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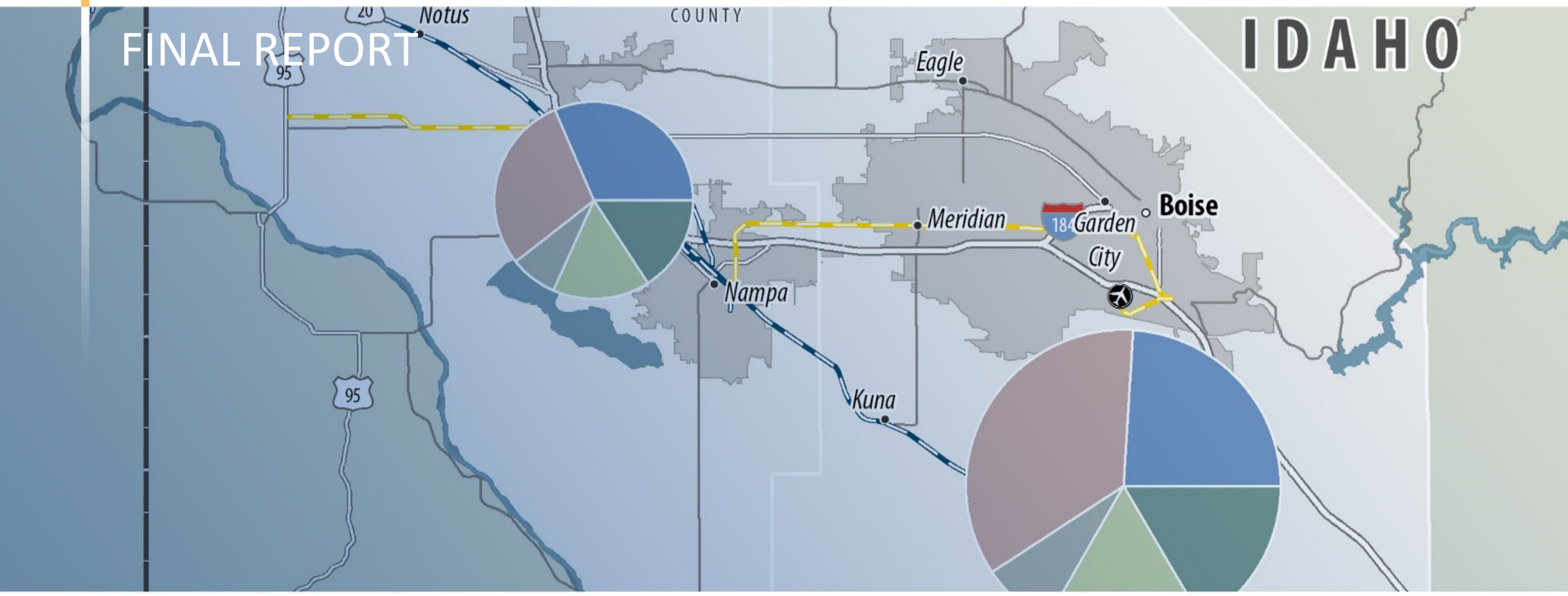

COMPASS Freight Study

Client Reference: RFQ 2017-02

Final Report

Prepared for:

COMPASS - Community Planning Association of Southwest Idaho

Prepared by:

CPCS Transcom Inc.

In association with:

Parametrix
American Transportation Research Institute

Solutions for growing economies

June 18, 2018
CPCS Ref: 16629

Acknowledgments / Confidentiality

The study team acknowledges and is thankful for input provided by COMPASS, and by the Freight Advisory Working Group Committee.

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Executive Summary

As the metropolitan planning organization (MPO) for the Boise-Nampa area, COMPASS is focused on integrating freight as one of the transportation system components with roadways, public transportation and bicycle and pedestrian modes into its transportation planning process. As COMPASS develops its long-range transportation plan, Communities in Motion 2040 2.0 (CIM 2040 2.0), and prepares for a future in which the region strives to be more competitive for freight-dependent industries, it is commissioning this study to inform CIM 2040 2.0 and to ensure that the current and future regional transportation system can safely and efficiently accommodate freight (movement of goods).

Anchored by Boise and comprised of Ada and Canyon Counties, the COMPASS region is a vibrant and growing region—home to almost 700,000 residents and many freight-dependent businesses. As the largest metropolitan area in the fastest-growing state,[1] the region faces unprecedented demands on its transportation infrastructure and its developable land. This study examines the transportation and land use needs of freight-dependent regional industries, including manufacturing, technology, agriculture, and warehousing/distribution, and organizes the findings for consideration in the COMPASS multimodal long-range transportation plan, CIM 2040 2.0.

Key Findings

Economy: Freight-dependent industries are not just those that own or operate transportation equipment. The total value of regional GDP that is freight-dependent is $9.7 billion – more than 15 times the GDP generated by Transportation and Warehousing alone. There are 63,359 freight-dependent jobs in the region.

Freight-Dependent Economic Activity in Ada and Canyon Counties

$9.7 billion in regional GDP,
29% of the region's total GDP

63,359 jobs,
16% of the region's total employment

$3.8 billion in annual income,
21% of the total employment income for residents in the region

[1] US Census Bureau (2017), "Idaho is Nation's Fastest-Growing State, Census Bureau Reports"

Commodities: The total value of commodity flows into, out of, and within the region is $27.3 billion annually. These include high-tonnage flows of Agri-Food Products and Primary Materials, and also high-value flows of Manufactures and Consumer Products.

Clusters: The study identifies four primary freight clusters in the region: Boise Southeast-Airport, Meridian-Boise Junction, Nampa, and Caldwell. These clusters, all located along interstate and/or rail corridors, account for 70-75% of freight activity in the region.

Corridors: Four classes of freight corridors were identified based on truck volumes and access to freight clusters. The study team used a novel approach to combine GPS data with truck counts for developing estimates of truck volumes throughout the region.

Prioritization: This study supports COMPASS's decision-making processes by enabling COMPASS to explicitly integrate freight and goods movement into the decision-making framework for prioritization.

Land Use: Local rail operations in the region sustain a steady customer base, with 60-70 active customers. It is important to consider the impacts on these economy-supporting businesses when considering how best to use the rail rights-of-way in the future.

Recommendations

The study team recommends that COMPASS:

1) Use the findings from this study to inform COMPASS's long-range transportation planning efforts to integrate all transportation system components and other work relevant to freight and goods movement

2) Integrate freight into its multi-criteria project evaluation framework by indicating whether a proposed project is located on the current truck corridor network

3) Further develop and refine its project list, in consultation with regional stakeholders, using as a base the needs list and preliminary solutions identified in this study

4) Consider reviewing future Critical Urban Freight Corridor (CUFC) designations with ITD based on the results of this study in order to determine whether or how these designations should be reviewed to make new sections available for freight funding

5) Consider follow-up items to this study such as investigating a rail transload facility, ongoing data improvement, and educating policymakers and the general public on the importance of freight and goods movement

6) Continue to use the Freight Advisory Work Group (FAWG) to convene public- and private-sector stakeholders to discuss and develop solutions to regional freight issues

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Acronyms / Abbreviations

Acronym	Meaning
ACHD	Ada County Highway District
ATRI	American Transportation Research Institute
BVRR	Boise Valley Railroad
CIM	Communities in Motion
COMPASS	Community Planning Association of Southwest Idaho
CSS	Context-Sensitive Solutions
CUFC	Critical Urban Freight Corridor
DC	Distribution Center
FAA	Federal Aviation Administration
FBC	Form-Based Code
FAST Act	Fixing America's Surface Transportation Act
FAWG	Freight Advisory Work Group
FHWA	Federal Highway Administration
GDP	Gross Domestic Product
GIS	Geographic Information System
GPS	Global Positioning System
IDOL	Idaho Department of Labor
IG	Infogroup
ITA	Idaho Trucking Association
ITD	Idaho Transportation Department
ITIP	Idaho Transportation Investment Program
MAP-21 Act	Moving Ahead for Progress in the 21st Century Act
MPO	Metropolitan Planning Organization
NAICS	North American Industry Classification System
OD	Origin Destination
ROW	Right-of-Way
RTAC	Regional Transportation Advisory Committee
SAFETEA-LU Act	The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SH	State Highway
STCC	Standard Transportation Commodity Codes
STIP	Statewide Transportation Improvement Program
TAZ	Traffic Analysis Zone
TIP	(Regional) Transportation Improvement Program
TREDIS	Transportation Economic Development Impact System"
UP	Union Pacific
UPRR	Union Pacific Railroad
US	United States
VMT	Vehicle Miles Traveled

1 Introduction

1.1 Background

As the metropolitan planning organization (MPO) for the Boise-Nampa area, COMPASS is focused on integrating freight as one of the transportation system components with roadways, public transportation, and bicycle and pedestrian modes into its transportation planning process. As COMPASS develops its long-range transportation plan, Communities in Motion 2040 2.0 (CIM 2040 2.0), and prepares for a future in which the region strives to be more competitive for freight-dependent industries, it is commissioning this study to inform CIM 2040 2.0 and to ensure that the current and future regional transportation system can safely and efficiently accommodate freight (movement of goods).

1.2 Objectives and Purpose

The key outcomes of this study are:

- Identification of freight corridors and related land use needs, including information about industrial uses and stakeholders along UP spur lines for the rail-with-trails project
- Profile of the regionally most important freight commodities and supply chains, and a summary of freight contribution to the region's economy
- Identification of freight-specific projects and/or policies to address maintenance needs, improve safety, mitigate choke points, and manage congestion

This study covers Ada and Canyon Counties (the "region," also referred to as the Treasure Valley or the COMPASS region). This document serves as the final report. Further detail is provided in the Working Papers of this study.

1.3 Methodology and Limitations

The study team prepared this report with information from numerous sources, including truck GPS data from ATRI, and various data from COMPASS (land use, vehicle classification) and ITD (safety). The study also relies on economic and commodity data from TREDIS, obtained via COMPASS, and employment data from Infogroup and the Idaho Department of Labor (via COMPASS). The study is likewise dependent on consultations and surveys with industry stakeholders. The study team is thankful for the insights and perspectives offered by the stakeholders, and to the Idaho Trucking Association for their help in finding consultees.

While the study team makes efforts to validate data, the study team cannot warrant the accuracy of third-party data.

2 Freight and the Economy

2.1 Top Commodities in the Treasure Valley

The total value of commodity flows into, out of, and within the region is **$27.3 billion annually.** Agri-Food Products, Primary Materials, Manufactures and Consumer Products each represent about one-quarter of all freight shipped in the region, by value (Figure 2-1). By tonnage, Agri-Food Products and Primary Materials represent 85% of freight. These patterns reflect the lower "value density" (i.e. value per ton) of products such as field crops and gravel.[2]

The data on commodity flows are for 2016, from TRANSEARCH, obtained via the TREDIS suite. The study team distilled the commodities into four commodity groups, corresponding to different sectors of the economy (listed in Appendix A).

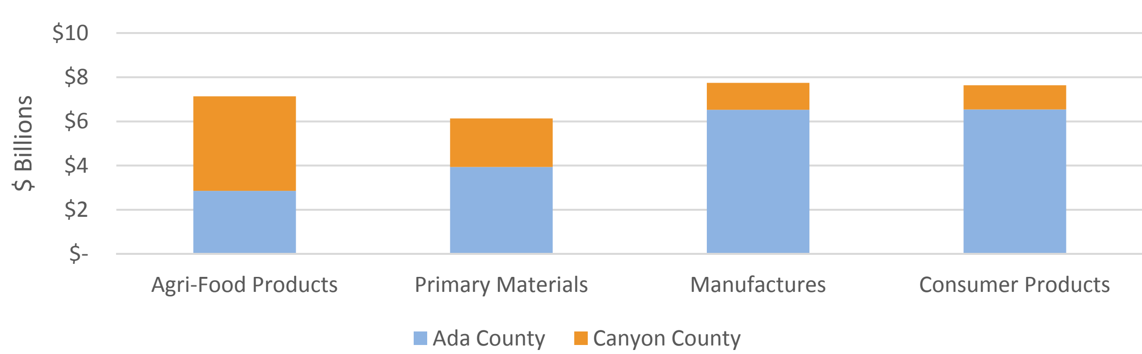
Figure 2-1: Commodity Groups

Commodity Group	Value of Flows ($M)	% by Value	% by Tonnage
Agri-Food Products	$6,777	25%	42%
Primary Materials	$5,439	21%	43%
Manufactures	$7,531	28%	5%
Consumer Products	$7,562	27%	11%

Source: CPCS analysis of Transearch (via TREDIS), 2016

Freight flows differ vastly by county. The large majority of Manufactures and Consumer Products freight activity is in Ada County, whereas Canyon County has the majority of Agri-Food Products freight.

Figure 2-2: Commodity Flows by County

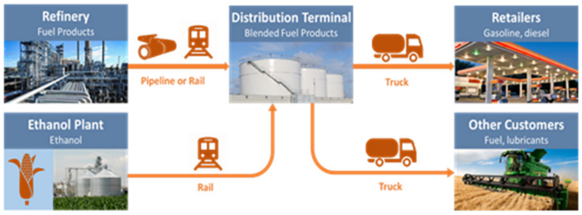


Source: CPCS analysis of Transearch via TREDIS (2016). Includes inbound, outbound and internal.

[2] Tonnage is more appropriate for understanding the needs and impacts of freight vehicles on roadways, while value is more relevant for understanding how freight facilitates regional economic prosperity.

2.2 Supply Chain Profiles in the Region

Retail Petroleum



About:

- Over $1.6 billion of refined petroleum products into, out of, within region in 2016
- Two fuel terminals located in Boise Junction
- Two high-pressure pipelines pass through region carrying batches of gasoline, diesel and jet fuel
- Oil comes in from refineries in Salt Lake City (Andeavor) or Wyoming/Montana (Sinclair Oil)
- Temporarily held in large tanks where additives such as ethanol may be blended into the fuel
- Delivery is via tank trailers and straight trucks for major retailers/dealers, or pickup trucks for agriculture/ construction site customers

Distribution and Warehousing

About:

- Value of distribution center (DC) freight was $2.67 billion in 2016
- The region's DCs and warehouses receive products from across the US, and primarily distribute them to Idaho and in some cases neighboring states like UT, OR and WA
- For example, a grocery DC receives various food products from across the US, consolidates these, and ships 1-2 times per day to large grocery stores
- DCs operate "just in time" to limit inefficiencies
- Some big-box stores rely on DCs outside of Idaho

Manufacturing

Electronics

- Low in weight, but make up a disproportionately large share of the region's freight value: $3.3 b.
- Due to the highly specialized nature of electronics manufacturing, the region's firms source parts internationally, which may arrive via truck or air freight, depending on time requirements.
- Finished components are shipped via truck to the west coast, or by air from Boise.

Transportation Equipment

- Raw materials are imported from outside the region
- Due to lack of nearby intermodal terminal, one example manufacturer uses high-quality steel imported from Europe to a Great Lakes port, which is shipped by rail to Portland and trucked to Boise
- Same company relies on empty refrigerated trailers on backhauls of food manufacturers shipping food products east, to bring in components from eastern US suppliers

Agricultural Products

Dairy Products

- $893 million of dairy products are transported on the region's freight network – mostly outbound
- One large dairy producer receives 75-100 milk trucks per day from the Treasure Valley and ships 80 truckloads of cheese per week across the US

Frozen Foods

- A large manufacturer and shipper of frozen vegetables and grains ships 700 rail cars per week, with an additional 35 trucks used for both shipping and receiving

Fresh Fruit

- One fruit producer in Canyon County, who operates farms throughout the Treasure Valley, ships 5-6 refrigerated trucks per week to grocery DCs across the Pacific Northwest. These shipments are highly seasonal, peaking during late summer and fall

Seed Products

- A company shipping seed products for corn an onions also has highly seasonal shipments (10 trucks per day during November through March)

2.3 Contribution of Freight to the Regional Economy

Freight-dependent industries are not just those that own or operate transportation equipment. The total value of regional GDP that is freight-dependent is $9.7 billion – more than 15 times the GDP generated by Transportation and Warehousing alone.

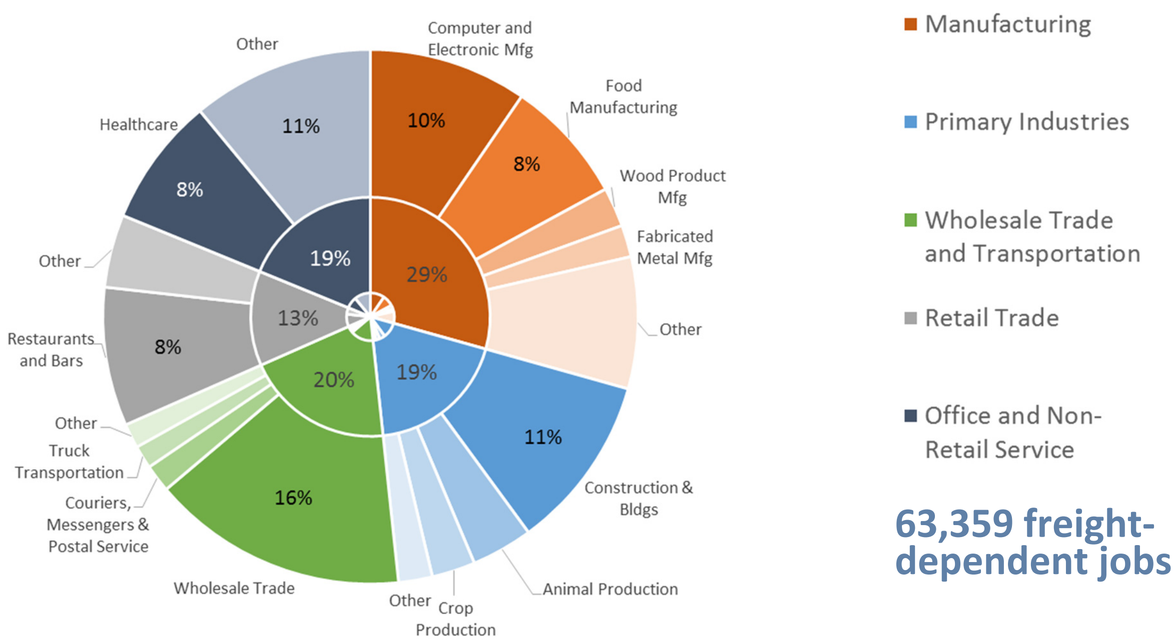
The data for this section were obtained from the TREDIS suite (specifically, the assessment of "freight dependence" is based on TREDIS's standard methodology; industry definitions are by the study team – more details in Appendix A).

