Addendum 2A: Freight Contribution to the Regional Economy

1.1 Overview

To understand the transportation performance needs of the freight sectors driving the Treasure Valley's economic activity and growth, this addendum provides a description of the regional economic impact of freight in Ada and Canyon counties ("the region").

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

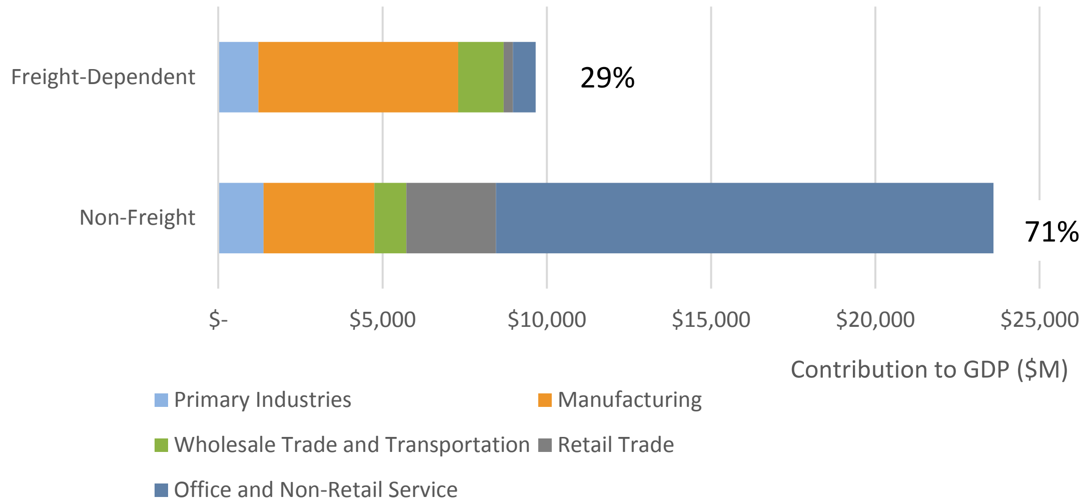
$9.7 billion in regional GDP, 29% of the region's total GDP	63,359 jobs, 16% of the region's total employment	$3.8 billion in annual income, 21% of the total employment income for residents in the region

1.2 Importance of Freight to the Region's Economy

Figure 1-1 breaks down freight-dependent economic activity by sector. The clear driver of most freight-dependent GDP (Gross Domestic Product) is the Manufacturing sector – responsible for $6.1 billion or 63% of freight-dependent GDP in the region. This reflects the fact that manufacturers depend on road and rail infrastructure to get product to market and to receive raw materials, inputs, and equipment. Expectedly, the Office and Non-Retail Service sector generates GDP that is mostly non-freight-dependent, but even this sector demands freight to some extent (e.g. businesses and hospitals requiring supplies).

Freight does not dominate the region's economy but does serve as an important contributor – with the Manufacturing sector leading the way.

Figure 1-1: Contribution to GDP, By Sector



Source: CPCS analysis of TREDIS data (2016). Non-Freight refers to GDP created in each sector that is not considered by TREDIS to be freight-dependent.

Transportation and Warehousing (a subset of Wholesale Trade and Transportation in the figure above) itself accounts for only $633 million of GDP or 2% of the regional total. This includes the GDP contributions of the air, rail, water, truck, and pipeline transportation industries, as well as couriers and warehousing/storage. However, when considering how many other industries rely on the freight system for delivering inputs and shipping outputs, the region's total economic freight dependence is far larger than the Transportation and Warehousing industries alone.

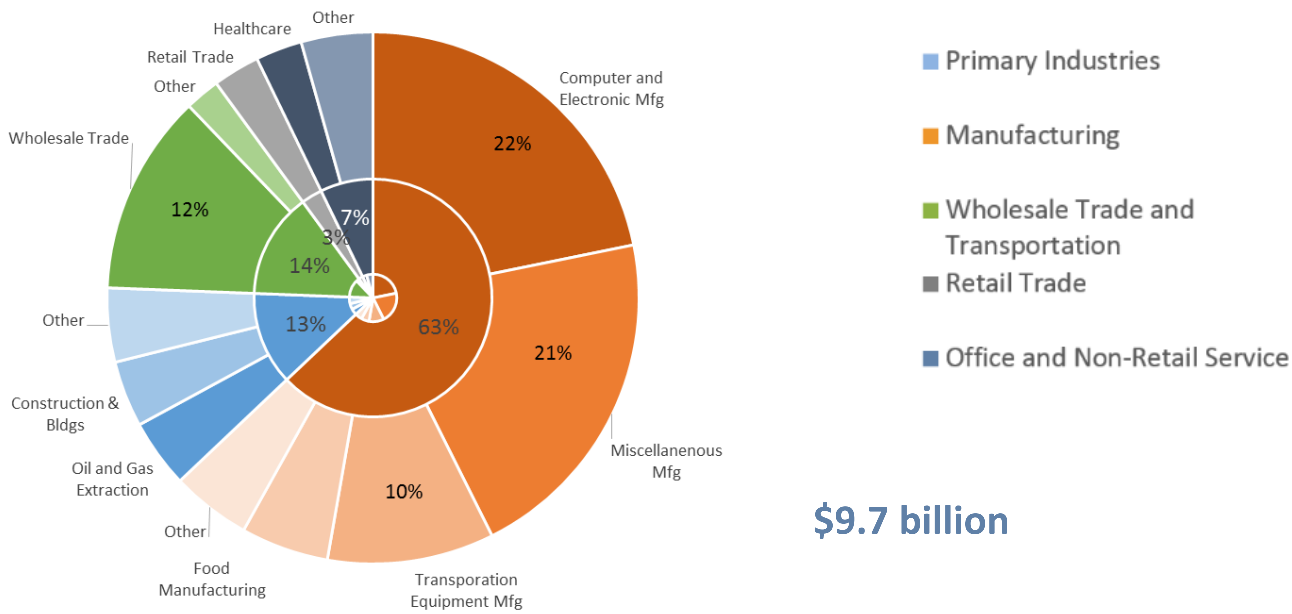
The total value of regional GDP that is freight-dependent is $9.7 billion – more than 15 times the GDP generated by Transportation and Warehousing alone.

1.3 Importance of Freight to GDP, Employment, and Labor Income

Breaking down the sectors further reveals which industries are most important to freight-dependent economic activity in the region. The top industries vary depending on whether one analyzes GDP, employment or labor income.

Figure 1-2 shows the top industries in terms of contribution to regional GDP. Computer and Electronic Manufacturing alone is responsible for 22% of all freight-dependent GDP in the region. Transportation Equipment Manufacturing is also a significant share at 10%. (It is not immediately clear what Miscellaneous Manufacturing refers to).

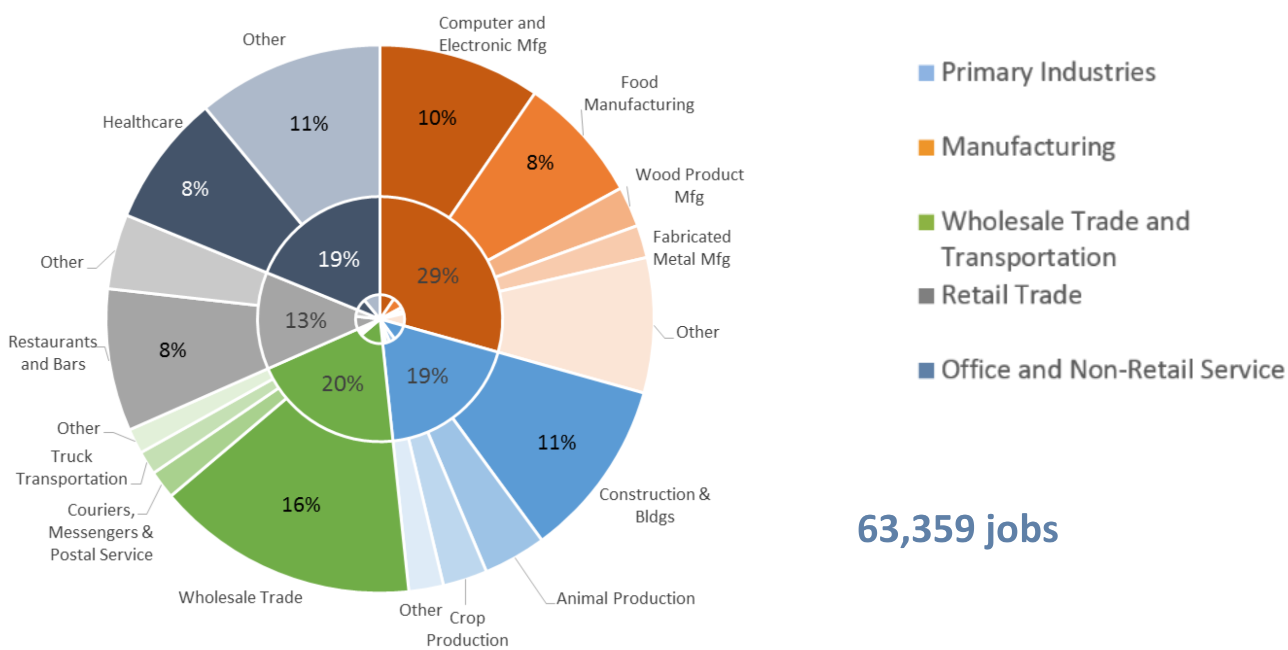
Figure 1-2: Top Industries – Contribution of Freight to Regional GDP



Source: CPCS analysis of TREDIS data (2016). Includes all economic activity classified as Freight-Dependent by TREDIS.

Figure 1-3 shows the top industries by employment. The distribution of jobs by industry is much more evenly distributed than for GDP. Wholesale Trade is responsible for 16% of freight-dependent jobs in the region.

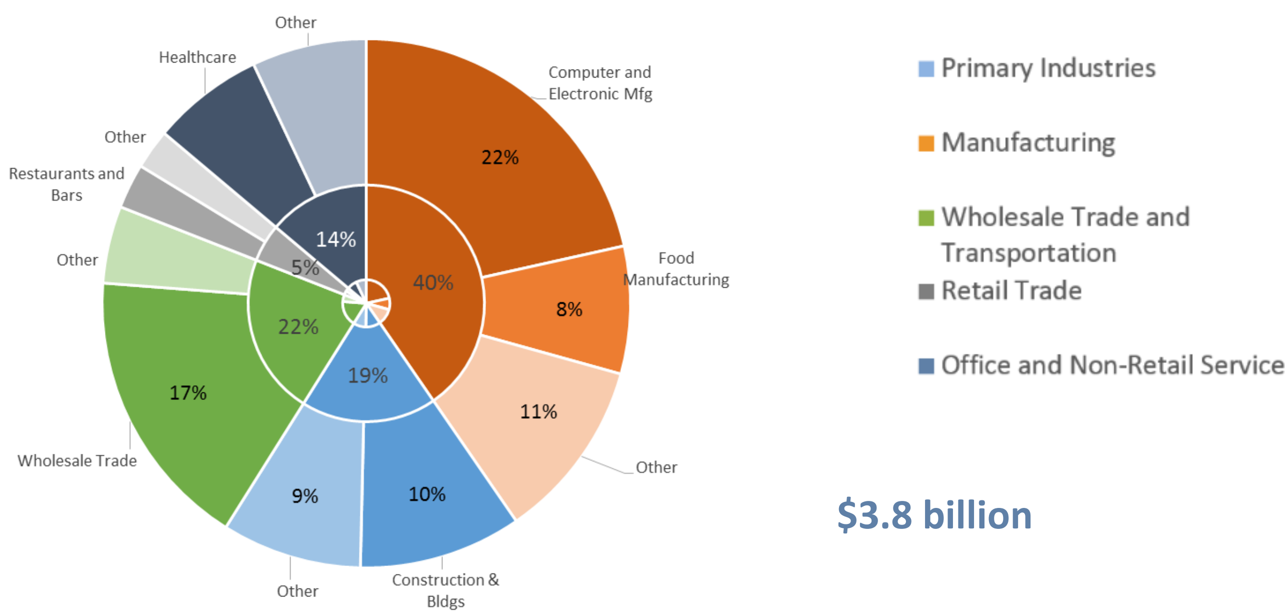
Figure 1-3: Top Industries – Contribution of Freight to Regional Employment



Source: CPCS analysis of TREDIS data (2016). Includes all economic activity classified as Freight-Dependent by TREDIS.

Figure 1-4 shows the same breakdown for labor income. Computer and Electronic Manufacturing is responsible for 22% of freight-dependent labor income in the region, with Wholesale Trade at 17%. Other important industries include Construction and Food Manufacturing. The high share for Computer and Electronic Manufacturing relative to its share for employment indicates that wages in this industry are substantially higher than in other freight-dependent industries.

Figure 1-4: Top Industries – Contribution of Freight to Regional Labor Income



Source: CPCS analysis of TREDIS data (2016). Includes all economic activity classified as Freight-Dependent by TREDIS.

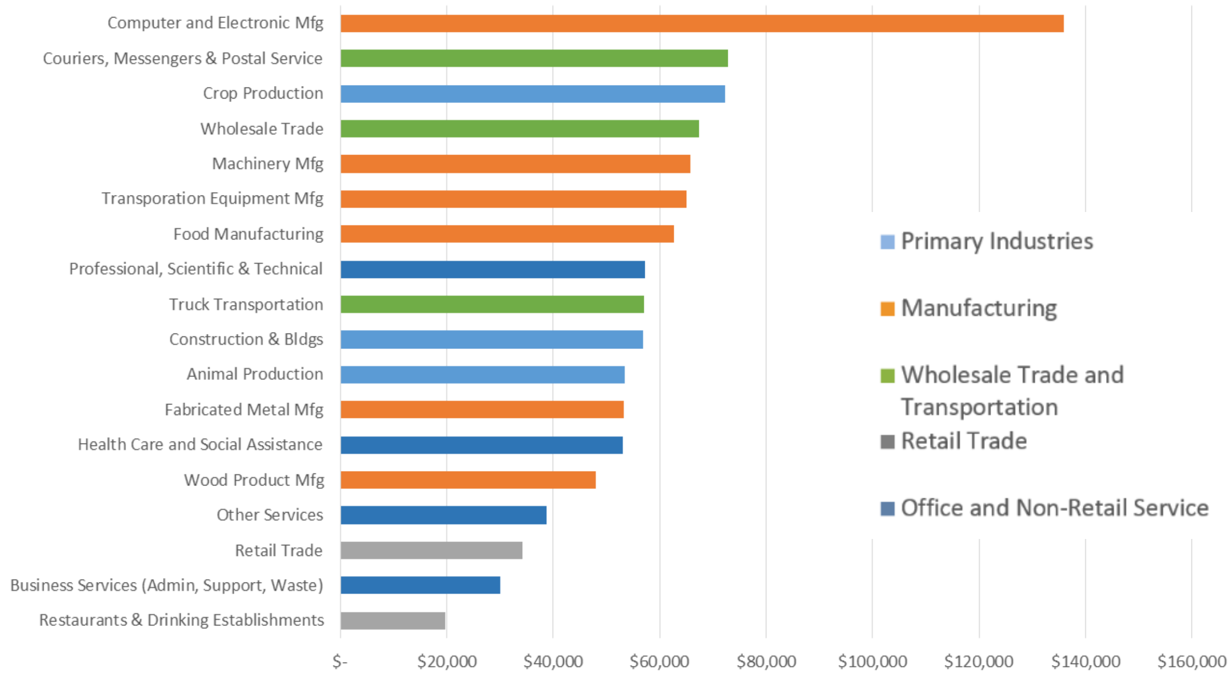
1.4 High-Income Freight-Dependent Industries

Figure 1-5 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 1-5: 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.

1.5 Focus on: Agri-Food

Figure 1-6 focuses on Agri-Food industries, comparing these to two regional average baselines. This subgroup is responsible for $1.3 billion in GDP, or 3.7% of the regional economy. The Agri-Food industries belong to the Primary Industries and Manufacturing sectors, and consist of:

- Crop Production
- Animal Production
- Food Manufacturing
- Beverage & Tobacco Manufacturing

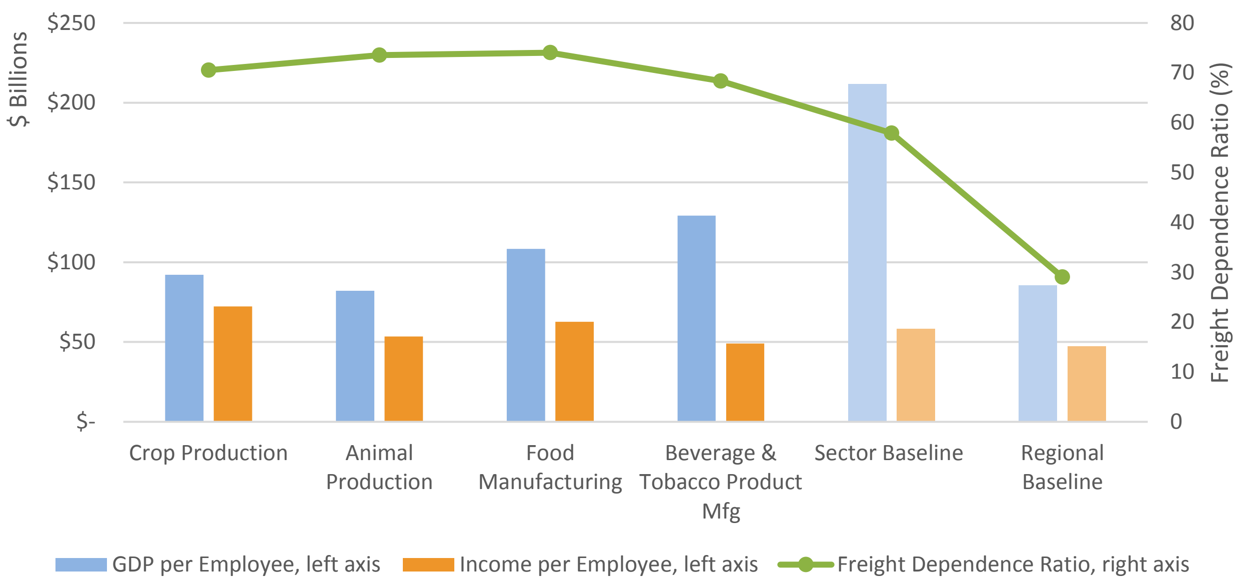
Downstream Agri-Food industries within Wholesale Trade could not be distinguished as this level of detail was not available for Wholesale Trade.

Two baselines are used: the regional baseline (for the regional economy as a whole), and the sector baseline (consisting of all Primary Industries and Manufacturing, excluding Computer and Electrical Manufacturing, which is a large proportion of regional GDP and would otherwise dominate the results).

Compared to the sector baseline, Agri-Food industries are low value-added (low GDP per employee – blue columns), but comparable in terms of income per employee (orange columns). When compared to the regional economy as a whole, both GDP per employee and income per employee are above average.

Agri-Food industries also have a high-level of freight dependence (ratio of GDP that is defined by TREDIS as "Freight-Dependent") – when compared not only to the general economy but also to other Primary Industries and Manufacturing. This demonstrates that Agri-Food is particularly reliant on road and rail infrastructure for its economic success.

Figure 1-6: Agri-Food Industries – Comparative View



Source: CPCS analysis of TREDIS data (2016). Includes all economic activity classified as Freight-Dependent by TREDIS (except "Avg for Regional Economy" which includes all economic activity, whether Freight-Dependent or not).

While Agri-Food industries are responsible for only 3.7% of the regional economy (by GDP), these industries are particularly reliant on the region's road and rail infrastructure.

1.6 Implications

Freight-dependent industries are significant contributors to regional GDP, employment, and 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.

Appendix A. Methodology

The regional GDP, income and number of jobs generated in each respective industry were extracted from TREDIS data provided by COMPASS. TREDIS approximates the dependency of each industry on freight by linking economic data to freight data through vFreight and Transearch prior to attributing a portion of economic measures to freight data through IMPLAN insights on which industries use or produce services. Freight is then made into an input in the form of raw materials and intermediate goods, along with being an output in terms of finished goods, in order to assign the proportion of economic measures that are related to inbound freight movements and outbound freight movements. The freight dependence output reflects a summation of both inbound and outbound values. Due to constraints of available data, indirect and induced impacts are excluded from this analysis.

The study team also utilizes industry categorization to define sectors. The table below describes how these industries are categorized:

Figure 1-7: Sector Categorization

Sector	Industry
Primary Industries	Crop Production
Primary Industries	Animal Production
Primary Industries	Forestry & Logging
Primary Industries	Fishing, etc.
Primary Industries	Support for Agric & Forestry
Primary Industries	Oil and Gas Extraction
Primary Industries	Mining, Quarrying, & Support
Primary Industries	Utilities
Primary Industries	Construction & Bldgs
Manufacturing	Food Manufacturing
Manufacturing	Beverage & Tobacco Product Mfg
Manufacturing	Textile Mills & Products Mfg
Manufacturing	Apparel Mfg
Manufacturing	Leather Product Mfg
Manufacturing	Wood Product Mfg
Manufacturing	Paper Mfg
Manufacturing	Printing
Manufacturing	Petroleum and Coal Products Mfg
Manufacturing	Chemical Mfg
Manufacturing	Plastics & Rubber Products Mfg
Manufacturing	Nonmetal Mineral Product Mfg
Manufacturing	Primary Metal Mfg
Manufacturing	Fabricated Metal Mfg
Manufacturing	Machinery Mfg
Manufacturing	Computer and Electronic Mfg

Sector	Industry
Manufacturing	Electrical Equipment & Appliance Mfg
Manufacturing	Transportation Equipment Mfg
Manufacturing	Furniture Mfg
Manufacturing	Miscellaneous Mfg
Wholesale Trade	Wholesale Trade
Retail Trade	Retail Trade
Transportation and Warehousing	Air Transportation
Transportation and Warehousing	Rail Transportation
Transportation and Warehousing	Water Transportation
Transportation and Warehousing	Truck Transportation
Non-Retail Service	Transit and Ground Transportation
Transportation and Warehousing	Pipeline Transportation
Non-Retail Service	Scenic & Sightseeing Transport Support
Transportation and Warehousing	Couriers, Messengers & Postal Service
Transportation and Warehousing	Warehousing & Storage
Office Sector	Media & Information
Office Sector	Finance & Insurance
Office Sector	Real Estate, Rental & Leasing
Office Sector	Professional, Scientific & Technical
Office Sector	Management Services
Office Sector	Business Services (Admin, Support, Waste)
Non-Retail Service	Education Services
Non-Retail Service	Health Care and Social Assistance
Non-Retail Service	Arts, Entertainment & Recreation
Retail Trade	Lodging
Retail Trade	Restaurants & Drinking Establishments
Non-Retail Service	Other Services
Non-Retail Service	Government (Public Administration)

Addendum 2B: Trucks and Road Maintenance Costs

1.1 Introduction

The study team calculated the annual estimated costs of truck traffic on interstate and non-interstate roadways within the COMPASS Region. Absent a documented methodology in place among Idaho transportation agencies, the 1997 Federal Highway Cost Allocation Study was used. These estimated costs, summarized in Figure 1-1, illustrate that trucks have a considerably larger impact on road maintenance costs than would be suggested by their share of traffic. To increase the accuracy of these calculations, further detailed analysis will be required.

Figure 1-1: Estimated Allocated Annual Highway Costs and Traffic Ratios

	Interstate		Non-Interstate	
	Cost (rounded)	Percent of Regional Traffic	Cost (rounded)	Percent of Regional Traffic
Car	$13,419,800	89.9%	$28,394,100	95.5%
Single-Unit Trucks	$1,492,900	2.45%	$2,550,500	1.90%
Combination-Unit Trucks	$8,909,200	6.80%	$4,159,800	1.45%
All Trucks	**$10,402,100**	**9.25%**	**$6,710,300**	**3.36%**

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

1.2 Methodology

Our estimated costs are rooted in the 2000 Addendum to the 1997 Federal Highway Cost Allocation Study produced by the Federal Highway Administration (FHWA).[1] Cents per mile values were used, broken out by vehicle type, from the FHWA Addendum Table 4, "2000 Highway Cost Responsibility by Vehicle Class under TEA-21 Program Structure." These values have likely changed in the intervening

[1] https://www.fhwa.dot.gov/policy/otps/costallocation.cfm

funding bills. However, no update to the FHWA Highway Cost Allocation Study has been done and therefore these values are the most recent available.

These values were then converted from cents per mile to dollars per mile and adjusted for inflation by multiplying these values by 1.46. The inflation adjustment factor was based on the United States Bureau of Labor Statistics' Consumer Price Index Inflation Calculator. [2] Figure 1-2 below displays the per-mile cost that was utilized in subsequent steps in our calculations.

Figure 1-2: Adjust Values Adapted from 2000 Highway Cost Responsibility by Vehicle Class

Vehicle Class	Dollars Per Mile (adjusted to 2017 dollars)
Autos	$0.012
Pickups/Vans	$0.011
Buses	$0.047
Single-Unit Trucks	
<25,000 pounds	$0.032
25,001 - 50,000 pounds	$0.080
>50,000 pounds	$0.265
Combination-Unit Trucks	
<50,000 pounds	$0.050
50,001 - 70,000 pounds	$0.076
70,001 - 75,000 pounds	$0.111
75,001 - 80,000 pounds	$0.126
80,001 - 100,000 pounds	$0.224
>100,001 pounds	$0.296

Source: Parametrix analysis of FHWA Highway Cost Study 1997

1.3 Annual Vehicle Miles Traveled

ATRI GPS data and COMPASS traffic classification counts were used to estimate total truck vehicle miles traveled (VMT) per year below in Figure 1-3: Annual Vehicle Miles TraveledFigure 1-3, as explained in Working Paper 2B. Assuming the non-truck (car) VMT is proportional to the percent of non-trucks in the COMPASS count data, estimates were calculated for non-truck VMT and total VMT.

[2] January 2000 ($1) – December 2017 ($1.46).

Figure 1-3: Annual Vehicle Miles Traveled

	Interstate	Non-Interstate	Total
Estimated Car VMT (per year)	1,148,959,318	2,430,999,756	3,579,959,074
Total Truck VMT (per year)	**118,249,150**	**85,417,274**	**203,666,423**
Estimated Total VMT (per year)	1,278,495,955	2,544,431,923	3,822,927,878

Source: CPCS Analysis (Working Paper 2B)

1.4 Calculating Allocation of Cost

The FHWA cost allocation truck values were reported by weight class for single or combination-unit trucks while the COMPASS counts were broken out by vehicle classification. Despite the differing schemes, there were equal numbers of sub-types of trucks within each data source. Thus, our methodology assumes correlation between weight of a vehicle and the number of axles and thus joins FHWA cost allocations categories to the vehicle classifications in a one-to-one relationship. For example, a "05-Single Unit Truck, 2 axle, 6 tire" vehicle is similar enough to a single-unit truck weighing <25,000 pounds to adopt its per mile maintenance costs. To generate our final cost allocation costs, the allocated cost per mile was multiplied by the corresponding vehicle type VMT. Figure 1-4 summarizes the results of these calculations.

1.5 Conclusions

The largest expense overall is due to automobiles comprising such a large percentage of the overall annual VMT estimate. Automobile VMT is higher on non-interstate roadways than interstates because the majority of private vehicular travel occurs off interstates. Similarly, single unit trucks, such as delivery vehicles, are utilized more on non-interstate roads while combination-unit trucks are more commonly used for interstate long-distance travel. The cost allocation difference between automobiles and overall trucks is much smaller on interstate facilities. It is worth noting that heavier vehicles, such as single and multi-unit trucks, are responsible for a large share of the overall cost relative to their relatively small VMT.

Figure 1-4: Summary of Process Values and Estimated Allocated Annual Highway Costs by Vehicle Classification

Allocation Study Vehicle Class[1]	Dollars per Mile[2]	FHWA Vehicle Classification[3]	Interstate		Non-Interstate	
			Annual VMT[4]	Annual Maintenance Cost[5]	Annual VMT[4]	Annual Maintenance Cost[5]
Autos	$0.012	02-Passenger Car	**1,148,959,318**	**$13,419,800**	**2,430,999,756**	**$28,394,100**
Single-Unit Trucks						
<25,000 pounds	$0.032	05-Single Unit Truck, 2 axle, 6 tire	24,173,036	$776,400	35,304,116	$1,134,000
25,001 - 50,000 pounds	$0.080	06-Single Unit Truck, 3 axle	6,364,182	$507,300	11,163,432	$889,900
>50,000 pounds	$0.265	07-Single Unit Truck, 4 or more axle	790,611	$209,200	1,990,511	$526,600
Total			**31,327,829**	**$1,492,900**	**48,458,059**	**$2,550,500**
Combination-Unit Trucks						
<50,000 pounds	$0.050	08-Single Trailer Truck, 4 or fewer axle	2,805,030	$140,500	4,006,976	$200,700
50,001 - 70,000 pounds	$0.076	09-Single Trailer Truck, 5 axle	62,968,159	$4,789,700	20,342,342	$1,547,400
70,001 - 75,000 pounds	$0.111	10-Single Trailer Truck, 6 or more axle	11,443,738	$1,273,100	6,891,919	$766,700
75,001 - 80,000 pounds	$0.126	11-Multi Trailer Truck, 5 or fewer axle	20,584	$2,600	152,732	$19,300
80,001 - 100,000 pounds	$0.224	12-Multi Trailer Truck, 6 axle	2,264,234	$506,400	304,466	$68,100
>100,001 pounds	$0.296	13-Multi Trailer Truck, 7 or more axle	7,419,577	$2,196,800	5,260,779	$1,557,700
Total			**86,921,321**	**$8,909,200**	**36,959,215**	**$4,159,800**

[1] From the 2000 Addendum to the 1997 Federal Highway Cost Allocation Study.

[2] December 2017 adjusted dollars, initial values from 2000 Addendum to the 1997 Federal Highway Cost Allocation Study.

[3] Classification used by ATRI data and COMPASS traffic counts.

[4] Applying COMPASS vehicle type ratios to Truck VMT estimates.

[5] Estimated dollars per mile multiplied by VMT and rounded.

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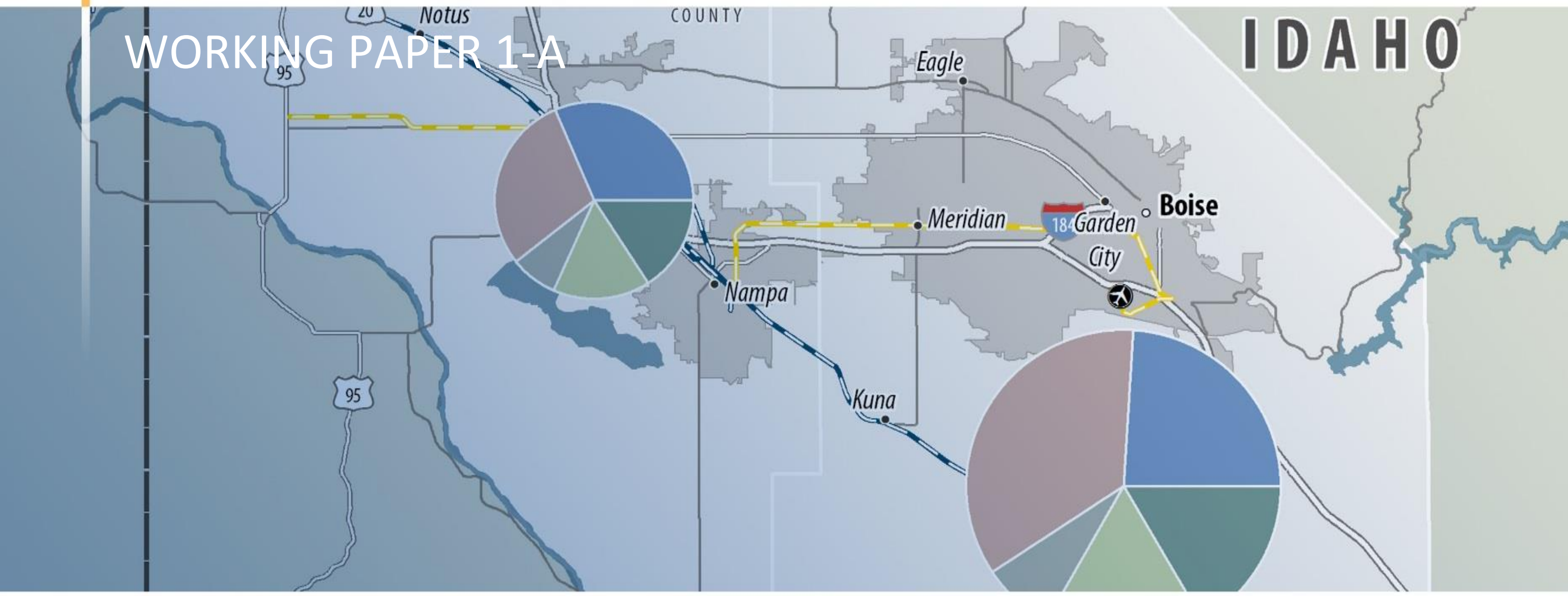
WORKING PAPER 1-A



COMPASS Freight Study

Client Reference: RFQ 2017-02

Regional Freight Clusters

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

CPCS Ref: 16629

Date: 7 July 2017

Acknowledgments / Confidentiality

CPCS acknowledges and is thankful for input provided by COMPASS in validating the data sources used in this report.

Cover image source: CPCS

Table of Contents

Acronyms / Abbreviations

ATRI	American Transportation Research Institute
CIM	Communities in Motion
COMPASS	Community Planning Association of Southwest Idaho
FAA	Federal Aviation Administration
GIS	Geographic Information System
GPS	Global Positioning Systems
HP	Hewlett Packard
IDOL	Idaho Department of Labor
IG	Infogroup
M.	Millions
NAICS	North American Industry Classification System
RFP	Request for Proposal
STCC	Standard Transportation Commodity Code
TAZ	Traffic Analysis Zone
TREDIS	Transportation Economic Development Impact System
UP	Union Pacific
UPRR	Union Pacific Railroad
WATCO	Watco Companies

Executive Summary

The Community Planning Association of Southwest Idaho (COMPASS) is conducting a freight study to support its long-range transportation plan, *Communities in Motion 2040*. The freight study is identifying freight corridors and related land use needs, developing a profile of the regionally most important commodities and supply chains, and identifying projects and/or policies to address maintenance needs, improve safety, and manage congestion.

This working paper uses a sector-based approach to identify the top freight clusters in Ada and Canyon Counties (the "region"). This involves classifying the top freight-related sectors in the region, based on the top commodities moved into, out of, and within the region. An objective, data-driven approach is used to define the top freight clusters in the region using a combination of ATRI GPS truck trip data and employment data from Infogroup and the Idaho Department of Labor (IDOL). This paper describes the procedure for identifying the clusters and includes profiles of the top freight clusters.

1. Economic sectors that directly depend on freight movement employ around a quarter of the regional workforce. The retail sector employs a further 20%.

Based on the top commodity flows inbound, outbound and internally within the region, four key freight-related sectors were defined. These are shown in Figure ES-1 along with two sources for employment: Infogroup data and IDOL data. Total employment in freight-related sectors is between 60,000 and 70,000 depending on the source, or around 22% to 25% of all jobs. These freight-related sectors are ones that directly depend on goods movement as a core part of their business operations. In addition, the retail sector is considered distinctly as a "quasi-freight-related" sector with an inbound movement of goods. Retail jobs comprise a further 21% of all jobs.

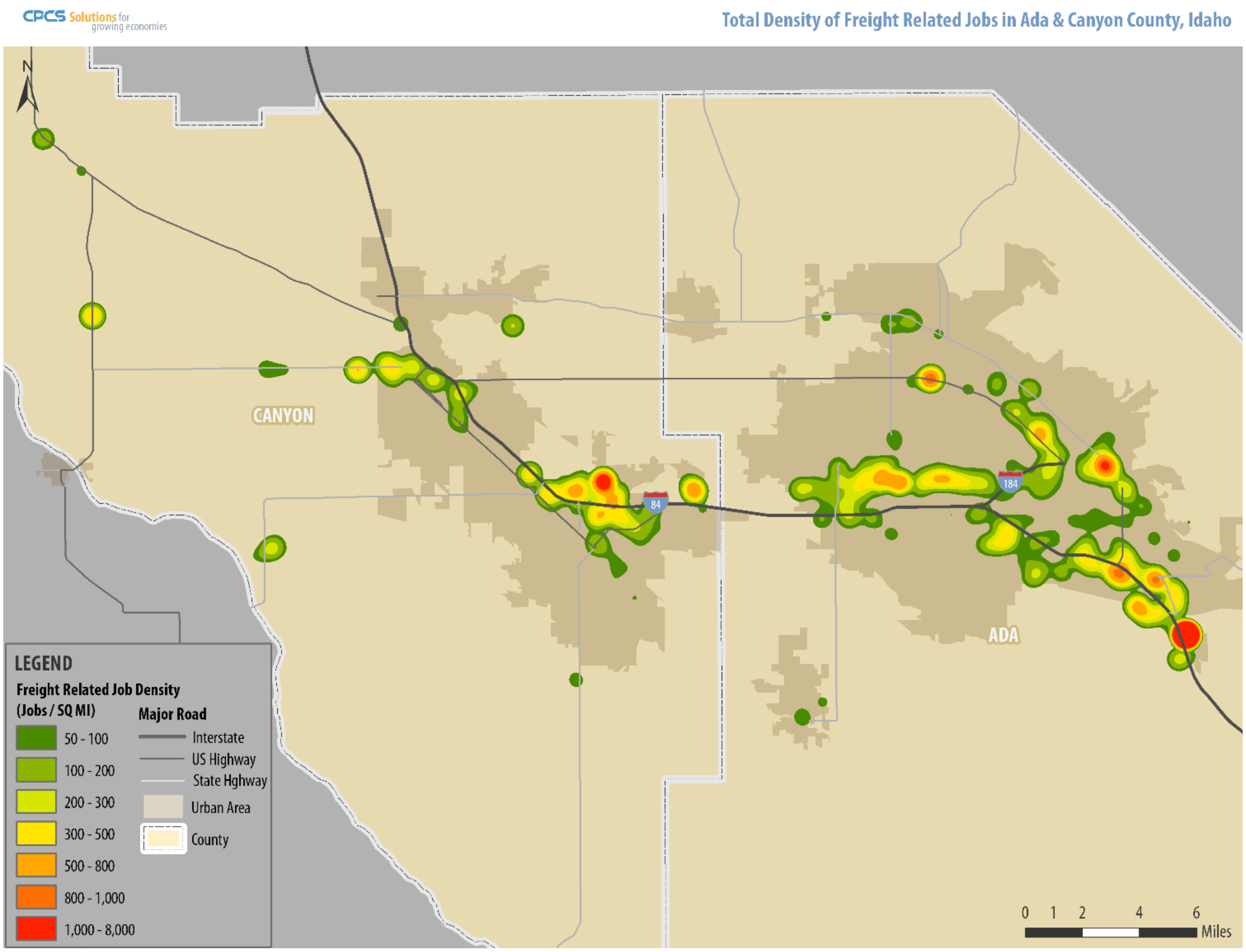
Figure ES-1: Employment by Sector, Study Area

Sector	Infogroup	IDOL	% of Jobs
Agri-Food	10,299	11,617	4%
Primary Materials*	20,463	25,587	7 - 9%
Manufactures	25,254	22,926	8%
Transportation and Distribution	6,030	9,416	3%
Retail	58,955	59,219	21%

Source: CPCS analysis of Infogroup and IDOL data (2016)
Note: Construction and Utilities are listed as part of Primary Materials, but excluded for the purpose of geospatial analysis.

