the time it takes to receive shipments. Tire shipments are transferred from the port to a Les Schwab distribution yard in Portland. Here trucks pick up tires for delivery to the Prineville distribution center, as well as for delivery to Portland Les Schwab stores. The company uses its own trucks (125 eighteen wheelers) and its own drivers. Shipments to stores are scheduled for morning delivery. The company schedules drivers so that most deliveries can be completed and the truck returned to Prineville in a single day. This allows each driver to make another delivery the next day and keep within Federal requirements for hours a driver can be on the road in a 24 hour period.

**Transportation issues and concerns.** Congestion in the Portland area is the major transportation issue faced by Les Schwab. To accommodate for increasing congestion, the company has made operational adjustments for both supply delivery and product delivery.

Due to increased congestion at the Port of Portland, Les Schwab has developed a shuttle system for transporting tires from the port to its Prineville distribution center. Until five years ago, drivers based in Prineville would pick up deliveries from the Port and return to Prineville with the shipment on the same day. Because congestion in the vicinity of the Port has become more difficult to predict, the company now uses Portland-based drivers to pickup shipments at the Port for delivery to the firm's Portland yards. Then Prineville-based drivers pick up the tires and deliver them to the Prineville distribution center.

For distribution to its stores, the company has adjusted delivery schedules to ensure that Portland area deliveries arrive by seven a.m. to avoid morning peak period congestion. Trucks leave Prineville between 2 and 4 in the morning, leaving an extra hour to accommodate for unforeseen congestion. In addition, the company now ships much of its product to the Portland yard, and has local Les Schwab drivers deliver to the stores in Portland. This "shuttle" program began a year ago to ensure that drivers can leave Prineville in the morning, make their delivery, and return to Prineville the same day. Les Schwab cannot identify a measurable cost increase associated with the shuttle system, because the company has been growing and the increase in Portland-based truckers is more a function of growth than congestion.

Because deliveries are made in the morning, the afternoon commute is usually not an issue. However, as the number of stores grows, the goal to have all trucks leave Portland by noon is becoming more challenging. The firm revises delivery schedules on an annual basis to accommodate increased demand while still getting the trucks out of Portland by early afternoon.

Route choices for the eighteen wheelers Les Schwab uses are limited. The most congested Portland area routes are I-5, I-205, Hwy 217, and Hwy 26. The firm tries to avoid these routes, especially during morning hours. The most used alternate route is Marine Drive.

## *(H) Monrovia Nursery*

**The company.** Monrovia Nursery is an ornamental plant container nursery headquartered in Azusa, CA. The company has a 600-acre farm in Dayton, OR, approximately 40 miles east of Portland. The firm ships plants to customers (primarily retail garden centers) throughout the United States.

**Transportation system usage.** All of Monrovia's products are shipped by truck. The company operates a private fleet (7 trucks based in Oregon) for shipments on the west coast. It uses common carriers for shipments to other parts of the United States. Monrovia's peak season is March through Mothers' Day. The third week in April is the peak week for shipments. During the peak season, Monrovia ships about 16 truckloads/week on its private fleet, and about 20 loads/day on common carriers. It ships 1,100 truckloads of product throughout the year.

**Transportation issues and concerns.** Congestion on Highway 99W now creates problems for Monrovia. The company generally ships its product to Seattle and other locations on the coast in the evening for early morning delivery. Drivers stay overnight near their delivery site. Until the past few years, the company dispatched trucks as soon as they were loaded. To avoid congestion, the trucks now do not leave the Dayton facility until after 6 p.m. While this practice does not result in a direct cost to the company, it does reduce the amount of sleep the drivers get.

Congestion does result in costs to the common carriers hired by Monrovia. Monrovia requires that trucks be available to start loading at 7:30 am. Trucking firms making deliveries to Portland businesses in the morning can no longer get to the Monrovia facility by 7:30 due to morning peak period congestion. This means that the trucks lose a full day before they can be reloaded at Monrovia.

Another issue for the trucking firms is that some of the county roads between Dayton and I-5 require county permits for large trucks. Many of the out-of-state trucking firms are not aware of the permit requirement, and are often ticketed. There are also weight limits on some roads (e.g., Hwy 47) while not on others. Trucking firms find it difficult to keep track of these inconsistencies.

## *(I) Powell's Book Store*

**The company.** Powell's Book Store is the largest independent seller of new and used books in the world. The firm has eight stores in the Portland area as well as national internet sales.

**Transportation system usage.** All products bought and sold by Powell's Books in Portland are shipped by truck. All new books sold at the firm come from a distributor in Roseburg and an out-of-state supplier. The firm operates an internet site, and ships products throughout the United States, some of which is sent by air.

**Transportation issues and concerns.** For retailers such as Powell's Book Store, the customer "drives" the delivery schedule. If a customer wants a shipment the next day, the firm must meet that demand or risk losing the customer. Congestion is making it more difficult to meet customer demands. The reliability of the transportation system directly effects the firm's inventory levels or the number of trucks that must be used to move shipments. If the roadway system is congested, the firm either needs to double inventories, or add more trucks to move the same volume of product to its eight locations. Additional congestion will require new operational changes to meet delivery schedules, and these changes will come with a cost. Businesses in the Pacific Northwest are at a locational disadvantage as they are further from major population centers in the U.S. An efficient transportation system is essential to overcome this disadvantage.

## *(J) Roseburg Forest Products*

**The company.** Roseburg Forest Products, located in Dillard, manufacturers plywood, particle board, laminated beams, lumber, and wood chips. The company has facilities in Oregon and in the southeastern United States, and ships to customers throughout the country. The company has over 4,000 employees nation-wide.

**Transportation system usage.** Approximately 70% of Roseburg's product is shipped by rail and 30% by truck. The firm occasionally uses barge for some shipments. The company owns trucks, and also uses several hundred private carriers. Roseburg ships to major home improvement stores as well as distributors.

Until recently, the firm used rail for shipments throughout the U.S. Due to changes in shipping rates, most rail shipments now occur in the I-5 corridor, and the firm relies on trucks for shipments to other parts of the country. Roseburg has a heavy concentration of customers in California, Arizona and Nevada. Major routes used for trucking include I-5, I-84, and I-80 (in CA).

**Transportation issues and concerns.** Overall, transportation vehicles (rail cars, semis, containers) are getting bigger, allowing more volume to be shipped in a single vehicle, thus reducing costs. However, the existing transportation system cannot

adequately accommodate larger vehicles. While the roads to the coast have been improved in recent years, Highways 42 and 38 must be straightened and widened. On Highway 38, the Scottburg bridge needs improvements to reduce curves on each end of the structure.

Southern Oregon needs better routes heading east. Right now, all freight headed east must be trucked north on I-5 to I-84, or south on I-5 to I-80, adding 200 miles to each trip at a cost of $.50-$1.00 per mile. This affects 15,000 trucks per year for Roseburg alone. As businesses expand, more shipments are headed east, increasing this cost. Roseburg would benefit from improvements to and extension of Route 138 from Roseburg to Diamond Lake where Route 138 intersects with Highways 230 and 62. The firm advocates for improvements that would allow trucks to travel from Roseburg to Riley on Route 138.

I-5 is becoming dangerous due to increased traffic levels on this 1950s era four lane road. I-5 needs another lane in each direction to accommodate a growing mix of truck and passenger vehicles. The mountainous terrain in southern Oregon forces trucks to travel at 20 mph on I-5, while passenger cars travel at 60 mph. This causes dangerous conflicts. The addition of a concrete divider between south- and north-bound lanes has helped, but is not sufficient to address the problem.

Congestion in the Portland area can also add costs to Roseburg's shipments. The area along I-5 between Eugene and the Washington border is growing rapidly, and the highway system cannot handle the increased traffic. A recently-added truck lane in the Portland area has helped, but more is needed. The trip from Roseburg to Portland used to take 3 hours. Now the trip requires four to four and one half hours. Trucking companies now plan for two additional hours for loads going to or through Portland, and are changing shipping schedules to avoid rush hour and other congested times. Routes 217 and 205 are also areas of congestion.

Road capacity issues are affecting business location decisions for firms in southern Oregon. Roseburg recently purchased 7 particle mills in the eastern US. The firm considered expanding its facilities in Roseburg instead of buying these facilities, but decided against the expansion. One significant issue affecting this decision is the limited transportation system available for east-bound shipments. More roads and lanes are needed to support business expansion and growth in southern Oregon.

Rail shipping costs, reliability, and availability each contribute to concern about shipping product by rail. Eugene, OR is a major trouble spot for rail shipments. After the Union Pacific merger in 1996, UP converted Roseville, CA and Hinkle, OR into super hubs. They removed 6 miles of track from the Eugene facility, greatly inhibiting its capacity. Also, due to interchange issues between the Burlington Northern Santa Fe railroad and the Union Pacific, three days can be lost on shipments through Portland.

The rail connection between Coquille and Coos Bay is in bad condition. This is of major concern, as the Port of Coos Bay has the capacity to expand, and in the next several decades, more product may be shipped through this port. Investment in the rail spur serving Coos Bay will be essential to meet future demand. However, right now there are not a lot of customers for this line, and investment in the line is minimal. Recently the line needed to close for two months due to a tunnel collapse, and bridge repairs further impeded service.

Over the past three years, rail shipping cost increases have decreased the desirability of using rail for shipping to many parts of the country. Changes in rail rates are tied to the fuel surcharge imposed by the railroads. In June 2003, the fuel surcharge was 2% of the base charge. This increased to 13.5% in May 2006, and has gone as high as 18.5%. The fuel surcharge has also increased for trucking, and is now $.33/mile.

## *(K) Smith Frozen Foods, Inc.*

**The company.** Smith Frozen Foods, located in Weston in northeastern Oregon, processes peas, corn, carrots and lima beans for sale throughout the United States and abroad. Most of the produce used in Smith products is grown within 60 miles of the plant in Oregon and Washington. During the busy processing season (6 months per year), employment at the plant increases from approximately 200 people to 500 people. Packaging and shipping occur twelve months per year at the plant.

**Transportation system usage.** All produce comes to the Smith plant via truck. The company leases 28 foot long trucks to bring peas to the plant, and hires common carriers to bring the remaining vegetables to the plant on 40 foot trucks. Smith uses trucks, rail, barge, and freighters to ship its frozen product to its customers. Rail is used to ship goods south (primarily Texas) and to the east coast, barge carries product to Portland, and trucks are used for destinations in the United States (primarily the west coast) and to the Port of Seattle for shipment by freighter overseas.