Freight has a significant impact on the region, directly contributing:

- **$9.7 billion in regional GDP,** 29% of the region's total GDP
- **63,359 jobs,** 16% of the region's total employment
- **$3.8 billion in annual income,** 21% of the total employment income for residents in the region

Figure 2-3 shows the top industries by employment. Manufacturing is responsible for 29% of the 63,359 freight-dependent jobs. Primary Industries such as construction and animal production are responsible for 19% of freight-dependent jobs and Wholesale Trade, 16%.

Figure 2-3: Top Industries – Contribution of Freight to Regional Employment



Source: CPCS analysis of TREDIS data (2016). Includes all economic activity classified as Freight-Dependent by TREDIS. Note: the categories in this economic analysis are similar to, but not the same as the categories included for the commodity analysis. This is because economic analysis is based on industry data, as opposed to commodity data.

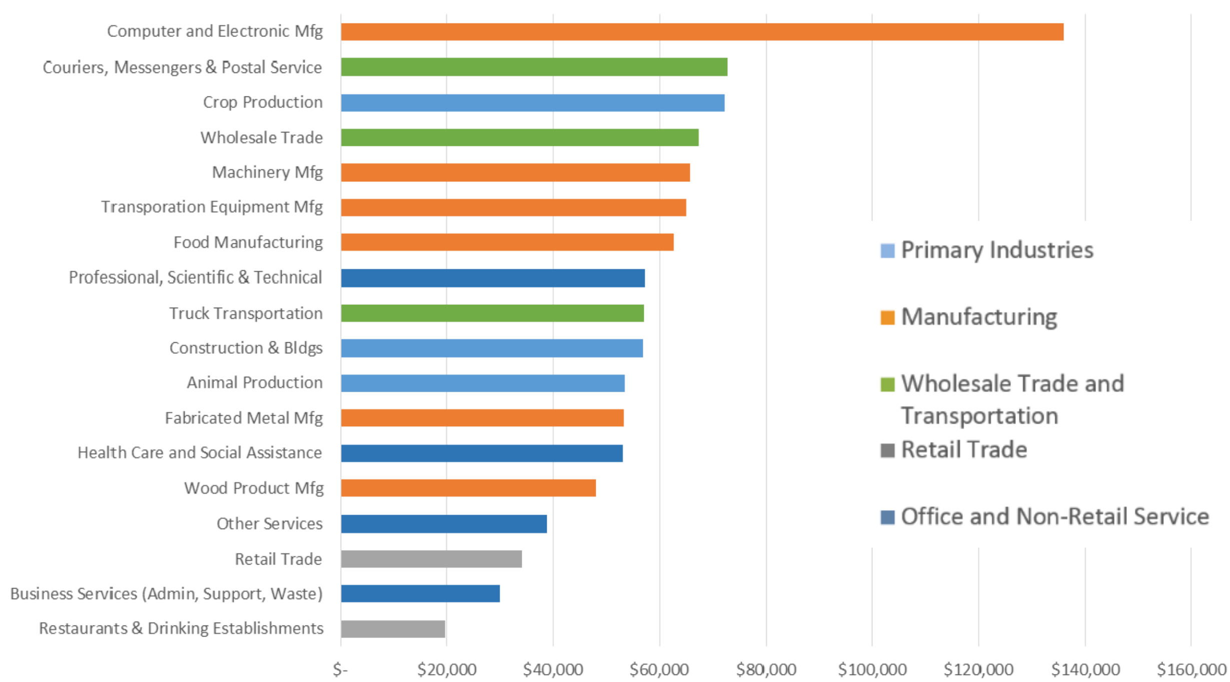
2.3.1 High-Income Freight-Dependent Industries

Figure 2-4 shows the Labor Income per Employee, i.e. wages, for industries with significant freight-dependent employment in the region (at least 750 freight-dependent jobs).

This figure draws attention to specific freight-dependent industries that are "punching above their weight," in terms of delivering household-sustaining jobs for the region.

Computer and Electronic Manufacturing produces $136,000 in income per employee – by far the most of any industry. Manufacturing and Transportation industries overall generate higher incomes, while Retail Trade industries have lower incomes.

Figure 2-4: Labor Income per Employee, for Top High-Employment Industries



Source: CPCS analysis of TREDIS data (2016). Includes all economic activity classified as Freight-Dependent by TREDIS. Note: To the extent that any employment is undercounted (e.g. season employment), this may skew the labor income per employee result.

2.3.2 Implications for the Regional Economy

Freight-dependent industries are significant contributors to regional GDP, employment, and labor income. Many diverse industries across the economy, from construction to agriculture to healthcare, depend on reliable transportation networks for their competitiveness. In reality, the freight impact described in this report is likely conservative, as it does not account for the fact that many freight-dependent businesses function as "base industries" that indirectly support demand for jobs in healthcare, education, restaurants, and other supporting industries.

The overall health of the freight system is closely intertwined with that of the broader regional economy. Assessing and improving the performance of the freight transportation system can help make the region a more competitive environment for exporters and help support investments in key industries, in turn driving economic growth in the region.

3 Regional Freight Clusters and Corridors

“Freight” and “goods movement” evoke images of trucks, trains, airplanes and vessels – the primary modes by which goods move across the country and globally. However, in order to understand the full freight picture it is necessary to also consider the “freight generators,” i.e. businesses that demand freight movement as a core part of their operations.

3.1 Freight Clusters

Defining freight clusters involved triangulating three data sources – disaggregate Infogroup business establishment employment data, Idaho Department of Labor (IDOL) employment data, and truck GPS “trip end”[3] data from the American Transportation Research Institute (ATRI), a study partner on the team. These were combined at the level of traffic analysis zones (TAZ), the building blocks of clusters. Figure 3-1 shows the characteristics of these sources.

Figure 3-1: Characteristics of Data Sources Used for Freight Cluster Definition

Characteristic	ATRI GPS Data	Infogroup Data	IDOL Data
At TAZ-Level	✓	✓	✓
Actual Trips	✓		
Employment		✓	✓
NAICS Available		✓	✓

Source: CPCS

The data sources thus are intended to complement one another by counterbalancing one another’s weaknesses. Specifically, the ATRI data reflect actual freight movement, giving greater weight to businesses that actually ship a lot of freight, even though they may have few employees. On the other hand, the two “land use” data sources help fill in any gaps since employment data are comprehensive rather than based on a sample. As well, the land use data allow for sectoral breakdowns, providing a more detailed view of freight activity within each cluster (whereas the GPS data are “blind” to the commodities within the trucks). The strengths of the data sources are summarized in Figure 3-2.

[3] A trip end is defined as a location where a truck trip starts or ends, and is a measure of truck trip generation/ attraction.

In total, these three sources were developed into six metrics (three "absolute" and three density-based – list in Appendix A) used to study the geospatial distribution of freight activity in the region. A quantitative, data-driven approach was used to define the freight clusters.

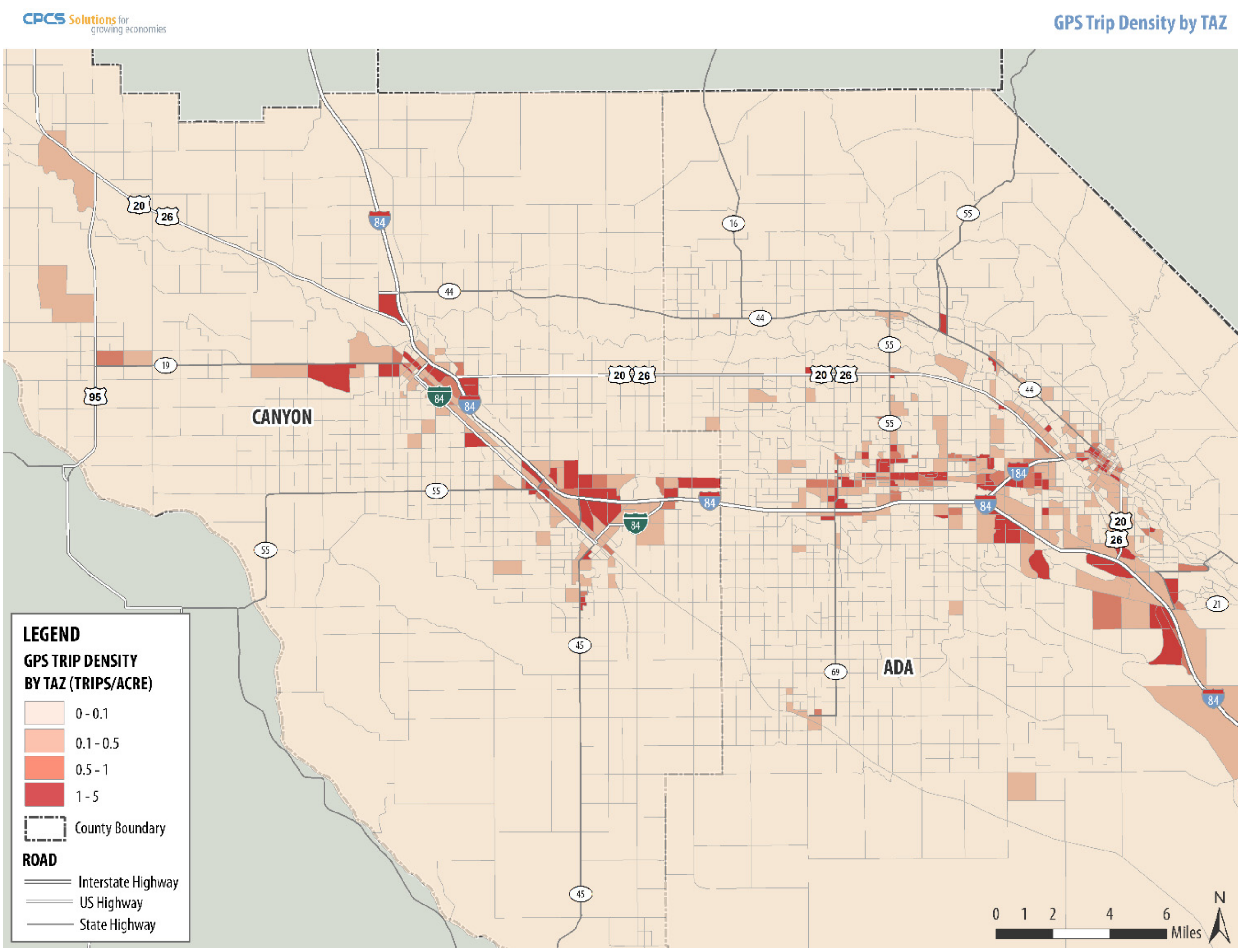
Figure 3-2: Strengths of Data Sources

Strength	ATRI GPS Data	Infogroup/IDOL Employment Data
Reflects actual freight activity	✓	
Reflects sector breakdown		✓
Comprehensive across businesses		✓
Accurate at TAZ level	✓	✓
Recent and up-to-date	✓	✓

Source: CPCS

Figure 3-3 shows one of the metrics used – the density of truck trip ends at a TAZ level.

Figure 3-3: Truck Trip Density by TAZ



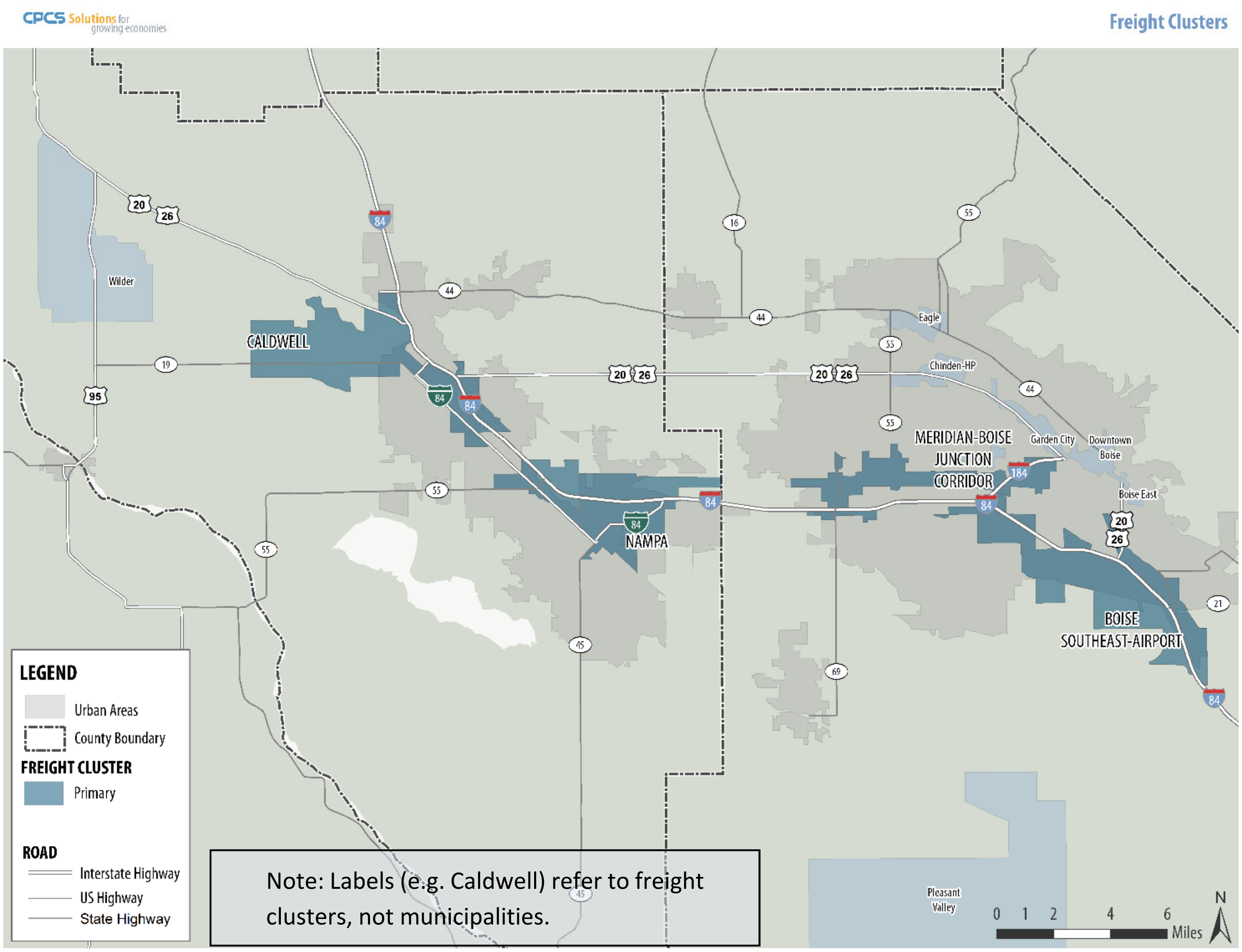
Source: CPCS analysis of ATRI GPS data (2016). Note: TAZ's are of variable size; large TAZ's may appear to overemphasize geographic scope of freight activity. Intended for regional rather than local-level analysis.

3.1.1 Freight Clusters in the Region

Four primary and eight secondary freight clusters were identified based on the data. These are shown in Figure 3-4. By any metric, the four primary clusters have on the order of 70-75% of all freight activity in the entire region. It is also noteworthy that each of the primary clusters is located along interstate highway and/or rail corridors.

Difference between Primary and Secondary Clusters	Four Primary Clusters in the Region:
Primary clusters are the most important freight-generating concentrations in the region. These clusters have large freight-related establishments and typically a variety of freight-related activity across multiple sectors. ***Secondary clusters*** typically have either one large freight-related business or else many small freight-related businesses. These are significant, but not at the level of the primary clusters.	• **Boise Southeast-Airport**, which stretches along I-84 from the eastern reaches of the metropolitan area to near the I-184 merge • **Meridian-Boise Junction Corridor**, which extends along the rail corridor and I-84 from Meridian to past I-184, near Boise Junction • **Nampa**, located on the northern reaches of that city along I-84 • **Caldwell**, extending along I-84 and westward to the Simplot complex

Figure 3-4: Location of Freight Clusters in the Region



Source: CPCS analysis. Note: Cluster definitions constrained by TAZ definitions - not meant for local-level application (e.g. may include residential areas)

3.1.2 Freight Transfer Centers

The study team also examined the location of freight transfer centers in the region. Upon review of the multimodal freight transfer centers, it was confirmed that these are located within the primary freight clusters identified in this section.