GIS software was used to produce heat maps of freight-related activity in the region, based on disaggregate establishment-level Infogroup data (Figure ES-2). Some clear geospatial patterns are evident from the map, as well as similar maps profiling each sector individually. The Infogroup data were aggregated to the TAZ level, and compared to other available TAZ-level data including IDOL employment data and truck trip end (origin and destination) data from ATRI. The top freight transfer centers in the region (rail-to-truck, air-to-truck, and pipeline-to-truck were also identified, and found to overlap with the locations of the top freight clusters.

Figure ES-2: Heat Map of Freight-Related Employment by TAZ



Source: CPCS analysis of Infogroup data (2016)

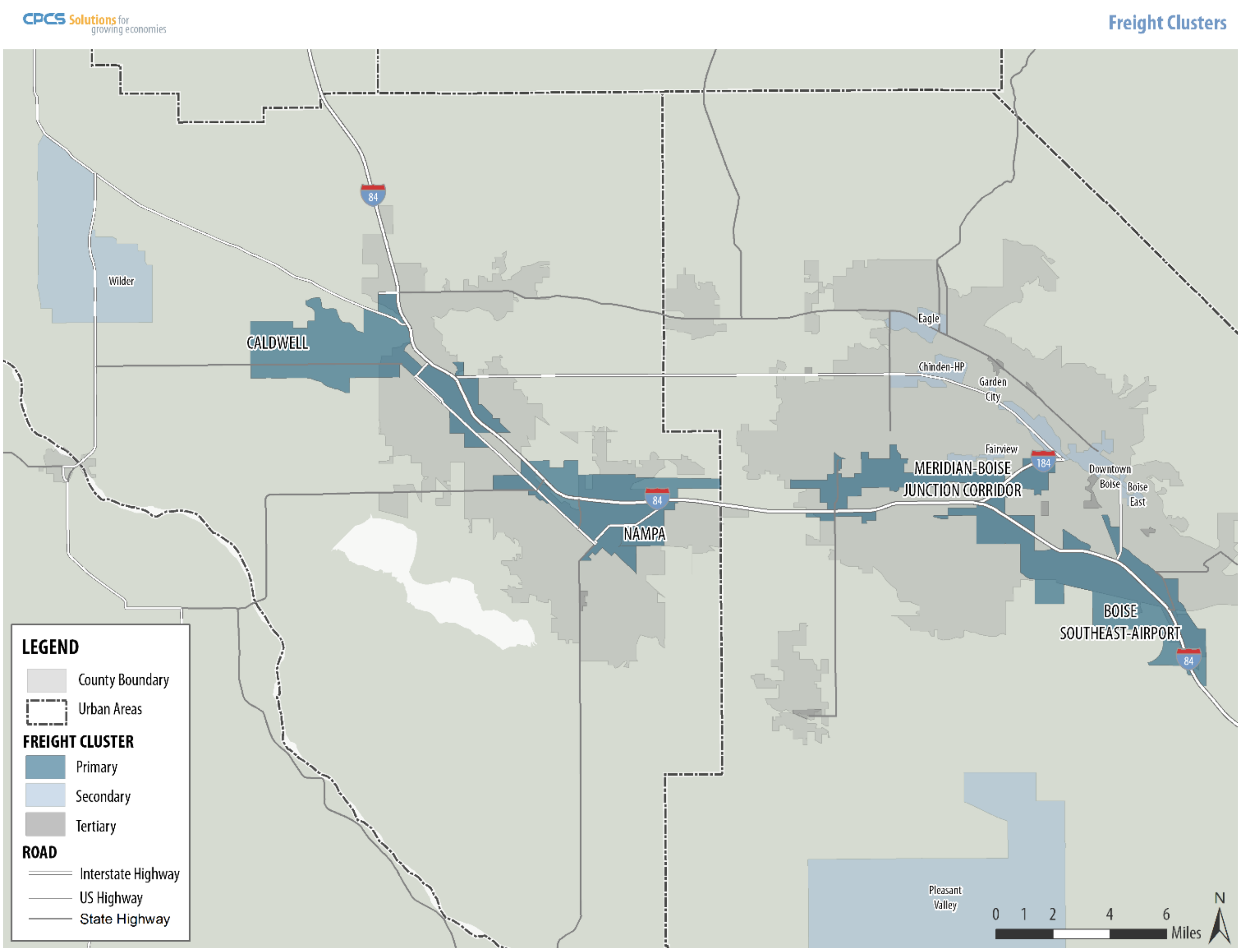
2. **There are four distinct primary freight clusters in the region. These are responsible for approximately three-quarters of truck trips and freight-related jobs in the region.**

77% of truck trip ends, and between 69% and 73% of freight-related jobs, are located in one of the four primary sectors, defined as: Caldwell, Nampa, Meridian-Boise Junction Corridor, and Boise Southeast-Airport. These primary freight clusters have most of the large freight-related establishments and typically a variety of freight-related activity.

Additionally, secondary freight clusters are ones defined as smaller concentrations of freight activity, typically with one large employer or many small employers. Examples of these freight clusters are Downtown Boise, Chinden-HP (centered on the HP campus), Garden City, and Wilder.

A map of freight clusters is shown as Figure ES-3.

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



Source: CPCS analysis

1 Introduction

Key Chapter Takeaways

The Community Planning Association of Southwest Idaho (COMPASS) is conducting a freight study to support its long-range transportation plan, *Communities in Motion 2040*. The freight study is identifying freight corridors and related land use needs, developing a profile of the regionally most important commodities and supply chains, and identifying projects and/or policies to address maintenance needs, improve safety, and manage congestion.

This working paper uses a sector-based approach to identify the top freight clusters in the region. This involves classifying the top freight-related sectors in the region based on the top commodities moved into, out of, and within the region. An objective, data-driven approach is used to define the top freight clusters in the region using a combination of ATRI truck GPS trip end data, and employment data from Infogroup and the IDOL. Finally, the top freight clusters are profiled.

1.1 Background

As the metropolitan planning organization (MPO) for the Boise-Nampa area, the Community Planning Association of Southwest Idaho (COMPASS) is focused on integrating freight 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).

The study area consists of Ada and Canyon Counties ("the region," also referred to as the Treasure Valley or the COMPASS region).

1.2 Objectives

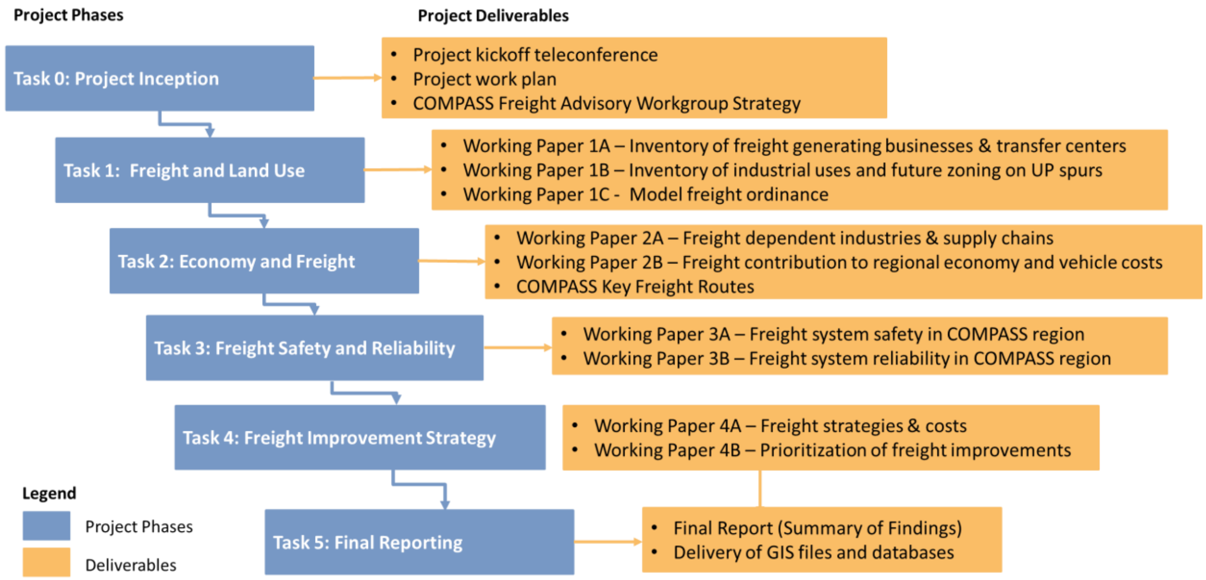
As set out in the RFP, the key outcomes of this study are:

- 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 projects and/or policies to address maintenance needs, improve safety, mitigate choke points, and manage congestion

1.3 Project Structure

The project is to be developed in five broad phases, as set out in the graphic below. Each of these phases has a series of deliverables.



1.4 Purpose of this Working Paper

As part of Task 1: Freight and Land Use, the purpose of this working paper is to identify the location and nature of major freight transfer centers and other areas with many freight-generating businesses. This deliverable corresponds to Working Paper 1-A.

Specifically, in this working paper we use a sector-based approach to identify the top freight clusters in the region. This involves classifying the top freight-related sectors in the region based on the top commodities moved into, out of, and within the region. An objective, data-driven approach is used to define the top freight clusters in the region using a combination of American Transportation Research Institute (ATRI) truck GPS trip end data, and employment data from Infogroup and the Idaho Department of Labor (IDOL). The location of important freight centers is also noted. Finally, the top freight clusters are profiled.

This working paper is also intended to provide COMPASS with an overview of progress to date and to solicit comments and other feedback on the structure and content of this component part of what will become the final report. Note that revisions to this working paper will be reflected in the Draft Final Report.

1.5 Methodology and Limitations

This working paper was prepared through analysis of data from ATRI, Infogroup, IDOL, and Transearch (via TREDIS). In the case of the latter three data sources, these were validated through consultations between the study team and COMPASS.

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

The specifics of the methodology for cluster identification are discussed within the chapters. For the purpose of this study, the Treasure Valley region (the "region") is defined as consisting of Ada and Canyon Counties.

2 Geographic Distribution of Freight Activity

Key Chapter Takeaways

Transearch data were used to identify the top commodity groups for multimodal inbound, outbound, and internal flows. The total value of flows within the region is $27.3 billion annually.

The commodities were segmented into four approximately equal groups (by value): agri-food products, primary materials, manufactures, and consumer products.

Based on these key commodity groups, four freight-related sectors were defined: agri-food, primary materials, manufactures, and transportation and logistics. Infogroup and IDOL business establishment data were used to profile the sectors in terms of freight employment. Total employment in freight-related sectors is between 60,000 and 70,000, or around 20% to 25% of all jobs. In addition, retail jobs are considered separately and are also around 20% of all jobs.

The geographic distribution of employment for the top freight-related sectors is displayed using heat maps.

2.1 Top Commodities in the Treasure Valley

The study team identified four commodity categories based on detailed analysis of Transearch commodity data provided to COMPASS through the TREDIS suite. Commodities were evaluated on the basis of value of outbound, inbound, and internal flows. The total value of commodity flows into, out of, and within the region is $27.3 billion annually.

Four commodity groups were identified based on approximate equivalency of total commodity flow values:

Figure 1: Commodity Groups

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

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

The precise definition of the commodity groups, according to the STCC codes represented, is as follows:

Figure 2: 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

These top commodities, including inbound, outbound, and internal flows, will be profiled in greater depth in the forthcoming Working Paper 2-A.

2.2 Freight-Related Economic Sectors

2.2.1 Definition of Freight-Related Sectors

"Freight" and "goods movement" evoke images of trucks, trains, airplanes, vessels, and pipelines, as these are 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. Generally, the businesses in these industries are involved in growing, extracting, manufacturing, or distributing goods (as distinguished from firms that primarily provide *services*). These companies rely on good transportation connections to get their product to market and to add value in the supply chain. Thus, although all businesses depend on goods movement to some extent (e.g. deliveries to hospitals, courier services to office buildings, etc.), it is possible to distinguish a set of businesses involved in freight transportation and generation that can be collectively described as "freight-related."

The first step to defining freight-related sectors was to use the top commodity groups from Section 2.1 and assign NAICS industry codes (generally at the 2-3 digit level, with some exceptions at the 4-5 digit level) among the four top commodity groups, plus transportation. NAICS refers to North American Industry Classification System, the dominant system across the continent for classifying establishments on the basis of economic activity.

These results are displayed in Figure 3.

Figure 3: Initial Grouping of NAICS Codes by Commodity Group

Commodity Group	Corresponding NAICS
Agri-Food Products	111 Crop production 112 Animal production 115 Support activities for agriculture & forestry 311 Food manufacturing 312 Beverage & tobacco manufacturing 4244 Grocery and related product wholesalers 4245 Farm product raw material wholesalers 4248 Beer, wine, alcohol wholesalers 42491 Farm suppliers merchant wholesalers
Primary Materials	113 Forestry and logging 114 Fishing, hunting and trapping 21 Mining and oil & gas 22 Utilities 23 Construction 313-316 Manufacturing 321-327 Manufacturing 4233 Lumber and constr. Materials wholesalers 4235 Metal and mineral wholesalers 4246 Chemical and allied products wholesalers 4247 Petroleum products wholesalers 562 Waste management and remediation services
Manufactures	331-339 Manufacturing 4231 Motor vehicle and parts wholesalers 4234, 4236-4239 Machinery and equipment wholesalers
Consumer Products	4232 Furniture and home furnishings wholesalers 4241 Paper product wholesalers 4242 Drugs wholesalers 4243 Apparel wholesalers 4249 Misc. nondurable goods wholesalers (except 42491 - farm suppliers merchant wholesalers) 4251 Wholesale electronic markets 44-45 Retail trade 72 Accommodation and food service
Transportation	48-49 Transportation (except 485 - Transit and 487 - Scenic/ sightseeing)

Source: CPCS

Next, the commodity groups were distilled into four economic sectors using the following revisions:

- Consumer products was broken down into two subcategories – retail and distribution. The retail component was assessed as a separate sector, and distribution was combined with transportation
- Utilities and construction were removed from primary materials. Construction industries generate freight, but this is less specifically tied to particular business establishment locations and therefore analyzing the geospatial spread of these establishments is not particularly meaningful

The resulting economic sectors are displayed in Figure 4. (A more detailed table by NAICS is listed in Appendix A). Four freight-related sectors remain, along with the retail sector, which is considered separately as "quasi-freight-related." Retail establishments straddle the line between goods- and service-oriented as their purpose is to receive goods inbound and sell them directly to the public. In addition, retail is a highly labor-intensive sector, meaning including these with other freight-related sectors would significantly skew analyses of freight clusters.

In the table, freight-related sectors are highlighted in blue, with retail highlighted in orange. The remaining NAICS codes are considered primarily service-oriented and are not the focus of this study.

Figure 4: Definition of Economic Sectors for Geosptatial Analysis

Economic Sector	NAICS Codes
Agri-Food	11 Agriculture, forestry… (except 113-114) 311-312 Manufacturing 4244, 4245, 4248, 42491 Wholesale trade
Primary Materials	113-114 Forestry, fishing 21 Mining and oil and gas extraction 313-316, 321-327 Manufacturing 4233, 4235, 4246, 4247 Wholesale trade 562 Waste management and remediation
Manufactures	331-339 Manufacturing 4231, 4234, 4236-4239 Wholesale trade
Transportation and Distribution	4232, 4241, 4242, 4243, 4249 (except 42491),4251 Wholesale Trade 48-49 Transportation and Warehousing (except 485 and 487)
Retail	441-454 Stores and retailers 721-722 Accommodation and food services/drinking places
Non-Freight	485 and 487 Transit and Scenic/sightseeing transportation 511-561 Office sector 611-713, 811-928 Non-retail service

Source: CPCS. Note: also excludes NAICS 22-23 (Utilities and Construction) from Primary Materials

The sectors are thus inspired by and correspond to the top commodity categories in the Treasure Valley, as described in Section 2.1. Of particular note, agri-food products has been defined as a distinct sector on the basis of the large value of flows into and outside of the region relative to other commodities.

2.2.2 Profiles of Freight-Related Sectors

Region-wide employment by sector is shown in Figure 5. The data are taken from two sources:

- Infogroup data obtained through COMPASS (subject to revisions made based on validation analysis by the study team and COMPASS). Infogroup is a private purveyor of business establishment data. The attributes obtained in the Infogroup dataset include NAICS, lat-long coordinates, and employment.

- Idaho Department of Labor data obtained through COMPASS. This is a similar dataset of employment by NAICS, except that it was available at the traffic analysis zone (TAZ)-level rather than individually by establishment.

Although Infogroup and IDOL are not identical, they show broadly similar employment levels for most of the sectors.

Figure 5: Employment by Sector, Study Area

Sector	Infogroup	IDOL
Agri-Food	10,299	11,617
Primary Materials	4,975	5,716
Manufactures	25,254	22,926
Transportation and Distribution	6,030	9,416
Retail	58,955	59,219
Non-Retail Service	116,861	95,728
Office Sector	48,039	57,432
Construction and Utilities*	15,488	19,871

Source: CPCS analysis of Infogroup and IDOL data (2016)
Note: Construction and Utilities are not listed as part of Primary Materials for the purpose of geospatial analysis.

The largest freight-generating sector by employment is manufactures. Employment in this sector is driven notably by several large employers, such as Micron Technology and Hewlett Packard among others.

Total employment in freight-related sectors is between 60,000 and 70,000, including construction and utilities. This is around 22% to 25% of total employment. Retail also occupies a similar percentage of jobs, at around 21%. The remaining jobs are in the office or non-retail service sector.

2.3 Geographic Distribution of Sectors

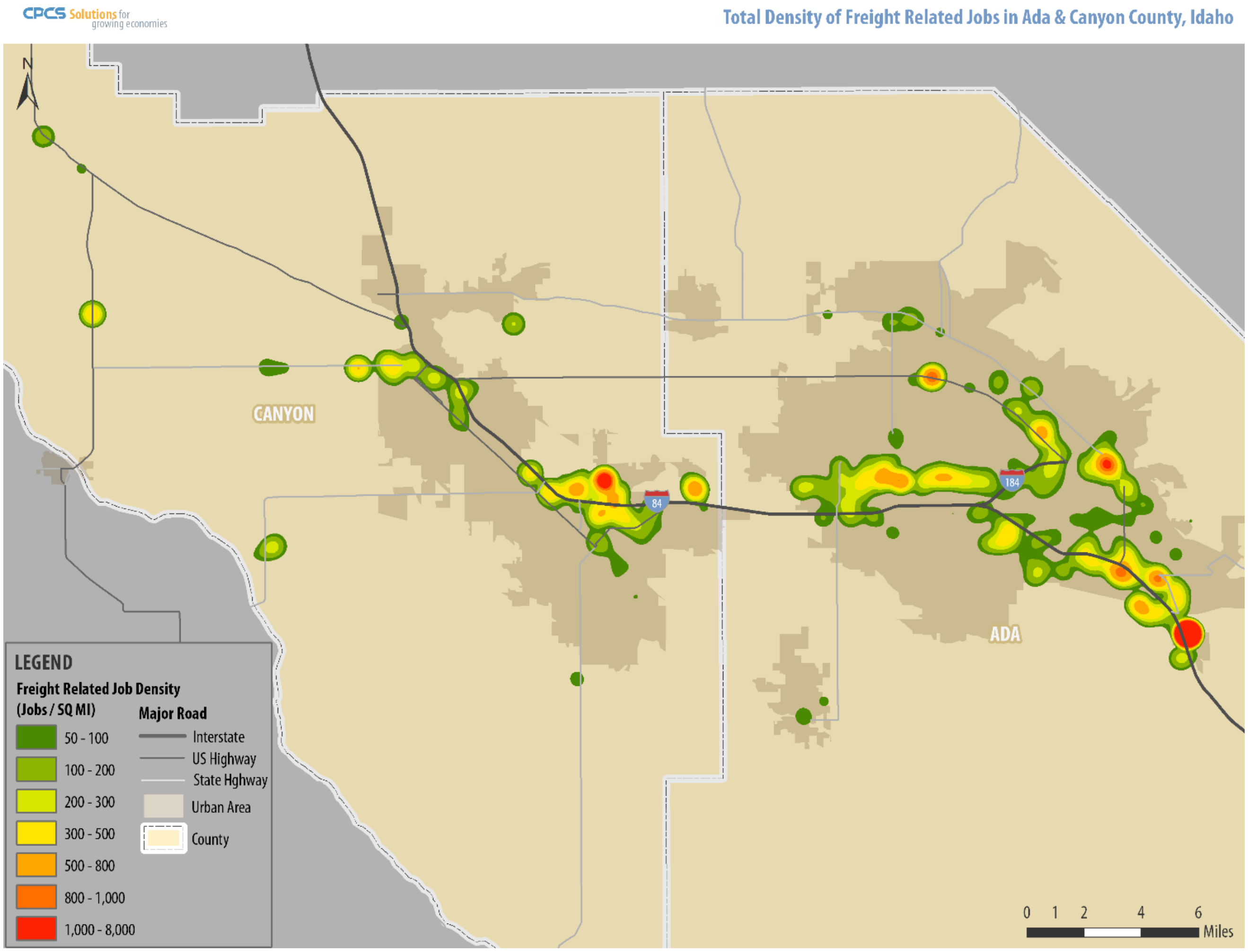
Heat maps were used to assess the geographic distribution of sectors in the region. The heat maps are constructed using GIS “kernel density” techniques, where the color spectrum reflects the intensity of employment within the sector. In the maps, a redder color is indicative of a high intensity, with green reflecting a lower intensity.

The heat maps are based on the Infogroup business establishment data, for which precise latitude-longitude data are available at the establishment level.

Figure 6 displays a heat map of employment in freight-related sectors (not including retail). Appendix B contains additional heat maps for each of the sectors individually, and also includes a heat map for the retail sector separately.

The heat map provides an initial visual sense of where freight activity takes place in the region. Chapter 3 builds on this analysis to develop an objective framework for identifying the top freight clusters in the region.

Figure 6: Heat Map of Freight-Related Employment by TAZ



Source: CPCS analysis of Infogroup data (2016)

3 Freight Clusters in the Treasure Valley

Key Chapter Takeaways

A combination of ATRI GPS data and business establishment data (from Infogroup and IDOL) were used to define freight clusters. These are concentrations of freight-related businesses operating in a distinguishable geographic area. Primary and secondary freight clusters were defined.

Approximately three-quarters of truck trip ends and freight-related jobs are located in one of the four primary freight clusters, defined as: Caldwell, Nampa, Meridian-Boise Junction Corridor, and Boise Southeast-Airport. These primary freight clusters have most of the large freight-related establishments and typically a variety of freight-related activity.

Additionally, secondary freight clusters are ones defined as smaller concentrations of freight activity, typically with one large employer or many small employers. Examples of these freight clusters are Downtown Boise, Chinden-HP (centered on the HP campus), Garden City, and Wilder.

3.1 Definition of Freight Clusters

3.1.1 Data Sources Used

Three data sources were used to define freight clusters in the region:

- Infogroup business establishment data, introduced in Chapter 2 and now mapped to the TAZ level
- Idaho Department of Labor data, introduced in Chapter 2
- Global positioning system (GPS) data for truck fleets from the American Transportation Research Institute (ATRI), a member of the study team.

Land use parcel data were also available but were not considered as suitable for this analysis as the other sources. The parcel data are considered in Working Paper 1-B.

The ATRI GPS data used for this study rely on real-time feeds from a large number of North American commercial vehicle fleets spanning the US, Canada and Mexico, and covering both large and small trucks. This includes over 100 million data points per day and covers nearly 4 million miles of roadway in the US (for reference, the National Highway System comprises approximately 160,000 miles). The data points are highly granular, enabling identification of flows along individual roadways or even within large freight facilities. Given the high temporal and spatial coverage, the ATRI GPS data are essentially a large-scale sample of the nation's trucks.

The data for this study were collected for four distinct two week periods of the most recent year (2016), assumed to be representative of the entire year:

- First two weeks in March
- First two weeks in June
- Last two weeks in September
- First two weeks in December

The ATRI trips were custom-mapped to the regional TAZ level, and each trip was identified on the basis of the origin or destination zone. The ATRI data used in this Working Paper, specifically, are the "trip end" data, where a trip end is defined as a trip origin or destination. In other words, for each TAZ, the number of trips listed is the number of truck trips originating or destining in that zone over the study periods.[1]

Figure 7 shows the characteristics of the data sources employed. Infogroup and IDOL are alternative ways of looking at freight-related employment, while the ATRI GPS data reflect actual truck trips.

Figure 7: 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. In other words, by triangulating the alternate sources, it is possible to build a holistic picture of freight clusters in the region.

Specifically, the ATRI data reflects actual freight movement, giving greater weight to businesses that actually ship a lot of freight, even though they may have few employees. Although this data source only covers truck trips, most freight establishments with significant rail traffic will also

[1] The average of origins plus destinations is used. In general origins equal or are nearly equal to destinations, because the same truck that "destines" in the zone for one trip also "originates" in the zone for the next trip. As the data are obtained from the truck's GPS unit, it is not possible to distinguish between loaded versus unloaded trips.

use trucks to some extent in their supply chains. In addition, trucking is the dominant mode for freight movement in the region, as profiled in the forthcoming Working Paper 2-A.

On the other hand, the ATRI data do not necessarily capture all truck trips or all freight movement, and thus the two "land use" data sources prove a helpful resource for any establishments that the ATRI data may "miss." Although not indicative of freight movement per se, these data have the advantage of comprehensive coverage across the region. The land use data can also be broken out by sector, 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 8.

Figure 8: 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

3.1.2 Methodology for Defining Freight Clusters

A data-driven, geospatial approach was used to define freight clusters.

Step One

First, six variables were computed at the TAZ-level, summarized in Figure 9. These variables reflect both absolute employment/trip activity, and the density of employment/trip activity. The latter is useful because TAZ's are not uniformly sized – failing to consider density would lead to potentially overlooking smaller TAZ's (such as in Downtown Boise or other dense areas).

Figure 9: 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 six variables were scored 1 through 3 using the following thresholds, shown in Figure 10.

Figure 10: Thresholds for Scoring TAZ's

Metric (Variable)	Score = 0	Score = 1	Score = 2	Score = 3
GPS Trip Ends	0	5	50	250
GPS Trip Density	0	0.1	0.5	1
IG Freight-Related Employment	0	25	100	500
IG Freight-Related Emp. Density	0	0.25	1	2.5
IDOL Freight-Related Employment	0	25	100	500
IDOL Freight-Related Emp. Density	0	0.25	1	2.5

Source: CPCS

Each TAZ was assigned a score across each of the six variables based on the amount or intensity of truck trips or freight-related employment. (For example, a TAZ with between 5-50 truck trip ends was assigned a score of 1. A TAZ with in excess of 2.5 freight-related jobs per acre was assigned a score of 3.)

Step Two

In the second step, a composite score was computed for each TAZ based on all six variables taken collectively. The composite score was deemed to be the maximum of all six of the individual variable scores, from 0 to 3. In addition, a value of 4 was assigned to TAZ's with a score of 3 for multiple variables.

Clusters were then constructed "from the inside out," by starting with TAZ's deemed very important (score of 4 – i.e. multiple metrics suggest the TAZ is very important for freight movement). The TAZ's were built outward by successively connecting additional adjacent TAZ's to these cores, with the action taken dependent on the freight importance of each successive TAZ. Figure 11 details the specific decision process employed.

Figure 11: Decision Process for Including TAZ in Cluster

Composite Score	Freight Importance	Action taken
4	Very important	Define as core of freight cluster
3	Important	Include in freight cluster
2	Moderately important	Include if adjacent to or very near a cluster
1	Somewhat important	Include if in between or surrounded by otherwise qualifying clusters
0	Minimally important	Include only if subsumed (3+ sides) by otherwise qualifying clusters

Source: CPCS

The key principles served by this approach are as follows:

- Capture all important TAZ's in a cluster
- Aggregate adjacent TAZ's into clusters according to a coherent, objective approach
- Ensure clusters are geographically continuous, within reason
- Reflect the fact that geographic context is important for defining the importance of TAZ's. For example, a moderately-sized freight facility located far from other freight activity may not be reflective of a "freight cluster" on its own, whereas a moderately-

sized facility surrounded by TAZ's with lots of freight activity may reasonably be considered part of the larger cluster. Thus, a TAZ classified as "moderately important" is included as part of a cluster if directly adjacent to an already-existing cluster, whereas if it is surrounded by residential areas with little freight activity it is not defined as a new cluster.

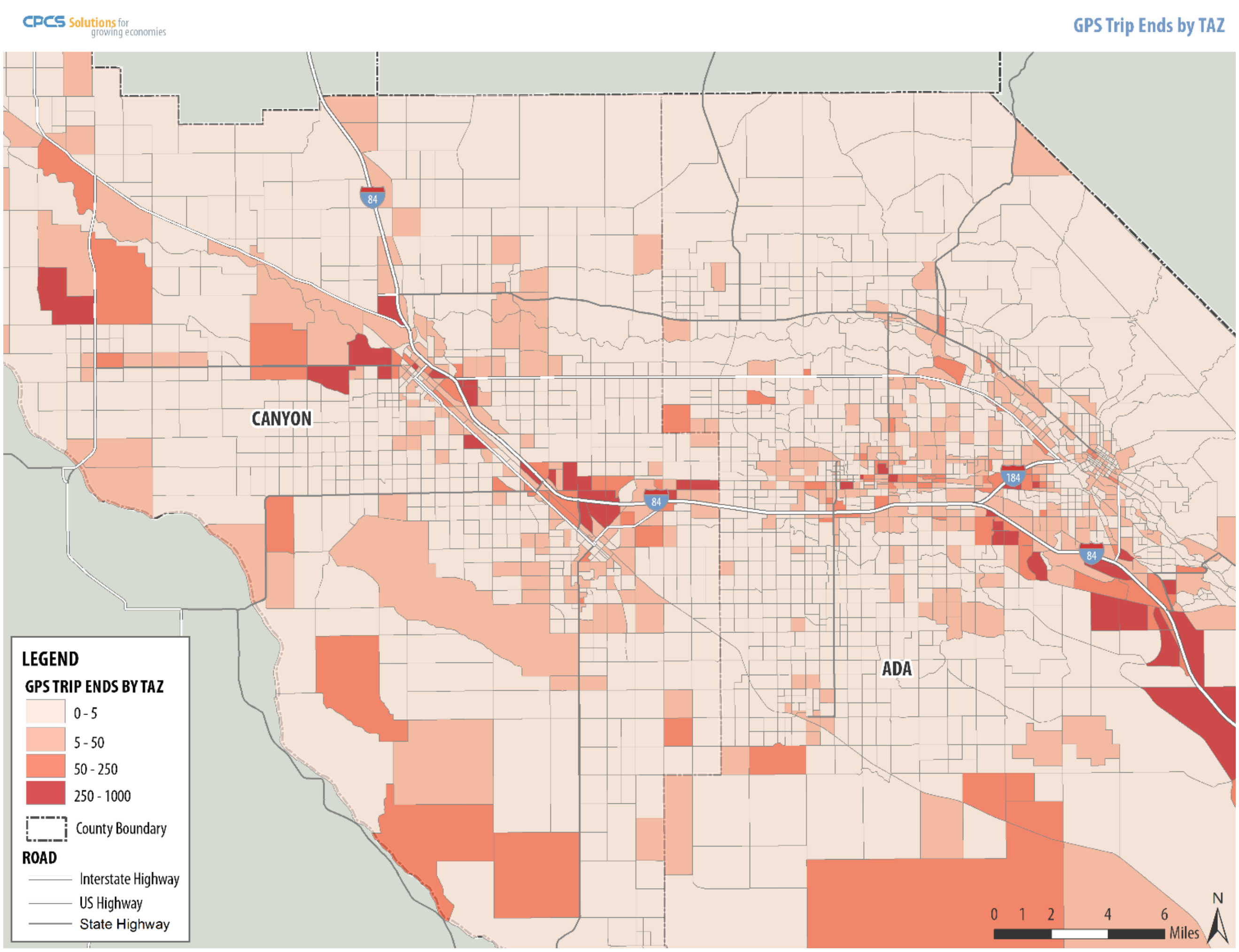
Step Three

In the third step, Steps One and Two were repeated for retail clusters using the same numerical thresholds as identified for freight-related sectors. TAZ's were either added on to existing clusters, or new clusters created, in situations where the retail density was sufficiently large of its own accord.

3.1.3 Maps of Key Metrics

This section displays maps of the six key metrics used for scoring freight clusters. Figure 12 shows the distribution of truck trip ends by TAZ.

Figure 12: Truck Trip Ends by TAZ

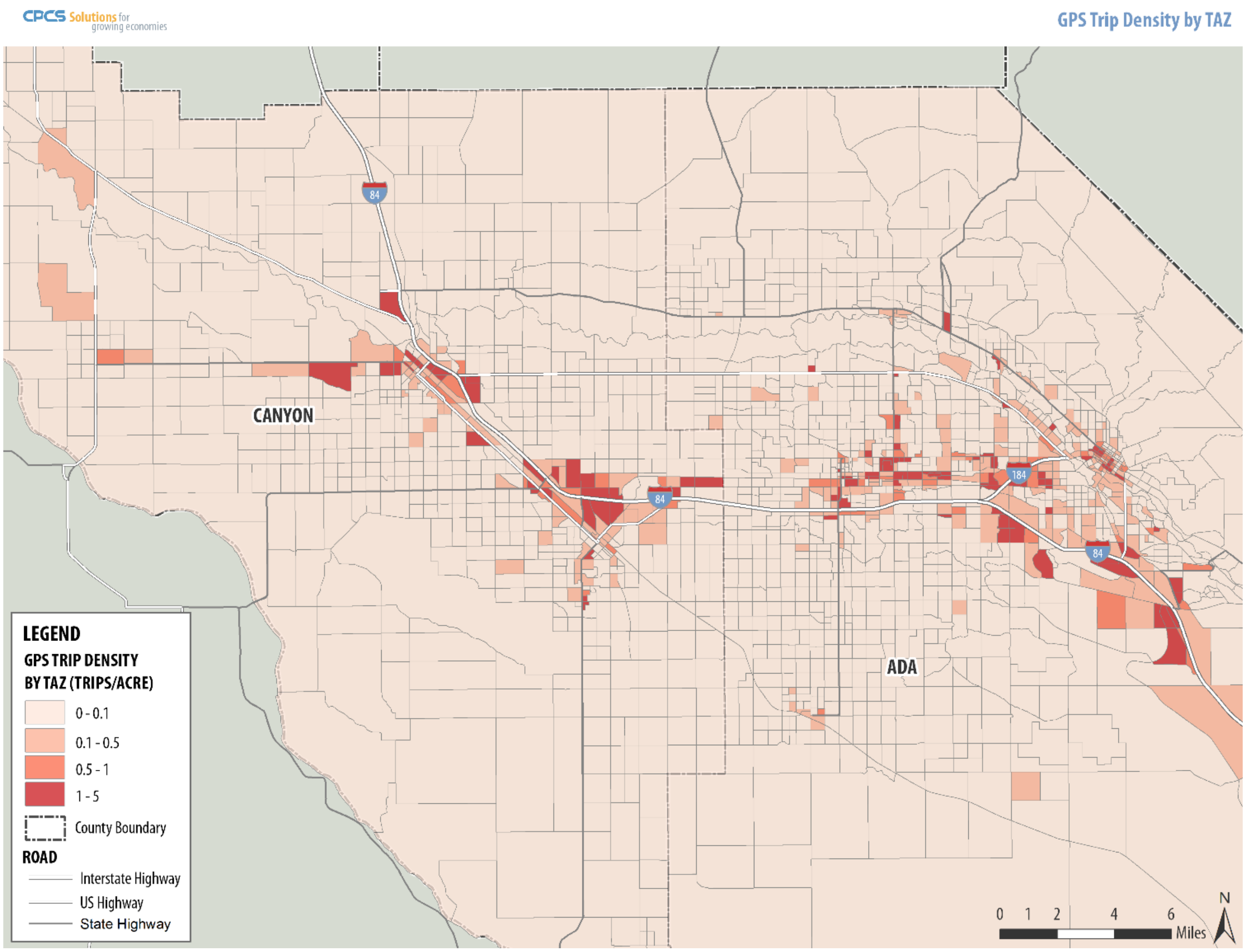


Source: CPCS analysis of ATRI GPS data

As the TAZ's are of variable size, there are some large outlying zones with significant truck activity, which may be more a reflection of the size of the zone. Additionally, it is noted that there are several TAZ's along I-84 east of the metro which are almost certainly associated with truck parking at rest stops. These zones were flagged and not included in the freight clusters.