**Transportation issues and concerns.** Rail service and cost are the biggest transportation issues facing the company. Class I rail carriers are not currently providing reliable service. Additionally, the cost of shipping by rail has increased dramatically. Rail rates have increased approximately 48 percent over the past four years, while truck rates have increased by 34 percent. Most of the truck increase is due to fuel costs, while most of the rail cost increase is due to rate increases. Four years ago, the cost to ship by rail was cheaper than shipping by truck for destinations more than 500 to 700 miles from the plant. Now trucks are more cost effective for any destination within 1,000 miles of the plant.

The firm trucks a lot of product to California. Fuel costs have affected the firm's market reach. Increased fuel costs have made the firm less competitive on the east coast. Conversely, the California market has grown because Smith can transport goods to that market more cheaply than firms located in the mid-west and east.

The preferred route for shipments to California is through central Oregon on Route 97 to Bend and then on to I-5 at Weed, CA. This is the shortest route in miles, so the least costly. However, some trucks will not use this route because it is a two-lane, undivided road. Further, the route can be difficult to navigate during the winter months. Many of the agricultural businesses located in northeastern Oregon would benefit if the state implements plans to improve Route 97 to a four-lane road. Congestion is not an issue for the firm within Oregon. Any product it sends to Portland is shipped by barge, thus avoiding congested highways.

Smith does not ship much product from the Port of Portland because too few ships that handle refrigerated product use the port. Smith Frozen Foods supports dredging the channel in Portland to allow more ships to serve the port. Currently, the company ships product through the Port of Seattle, and the land transportation costs for reaching this port result in higher costs for Smith's customers.

## *(L) Weyerhaeuser Company*

**The company.** Weyerhaeuser, a Fortune 500 company, is an international forest products firm with over 54,000 employees world-wide. Products include building supplies, paper, pulp, and packaging. The firm has several facilities in Oregon, including operations in Portland, Beaverton, Stayton, and Dallas, a paper mill in Albany, a saw mill in Lebanon, and six facilities in Eugene that make paper and engineered wood products.

**Transportation system usage.** Weyerhaeuser uses Union Pacific both for importing product (scrap paper, components for industrial wood products, OSB, veneer) and exporting product (lumber and paper). These shipments parallel the I-5 corridor from Longview, WA to southern California and into Tijuana, MX. The firm also ships through the central corridor in California. The Los Angeles basin is the largest receiving area for the firm's products. Customers are primarily box manufacturers and home manufacturers.

**Transportation issues and concerns.** Weyerhaeuser experiences rail problems in Hinkle and Eugene. When the Union Pacific and Southern Pacific merged in1999, the company reduced the ability of the Eugene yards to handle volume. Classification yards were moved to other locations such as Redding, CA. All traffic bound for California goes through Eugene, and Weyerhaeuser is the largest industrial products user of the Union Pacific in the I-5 corridor. Excessive delays can cause shipments to lag by as much as one week. The company has a 90% on-time commitment for rail shipments, and is currently only achieving 75%. (The on-time commitment for truck shipments in 98%.)

Weyerhaeuser has its own trucking firm located in Albany, OR, which handles about 100,000 truckloads of product each year. Rail is used more frequently because the product is bulky and trucking costs 25% more than shipping by rail. The firm ships about 40,000 rail car shipments per year. Each rail car holds 3-4 truckloads of

product. Trucks are used when the shipment is time-sensitive because the company has more control over truck shipments.

The capacity of I-5 to handle current traffic volumes in southern Oregon is a major concern. The four lane (two lanes in each direction) highway is not sufficient to handle the ever increasing volumes of truck traffic using the facility.

Weyerhaeuser also would benefit from additional port improvements. The state needs to attract more liners and improve coastal barge facilities. The company ships a lot of its lumber by barge through Columbia City and Coos Bay. Weyerhaeuser would ship more product by barge if the capacity to do so existed.

## *(M) Summary of Other Portland Area Interviews*

Besides the detailed interviews discussed here, there were additional interviews conducted earlier for the Portland Cost of Congestion study. They covered: region-serving organizations, retailing and wholesaling, manufacturers and transportation/ warehousing companies. Key findings from those interviews are shown below.

**Region-Serving Organizations.** Both Providence Health Systems (PHS) and Portland General Electric (PGE) provide regional services for the Portland area, and both maintain extensive logistics support functions to respond to both routine and emergency demands.

PGE, the electric utility, has a central load management center and nine crew dispatch centers. The effects of congestion have influenced how PGE responds to both routine and emergency repair needs. For instance, PGE has added pre-positioned emergency crews. It has also absorbed extra costs for contract trimming and line crews. PGE estimates that the travel time penalties for these crews has increased by between 20 and 30 minutes in the past 7 years. This adds between $30 and $50 per day to the costs for each of the 36 crews currently employed year-round.

PHS has four hospitals and 29 clinics in the region. It has responded to growing congestion by adjusting its supply distribution system. A decade ago, most deliveries to hospitals and clinics from the central warehouse were made in the 9 AM to 3 PM period. Today, most deliveries to nearby hospitals are made in the early mornings or late evening hours. Unpredictability of delivery times to hospital receiving areas due to congestion has also raised costs in hospital loading areas, as workers wait for deliveries that may be delayed. Deliveries from the central warehouse to the West Side have become particularly difficult, requiring PHS to implement plans for a new satellite warehouse there

**Retail, Wholesale and Distribution Companies.** Interviews with Fisher Farms, Columbia Sportswear, Powell's Books, OrePac, and Fred Meyer found common concerns:

- **Regional Distribution Centers Moving Outside of Metro Region.** The ability to serve both metropolitan area and broader state markets is affected by congestion inside the region. (For instance, over 6,000 truckloads per week (inbound + outbound) are required just to operate the Fred Meyer Distribution Warehouses on Highway 212.) Every one of the businesses reported increased difficulty serving retail outlets in Oregon outside of Portland area. Increased travel times that result from congestion effectively shrink the distribution radius of existing operations, making both existing service and expansion into new regional markets more difficult. The biggest factor in providing logistics support outside of the metropolitan area has to do with the fact that congestion limits the morning outbound and afternoon return times. Some firms (e.g., Fisher Farms) are serving customers 1,000 miles away and finding local congestion a major factor limiting extension of its market area. .

- **Shift Support Functions to Earlier Start Times.** Congestion has significantly reduced, and in many cases eliminated afternoon stock/merchandise deliveries. Early morning deliveries are now required to support stocking in the morning or during swing shifts. This creates problems in mixed residential areas with noise. Some distribution warehouse/loading operations begin these swing shifts at 2 AM, especially if they distribute beyond the metropolitan area.

- **Adding More Delivery Vehicles.** When large trucks are held up by traffic delays, distributors may dispatch small delivery vans or hire common carriers to fill missed or delayed shipments. While this keeps customers happy, it adds to costs and increases congestion on the region's roadways. Outsourcing can add 35% to delivery costs. Other firms are responding by paying for smaller and more numerous delivery vehicles to provide more flexibility for delivery of urgent or missed orders.

- **Increased Inventory.** Reliable delivery schedules allow for efficient "just-in-time" processing, but delays undo those opportunities for business efficiency. As a result, businesses with chronic delivery problems have had to increase inventories by as much as 5% to 8% compared to 5 years ago. Some of that is due to road congestion and some to railroad delays. OrePac estimates that congestion in the past 3 to 4 years has forced them to increase inventory by over 7%.

**Manufacturing Industries.** Interviews with Blount, Gunderson, Boeing and Schnitzer Steel (as well as Intel, profiled separately) found that they face common issues.

- **Earlier Start Times for Shift Workers.** Earlier start times for shift workers are becoming standard as roadway congestion makes constrains the ability to move finished materials to consignees. Early start times and staggered shifts mean that alternatives to auto commuting have to address very early start times and the effects on second-shift start/end times.

- **Rescheduled Deliveries/Shipments.** Most firms are involved in on-going review of routings and have developed methods for "on-the-fly" rerouting or regular adjustment of departure times, loading and preparation of loads for delivery and other measures. However, some firms – particularly those with large, heavy loads moving between established manufacturing operations, do not have the flexibility to make these adjustments. Slower turn-around between plants requires adding more vehicles to sustain production, adding shifts, or cutbacks in production schedules. For instance, Schnitzer Steel supplies its McMinnville plant using scrap metal barged into the region and off-loaded at the Port of Portland. Maintaining production in McMinneville requires that 40 trucks make 3 round-trips (turns) per day. When congestion increases the time "per turn," either extra trucks or later runs have to be scheduled. Costs increase and productivity goes down.

**Transportation and Warehousing.** Interviews with SYSCO, Oregon Transfer, USF Reddaway, and George S. Bush Logistics found the following common issues:

- **Shift Starts and Relief Drivers.** In the case of the transportation and warehousing industries, first shift start times for drivers have been moved to very early in the day – often 4 AM to 6 AM. This is because afternoon congestion has become a problem for firms with scheduled deliveries or routes, and most firms want to avoid overtime pay or violating state/federal regulations on truck driving hours (typically 11 hours per day within Oregon). Some firms have begun to rely on "rescue drivers" to avoid those situations. However, the total cost per hour for a driver is between $35 and $55, and sending out a "rescue driver" can double or triple the hourly costs. Rescue driver dispatch usually occurs during periods of heavy congestion, so, costs for these operations can become expensive.

- **Delivery/Shipment Patterns.** Shifting early morning dispatches to the 4 AM to 6 PM time slots requires even earlier start times for loading and support personnel (2 AM to 3 PM). Dispatch times are limited by the ability to prepare and load trailers from the time they arrive in the afternoon to the time that they are scheduled to depart in the early morning. The ability of warehouse operations to assemble loads and stage them for loading in the evening shifts, reposition trailers based on available dock/door capacity, and stage trailers for departure is constrained by available time between drop off and whenever trailers with backhaul materials are ready. Increasing the trailers on-site is limited by available space and adds cost for redundant equipment. Very early dispatch times are also limited by the ability of businesses to receive goods in early morning hours.

- **Increased "Stem Times"** The time it takes to get from the warehouse to the first stop/delivery (stem time) has increased by about 50% in the past 5 to 8 years. There has led to more vehicles on the road (to maintain service to distribution and trucking markets) and routes are changed more often. Also, east-west movements

are much more difficult than they have been in the past and have required constant adjustments in scheduling drivers and deliveries. Uncertainty in travel times is also a concern. For instance, USF Reddaway depends on each driver making 15 to 20 deliveries per 8-hour shift. Increases in stem times or delays along the route of even ½ hour can mean missing 2 or more deliveries – even if there are no more congestion-related delays for the rest of the run.