- **Rail-to-truck**: There is no central transload facility in the region for rail-to-truck transfers, but transfers (along with other activity such as storage) take place in many points along the spurs, corresponding to the location of freight-dependent shippers.
- **Air-to-truck:** The Boise Airport serves as the transfer center for air-to-truck movements. In general, any cargo shipped by air is delivered by truck to its final destination. According to the FAA, in 2016 Boise Air Terminal/Gowen Field handled 346 million pounds of cargo by landed weight, ranking 67th among all airports nationally.[4]
- **Pipeline-to-truck:** Refined oil is delivered to fuel terminals in the region via pipeline (see Section 2.2). The terminals are located in the Boise Junction part of Boise.

3.2 Freight Corridors in the Region

Identification of the truck corridor network relied heavily on the following data sources:

- Truck volume and classification data provided by COMPASS (including supplementary counts that were conducted specifically for this study).
- Truck global positioning system (GPS) data obtained from the American Transportation Research Institute (ATRI), a partner on this study. ATRI is the nation's largest provider of truck GPS data, with a national repository consisting of over 100 million data points a day made available by member fleets, representing about 700,000 trucks nationally.
- Land use data to identify freight clusters, as described earlier in this chapter.

One of the key aspects of this analysis is the synthesis of truck count (classification) data and ATRI GPS data. This innovative approach harnesses the best attributes of both data sources in order to develop a more complete picture of truck activity through the region. Most notably, the GPS data cover all roads in the entire region, meaning that these roads can be compared using a consistent method even where truck counts are not available. The synthesis essentially works by comparing values for road sections where both data sources are available, and then "scaling up" the GPS truck sample volumes elsewhere.[5]

Key principles underlying development of the truck corridor network are show in Figure 3-5.

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[4] Federal Aviation Administration, "CY 2016 Preliminary All-Cargo Landed Weights, Rank Order."

[5] It is important to note that the truck volume estimates developed for this study should be treated with caution at the local level. The methodological approach has been tailored to the key purposes of this study, which involve identifying routes with high truck volumes at a high level of confidence. However, the data sample is not necessarily appropriate for distinguishing between relatively low volumes of trucks (e.g. under 100 trucks per day) on local streets.

Figure 3-5: Principles Underlying Truck Corridor Network Development

Principle	Description
Reflects Reality	Network reflects the “reality on the ground” of where trucks are traveling today, as opposed to planned or proposed routes
Truck-Focused	Network describes the most important corridors for trucks traveling into, out of, through and within the region
Data-Driven	Development of network uses quantitative, data-focused approach to the fullest extent
Functionally-Focused	Network comprises different tiers or layers, to reflect differences in function between different types of routes (including agricultural routes)
Continuous	Free of illogical gaps or discontinuities
Current Data	Network is reflective of the most recent data available
Adaptable	Network is designed in such a way that it is straightforward to update in the future as conditions change

Source: CPCS

What the Truck Corridor Network is Not

This study is not intended as a planning exercise and thus does not:

- Reflect a full local-level analysis of how access can be provided to each individual facility,
- Produce a planned “closed network” that forces all corridors to link together (although efforts are made to reduce obvious discontinuities, this is not done at the expense of other quantitative criteria and is not the central focus of the study),
- Reflect an assessment of where trucks “should go” or what routes they should use. Rather, this study evaluates the routes in Ada and Canyon County already used by trucks on a daily basis.

Understanding what routes trucks are using can be a precursor to planning-type analyses to designate “truck routes” or to define a “truck route network.” Such an analysis is best conducted with careful attention to local detail, including assessing factors such as land use, compatibility of other road uses, and roadway geometry (issues such as pavement thickness, turning radii, bridge clearances, etc.).

This study provides the groundwork that could support a future planning analysis of truck routes in the region. By providing an objective analysis of where key freight clusters and freight corridors are located, this study provides information that helps policymakers and planning staff consider the implications of questions such as: if trucks are to be discouraged from using Road X, are there other roads nearby that can serve as truck connectors instead? Truck route designation should also inform other regional modal and land use choices, including the designation of bicycle routes and pedestrian usage.

What is a Truck

For the purpose of this study, trucks are defined based on the Federal Highway Administration (FHWA) class system, which COMPASS uses for vehicle classification, as Class 5 or above (two-axle, six-tire, single-unit trucks).

Figure 3-6 shows examples of several truck configurations commonly seen on the region’s road network.

Figure 3-6: Types of Heavy Trucks on the Interstate Network

53' dry van trailers are the most common type of configuration and carry all kinds of cargo. Trailers with a refrigerated unit are known as "reefers" and are used for temperature-controlled goods such as food products.

Flatbed trailers (and similar configurations, e.g. drop-decks) carry equipment and materials, such as metal products. Oversize/overweight vehicles require a special permit.

Tank trucks (tanker trucks) carry fluids such as fuels, chemicals, or milk.

There are many other configurations for hauling freight with unique needs, such as agricultural products, raw materials, livestock, motor vehicles, and many other commodities.

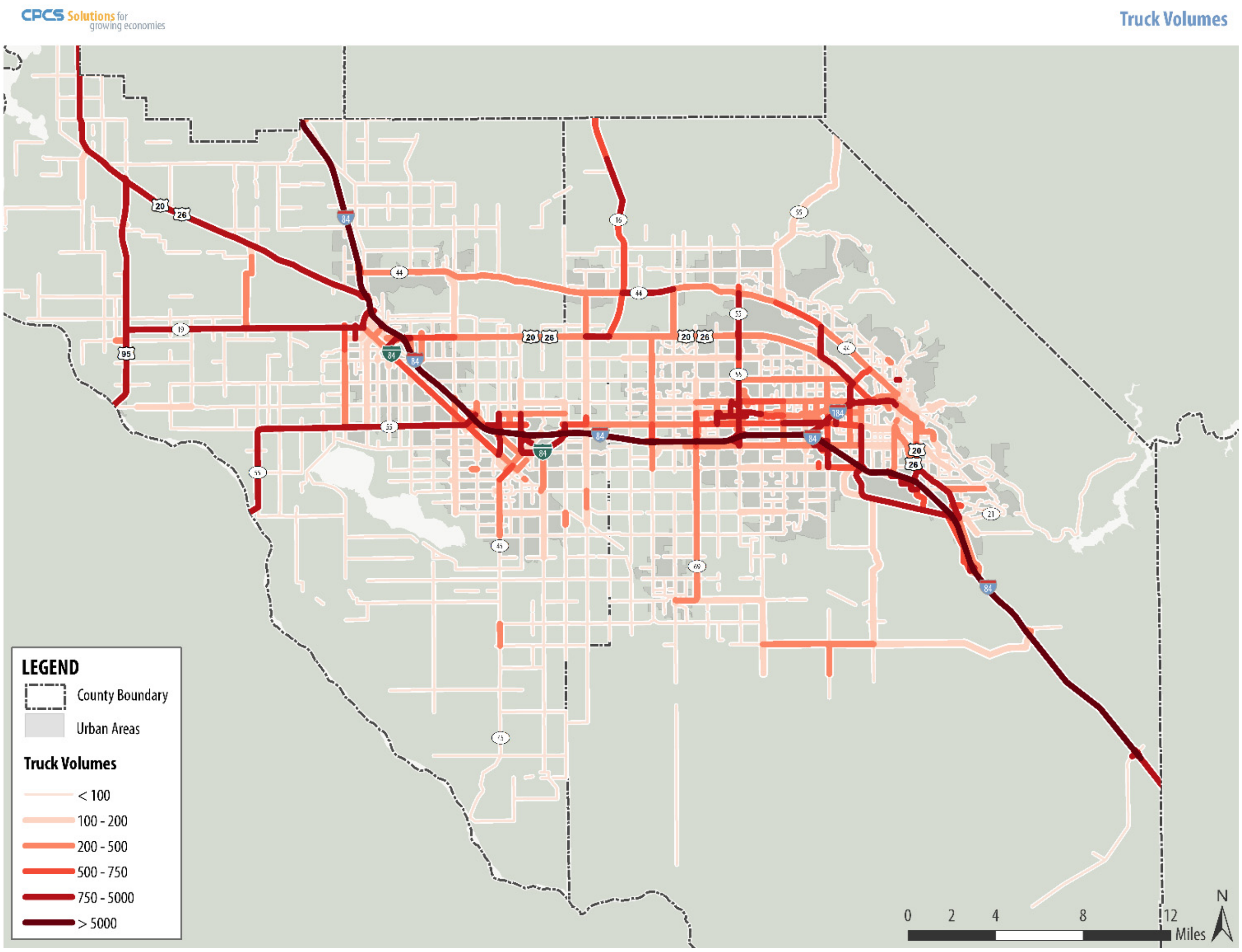
Combination vehicles include triple trailers and "Rocky Mountain doubles" (long trailer, followed by a shorter "pup" trailer). These are often used by courier and less-than-truckload carriers, as well as grocery retailers.

Source: CPCS

3.2.1 Synthesized Truck Volumes

Figure 3-7 displays synthesized daily truck volumes at a corridor level.

Figure 3-7: Truck Volumes by Corridor



Source: CPCS analysis of data from COMPASS and ATRI.

3.2.2 Current Truck Corridor Network

The study defines four classes of truck corridors. These are based on both existing truck volumes and access to freight clusters (specific criteria shown in Appendix A). Although the classification is data-driven, the choice of methodology is also intended to reflect a practical, functional focus, with the classes reflecting different needs of the system: e.g. some routes are needed for moving freight *across* or *through* the region, while others serve primarily as last-mile connectors to clusters or facilities. The truck corridor network is "current" in the sense of representing current conditions, rather than future anticipated, projected or planned conditions.

In addition to the volumes and clusters described above, the corridor definitions also relied on two complementary past or ongoing studies – the ongoing **I-84/I-184 Detour Plan** update as part of the Treasure Valley Incident Management Operations Manual, and the **Agricultural Freight Study** conducted by COMPASS in 2015, which tracked the corridors used for agricultural goods transport based on consultations with some of the large agricultural producers and transporters in the region (including JR Simplot, Amalgamated Sugar and Ruan Transportation).

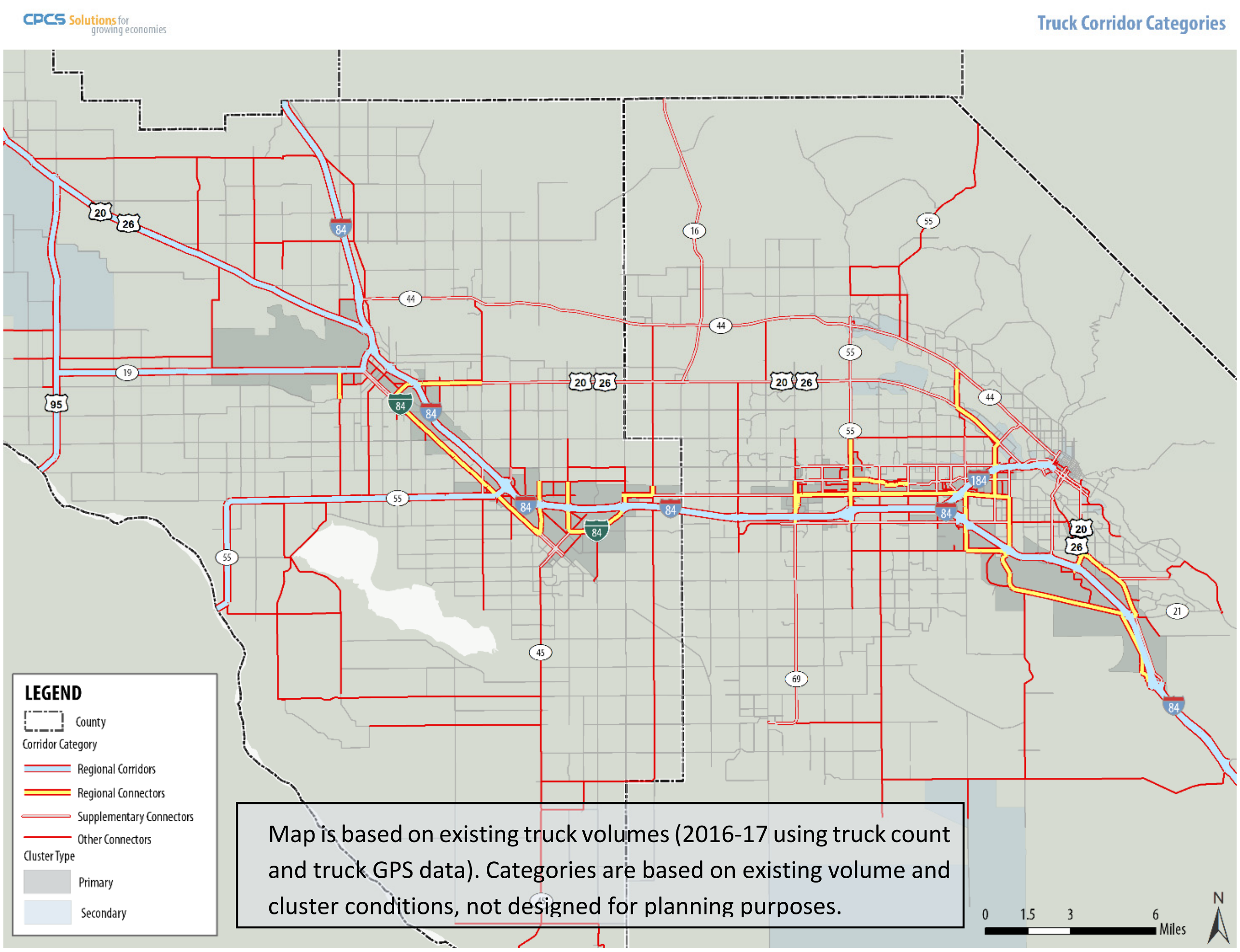
The Freight Advisory Work Group (FAWG) validated the truck corridor network through a webinar meeting held on October 13, 2017, and through subsequent review and comment provided via email and via a web mapping tool. Figure 3-8 describes the four classes of truck corridors, which are shown graphically in Figure 3-9 (close-ups in Appendix A).

Figure 3-8: Classes of Truck Corridors

Class of Corridor	Function
Regional Corridors	High-volume truck corridors that serve as the backbone of the network
Regional Connectors	High-volume truck corridors that provide connectivity from regional corridors to primary freight clusters
Supplementary Connectors	Corridors that provide redundancy for the Regional Corridors and Regional Connectors, or connect to secondary freight clusters
Other Connectors	Other truck corridors with sufficient truck volumes. Also includes identified agricultural routes and detour routes (unless already included in higher-order category)

Source: CPCS

Figure 3-9: Map of Truck Corridor Network Overlaid with Freight Clusters



Source: CPCS

The regional truck network consists of 600 centerline miles distributed across four Corridor Classes (Figure 3-10). Regional Corridors account for 122.9 miles of road, with approximately half of that attributable to interstates and half to other roads. The total non-interstate mileage for Regional Corridors and Regional Connectors is approximately equal.

Figure 3-10: Mileage Table for Corridor Classes

	Regional Corridor	Regional Connector	Supplementary Connector	Other Connector
Interstate	63.9	0.0	0.0	0.0
Principal Arterial	59.0	44.0	105.8	75.5
Minor Arterial	0.0	15.0	23.0	90.8
High-Speed Arterial/ Collector	0.0	0.0	0.0	64.2
Collector	0.0	0.0	0.0	42.0
Local	0.0	0.0	0.0	16.5
TOTAL MILES	**122.9**	**59.0**	**128.8**	**289.0**

Source: CPCS analysis. Note: Centerline mileage shown.

The Regional Corridors overall account for 75% of truck vehicle-miles traveled (VMT), most of which are on the interstate network. Each of the other classes individually accounts for less than 10% of truck VMT. Figure 3-11 summarizes regional truck VMT by Corridor Class.

Figure 3-11: Truck Vehicle Miles Traveled for Corridor Classes

	Regional Corridor	Regional Connector	Supplementary Connector	Other Connector	Total
Interstate	394,164	0	0	0	**394,164**
Principal Arterial	68,066	40,009	40,158	13,120	**161,353**
Minor Arterial	0	17,973	8,829	10,894	**37,696**
High-Speed Arterial/ Collector	0	0	0	2,210	**2,210**
Collector	0	0	0	11,390	**11,390**
Local	0	0	0	6,779	**6,779**
TOTAL TRUCK VMT	**462,230**	**57,981**	**48,987**	**44,393**	**613,592**

Source: CPCS analysis of truck volume data

3.3 Trucks and Road Maintenance Costs

The study team calculated the annual estimated costs of truck traffic on interstate and non-interstate roadways within the region.

These estimated costs, summarized in Figure 3-12, illustrate that trucks have a larger impact on road maintenance costs than what is suggested by their share of traffic. It is worth noting that heavier vehicles, such as single and multi-unit trucks, are responsible for a large share of the overall cost compared to their relatively small VMT. Yet, cars are still responsible for the majority of costs on the interstate and in particular non-interstate network (note that trucks traveling on the interstate are more likely to be combination vehicles, such as long-haul trucks, rather than single-unit trucks such as delivery vehicles).