Figure 13 shows truck trip density by TAZ. This metric controls for the size of each zone and thus gives greater weight to smaller zones with a large number of truck trips.

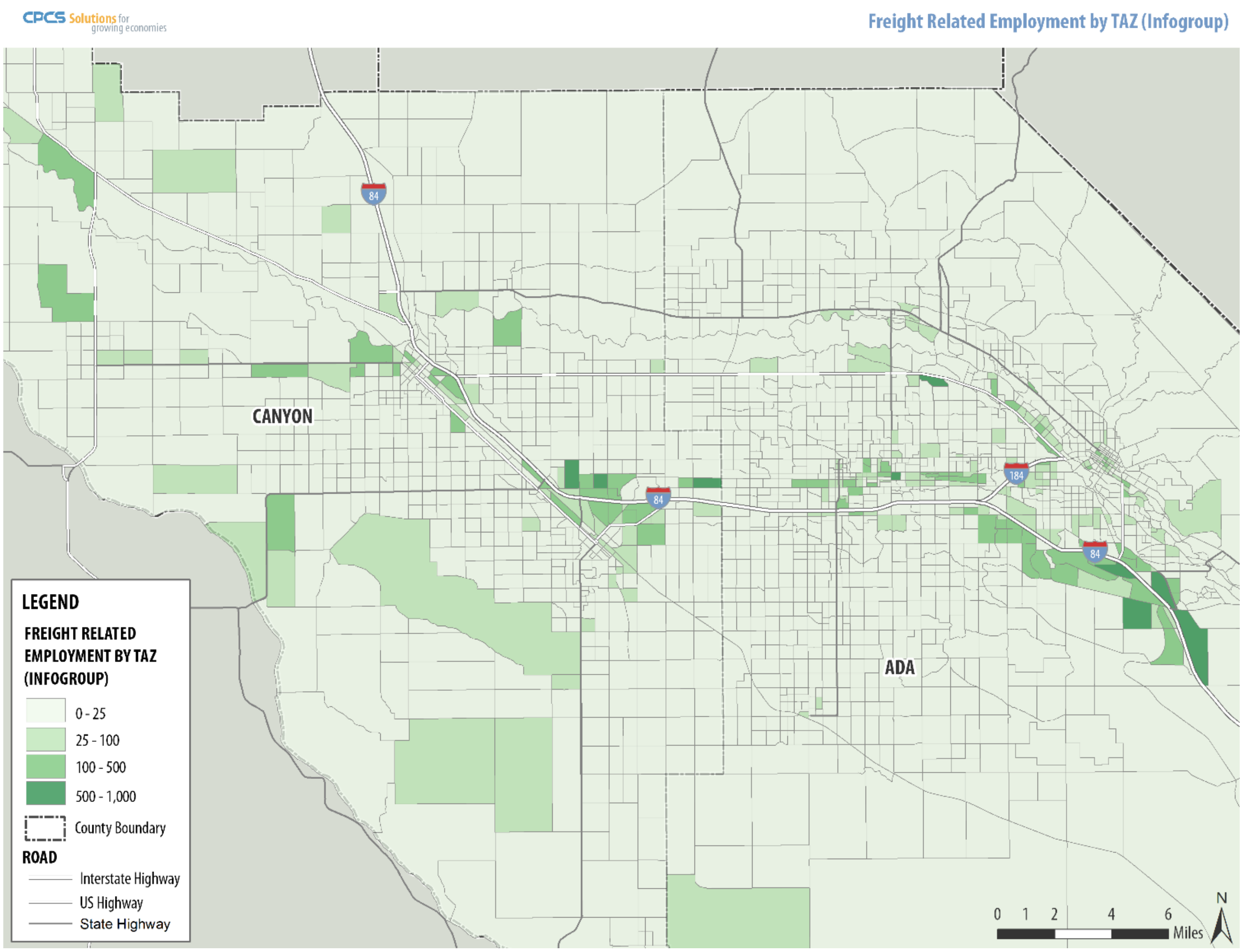
Figure 13: Truck Trip Density by TAZ



Source: CPCS analysis of ATRI GPS data

Figure 14 shows freight-related employment, according to the Infogroup data. This is based on the same data as the heat map shown in Chapter 2, except that the establishments are aggregated to the level of the TAZ so as to be consistent with and comparable to the other data sources (which are not disaggregate and specific to establishments).

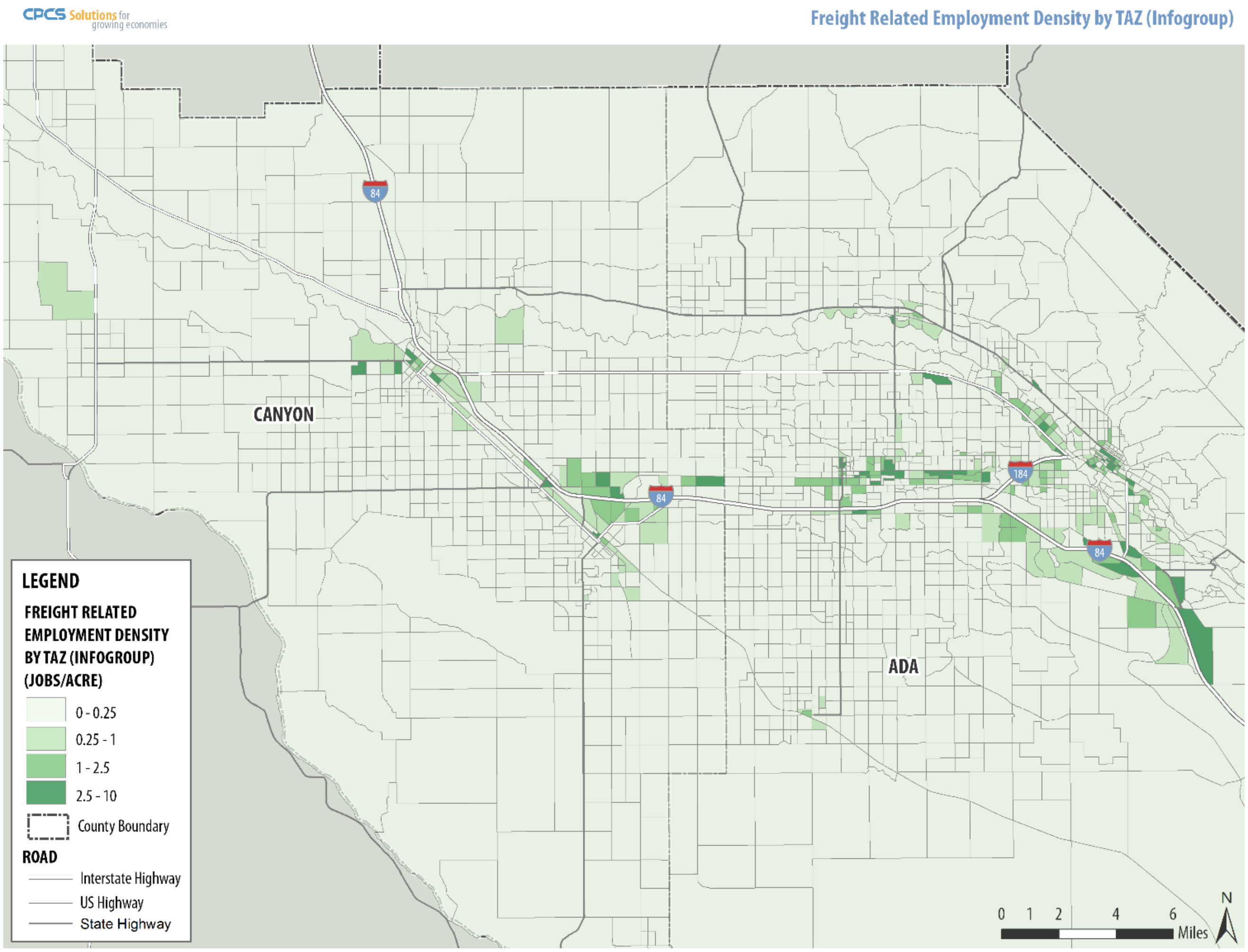
Figure 14: Infogroup Freight-Related Employment by TAZ



Source: CPCS analysis of Infogroup data

Figure 15 shows the density of freight-related employment, according to the Infogroup data. The metric is jobs per acre.

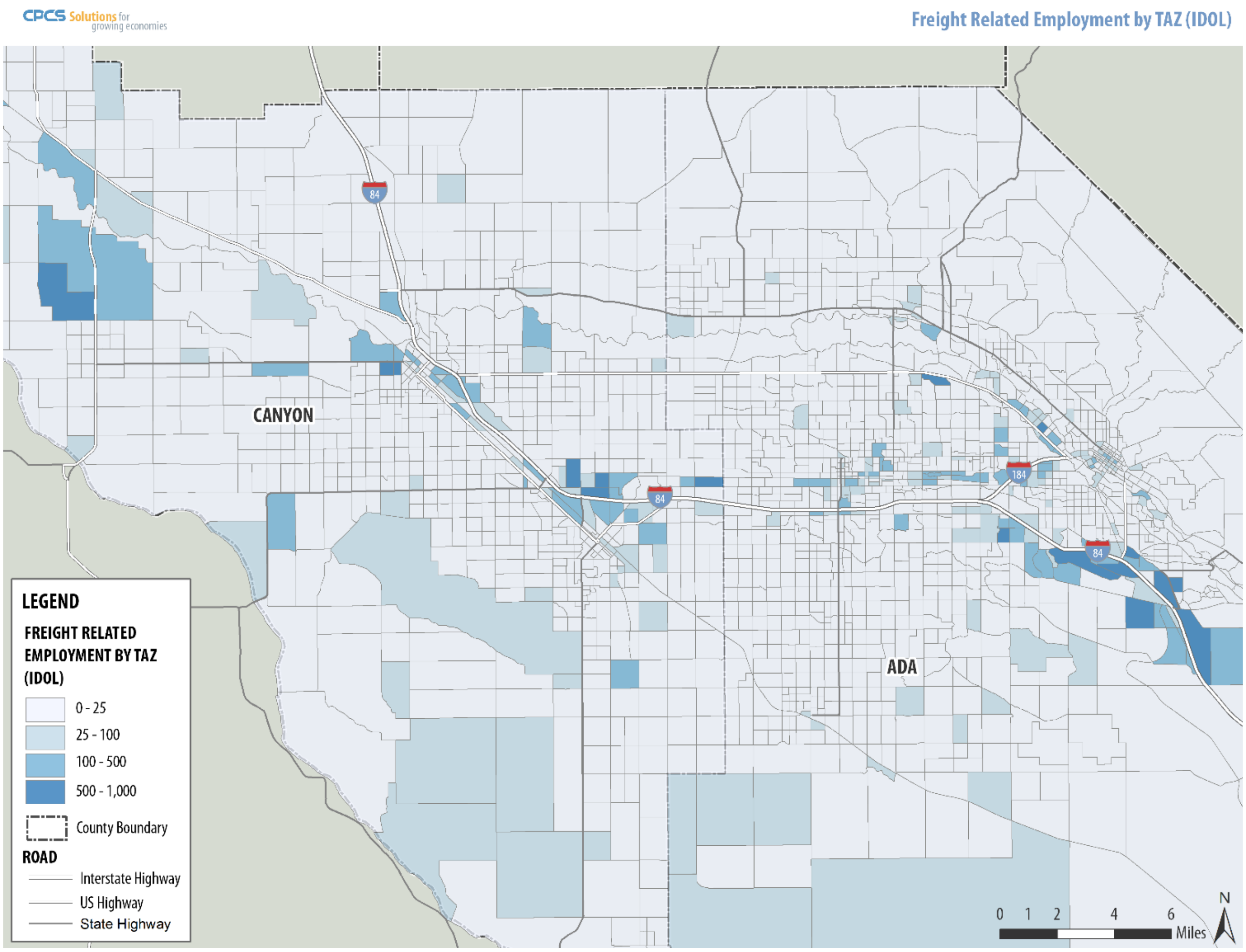
Figure 15: Infogroup Freight-Related Employment Density by TAZ



Source: CPCS analysis of Infogroup data

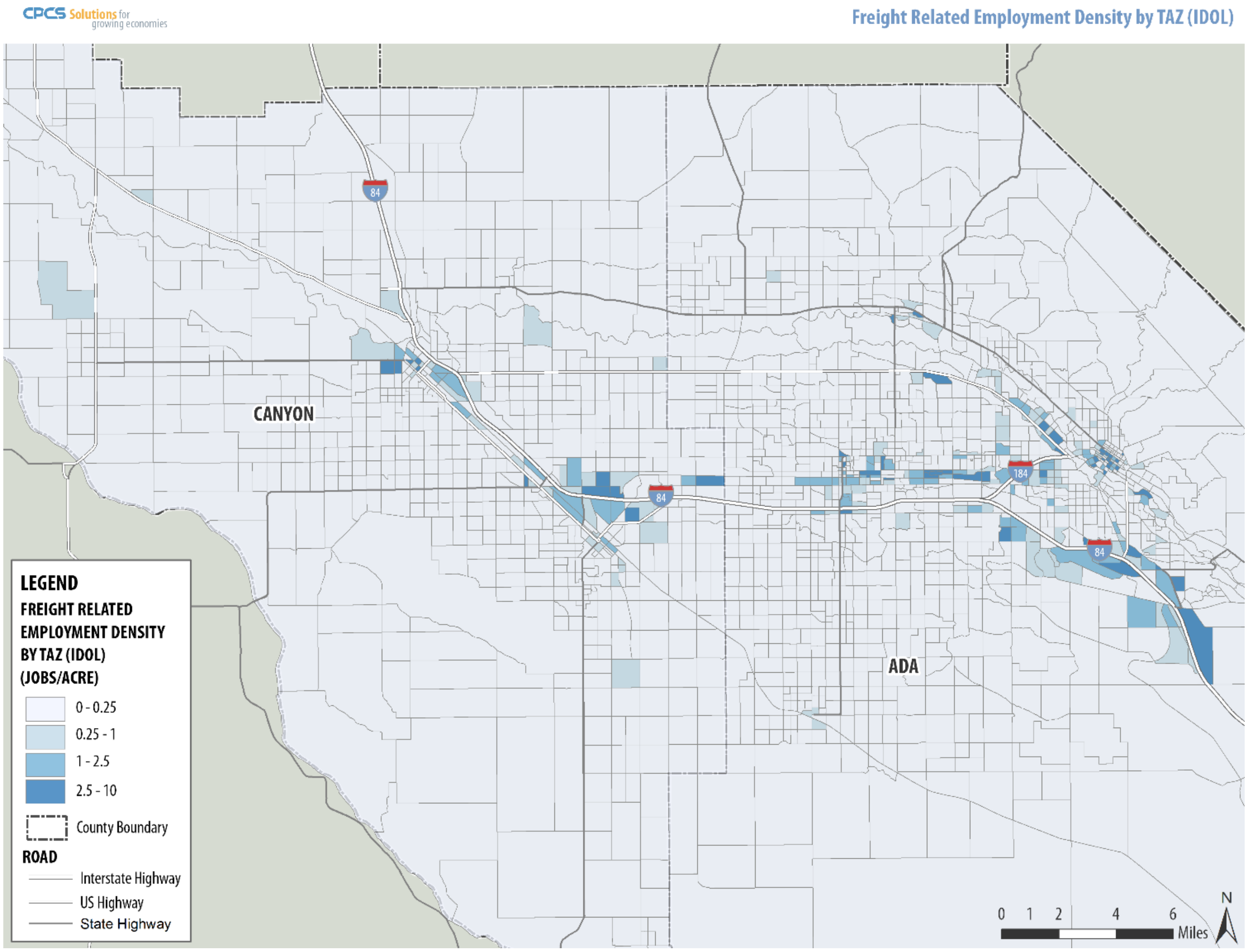
Figure 16 and Figure 17 show the same information as the previous two maps, except using IDOL rather than Infogroup data. Figure 16 displays freight-related employment while Figure 17 shows freight-related employment density.

Figure 16: IDOL Freight-Related Employment by TAZ



Source: CPCS analysis of IDOL data

Figure 17: IDOL Freight-Related Employment Density by TAZ



Source: CPCS analysis of IDOL data

3.2 Freight Clusters

The maps shown in 3.1.3 highlight some consistent patterns in terms of the geographic distribution of freight-related activities. Several parts of the metropolitan area stand out from the maps whatever the metric used.

3.2.1 Freight Transfer Centers

The study team also examined the location of freight transfer centers in the region. These were classified into three core categories:

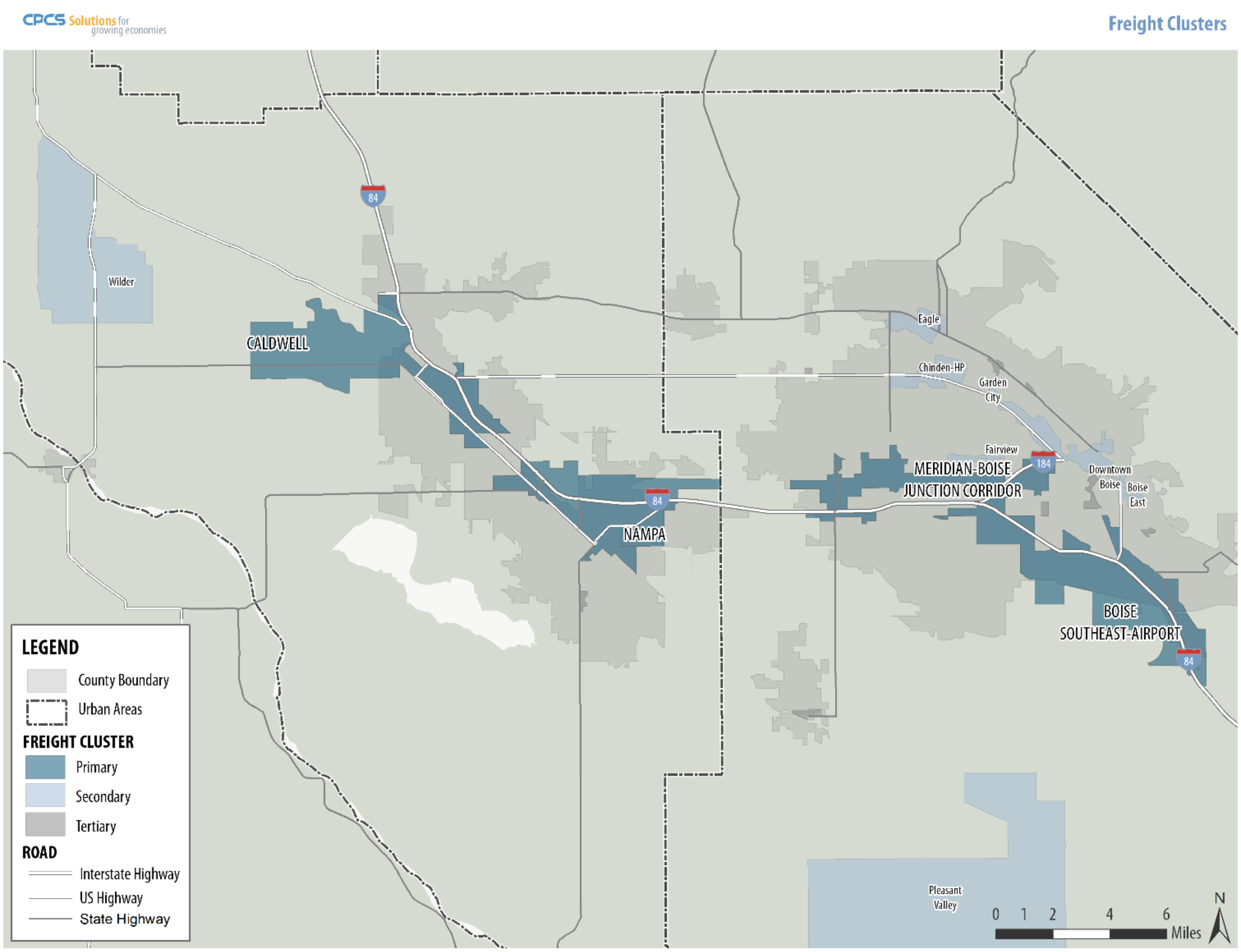
- **Rail-to-truck**: There is no central transload facility in the region for rail-to-truck transfers, but transfers (along with other activity such as storage) take place in many points along the spurs, corresponding to the location of freight-dependent shippers

- **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.[2]
- **Pipeline-to-truck:** Refined oil is delivered to fuel terminals in the region via pipeline. The terminals are located in the Boise Junction part of Boise. Notably, the retail petroleum supply chain will be further explored in Working Paper 2-A.

3.2.2 Location of Clusters

The key freight transfer centers overlap with the primary freight clusters. The process described in the previous section culminated in the definition of four primary and eight secondary freight clusters for the region. The freight clusters are displayed graphically in Figure 18.

Figure 18: Location of Freight Clusters in the Region



Source: CPCS analysis

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

Across the three data sources, there were four clusters that stood out as having a heightened level of freight-related activity. These were classified "primary" freight clusters."

The four primary freight clusters are:

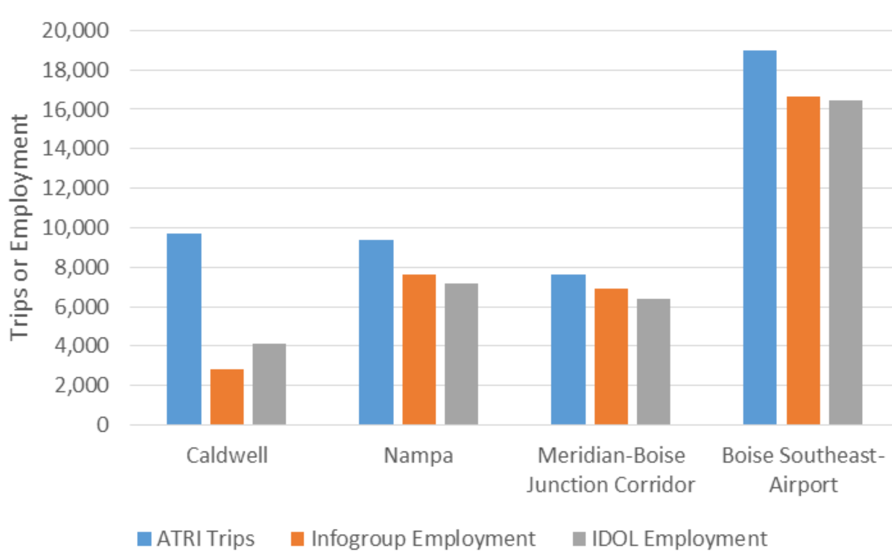
- Boise Southeast-Airport, which stretches along I-84 from the eastern reaches of the metropolitan area to near the I-184 merge
- Meridian-Boise Junction Corridor, which extends along the rail corridor and I-84 from Meridian to past I-184, near Boise Junction
- Nampa, located on the northern reaches of that city along I-84
- Caldwell, extending along I-84 and westward to the Simplot complex

It is noteworthy that each of these primary clusters is located along notable road and/or rail corridors.

Figure 19 shows the relative size of the primary clusters, measured in terms of truck trip ends (for ATRI Trips) or freight employment (Infogroup/IDOL). It should be noted that similarity in the magnitude of these variables is purely coincidental, as the truck trip variable reflects the total trip ends in the study period (four two-week periods) for the ATRI sample – which has no obvious relation to the total employment. Nonetheless, the graph shows the relative importance of the clusters according to the three data sources.

Boise Southeast-Airport is the largest freight cluster by all metrics. The other three are fairly close to one another, with the ATRI data favoring Caldwell and the employment data favoring Nampa, and then Meridian-Boise Junction Corridor.

Figure 19: Size of Primary Clusters, by Truck Trip Ends or Freight-Related Employment



Source: CPCS analysis of ATRI, Infogroup, and IDOL data (2016)

The top clusters, including primary and secondary, are shown in Figure 20, in which the clusters are ranked on the basis of the number of ATRI GPS trip ends, and Infogroup and IDOL freight employment. 77% of truck trip ends, and between 69% and 73% of freight-related jobs, are located in one of the four primary sectors.

Figure 20: Top Clusters by Truck Trips and Employment

	ATRI Trips	IG Fr-Related Emp.	IDOL Fr-Related Emp.	Rank ATRI	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
Tertiary Clusters (Not Considered Further)							
Chinden-Linder	114	0	0	14	19	18	Tertiary
Kuna	61	82	54	16	12	15	Tertiary
Nampa South	232	17	0	10	17	18	Tertiary
Overland-Orchard	72	7	65	15	18	14	Tertiary
Southeast Boise	42	43	4	17	14	16	Tertiary
State-Bloom	9	162	0	20	11	18	Tertiary
State-Glenwood	121	35	2	13	16	17	Tertiary
Vista	41	36	70	18	15	13	Tertiary
TOTAL (ENTIRE REGION)	**59,475**	**46,558**	**49,675**				
Primary, Percentage of Region	**77%**	**73%**	**69%**				

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

The clusters are assigned into primary, secondary, and tertiary based on the combined rankings of the three data sources. The principles behind the three-level classification scheme are as follows:

- Primary clusters are the most important freight-generating locations in the region. These are explored in the greatest depth. These clusters have large freight-related establishments and typically a variety of freight-related activity across multiple sectors.

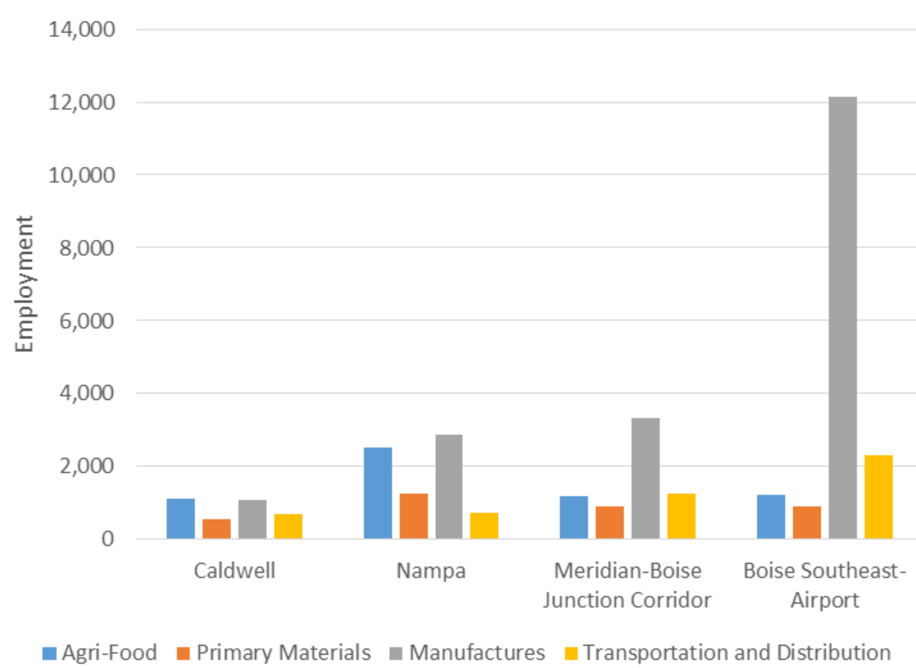
- Secondary clusters typically have either one large freight-related business or else many small freight-related businesses. These are significant, but not at the level of the primary clusters.
- Tertiary clusters were identified in the cluster definition procedure as having some freight-related activity, though overall these are very small concentrations of freight activity possibly only consisting of a single or a few TAZ's. Because of how localized these are and the limited impact on region-wide freight issues, tertiary clusters are not considered further in this study.

3.3 Profiles of Freight Clusters

3.3.1 Primary Clusters

Figure 21 shows the sectoral breakdown of the top four freight clusters. Of immediate note is the heavy concentration of manufactures jobs in the Boise-Southeast Airport cluster. Much of this is due to the Micron Technology campus (8000 jobs). However, even excluding this large employer, the cluster would be the largest in the region, and the manufactures employment within the cluster would be larger than in any other cluster. Also notably, Nampa has a significant agri-food presence. These patterns are explored further in this section.

Figure 21: Employment by Sector, for Top Clusters



Source: CPCS analysis of Infogroup and IDOL data (2016) – employment shown is average of the two.

Figure 22 shows a breakdown by top industries (NAICS codes) under each sector, subcategorized into subsectors. The columns show the percentage of employees in each industry located within each of the four primary freight clusters, as well as “Other,” meaning the rest of the region excluding the primary clusters. The employment shown is the average of the Infogroup and IDOL values.

There is considerable range in the extent to which industries are concentrated in the primary clusters. In general, food manufacturing, wood and petroleum products, machinery and equipment manufacturing, and transportation tend to be highly concentrated within the top clusters. On the other hand, farming and growing, as well as metals and minerals tend to be highly non-concentrated.

The table shows that even within the four sectors, there is disparity in the degree of clustering and the location of freight activities across the region. The degree of clustering depends on a variety of factors, such as businesses’ space needs, access to specific natural resources, access to freeways and rail corridors, and advantages of co-location with complementary businesses/industries.

Figure 22: Distribution of Top Freight-Related Industries by Cluster (by Employment)

	Caldwell	Nampa	Meridian-Boise Junction	Boise Southeast-Airport	Other	Employ-ment
Agri-Food: Farming and Growing						
111 - Crop production	1%	0%	1%	0%	98%	1,221
112 - Animal production and aquaculture	4%	1%	3%	0%	91%	807
42491 - Farm supplies merchant wholesalers	39%	10%	6%	0%	45%	655
115 - Support activities for agriculture and forestry	6%	1%	2%	6%	85%	403
Agri-Food: Food Manufacturing						
311 - Food manufacturing	14%	43%	9%	8%	26%	4,506
4244 - Grocery and related product merchant wholesalers	4%	18%	26%	23%	30%	2,296
312 - Beverage and tobacco product manufacturing	2%	13%	6%	7%	73%	599
4248 - Beer, wine, and distilled alcoholic beverage merchant wholesalers	0%	0%	17%	66%	17%	398
Primary Materials: Wood Products						
321 - Wood product manufacturing	12%	39%	12%	28%	10%	1,394
4233 - Lumber and other construction materials merchant wholesalers	3%	17%	27%	24%	30%	835
Primary Materials: Metal and Minerals						
327 - Non-metallic mineral product manufacturing	16%	12%	17%	1%	54%	484
212 - Mining and quarrying (except oil and gas)	6%	10%	14%	3%	67%	62
Primary Materials: Plastics and Chemicals						
325 - Chemical manufacturing	7%	16%	18%	5%	53%	296
326 - Plastics and rubber products manufacturing	42%	11%	7%	15%	25%	258

	Caldwell	Nampa	Meridian-Boise Junction	Boise Southeast-Airport	Other	Employ-ment
Primary Materials: Petroleum Products						
4247 - Petroleum and petroleum products merchant wholesalers	28%	13%	10%	27%	22%	144
Manufactures: Manufacturing						
334 - Computer and electronic product manufacturing	0%	12%	4%	70%	14%	10,989
336 - Transportation equipment manufacturing	9%	15%	5%	65%	6%	2,071
332 - Fabricated metal product manufacturing	13%	16%	20%	24%	27%	1,952
339 - Miscellaneous manufacturing	2%	19%	39%	9%	32%	1,131
333 - Machinery manufacturing	16%	4%	16%	46%	18%	996
337 - Furniture and related product manufacturing	3%	6%	23%	39%	28%	394
Manufactures: Distribution						
4238 - Machinery, equipment, and supplies merchant wholesalers	9%	14%	19%	35%	24%	2,149
4236 - Household appliances and electrical and electronic goods merchant wholesalers	1%	2%	38%	23%	37%	1,221
4234 - Professional and commercial equipment and supplies merchant wholesalers	0%	12%	27%	22%	38%	911
4239 - Miscellaneous durable goods merchant wholesalers	5%	8%	34%	31%	22%	891
4237 - Hardware, plumbing and heating equipment and supplies merchant wholesalers	1%	11%	59%	7%	21%	475
Transportation and Distribution: Transportation						
484 - Truck transportation	17%	10%	16%	24%	34%	2,806
488 - Support activities for transportation	12%	5%	8%	46%	29%	925
481 - Air transportation	0%	2%	0%	95%	3%	401
Transportation and Distribution: Warehousing and Couriers						
491 - Postal service	4%	12%	11%	28%	44%	774
493 - Warehousing and storage	2%	30%	14%	43%	11%	583
492 - Couriers and messengers	0%	11%	10%	35%	44%	578

Source: CPCS analysis of Infogroup and IDOL data (2016) – employment shown is average of the two.

3.3.2 Profiles of Primary Clusters

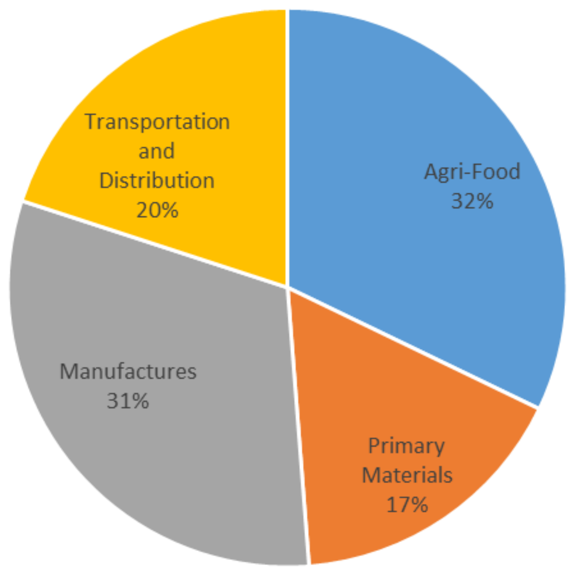
Caldwell Cluster

Caldwell's sector profile is displayed in Figure 23. The top freight-related sectors by employment are agri-food and manufactures. The top freight-related businesses in the Caldwell cluster are shown in Figure 24.

To a large extent, the Caldwell cluster is dominated by Simplot as well as seed suppliers. Darigold, a dairy producer in the center of Caldwell, is another notable agri-food company.

Many of the manufactures businesses are smaller establishments producing farm or transportation equipment.

Figure 23: Sector Profile for Caldwell Cluster (Employment Distribution)



Source: CPCS analysis of Infogroup and IDOL data (2016) – employment shown is average of the two.

Figure 24: Top Freight-Related Businesses in Caldwell Cluster

Company	Employment	Industry (NAICS)
Simplot	500	311 - Food manufacturing
Crookham	160	42491 - Farm supplies merchant wholesalers
Western Stockmen's	150	42491 - Farm supplies merchant wholesalers
Simplot Transportation	150	488 - Support activities for transportation
C&B Trailers	100	336 - Transportation equipment manufacturing
Darigold	90	4244 - Grocery and related product merchant wholesalers
Hansen Eagle Precast	80	327 - Non-metallic mineral product manufacturing

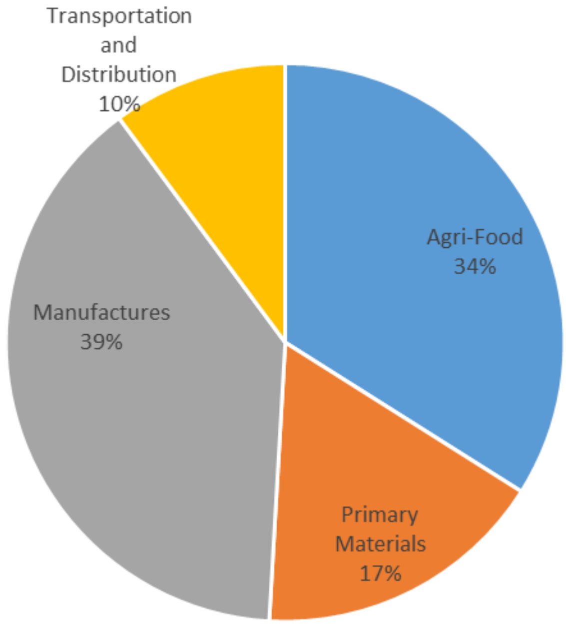
Source: Infogroup (2016)

Nampa Cluster

Nampa's sector profile is displayed in Figure 25. Similar to Caldwell and to an even greater extent, the top freight-related sectors by employment are agri-food and manufactures. The top freight-related businesses in the Nampa cluster are shown in Figure 26.

Compared to Caldwell, Nampa has more large employers. Food manufacturing is particularly significant in Nampa, led by Lactalis (cheese), Amalgamater Sugar (sugar), and Great American Appetizers (packaged frozen food), among many others. 43% of food manufacturing employment (NAICS 311) in the entire region is located in the Nampa cluster alone.

Figure 25: Sector Profile for Nampa Cluster (Employment Distribution)



Source: CPCS analysis of Infogroup and IDOL data (2016) – employment shown is average of the two.