## 3.3 Interview Conclusions

Altogether, the business interviews uncovered a number of important transportation issues and concerns facing businesses in all regions of the state. These can be grouped into four categories:

**Congestion delays and incidents due to traffic exceeding capacity**

- **Decreasing "windows of opportunity" for deliveries.** Due to evening peak period congestion, most firms making deliveries in Portland have shifted operations to accommodate morning deliveries. However, as traffic volumes grow in the morning peak period, highway capacity is shrinking sufficiently to limit the efficiencies of morning hour operations. Since there are limited options for further shifting delivery schedules, the continued increase of peak period congestion will have serious negative impacts on business operations. This issue not only affects firms making deliveries in Portland, but also any firm that uses the regional highway network to ship goods through Portland to other destinations.

- **Delivery costs.** Businesses incur costs in several ways as they work to meet delivery schedules while adjusting for the uncertainty of congestion and deficiencies in the transportation system. Companies have added up to two hours of additional lead time for shipments made to or through Portland to ensure they meet delivery schedules. Some firms that previously included orders for multiple destinations in a single truck now split these shipments among multiple trucks, increasing the cost of fuel, labor, and vehicle "wear-and-tear".

  Despite efforts to adjust for congestion, shipments sometimes do not make a set delivery window, resulting in poor customer relations, lost sales, and customer refunds. Missed delivery windows can mean that truckers must stay overnight at their destination, delaying other shipments scheduled for the truck and adding lodging costs. Firms increasingly use the internet to track areas of congestion and reroute shipments accordingly. This can add costs to the customer for increased mileage and to the shipper for increased driver time. The number of shipments being rerouted continues to increase.

Some Portland-based regional employers like Providence Health Systems, provide "mission critical" services, routinely respond to emergencies, and cannot tolerate missed deliveries or delays. For these businesses, effective responses to congestion are critical. At a substantial cost, these businesses have adopted complex internal logistical support systems to respond to congestion-related delays.

- **Shifting production schedules and operations.** Because trucking firms have added to the lead time for some shipments, companies have had to adjust production and loading schedules to accommodate earlier departure times. Some companies have incorporated late night-early morning production schedules. Loading shifts may start as early as 2 a.m. These shifts do not have direct costs to the businesses, but may affect employee productivity and labor availability in the future. For companies located in Portland, earlier shifts limit non-auto commuting options for workers.

- **Interface between large trucks and passenger vehicles.** As both truck traffic and passenger vehicle traffic increase on roads throughout the state, there are some locations where the interface between large trucks and passenger vehicles results in both higher costs to businesses and potentially dangerous conditions. New, longer trucks used to ship goods from businesses along the coast must travel on Highway 101. During the summer season, trucks often get stuck behind slow-moving RVs and other tourist traffic, increasing the time needed to complete deliveries. These delays have a negative impact on shipping costs. In the mountainous area of southern Oregon, trucks traveling on Interstate 5 must travel at reduced speeds. At the same time, passenger vehicles travel at the speed limit. As traffic volumes increase, the interface between trucks and passenger vehicles is increasing, creating dangerous conditions on this four-lane highway. More travel lanes or passing lanes on inclines are needed to alleviate this problem.

- **Increased inventory costs.** Firms must have supplies available to meet production schedules. When congestion regularly interferes with supply deliveries, firms need to increase their inventory on-site to ensure they can continue to meet customer orders. Increased inventories add to production costs.

**Intermodal connections**

- **Costs of missed connections.** Many companies utilize two or more modes for transporting goods. Roadway congestion can cause truck shipments to miss connections at ports and airports. Costs of missed connections can include fees for storing freight at the port for up to a week, additional truck transportation costs for returning the shipment to its origin, penalties for late deliveries, and refunds to customers for unmet overnight delivery

commitments. To avoid missing connections, some companies are sending truck shipments a day in advance, and absorbing the cost of overnight lodging for the driver.

- **Limited and unreliable intermodal options.** Many companies shipping heavy and bulky goods prefer to ship via rail or freighter. However, several firms cited the limited number of liners serving the Port of Portland, delays accessing the port, and the unreliability of rail service as reasons that they often opt for shipping by truck despite a higher cost. Shippers find meeting on-time commitments especially difficult with rail. Firms adopting intermodal shipping to reduce costs are finding they must increase inventories due to unforeseen delays and uncertainties.

**Infrastructure limitations that cause longer distance truck routing**

- **Insufficient and limited capacity east-west shipping options.** Many resource-based businesses must locate in more remote agricultural and forested regions of the state. However, these areas, particularly along the coast and in southern Oregon, have limited options for shipping goods east and west. Some businesses must truck their products up to 200 miles north or south before connecting to a major east-west highway, adding considerable costs to the companies and their customers, and thus making them less competitive. Many of these firms rely heavily on rail for transporting goods, and are particularly susceptible to rail tunnel collapses and bridge outages which require rerouting shipments by trucks over circuitous routes. Limited transportation access is considered in business expansion decisions, and has factored into the decisions of some firms to expand at plants outside of Oregon with better transportation access.

- **Changes in technology outpacing the capacity of existing infrastructure.** The transportation problems faced by businesses in more rural locations are exacerbated by changes in the size of vehicles and vessels used to ship goods. Trucks, ships and rail cars have all increased in size, allowing more product to be included in a single shipment, ostensibly reducing shipping costs. However, not all the state's transportation infrastructure is able to accommodate larger vehicles and vessels. Semis that used to be 48 feet long are now only being manufactured at 53 feet long. These longer vehicles cannot negotiate the curves and narrow width of some rural roads, and are banned from using them. Shipments on these larger trucks are forced to travel on less direct routes to their destinations, adding to shipping costs. This is also an issue for the Ports, which are not all equipped to handle larger vessels, and some railroad tunnels that cannot accommodate double stacked cars.

**Location requirements that cause network access limitations**

- **Increased costs due to deadheading to/from rural locations.** Resource-based firms are often located in remote areas away from other manufacturing or distribution facilities. Therefore, they pay a premium for common carriers to make deliveries and pick up product because these carriers must travel empty either to or from these businesses. During periods of high demand, these businesses may be unable to secure trucks for receiving or shipping goods. The higher cost of securing transportation services for these firms has influenced some businesses to expand in more economically diversified locations outside Oregon. To address this issue, more economic diversity or better connections to the broader transportation network are needed in these areas of the state.

# 4 TRAVEL CONDITIONS

Prior chapters showed the many ways in which Oregon's business activity and economic base are vulnerable to delays caused by highway system limitations and congestion. The next logical step is to assess how traffic conditions are expected to change in the future. This chapter presents current travel conditions and two scenarios for the period from now to the year 2025: (a) a *Future Base Case* that maintains current spending levels in real terms (i.e., increasing spending just enough to keep with inflation), and (b) an illustrative alternative, referred to as the *Improved System Scenario*, that requires additional funding to better meet future needs.

Transportation forecasting models show that the *Future Base Case* will not keep up with traffic growth, resulting in increasing limitations and delays for many areas. The vehicle hours traveled for cars and trucks are expected to grow annually, rising to roughly 1 million hours of additional delays per weekday (and 338 million hours per year) of additional travel time annually) by 2025. These are substantial numbers that will negatively affect the quality of life for many Oregonians and have a particularly strong impact on the state's business and jobs base.

While the *Improved System Scenario* will not fully solve the problems associated with the transportation system, it will substantially hold down the growth of traffic delay (compared to the Future Base Case). It will help to maintain the quality of life for Oregon residents, allow local businesses to more efficiently deliver products and services to customers, and retain the competitive position of Oregon for national and international businesses, including manufacturers as well as the wholesale and distribution businesses that serve them.

## 4.1 Profile of Current Travel Congestion

***Conditions in Oregon.*** Table 4-1 shows travel data for cars and trucks under current conditions (2005) for Oregon. Altogether, vehicles in Oregon now average speeds of 38 miles per hour along with an average trip length of 7 miles. However, trucks have a higher average trip length, reflecting the longer highway distances often involved in cargo deliveries between producers, suppliers of their materials, and customer markets. Freight movement distances are typically longer than household trips for shopping, commuting and personal travel. That can make truck trips even more susceptible to traffic delays if we allow the traffic bottlenecks and routes with truck limitations to expand over time.

**Table 4-1. Current Road Conditions in Oregon** *(average weekday)*

| *2005* | *Car: Business Trips* | *Car: Commute Trips* | *Car: Personal Trips* | *Freight Truck Trips* | *All Trips* |
|---|---|---|---|---|---|
| **Vehicle Trips** | 1,515,000 | 3,099,000 | 7,517,000 | 977,000 | 12,926,000 |
| **Vehicle-Miles of Travel** | 10,337,000 | 21,080,000 | 51,370,000 | 9,596,000 | 92,383,000 |
| **Vehicle Hours of Travel** | 251,000 | 635,000 | 1,347,000 | 204,000 | 2,437, 000 |
| **Average Miles per Trip** | 6.8 | 6.8 | 6.8 | 9.8 | 7.1 |
| **Average Miles per Hour** | 41.1 | 33.2 | 38.1 | 47.3 | 37.9 |

*Source: Traffic model studies provided by Oregon Department of Transportation and Metro, with ratio calculations by EDR Group. Note: All numbers have been rounded to simplify viewing.*

It is important to note that these differences between car and truck trips hold for both the Portland region and the rest of the state. Altogether, the Portland metro area accounts for 43% of the total vehicle-miles of travel occurring across the state. Trip lengths tend to be shorter within the Portland area (averaging 5.7 miles for cars and 7.1 for trucks in the Portland area, compared to 8.4 for cars and 11.0 for trucks in the rest of the state). However, in all cases, the truck trips are longer than the car trips.

The measures of daily average travel conditions shown in the preceding table mask the extent of greater delays already occurring during peak time periods. At peak times, there is already congestion occurring as traffic levels approach the capacity of highway links in the Portland area, Salem and Eugene metropolitan areas, as well as along intercity portions of I-5 in the Willamette Valley and Rogue Valley. The *Statewide Congestion Overview for Oregon* (Oregon DOT, Transportation Planning Unit, 2004) confirms that significant peak period traffic congestion is currently affecting portions of I-5 and I-84, the major interstate highways across Oregon. It also shows peak period congestion affecting parts of OR-22 in the Salem area, I-105 in the Eugene area, OR-62 in the Medford area, and I-205, US-26 and I-405 in the Portland area. Estimates developed for this study (using data from Oregon DOT, Metro and Texas Transportation Institute) indicate that weekday congestion delays are affecting over 11% of traffic movement (vehicle-miles of travel) across the state.

There is another form of travel delay, which occurs during peak summer seasons when traffic levels rise along two-lane roads in rural areas that serve major coastal recreation destinations. In some of these areas, winding mountain routes, steep grades and lack of passing lanes all act to constrain traffic capacity. It is estimated that another 7% of annual traffic movement (vehicle-miles of travel) across the state is affected as a result by seasonal traffic slowdowns and delays in recreation areas.