Figure 3-12: Estimated Allocated Annual Highway Costs and Traffic Ratios

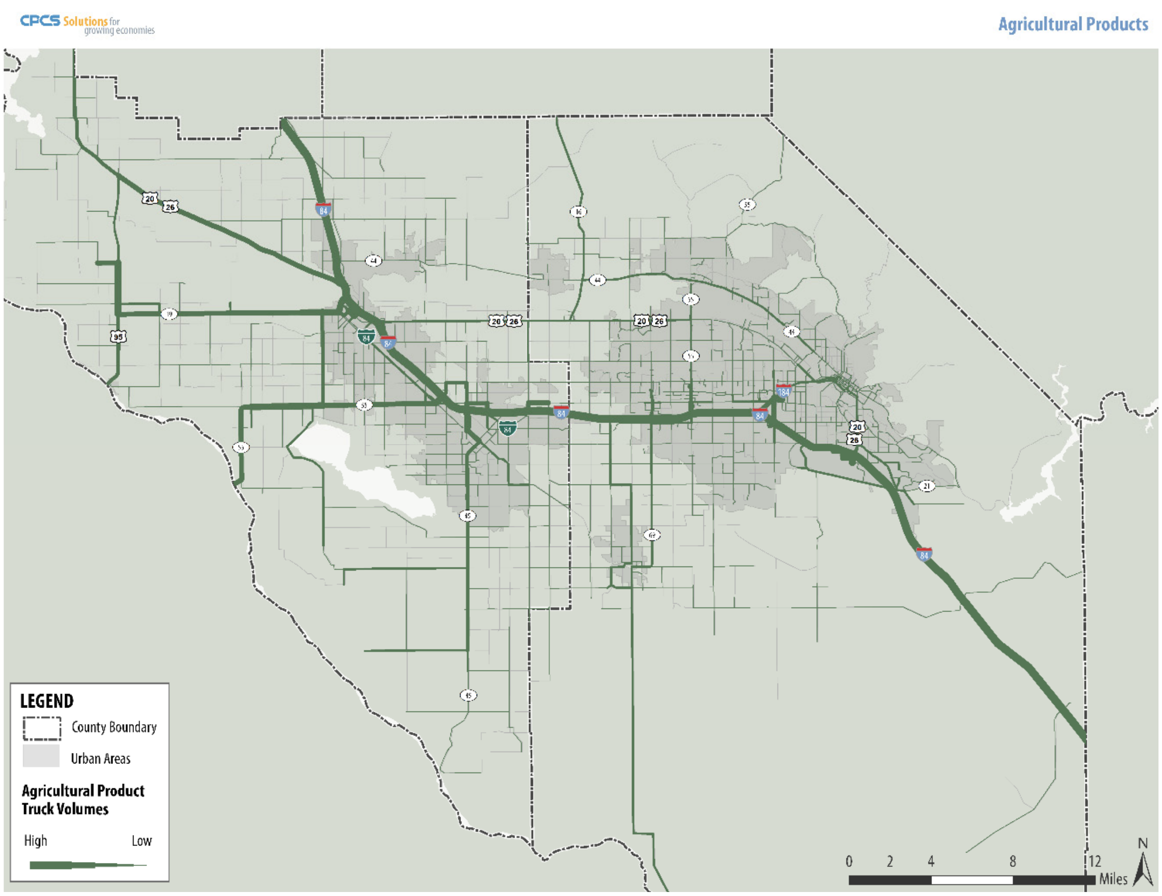
	Interstate			Non-Interstate		
	Cost (rounded)	Pct. Cost	Pct. Traffic	Cost (rounded)	Pct. Cost	Pct. Traffic
Car	$13,419,800	56.3%	89.9%	$28,394,100	80.9%	95.5%
Single-Unit Trucks	$1,492,900	6.3%	2.5%	$2,550,500	7.3%	1.9%
Combination-Unit Trucks	$8,909,200	37.4%	6.8%	$4,159,800	11.8%	1.5%
Subtotal Trucks	**$10,402,100**	**43.7%**	**9.3%**	**$6,710,300**	**19.1%**	**3.4%**

Source: Parametrix analysis of COMPASS data using FHWA Highway Cost Allocation Study, 1997 (costs inflated to 2017)

3.4 Mapping Commodity Flows

Mapping commodity flows is typically challenging given that origin-destination (OD) truck data from GPS readings has no commodity information. To circumvent this challenge, the study team used an innovative methodology triangulating truck GPS OD patterns and land use data at the TAZ level. The effect is to merge two separate datasets to map out how different commodities flow through the region, providing insights that either dataset on its own does not. Figure 3-13 shows flows of Agri-Food Products as an example (other commodity groups in Appendix A).

Figure 3-13: Flows of Agri-Food Products



Source: CPCS analysis

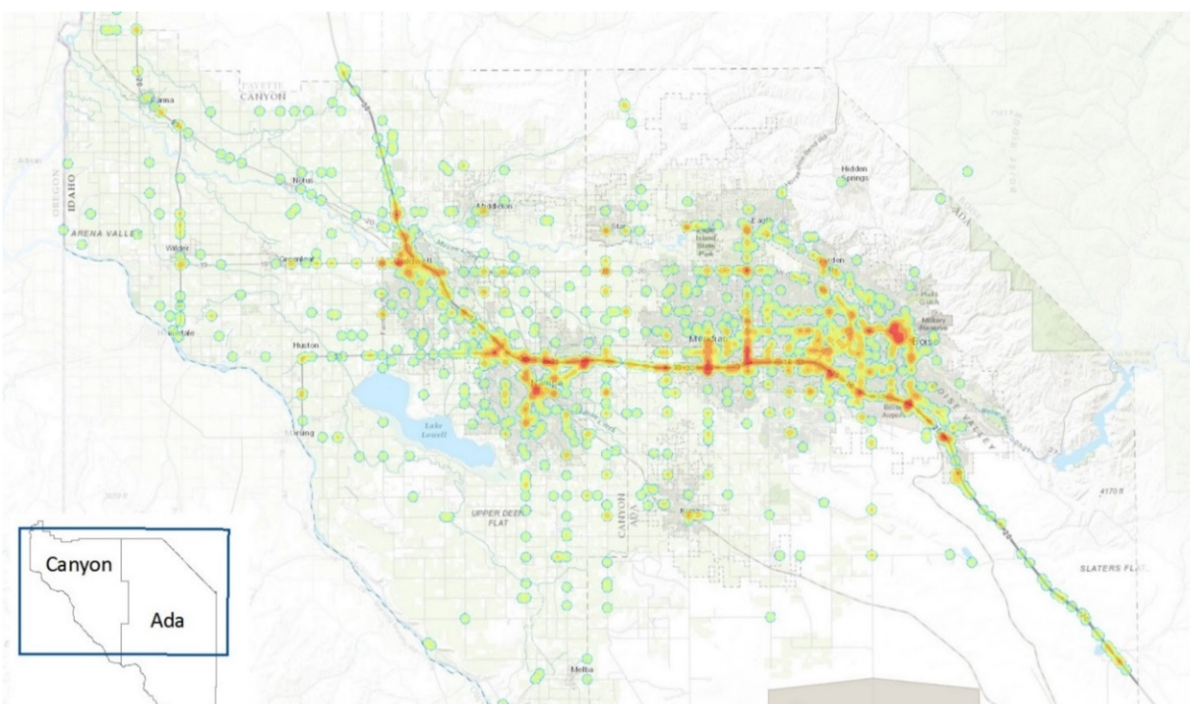
4 Freight System Performance Issues

4.1 Safety

Data for the safety analysis comprised approximately 86,000 records for vehicles involved in crashes during the years 2011-2015, obtained from the Idaho Transportation Department (ITD). The 2015 data were the most recent year available. Both absolute crash data and VMT-normalized crash data were considered. The reason for using the five most recent years is that a single year's worth of data may not represent a large enough sample to distinguish anomalies from real trends. In other words, this reduces the risk of one or two random crashes in a given year creating an anomalous picture of freight crashes in the region.

Figure 4-1 displays truck-involved crashes in the region in the form of a heat map. Crash density is a representation of the frequency of crashes within a geographic buffer. These heat maps do not display crash severity, crash cause, or number of vehicles involved in a particular event.

Figure 4-1: Truck-Involved Crashes 2011-2015



Source: Parametrix analysis of ITD data, 2017. Data from 2011-2015 (inclusive).

Figure 4-2 illustrates the way in which the study team distilled crash reports into three common contributing factors. Identifying hotspots through this causal approach (as opposed to absolute numbers of truck crashes, or normalized truck crash rates), allowed the study team to more confidently tie truck hotspots to specific solutions that would improve safety.

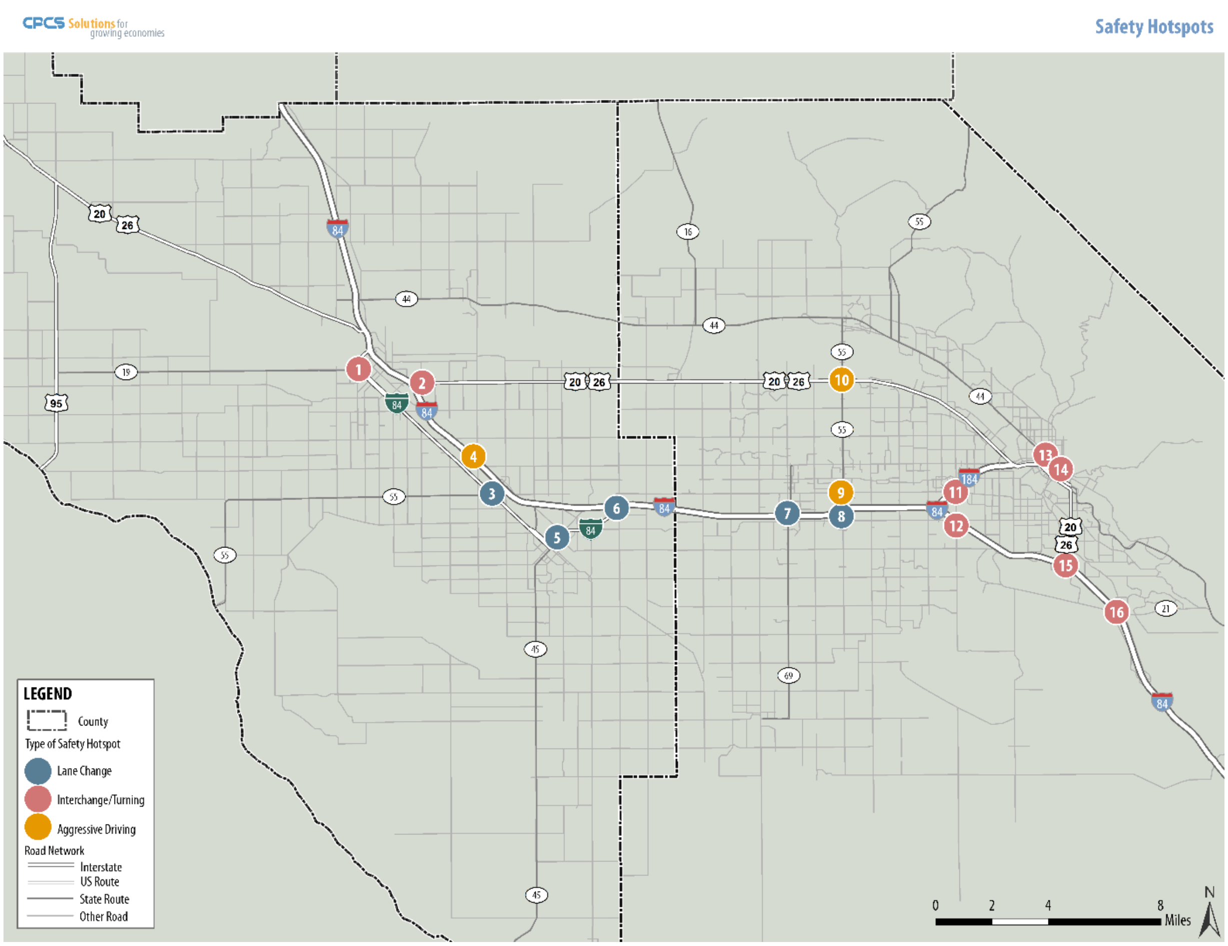
Figure 4-2: Thematic Heat Map Crash Attributes

Intersection/Turning Issues Primary Contributing Factors	Lane Change Issues Primary Contributing Factors	Aggressive Driving Issues Primary Contributing Factors
Failed to Obey Signal	Drove Left of Center	Exceeded Posted Speed
Failed to Obey Stop Sign	Failed to Maintain Lane	Following Too Close
Failed to Signal	Improper Lane Change	Inattention
Failed to Yield	Improper Overtaking	Speed Too Fast for Conditions
Improper Turn	Overcorrected	Too Slow for Traffic
Improper Use of Turn Lane		

Source: ITD, Parametrix analysis, 2017

Figure 4-3 shows the top 16 truck-related crash hotspots, color-coded based on their contributing factor (the numbers are unique identifiers and do not reflect a ranking). A more in-depth analysis of crash hotspots and safety-related issues can be found in Working Paper 3A.

Figure 4-3: Truck Safety Hotspots



Source: Parametrix analysis of ITD crash data

4.2 Truck Delay

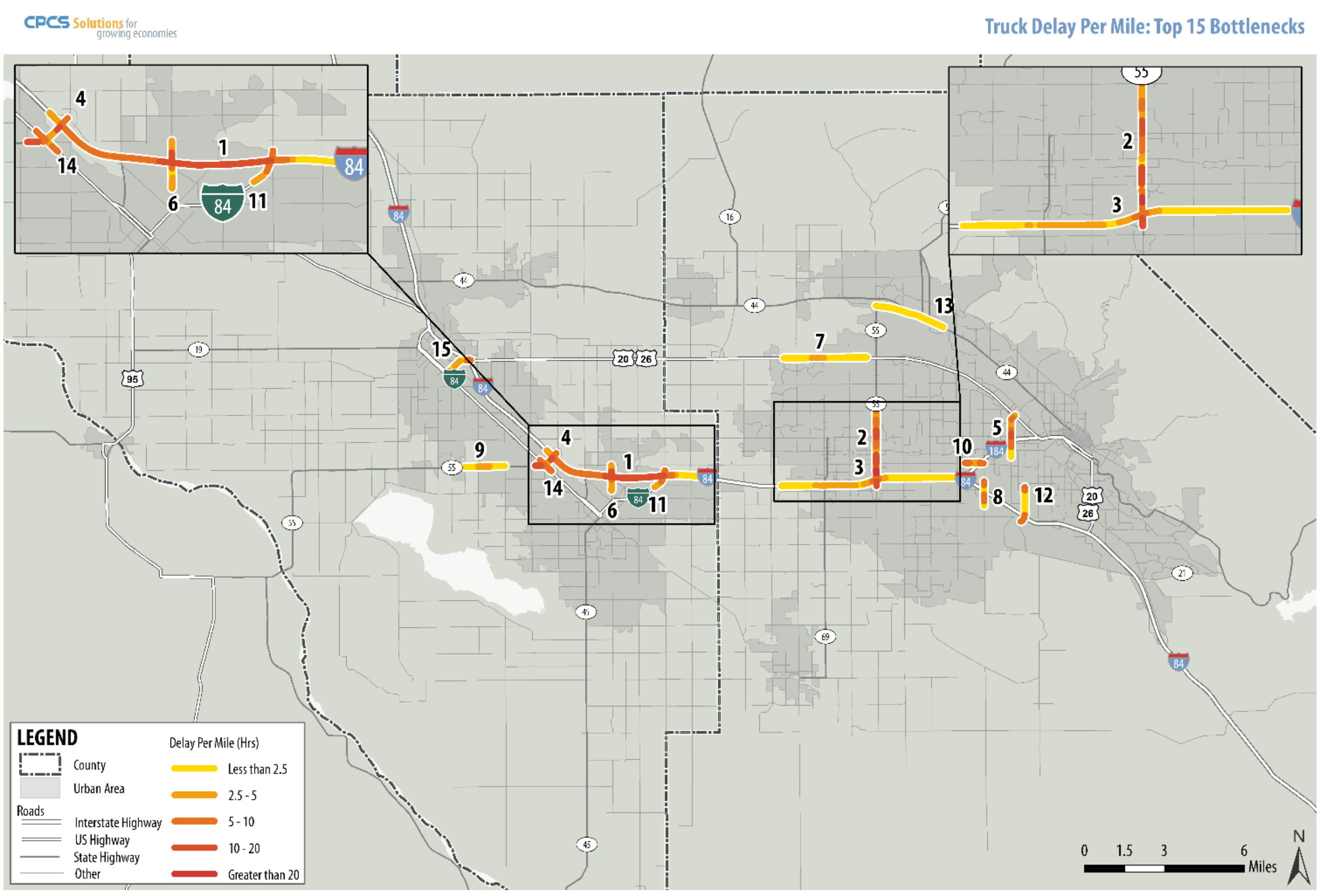
The study also estimated truck delay to gauge regional freight system performance. Truck delay is measured in hours, and is dependent on two factors:

- Truck Speeds (Relative to Baseline – i.e. 90% of observed free-flow speed)
- Truck Volumes

In other words, corridors with a high level of truck delay are those with slow truck speeds and a high number of trucks affected by delay. Truck speeds (including segment-specific free-flow speeds) were obtained from the GPS data retrieved from ATRI. Truck volumes were developed using the synthesis of classification counts and truck GPS data, as described in Chapter 3.

Figure 4-4 shows a map of the top 15 truck bottlenecks in the COMPASS study area. As the map indicates, many of these hotspots are clustered in a few geographic areas, especially along I-84 and some of the corridors connecting to it such as Eagle Rd. and Franklin Blvd., among others.