Figure 26: Top Freight-Related Businesses in Nampa Cluster

Company	Employment	Industry (NAICS)
Plexus Corp	1500	334 - Computer and electronic product manufacturing
Sorrento Lactalis	550	311 - Food manufacturing
Amalgamated Sugar	500	311 - Food manufacturing
Great American Appetizers	400	4244 - Grocery and related product merchant wholesalers
Woodgrain Millwork	400	321 - Wood product manufacturing
Simplot	350	311 - Food manufacturing
Selkirk Corp	175	332 - Fabricated metal product manufacturing
Transystems	175	484 - Truck transportation
Mirage Trailers	150	336 - Transportation equipment manufacturing
AIM International	133	4244 - Grocery and related product merchant wholesalers
Boise Packaging	130	322 - Paper manufacturing
Building Components of Idaho	120	4233 - Lumber and other construction materials merchant wholesalers
Pepsi Bottling Group	120	312 - Beverage and tobacco product manufacturing

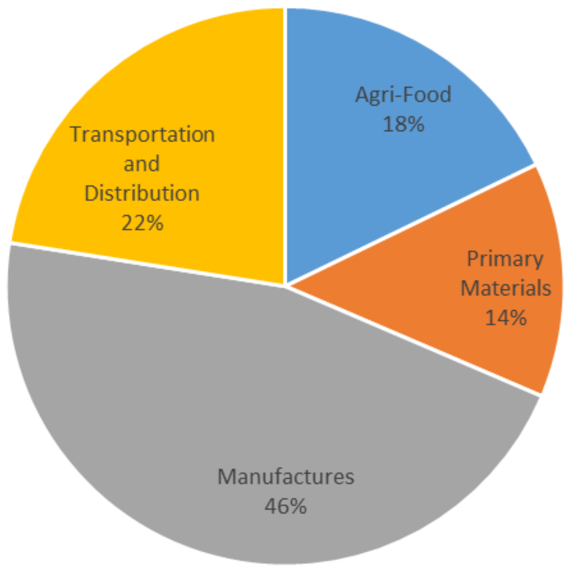
Source: Infogroup (2016)

Meridian-Boise Junction Corridor Cluster

Meridian-Boise Junction's sector profile is displayed in Figure 27. The top freight-related sector by employment is manufactures, followed by transportation and distribution. The top freight-related businesses in the cluster are shown in Figure 28.

Manufacturing is led by Scentsy, as well as Crucial Technology and Computrol.

Figure 27: Sector Profile for Meridian-Boise Junction Cluster (Employment Distribution)



Source: CPCS analysis of Infogroup and IDOL data (2016) – employment shown is average of the two.

Figure 28: Top Freight-Related Businesses in Meridian-Boise Junction Cluster

Company	Employment	Industry (NAICS)
Scentsy	500	339 - Miscellaneous manufacturing
Albertsons Distribution Center	500	4239 - Miscellaneous durable goods merchant wholesalers
Crucial Technology	250	334 - Computer and electronic product manufacturing
Computrol	150	4236 - Household appliances and electrical and electronic goods merchant wholesalers
Swire Coca Cola	150	4244 - Grocery and related product merchant wholesalers
Fresca Mexican Foods	148	311 - Food manufacturing
Darigold	112	4244 - Grocery and related product merchant wholesalers
Micro 100 Tool Corp	110	332 - Fabricated metal product manufacturing
Schwan Food	100	4244 - Grocery and related product merchant wholesalers
Diamondline Delivery Systems	100	484 - Truck transportation

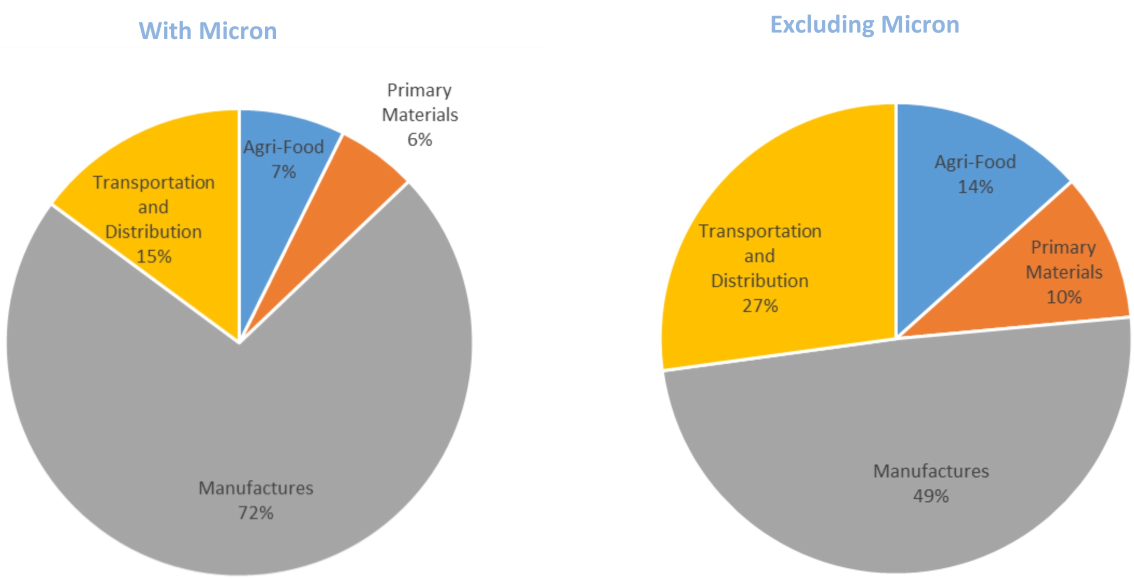
Source: Infogroup (2016)

Boise Southeast-Airport Cluster

Boise Southeast-Airport's sector profile is displayed in Figure 29. The top freight-related sector by employment is manufactures, followed by transportation and distribution. The top freight-related businesses in the cluster are shown in Figure 30.

Manufacturing is dominated by the Micron Technology campus, which is the largest employer in the region. However, the list of top employers also includes many other businesses in the manufactures sector. The transportation and distribution sector is led by Motive Power and Western Trailers.

Figure 29: Sector Profile for Boise Southeast-Airport Cluster (Employment Distribution)



Source: CPCS analysis of Infogroup and IDOL data (2016) – employment shown is average of the two.

Figure 30: Top Freight-Related Businesses in Boise Southeast-Airport Cluster

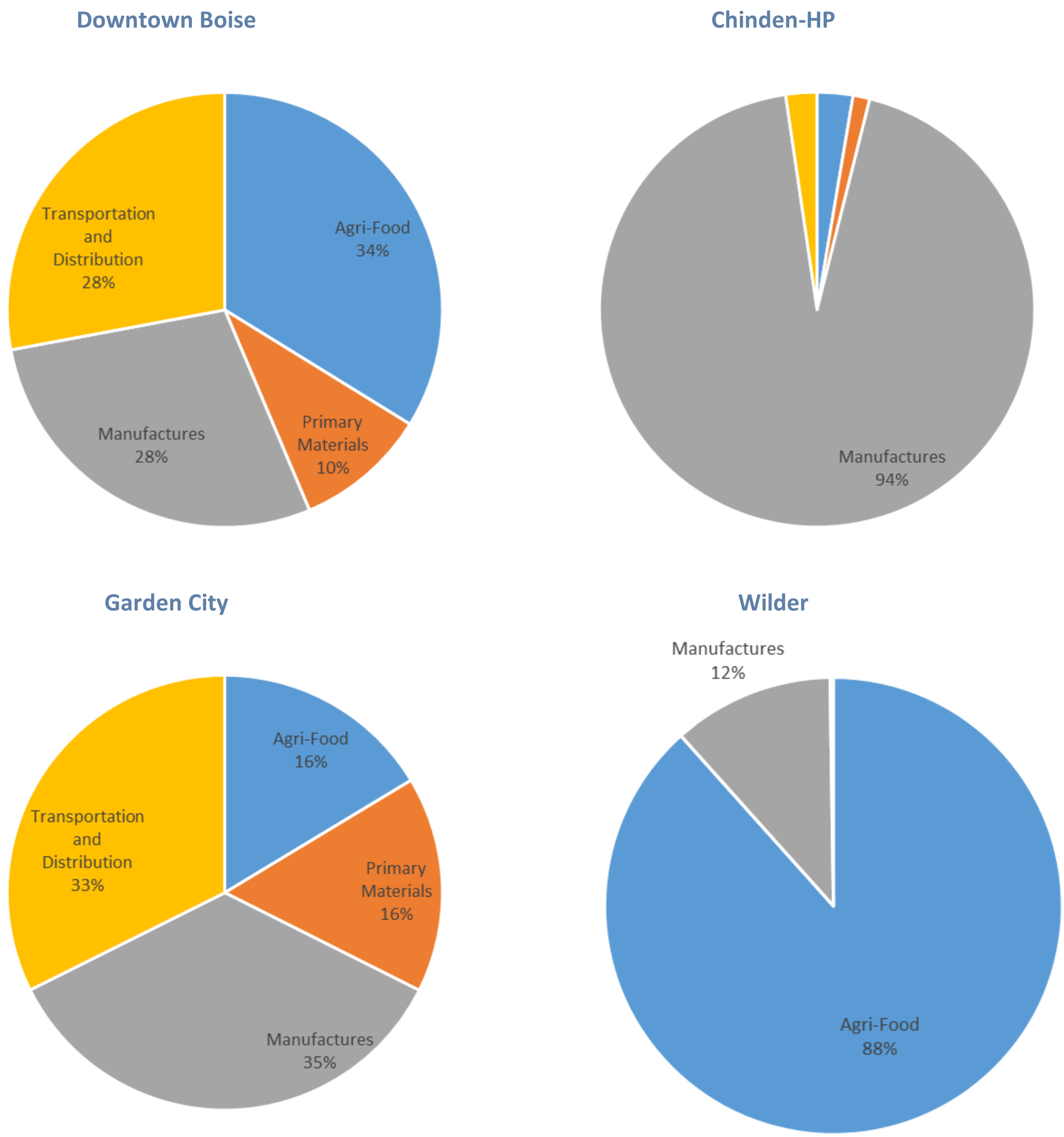
Company	Employment	Industry (NAICS)
Micron Technology	8000	334 - Computer and electronic product manufacturing
Motive Power	800	336 - Transportation equipment manufacturing
Western Trailers	500	336 - Transportation equipment manufacturing
Hayden Beverage	300	4244 - Grocery and related product merchant wholesalers
Norco	280	4238 - Machinery, equipment, and supplies merchant whls
Winco Foods Distribution Ctr	240	4239 - Miscellaneous durable goods merchant wholesalers
Simplot	230	311 - Food manufacturing
MWI Veterinary Supply	210	4238 - Machinery, equipment, and supplies merchant whls
Sysco Idaho	210	4244 - Grocery and related product merchant wholesalers
MQ Whiteman	200	333 - Machinery manufacturing
Ecco Group	190	336 - Transportation equipment manufacturing
FedEx Airport	180	484 - Truck transportation

Source: Infogroup (2016)

3.3.3 Profiles of Top Secondary Clusters

Of the eight secondary clusters listed in Figure 20, the top cluster is Downtown Boise. Overall, the top four secondary clusters by employment are Downtown Boise, Chinden-HP, Garden City, and Wilder. Downtown Boise is fairly balanced in its employment and notably has a number of breweries within the agri-food sector. Garden City is led by UPS, as well as many small companies involved in diverse industries such as sheet metal and sign manufacturing. Chinden-HP and Wilder are dominated by specific large companies, Hewlett-Packard and CTI Foods respectively. Wilder also has a number of other produce growers/suppliers.

Figure 31: Sector Profile for Top Secondary Clusters (Employment Distribution)



Source: CPCS analysis of Infogroup and IDOL data (2016) – employment shown is average of the two.

4 Conclusions and Next Steps

This Working Paper 1-A used a sector-based approach to identify the top freight clusters in the region, making use of ATRI truck GPS data, as well as employment data from Infogroup and the Idaho Department of Labor (IDOL).

The top freight clusters identified in this Working Paper will be further referenced in future deliverables, including as key freight corridors are defined. Specifically, it is anticipated that access to freight clusters will be one of the variables used in defining key freight corridors.

The commodity flow results presented in Chapter 2 will feed directly into the forthcoming Working Paper 2-A.

Appendix A

Figure 32: Detailed Sector Definition Table by NAICS

NAICS3 or Higher	Sector
111 - Crop production	Agri-Food
112 - Animal production and aquaculture	Agri-Food
113 - Forestry and logging	Primary Materials
114 - Fishing, hunting and trapping	Primary Materials
115 - Support activities for agriculture and forestry	Agri-Food
211 - Oil and gas extraction	Primary Materials
212 - Mining and quarrying (except oil and gas)	Primary Materials
213 - Support activities for mining, and oil and gas extraction	Primary Materials
221 - Utilities	Construction and Utilities
236 - Construction of buildings	Construction and Utilities
237 - Heavy and civil engineering construction	Construction and Utilities
238 - Specialty trade contractors	Construction and Utilities
311 - Food manufacturing	Agri-Food
312 - Beverage and tobacco product manufacturing	Agri-Food
313 - Textile mills	Primary Materials
314 - Textile product mills	Primary Materials
315 - Clothing manufacturing	Primary Materials
316 - Leather and allied product manufacturing	Primary Materials
321 - Wood product manufacturing	Primary Materials
322 - Paper manufacturing	Primary Materials
323 - Printing and related support activities	Primary Materials
324 - Petroleum and coal product manufacturing	Primary Materials
325 - Chemical manufacturing	Primary Materials
326 - Plastics and rubber products manufacturing	Primary Materials
327 - Non-metallic mineral product manufacturing	Primary Materials
331 - Primary metal manufacturing	Manufactures
332 - Fabricated metal product manufacturing	Manufactures
333 - Machinery manufacturing	Manufactures
334 - Computer and electronic product manufacturing	Manufactures
335 - Electrical equipment, appliance and component manufacturing	Manufactures
336 - Transportation equipment manufacturing	Manufactures
337 - Furniture and related product manufacturing	Manufactures
339 - Miscellaneous manufacturing	Manufactures
4231 - Motor vehicle and motor vehicle parts and supplies merchant wholesalers	Manufactures
4232 - Furniture and home furnishing merchant wholesalers	Transportation and Distribution
4233 - Lumber and other construction materials merchant wholesalers	Primary Materials
4234 - Professional and commercial equipment and supplies merchant wholesalers	Manufactures

NAICS3 or Higher	Sector
4235 - Metal and mineral (except petroleum) merchant wholesalers	Primary Materials
4236 - Household appliances and electrical and electronic goods merchant wholesalers	Manufactures
4237 - Hardware, plumbing and heating equipment and supplies merchant wholesalers	Manufactures
4238 - Machinery, equipment, and supplies merchant wholesalers	Manufactures
4239 - Miscellaneous durable goods merchant wholesalers	Manufactures
4241 - Paper and paper product merchant wholesalers	Transportation and Distribution
4242 - Drugs and druggists' sundries merchant wholesalers	Transportation and Distribution
4243 - Apparel, piece goods, and notions merchant wholesalers	Transportation and Distribution
4244 - Grocery and related product merchant wholesalers	Agri-Food
4245 - Farm product raw material merchant wholesalers	Agri-Food
4246 - Chemical and allied products merchant wholesalers	Primary Materials
4247 - Petroleum and petroleum products merchant wholesalers	Primary Materials
4248 - Beer, wine, and distilled alcoholic beverage merchant wholesalers	Agri-Food
42491 - Farm supplies merchant wholesalers	Agri-Food
4249 - Miscellaneous nondurable goods merchant wholesalers	Transportation and Distribution
4251 - Wholesale electronic markets and agents and brokers	Transportation and Distribution
441 - Motor vehicle and parts dealers	Consumer Products (Retail)
442 - Furniture and home furnishings stores	Consumer Products (Retail)
443 - Electronics and appliance stores	Consumer Products (Retail)
444 - Building material and garden equipment and supplies dealers	Consumer Products (Retail)
445 - Food and beverage stores	Consumer Products (Retail)
446 - Health and personal care stores	Consumer Products (Retail)
447 - Gasoline stations	Consumer Products (Retail)
448 - Clothing and clothing accessories stores	Consumer Products (Retail)
451 - Sporting goods, hobby, book and music stores	Consumer Products (Retail)
452 - General merchandise stores	Consumer Products (Retail)
453 - Miscellaneous store retailers	Consumer Products (Retail)
454 - Non-store retailers	Consumer Products (Retail)
481 - Air transportation	Transportation and Distribution
482 - Rail transportation	Transportation and Distribution
483 - Water transportation	Transportation and Distribution
484 - Truck transportation	Transportation and Distribution
485 - Transit and ground passenger transportation	Non-Retail Service
486 - Pipeline transportation	Transportation and Distribution
487 - Scenic and sightseeing transportation	Non-Retail Service
488 - Support activities for transportation	Transportation and Distribution
491 - Postal service	Transportation and Distribution
492 - Couriers and messengers	Transportation and Distribution
493 - Warehousing and storage	Transportation and Distribution
511 - Publishing industries (except internet)	Office Sector
512 - Motion picture and sound recording industries	Office Sector
515 - Broadcasting (except internet)	Office Sector
517 - Telecommunications	Office Sector
518 - Data processing, hosting, and related services	Office Sector
519 - Other information services	Office Sector

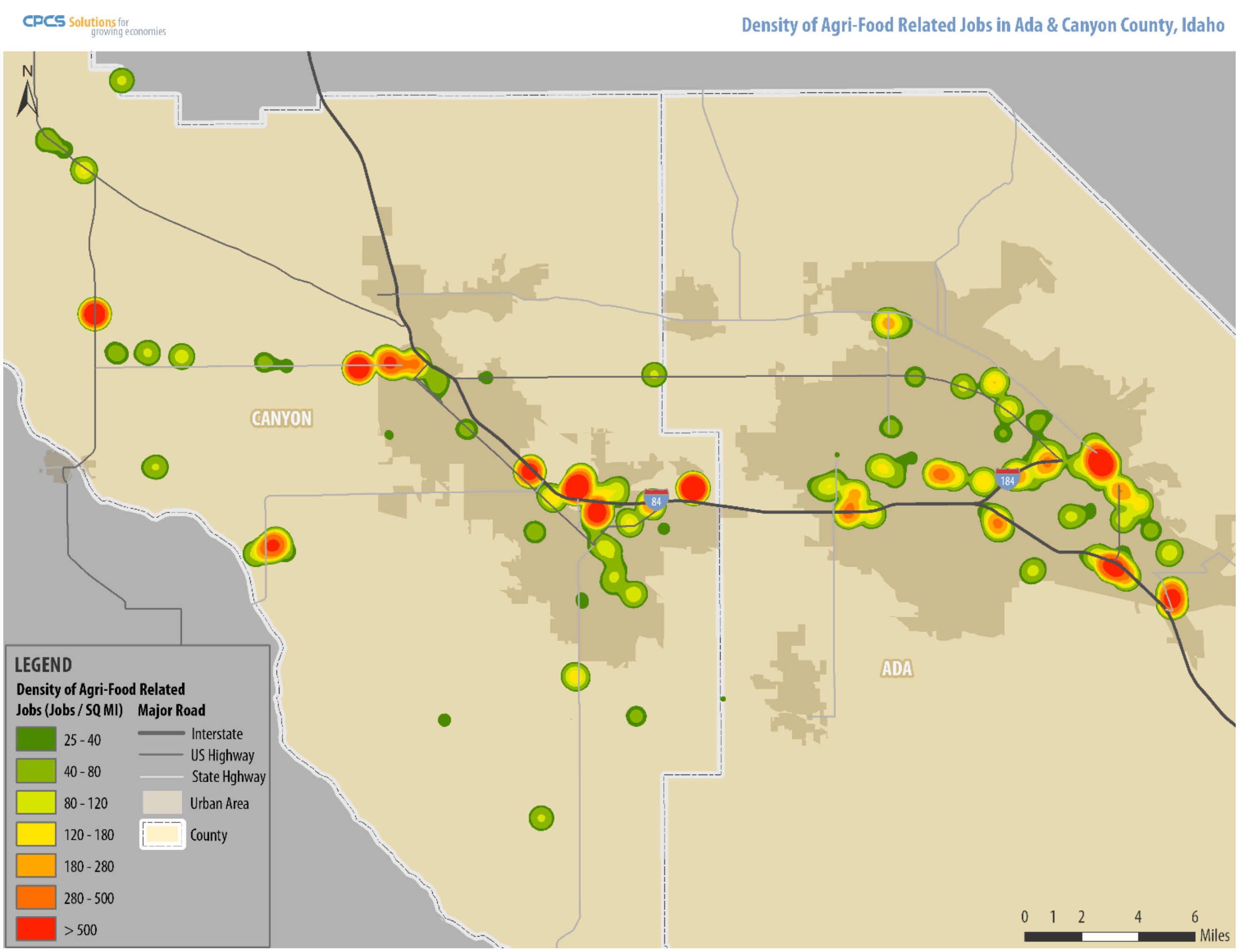
NAICS3 or Higher	Sector
521 - Monetary authorities - central bank	Office Sector
522 - Credit intermediation and related activities	Office Sector
523 - Securities, commodity contracts, and other financial investment and related activities	Office Sector
524 - Insurance carriers and related activities	Office Sector
535 - Funds, trusts and other financial vehicles	Office Sector
526 - Funds and other financial vehicles	Office Sector
531 - Real estate	Office Sector
532 - Rental and leasing services	Office Sector
533 - Lessors of non-financial intangible assets (except copyrighted works)	Office Sector
541 - Professional, scientific and technical services	Office Sector
551 - Management of companies and enterprises	Office Sector
561 - Administrative and support services	Office Sector
562 - Waste management and remediation services	Primary Materials
611 - Educational services	Non-Retail Service
621 - Ambulatory health care services	Non-Retail Service
622 - Hospitals	Non-Retail Service
623 - Nursing and residential care facilities	Non-Retail Service
624 - Social assistance	Non-Retail Service
711 - Performing arts, spectator sports and related industries	Non-Retail Service
712 - Heritage institutions	Non-Retail Service
713 - Amusement, gambling and recreation industries	Non-Retail Service
721 - Accommodation services	Consumer Products (Retail)
722 - Food services and drinking places	Consumer Products (Retail)
811 - Repair and maintenance	Non-Retail Service
812 - Personal and laundry services	Non-Retail Service
813 - Religious, grant-making, civic, and professional and similar organizations	Non-Retail Service
814 - Private households	Non-Retail Service
911 - Federal government public administration	Non-Retail Service
912 - Provincial and territorial public administration	Non-Retail Service
913 - Local, municipal and regional public administration	Non-Retail Service
914 - Aboriginal public administration	Non-Retail Service
919 - International and other extra-territorial public administration	Non-Retail Service
921 - Executive, legislative, and other general government support	Non-Retail Service
922 - Justice, public order and safety activities	Non-Retail Service
923 - Administration of human resource programs	Non-Retail Service
924 - Administration of environmental quality programs	Non-Retail Service
925 - Administration of housing programs	Non-Retail Service
926 - Administration of economic programs	Non-Retail Service
928 - National security and international affairs	Non-Retail Service
999 - Nonclassifiable establishments	Not Classified

Source: CPCS

Appendix B

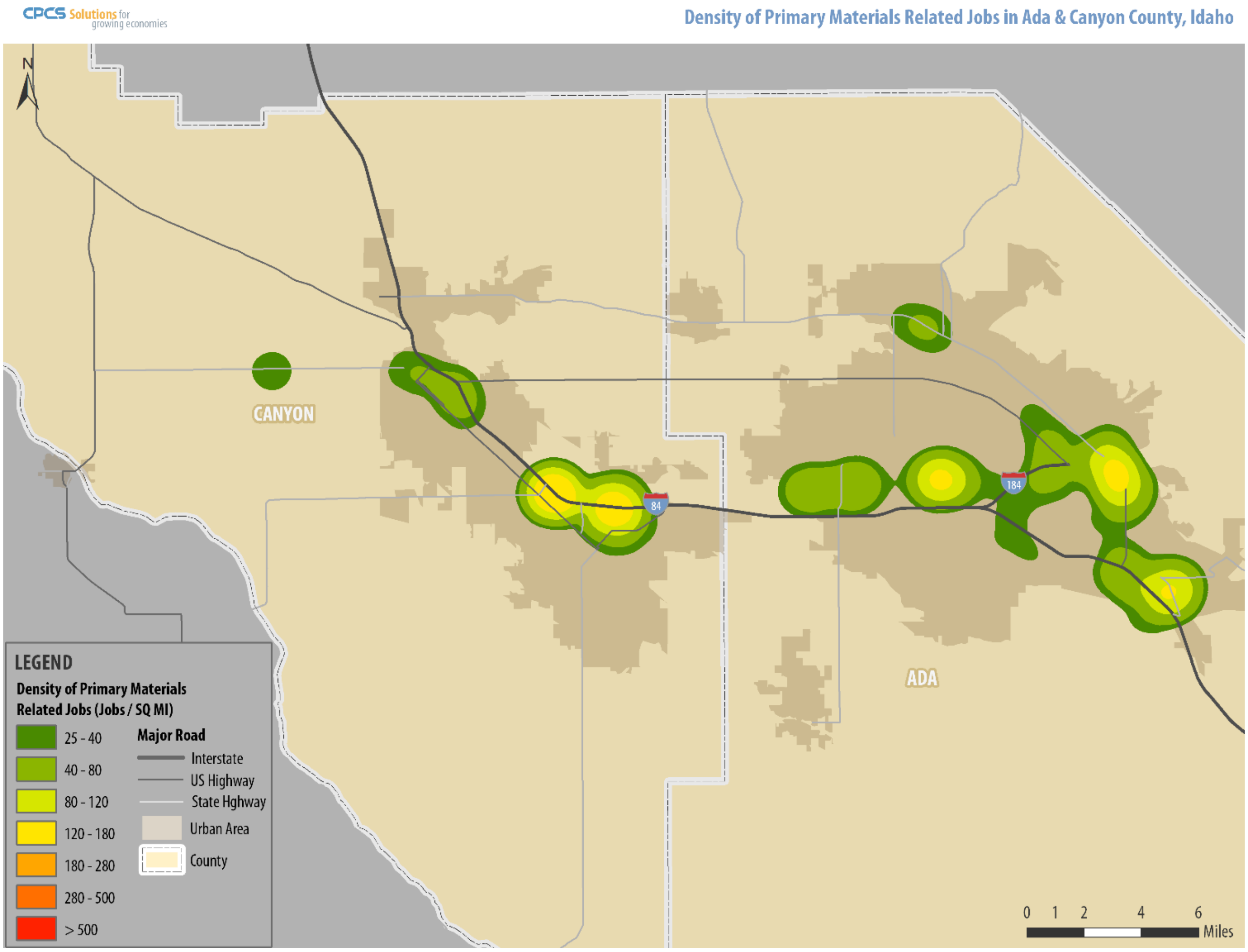
This appendix contains heat maps for the four freight-related sectors, plus retail. Notably, the four freight-related sector maps all have the same scale, whereas the retail map has a distinct scale because of the labor-intensiveness of this sector.

Figure 33: Heatmap for Agri-Food Sector



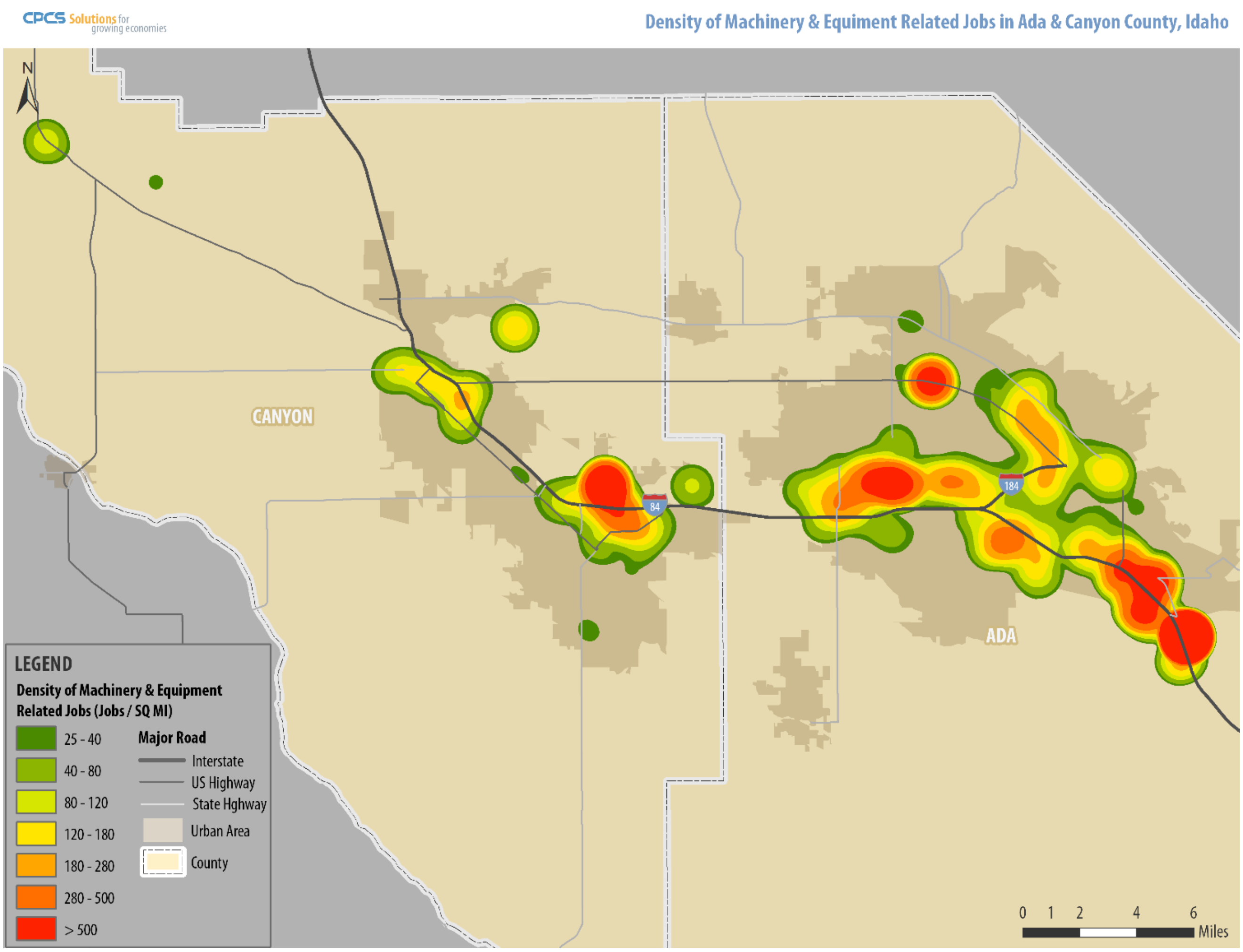
Source: CPCS analysis of Infogroup data

Figure 34: Heatmap for Primary Materials Sector



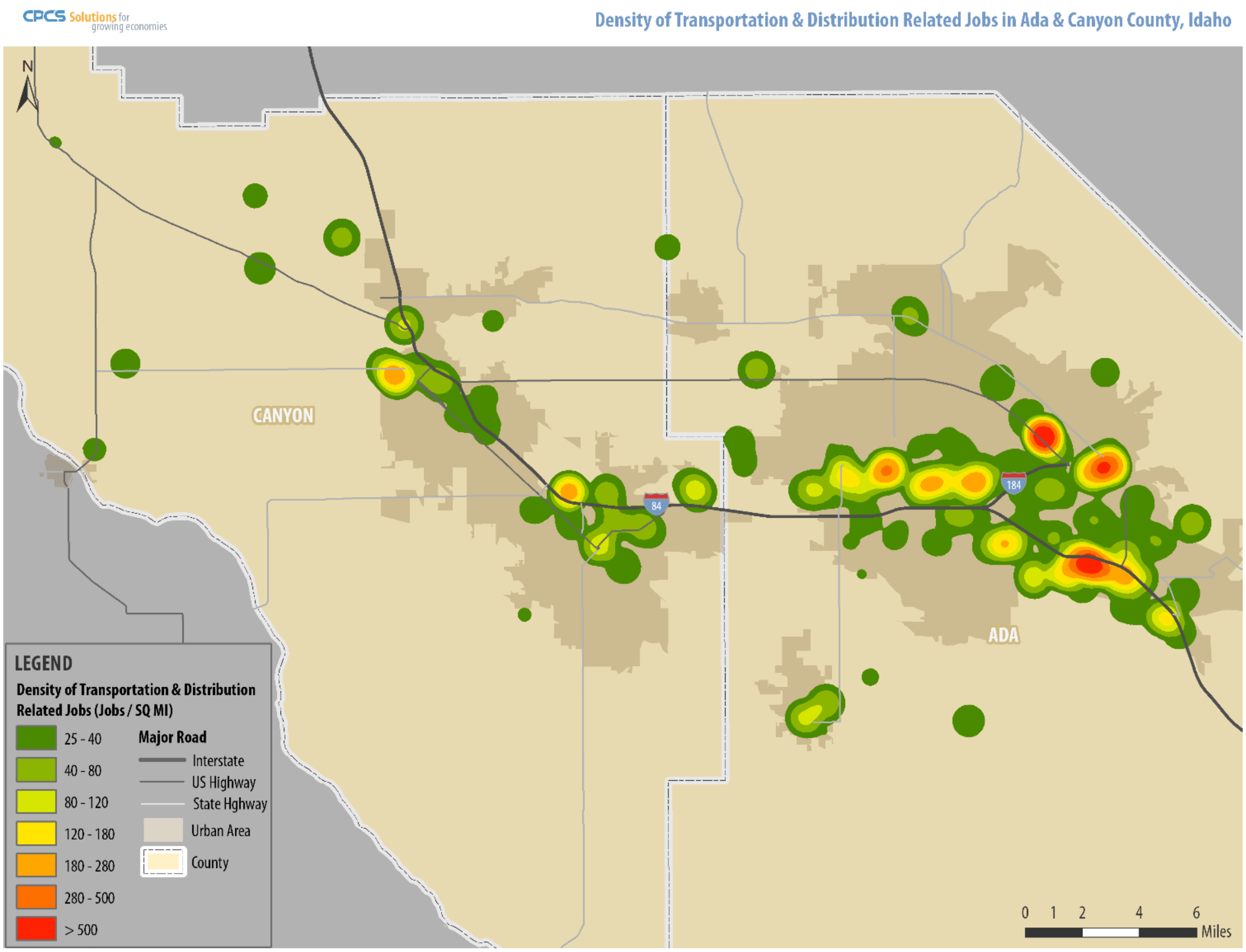
Source: CPCS analysis of Infogroup data

Figure 35: Heatmap for Manufactures Sector



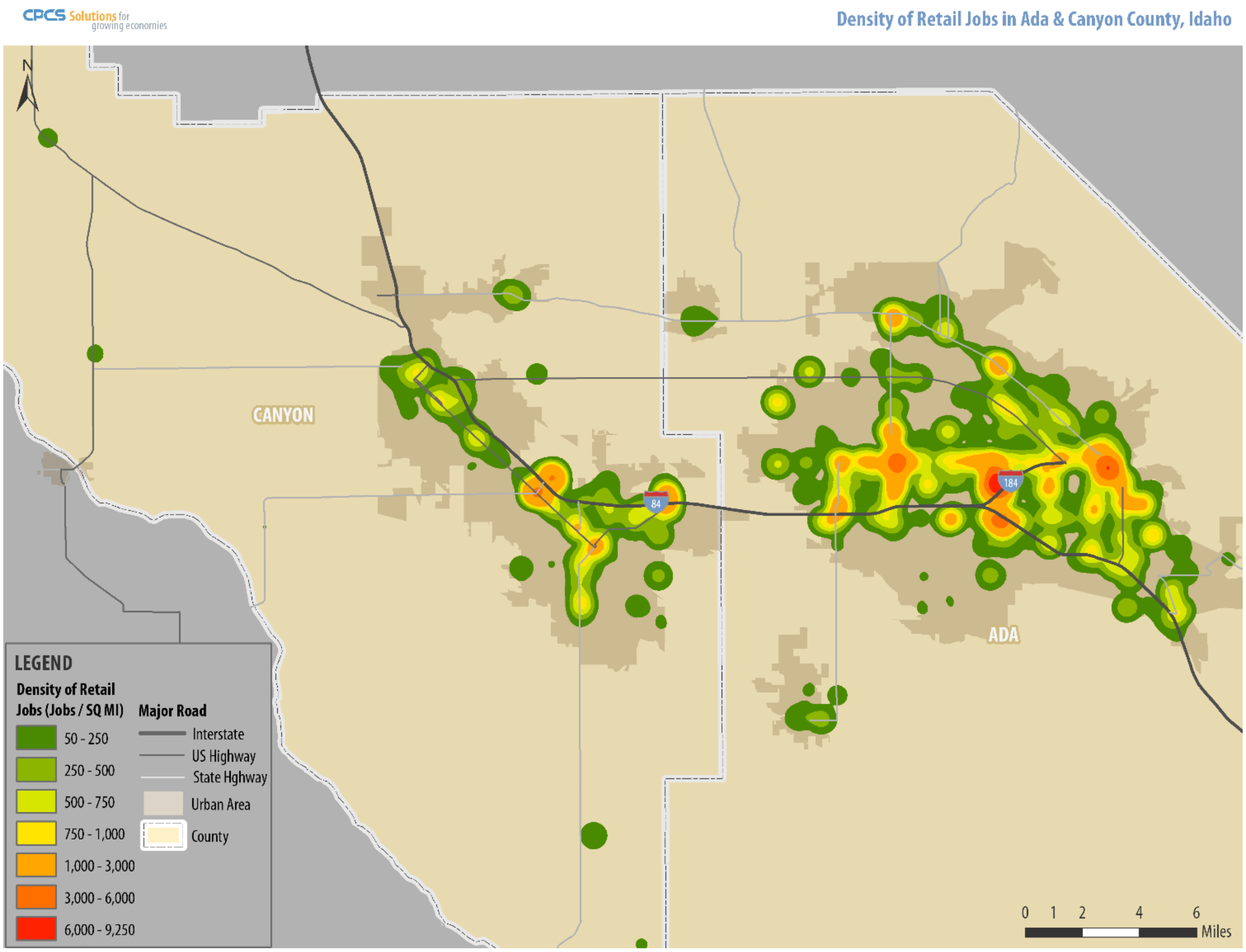
Source: CPCS analysis of Infogroup data

Figure 36: Heatmap for Transportation & Distribution Sector



Source: CPCS analysis of Infogroup data

Figure 37: Heatmap for Retail Sector



Source: CPCS analysis of Infogroup data

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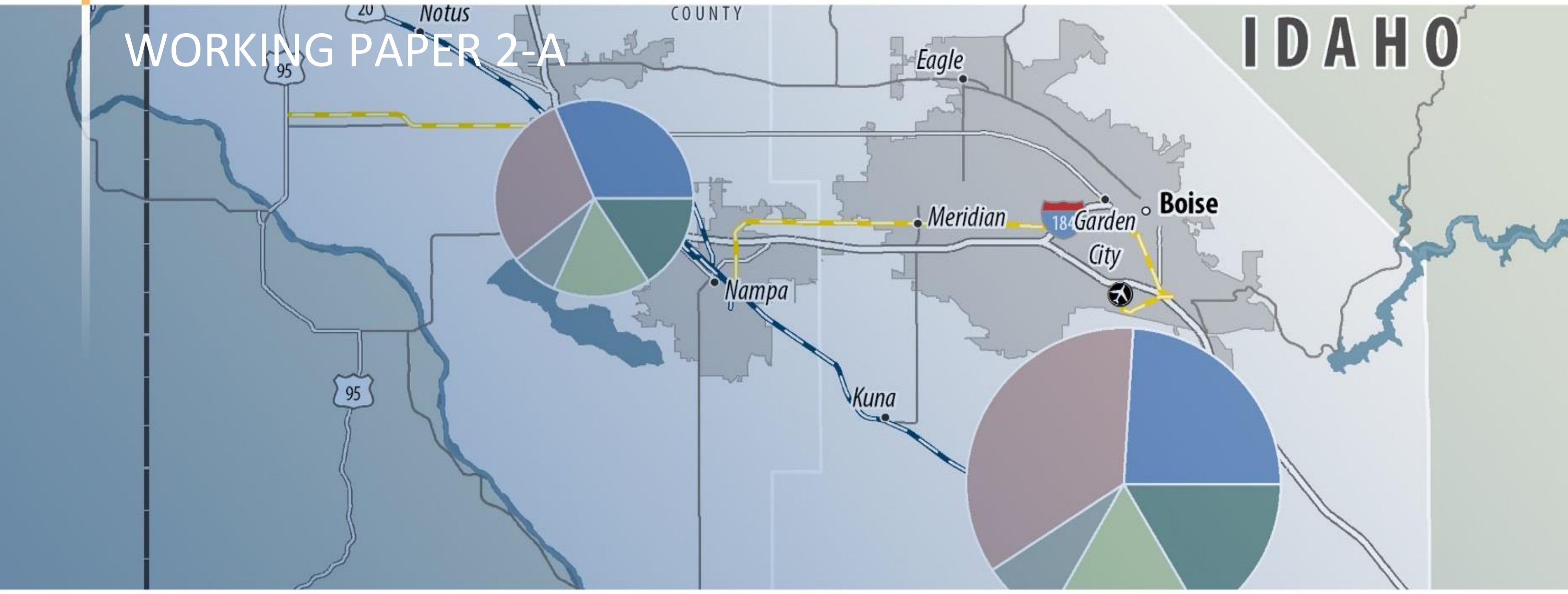
WORKING PAPER 2-A



COMPASS Freight Study

Client Reference: RFQ 2017-02

Freight Commodities and Supply Chains

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

CPCS Ref: 16629

Date: 25 July 2017

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CPCS acknowledges and is thankful for input provided by freight industry representatives in the COMPASS region.