The extent of already-existing delays is not surprising, given trends indicated in the *Statewide Congestion Overview for Oregon.* That report showed that traffic levels across Oregon have continued to rise faster than population growth since 1980. In fact, it shows that annual vehicle-miles of travel per person increased 80% during the

1980-2002 time period, and that this statewide traffic growth has been at a level four times greater than the increase in roadway lane-miles.

## 4.2 Scenarios for Future Travel Conditions

To assess the need for additional capital investment, it is necessary to first define a "Future Base Case" which represents normally expected levels of capital investment and then an alternative case (referred to as the "Improved System Scenario") which represents more aggressive investment in transportation capacity and services for the period from 2005 to 2030. To maximize the credibility and usefulness of this analysis, it is important that these cases be defined in ways that are deemed realistic.

For both the "Future Base Case" and "Improved System Scenario," this study used scenarios from the OTP -- *Oregon Transportation Plan* (Oregon DOT, Planning Section, Transportation Development Division, 2006).

- The "Future Base Case" assumed for this report is the policy scenario of OTP Level 2 (also referred to as "Reference Scenario"), which has expenditures on highways and transit facilities in Oregon growing to keep up with inflation from 2005 to 2030. This is far better than the worst case scenario of OTP Level 1, which holds current funding constant for 25 years without any upward adjustment for inflation. By using a more believable Future Base Case, the impacts of future travel time changes will appear smaller but also more realistic than would result from assuming the worst case scenario.

- The "Improved System Scenario" examined in this report is the policy scenario of OTP Level 3 (also referred to as "Major Improvements 2"), which assumes enhanced funding to modernize facilities and improve freeway capacity to better keep up with growth travel needs associated with growth of Oregon's economic and population base.

- For both policy scenarios, forecasts of future changes in travel conditions were developed by Oregon DOT using its statewide transportation and land use model. Those results were calculated for all of Oregon outside of the Portland region, and then combined with Metro's more detailed transportation model results for the Portland region (for similar types of scenarios, which were referred to as "Planned Investments" and "Improved System" scenarios in *The Cost of Congestion for the Portland Region*, 2005).

## 4.3 Future Base Case Scenario

***Forecast Changes.*** Under all future scenarios, travel conditions are forecast to change as Oregon's population and economic base continues to expand. Under the "Future Base Case" scenario, total vehicle hours of travel for the state of Oregon are projected to increase by over 1 million from current conditions to the 2025 Future Base Case. This number represents the change for an *average weekday*; annually this scenario would result in over 338 million more vehicle hours of travel.

Table 4-2 illustrates that these added hours are not just a result of more people being on the road. For both cars and trucks, average speeds are projected to decrease. The changes are even more pronounced for trucks than for cars. Since the most important aspect of travel for trucks is time on the road, the 54% increase in vehicle-hours of travel and the 12% decrease in speed both reflect the projection of longer travel times and greater delays for trucks by the year 2025.

**Table 4-2. Change in Traffic Conditions Under the Future Base Case Scenario**
*(Percentage Change from Current Conditions, avg. weekday)*

| | Cars | Trucks | Daily Total |
|---|---|---|---|
| **Vehicle Trips** | | | |
| 2005 "Current Conditions" | 12,131,000 | 795,000 | 12,926,000 |
| 2025 Future Base Case | 16,206,000 | 1,142,000 | 17,348,000 |
| **Percent Change** | **+ 34%** | **+ 44%** | **+ 34%** |
| **Vehicle-Miles of Travel** | | | |
| 2005 "Current Conditions" | 82,787,000 | 9,596,000 | 92,383,000 |
| 2025 Future Base Case | 109,389,000 | 13,606,000 | 122,995,000 |
| **Percent Change** | **+ 32%** | **+ 42%** | **+ 33%** |
| **Vehicle-Hours of Travel** | | | |
| 2005 "Current Conditions" | 2,233,000 | 203,000 | 2,436,000 |
| 2025 Future Base Case | 3,142,000 | 312,000 | 3,454,000 |
| **Percent Change** | **+ 41%** | **+ 54%** | **+ 42%** |
| **Average Miles per Hour** | | | |
| 2005 "Current Conditions" | 37.1 | 47.3 | 37.9 |
| 2025 Future Base Case | 34.8 | 43.6 | 35.6 |
| **Percent Change** | **- 6%** | **- 8%** | **- 6%** |

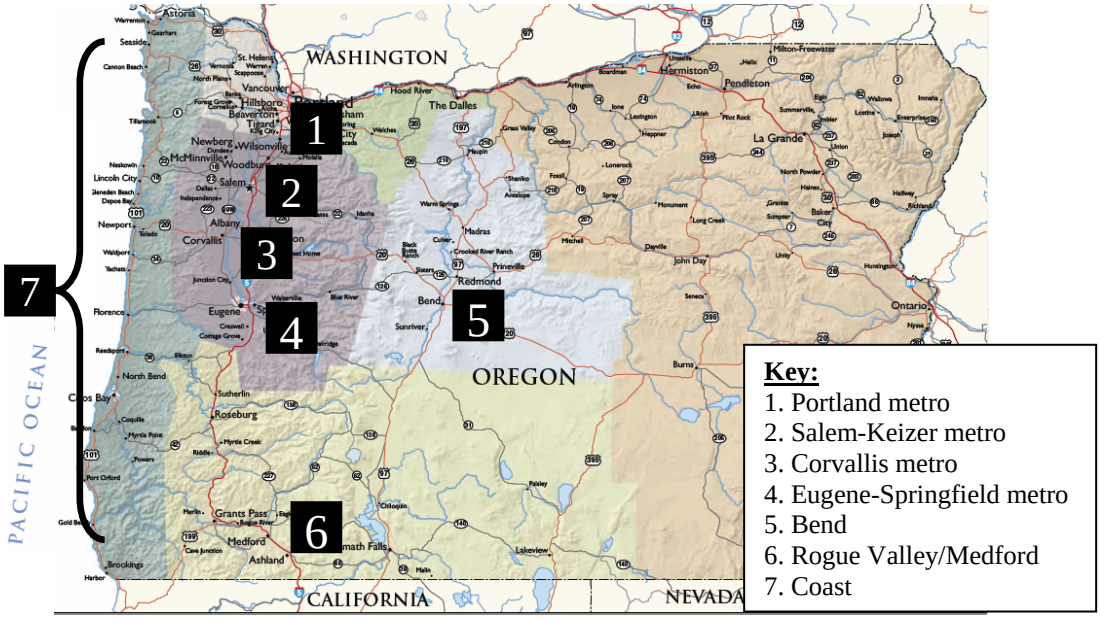
*Source: Traffic model studies provided by Oregon Department of Transportation and Metro, with ratio calculations by EDR Group. Note: All numbers have been rounded to simplify viewing.*

Slower traffic movement and longer travel times are forecast for both the Portland area and rest of state, as total vehicle-hours of traffic are forecast to increase by 47% in the Portland area and 35% in the rest of Oregon. In fact, increasing delays are

expected in many urban areas of the state besides the Portland area. They include the metropolitan areas and highway corridors of Salem-Keizer, Eugene-Springfield, Corvallis, Bend and Medford areas. They also include intercity portions of I-5 in the Willamette Valley and Rogue Valley, as well as smaller cities dotted along Oregon's scenic coast. (See Figure 4-1.)

In many of these areas, the forecasts of increasing traffic delays result from growing traffic volumes in combination with limited road options, geographically constrained land use patterns, rising tourism and recreation activity, and congestion bottlenecks. In other areas, a combination of high truck volumes, difficult grades for heavy vehicles, lack of passing lanes for getting around slow moving vehicles, and congested interchanges all contribute to travel delays that are projected to become worse in the future.

**Figure 4-1. Areas with Increasing Congestion and Delays**




From the viewpoint of Oregon's business base, it is particularly notable that forecasts show the vehicle-hours of *truck travel* to almost double by 2025 in the Portland region, while also going up 38% in the rest of the state. This finding reinforces the fact, implied by the Chapter 2 interviews, that truck growth serving Oregon's economy can cause that element of traffic to be particularly hard hit by projected growth in travel times and delays.

Of course, rising congestion facing trucks in the Portland area also affects downstate businesses that depend on trade with the Portland area, or that depend on access to Portland's air, sea or rail terminals. It similarly hits any firms in the state that depend

on incoming supplies or outgoing deliveries that must pass through that area or along other congested parts of the I-5 spine.

***Additional Effects on Travel Conditions.*** The projected changes in travel conditions shown earlier in Table 4-2 are based on forecasts of *average* travel times and speeds. However, it is well known that congestion not only slows traffic speeds, but it also increases *variability* in travel times. When congestion becomes severe (i.e., traffic levels exceed 90% of road design capacity), the frequency of incident-related delays increases dramatically. Under those conditions, any minor accident, flat tire or engine stall can lead to traffic backups and long-lasting slowdowns. This increases the unpredictability of travel times on affected routes. When such traffic incidents occur, the time delays are often double or triple the average delay due to congestion alone. This can be particularly troublesome in areas of the state with limited transportation routes to serve as an alternative. As occurrences become more common, travelers and businesses adjust their schedules to allow for this uncertainty. The result is further time built into commuter and business delivery schedules.

Increases in travel times around the state also affect *market access*. As travel speeds slow, the delivery market that a business can serve within any given time period shrinks. So too does the labor market from which a business can draw for its workers. The decrease in speed for trucks results in a smaller market within reach than under current conditions. As increases in travel times also increase schedule uncertainty, the result is yet further shrinkage in job, shopping and delivery market access in addition to the previously cited effects on travelers.

Another important form of access for Oregon's businesses serving regional and national markets is truck access to the international airport and international marine port facilities, as well as intermodal rail facilities, located in the Portland area. Under the Future Base Case Scenario for the year 2025, average daily travel times to the Portland area are projected to be 15-20 minutes longer from Lane, Douglas, Coos, Curry, Josephine, Jackson and Klamath counties. Of course, those are 24-hour averages; actual travel delays are expected to be double those values at peak times.

In the long run, slower travel movement and rising travel times can cause businesses and households to shift their locations to compensate for the increased transportation related costs. This can have an adverse effect not only on the Portland area, but notably also these "downstate" areas. For instance, if rising congestion in Portland (and other urban areas) causes firms to move outside of those congested areas, then other parts of the state can also suffer if they depend on trade with the Portland area. Even if some businesses and households in the Portland area move closer together to minimize the effects of rising congestion on themselves, that does not help travel times and costs for downstate businesses that still have to cope with Portland congestion to get their products to market.