Figure 4-4: Truck Delay Bottlenecks: Delay Intensity



Source: CPCS analysis of ATRI data

Figure 4-5 displays the top 15 bottlenecks in the study area. The column on the right side shows total hours of truck delay per day for each bottleneck.

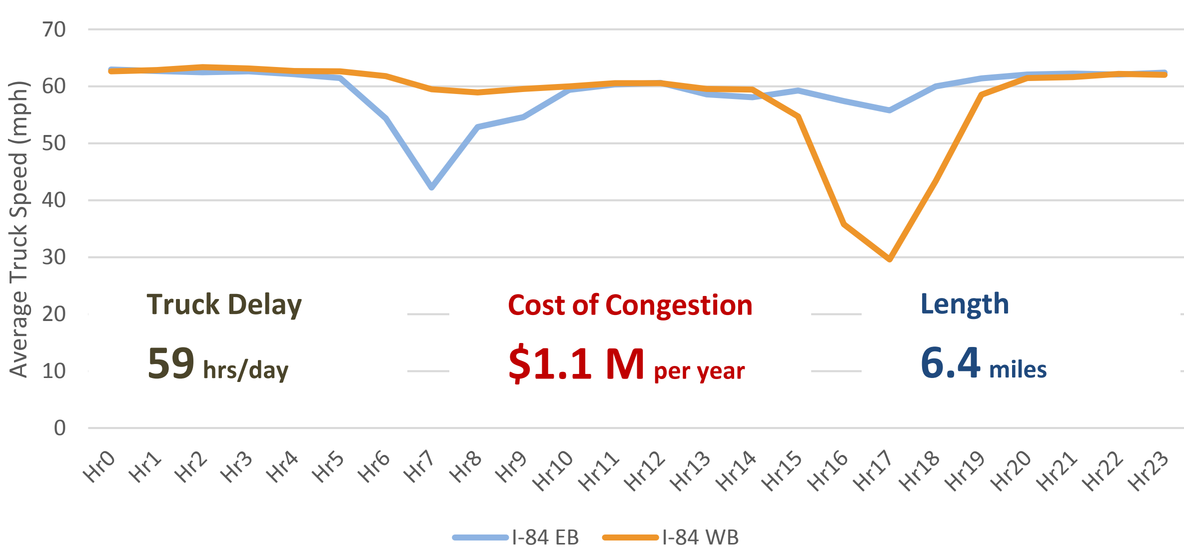
Figure 4-5: Table of Top 15 Truck Delay Bottlenecks

Rank	Corridor Name	Location	Type	Truck Delay (hrs/day)
1	**I-84 in Nampa**	County line to past Karcher Rd	Interstate	58.8
2	**SH 55 (Eagle Rd.)**	I-84 to north of Ustick Rd	Principal Arterial	22.4
3	**I-84 in Meridian**	Ten Mile Rd to I-184	Interstate	13.1
4	**SH 55 (Karcher Rd.)**	Midland Rd to Middleton Rd	Principal Arterial	10.3
5	**Curtis Rd.**	Franklin St to Chinden Blvd	Minor Arterial	7.4
6	**Franklin Blvd.**	Karcher Rd to 11th Ave N	Minor Arterial	5.1
7	**US 20/26 (Chinden Blvd.)**	Ten Mile Rd to Eagle Rd	Principal Arterial	4.1
8	**Cole Rd.**	North of Victory Rd to McMullen St	Principal Arterial	4.0
9	**SH 55 (Karcher Rd.)**	Midway Rd to west of 10th Ave	Principal Arterial	3.7
10	**Franklin Rd.**	Cole Rd to Maple Grove Rd	Collector	3.4
11	**Garrity Blvd.**	Franklin Rd to N 39th St	Principal Arterial	3.4
12	**Orchard St.**	S of Victory Rd to Kootenai St	Principal Arterial	3.2
13	**SH 44 (State St.)**	Eagle Rd to Duncan Ln	Principal Arterial	3.2
14	**Caldwell Blvd.**	Around Karcher Rd intersection	Principal Arterial	3.0
15	**21st Ave.**	I-84 to Cleveland Blvd	Principal Arterial	2.9

Source: CPCS analysis of ATRI data

The top bottleneck in the region is I-84 in Nampa, where the interstate decreases to four lanes from six lanes. Most notably, peak p.m. truck speeds decrease to an average 30 miles per hour in the westbound direction – which is less than 50% of the baseline speed. This bottleneck costs trucks in the region approximately $1.1 million annually.[6] Further detail on the top bottlenecks is reported in Working Paper 3B of this study.

Figure 4-6: Bottleneck #1 Speed Profile (I-84 in Nampa)



Source: CPCS analysis of ATRI data. Note: Cost of Congestion is for trucks only (not all vehicles)

[6] Assumes the national average operational cost per hour of $63.70, consistent with ATRI's 2017 Cost of Congestion study).

4.3 Issues Raised in Industry Consultations

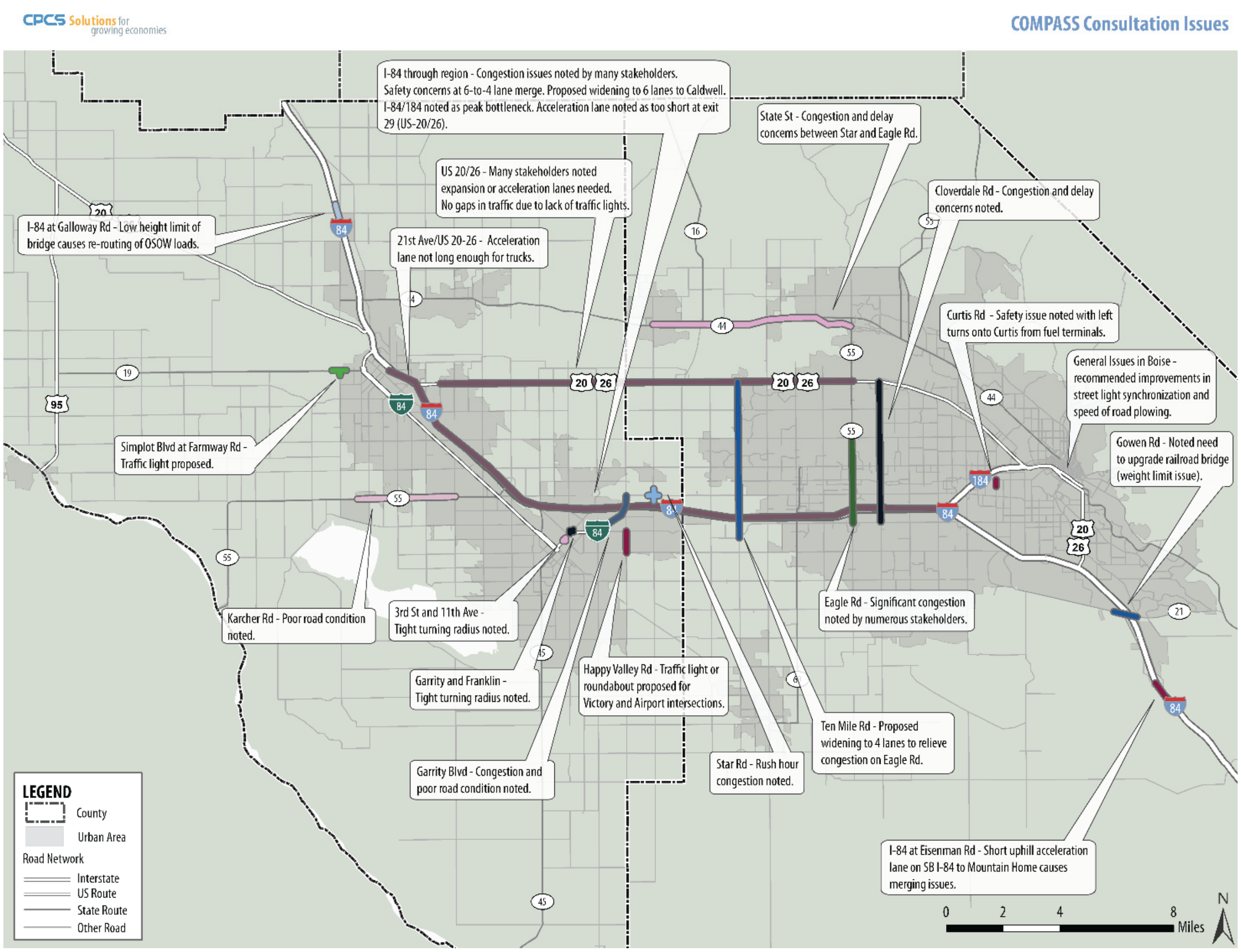
Method: The study team consulted freight stakeholders across the region, including through reaching out to industry associations (including the Idaho Trucking Association) and local development agencies.

Responses: The study team received information on location-specific freight issues from approx. two dozen companies, many indicating multiple issues. Stakeholders included trucking companies and major shippers in a variety of industries (e.g. heavy industry, petroleum, manufacturing, grocery, courier).

What the Responses Reveal: In many cases, issues raised in consultations refer to locations that are already identified in the delay or safety analysis, helping to validate key findings (e.g. I-84, Eagle Rd.). In some cases, issues noted in consultations are not directly supported by data, although this does not make them invalid. For example, many stakeholders noted congestion problems along a longer span of US-20/26 (Chinden Blvd.) than what was identified in the truck bottleneck analysis (which are based on current truck volumes) – possibly suggesting that the trucking industry would like to make greater use of US-20/26 as an east-west route, and would do so if the corridor were improved (e.g. widened, access improved). Finally, in some other cases, some issues noted in the consultations fill gaps that could not have been identified by the delay and safety analysis (e.g. roadway geometry or access).

The locations identified in consultations are displayed in Figure 4-7.

Figure 4-7: Issues Raised in Industry Consultations



Source: CPCS industry outreach. Note: colors are unique to each location (no relationship intended between similar-colored locations)

5 Freight Needs and Prioritization

5.1 Freight Needs

The study team used a quantitative, data-driven approach to define the most important freight needs in the region. The freight needs developed through this process:

- Are regionally important (focus is at regional level rather than local level),
- Are developed using a single clear, consistent and methodologically sound framework across the region,
- Are truck-focused. This is for practical reasons (the metrics used are mode-specific, and a parallel methodology for other modes would not be obvious), and also for principled reasons (road infrastructure is most obviously influenced by public policy, and most supply chains that rely on other modes also rely on public roads at some stage),
- Are distinct from freight *solutions*. Prioritizing freight needs helps generate an understanding of problem spots that, if addressed, would go farthest in benefitting freight. Prioritizing solutions (which could include projects, as discussed in 5.2), could serve as a follow-up task to this study, taking into account that many of the top freight needs also have important non-freight elements.

5.1.1 Approach to Determining Freight Needs

The study team prioritized freight needs according to two basic criteria: performance issues and regional importance. Performance issues (delay, safety, consultations) are assigned 70% of the score, while the truck network is assigned 30%. In addition to these weighting scheme, two other weightings were also considered as part of a sensitivity analysis: a) one that gives greater weighting to safety[7] (up from 20% to 30%), and b) one that gives greater weighting to quantitative factors (safety and delay both up from 20% to 30%). The baseline and sensitivity

[7] It should be noted that safety is also considered partially in the Consultations metric, since many of the comments received related to safety issues. Thus, the actual safety data (where crashes occurred) are complemented by the inclusion of *perceived* safety issues.

cases were confirmed by the Freight Advisory Work Group, and were all found to give broadly similar results (some differences within tiers but not across tiers).

Figure 5-1 provides a detailed description of the (baseline) freight needs scoring system. This framework is intended both to be applicable to this study, and to be adjustable in the future should COMPASS wish to update the study with new data or metrics.

Figure 5-1: Detailed Description of Freight Needs Scoring System

Metric	Points	Details
Delay	0 – 2 points	- 1 point if identified as a delay hotspot - 0-1 extra points depending on magnitude of hotspot
Safety	0 – 2 points	- 1 point if identified as a delay hotspot - 0-1 extra points depending on magnitude of hotspot*
Industry Consultations	0 – 3 points	- 1 point if identified as a hotspot - 1-2 extra points if identified by multiple stakeholders (max of 3 points corresponds to five mentions)
Current Truck Network	0 – 3 points	- 0 points if not on the current truck network - 1 point if Other Connector - 2 points if Supplementary Connector - 3 points if Regional Corridor or Regional Connector
TOTAL	0 – 10 points	

Source: CPCS. *Note: since safety hotspots not ranked, these are each assigned a value of 0.5/1

The study team assessed 27 freight needs – which were distinct locations with one or multiple freight issues – and divided these into three tiers based on the scoring system. The top tier of freight needs repeatedly rose to the top when measured against multiple metrics.

Figure 5-2: Top-Tier Freight Needs

#1. I-84 in Nampa Delay: Top bottleneck in the region Safety: Many crashes related to freeway lane drop. Consultations: Congestion and safety concerns with merging trucks. Noted that freeway should be widened to Caldwell.	**#2. Eagle Road** Delay: #2 hotspot in the region Safety: Hotspot along Eagle Rd north of I-84 to Pine Rd. Consultations: Congestion due to competition from passenger cars and limited north-south alternatives.
#3. I-84 from Meridian to I-184 Delay: #3 truck delay hotspot Safety: Improper lane change crashes Consultations: Bottleneck during peak times, high level of commuter traffic.	**#4: US-20/26 through Region** Delay: #7 delay hotspot Safety: Hotspot at Eagle Rd. Consultations: One of most-mentioned locations – issues are congestion and two-lane width (with few gaps due to lack of lights)

Source: CPCS

The study team also did a preliminary evaluation of potential solutions to help address the freight needs – along with order-of-magnitude costs – although these are not intended to be comprehensive. This process consisted of cross-checking locations of freight needs against projects in the same location listed by ITD in its Idaho Transportation Investment Program (ITIP), or by COMPASS in its long-range transportation plan CIM 2040; and in cases with no overlap, proposing potential solutions on the basis of the study team's professional judgment and experience (in particular for safety issues). Detailed lists of the top freight needs and solutions are in Working Paper 4-A.

5.2 Project Prioritization

Project prioritization can take several forms. This study recommends integrating the freight corridors into a **multicriteria framework**, since this is the approach currently used by COMPASS in project prioritization. A multicriteria framework assigns values to a wide range of variables or metrics that can help determine priorities for project needs. This also provides a mechanism for integrating freight needs.

Funding programs relevant to freight transportation in the region include COMPASS's Transportation Improvement Program (TIP), ITD's ITIP, and the Statewide Transportation Improvement Program (STIP). In addition, federal funding dedicated to freight is available through the FAST Act's Critical Urban Freight Corridors (CUFC), which can be redefined on a rolling basis.

This study supports COMPASS's decision-making processes by explicitly integrating freight and goods movement into the decision-making framework for prioritization. Specifically, as freight needs are being addressed and solutions are developed into projects, proposed projects that are on freight corridors identified in this study can receive emphasis, reflecting the amplified importance of these corridors for freight mobility.

In addition to the step described above, this study recommends that COMPASS in consultation with local freight stakeholders develop a supplementary list of freight-related projects, building on the specific needs and preliminary solutions identified in this study.

6 Freight and Land Use

6.1 Background

Anchored by Boise and comprised of Ada and Canyon Counties, the COMPASS region is a vibrant and growing region—home to over 700,000 residents and many freight-dependent businesses. As the largest metropolitan area in the fastest-growing state,[8] the region faces unprecedented demands on its transportation infrastructure and its developable land.

Growth in the region is placing pressures on existing land uses, including the land along the Boise Cutoff rail corridor that bisects the heart of the Treasure Valley east-west. As part of the study, the study team examined the existing and planned land uses along rail corridors, with a focus on describing the freight activity that relies on these corridors. The study team also prepared practical guidance for integrating freight into local transportation and land use planning processes. The outputs of this study provide policymakers a more complete picture of freight considerations to take into account in their ongoing planning efforts.

6.2 Land Use Along Rail Spurs

The study team completed this analysis through a combination of data analysis (mostly land use databases provided by COMPASS and business establishment data), field reconnaissance (including site visits and also aerial imagery e.g. Google Earth), and consultations with freight stakeholders including Union Pacific Railroad, WATCO and rail shippers.