Cover image source: CPCS

CPCS

Table of Contents

Acronyms / Abbreviations

ATRI	American Transportation Research Institute
CIM	Communities in Motion
COMPASS	Community Planning Association of Southwest Idaho
DC	Distribution Center
GIS	Geographic Information System
GPS	Global Positioning Systems
HP	Hewlett Packard
IDOL	Idaho Department of Labor
IG	Infogroup
M.	Millions
NAICS	North American Industry Classification System
RFP	Request for Proposal
STCC	Standard Transportation Commodity Code
TAZ	Traffic Analysis Zone
TREDIS	Transportation Economic Development Impact System
UP	Union Pacific
UPRR	Union Pacific Railroad
WATCO	Watco Companies

Executive Summary

Freight movement in Ada and Canyon Counties (the "region," also referred to as the Treasure Valley or the COMPASS region) sustains key industries including agriculture and food production, high-tech and equipment manufacturing, and distribution of consumer products. This Working Paper summarizes data analysis and consultations with regional freight-dependent businesses to paint a picture of regional freight activity, including chief commodities, industries, supply chains, and truck movement patterns.

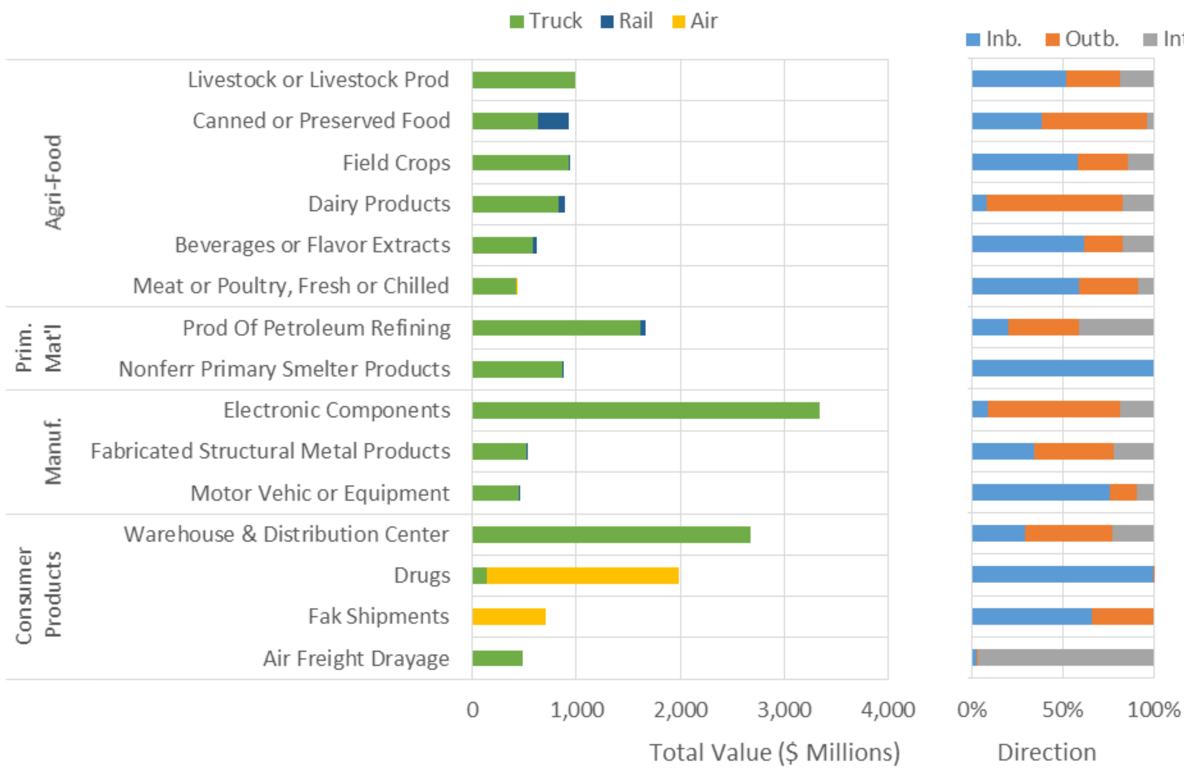
A Net Importing Region

Businesses and consumers generate $27.3 billion worth of freight movements annually into, out of, and within the region. The region is a net importer of goods, with 51 percent of shipments flowing inbound (imports) versus 34 percent outbound (exports). The remaining commodity flows are internal within Canyon and Ada Counties (15 percent of total flows).

Most freight moves by truck in the region, although rail, air and pipelines also play important roles for certain commodities. Commodity flows within the region are dominated by a few significant economic sectors, including agri-food, petroleum products, manufactured products, and distribution center shipments. There are clear differences in the composition of commodities shipped out of the region versus into it (Figure ES-1).

Most notably, there are significant outflows of electronics components, a category that would include shipments by microchip manufacturer Micron. Dairy products and preserved food are the top outbound agri-food commodities, while livestock, meat, crops and beverages are shipped in. Consumer products flow into the region from across the US and beyond and are distributed across Idaho or to neighboring states.

Figure ES-1: Top Commodities by Value



Source: CPCS analysis of Transearch via TREDIS (2016)

Varied Supply Chains

Retail petroleum products (such as gasoline, diesel and jet fuel) enter the region through two co-adjacent distribution terminals in the Boise Junction area, located along parallel high-pressure pipelines from Salt Lake City to Spokane, WA. These are distributed by tank trucks to gas stations within a two-hour drive of the region, as well as to industrial customers by various other types of vehicles according to their needs. The pipeline terminals that supply gasoline and diesel for the region adjust their prices to control their inventory. Occasionally price changes, if great enough, can disrupt supply chains.

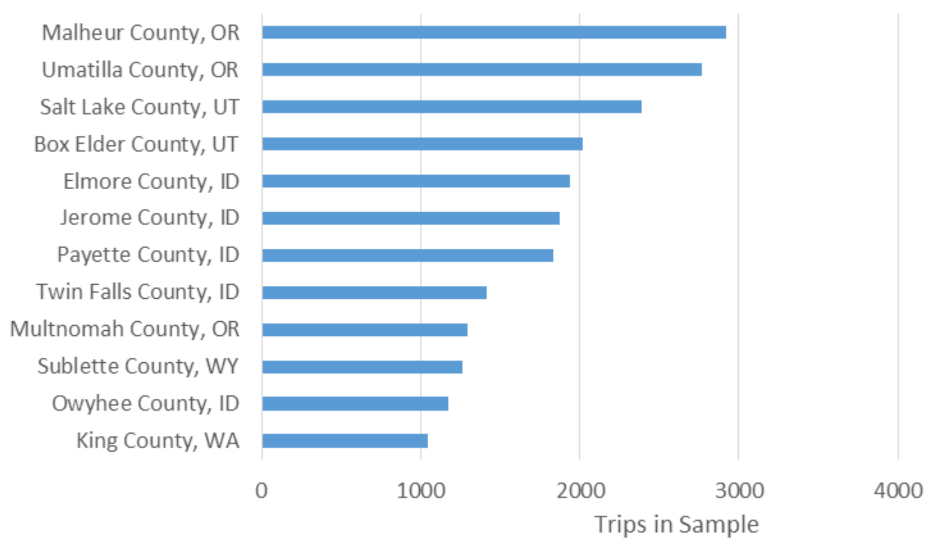
Distribution centers (DCs) in the region distribute freight on a “just in time” basis to supermarkets, general merchandise retailers, and institutions like schools and hospitals. DCs work by consolidating goods from a variety of sources and distributing combinations of those goods to receivers. For example, one grocery distribution center in Boise receives all types of food (dairy, produce, meat, dry goods, etc.) from across the United States, and fills trucks with unique combinations of those food products as requested by local grocery stores. Distribution centers in the region can receive anywhere from a dozen to over 50 trucks per day. Grocery stores are often served several times a day from the DC, as they maintain limited shelf space. A parcel service in the region operates a distribution center which receives packages from larger distribution centers in Portland (for West Coast items) or Salt Lake City (for East Coast).

Compared to the other supply chains, manufacturing supply chains are national and global and their nature varies widely by the type of product. Electronics manufacturing relies heavily on shipments by truck or air, depending on the location of suppliers and customers, the type of product, and the expediency of delivery. Heavy manufacturing (such as transportation equipment) relies on shipments of inputs such as steel by rail. However, because of the deficit of rail-to-truck transfer facilities in the region, it is sometimes more advantageous for east-coast suppliers to ship directly by truck, rather than by rail to Portland and then truck. Other manufacturers rely on overseas imports delivered to west coast ports such as Seattle and Portland, and trucked to the region.

Regional Freight Linkages

Truck GPS data traces the movement of trucks starting or ending trips in the COMPASS region. Of the top dozen out-of-region partner counties for truck trips, five are located elsewhere in Idaho (Figure ES-2), three are in Oregon, one Washington, two in Utah, and one in Wyoming. The truck travel patterns reveal significant freight activity freight activity between Ada and Canyon Counties and neighboring counties in Eastern Oregon. The data also show trade dependencies between the region and the three nearest large urban centers: Salt Lake City, Portland, and Seattle (Salt Lake, Multnomah and King Counties, respectively).

Figure ES-2: Top Out-of-State Partner Counties for Truck Trips



Source: CPCS analysis of ATRI GPS truck data, 2016

1 Introduction

Key Chapter Takeaways

The Community Planning Association of Southwest Idaho (COMPASS) is conducting a freight study to support its long-range transportation plan, *Communities in Motion 2040*. The freight study is identifying freight corridors and related land use needs, developing a profile of the regionally most important commodities and supply chains, and identifying projects and/or policies to address maintenance needs, improve safety, and manage congestion.

This working paper describes commodity flows of freight-dependent industries and supply chains in the region. The data utilized for this working paper include county-level Transearch commodity flow data, truck origin-destination data provided by the American Trucking Research Institute (ATRI), and Idaho Department of Labor employment data. The supply chain analysis relies on the available data sources but mostly on telephone interviews conducted by the study team. The intent of this Working Paper is to provide information on the linkages between freight and the economy to inform development of project deliverables, including beneficial regional freight projects and policies to improve freight transportation and land use planning.

1.1 Background

As the metropolitan planning organization (MPO) for Ada and Canyon Counties, the Community Planning Association of Southwest Idaho (COMPASS) is focused on integrating freight 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).

The study area comprises Ada and Canyon Counties (the "region," also referred to as the Treasure Valley or the COMPASS region).

1.2 Objectives

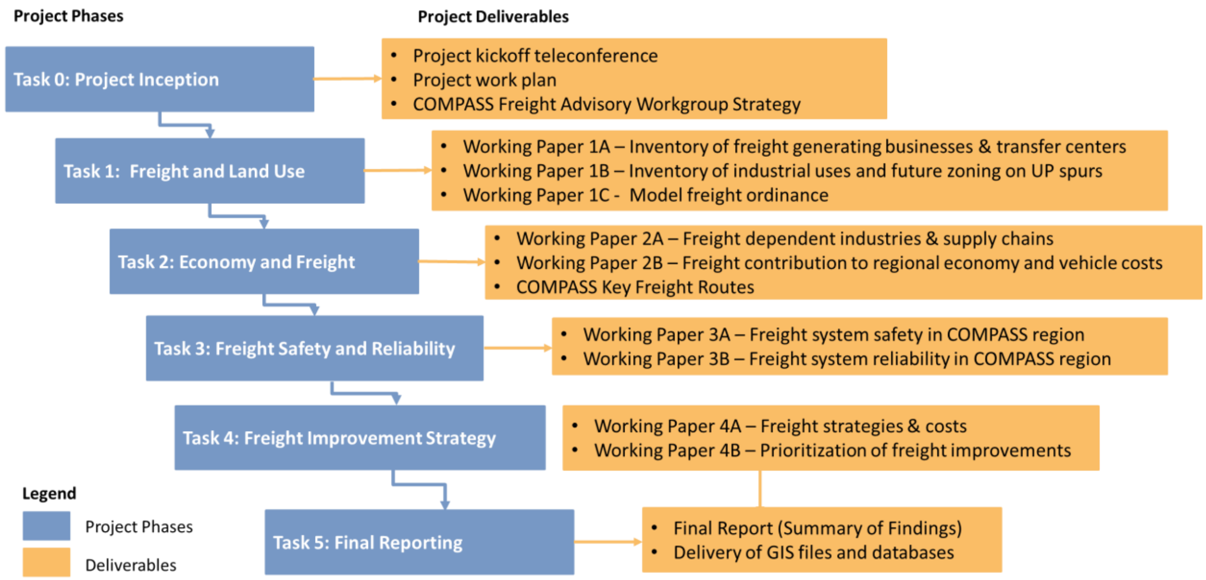
As set out in the RFP, the key outcomes of this study are:

- 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 region's most important freight commodities and supply chains, and a summary of freight contribution to the region's economy
- Identification of projects and/or policies to address maintenance needs, improve safety, mitigate choke points, and manage congestion

1.3 Project Structure

The project is to be developed in five broad phases, as set out in the graphic below. Each of these phases has a series of deliverables.



1.4 Purpose of this Working Paper

As part of Task 2: Economy and Freight, the purpose of this working paper is to identify the top freight-dependent industries, the commodities moved, and the composition of their supply chains. This deliverable corresponds to Working Paper 2-A.

Specifically, this working paper is divided into three chapters:

- Chapter 2 describes commodity flows into, out of, and within the region, based on available Transearch data obtained from COMPASS via the TREDIS suite
- Chapter 3 profiles some of the key supply chains in the region, based on consultations with freight stakeholders and other available data
- Chapter 4 describes commodity flows to/from and within the region, using an innovative approach that links truck trips to freight land uses.

This working paper is also intended to provide COMPASS with an overview of progress to date and to solicit comments and other feedback on the structure and content of this component part of what will become the final report. Note that revisions to this working paper will be reflected in the Draft Final Report. Ultimately, the intent of this Working Paper is to provide information on the linkages between freight and the economy to inform development of project deliverables, including beneficial regional freight projects and policies to improve freight transportation and land use planning.

1.5 Methodology and Limitations

This working paper was prepared through analysis of data from ATRI, Infogroup, IDOL, and Transearch (via TREDIS). In the case of the latter three data sources, these were validated through consultations between the study team and COMPASS. The methodology for each section of this report is described in the relevant chapter.

The working paper also relies on consultations with freight stakeholders in the COMPASS region. The study team is thankful for the insights and perspectives offered by the stakeholders.

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

2 Commodity Flows to and From the Region

Key Chapter Takeaways

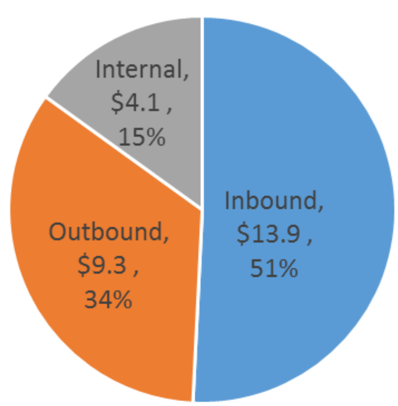
Annually, $27.3 billion worth of commodities are shipped into, out of, and within the COMPASS region. The region is a net importer of goods, with 51 percent of shipments flowing inbound (imports) versus 34 percent outbound (exports). The remaining commodity flows are internal within Canyon and Ada Counties (15 percent of total flows).

Most freight moves by truck in the region, although rail, air and pipelines also play important roles for certain commodities. Commodity flows within the COMPASS region are dominated by a few very significant sectors and commodities, including agri-food, petroleum products, manufactured products, and distribution center shipments.

2.1 Top Commodities in the Treasure Valley

A total of $27.3 billion worth of commodities are shipped into, out of, and within the COMPASS region annually. As shown in Figure 2-1, just over half of this total consists of inflows into the Region, while approximately one-third is outflows and the remaining 15% internal flows.

Figure 2-1: Breakdown of Multimodal Flows in the COMPASS Region



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

The study team identified four commodity categories based on detailed analysis of Transearch commodity data provided to COMPASS by IHS Markit through the TREDIS regional economic impact module. Commodities were evaluated separately on the basis of value of outbound, inbound, and internal flows. The four commodity groups broadly represent different stages of the supply chain: primary materials consist of raw or semi-processed products (e.g. wood products, minerals, fuels); manufactures includes manufactured products often used in further production processes (including machinery and equipment, but also electronics used by non-freight businesses); and consumer products represent end-use finished products consumed by households. Agri-food products were identified as a separate category owing to their particular economic importance in the region (these products alone represent 25% of flows in the region, by value).

Although there remains much variability within each of the categories, such a segmentation scheme helps focus attention on overarching commonalities between products within a single group (for example, as a general rule transportation of primary materials tends to be most sensitive to the cost of transportation, while agricultural products may be more sensitive to time and manufactured products such as machinery to reliability).

The four commodity groups were initially presented in Working Paper 1-A and are listed in Figure 2-2:

Figure 2-2: Commodity Groups

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

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

The precise definition of the commodity groups, according to the STCC codes represented, is as follows:

Figure 2-3: 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

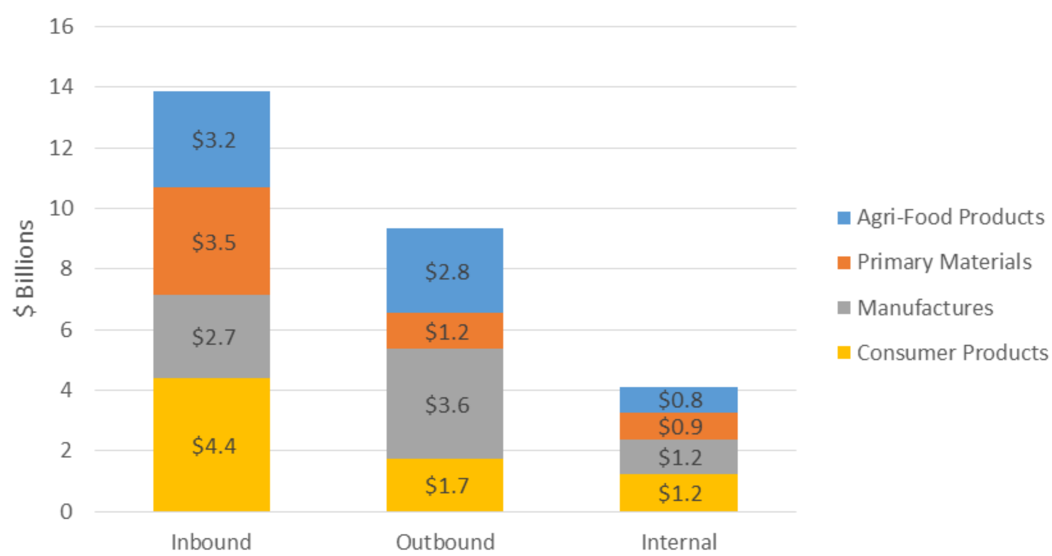
Exceptions: Consumer Products includes 25-1 Household or Office Furniture, 28-3 Drugs, 28-4 Soap or Other Detergents, 31-4 to 31-9 Leather Products

2.1.1 Top Commodities by Value

Figure 2-4 shows the breakdown of flows by direction. Notably, inbound and outbound flows are unbalanced. The region is a net importer, with approximately 50% more inbound flows than outbound ($13.9 billion versus $9.3 billion in 2016). Internal flows comprise another $4.1 billion.

There are clear differences in the composition of commodities shipped out of the region versus into it. Most notably, manufactures are predominantly shipped out of the region, in contrast to other commodity groups. Primary materials and consumer products are primarily shipped into the region.

Figure 2-4: Inbound, Outbound, and Internal Flows by Commodity Group (by Value)



Source: CPCS analysis of Transearch via TREDIS (2016)

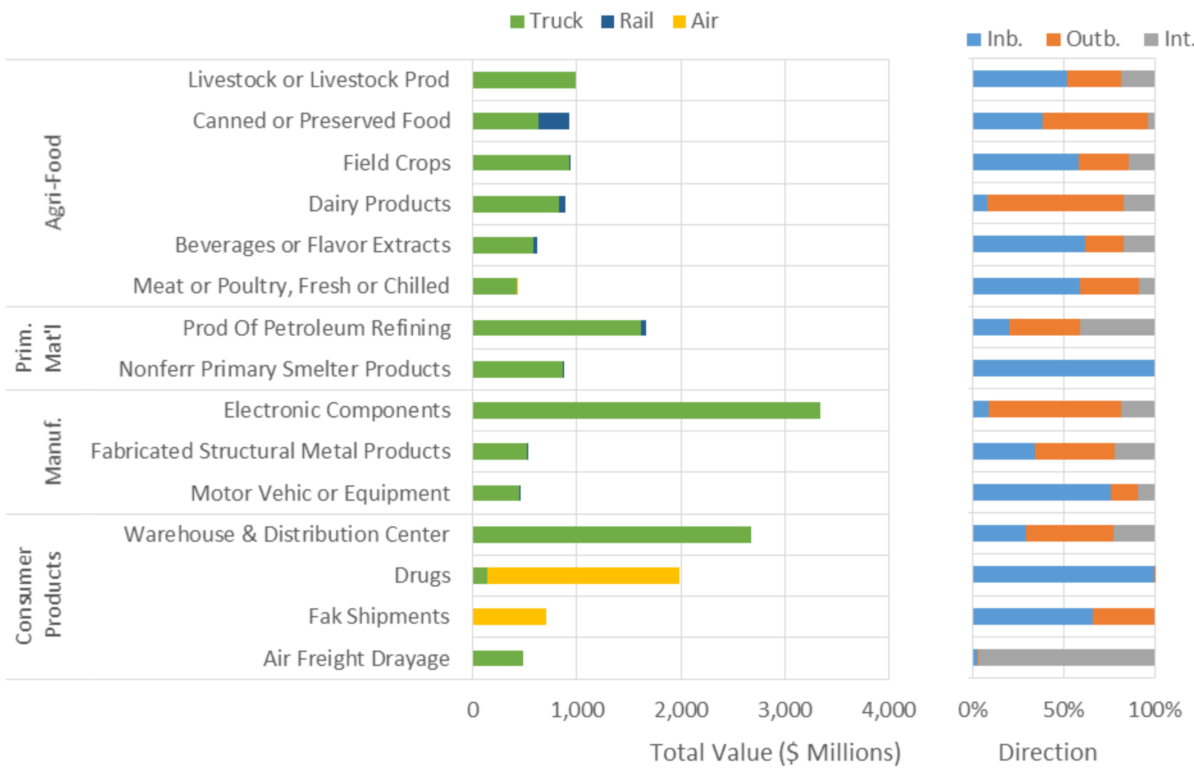
Detailed Commodity Breakdown

The top commodity groups are shown in Figure 2-5. The left side displays the mode split (truck, rail, and air), while the right side shows the directional split (inbound, outbound, internal).

As the graph indicates, most of the high-value commodities move primarily by truck. Some food products move by rail, while some consumer goods move by air, mostly inbound into the region. However, the Transeach data may not necessarily identify all rail movements. Rail-related land uses were discussed in Working Paper 1-B, and the study team is continuing to use other sources, including consultations, to identify shippers and commodities moved by rail.

The highest-value commodity is electronic components, which are primarily shipped outbound from the region.

Figure 2-5: Top Commodities by Value



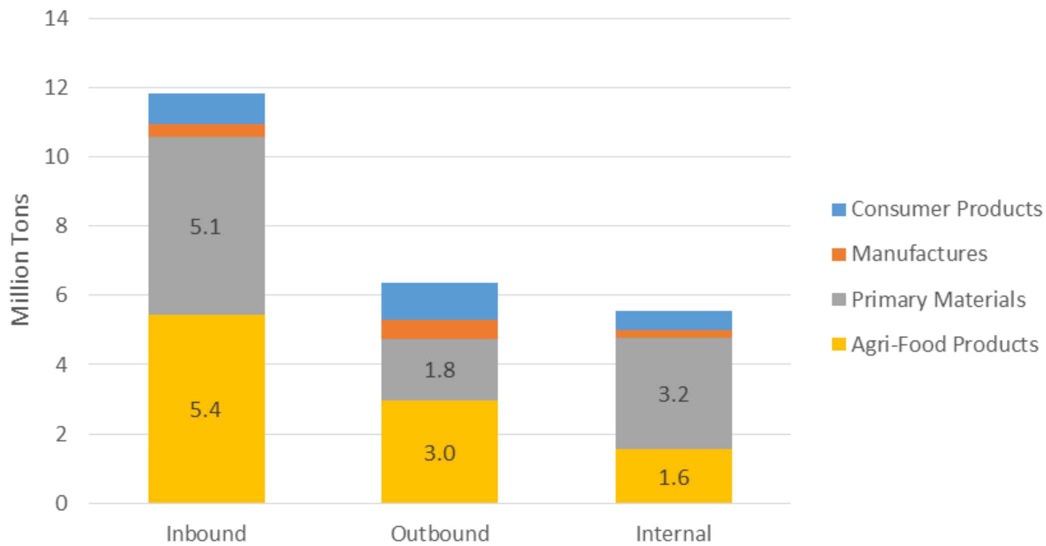
Source: CPCS analysis of Transearch via TREDIS (2016)

2.1.1 Top Commodities by Tonnage

Figure 2-6 shows the tonnage breakdown of flows by direction. Compared to value, tonnage is dominated by agri-food products and primary materials. This reflects the low value density of these commodities.

Similar to value, tonnage exhibits an unbalance with 50% more inbound flows versus outbound (11.8 million tons vs. 6.4 million tons). Internal flows are a further 5.5 million tons.

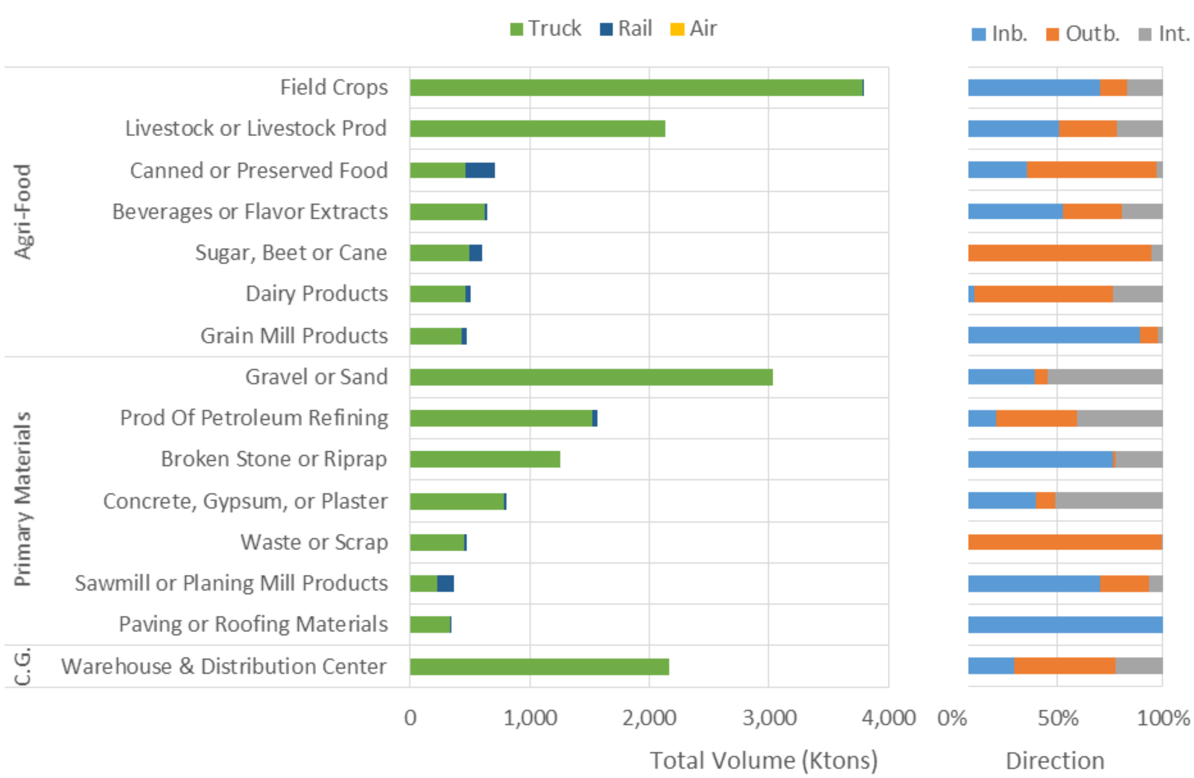
Figure 2-6: Inbound, Outbound, and Internal Flows by Commodity Group (by Tonnage)



Source: CPCS analysis of Transearch via TREDIS (2016)

Figure 2-7 shows a breakdown of the top commodities by tonnage.

Figure 2-7: Top Commodities by Tonnage



Source: CPCS analysis of Transearch via TREDIS (2016)

The top commodities are field crops (primarily inbound into the region), gravel and sand (primarily internal), and warehouse and distribution center shipments (fairly balanced). As is the case with value, most freight activity is by truck rather than rail or air.

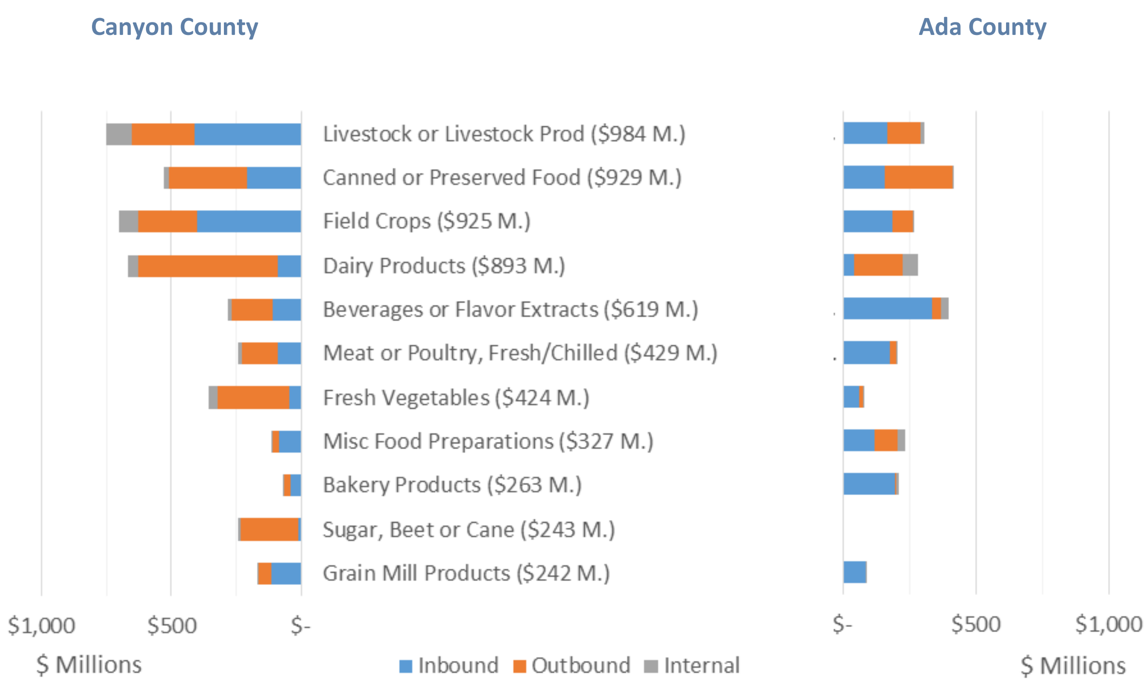
2.2 Top Sector Profiles

This section describes the top commodities in each commodity group/sector, including breakdowns by county and direction. As seen in the graphs, agri-food commodities flows are generally weighted towards Canyon County, while manufactures and consumer products flows are weighted towards Ada County.

Figure 2-8 shows the top agri-food commodities by value, for the region. The top commodities in this sector are livestock products, canned/preserved food, field crops, and dairy products.

Most of the top agri-food commodities are shipped to or from Canyon County, to a greater extent than Ada County. This is particularly true of raw materials. The commodities that are more balanced between the two counties (or favor Ada County) include beverages, food preparations, and bakery products.

Figure 2-8: Top Agri-Food Commodities by Value

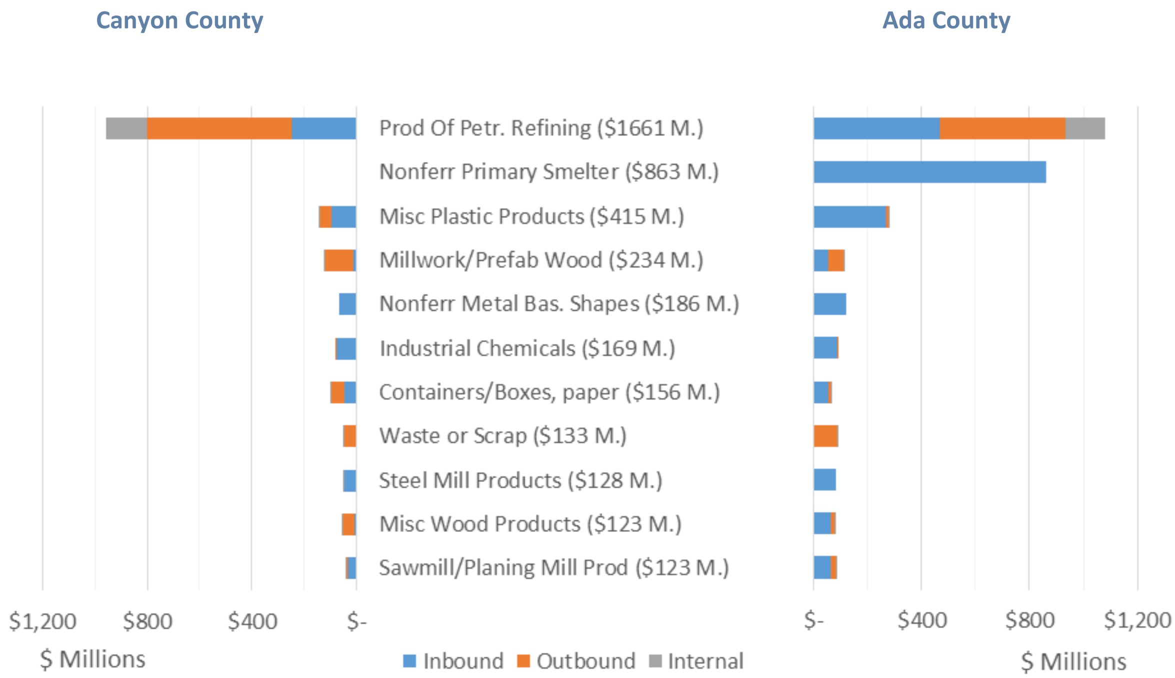


Source: CPCS analysis of Transearch via TREDIS (2016)

Figure 2-9 shows the top primary materials commodities by value. The top commodity by value is products of petroleum refining, which is approximately equally distributed between Ada and Canyon Counties. This category would include petroleum products such as gasoline and diesel.