## 4.4 Improved System Scenario

***Definition of Alternative Case.*** To assess the relative benefit of additional capital investment in transportation capacity, it is necessary to define an alternative case representing a higher level of investment in transportation infrastructure than the base case of normally expected investment. The purpose of this comparison is to show the potential economic benefit associated with additional investment in an improved transportation system, and the potential cost of failing to do so. For this study, the Improved System Scenario is defined in the *Oregon Transportation Plan* as Investment Scenario Level 3 – "Expanding Facilities. It represents a policy scenario of enhanced funding to modernize facilities and improve freeway capacity to better keep up with growth travel needs associated with growth of Oregon's economic and population base. This policy scenario is also generally consistent with the more detailed concept of Metro's Regional Transportation Plan for the Portland area.

The difference in funding for highway modernization investment between the "Improved System Scenario" and "Future Base Case" is estimated to be in the range of roughly $10 billion in constant 2004 dollars, which represents roughly $500 million/year over a period of 25 years. (See Chapter 5 for further discussion of scenario costs.)

***Forecast Changes.*** Table 4-3 shows the differences in traffic flow between these scenarios. It shows that implementation of the Improved System Scenario would save around 157,000 hours of traveler time per day. Over the course of a year, that totals over 53 million vehicle-hours of time saved under the Improved System Scenario that would be time lost under the Future Base Case. Average speeds are notably improved with the Improved System Scenario, though still not back up to the levels achieved by drivers today.

**Table 4-3. Changes in Traffic Conditions Under the Improved System Scenario:**
*(Change from Future Base Case to Improved Systems Scenario, avg. weekday)*

| | Cars | Trucks | Daily Total |
|---|---|---|---|
| **Vehicle Trips** | | | |
| 2000 "Current Conditions" | 12,131,000 | 796,000 | 12,927,000 |
| 2025 Future Base Case | 16,207,000 | 1,143,000 | 17,348,000 |
| 2025 Improved System Scenario | 15,881,000 | 1,145,000 | 17,026,000 |
| Change 2025 FBS-ISS | - 326,000 | + 2,000 | - 322,000 |
| | | | |
| **Vehicle-Miles of Travel** | | | |
| 2000 "Current Conditions" | 82,787,000 | 9,596,000 | 92,383,000 |
| 2025 Future Base Case | 109,389,000 | 13,606,000 | 122,995,000 |
| 2025 Improved System Scenario | 109,349,000 | 13,596,000 | 122,945,000 |
| Change 2025 FBS-ISS | - 40,000 | - 10,000 | - 50,000 |

**Table 4-3 (continued)**

| | | | |
|---|---|---|---|
| **Vehicle-Hours of Travel** | | | |
| 2000 "Current Conditions" | 2,233,000 | 203,000 | 2,436,000 |
| 2025 Future Base Case | 3,142,000 | 312,000 | 3,454,000 |
| 2025 Improved System Scenario | 2,998,000 | 299,000 | 3,296,000 |
| Change 2025 FBS-ISS | -144,000 | -13,000 | -157,000 |
| | | | |
| **Average Miles per Hour** | | | |
| 2000 "Current Conditions" | 37.1 | 47.3 | 37.9 |
| 2025 Future Base Case | 34.8 | 43.6 | 35.6 |
| 2025 Improved System Scenario | 36.5 | 45.5 | 37.3 |
| Percent Change 2025 FBS-ISS | 4.8% | 4.4% | 4.7% |

*Source: Traffic model studies provided by Oregon Department of Transportation and Metro, with ratio calculations by EDR Group. Note: All numbers have been rounded to simplify viewing.*

The forecast reduction in total trips (2%) under the Improved System Scenario largely reflects a modest shift towards more use of public transportation. The drop is most concentrated in the Portland area, where the total vehicle trips are forecast to decrease by over 5%.

***Additional Effects on Travel Conditions.*** It is important to note that figures shown in Table 4-3 actually understate the full benefits of the Improved System Scenario because they only reflect forecasts of differences in *average* travel times and speeds. In fact, the avoidance of severe congestion (that would otherwise occur under the Future Base Case) will also reduce the *variability* in travel times.

The increased speeds possible under the Improved System Scenario will also maintain *market access* closer to current conditions, instead of allowing it to degrade as much as predicted under the Future Base Case. Access improvements are forecast to benefit all parts of Oregon, but particularly downstate areas (south of Portland). For instance, daily average access time to the Portland area is forecast to be improved by 5-13% in Josephine, Jackson, Coos, Douglas, Lane, Linn, Benton, Polk and Marion counties.

Seasonal delays along coastal roads are also forecast to diminish if the Improved System Scenario is implemented. That is estimated to total another 225,000 annual vehicle-hours of delay reduction in addition to the values previously discussed.

***Public Transit Shares.*** The changes in transit reliance are shown in Table 4-4. The Improved System Scenario increases the public transit share of person trips. The most significant change is in commuting trips -- this share has increased by 2.4%. The effects on other trip purposes are slight but the change in trips is also met with a substantial increase in passenger miles of transit travel. In Portland, the transit

passenger miles increased by 40.9% (36% for buses and 49% for rail) and in the rest of the state the passenger miles increased by 8%.

**Table 4-4. Improved System Scenario: Change in Public Transit Share**
***-- Difference of Improved System Scenario to Future Base Case***
***(avg. weekday person-trips, motorized modes only)***

| Trip Purpose | 2025 Base Case | 2025 Improved System Scenario |
|---|---|---|
| Business Travel | 1.3% | 1.4% |
| Commute to Work | 8.6% | 11.1% |
| Personal Travel | 2.3% | 2.9% |
| Total: All Trips | 3.9% | 4.9% |

*Source: Transportation studies provided by Oregon Department of Transportation and Metro, with ratio calculations by EDR Group. Note: All numbers have been rounded to simplify viewing.*

The increase in public transit trips and passenger miles work towards alleviating road congestion, especially during peak hours when most congestion occurs. Of course, improved roads also help improve transit performance, especially for buses. That is in addition to the important role that road improvement plays in facilitating freight deliveries, which are often considered to be "prisoners of congestion" (since most freight cannot move via public transit).

## 4.5 Travel Impact Conclusions

Transportation forecasting models show that the *Future Base Case* will not keep up with traffic growth, resulting in severe congestion delays. While the *Improved System Scenario* will not fully solve all of the travel delay and congestion problems, it will provide substantial savings in personal, commuting and business-related travel time. The avoidance of congestion and delay expansion projected for the Future Base Case will help keep Oregon a competitive location for manufacturers and wholesale/ distribution businesses to remain and grow. It will also allow "local-serving industries" in Oregon to avoid having to pass on their additional costs of congestion to their customers. Last but not least, it will help Oregon residents to maintain and preserve the current high quality of life prevalent throughout the state.

# 5 ECONOMIC IMPACTS

Earlier chapters showed that Oregon's business activity and economic base are particularly vulnerable to travel time delay, and that planned transportation system investments will be insufficient to avoid the development of severe delays in the next twenty years, potentially causing significant loss of time and access for residents and businesses.

This chapter calculates the economic stakes involved in transportation capital investment for Oregon by comparing economic impacts of an Improved System Scenario against those of implementing only a Future Base Case. It considers impacts on business delivery and operating costs, household expenses, and access for product delivery markets and labor markets. Altogether, it shows that the stakes involved for the development and competitiveness of Oregon's economy are indeed substantial.

The analysis shows that the benefit of implementing an Improved System Scenario, or the loss associated with not implementing it, will grow each year. The statewide impact (counting both income generated and the value of personal time) can exceed $1.7 billion/year by 2025, with over 16,000 jobs at stake.

These findings do not endorse any specific transportation policies or projects, but they do show the importance of taking action and the magnitude of potential stakes. They indicate a need for further discussion among residents, businesses and government agencies to further refine plans for future transportation investment.

## 5.1 Types of Economic Impacts and Benefit Measures

***Economic Context.*** Use of ground transportation – including trucks, buses and cars – is a natural element of economic activity. The *Statewide Congestion Overview for Oregon (ODOT, 2004, Table 4)* showed that vehicle-miles of travel on Oregon roads has consistently grown at the same rate as total statewide income, after adjusting for inflation. Even on a per person basis, both VMT per capita and real income per capita have continued to increase at the same rates for over thirty years.

The productivity and income generated by Oregon residents has continued to rise over this time period, as the economy has moved towards a greater focus on high value added products and services. The internet has brought an increase in long distance shipments and delivery vehicles. Oregon businesses – from booksellers and fruit sellers to computer chip makers and scrap metal recyclers – have developed

national and in some cases international markets for their products. Today, trucks are the fastest growing mode of transportation in Oregon as well as nationally across the US. In this context, an unavoidable conclusion is that the economic stakes associated with maintaining flow on Oregon's road system are continuing to rise.

***Types of Economic Impacts.*** In the previous chapter, it was noted that traffic volumes are continuing to rise with both population and economic growth, while patterns of freight (and passenger) flows are changing in addition to shifts in the mix of freight vehicle types. The alternative scenarios showed how the capacity of Oregon's road system will face challenges from growing demand, with resulting differences in travel times, distances and delays depending on the level of future highway investments. The resulting changes in transportation system performance can be organized into two broad groups which are discussed in Sections 5.2 and 5.3:

(1) Travel cost impacts – including travel time, schedule variability and travel distance impacts, which in turn also affect traveler fuel use, safety, cost of living and business operating expenses. (Section 5.2)

(2) Market Access impacts – effects beyond the cost of travel, that impact the nature of freight delivery markets, logistics, labor markets and the business productivity of operating in alternative locations. (Section 5.3)

***Types of Benefit Measures.*** The different types of economic impacts can be used to generate three benefit measures. They are discussed in Section 5.4.

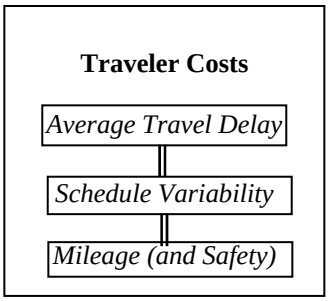
(1) Direct Traveler Benefit – This measure puts a dollar value on benefits to travelers. It includes savings in business costs, household expenses and personal time savings. This is the traditional "user benefit" measure used in evaluation of transportation system efficiency.

(2) Benefit to the Economy – This measure counts growth of the state economy due to changes in household travel-related expenditures, business operating cost, productivity and competitiveness. However, it does not count the value of travel time for non-business related activities (i.e., personal travel time). This is because the dollar-value of personal travel time does not directly affect the flow of money through the broader economy.

(3) Society Benefits – This measure combines the income-generating value of benefits to the economy together with the value of non-money benefits such as personal time savings. Other quality of life impacts such as air quality and safety (beyond medical expenses) would also be counted as society benefits, but are not measured in this study. Overall, the society benefits (also sometimes referred to as "social benefits") is the broadest and most comprehensive measure of overall impact. However, care must be taken to avoid double-counting between the representation of income benefits generated by the economy and the value of other non-money benefits.