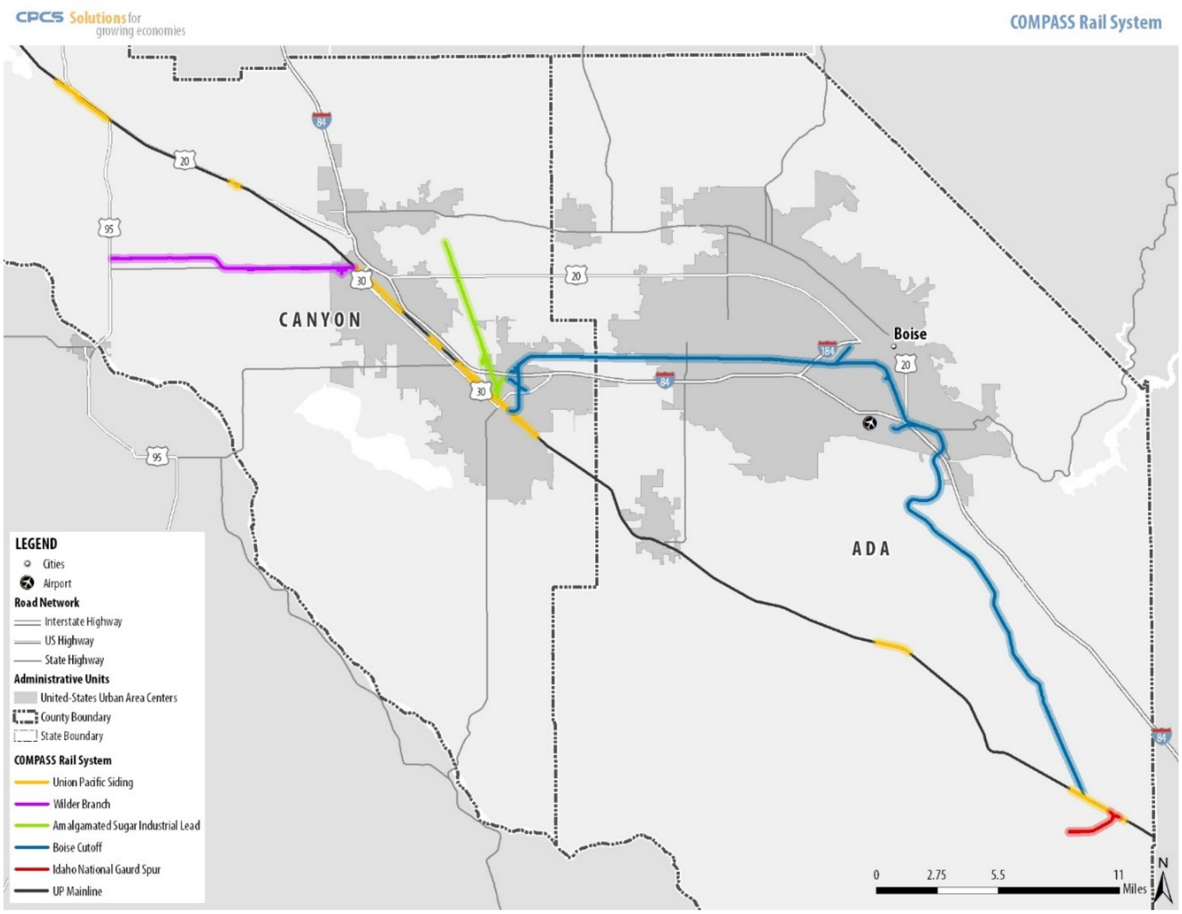
6.2.1 Freight Rail in the Region

Union Pacific Railroad (UPRR) and Boise Valley Railroad (BVRR) provide freight rail service in the region. Union Pacific operates the largest rail network in the United States and provides long-haul freight connectivity between the COMPASS region and the rest of Idaho and the U.S. UPRR owns 234.4 miles of track in the COMPASS region with 95.1 track miles in Ada County and 139.2 in Canyon County, representing nearly 28% of total UPRR track miles in Idaho. BVRR, a short line railroad owned by WATCO, operates over UPRR trackage on 63 track miles in the region, including the Boise Cut-Off (26 track miles) and the Wilder Branch (11 track miles). UPRR and BVRR serve the region's local shippers and receivers, connecting the region with customers and suppliers across North America and globally through major maritime ports.

Figure 6-1 shows the freight rail system in the region.

[8] US Census Bureau (2017), "Idaho is Nation's Fastest-Growing State, Census Bureau Reports"

Figure 6-1: COMPASS Region Freight Rail System



Source: Parametrix analysis of railroad information.

Figure 6-2 shows industrial land by rail spur. The Boise Cut-off has the most existing industrial land, but given that it is the longest spur and passes through large undeveloped areas, the industrial land concentration is relatively low at 6%. This is the lowest concentration of industrial land along a spur in the study area, except for the Idaho National Guard Spur, which doesn't contain any industrial uses. The Amalgamated Sugar Industrial Lead has the highest concentration of industrial land at 33%, a total of 794 acres.

Figure 6-2: Industrial Land by Rail Spur

Rail Spur	Existing Industrial Land Use (acres)	Share of Total Existing Industrial Land	Concentration (proportion of industrial land to all land)
Amalgamated Sugar Industrial Lead	794	27%	33%
Boise Cut-off	1,031	35%	6%
Idaho National Guard Spur	0	0%	0%
UP Main Line Spurs	437	15%	9%
Wilder Branch	684	23%	18%
Total	**2,937**	100%	**10%**

Source: Parametrix Land Use Analysis, 2017.

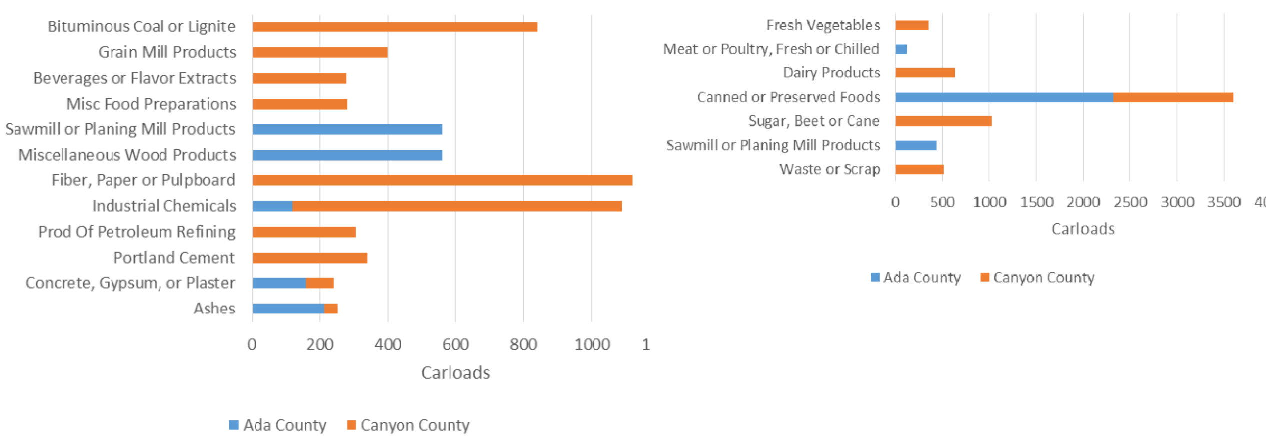
6.2.2 Freight Shipments in the Region

The study team examined Transearch commodity flow data to identify total current regional rail flows. While it is not possible to identify the exact number of carloads generated on the spurs examined in this report, railroad consultations and analysis of available data suggests that a high percentage of the carloads generated in the region are from the spurs. Overall, shippers in the region moved approximately 7,000 carloads inbound and 7,000 carloads outbound in 2013. Canyon County was responsible for 73% of inbound carloads and 58% of outbound carloads. Figure 6-3 displays the top commodities shipped by rail.

Boise Valley Railroad

The BVRR serves 84 customers, of which between 60 and 70 are currently active. There is wide variation in the number of railcars generated per customer. Some customers may ship or receive only 1 to 2 carloads per year while others may generate 1,500 carloads per year. BVRR serves customers on the Boise Cut-Off with twice-daily service on weekdays (10 times a week). BVRR serves the Wilder Branch with three trains a week (Monday, Wednesday, Friday). All trains originate at BVRR's Nampa Yard.

Figure 6-3: Top Commodities Shipped Inbound (Left) and Outbound (Right)



Source: Transearch via TREDIS (2013)

The BVRR operates over track capable of supporting industry-standard 286,000-lb. railcars, allowing all customers to ship or receive over UPRR's entire network. Of note, the operations of rail spurs in the region, including the BVRR, include servicing customers on sidings on both sides of the rail right-of-way. This particular configuration makes it difficult to align other potential uses in the corridor, including trails or passenger rail, given the conflicts with freight rail movements.

The top commodities moved by the BVRR include frozen potatoes, onions, lumber, ethanol, chemicals, and asphalt (seasonal). Each commodity sustains regional economic activity:

- Frozen potatoes and onions are exported from the COMPASS region by rail throughout North America. Onions are seasonal
- The lumber is used in local building activities

- Ethanol, frequently originating from the U.S. Midwest, is mixed with petroleum (imported via pipeline) to supply retail petroleum demand in the region
- Asphalt arrives by rail seasonally to support road building and maintenance projects
- Chemicals are utilized in a variety of uses, including municipal wastewater and water treatment.

Most rail shippers along the Wilder branch are agricultural users, with the most significant cluster in the Caldwell area, including Simplot and the Crookham Company. On the Amalgamated Sugar Industrial Lead, Amalgamated Sugar itself is the major freight generator, along with businesses shipping and receiving cement and steel. The main activity clusters on the UP main lines are onions in Parma and sugar beets and onions in Notus. Finally, the Idaho National Guard Spur is for military use.

6.2.3 Rail Trends and Growth Opportunities

A steady customer base sustains local rail operations in the region, with major rail shippers anchoring the line and only periodic fluctuation in small customers (e.g. losing one, adding another). The railroads operating in the region believe that there are major growth opportunities if the land uses and rail service plans are synchronized in a way to attract additional industrial users.

A Transload Facility? Both UPRR and BVRR, in partnership with local economic development officials and businesses, are examining the possibility of developing a multimodal transload facility in the region. A transload facility typically consists of one or more dedicated tracks within a paved or unpaved area that allows for truck-to-rail and rail-to-truck transfers of different types of cargoes, including project cargoes associated with construction or manufacturing projects. Frequently, transload facilities are used to transfer oversize and overweight shipments between truck and rail. Shippers in the region have expressed the need for a facility of this type. The 2013 Idaho State Rail Plan recommended the development of a multimodal transload facility in two phases: first phase would construct a 50-acre facility with a 50,000 square foot warehouse; second phase would develop an adjacent 100-acre industrial park.

Intermodal Rail? While intermodal container and trailer shipments have been among the fastest-growing rail shipment type in the US, shippers in the region continue to rely on intermodal transfer facilities outside the region, including the Union Pacific Intermodal Transfer Facility in Salt Lake City. UPRR has worked with retail companies and the Idaho Department of Commerce to examine the feasibility of developing an intermodal center in the Boise-Nampa region but has concluded that there is not sufficient present demand to create the economy of scale required for successful local intermodal operations. In fact, the examination concluded that shipping containers from a local facility would be more expensive than draying the container by truck to Salt Lake City.

6.2.4 Industrial Land Along Rail Spurs

Utilizing regional planning documents and digital maps, the study team analyzed the future potential for industrial development along the rail spurs in the COMPASS region. The analysis found that current zoning allows industrial uses to grow from 7% to 17%, while the comprehensive plans allow an even greater increase to 21%. The study team also examined the potential changes to existing industrial land uses—as they are converted to other uses or as non-industrial zoned land is converted to industrial. Overall the analysis found that industrial land use along the rail spurs has the opportunity for net growth (allowed by existing zoning and comprehensive plans), although at a local level some existing industrial land is being lost to residential, commercial, and institutional uses. Figure 6-4 shows existing industrial land for each spur compared to zoned and planned (comprehensive plan) industrial land.

Figure 6-4: Zoned Industrial Land by Rail Spur

Rail Spur	Existing Industrial Land (acres)	Zoned Industrial Land (acres)	Planned Industrial Land (acres)
Amalgamated Sugar Industrial Lead	1,031	742	1,485
Boise Cut-off	684	2,912	2,857
Idaho National Guard Spur	0	0	0
UP Main Line Spurs	437	1,086	905
Wilder Branch	794	596	1,226
Total	**2,937**	**5,308**	**6,450**

Source: Parametrix Land Use Analysis, 2017.

6.3 Guidelines for Model Freight Ordinance

The integration of freight considerations into state and metropolitan planning organization (MPO) transportation planning has become increasingly common as transportation agencies have institutionalized federal freight recommendations and requirements embodied in recent surface transportation laws (SAFETEA-LU, MAP-21, FAST Act). Yet, formal freight planning, or the inclusion of freight in municipal comprehensive plans, has historically been neglected. Failure to incorporate freight into local comprehensive plans may result in land use conflicts that lead to nuisance complaints and unhealthy or unsafe living conditions for residents.

As a starting point, county and municipal planners should work with their counterparts at the MPO (COMPASS) and state level (Idaho Transportation Department) to understand the nature of goods movement in their communities.

This study included a stakeholder survey of members of the Freight Advisory Work Group (FAWG) and Regional Transportation Advisory Committee (RTAC). The primary issues identified that are resolvable by zoning ordinance were redevelopment that displaces or impedes freight transportation, interaction of freight vehicles with non-motorized users, pollution (air, light, noise), and street geometry (intersection and road configuration). Competing land use philosophies and interests may affect the way that counties and municipalities integrate freight into their planning and zoning. For example, some may favor multiuse freight corridors while others may promote exclusivity for freight, passenger, or non-motorized transportation.

This study does not prescribe specific "one-size-fits-all" planning solutions. Rather, it provides information and tools from a "freight lens" that can help municipalities make decisions on how best to support freight needs alongside other regional and local priorities.

6.3.1 Freight Rail Mobility Issues

A private freight rail ROW may have the appearance of underutilization and seem like an attractive location for active transportation or transit facilities. Yet, it is important to understand trade-offs with locating a public transportation facility in a freight rail ROW:

Freight Considerations for Freight Rail Rights-of-Way

Safety: This is the primary concern with rail facilities. It is important to consider emergency stopping as freight trains have much longer stopping distances when compared to personal automobiles. Derailment risk also increases during emergency braking applications. Trespassing incidents, which are associated with safety concerns, have been shown to increase in rail corridors that are adjacent to other incompatible uses.

Freight operations: A multiuse path adjacent to freight rail may cut off access to freight users on one side of the corridor, causing potential loss of rail-dependent businesses.

Transit operations requirements: Co-location of transit rail and freight rail in the same corridor requires additional systems investment to monitor corridor conditions and guarantee safe passage of all vehicles. The Federal Railroad Administration prohibits freight trains and light rail transit from concurrent operation on the same tracks. For example, in Salt Lake City where freight and light rail transit share track, freight movement is limited to four hours of operation, 12:30 a.m. to 4:30 a.m., limiting rail freight operations. Even when rail freight and transit operate on separate lines in the same ROW, rail freight access is cut off on one side of the corridor.

Freight-dependent economic impacts: Limiting freight access to one side of a ROW corridor or placing restrictions on time of day freight operations can negatively impact the financial viability of freight rail-dependent businesses. When freight-dependent businesses close or relocate, transportation and warehousing jobs are potentially jeopardized. These jobs pay higher on average than the service jobs that may replace them along multiuse corridors, affecting the region's economic output and diminishing the number of higher-paying base economy jobs.

Unintended shift to truck: Shifting freight activity away from freight rail corridors may lead to increased net regional truck vehicle miles traveled (VMT) given the shortage of rail-served land and the likely shift to truck. This may have the unintended consequence of impacting truck safety and increasing air quality and environmental impacts.

6.3.2 Freight Corridor Preservation

Urban encroachment is a growing trend as urban populations increase and urban areas expand onto land that is or was previously a functional buffer. Industrial preservation is also a growing concern for freight centers in cities as the demand to redevelop grows. Reactive strategies are often limited in their efficacy and the best preservation strategy is to proactively manage land use with adequate buffers between incompatible land uses and to use other growth management tools.

Potential Threats to Freight Activity in Growing Areas

Encroachment of incompatible land uses: Incompatible land use adjacent to freight facilities or freight-dependent shippers may affect their ability to expand capacity to respond to growing freight demand.

Operational restrictions: In response to the encroachment of different land uses, public officials may impose speed restrictions, hours of operation restrictions, bulk and mass limitations, and hazardous material restrictions, some of which may negatively affect business operations and viability.

Conflicts and complaints: Regular freight operations may be labeled a nuisance when located adjacent to an incompatible land use, triggering litigation that may ultimately force cessation of operations and displacement of freight activities. Conversely, when misplaced, freight activity may also negatively affect residential neighborhoods, schools, hospitals or other facilities by producing noise, vibration or pollution.

Corridor Designation

Municipalities and Ada County Highway District (ACHD) may formally designate roadway corridors for freight by recognizing and delineating truck routes.[9] Formally designating a truck route network is a common strategy to guide truck or freight traffic through areas more susceptible to negative impacts from truck traffic and informs land use provisions of the comprehensive plan or general plan. Isolating negative impacts from truck traffic to specific areas also reduces resident exposure to noise, vibration, and emissions.

As described in Section 3.2, the truck corridor network in this study is not intended for planning or enforcement purposes, but could be used to guide development of a designated truck route network. In particular, in addition to the variables considered in this study, a planning exercise to guide development of such a truck route network should further take into account adjacent land uses, engineering considerations and capacity.

Stakeholder Involvement

The process of designating truck routes and planning for freight corridors is most effective when inclusive. Robust stakeholder involvement begins with inviting the right stakeholders to participate in the process. Stakeholder representation should generally cover private-sector freight operators, state government, regional agencies, and local governments. The existing FAWG is a structure that can effectively continue to fulfill this role.

It is worth noting that freight planning has not typically been included in complete streets planning efforts nationally. In an effort to change this trend, it is recommended that freight planning efforts include representation of active transportation efforts. In turn, it is hoped that freight and freight needs are considered in future complete streets planning efforts. Bridging this divide will help ensure the future of freight mobility in the region.

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[9] A truck route refers to network of roads or a corridor that is formally designated for use by trucks of a certain size when traversing through or within a municipal jurisdiction.