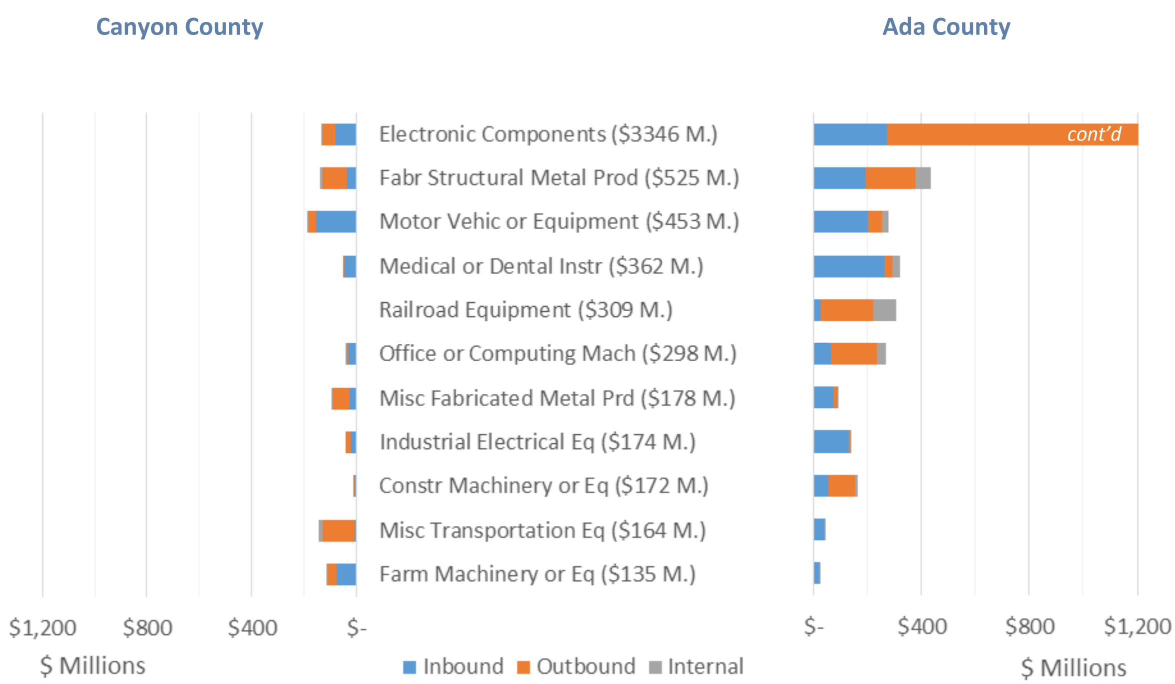
Figure 2-10 shows the top manufactures commodities by value. The top commodity by value is electronic components, primarily shipped outbound from Ada County (the full extent of this commodity is not shown so as not to completely overwhelm the other commodities visually).

Figure 2-9: Top Primary Materials Commodities by Value



Source: CPCS analysis of Transearch via TREDIS (2016)

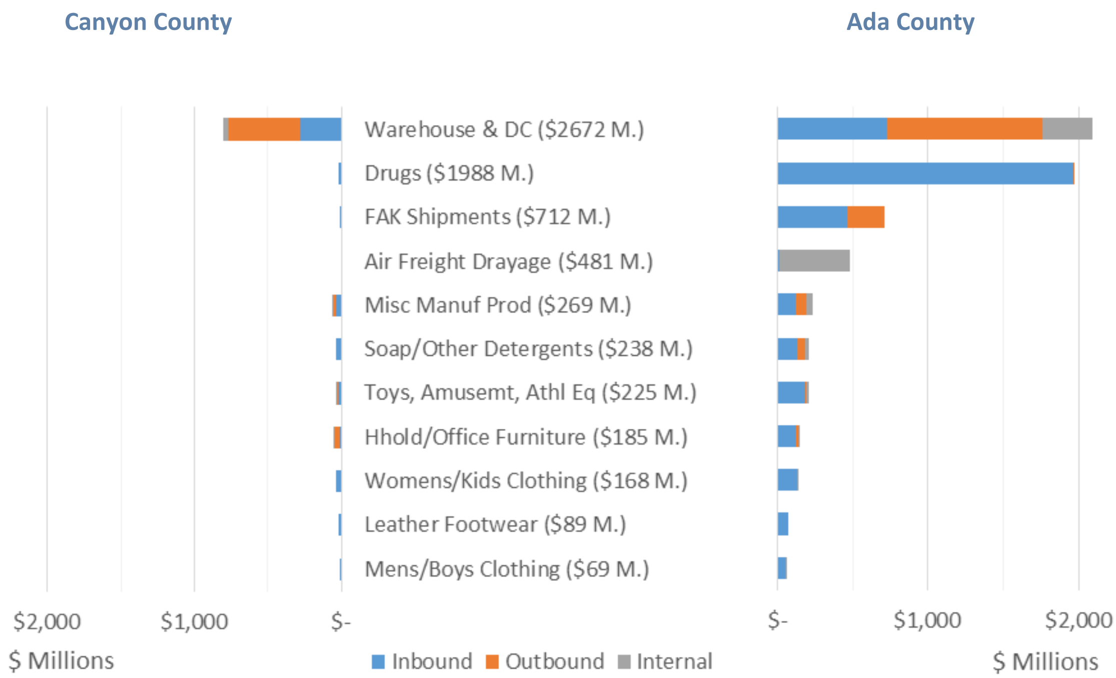
Figure 2-10: Top Manufactures Commodities by Value



Source: CPCS analysis of Transearch via TREDIS (2016)

Figure 2-11 shows the top consumer products commodities by value. Once again, Ada County has the majority of freight activity associated with this sector, although Canyon County does have $802 million in warehouse and distribution center shipments. Ada County dominates for drugs (pharmaceuticals), as well as other air-associated shipments and other consumer products.

Figure 2-11: Top Consumer Products Commodities by Value



Source: CPCS analysis of Transearch via TREDIS (2016)

Conclusion

Commodity flows within the region are dominated by a few significant sectors and commodities, including agri-food, petroleum products, manufactured products, and distribution center shipments. While the Transearch data are valuable in showing the scale and modal nature of commodity flows, they do not tell the whole story. The next chapter describes in greater detail some of the supply chains most important to the Treasure Valley freight economy.

3 Supply Chain Profiles

Key Chapter Takeaways

This section answers the question *what is the composition of supply chains?* It provides an in-depth description of retail petroleum, and distribution center supply chains. Higher-level overviews of manufacturing supply chains are also presented. Stakeholder consultations with local businesses informed research on chain, which is summarized below:

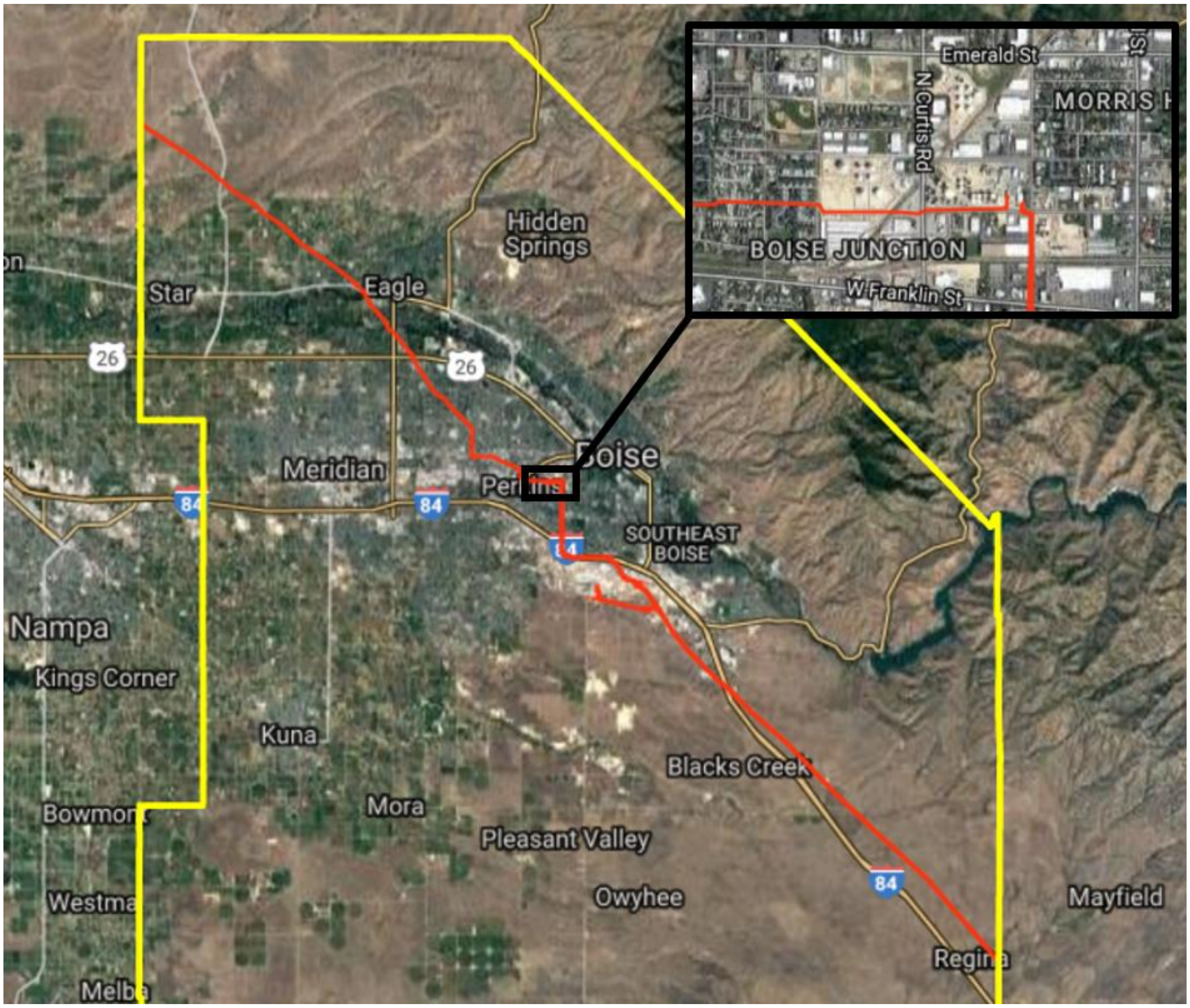
- Retail petroleum is supplied to the region via pipeline and rail connections, and then distributed in a roughly two-hour radius around Boise.
- The region's distribution centers draw in product from across the nation, and distribute it to neighboring states.
- Manufacturing supply chains vary by sub-industry, but most manufacturing inputs must be imported, especially from the international sources, and the eastern United States.

Consultations with agricultural and food firms are ongoing, and a brief on their supply chains will be submitted for review prior to the next Freight Advisory Work Group meeting.

3.1 Retail Petroleum

Over $1.6 billion worth of refined petroleum products flowed into, out of, and within the COMPASS region in 2016. To better understand this important commodity, CPCS conducted four consultations with petroleum distributors and one consultation with a pipeline operator. Figure 3-1 shows the pipeline's route in Ada County, as well as the location of Boise's petroleum terminals.

Figure 3-1: Ada County Pipeline and Boise Terminal Location



Source: National Pipeline Mapping System

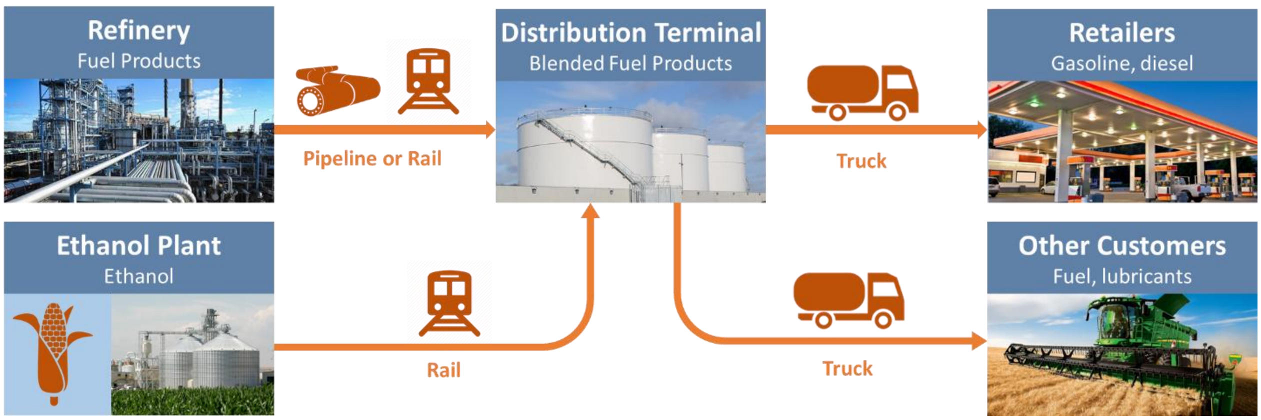
3.1.1 Origins for Petroleum Products

The primary source of petroleum for the region is a set of two pipelines owned by Andeavor Logistics (formerly named Tesoro). These two high-pressure pipelines run in parallel from Salt Lake City, UT to Spokane, WA, and are capable of carrying batches of gasoline, diesel, and jet fuel. The pipelines can be accessed through two terminals owned by Andeavor and Sinclair Oil at Boise Junction.

Fuel bound for the COMPASS region via pipeline originates at Tesoro's refinery in Salt Lake City, UT or Sinclair Oil's refineries in Wyoming and Montana. Once fuel arrives at the Boise terminals, it is temporarily held in large tanks, where additives such as ethanol may be blended into the fuel. Local energy companies and distribution companies then send their own trucks to purchase fuel from the terminals and distribute it to retail establishments and other fuel dealers. Delivery is accomplished using tank trailers and straight trucks for fuel deliveries to major retailers or dealers, as well as pickup trucks for agriculture and construction site customers, and box vans for specialty products like lubricants.

In addition to the pipeline terminals in Boise, the region receives some inputs and petroleum products from rail terminals. An ethanol depot in Nampa served by the BVRR provides eight cars per week of ethanol that is blended at the Boise pipeline terminals. Additional diesel, fuel oil, and specialty oils like lubricants are occasionally supplied by rail facilities in Jerome, ID and Ontario, OR. One distributor estimated that about 20% of the fuel they distributed to the region originates at the rail terminal in Jerome.

Figure 3-2: Illustrative Petroleum Products Supply Chain



Source: CPCS

3.1.2 Destinations for Petroleum Products

The Boise pipeline terminals serve a wide geographic area, north to New Meadows, ID, two hours west to eastern Oregon and two hours south to the Nevada border. Service to points east varies by distributor, as pipeline terminals are available in Burley, ID, and Pocatello, ID.

3.1.3 Price Volatility and Supply Chain Shocks

Refining companies control their inventories by adjusting prices at terminals. When prices at the Boise terminal are significantly different than prices at terminals served by other refineries, it becomes cost effective for distributors to send their trucks longer distances in search of cheaper supply. For example, in the winter of 2016-2017, heavy mountain snow destabilized a crude oil pipeline serving Tesoro's Salt Lake City refinery. The subsequent pipeline shutdown resulted in a minor refined fuel shortage in the Salt Lake City market, and the refineries raised the price at the Boise terminal to encourage distributors to purchase fuel in other markets. As a result, it became cost effective for the region's bulk fuel purchasers to send their trucks to purchase products at the terminal in Pasco, WA, which receives fuel from a refinery in Washington State and had lower prices. This phenomenon occurs in reverse when Boise's fuel prices are significantly lower than prices in eastern Washington State.

The pipeline terminals that supply gasoline and diesel for the region adjust their prices to control their inventory. Price changes, if great enough, can temporarily disrupt supply chains.

Looking toward the future, some fuel dealers believe such price shocks and supply chain shifts are likely to occur more often because pipeline capacity for Boise is fixed. The two pipelines serving Boise have not been expanded to meet increased demand. Currently, one line carries 1,700 to 1,950 barrels of gasoline per hour, while the second line carries 1,110 to 1,400 gallons of diesel per hour. This rate is currently sufficient to meet the region's needs, but as demand continues to increase, the potential for constrained supply and price spikes increases as well. In terms of seasonality, demand for fuel is highest in the summer, making that season most common for price spikes.

One fuel dealer believed that expansion or replacement of the aging pipeline is unlikely, and additional fuel to meet the region's needs would have to be provided via rail shipment. If a rail fuel terminal was constructed in Ada or Canyon County, it would have the additional benefit of partially unchaining the COMPASS region's oil prices from Salt Lake City's markets, as fuel from Pacific Northwest and Midwest markets could be easily imported at more competitive prices.

3.2 Distribution and Warehousing

The region is home to many distribution centers (DCs) and warehouses that serve a variety of consumer retail establishments, primarily serving a regional market consisting of Idaho and in some cases neighboring states. The value of warehouse and distribution center freight in the region ($2.67 billion) reflects their importance. The study team completed consultations with four DCs in the region, and one delivery service. These DCs distributed freight to supermarkets, institutions like schools and hospitals, and general merchandise retailers. While business practices and supply chains varied between each company and industry, there are commonalities between all of the consultees that provide a good "big picture" view of how the region's DCs and warehouses operate.

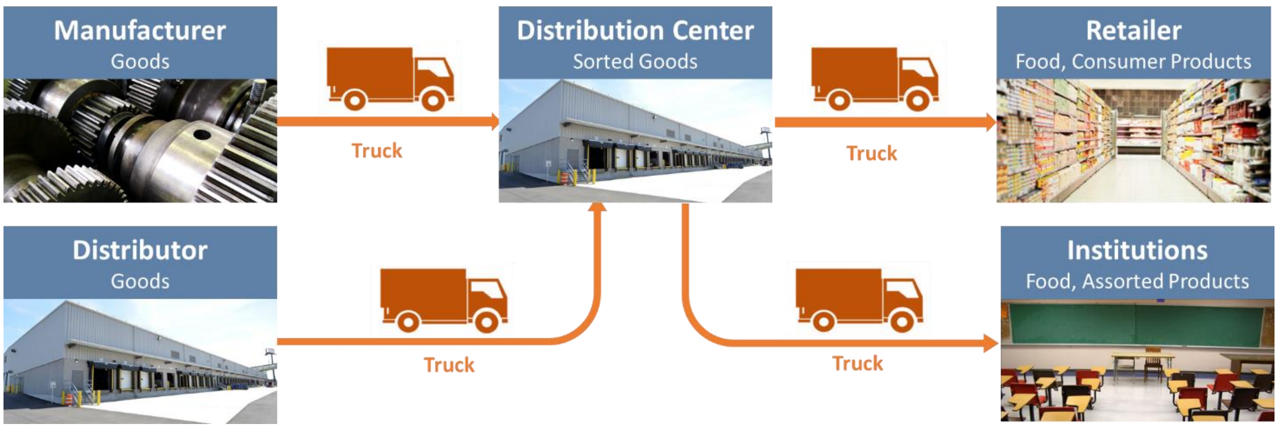
The COMPASS region's distribution centers receive products from across the United States, and primarily distribute them to Idaho and neighboring states like Utah, Oregon, and Washington.

3.2.1 Distribution Centers and Just-in-Time Inventory

A distribution center consolidates goods from a variety of sources and distributes combinations of those goods to receivers, such as local stores or factories. For example, one grocery DC in Boise receives all types of food (dairy, produce, meat, dry goods, etc.) from across the United States, and fills trucks with unique combinations of those food products as requested by local grocery stores. The stores served by the DC receive two trucks per day, seven days per week, as they have extremely limited storage space onsite.

This frequent delivery schedule illustrates how DCs are increasingly important supply chain elements as retail establishments and manufacturing firms adopt "just-in-time" supply models, where only small amounts of products or raw materials are kept on hand at a store or manufacturing facility. Prior to the adoption just-in-time inventory methods, freight receivers would keep maximum amounts of product on hand for longer periods. Keeping smaller amounts of product in inventory at both local facilities and DCs is a cost-saving measure, as less storage space is required, and less money is "frozen" in products sitting unsold or unused at warehouses. For food service companies, just-in-time is especially important, as fresh products such as fruits, vegetables, and meat will spoil and have a very limited shelf life.

Figure 3-3: Illustrative Distribution Supply Chain



Source: CPCS

3.2.2 Origins of Distributed Retail Goods

The C region's DCs draw products from vendors and other DCs across the United States and are major freight receivers for the region. Of the four DCs interviewed, one received about 14 truckloads per day, two received 20-25 loads per day, and the largest DC received over 50 trucks per day. The parcel service received one 53' long and five short "pup" trailers per day. While each DC noted that they received products from across the nation, one noted that they received fruits and vegetables from California, and meat and fish from Seattle, and another DC noted that, when possible, they preferred to buy their products from "local" vendors, such as vendors in Salt Lake City. This way, otherwise empty trucks returning from areas like Salt Lake City could then be filled with product for their return trip to the Boise DC. Food-related DC consultees also noted that the region's businesses receive many products from DCs located in the Salt Lake City area.

3.2.3 Destinations of Distributed Retail Goods

Since DCs are operated under a just-in-time model, where the goal is to keep as little product on hand as possible, their outbound truck count is very similar to their inbound count. For example, in the month of June, one region DC said that they shipped 7,700 tons of goods, and received 7,600 tons. The area served by the region's DCs varies by company, but most focus on northwestern states, or locations that are within a one-day drive, including Montana, Utah, Idaho, Oregon, and Washington. Some DCs also served farther locations like Arizona and northern California. DCs serving businesses within a one-day round trip of the region hired their own drivers, and maintained their own fleets of trucks. Those DCs serving larger areas either retained a small number of over-the-road drivers for longer-distance driving, or contracted with outside trucking companies for distribution to areas like Arizona and California. For the parcel service, nearly all packages were shipped to, and received from larger distribution centers in Portland or Salt Lake City. Choice of distribution center depended on the origin or destination of parcels: items originating or terminating in the eastern US were routed through Salt Lake City, while items originating or terminating on the pacific coast were routed through Portland.

Most distribution centers serve a geographic area that is defined by a one-day round trip from the region.

3.2.4 Supply Chain Variability

Some DCs noted variability in freight volume or customer make-up across the year. A grocery DC in the region noted that freight volumes are 20% higher than average during the first 1/3 of the each month, and 20% lower than average during the last 1/3 of the month. This variation was due to social welfare policies in Idaho and neighboring states, which issue food stamps and other social assistance at the beginning of the month. As a result, grocery demand peaks when this assistance is being distributed. Another food service firm that distributes to restaurants and institutions like schools, hospitals, and hotels noted that their customer base changes based on the season; they serve many schools from August to June, and many resorts from May to September.

3.3 Manufacturing

3.3.1 Electronics

Electronics are relatively low in weight, but make up a disproportionately large share of the region's freight value: $3.3 billion. This amount is $700 million greater than the value of the region's next ten manufactured goods flows combined. CPCS interviewed one manufacturer of electronic components. Since these firms generate relatively low freight tonnage relative to their value, the supply chain descriptions they provided were simple. 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.

3.3.2 Transportation Equipment

Businesses in the region do not produce the raw material inputs required for many heavy manufacturing processes, so materials must be imported from outside the region. Sources for transportation equipment inputs include the eastern United States and Europe. These materials arrive primarily by truck, for reasons explained below.

The location of transportation facilities like intermodal terminals outside the region dictates how manufacturing supply chains are structured. For example, one transportation equipment manufacturer uses high-quality steel imported from Europe, which arrives in the US via a port on the Great Lakes. The steel is then shipped by rail to a terminal in Portland, where it is loaded on trucks and sent east to Boise. This long supply chain route is necessary because the region has limited rail-to-truck transfer facilities, and manufacturing firms may need to go to Salt Lake City, Portland, or Seattle if they want to receive products that were moving by rail or by water. This limited selection of rail terminals means that for many firms, manufacturing inputs coming from the eastern United States are cheaper to move by truck than by container. The same transportation equipment stakeholder noted that empty refrigerated trailers (like those used by the region's food manufacturers to ship frozen food east) are critical for carrying components from suppliers in the eastern United States back to the region. Finished trailers were shipped to dealers in Idaho, Oregon, and Washington.

Inputs for manufacturing in the COMPASS region must be imported from the rest of the United States, or international sources.

3.3.3 Lumber and Other Wood Products

The study team interviewed two firms that processed lumber, both of which used the rail system to some degree. One company shipped and received five to seven trucks per day, and shipped one rail car per week. The second company received and shipped about eight trucks and rail cars each week. Both received product from some parts of Idaho or the Pacific Northwest, and both shipped to locations across the United States.

The study team also interviewed two manufacturers of wood or building materials. One firm manufactures wooden doors, and receives and ships five to six truckloads of raw wood, and products each day. This industry receives inputs like wood and fixtures via truck trailer and container, primarily from Seattle and other locations in the Pacific Northwest. Some wood is sourced internationally from Asia, and arrives in Seattle via container, where it is either shipped directly to the region, or transloaded to a box trailer for shipment. The firm distributes its finished products nationwide to distribution centers and hardware dealers via truck. This firm's shipment rate was constant through the year.

The building supply company had a similar supply chain, drawing resources from the Pacific Northwest via eight to ten railcars and 100 trucks per week, and shipping finished product out to the rest of the United States via 70 trucks per week. This firm's shipment rate was consistent year round, with the exception of December, January, and February, which were slower months.

4 Regional Truck Flows

Key Chapter Takeaways

This section describes a process for linking ATRI GPS truck trip data to commodities, using employment data at the TAZ level by freight-related sector, with a weighting factor accounting for the differential rates of truck trip generation for different commodities. Initial findings are presented, subject to further validation.

Based on this analysis, 86% of the truck trips within the region start or end in one of the primary clusters introduced in Working Paper 1-A, according to ATRI origin-destination (OD) data. This statistic reinforces the overwhelming freight importance of these clusters.

Of the top dozen out-of-region partner counties for external truck trips, five are located elsewhere in Idaho. Three are in Oregon, one Washington, two in Utah, and one in Wyoming. Three large urban centers are represented are: Salt Lake City, Portland and Seattle (Salt Lake, Multnomah and King Counties, respectively).

4.1 Introduction

InfoGroup and Idaho Department of Labor (IDOL) provide an important picture of where different types of freight activities are located within the Region, as profiled in Working Paper 1-A. These resources involve employment data at an establishment or TAZ level, classified by industry using North American Industry Classification System (NAICS) codes.

In Working Paper 1-A, InfoGroup and IDOL employment data were used in conjunction with ATRI truck trip end data to identify the top clusters for freight activity in the Region, including both primary and secondary clusters. As discussed in Working Paper 1-A, these distinct data sources each have their advantages, and combining them takes advantage of the strengths of each.

Chapter 2 of this working paper used commodity data through Transearch to profile inbound, outbound, and internal flows by commodity (including by tonnage and value), at a county level. The available Transearch data did not, however, include more detailed origin and destination data – nor is it able to describe commodity flow movements within the region.

ATRI truck trip data can be used to fill in the gaps in identifying out-of-region origins/destinations, as well as patterns internal to the region. This chapter lays the groundwork for an approach that will be used in future analyses in this study. Specifically, the chapter describes how ATRI origin-destination data can be linked to industries and sectors using employment data at the TAZ level, to make inferences about how commodities move within and into/out of the region.

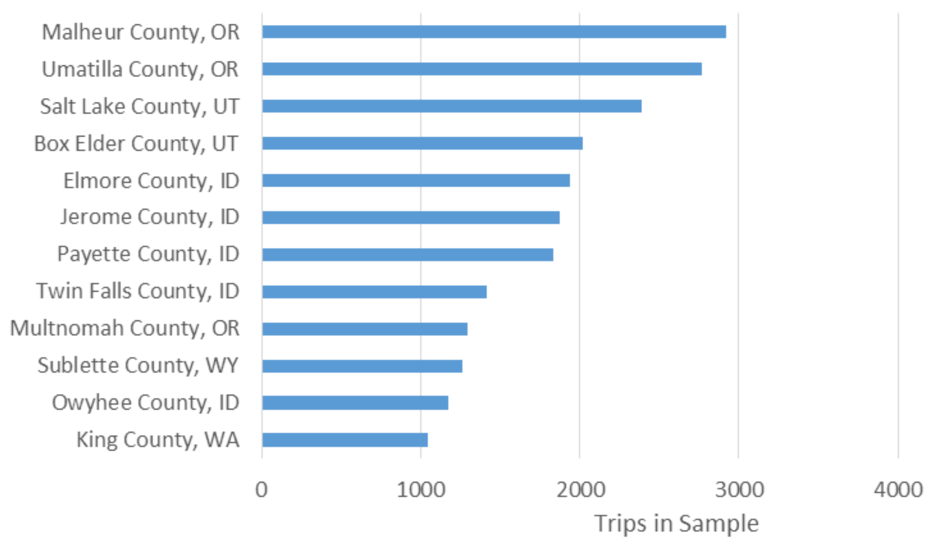
4.2 External and Internal Flows

4.2.1 External Flows using ATRI GPS Data

The ATRI truck trip sample can be used to identify the out-of-region (external) origins and destinations of truck trips to or from[1] the region. This analysis can help identify important commodity flow linkages between the region and neighboring states.

The top external (out-of-region) counties shipping freight to or from the COMPASS region are shown in Figure 4-1. Of the top dozen out-of-region partner counties for truck trips, five are located elsewhere in Idaho, three are in Oregon, one Washington, two in Utah, and one in Wyoming. The truck travel patterns reveal significant freight activity freight activity between Ada and Canyon Counties and neighboring counties in Eastern Oregon. The data also show trade dependencies between the region and the three nearest large urban centers: Salt Lake City, Portland, and Seattle (Salt Lake, Multnomah and King Counties, respectively).

Figure 4-1: Top External Partner Counties, for ATRI Truck Trip Sample



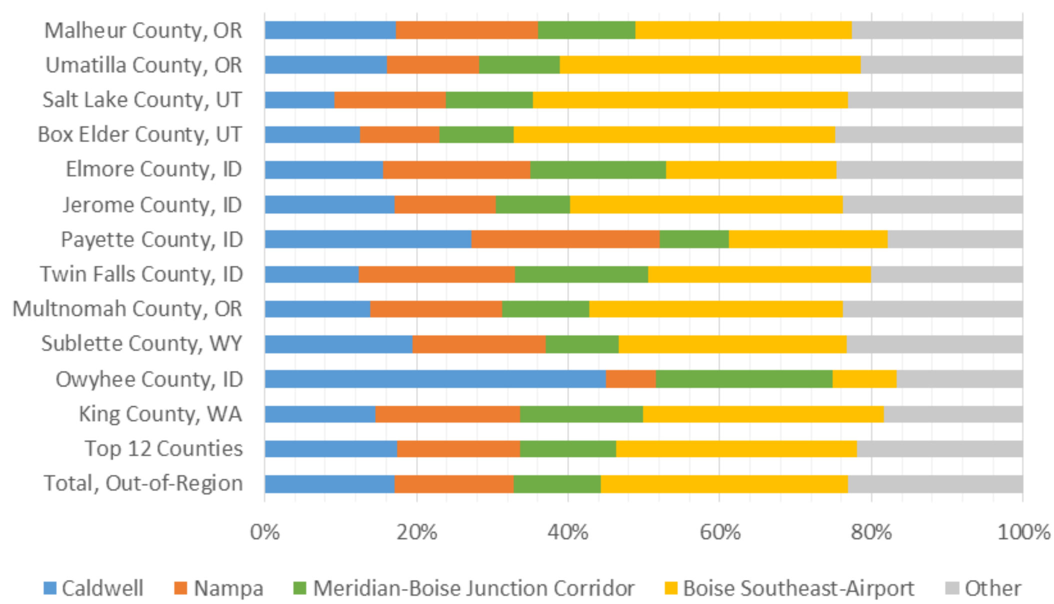
Source: CPCS analysis of ATRI GPS truck data, 2016

Figure 4-2 shows a further breakdown of the top partner counties according to the specific freight cluster within the COMPASS region where the given truck trips originate or end. The four primary freight clusters are shown:

[1] As described in Working Paper 1-A, the GPS data cannot distinguish between loaded or empty trips, meaning distinguishing between the "origin" versus "destination" for these trips is not particularly valuable when it comes to interpreting commodity flows.

- Caldwell
- Nampa
- Meridian-Boise Junction Corridor
- Boise Southeast – Airport

Figure 4-2: COMPASS Region Clusters for Top Out-of-Region Partner Counties



Source: CPCS analysis of ATRI GPS truck data, 2016

Of the top out-of-region partner counties for COMPASS-region external truck trips, five are located elsewhere in Idaho. Three are in Oregon, one Washington, two in Utah, and one in Wyoming.

The breakdown by cluster helps illuminate certain patterns. For example, nearby Payette County and Owyhee County are primarily linked to the clusters in Canyon County. In contrast, Box Elder and Salt Lake Counties in Utah are predominantly linked to the Ada County clusters, particularly Boise Southeast-Airport.

Of note, there are Walmart distribution centers located in Box Elder and Umatilla Counties, a factor that likely helps explain the large truck volumes to these counties.

Boise Southeast-Airport is the largest cluster in terms of out-of-region truck trip generation: 33% or one-third of external truck trips start or end in this cluster alone.

The “Other” category refers to all parts of the region outside the four primary clusters (thus consisting of secondary clusters plus non-cluster traffic zones).

4.2.2 Internal Flows using ATRI GPS Data

The ATRI origin-destination data can also be used to identify truck trip patterns within the region. Figure 4-3 represents one way of doing this – using a trip matrix organized by cluster. The matrix shows the percentage of all truck trips within the region traveling between each pair of clusters.

Figure 4-3: Truck Trip Matrix by Cluster, for Trips Within the Region

	Caldwell	Nampa	Meridian-Boise Junction Corridor	Boise Southeast-Airport	Other
Caldwell	3%	4%	3%	3%	8%
Nampa		5%	5%	7%	4%
Meridian-Boise Junction Corridor			4%	9%	11%
Boise Southeast-Airport				10%	10%
Other					14%

Source: CPCS analysis of ATRI GPS truck data, 2016

As revealed in the table, only 14% of truck trips in the region are not linked directly to one of the primary clusters. In other words, 86% of truck trips start or end in one of the primary clusters. This statistic reinforces the overwhelming freight importance of these four parts of the region, compared to the region as a whole.

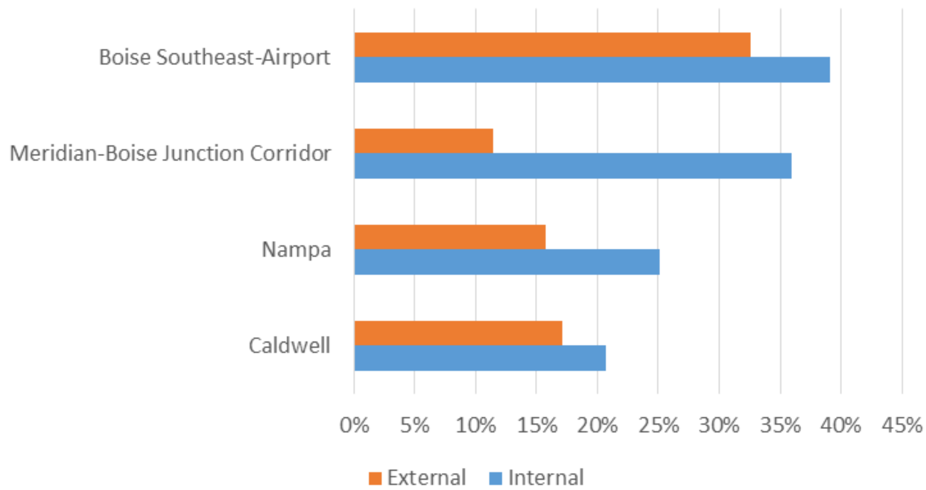
The vast majority of truck trips within the region are associated with at least one of the primary freight clusters.

Figure 4-4 combines the external flows from the previous subsection with the internal flows listed above. The graph shows the percentage of trips in the region associated with (i.e. originating or destining) in each cluster. For example, 39% of all internal truck trips within the Region start or end in the Boise Southeast-Airport cluster, and 33% of all external trips start or end in the cluster. The purpose of the graph is to show the relative importance, in terms of truck trip generation, of each of the clusters.

Of particular interest in Figure 4-4, Meridian-Boise Junction is very important as an internal cluster, but considerably less impactful for external trips. This suggests that the truck freight-related activities taking place in this cluster are overwhelmingly locally-oriented, compared to the other primary clusters in the region. One reason for this result may be that the cluster contains more retail activity, such as Boise Towne Center, compared to other clusters; these facilities are more locally-oriented in terms of truck trips. Another reason may be that the geographic scope of truck trips from the industrial uses within this cluster is smaller than for other clusters.

The internal share exceeds the internal share for each cluster. Relatedly, the internal percentages sum to over 100%. The reason for this seeming peculiarity is that each internal truck trip has two "trip ends," thus can be assigned to more than one cluster. (However, a truck trip within a single cluster is only counted once).

Figure 4-4: Internal vs. External Truck Trips Associated with each Primary Cluster



Source: CPCS analysis of ATRI GPS truck data, 2016

4.3 Linking Commodities to Truck Trips

This section describes a process for linking ATRI GPS truck trip data to commodities, using employment data at the TAZ level by freight-related sector, with a weighting factor accounting for the differential rates of truck trip generation for different commodities.