## 5.2 Traveler Savings from Improved System Scenario

***Concept of Traveler Cost.*** The traveler cost of congestion is the dollar value of the additional travel time, vehicle operation and accidents that congestion causes for travelers. The key components of this economic cost are:




- Cost of Time Delay. High levels of delay resulting under the Future Base Case affect travel speeds and distances. That leads to increased travel costs for excess engine idling time, driver and passenger time, and truck freight logistics (loading dock and inventory staff) time. There is a daily average travel time delay captured in the statewide and regional travel models, plus additional seasonal delays and peak period delays that have been estimated separately from the statewide travel model.

- Cost of Travel Time Variability. When travel demand and traffic levels rise relative to the capacity of roadways and intersections, then congestion becomes more severe. As that occurs, the frequency of traffic incident-related delays increases dramatically. This increases the unpredictability of travel times on affected routes. It can also lead to further freight logistics costs as businesses either pad their schedules to allow for the likelihood of delays, or else add extra inventory to be available in case of missed or late schedules.

- Cost of Excess Mileage to Avoid Bottlenecks or Other Problem Areas. Some car and truck drivers resort to use longer routes to avoid congestion backups. Heavy freight vehicles can also face additional constraints on vehicle size or weight, limitations on turning radius or a lack of passing lanes – all issues that can become more severe, more prevalent and generally more problematic over time if there is insufficient funding to maintain the functionality and flow of all roads in the state. Each additional vehicle-mile (and vehicle-hour) of travel resulting from highway limitations and bottlenecks also yields additional household or business costs.

All of these travel-related costs are calculated on the basis of average daily and average peak period travel speeds and distances. As such, they understate the full problem for businesses, since they do not reflect the extent to which some firms discourage their workers from traveling on certain corridors and at times of day because of congestion. The result for businesses –trucks shifting to alternative routes and earlier or later delivery times, was already reported and confirmed in the business interviews. Such shifts in business operation are usually accomplished with higher operating costs for those affected businesses, which are in addition to the directly measured travel delay costs.

***Traveler Savings from Implementing the Improved System Scenario.*** The total annual traveler savings associated with the Improved System Scenario (instead of allowing the Future Base Case) is projected to rise to a level of $1.7 billion/year by the year 2025. (All dollar figures are in constant 2006 dollars.) The value of this benefit grows over time, so it is smaller in years before 2025 and greater for years after 2025.

> ***Traveler Savings***
> *The travel time and expense savings from implementing the Improved System Scenario is **$1.7 billion per year** as of the year 2025. This is just one element of the total cost of transportation system deficiencies.*

This benefit measure includes the dollar value of all delay and congestion-related travel time, travel expense and travel safety impacts that can be avoided by implementing that scenario in place of the Future Base Case. These traveler impacts in turn affect business costs, household expenses and personal time savings, which are discussed later.

This traveler savings is the traditional measure of transportation system efficiency, in that it encompasses the value of travel time, vehicle operating cost and safety benefits. However, it is important to note that this measure does not discriminate between real money cost savings and personal time savings that do not affect the flow of money in the economy. A breakdown of these savings is shown in Table 5-1, and these benefits are explained in the text that follows.

**Table 5-1. Economic Value of Forecast Change in Traffic Conditions Associated with Implementing the Improved System Scenario**

*(Annual Benefit of the Implementing the Improved System in place of the Future Base Case, as of 2025)*

| Category of Impact | Statewide Impact |
|---|---|
| (a) Savings to Business – Total [1] | $784 mil. |
| (b) Savings to Households - Time[2] | $813 mil. |
| (c) Savings to Households - Travel Expense [3] | $109 mil. |
| (d) Total Traveler Savings | $1,706 mil. |

*(1) Business expense savings, including labor cost and vehicle operating cost associated with changes in travel times, distances and speeds, plus logistics expenses incurred due to travel time unreliability*
*(2) Value of the reduction in total travel time for non-business travel*
*(3) Household expense savings from reduced vehicle operating costs resulting from changes in travel distances and speeds*
*Source: Calculations by EDR Group using the TREDIS framework; see Appendix for further explanation.*
*Note: All values are in constant year 2006 dollars*

(a) Business Cost Savings ($784 million/year) – Businesses save through reduced travel mileage and travel time. Lower mileage translates to lower operation and accident costs, while reduced travel time yields lower wage payments (for drivers), lower vehicle operating costs, and improved scheduling (through greater travel time reliability).

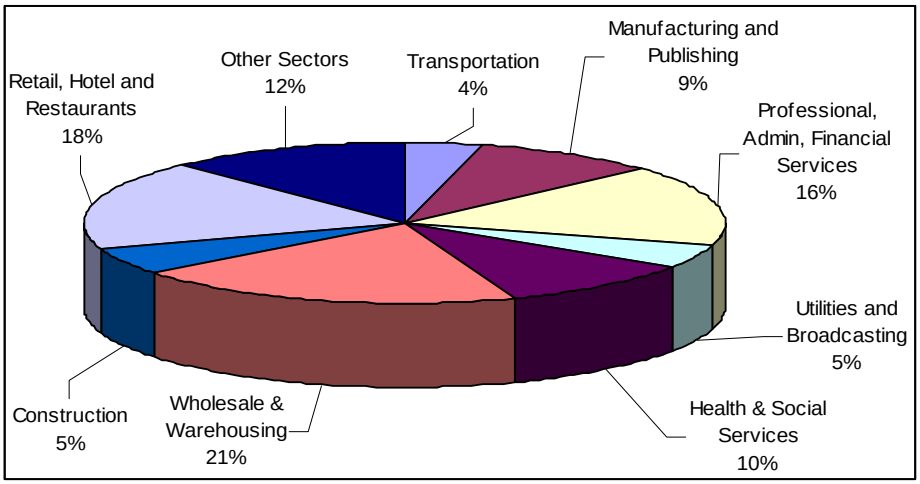
(b) Household Personal Time Savings ($813 million/year) – Households receive a benefit from congestion reduction in the form of time savings for personal travel (that is not business related). These time savings are considered by transportation planners and economists to be of significant value to households; as such, they are typically incorporated as benefits in benefit-cost analyses. However, travel-time benefits do not affect household income levels; therefore, they do not directly affect flow of money in the economy.

(c) Household Personal Expense Savings ($109 million/year) – Households save through lower vehicle operation costs (fuel, maintenance) and lower accident costs. Both result directly from lower vehicle-miles and vehicle-hours traveled, as well as improved travel time reliability. These avoided costs translate to additional disposable income for households. While small relative to household time-savings, operation cost benefits are indeed significant due to recent fuel price increases.

***Economic Sectors Benefiting from Cost Savings.*** The Improved System Scenario yields $784 million of direct business cost savings to Oregon businesses. These savings are distributed among sectors of each state's economy based on (1) the relative levels of industry as a portion of total industrial activity, and (2) the degree to which each sector depends on freight and passenger road travel. Figure 5-1 shows the relative shares of these business cost savings that benefit each type of business in Oregon. The "supply chain" of manufacturers, wholesalers and retailers along with related transportation services account for the largest share of the cost impact (43%). These are also the sectors that depend most on truck movements. The other elements of the economy that benefit include various types of services and utilities (31%). For these types of business, much of the benefit is associated with commuter and "on-the-clock" worker travel.

***Location of Traveler Cost Savings.*** The total traveler cost savings accrues to cars, trucks and bus trips with origins and/or destinations in Oregon, as well as pass-through trips moving between California and Washington. The trip origins and destinations becomes an important factor in later calculations of impact on Oregon's economy. However, when measuring transportation system efficiency, the standard practice is to measure changes in traveler costs among the scenarios by measuring those savings based on where they occur. Using that approach, it is notable that the majority of the traveler benefit of the Improved System Scenario occurs along the I-5 corridor and connecting highways. Two-thirds (1.0 billion) of the total value of time and cost savings occurs in Oregon's largest metropolitan areas.

**Figure 5-1. Direct Business Cost Savings Among Oregon Industries**




*Source: economic model analysis by EDR Group using the TREDIS framework; see Appendix for further explanation.*

***Unmeasured Additional Business Benefits.*** In evaluating benefits of implementing the Improved System Scenario, it is important to note that there are additional types of benefits that are not counted in the current calculations. One type of unmeasured benefit pertains to the special needs of morning business deliveries in urban areas. Many deliveries to local retail and service businesses are made early in the morning. The business interviews indicated a distinct possibility that failure to slow the growth of morning peak period congestion could make current morning truck delivery "time windows" no longer viable for trucking/freight transportation in the future. If these "windows" were to close, there would be no other time for shippers to schedule deliveries unless it is in the very late or very early hours – which will bring their own set of financial costs for business and environmental impacts for residents.

***Other Societal Benefits.*** There are additional non-business benefits that are also important to consider in a full evaluation of all societal benefits and costs, though they are not considered in this study of economic impacts. They include:

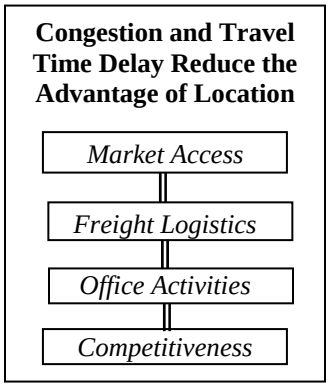
- air quality improvements (reduction in air pollution),
- human safety improvements (reduction in fatal and personal injury accidents) and
- "quality of life" improvements (such as reduction in undesirable traffic noise).

All of these benefits can be expected to occur as the Improved System Scenario reduces engine idling and running times as well as stop-and-go traffic movements. They all have a very real value to people that has been documented in surveys as a "willingness to pay" for improved conditions. However, all of these societal benefits values involve elements of benefit that are beyond the direct "out-of-pocket" money

cost incurred by households and businesses. So while this study does account for safety benefits to the extent that they affect insurance expenses, it does not account for the additional value of reduced pain and suffering from traffic accidents or the additional value of cleaner air to breath.

## 5.3 Market Access and Competitiveness Impacts

***Market Access Effect on Logistics.*** Beyond the impact on costs for existing travel (covered in Section 5.2), congestion and travel time delay can have an additional impact on state competitiveness for business attraction and expansion. Quite simply, travel time delay reduces the advantage of location. For example, as average travel speeds slow and travel time variability increases, the *delivery market* that a business can reliably serve within any given time period shrinks. So too does the *labor market* from which a business can draw for its workers.




Facing a loss of market access, those businesses that depend on delivery of goods and services can respond in several ways. They can adjust their warehousing and logistics processes to stock more inventories, provide distribution from a larger number of locations, deploy more delivery vehicles and drivers, or reduce guarantees for delivery times. All of these adjustments involve increased costs or reduced revenues that are beyond the direct change in travel time and expense.