6.3.3 Land Use Planning for Freight

Zoning is an effective tool for local municipalities to guide development. A zoning ordinance can be particularly effective when working to mitigate impacts from freight activities by enacting buffer requirements or other design components in the zoning ordinance. Zoning may also be used to protect freight facilities that are a recognized nuisance from urban encroachment. Other strategies include designated manufacturing/industrial districts as well as designated industrial corridors. This may be accomplished by rezoning undeveloped land adjacent to freight facilities to protect from encroachment of non-compatible land uses.

Site Planning is another freight impact mitigation strategy which involves optimizing lot orientation of adjacent incompatible land uses to fully capitalize on potential buffers. Effective site planning optimizes lot orientation to place garages, carports, and other uninhabited spaces between living spaces and the incompatible use.

Conventional zoning does not generally regulate site planning beyond setback requirements. **Form-based code (FBC)** may be used to regulate the entire building envelope – including property line setback, upper level step-back, and potentially landscape requirements of buffer zones. This approach may effectively work to address the impact of freight-related land uses rather than solely regulating and promoting the segregation of uses.

Sensitive land uses may be further protected from incompatible land uses with the establishment of a **transition zone**. Transition zones contain commercial or other uses that are less sensitive to freight impacts. Transition zones effectively serve as a buffer between incompatible uses.

Freight volumes are projected to increase approximately 60% over the next 20 years. One of the recommendations offered by FHWA is to adopt "**Freight as a Good Neighbor**" programs. When this initiative is well executed, negative impacts from freight are mitigated through agreements with neighbors or appropriate physical buffers between incompatible land uses.

Freight Planning: Guiding Documents

Comprehensive Plan. The comprehensive plan of a municipality sets public policy for development and permitted land uses, transportation and general goals. The comprehensive plan is developed through planning and land use planning process. Land-use planning is a state power that is delegated to local municipalities in Idaho as well as most states. Some communities are integrating freight considerations into their comprehensive planning.

State Freight Plan. A freight plan, as required by the 2016, Fixing America's Surface Transportation (FAST) Act, is a state-level plan guiding development of freight facilities for the state and providing context for local freight planning and zoning.

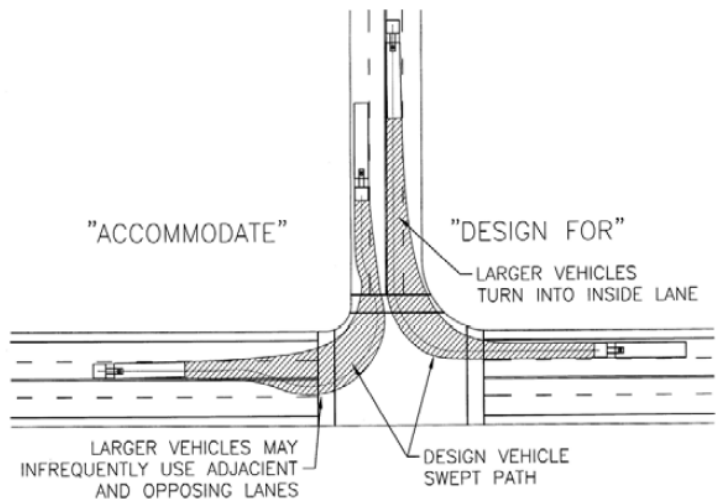
MPO Freight Planning. MPOs are required by federal law to develop and update long-range transportation plans for the metropolitan area in addition to short-range plans called transportation improvement programs (TIP). MPO plans designate where federal funds are spent locally and have substantial impact on freight mobility. These plans cover transportation aspects of planning but do not address land use.

6.3.4 Freight Corridor Design

Context-sensitive solutions (CSS) is a transportation planning framework that responds to adjacent land use variation. An example of this is a freight route that passes through an established residential neighborhood before proceeding to a rural area. The street configuration might provide a separated bike facility through the residential area as well as enhanced pedestrian facilities and buffers that separate freight traffic from pedestrians and cyclists. This same design is unnecessary in an unpopulated rural area and the street configuration responds to the change in context. This may apply to corridors through industrial neighborhoods and others as well.

Intersection/Interchange Design: Some cities have integrated a "design for" versus a "design to accommodate" approach to truck route planning. This design framework results in a facility that is designed for a larger vehicle to perform all turning maneuvers while maintaining the vehicle lane or a design that occasionally accommodates a larger vehicle on a tighter street environment. "Design to accommodate" preserves intersection accessibility for pedestrians and cyclists by constraining street crossing width and corner radii. "Design for" conventions require a larger intersection footprint accompanied by larger corner radii and wider street crossing widths.

Figure 6-5: Example of "Design For" and "Design to Accommodate"



Source: City of Portland Freight Master Plan, 2006

Roadway Design: Several aspects of roadway design are impacted on a designated freight route. The design speed should provide for the safe movement of freight at the posted speed limit. Design speed of a roadway will determine the lane width for vehicles. A twelve-foot width is desired for roads that serve as truck routes or have large amounts of truck volumes. Otherwise ten feet to eleven feet is sufficient depending on the functional classification of the roadway – freeway, arterial, collector, or local.

Multimodal Integration: Roadway freight traffic, bicycle traffic, and pedestrians may safely coexist with proper design. As bicycles and large freight vehicles can be inherently incompatible, these modes should be physically separated. It is not recommended to place a conventional bike lane on a truck route without an appropriate buffer.

Wayfinding: Placement of signs that indicate truck routes help drivers navigate through and within municipalities.

Appendix A – Supplementary Tables and Figures

Commodity and Industry Data

Commodity data are based on Standard Transportation Commodity Codes (STCC), provided in TREDIS; whereas industry data are based on North American Industry Classification System (NAICS) codes, provided in TREDIS as well as through land use sources (e.g. employment).

In general, this study simplifies these categories into commodity groups and sectors which reflect the varied nature of production processes. While there is some overlap in these definitions, there are also differences.

Commodity Groups

Commodity group definitions are shown in the figure below.

Figure 6-6: Definition of Commodity Groups

Commodity Group	STCC Codes
Agri-Food Products	01-09, 20-21
Primary Materials	10-14, 24-33, 40
Manufactures	19, 34-38
Consumer Products	39, 41-50

Source: CPCS

Exceptions: Consumer Products includes 25-1 Household or Office Furniture, 28-3 Drugs, 28-4 Soap or Other Detergents, 31-4 to 31-9 Leather Products

Economic Sectors

The regional GDP, income and number of jobs generated in each respective industry were extracted from TREDIS. TREDIS uses a proprietary model to determine the freight-dependency of jobs, wages and output, reflecting both the inputs and outputs of each industry (e.g. office buildings receive some incoming freight as inputs but produce almost entirely services).

It should be noted that the sector definitions for the regional economic analysis do not exactly align with the freight cluster analysis. In general, the definition of what constitutes freight-related industry is similar, but the sectoral breakdown differs. The discrepancy is due to both data limitations and methodological reasons.[10]

[10] Only 3-digit NAICS data were available for the regional economic analysis. Also, the purpose of the analyses was quite different. The regional economic analysis prioritized reducing complexity so that the analysis could be easily

The two categorization approaches are shown in the table below.

Figure 6-7: Sector Categorization

Industry (NAICS)	Sector (Economic Analysis)	Sector (Cluster Analysis)
Crop Production (111)	Primary Industries	Agri-Food
Animal Production (112)	Primary Industries	Agri-Food
Forestry & Logging (113)	Primary Industries	Primary Materials
Fishing, etc. (114)	Primary Industries	Primary Materials
Support for Agric & Forestry (115)	Primary Industries	Agri-Food
Oil and Gas Extraction (211)	Primary Industries	Primary Materials
Mining, Quarrying, & Support (212)	Primary Industries	Primary Materials
Utilities (22)	Primary Industries	Excluded
Construction & Bldgs (23)	Primary Industries	Excluded
Food Manufacturing (311)	Manufacturing	Manufactures
Beverage & Tobacco Product Mfg (312)	Manufacturing	Manufactures
Textile Mills & Products Mfg (313-314)	Manufacturing	Manufactures
Apparel Mfg (315)	Manufacturing	Manufactures
Leather Product Mfg (316)	Manufacturing	Manufactures
Wood Product Mfg (3121)	Manufacturing	Manufactures
Paper Mfg (322)	Manufacturing	Manufactures
Printing (323)	Manufacturing	Manufactures
Petroleum and Coal Products Mfg (324)	Manufacturing	Manufactures
Chemical Mfg (325)	Manufacturing	Manufactures
Plastics & Rubber Products Mfg (326)	Manufacturing	Manufactures
Nonmetal Mineral Product Mfg (327)	Manufacturing	Manufactures
Primary Metal Mfg (331)	Manufacturing	Manufactures
Fabricated Metal Mfg (332)	Manufacturing	Manufactures
Machinery Mfg (333)	Manufacturing	Manufactures
Computer and Electronic Mfg (334)	Manufacturing	Manufactures
Electrical Equipment & Appliance Mfg (335)	Manufacturing	Manufactures
Transportation Equipment Mfg (336)	Manufacturing	Manufactures
Furniture Mfg (337)	Manufacturing	Manufactures
Miscellaneous Mfg (338)	Manufacturing	Manufactures
Motor vehicle… merchant wholesalers (4231)	Wholesale Trade	Manufactures
Furniture and home furnishing merchant wholesalers (4232)		Transportation and Distribution

repeatable in the future. For the cluster analysis, the main goal was spatial analysis (Utilities and Construction were excluded because the location of business establishments is not reflective of the freight activity); a second goal was to match up economic sectors with commodities to the extent possible, to support mapping commodity flows.

Industry (NAICS)	Sector (Economic Analysis)	Sector (Cluster Analysis)
Lumber and other… merchant wholesalers (4233)		Primary Materials
Professional and commercial equipment… merchant wholesalers (4234)		Manufactures
Metal and mineral (except petroleum) merchant wholesalers (4235)		Primary Materials
Household appliances… merchant wholesalers (4236)		Manufactures
Hardware, plumbing and heating equipment… merchant wholesalers (4237)		Manufactures
Machinery, equipment, and supplies merchant wholesalers (4238)		Manufactures
Misc. durable goods merchant whoelsalers (4239)		Manufactures
Paper and paper product merchant wholesalers (4241)		Transportation and Distribution
Drugs and druggists' sundries merchant wholesalers (4242)		Transportation and Distribution
Apparel, piece goods, and notions merchant wholesalers (4243)		Transportation and Distribution
Grocery and related product merchant wholesalers (4244)		Agri-Food
Farm product raw material merchant wholesalers (4245)		Agri-Food
Chemical and allied products merchant wholesalers (4246)		Primary Materials
Petroleum and petroleum products merchant wholesalers (4247)		Primary Materials
Beer, wine and distilled alcoholic beverage merchant wholesalers (4248)		Agri-Food
Misc. nondurable goods merchant wholesalers (4249)		Transportation and Distribution
Wholesale electronic markets and agents and brokers (425)		Transportation and Distribution
Retail Trade (44-45)	Retail Trade	Retail
Air Transportation (481)	Transportation and Warehousing	Transportation and Distribution
Rail Transportation (482)	Transportation and Warehousing	Transportation and Distribution
Water Transportation (483)	Transportation and Warehousing	Transportation and Distribution

Industry (NAICS)	Sector (Economic Analysis)	Sector (Cluster Analysis)
Truck Transportation (484)	Transportation and Warehousing	Transportation and Distribution
Transit and Ground Transportation (485)	Non-Retail Service	Non-Freight
Pipeline Transportation (486)	Transportation and Warehousing	Transportation and Distribution
Scenic & Sightseeing Transport Support (487)	Non-Retail Service	Non-Freight
Support Activities for Transportation (488)	Transportation and Warehousing	Transportation and Distribution
Couriers, Messengers & Postal Service (491-492)	Transportation and Warehousing	Transportation and Distribution
Warehousing & Storage (493)	Transportation and Warehousing	Transportation and Distribution
Media & Information (51)	Office Sector	Non-Freight
Finance & Insurance (52)	Office Sector	Non-Freight
Real Estate, Rental & Leasing (53)	Office Sector	Non-Freight
Professional, Scientific & Technical (54)	Office Sector	Non-Freight
Management Services (55)	Office Sector	Non-Freight
Business Services (Admin, Support, Waste) (56)	Office Sector	Non-Freight
Education Services (61)	Non-Retail Service	Non-Freight
Health Care and Social Assistance (62)	Non-Retail Service	Non-Freight
Arts, Entertainment & Recreation (71)	Non-Retail Service	Non-Freight
Lodging (721)	Retail Trade	Retail (Partly Excluded)
Restaurants & Drinking Establishments (722)	Retail Trade	Retail (Partly Excluded)
Other Services (81)	Non-Retail Service	Non-Freight
Government (Public Administration) (92)	Non-Retail Service	Non-Freight

Source: CPCS. Note: 42491 excluded from Transportation and Distribution and included in Agri-Food

Clusters and Corridors

Clusters

The six variables used to develop freight clusters, computed at the TAZ-level, are summarized in the table below.

Figure 6-8: Variables for Scoring TAZ's

Metric	Data Source
Trip Ends	ATRI GPS data
Trip Density / acre	ATRI GPS data
Freight-Related Employment	Infogroup (IG) data
Freight-Related Emp. Density / acre	Infogroup (IG) data
Freight-Related Employment	IDOL data
Freight-Related Emp. Density / acre	IDOL data

Source: CPCS

The following table shows the primary and secondary freight clusters according to truck trips and employment.

Figure 6-9: Top Freight Clusters by Truck Trips and Employment

	GPS Trips	IG Fr-Related Emp.	IDOL Fr-Related Emp.	Rank GPS	Rank IG	Rank IDOL	Type
Primary Clusters							
Boise Southeast-Airport	18,970	16,666	16,485	1	1	1	Primary
Caldwell	9,718	2,802	4,100	2	4	4	Primary
Meridian-Boise Junction Corridor	7,651	6,945	6,389	4	3	3	Primary
Nampa	9,389	7,613	7,145	3	2	2	Primary
Secondary Clusters							
Boise East	18	393	316	19	9	10	Secondary
Chinden-HP	231	1,149	1,750	11	7	6	Secondary
Downtown Boise	769	2,032	1,923	6	5	5	Secondary
Eagle	198	330	379	12	10	9	Secondary
Fairview	274	61	274	9	13	11	Secondary
Garden City	347	1,630	1,696	8	6	7	Secondary
Wilder	955	717	1,032	5	8	8	Secondary
Pleasant Valley	443	0	86	7	19	12	Secondary
Primary, Percentage of Region	**77%**	**73%**	**69%**				

Source: CPCS analysis of ATRI, Infogroup, and IDOL data (2016). Note GPS trips refers to trips in available sample dataset.

Corridors

The table below shows the detailed methodology for defining the current truck corridor network.

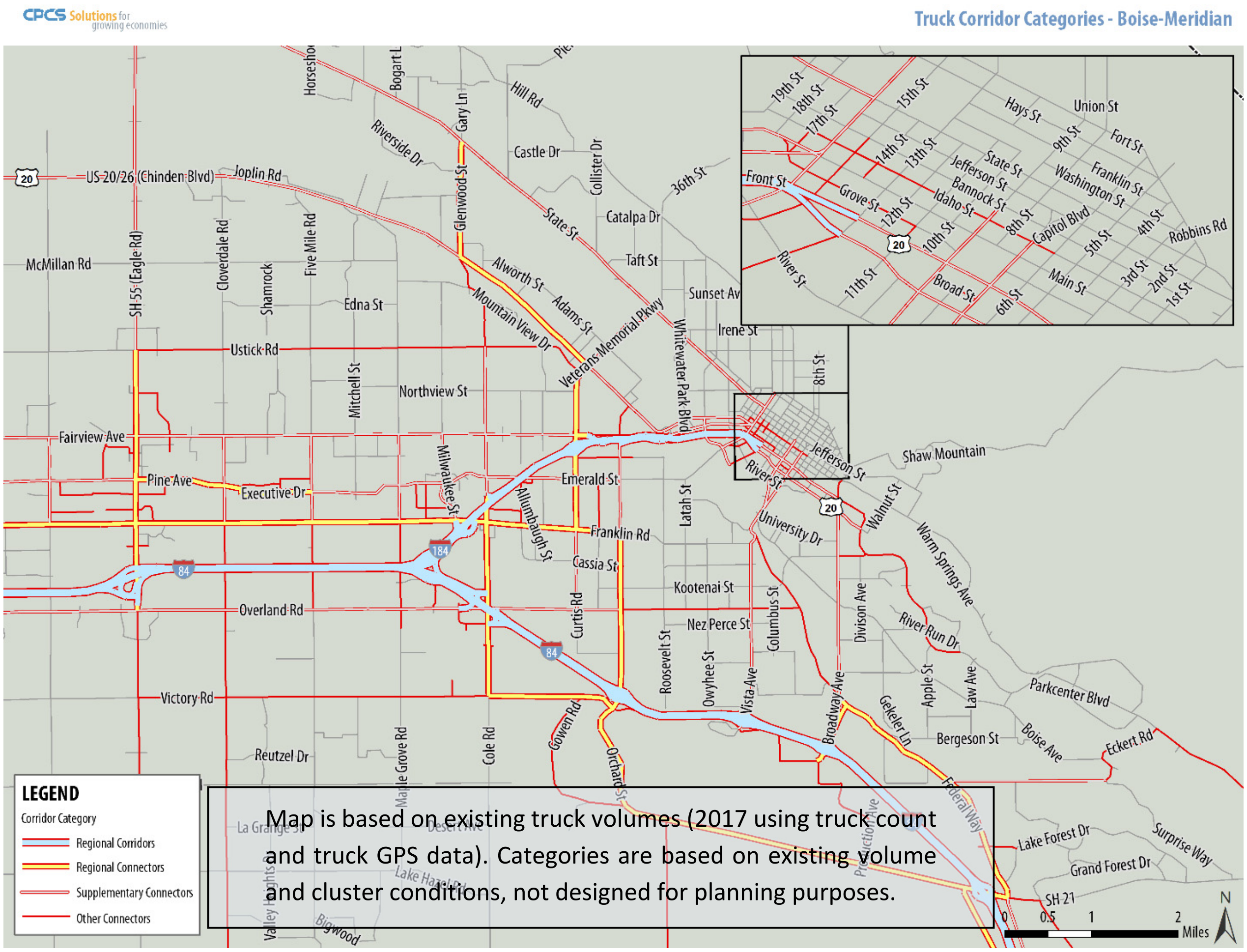
Figure 6-10: Methodology of Corridor Classification