4.3.1 Methodology

Step One

First, the four primary commodity categories from Chapter 2 were subdivided into 15 subcategories, with the intention of using a subcategorization scheme that was easily relatable to both industry codes (NAICS) and commodity codes (STCC). This is shown in Figure 4-5.

Figure 4-5: Subcategorization Scheme for Commodities

Commodity Category	Subcategory
Agri-Food Products	Agricultural
	Processed Food
Primary Materials	Metal Ores*
	Gravel, Cement, Concrete
	Wood Products
	Petroleum Products
	Paper Products

Commodity Category	Subcategory
	Chemicals and Products
	Leather & Apparel
	Waste Products
Manufactures	Metals
	Machinery
	Electronics & Electrical
	Transportation Equipment
Consumer Products	Consumer Products
	Warehouse & Distribution

Source: CPCS *Dropped due to the low volume of this activity in the region

Step Two

Next, employment within each TAZ was categorized according to the above scheme. Although both IDOL and Infogroup data sources were available, Infogroup was used due to the greater transparency of the constituent businesses (as it is disaggregate at the establishment data).

The employment with each TAZ was then weighted by a truck trip generation factor derived from combining the Transearch data with employment data for each subcategory. Although the two data sources are not a perfect match, the principle is to take into account the fact that there are wide differences among different types of freight-related industries in how labor-intensive they are, and how many truckloads are generated relative to the value of the product.

Figure 4-6: Truck Trip Generation Factors Applied

Commodity Subcategory	Internal Truck Trips	External Truck Trips	Employment	Internal Trips/Emp	External Trips/Emp
Agricultural	64,061	282,646	2,172	29.5	130.1
Processed Food	17,096	112,719	8,135	2.1	13.9
Gravel, Cement, Concrete	111,478	139,816	447	249.4	312.8
Wood Products	3,497	24,562	1,975	1.8	12.4
Petroleum Products	26,196	53,219	261	100.4	203.9
Paper Products	862	9,004	979	0.9	9.2
Chemicals and Products	1,176	19,393	642	1.8	30.2
Leather & Apparel	227	3,028	124	1.8	24.4
Waste Products	90	18,167	393	0.2	46.2
Metals	3,228	21,740	2,861	1.1	7.6
Machinery	1,432	9,698	3,190	0.4	3.0
Electronics & Electrical	2,022	14,292	13,815	0.1	1.0
Transportation Equipment	8,040	23,253	2,740	2.9	8.5
Consumer Products	25,227	92,797	62,976	0.4	1.5
Warehouse & Distribution	2,110	70	4,403	0.5	0.0

Source: CPCS analysis of Infogroup employment data and Transearch truck trip data. Trips are annual.

Step Three

The third step involved assigning every ATRI truck trip in the sample a commodity, or more accurately a percentage of a commodity, based on the predominant freight-related activities in the TAZ's where the truck trip starts and ends. For example, if 90% of the employment in a TAZ (weighted by the truck trip-generation factors) corresponds to agricultural commodities, then simplistically 90% of the truck trips to or from that TAZ are assumed to be carrying agricultural commodities.

The actual procedure proceeded along the principle described, except taking into several additional nuances. First, for internal trips, the breakdown of employment in both origin and destination TAZ's was considered. Second, the procedure assigned weights to the origin and destination TAZ's unequally if one of the TAZ's had a highly unequal level of employment, up to 50 employees.

These steps were taken so as to minimize bias in the results. For example, for a truck trip from TAZ "A" to TAZ "B," suppose TAZ A only has 5 employees in total while TAZ B has 100. In that case, it would make sense to give much more weight to the employment breakdown in TAZ B in assigning commodities to the trip.

Another potential source of bias is the fact that the ATRI sample does not necessarily cover all commodities and industries equally. In this case, these trips will continue to be underrepresented in the procedure described in this step. However, the procedure limits the amount of any further bias compared to an alternative approach where truck trips are assumed to be generated based on the truck trip generation factors, and then assigned destinations based on the ATRI data.

For external trips, only the in-region employment breakdown was used to distribute commodities.

Step Four

Using the procedure described in Step Three, a commodity matrix was obtained for each ATRI truck trip. By aggregating over all trips for each commodity, it is then possible to develop a picture of how different commodities move in the region.

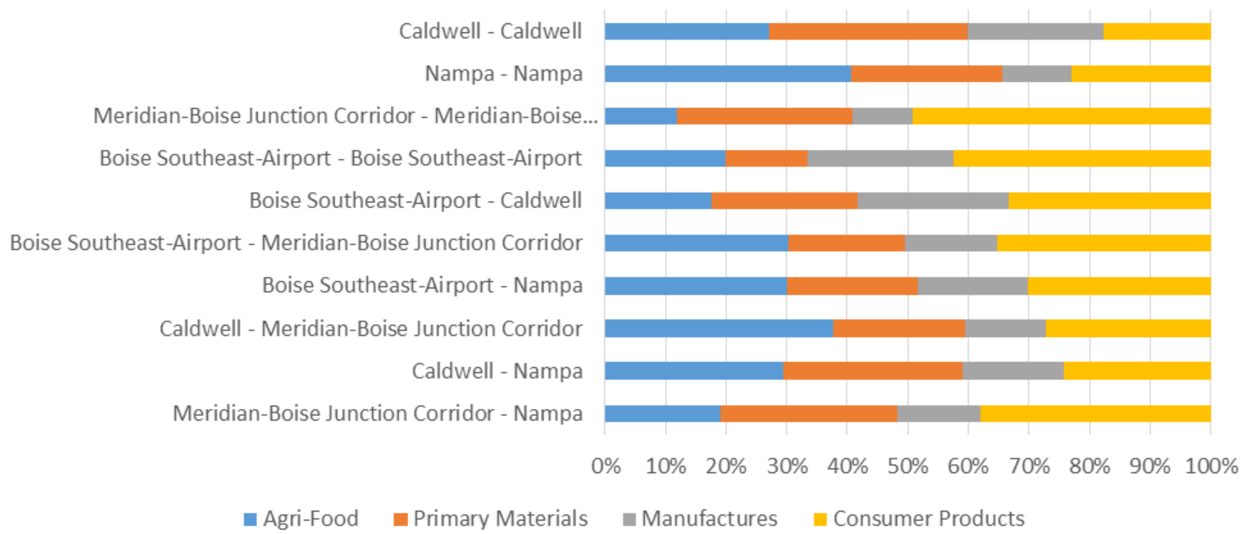
The methodology described in this section lays the groundwork for future mapping and analysis on truck flows in the region. The next section presents some initial findings, which will be subject to further validation and analysis.

4.3.2 Initial Findings on Commodity Flows

Internal Flows

Figure 4-7 shows a modelled breakdown of commodity flows between clusters, based on the procedure described.

Figure 4-7: Modelled Commodity Flows between Clusters within the Region



Source: CPCS modelling

Certain cluster pairs stand out for agri-food, particularly truck trips within Nampa and Caldwell, and between Caldwell and Meridian-Boise Junction. Primary materials flows are also high between Caldwell, Nampa, and Meridian-Boise Junction.

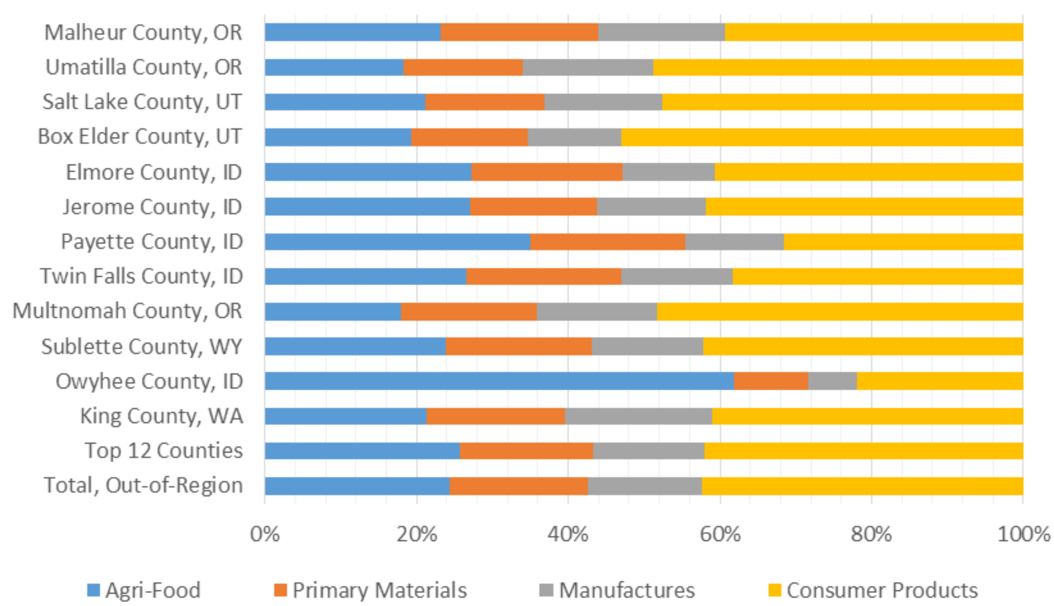
Manufactures flows are greatest within Boise Southeast-Airport, as well as between Boise Southeast-Airport and Caldwell. Consumer products dominate in Meridian-Boise Junction Corridor as well as within Boise Southeast-Airport.

Overall, the findings are consistent with past Working Papers suggesting that the freight economy western part of the region (Canyon County) is more oriented to agri-food products and primary materials, while the eastern part of the region (Ada County) is more oriented to consumer products. Whereas Working Paper 1-A showed this finding on the basis of freight-related employment and freight flows at the county-level, this Working Paper corroborates the finding in terms of actual trip generation at the cluster level. Future analysis will delve deeper into these findings specifically at the TAZ level, and seek to link particular commodities to the *key truck freight corridors*.

External Flows

Figure 4-8 shows a modeled breakdown of commodity flows between the region and the top out-of-region partner counties, which were presented in 4.2.1.

Figure 4-8: Modelled Commodity Flows between the Region and Top Out-of-Region Counties



Source: CPCS modeling

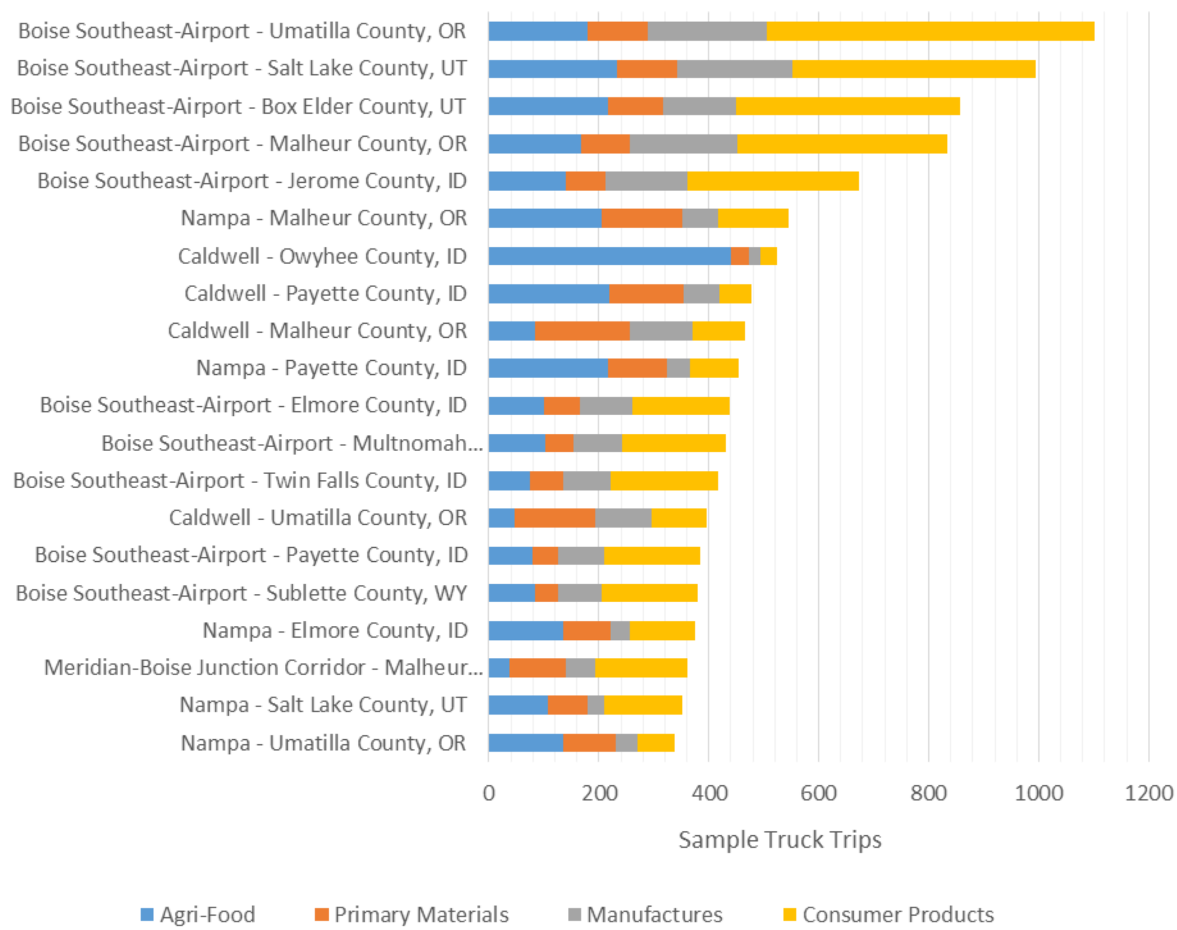
The clusters, commodity groups, and counties are combined in Figure 4-9. The top 20 cluster-county pairs, from among the twelve counties listed above, are displayed in the graph.

The origin-destination pairs (ODs) with the most truck trips according to the ATRI data involve Boise Southeast-Airport. Consumer products are the dominant commodity for each of these ODs. However, agri-food products are linked to a greater extent with the two Utah counties as opposed to the others.

Agri-food products are a dominant commodity for truck trips between the Caldwell cluster and Owyhee County, as well as between Nampa/Caldwell and Payette County. Owyhee County is particularly dependent on agriculture, with nearly two-thirds of agriculture sales derived from livestock operations.[2]

[2] Owyhee County: owyheecounty.net/extension.agriculture

Figure 4-9: Modelled Commodity Flows between Clusters and Out-of-Region Counties



Source: CPCS modeling

Conclusions

A combination of ATRI, Transearch, and Infogroup data are used to model truck freight flows across the region and beyond. Whereas previous working papers showed the importance of the four primary freight clusters on the basis of freight-related employment, this chapter confirms it on the basis of actual truck trips. Future analysis will delve deeper into these findings specifically at the TAZ level, and seek to link particular commodities to the *key truck freight corridors*. For example, what are the commodities most affected by truck delays and bottlenecks? In this way corridors of interest can be linked to particular commodities, drawing attention to how the key corridors support the region's most important supply chains.

5 Conclusions and Next Steps

This Working Paper 2-A analyzed commodity flows in the region. The top commodities were selected for more detailed supply chain profiles. Finally, a process for linking ATRI truck trip data to commodities was described. This process will support future work, including mapping commodity flows in the region.

An addendum to Working Paper 2-A will describe the importance of freight to the region's economy, including not only transportation and logistics but also freight-dependent industries.

Working Paper 2-B will detail the primary freight corridors in the region. This will take into account the region's Critical Urban Freight Corridors designated in 2016, but will go beyond this to consider the location of freight clusters, truck volumes, and other factors to prioritize corridors across the region by tiers. These steps will be critical for futures study tasks, such as assessing freight system performance and developing prioritization methods.

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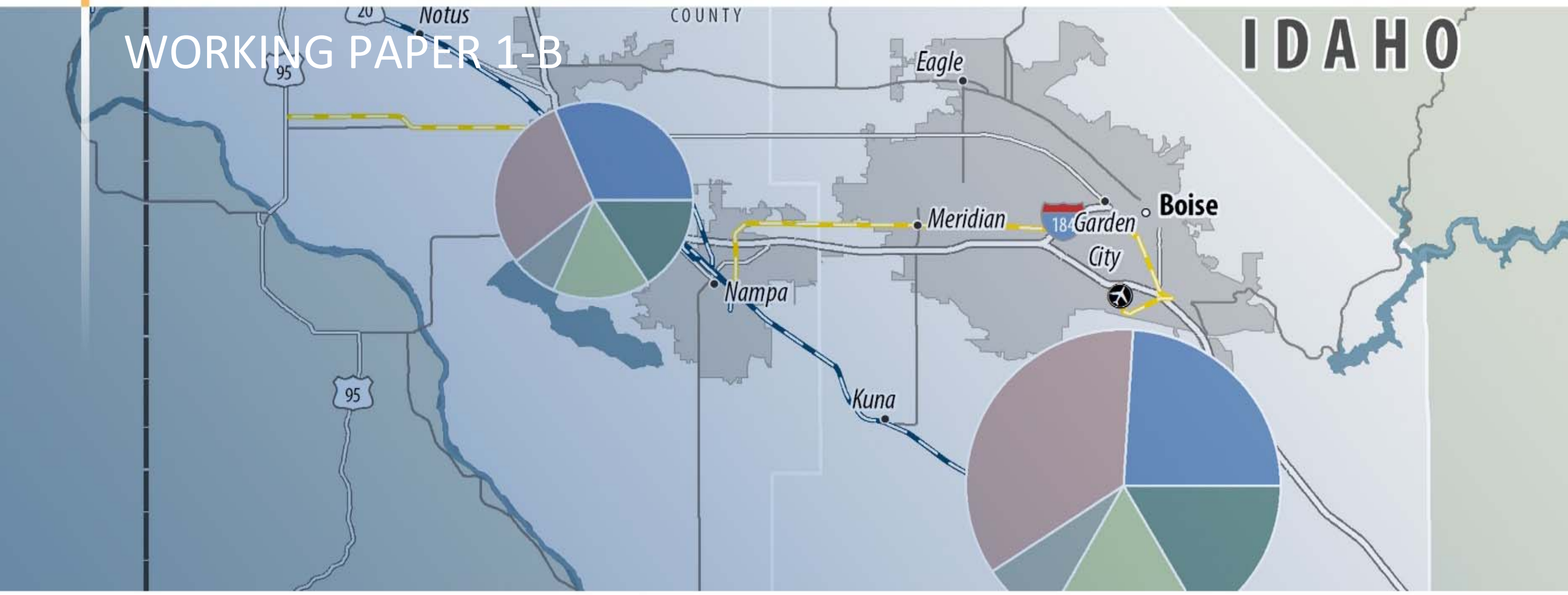
WORKING PAPER 1-B



COMPASS Freight Study

Client Reference: RFQ 2017-02

Inventory of Industrial Uses and Future Zoning on UPRR Spurs

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

CPCS Ref: 16629

Acknowledgments / Confidentiality

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Cover image source: CPCS

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Table of Contents

Acronyms / Abbreviations

BVRR	Boise Valley Railroad
COMPASS	Community Planning Association of Southwest Idaho
GIS	Geographic Information System
UP	Union Pacific
UPRR	Union Pacific Railroad
WATCO	Watco Companies

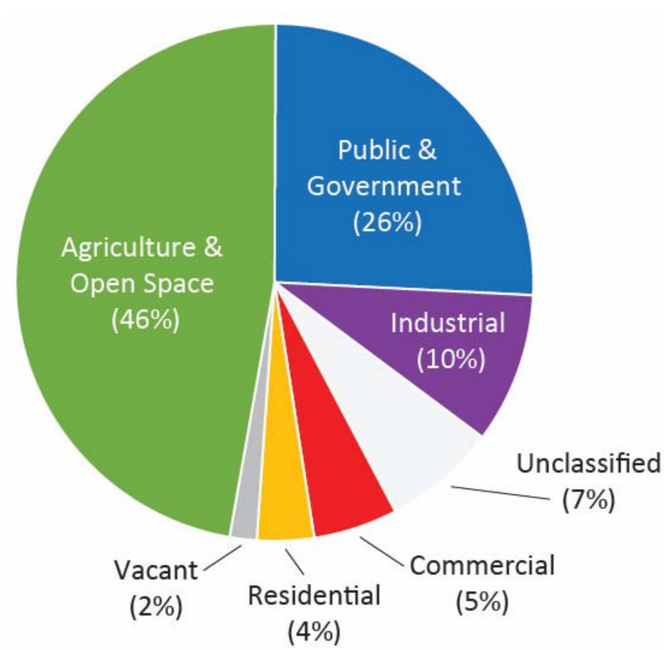
Executive Summary

The Community Planning Association of Southwest Idaho (COMPASS) is conducting a freight study to support its long-range transportation plan, *Communities in Motion 2040*. The freight study is identifying freight corridors and related land use needs, developing a profile of the regionally most important commodities and supply chains, and identifying projects and/or policies to address maintenance needs, improve safety, and manage congestion. A key component of the study is the examination of the current land uses along the Union Pacific (UP) spurs in the region. This deliverable focuses on the rail land uses by answering the following three key questions:

1. What is the current composition of industrial land and facilities along Union Pacific spurs?

The analysis considered all parcels whose boundary is within 400 feet of an active rail spur in Ada and Canyon Counties. Under these criteria, this area is comprised of 4,697 parcels on 30,672 acres located along 121 miles of track. Major existing land uses in the study area are agriculture and open space (46 percent), public and government (26 percent), and industrial (10 percent). Based on an analysis of geographic information system (GIS) data, we find that existing zoning and future comprehensive plans allow for industrial uses to increase with sufficient land set aside along Union Pacific Railroad and Boise Valley Railroad spurs in the COMPASS region.

Figure ES-1: Existing Land Use Composition



Source: Parametrix Land Use Analysis, 2017.

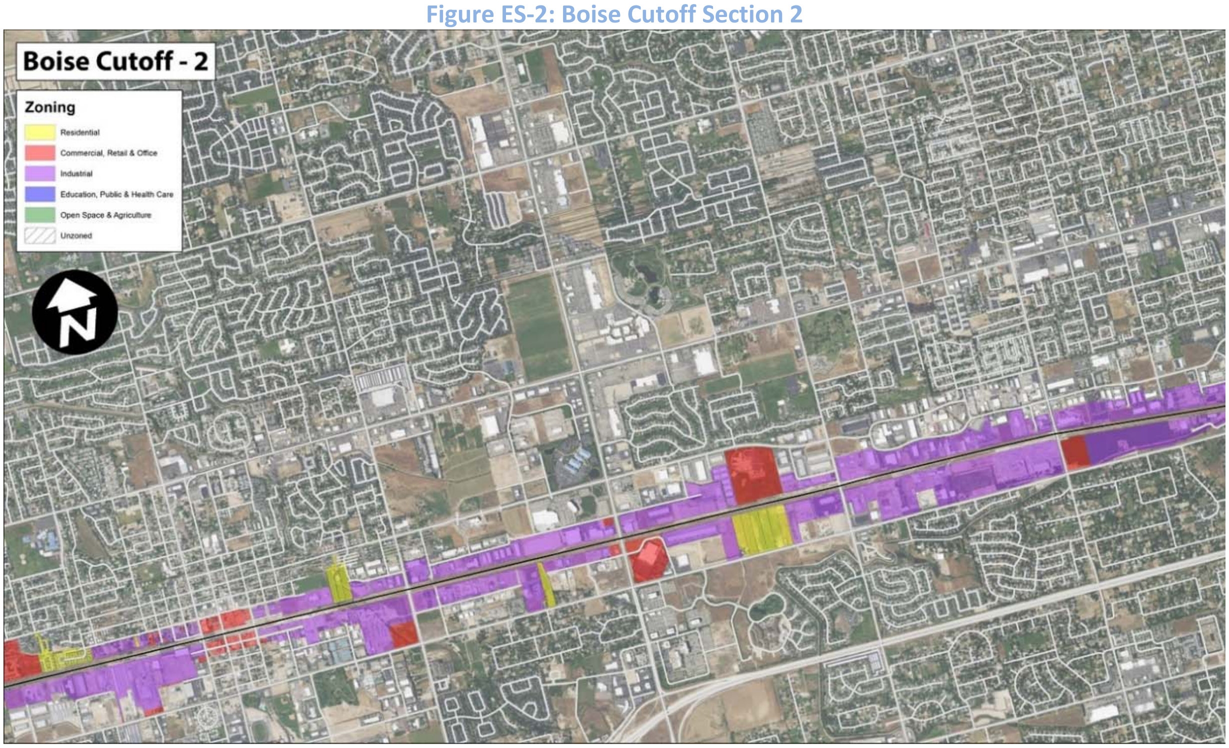
2. Which businesses use rail for freight delivery?

Businesses in the COMPASS region rely on freight rail to import and export 14,000 carloads each year. The top rail-moved commodities include lumber, agricultural, and chemicals, with an even balance between imports and exports. UPRR and BVRR serve local customers, with the majority served by BVRR on the Boise Cuttoff and Wilder Spurs. The number of businesses shipping by rail has remained steady, with some fluctuations from year-to-year. The number of carloads shipped varies significantly by specific customer and type, with some businesses shipping or receiving as many as 1,500 carloads per year and some only moving 1-2 carloads per year. The existing rail system and land uses could support significant growth to accommodate rail-dependent businesses. Economic developers and the railroads are examining options for a multimodal transload facility in the region to meet growing demand for truck-to-rail and rail-to-truck transfers of certain cargoes.

3. Which parcels are zoned for potential/future industrial/freight use along the spurs?

Using regional planning and zoning information, current zoning allows industrial uses to grow from seven percent to 17 percent, while the comprehensive plans allow an even greater increase to 21 percent. Industrial land in the study area is mainly concentrated in Boise, Nampa, and on county land along the western end of the Boise Cutoff and along the two industrial leads. Zoning and planning efforts continue this theme, with most growth allowed in those same areas. A majority of the existing industrial land will remain intact, existing as a conforming use through zoning and planning. Some existing industrial land is slated to be converted to other uses, while a larger portion of the existing non-industrial land will be converted to industrial. These zoning and planning efforts allow for growth of industrial land within the study area into the future and should continue to be designated as such and not be changed to other land uses due to development pressures. The following figure illustrates the current zoning along a section of the Boise Cutoff.

Figure ES-2: Boise Cutoff Section 2



Source: Parametrix Land Use Analysis, 2017.

1 Introduction

Key Chapter Takeaways

The Community Planning Association of Southwest Idaho (COMPASS) is conducting a freight study to support its long-range transportation plan, *Communities in Motion 2040*. The freight study is identifying freight corridors and related land use needs, developing a profile of the regionally most important commodities and supply chains, and identifying projects and/or policies to address maintenance needs, improve safety, and manage congestion. A key component of the study is the examination of the current land uses along the Union Pacific spurs in the region. This deliverable focuses on the rail land uses by answering the following key questions: 1) What is the current composition of industrial land and facilities along Union Pacific spurs? 2) Which businesses use rail for freight delivery? and 3) Which parcels are zoned for potential/future industrial/freight use along the spurs?

1.1 Background

As the metropolitan planning organization (MPO) for the Boise-Nampa area, the Community Planning Association of Southwest Idaho (COMPASS) is focused on integrating freight 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).

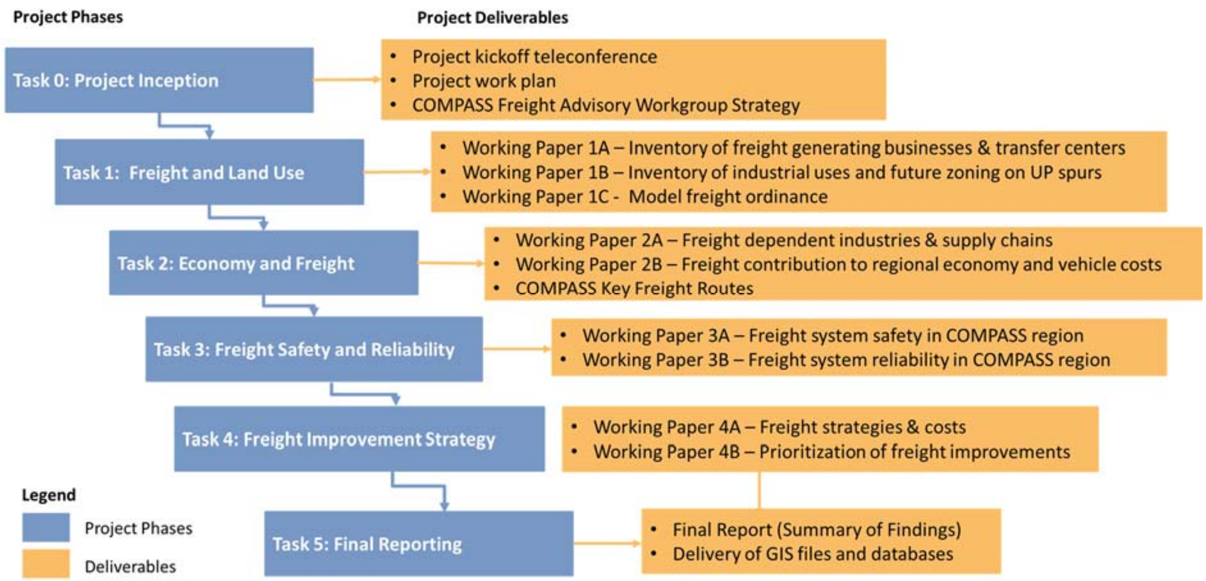
1.2 Objectives

As set out in the RFP, 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 projects and/or policies to address maintenance needs, improve safety, mitigate choke points, and manage congestion

1.3 Project Structure

The project is to be developed in five broad phases, as set out in the graphic below. Each of these phases has a series of deliverables.



1.4 Purpose of this Working Paper

As part of Task 1: Freight and Land Use, the purpose of this working paper is to identify industrial land and facilities along Union Pacific spur lines. Specifically, this working paper answers the key questions:

- What is the current composition of industrial land and facilities along Union Pacific spurs?
- Which businesses use rail for freight delivery?
- Which parcels are zoned for potential/future industrial/freight use along the spurs?

Specifically, in this working paper we examine land use and freight utilization of businesses along spurs operated by Union Pacific Railroad (UPRR) and the Boise Valley Railroad (BVRR), operated by WATCO. The desired outcome of the working paper is to provide a base of knowledge about current and future land uses along the rail spurs in the COMPASS region to inform transportation and land use decisions.

This working paper is also intended to provide COMPASS with an overview of progress to date and to solicit comments and other feedback on the structure and content of this component part of what will become the final report. Note that revisions to this working paper will be reflected in the Draft Final Report.

1.5 Methodology

This working paper was prepared through a combination of data analysis, field reconnaissance, and consultations with freight rail stakeholders. Given the key questions of the working paper, the most important data sources are the land use databases provided by COMPASS which reflect current and future zoning along the rail lines. Supplementing the COMPASS data, the team utilized aerial imagery (e.g. Google Earth) to confirm examine land uses and rail activity, including the presence of rail cars. The consulting team utilized a geographic information system (GIS) framework to analyze the land use data in relationship to the rail spurs. COMPASS also provided information on current land uses from its ongoing Rails to Trails initiative. Other important data sources included rail line data and business establishment data, which provide insight on the nature of businesses utilizing the spurs and the commodities they ship.

The team conducted extensive field reconnaissance to validate the data analysis and to identify additional insights related to current land uses and freight rail operations. Consultations with UPRR, WATCO, and rail shippers also informed the working paper.

1.6 Limitations

Some of the findings in this report are based on the analysis of third party data. While the study team makes efforts to validate data, the study team cannot warrant the accuracy of third party data.

2 Inventory of Land Uses along Railroad Spurs

Key Chapter Takeaways

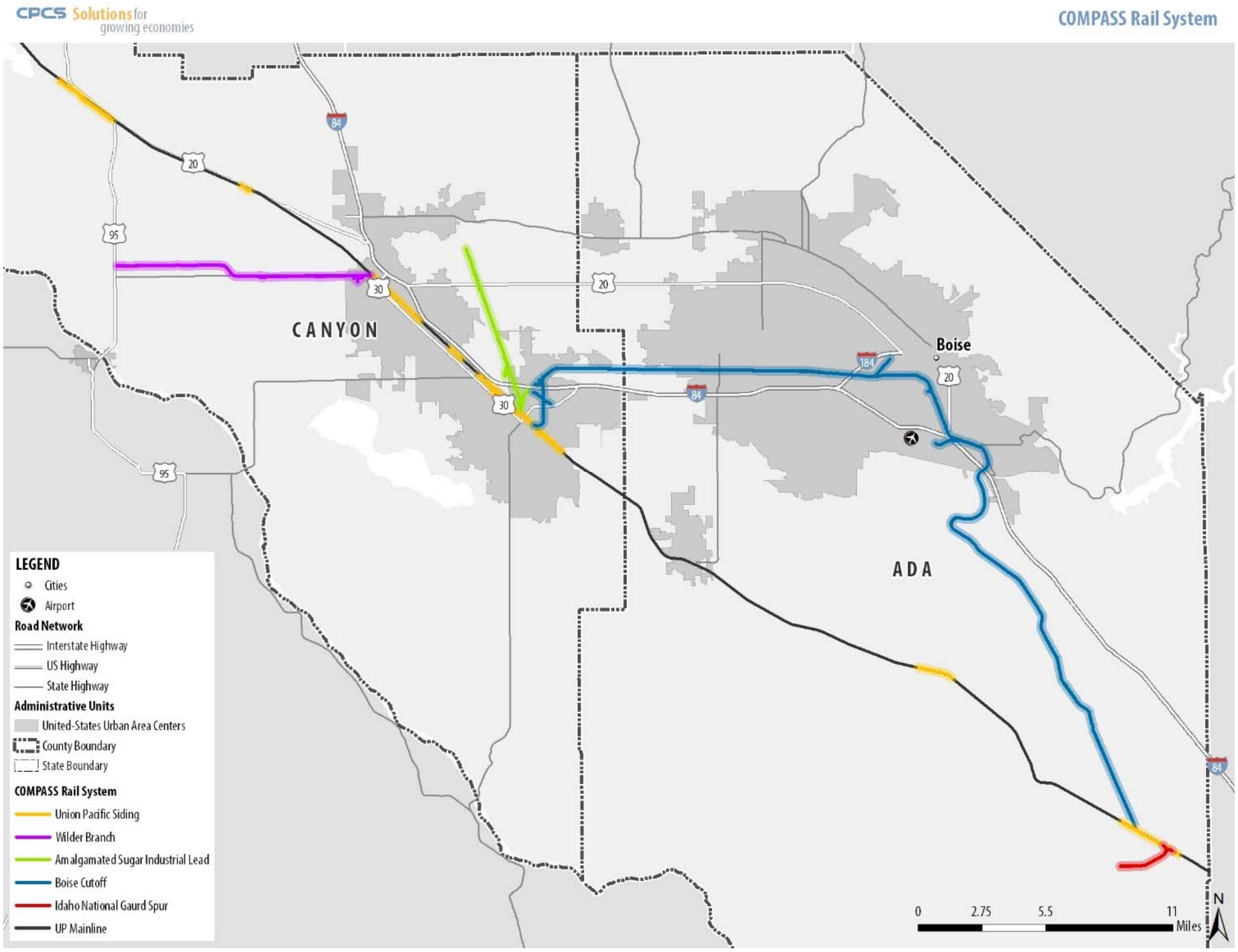
This chapter answers the question: What is the current composition of industrial land and facilities along Union Pacific spurs? As a first step, the study limits are defined as all parcels whose boundary is within 400 feet of an active rail spur in Ada and Canyon Counties. Under these criteria, this area is comprised of 4,697 parcels on 30,672 acres located along 121 miles of track. Major existing land uses in the study area are agriculture and open space (46 percent), public and government (26 percent), and industrial (10 percent). Based on an analysis of geographic information system data, we find that existing zoning and future comprehensive plans allow for industrial uses to increase with sufficient land set aside along Union Pacific Railroad and Boise Valley Railroad spurs in the COMPASS region.

2.1 Freight Rail in the COMPASS Region

Union Pacific Railroad (UPRR) and Boise Valley Railroad (BVRR) provide freight rail service in Ada and Canyon County, Idaho. 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 percent 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 COMPASS region with customers and suppliers across North America and globally through major maritime ports. Figure 2-1 shows the freight rail system in the COMPASS region.

Figure 2-1: COMPASS Region Freight Rail System



Source: Parametrix analysis of railroad information.

2.2 Study Area

This working paper focuses specifically on four individual rail spurs as well as multiple sidings along the UP main line in the COMPASS region. These industrial spurs serve a diverse customer base along the rapidly suburbanizing corridor between Nampa and Boise (e.g. on the Boise Cut-Off) and reach agricultural and manufacturing customers on other spurs in the region. In total the spurs and sidings contain approximately 121 miles of track accessing nine municipalities and several unincorporated areas in Ada and Canyon Counties. Figure 2-2 below briefly describes each rail spur.