If the delivery market shrinkage, delivery reliability loss or cost increase for serving outside markets becomes large enough, then businesses can also become more likely to move activities out of state. Other businesses that remain may be able to expand to serve the remaining markets, but that still brings a reduction in competition and customer choice. In this way, both livability and costs of living in Oregon can be further affected by traffic congestion and delays.

Examples offered in the Chapter 3 business interviews show how these effects on business location are already starting to occur for some manufacturing, service and wholesale distribution firms around the state of Oregon, both within the Portland region and along other areas such as the metropolitan areas and highway corridors of Salem-Keizer, Eugene-Springfield, Corvallis, Bend and Rogue Valley (including Medford). Congestion and travel delay are also growing in smaller cities along Oregon's coast, as a result of road networks and land use patterns that are geographically constrained and further affected by seasonal tourist/recreation traffic.

Of course, there are ways to minimize congestion and associated travel delay impacts. Improvement in both transit services and highway travel speeds, as projected for the 2025 Improved Investment Scenario, can help to minimize any shrinkage in effective

geographic scale or size of labor markets. However, only highway system improvements can help maintain truck delivery market access. Moreover, highway improvements have the potential to enhance market access for rural areas of Oregon, as a result of increasing connectivity to other parts of the state.

***Market Access Requirements of Office Activities.*** A portion of the economy does not depend on the delivery of goods and services via truck, but instead operates through electronic, telephone, mail and courier services. This includes headquarters operations and major back office functions of financial institutions, insurance companies, and some business services (such as data processing). It also includes regional and national headquarters offices of retail chains and distribution companies. However, these major office activities still require access; they typically locate where there is broad labor force access for both executives and clerical staff (including both public transit and highway access) and often also good access to a major airport for regional or national travel by executives and sales force employees.

As congestion and travel time delays increase under the Future Base Case conditions, it will reduce the future attractiveness of Oregon as a place to locate and expand a business. Improvements in transit services and highway systems, as projected for the Improved System Scenario, would help to maintain worker access, thus enhancing the ability of the Oregon to attract and expand its base of business activities.

***Access Effects on Economic Competitiveness.*** In addition to short-term logistical impacts, poor accessibility can affect long-run prospects for economic development. In both urban and rural areas, limitations on accessibility can reduce statewide competitiveness for business site location, thereby affecting attraction, retention and expansion for firms that serve markets beyond Oregon. This effect can even spill over into less congested areas. Congested corridors can become supply chain "choke points" affecting businesses far from the actual congestion. In these respects, the effect of congestion on business location and investment decisions can be deceptive. Even when the term "congestion" is not stated as a business site selection criterion, it ends up affecting other site selection factors, as shown in the box that follows.

**Travel Time Effects on Location Competitiveness for Business Attraction**

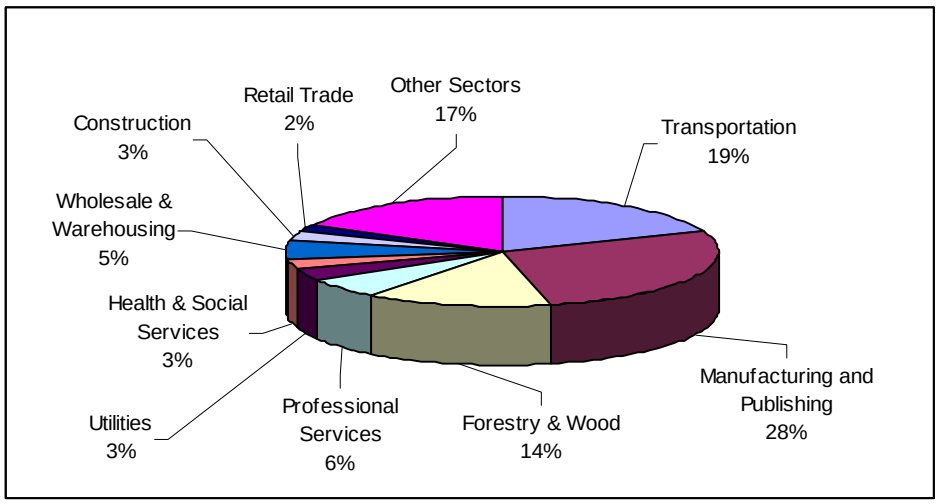
- At the point when a business site selector is screening competing areas, travel time can affect the availability of a workforce with required skills, especially for firms seeking more specialized and larger workforces at a single location.
- Travel time can also affect accessibility to transportation routes and terminals, and transportation shipping costs, especially for firms with heavy freight shipping requirements and broad scale delivery markets.
- Within a region, areas with significant travel time delay can have higher wage rates to compensate for the more difficult worker commute.
- At the point of screening specific sites, travel time can affect land costs, and it will clearly affect travel times for truck access to suppliers, customers, ports and intermodal terminals.
- When travel time becomes a sufficiently sized problem, then it also becomes a quality of life issue that influences where people choose to live and how much they pay for housing, as well as accessibility to cultural and recreational assets and leisure time available.

***Improved System Scenario: Business Attraction Impact***. A business competitiveness and targeting model was used with a "geographic information system" to calculate how the future traffic scenarios would affect size of the population base within commuting range, and the business base within delivery range of the Portland region, other communities along the I-5 corridor and in non-metro parts of Oregon.[1] The system also calculated how these scenarios would affect access time to the nearest commercial airport, marine port and intermodal rail facilities from each county in Oregon. Finally, the system calculated changes in travel times from each county to the international air and sea gateways in Portland.

The economic model then estimated how changes in these various elements of access would affect productivity for various industries and hence the state's competitiveness for attracting and expanding them. The analysis showed that the Improved System Scenario would retain greater statewide economic competitiveness than the Future Base Case. Figure 5-2 shows a breakdown of the Oregon business sectors that are most affected by market access, which are largely sectors that depend most on delivery access to broader markets -- manufacturing, lumber, wholesale/warehousing and transportation services. Those sectors account for 67% of the market access impact. It is important to note that these economic sectors in that are most affected by market access changes are <u>not</u> the same as those incurring direct operating costs of traffic delay. (As shown earlier in Figure 2-1, the industries most affected by direct operating cost changes included a higher representation of retail business activity and a variety of services and utilities, in addition to manufacturers and wholesalers.

[1] Transportation Economic Development Impact System; see Appendix for further information

**Figure 5-2. Oregon Industries Most Affected by Market Access Changes**




*Source: economic model analysis by EDR Group*

## 5.4 Overall Economic Impact

***Economic Analysis System.*** The Transportation Economic Development Impact System (TREDIS) is a framework for evaluating statewide economic impacts of transportation scenarios, encompassing traveler impacts (as discussed in Section 5.2) as well as market access effects (as discussed in Section 5.3). It also includes impacts for both freight and passenger travel, and for both public transit and road transport modes. These direct effects can be summarized in terms of three categories:

- Economic Impact of Travel Cost Changes – Business travel time and expense changes affect local cost of doing business, while household expense savings affect local cost of living. Changes in these cost savings end up shifting local spending patterns and prices, affecting local business activity and investment, and thus employment for some industries. The economic analysis system also recognizes that not all of these changes are absorbed within the Oregon's economy; some are passed on to customers outside of Oregon.
- Economic Impact of Access Changes – Changes in access times also lead to effective changes in labor market and product delivery market areas, as well as access to intermodal transportation connections. These access changes end up shifting productivity and thus statewide competitiveness for attracting various manufacturing, service and office industries.
- Economic Value of Personal Time Changes – Changes in travel time for personal (non-business) trips have a value to society. However, they do not directly affect the flow of dollars in the economy, so their value is counted separately from the calculation of impact on the regional economy.

In addition, there are indirect and induced effects on the statewide economy that follow as a consequence of the above direct changes. They include: changes in business supplier orders, respending of wages on consumer purchases, and shifts in national and international trade, population growth and industry requirements.

***Types of Results.*** The findings on economic impacts are presented in the tables which follow. These tables show the positive benefits of implementing an Improved System. Alternatively, their results can be interpreted as the loss that would occur if the state fails to implement the Improved System Scenario.

The results are presented in terms of two perspectives: (1) impact on *growth of the state economy* is shown in Table 5-2, and (2) *societal benefit* for residents and businesses in the state is shown in Table 5-3. Both are shown in terms of annual difference between scenarios as of the target year 2025. In both cases, the level of impact changes over time. As transportation forecasts indicate that travel time delay will continue to be growing over time, and since the Improved System Scenario would be implemented over twenty years, the benefits of implementing this scenario will also grow larger over time. Benefits for years before 2025 will be smaller and benefits for later years will be even larger than these values.

***Economic Effects.*** Table 5-2 shows forecasts of total impact of the Improved System Scenario on the Oregon economy. Impacts can be measured in terms of either total Output (business sales) or as the portion of those business sales that is additional personal income and corporate profits generated in the state (referred to as Value Added or Gross Domestic Product).

The statewide impact of implementing the Improved System Scenario is estimated to be approximately $1.7 billion in Output (business sales) as of the year 2025. This translates to nearly $900 million in additional Value Added (income) generated annually in the state. It also corresponds to over 16,000 additional jobs. These are full-time, permanent jobs that remain year after year, and which would be lost without the additional infrastructure investment. The actual level of these benefits are increasing over time as traffic levels grow, so they are smaller for earlier years and larger for later years.

It is important to note that these figures count only economic growth associated with reduced costs and better accessibility for businesses operating in Oregon. They ignore additional economic benefits accruing to businesses outside of Oregon that use (or rely on) truck movements passing through Oregon. They also do not count economic impacts of business location shifts within Oregon.

The overall impacts are distributed across all sectors of the state's economy, as shown in Figure 5-3. In fact, they are more widely distributed than the direct cost or access impacts shown in prior pie charts. That result occurs because the beneficiaries include not only businesses that directly incur costs of traffic delay and impacts of

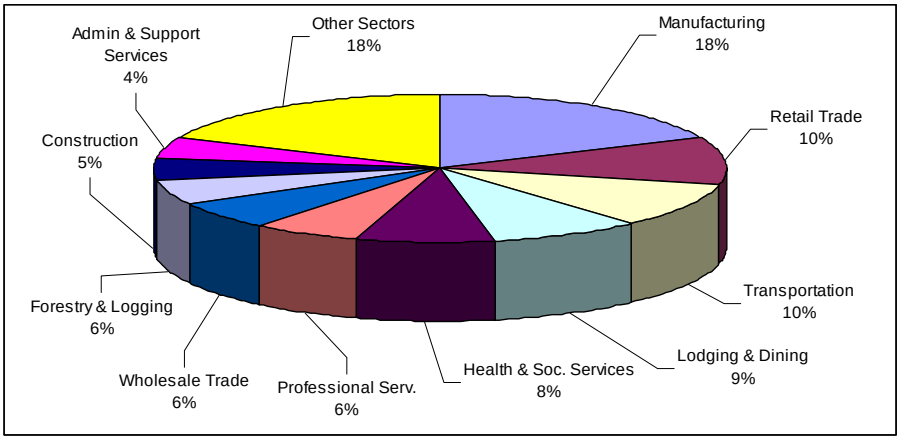
access changes, but also other elements of the economy (such as retail and professional services) that benefit from worker spending on consumer purchases.