Category	Satisfies all of:	Satisfies one of:
Regional Corridor	- Principal Arterial or higher - Part of an extended corridor at least 5 miles in length	A) Truck volume over 750 per day B) Part of Interstate Highway System
Regional Connector	- Minor Arterial or higher - Part of an extended corridor at least 1 mile in length	A) Truck volume over 750 per day B) Truck volume over 500 per day and connects primary cluster
Supplementary Connector	- Minor Arterial or higher - Part of an extended corridor at least 1 mile in length	A) Truck volume over 500 per day B) Truck volume over 200 per day and connects primary or secondary cluster
Other Connector	- Any length and road class	A) Truck volume over 200 per day B) Truck volume over 100 per day and connects primary or secondary cluster C) Listed as an agricultural route in the Agricultural Freight Study (2015) D) Listed as a detour route in the ongoing Treasure Valley Incident Management Operations Manual (I-84/I-184 Detour Plan)

Source: CPCS

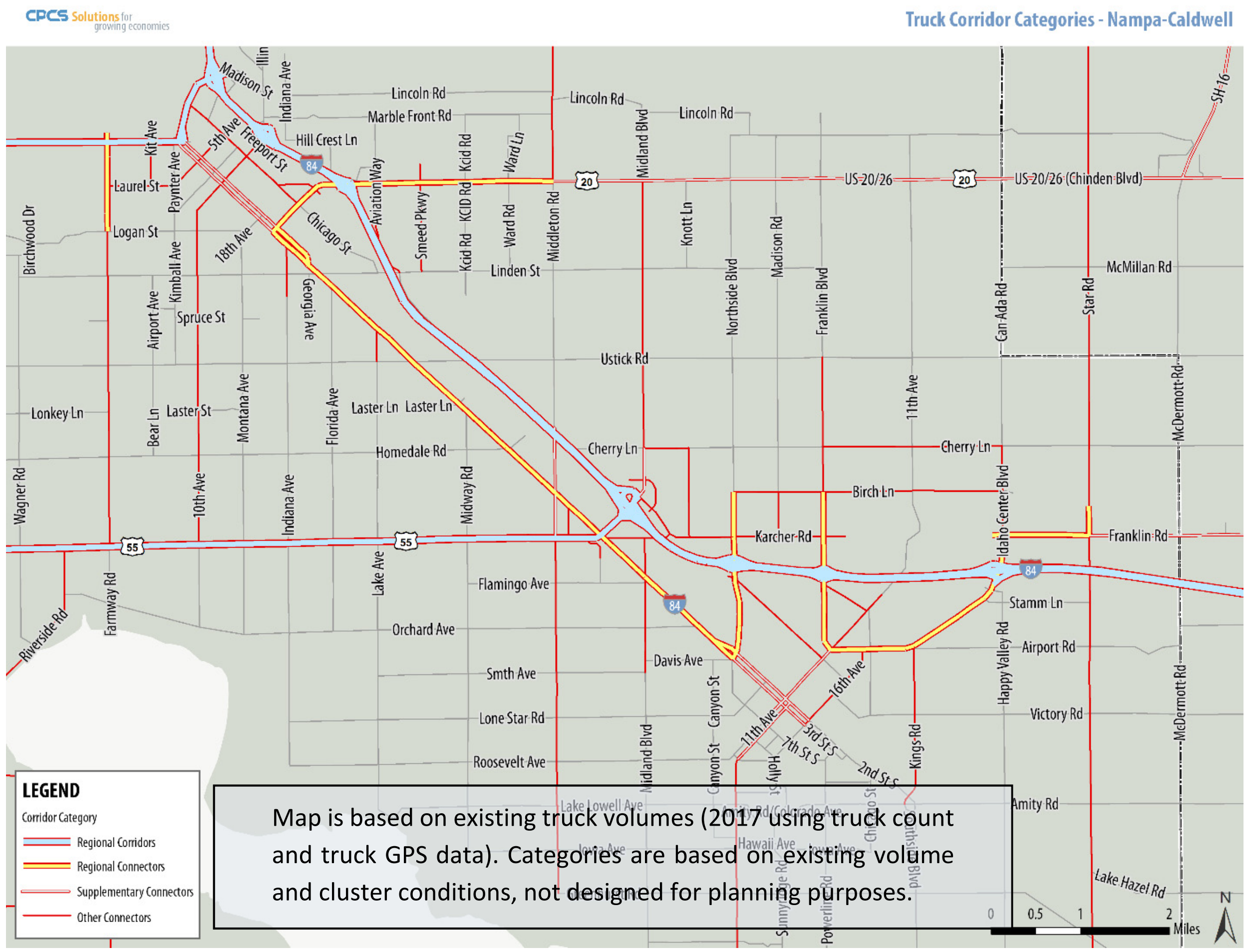
The following two figures show zoomed versions of the truck corridor network for Boise/Meridian and Nampa/Caldwell.

Figure 6-11: Truck Corridor Network: Boise and Meridian



Source: CPCS

Figure 6-12: Truck Corridor Network: Nampa and Caldwell



Source: CPCS

Commodity Flows

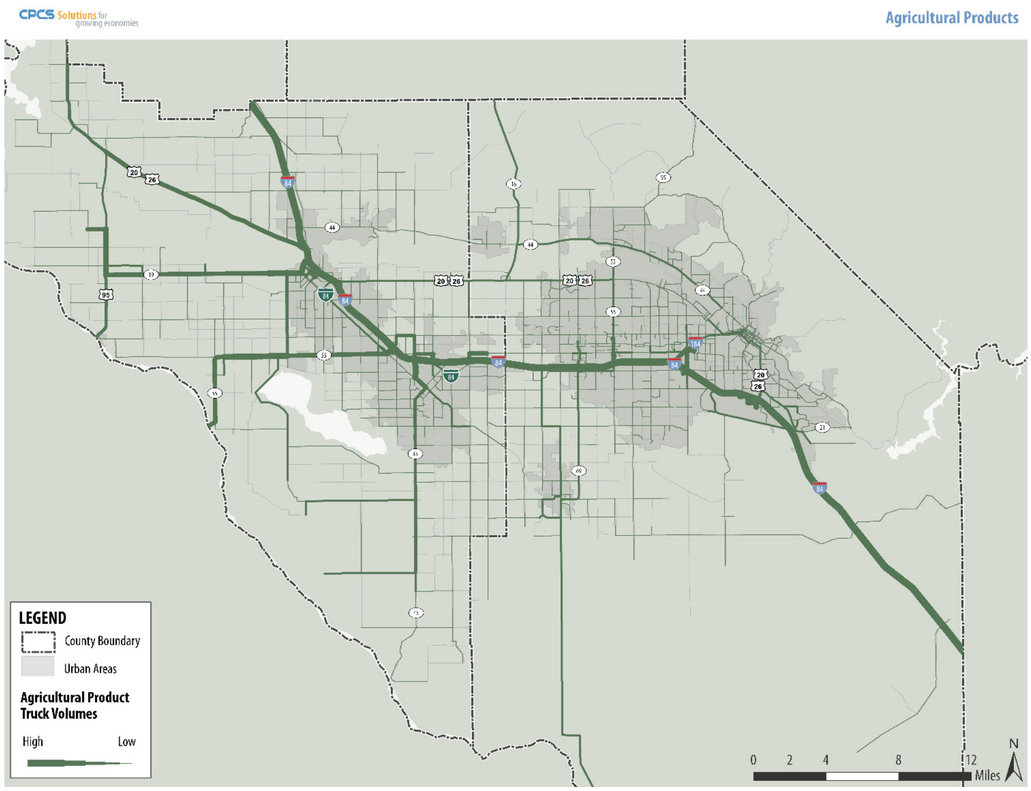
The study team mapped out the different truck flow patterns of different commodities in the region, providing more nuance to the truck corridor network. The analysis relies on an innovative methodology that combines ATRI truck GPS-origin-destination trip patterns (i.e. observed behavior on how trucks move in the region) with land use data at the TAZ level. The effect is to merge two separate datasets to map out how different commodities flow through the region. Although not an “exact science,” this approach can provide insights that either dataset on its own does not.

Specifically, a shortcoming of the GPS data is that although they show very effectively where trucks are moving, there is no way to know precisely what commodities are within the trucks. However, using knowledge of industry locations, it is possible to make an educated guess. As a simplified example, if a truck trip begins in a highly agricultural area and ends in a major food processing area, it is highly likely the commodity carried can be classified as an agricultural product.

The analysis can only be performed at the TAZ level to maintain privacy, so there are necessarily some assumptions associated with aggregating many types of businesses within a TAZ. This approach works best when TAZ's are relatively small and numerous, which is the case in the COMPASS region.

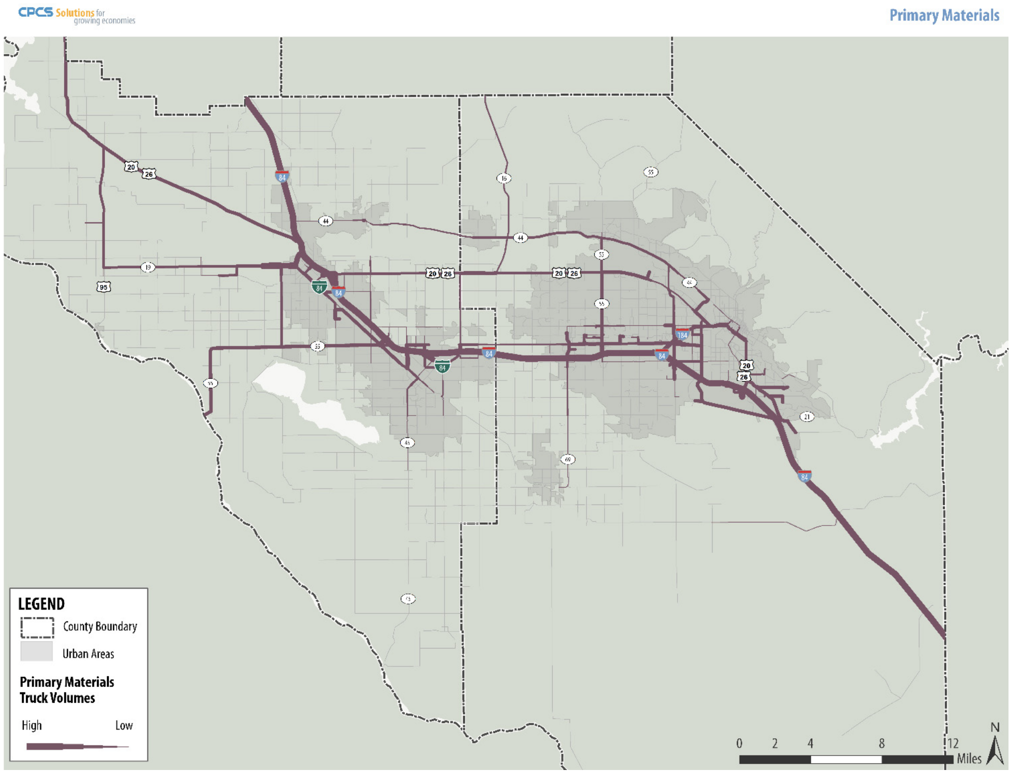
The figures below show the corridors used for four categories of products: Agricultural Products, Primary Materials, Manufactures, and Consumer Products.

Figure 6-13: Flows of Agri-Food Products



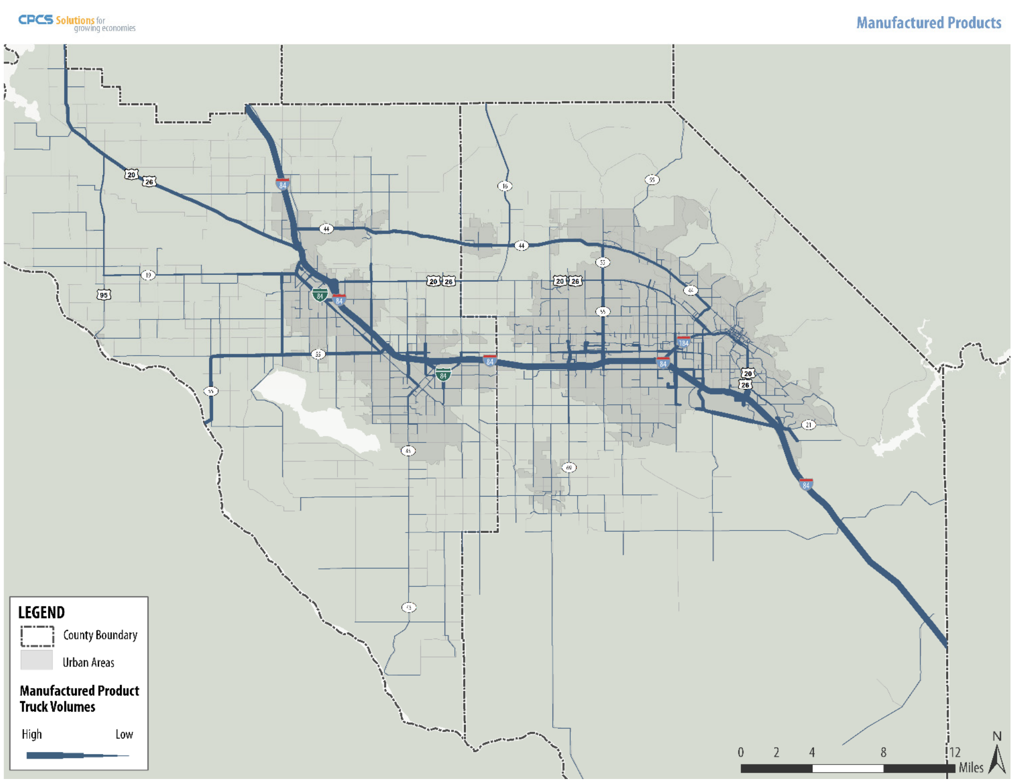
Source: CPCS analysis.

Figure 6-14: Flows of Primary Materials



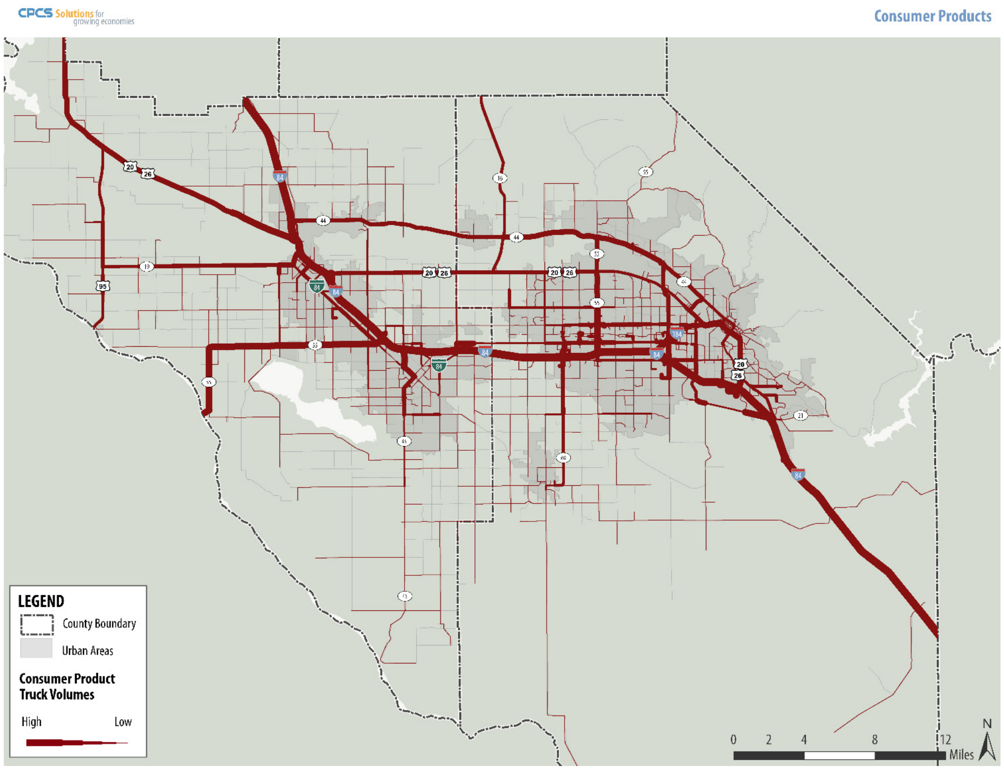
Source: CPCS analysis.

Figure 6-15: Flows of Manufactures



Source: CPCS analysis.

Figure 6-16: Flows of Consumer Products



Source: CPCS analysis.