**Table 5-2. Impact on the Oregon Economy of Implementing the Improved System Scenario *instead* of the Future Base Case**
*(Annual Impact as of 2025)**

| Part I – Annual Impact on the Economy | Statewide Impact [3] |
|---|---|
| (A) Total Growth of ***Business Output*** [1] | $1,751 mil. |
| (B) Portion of (A) that is ***Value Added*** [2] | $896 mil. |
| (C) Total ***Jobs*** supported by (B) | 16,300 jobs |

* *All values are as of the target year 2025, but are expressed in constant 2006 dollars*
*[1] Output is the total business revenue or sales volume.*
*[2] Value Added is the output minus the cost of materials. It thus represents the total of income paid to workers and net corporate income that is either reinvested in the firm or distributed to its owners. It also represents the change in Gross Domestic Product (GDP) of the region.*
*Source: Projections using TREDIS model based on transportation changes shown in Chapter 4.*

**Figure 5-3. Employment Impacts of the Improved System Scenario**
*(percent of jobs created, by industry)*




*Source: economic model analysis by EDR Group*

***Total Benefits.*** Table 5-3 shows a measure of the total economic value of benefits to people living and working in Oregon. This is the sum of the impacts on Value Added income generated in the economy *plus* the value of non-money impacts that were assumed to not directly affect the flow of dollars in the economy (such as time saved on personal and shopping trips). This is still an incomplete measure of benefits, because it does not include the value of air quality improvements that can also result from reduction in traffic delays. If those benefits were added, then the total benefit of

implementing an Improved System scenario (or the loss from failing to implement it) would be even greater.

**Table 5-3. Total Annual Benefit of Implementing the Improved System Scenario *instead* of the Future Base Case**
*(Annual Impact as of 2025)**

| Part II - Total Annual Benefit | Statewide Impact [3] |
|---|---|
| Additional Income *(from B above)* | $896 mil. |
| + Value of Personal Time *(Table 5-1-c)* | $813 mil. |
| + Value of Air Quality and Other Quality of Life Improvements | *not measured* |
| = **Total Benefit to the Region** | **$1,709 mil.** |

*Source: Projections using TREDIS model based on transportation changes shown in Chapter 4.*

Even as an incomplete measure of benefit, it is notable that the Improved System Scenario is estimated to provide over $1.7 billion of annual benefit value as of the year 2025. Of this, roughly half is realized as increased income, with the captured as the value of personal travel time.

*The fact that this benefit figure is nearly the same as the economic growth figure shown earlier is coincidental.* The benefit figure shown here adds personal time savings that was neither considered nor counted in the economic impact measure. However, at the same time, the benefit figure shown here omits economic impacts of business location shifts within Oregon and additional economic benefits accruing to businesses outside of Oregon as a direct or indirect impact of improving Oregon's transportation system.

In the final analysis, the ultimate impacts of reducing traffic congestion and delay include preservation of the quality of life and attractiveness of Oregon as a place to live, as well as preservation of the attractiveness of Oregon as a place to do business.

***Economic Efficiency.*** Ultimately, it can be useful to compare the benefits of investing in an Improved System to the costs of doing so. That can demonstrate the efficiency of investing in these improvements. However, to do so, there needs to be a more complete accounting of the full benefits, including air quality and additional elements of safety beyond insurance costs. Equally important, there needs to be a more careful identification of the incremental costs of investments that are intended to reduce congestion and other forms of traffic delay.

The Improved System Scenario is derived principally from the Oregon Transportation Plan (OTP), which includes highway and local road improvements across the state. Its cost estimates are generally in line with Metro's estimates of cost for the portion

of highway and local road improvements needed in the Portland region. However, Metro had a higher estimate for transit investment for its region, and that level of transit enhancement was also assumed to occur in this study's analysis of the Improved System Scenario.

The costs of needed ground transportation (road and transit) improvements in the OTP sums to more than $1.5 billion per year, but that includes significant costs for highway maintenance and preservation projects, as well as driver and motor carrier services, scenic byways and culvert programs. The basic cost for state highway "modernization" is actually $222 million per year, and adding local roads brings that figure to $689 million. Even then, these modernization projects combine spending on highway and road capacity improvements with other safety and operational improvements. So at this juncture, it is difficult to isolate the relevant portion of cost that is applicable for a benefit/cost analysis focusing just on capacity enhancements to reduce travel delays. More work is needed to be done by ODOT and Metro planners in coming years to derive a more specific list of proposed projects. However, it is safe to note that the $1.7 billion/year of growing benefits shown here is likely to compare favorably to the likely magnitude of investment costs.

***Conclusion.*** At this juncture, a detailed benefit/cost analysis is premature, as well as unnecessary. The basic finding of this study is that the economic stakes for Oregon's long term future are high, and the benefits of investing in transportation infrastructure and services to keep up with economic and population growth are also quite substantial. In the final analysis, the livability of Oregon as well as the cost of living and cost of doing business in the state can be affected by long-range transportation investment decisions.

# APPENDIX

This appendix provides brief summaries of the transportation and economic models used for this study.

**Transportation Model**

The Oregon statewide model used to produce these data was the first statewide integrated land use/transportation/economic model developed in the U.S. This model, implemented by the Transportation Planning Analysis Unit at Oregon Department of Transportation's (ODOT), expands the ability of ODOT to evaluate the effects of transportation and land use policies on the state transportation system, land use and the economy. As such, the model is intended to be used primarily to make relative comparisons of the effects of different policies, and not for evaluating improvements on individual highway links.

ODOT staff applied this model to provide the data inputs to this study. To do so, a substantial amount of post-processing of the model results was necessary. This was done by developing scaling factors to make statewide model results reasonably consistent with travel inventories and travel model results used in the earlier Portland Cost of Congestion Study. The statewide model results were then used to represent transportation impacts on the state outside of the Portland region. For the Portland region, the study team then drew on compatible results of Metro's EMME2 model, as previously reported in the earlier Portland study.

Key assumptions and adjustments made to the transportation models include the following items:

- Total traffic volumes - Statewide model projections of vehicle miles of travel (VMT) for the year 2005 were scaled so that they reproduced 2005 HPMS (Highway Performance Monitoring System) estimates of VMT. Scaling factors were calculated for each ODOT region, simplified road classification (Interstate, urban other, rural other), and vehicle type (auto/light truck, heavy truck). The weights were also applied to the year 2000 statewide model VMTs and compared to VMT calculated by the Metro model for the year 2000 to ensure consistency.

- Percent Congested - The percent of daily VMT that is congested was calculated by adding up the VMT on links with equilibrium model speeds that are reduced from free-flow speeds by more than a threshold percentage. The percentage reduction threshold was calibrated by testing various threshold values and comparing the computed congested VMT percentages with estimates produced by the Texas Transportation Institute for Portland, Salem and Eugene in the 2005 Annual Urban

Mobility Report. In doing the calculations, model link lane miles by type and region were factored by HPMS estimates of lane-miles by type and region to account for the effect of network simplification.

- Per Vehicle Occupancy and Loadings - Statewide travel survey data was used to estimate the average number of passengers per vehicle by trip purpose. The average truck loading (tons per truck) was taken from statewide model input assumptions. These were developed from the analysis of truck survey data.

- Trip Ends - The percentage of trips that have at least one end that is internal to the state was calculated by subtracting the sum of external-external trips in the model from the sum of all trips and dividing by the sum of all trips. This was done for each trip purpose.

- Accident Rates – Oregon-specific data was used to represent crash rates for the various urban and rural areas and highway functional classes.

The model scenario used to produce the base case results for this study is the Reference Case Scenario used for the Oregon Transportation Plan (OTP) update. This scenario assumes Oregon will grow according to Office of Economic Analysis forecast, the transportation system will be expanded consistent with financial constraints, and there will be no significant changes in land use policy or transportation operation costs. The Improved System Scenario used for this study is Investment Scenario Level 3 ("Expanding Facilities") in the Oregon Transportation Plan, with additional transit improvements for the Portland region as assumed in Metro's Regional Transportation Plan (RTP) "2025 Preferred Alternative."

## Economic Model

TREDIS® (Transportation Economic Development Impact System) is a system for evaluating the full economic development impacts of transportation projects spanning multiple modes. It calculates both the user benefit of transportation programs and their separate economic development impacts through a process involving four modules:

**1. Travel Cost Response Module.** The first module of translates results of travel demand models, including changes in VMT, VHT and peak period congestion, into direct cost savings that accrue to households and businesses (given current and projected trip patterns). These may result from operational cost savings, schedule time savings, or accident cost savings. The module then segments the total savings among economic sectors, based on the mix of businesses in the region, characteristics of vehicles, commodity flow patterns and local vs. external trip ends.

**2. Market Access Response Module**. The second module translates changes in regional accessibility into changes in opportunities for new business market expansion and activity attraction. These effects are due to market access effects beyond the cost

savings to existing trips. The module estimates these impacts via an economic development tool known as the Local Economic Assessment Package (LEAP). This tool draws on "economic geography" research to estimate how changes in access to airports, marine ports, rail/truck inter-modal terminals, labor markets, supplier markets and customer markets can lead to additional productivity and business growth over time.

**3. Economic Adjustment Module.** Together, the first two modules determine the direct cost and access effects of transportation projects. The third module estimates additional economic impacts – dynamic effects generated through business responses to transportation cost and market size changes, indirect effects due to inter-industry supplier-buyer linkages, and induced effects generated by the recirculation of wages into the local economy. The economic engine used for the Oregon study is a "Cost-Response Input-Output" model, which tracks how various industries absorb costs, invest in their own growth and/or pass on the costs to other industries, combined with a multi-regional growth forecasting and economic impact model using regional inter-industry buy/sell flow data from IMPLAN.

**4. Impact/Benefit Accounting Module.** The fourth module gathers information from the first three modules and organizes them in terms of various economic impact and economic benefit measures. It separates elements of travel efficiency, cost savings, and social benefit measures. It also separates impacts on income and business sales generated in the state economy from the economic value of other social benefits that do not directly affect the flow of dollars in the economy.