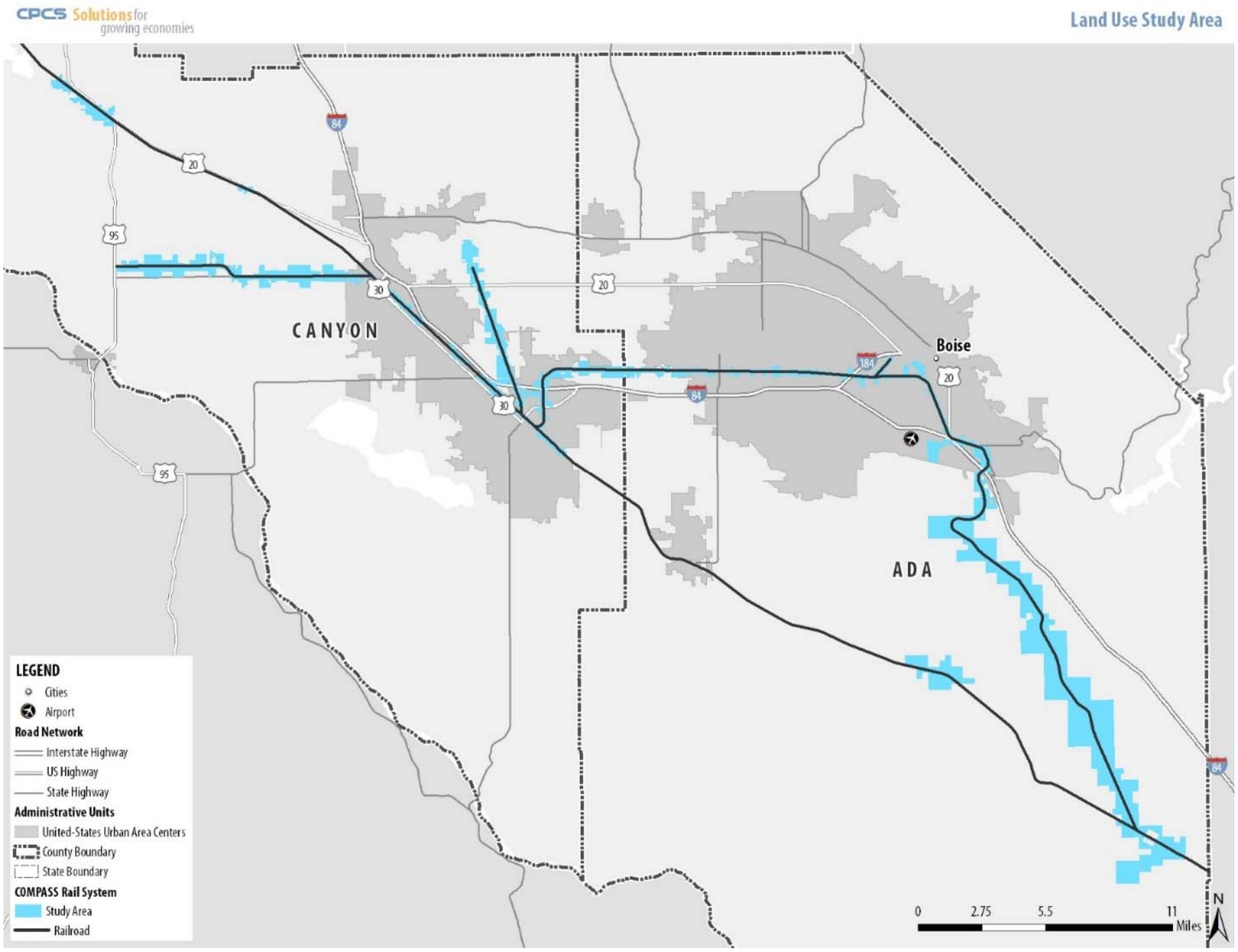
Figure 2-2: Rail Spurs List and Description

Rail Spur	Description
Amalgamated Sugar Industrial Lead	The Amalgamated Sugar Industrial Lead contains 11 miles of track extending north off the UP main line in Nampa, servicing Nampa, Middleton, and unincorporated county land in Fischer and Maddens. The Amalgamated Sugar Industrial Lead is served by the UP.
Boise Cut-off	Containing 50 miles of track, the Boise Cut-off services industrial uses in Nampa, Meridian, and Boise. It extends from the UP main line in Nampa, east through Meridian and Boise, and then turns southwards where it eventually connects back to the UP main line in Orchard. The Boise Cut-off also contains several of its own spurs and sidings and is served by the BVRR.
Idaho National Guard Spur	The Idaho National Guard Spur is a short section which extends south and west off the UP main line in Orchard. This spur services the Idaho National Guard Orchard Combat Training Center with more than three miles of track and is served by the UP.
UP Main Line Spurs	The remaining 44 miles of track are spread in several sections along the UP main line, servicing Parma, Notus, Caldwell, Nampa, and county land in Owyhhee and Orchard. These spurs and sidings are served by the UP.
Wilder Branch	The Wilder Branch contains 13 miles of track which services Caldwell, Greenleaf, and Wilder. It heads west off the UP main line in Caldwell, and heads due west, terminating in Wilder. The Wilder Branch is served by the BVRR.

Source: Parametrix Land Use Analysis, 2017.

For the purposes of this study, land uses were inventoried along the Union Pacific (UP) Railroad and Boise Valley Railroad (BVRR) spurs in the COMPASS region. The study area was defined as all parcels whose boundary is within 400 feet of an active rail spur. This area is comprised of 4,697 parcels on 30,672 acres. Figure 2-3 shows the study area and the rail spurs it envelops.

Figure 2-3: Study Area with Rail Spurs



Source: Parametrix Land Use Analysis, 2017.

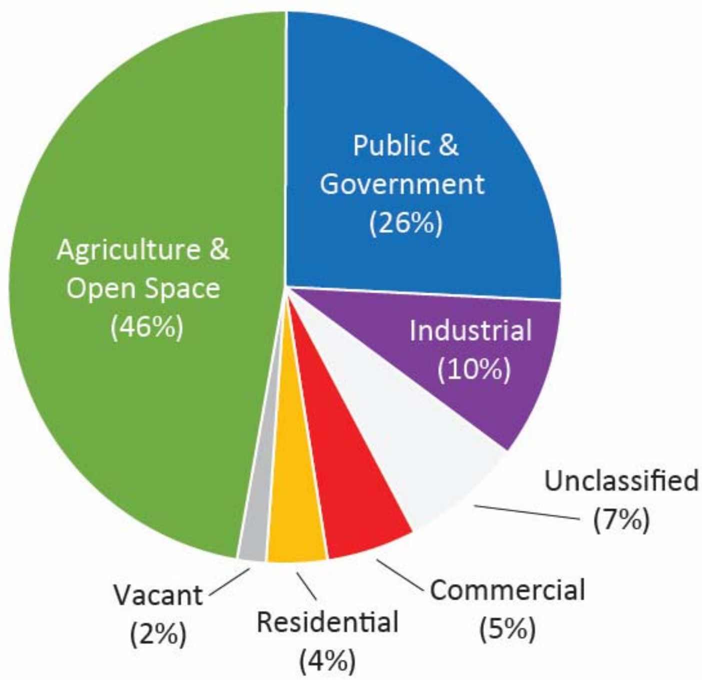
2.3 Existing Land Use

Major existing land uses in the study area are agriculture and open space (46 percent), public and government (26 percent), and industrial (10 percent). While public and government land makes up a significant portion of the land use in the study area, a majority of this land has been found to be publically held open space to the south and east of Boise. Figure 2-4 shows the composition of existing land uses in the study area.

Industrial land within the study area totals 2,937 acres. Canyon County contains 2,218 acres of industrial land in the study area, an industrial land concentration of 22 percent. In Canyon County most of the industrial land is found in Nampa and unincorporated county land, comprising of 34 percent and 33 percent of all industrial land respectively.

Figure 2-5 shows industrial land totals and concentration by jurisdiction. The industrial land concentration is the proportion of industrial land to all land in the study area. Twenty-four percent of all the industrial land in the study area is found in Ada County, where the industrial land concentration is only three percent. This low concentration is explained by the low levels of development in southeast Ada County. A majority of the industrial land in Ada County is found in Boise, containing 18 percent of the total. Meridian contains less of the total industrial land, but the industrial land is more concentrated there, with 28 percent concentration as opposed to Boise's 19 percent.

Figure 2-4: Existing Land Use Composition



Source: Parametrix Land Use Analysis, 2017.

Canyon County contains 2,218 acres of industrial land in the study area, an industrial land concentration of 22 percent. In Canyon County most of the industrial land is found in Nampa and unincorporated county land, comprising of 34 percent and 33 percent of all industrial land respectively.

Figure 2-5: Industrial Land by Municipality

Jurisdiction	Existing Industrial Land Use (acres)	Percent of Total Industrial Land	Industrial Land Concentration (proportion of industrial land to all land)
Boise	534	18%	19%
Meridian	182	6%	28%
County	2	0%	0%
Ada County Total	**718**	**24%**	**3%**
Caldwell	255	9%	28%
Greenleaf	0	0%	0%
Middleton	0	0%	0%
Nampa	985	34%	38%
Notus	0	0%	0%
Parma	15	1%	7%
Wilder	3	0%	3%
County	960	33%	16%
Canyon County Total	**2,218**	**76%**	**22%**
Total	**2,936**	**100%**	**10%**

Source: Parametrix Land Use Analysis, 2017.

Figure 2-6 shows industrial land by rail spur. The Boise Cut-off contains the most industrial land, but given that it is the longest spur and passes through large undeveloped areas, the industrial land concentration is relatively low at six percent. 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 percent, a total of 794 acres. This is followed by the Wilder Branch, and UP main line spurs, with 18 percent (684 acres), and nine percent (437) respectively.

Figure 2-6: Industrial Land by Rail Spur

Rail Spur	Existing Industrial Land Use (acres)	% of Total Industrial Land	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.

3 Business Shippers along Railroad Spurs

Key Chapter Takeaways

Businesses in the COMPASS region rely on freight rail to import and export 14,000 carloads each year. The top rail-moved commodities include lumber, agricultural, and chemicals, with an even balance between imports and exports. UPRR and BVRR serve local customers, with the majority served by BVRR on the Boise Cuttoff and Wilder Spurs. The number of businesses shipping by rail has remained steady, with some fluctuations from year-to-year. The number of carloads shipped vary significantly by specific customer and type, with some businesses shipping or receiving as many as 1,500 carloads per year and some only moving 1-2 carloads per year. The existing rail system and land uses could support significant growth to accommodate rail-dependent businesses. Economic developers and the railroads are examining options for a multimodal transload facility in the region to meet growing demand for truck-to-rail and rail-to-truck transfers of certain cargoes.

3.1 Overview of Regional Freight Rail Demand

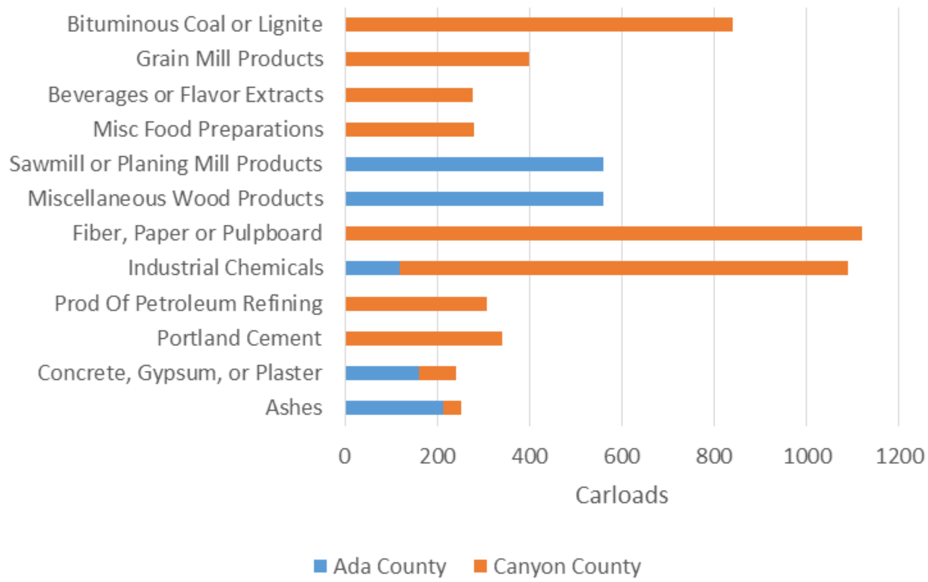
To provide context to the examination of business uses of the rail spurs in the COMPASS region, the team examined Transearch commodity flow data to identify total current regional rail flows. While it is not possible to identify the exact number of carloads generated on the spurs examined in this report, 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. Seventy-three percent of inbound carloads were to Canyon County, while fifty-eight percent of outbound carloads were from Canyon County. Figure 3-1 displays the top commodities shipped inbound by rail, along with the number of annual carloads. Figure 3-2 shows the top outbound commodities by rail.

The top inbound commodities include wood products, chemicals, agri-food products, oil/coal products, and raw materials for construction. The top commodities by carloads were fiber, paper and pulpboard; and industrial chemicals, with over 1,000 carloads each.

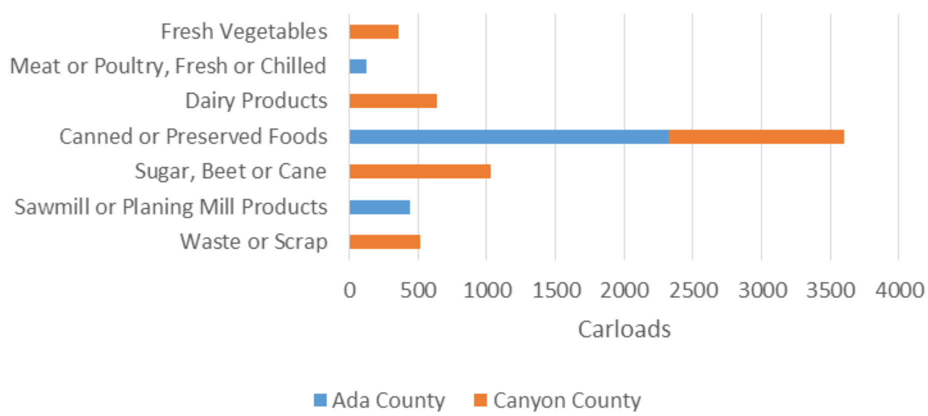
Outbound commodities consisted largely of food products, along with to a lesser extent wood products and waste/scrap. By far the largest outbound commodity is canned or preserved foods, at over 3,500 carloads (over half of all outbound carloads).

Figure 3-1: Top Commodities Shipped Inbound by Rail



Source: Transearch via TREDIS (2013)

Figure 3-2: Top Commodities Shipped Outbound by Rail



Source: Transearch via TREDIS (2013)

Figure 3-3 displays the breakdown of inbound versus outbound rail shipments for the region (Ada plus Canyon Counties). Volume (tonnage) shows an imbalance favoring the inbound direction, while value indicates the opposite – an imbalance toward outbound flows. Thus in general low-value products are flowing into the region by rail, and higher-value products are flowing out. The commodities moving into, out of, and within the region will be explored in further depth in future working papers.

Figure 3-3: Inbound vs. Outbound Rail Shipments, for Region

	Inbound	Outbound
Carloads	7,024	6,924
Volume (ktons)	646	493
Value ($M)	$389	$460

Source: Transearch via TREDIS (2013)

3.2 Businesses Utilizing the Rail Corridors

This chapter focuses on the key question: Which businesses use rail for freight delivery? To answer this question, the team utilized business establishment data, commodity flow data for the region, field reconnaissance, and consultations.

The BVRR serves 84 customers, of which, between 60 and 70 are currently active. There is wide variation in the number of rail cars generated by customer. Some customers may ship or receive only 1 to 2 carloads per year while others may generate 1,500 carloads per year. The 2013 Idaho State Rail Plan estimated that together, the Boise Cutoff and Wilder Branch generated 8,704 carloads in 2012 and forecast that the number would increase to 12,418 by 2013.

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.

3.3 Rail Customer Operations

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. 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.

3.4 Business Clusters on Corridor

Freight-rail-served businesses are located in clusters of activity along the rail spurs in the region. Along the Boise Cutoff, rail shippers are located in the following four major clusters:

- Nampa – serving multiple products, including asphalt and chemicals
- Meridian – several lumber customers
- Station Beatty (within the City of Boise) – lumber and ethanol on spur
- Gilcrest – (on the eastern end of the line), principally serving lumber customers

Dispersed between these four clusters are other active rail sidings providing services to multiple products. For example, Scentsy utilizes BVRR to provide wax in heated tank cars for production.

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 in onions in Parma and sugar beets and onions in Notus. Finally, the Idaho National Guard Spur is for military use.

Subsequent Working Papers, including 1A, Inventory of Freight-Generating Businesses and Transfer Centers and 2B, Freight-Dependent Industries and Supply Chains will provide additional detail and maps on the business clusters in the region.

3.5 Trends and Growth Opportunities

Local rail operations in the region are characterized by a steady customer base. Yet, the local rail business has been flat, with some fluctuation in small customers (e.g. losing one, adding another). The railroads operating in the COMPASS region believe that they are major growth opportunities if the land uses and rail service plans are synchronized in a way to attract additional industrial users.

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.

Of note, while intermodal container and trailer shipments have been among the fastest-growing rail shipment type in the U.S., shippers in the region continues to rely on intermodal transfer facilities outside the COMPASS 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.

The following section details future zoning and land use availability along the rail spurs.

4 Zoning and Future Land Uses

Key Chapter Takeaways

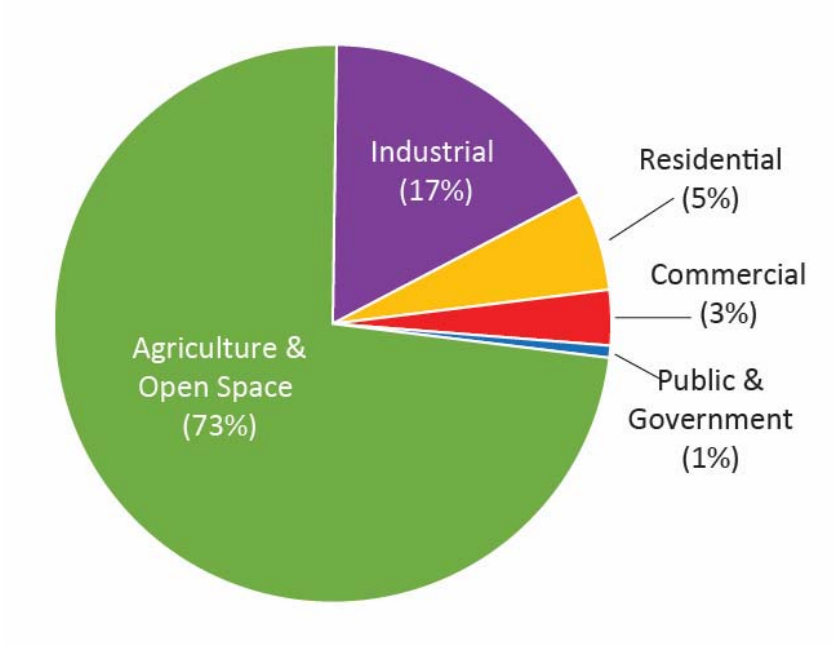
This section answers the question: Which parcels are zoned for potential/future industrial/freight use along the spurs? Using regional planning and zoning information, current zoning allows industrial uses to grow from 7 percent to 17 percent, while the comprehensive plans allow an even greater increase to 21 percent. Industrial land in the study area is mainly concentrated in Boise, Nampa, and on county land along the western end of the Boise Cut-off and along the two industrial leads. Zoning and planning efforts continue this theme, with most growth allowed in those same areas. A majority of the existing industrial land will remain intact, existing as a conforming use through zoning and planning. Some existing industrial land is slated to be converted to other uses, while a larger portion of the existing non-industrial land will be converted to industrial. These zoning and planning efforts allow for growth of industrial land within the study area into the future and should continue to be designated as such and not be changed to other land uses due to development pressures.

4.1 Potential/Future Industrial Land Use

This chapter answers the key question: Which parcels are zoned for potential/future industrial/freight use along the spurs?

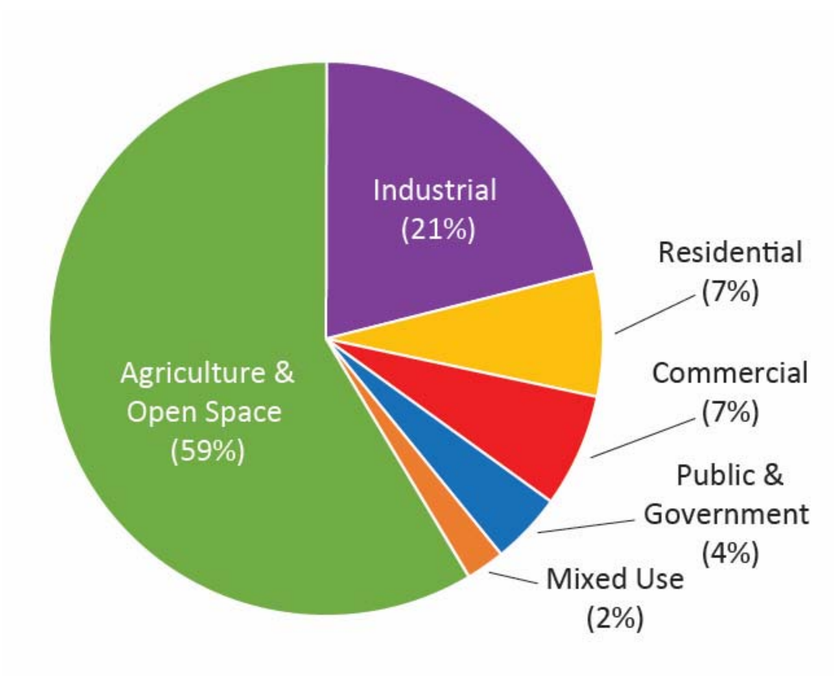
Utilizing regional planning documents and digital maps, the team analyzed the future potential for industrial development along the rail spurs in the COMPASS region. The analysis found that current zoning allows industrial uses to grow from seven percent to 17 percent, while the comprehensive plans allow an even greater increase to 21 percent. Figure 4-1 and Figure 4-2 show the land use composition for zoning and future land use respectively.

Figure 4-1: Zoning Composition



Source: Parametrix Land Use Analysis, 2017.

Figure 4-2: Comprehensive Plan Land Use Composition



Source: Parametrix Land Use Analysis, 2017.

Zoning allows for the most increases in industrial land in Ada County with a potential increase of 1,786 acres. Much of this increase is concentrated in Boise, where zoning allows for an additional 1,154 acres of industrial land. In Canyon County, zoning allows for an additional 586 acres of industrial land, with increases in most municipalities, and some decreases in the unincorporated county. Figure 4-3 shows zoned industrial land by jurisdiction.

Figure 4-3: Zoned and Comprehensive Plan Industrial Land by Jurisdiction

Jurisdiction	Existing Industrial Land	Zoned Industrial Land (acres)	Zoning Change from Existing
Boise	534	1,688	1,154
Meridian	182	417	235
County	2	399	397
Ada County Total	**718**	**2,504**	**1,786**
Caldwell	255	481	226
Greenleaf	0	0	0
Middleton	0	20	20
Nampa	985	1,311	326
Notus	0	31	31
Parma	15	187	172
Wilder	3	4	1
County	960	770	-190
Canyon County Total	**2218**	**2,804**	**586**
Total	**2,936**	**5,308**	**2,372**

Source: Parametrix Land Use Analysis, 2017.

Planning allows for less growth of industrial land in Ada County as compared to zoning, with less slated in Boise. Conversely, planning accounts for large increases in Canyon County, with much of this growth occurring on unincorporated county land. Figure 4-4 shows planned industrial land by jurisdiction.

Figure 4-4: Zoned and Comprehensive Plan Industrial Land by Jurisdiction

Jurisdiction	Existing Industrial Land	Planned Industrial Land (acres)	Planning Change from Existing
Boise	534	1,534	1,000
Meridian	182	189	7
County	2	559	557
Ada County Total	**718**	**2,282**	**1,564**
Caldwell	255	446	191
Greenleaf	0	0	0
Middleton	0	20	20
Nampa	985	1,381	396
Notus	0	31	31
Parma	15	0	-15
Wilder	3	0	-3
County	960	2,291	1,331
Canyon County Total	**2,218**	**4,169**	**1,951**
Total	**2,936**	**6,451**	**3,515**

Source: Parametrix Land Use Analysis, 2017.

When looking at zoning and future land use by rail spur, differences between them become apparent once again. Zoning allows all of its increases in industrial land uses along the Boise Cut-off and the UP main line, and calls for decreases along the Wilder Branch and the Amalgamated Sugar Industrial Lead. Planning similarly allows for the most industrial growth along the Boise Cut-off, but also allows for some growth along the two industrial leads as well as the main line. Figure 4-5 and Figure 4-6 show industrial zoned land and planned industrial land by rail spur, respectively.

Figure 4-5: Zoned Industrial Land by Rail Spur

Rail Spur	Existing Industrial Land	Zoned Industrial Land (acres)	Zoning Change from Existing
Amalgamated Sugar Industrial Lead	1,031	742	-289
Boise Cut-off	684	2,912	2,228
Idaho National Guard Spur	0	0	0
UP Main Line Spurs	437	1,086	649
Wilder Branch	794	596	-198
Total	**2,937**	**5,308**	**2,371**

Source: Parametrix Land Use Analysis, 2017.

Figure 4-6: Comprehensive Plan Industrial Land by Rail Spur

Rail Spur	Existing Industrial Land	Planned Industrial Land (acres)	Planning Change from Existing
Amalgamated Sugar Industrial Lead	1,031	1,485	454
Boise Cut-off	684	2,857	2,173
National Guard Spur	0	0	0
UP Main Line Spurs	437	905	468
Wilder Branch	794	1,226	432
Total	**2,937**	**6,450**	**3,513**

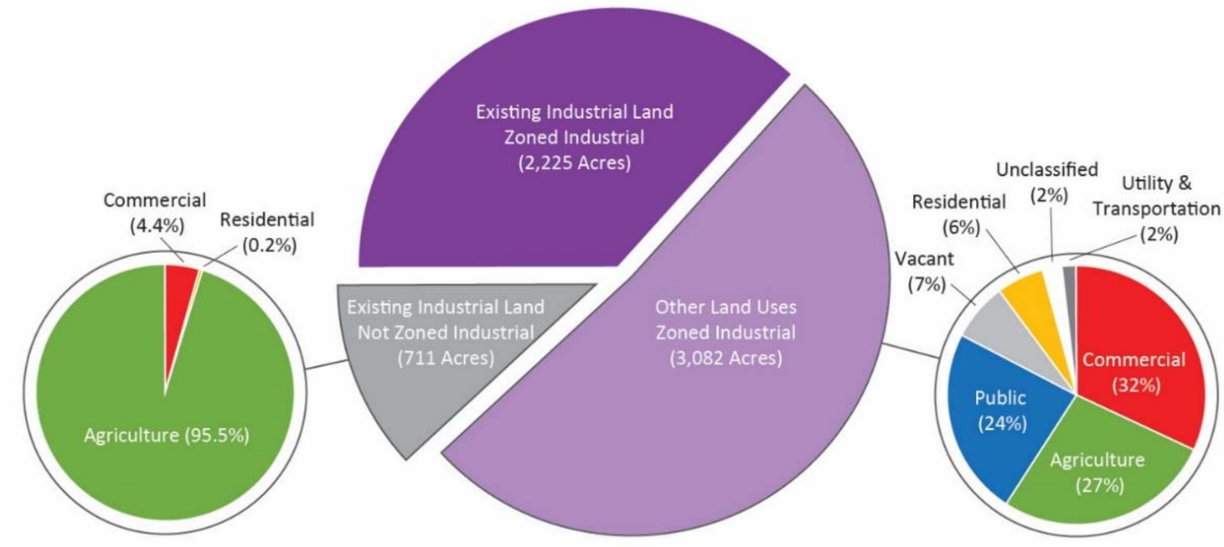
Source: Parametrix Land Use Analysis, 2017.

4.2 Industrial Change Analysis

In addition to examining future industrial land potential based on zoning and planning, the 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. Our analysis found that while industrial land use in the study area has the opportunity for net growth (allowed by existing zoning and comprehensive plans), some existing industrial land is still being lost while other non-industrial land uses are being converted to industrial in the process. This section details the potential changes.

Of the 2,937 acres of existing industrial land uses, 76 percent is currently zoned industrial. The other 24 percent is being lost through zoning to other uses. Conversely, 3,082 acres of industrial land is being gained through zoning, as non-industrial land uses and converted to industrial. Figure 4-7 shows the differences between existing and zoned industrial land, and shows the land use composition of land which is changing to and from industrial.

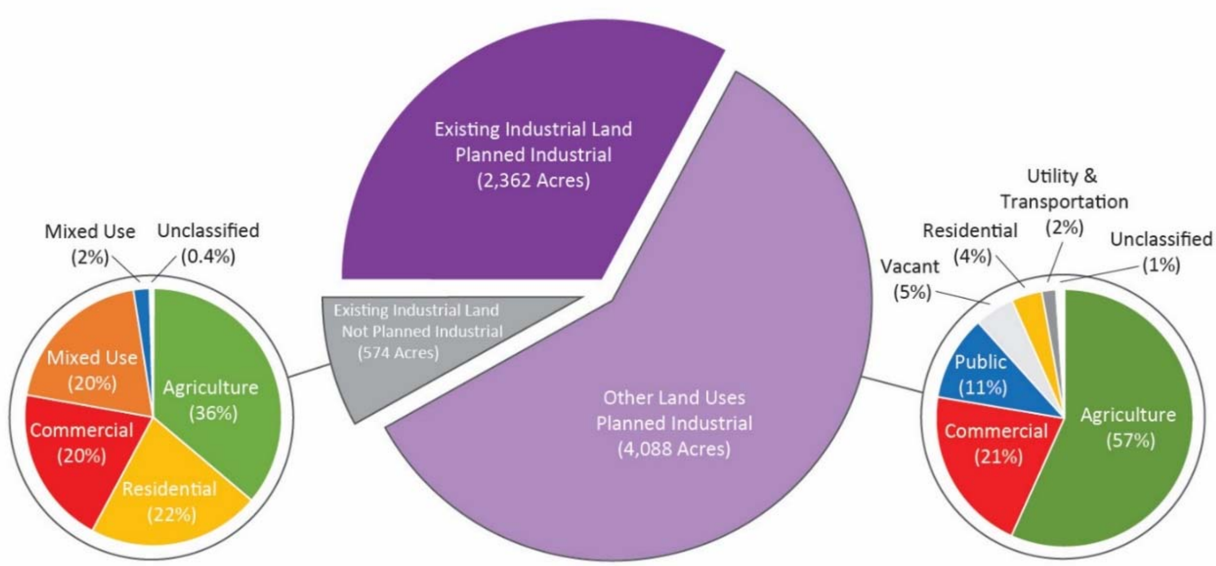
Figure 4-7: Existing Land Use and Zoning Comparison



Source: Parametrix Land Use Analysis, 2017.

Figure 4-8 displays the differences of existing land use to land uses planned for in comprehensive plans. A total of 6,450 acres of land is planned as industrial, 21 percent of all land in the study area. Thirty-six percent (2,362 acres) of this planned industrial land is comprised of existing industrial land, while the remaining 64 percent (4,088 acres) is comprised of other existing land types. Twenty percent (574 acres) of existing industrial land is not currently planned as industrial.

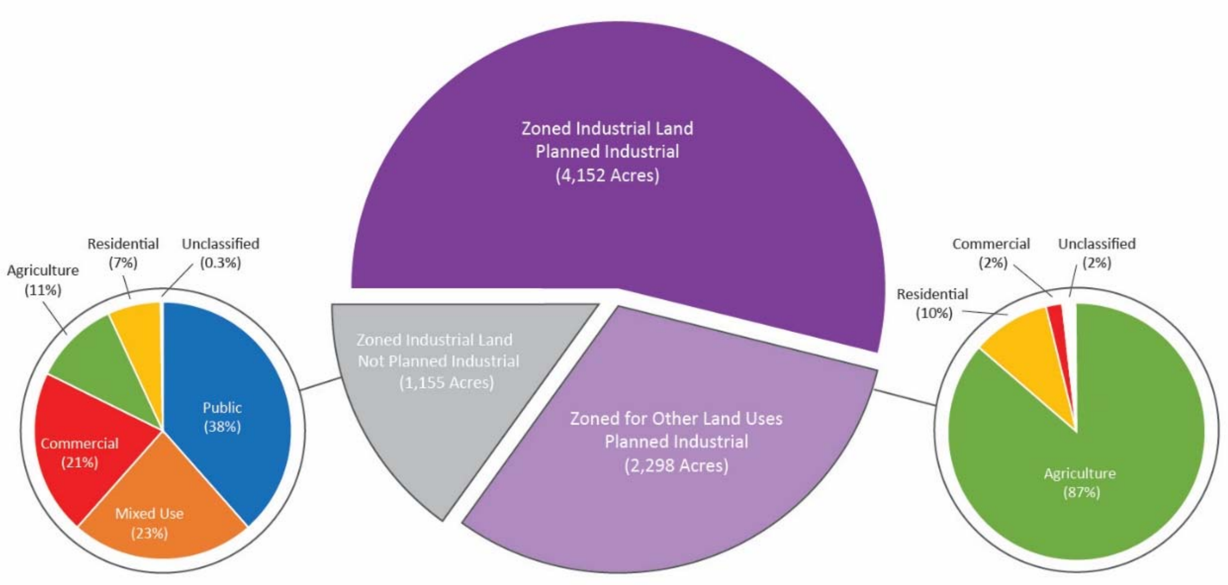
Figure 4-8: Existing Land Use and Comprehensive Plan Comparison



Source: Parametrix Land Use Analysis, 2017.

Finally, Figure 4-9 compares zoning to the comprehensive plans. Of the 6,610 acres of land planned as industrial, 63 percent is currently zoned industrial and 37 percent is zoned for other uses. Twenty-two percent (1,171 acres) of currently zoned industrial land is not being planned as industrial.

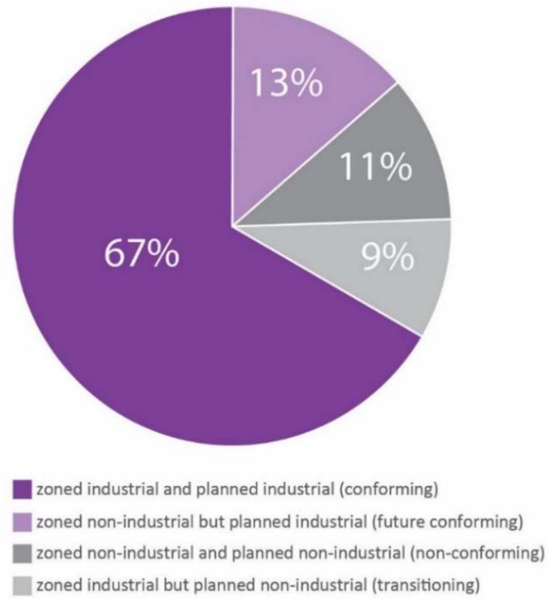
Figure 4-9: Zoning and Comprehenisve Plan Comparison



Source: Parametrix Land Use Analysis, 2017.

In addition to looking at how and what type of land is being converted to and from industrial uses, it is also important to look at existing and future conformance of existing industrial land. Figure 4-10 shows the conformance of industrial land now and into the future. Among all existing industrial land 67 percent is currently conforming, being both zoned and planned industrial. Thirteen percent is future conforming, industrial land which is not zoned industrial, but is planned industrial. Eleven percent is non-conforming, having non-industrial zoning and planned uses. And finally, nine percent is transitioning, industrial land which is zoned industrial, but is not planned industrial.

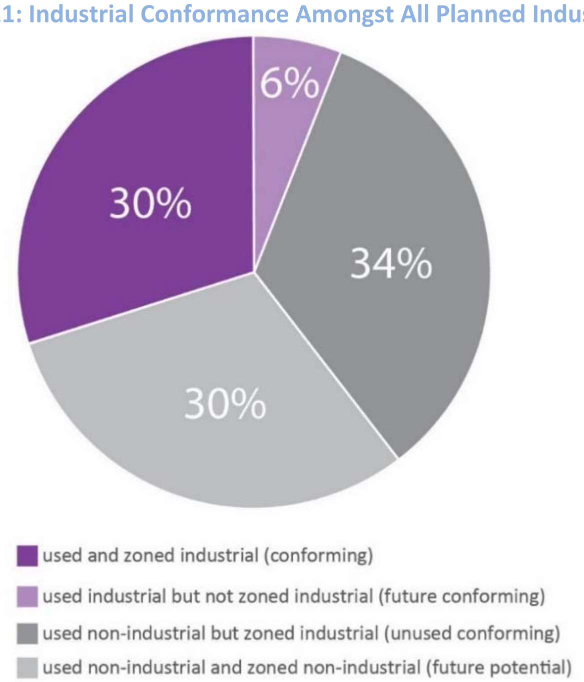
Figure 4-10: Industrial Conformance Amongst Existing Industrial Land



Source: Parametrix Land Use Analysis, 2017.

Figure 4-11 shows industrial conformance amongst all planned industrial land. Thirty percent is conforming, being both existing industrial and zoned industrial. Six percent is future conforming, land that is existing industrial, but not zoned industrial. Thirty-four percent is existing non-industrial land that is zoned industrial. And the last 30 percent is future potential industrial land which is neither existing nor zoned industrial.

Figure 4-11: Industrial Conformance Amongst All Planned Industrial Land



Source: Parametrix Land Use Analysis, 2017.

4.3 Land Use Summary

Industrial land in the study area is mainly concentrated in Boise, Nampa, and on county land along the western end of the Boise Cut-off and along the two industrial leads. Zoning and planning efforts continue this theme, with most growth allowed in those same areas. A majority of the existing industrial land will remain intact, existing as a conforming use through zoning and planning. Some existing industrial land is slated to be converted to other uses, while a larger portion of the existing non-industrial land will be converted to industrial. These zoning and planning efforts allow for growth of industrial land within the study area into the future and should continue to be designated as such and not be changed to other land uses due to development pressures.

4.4 Existing Land Use Maps

Figure 4-12 through Figure 4-21 show the existing land uses along the UP and BVRR spurs in the COMPASS region. The study area was defined as all parcels whose boundary is within 400 feet of an active rail spur.

Figure 4-12: Amalgamated Sugar Industrial Lead

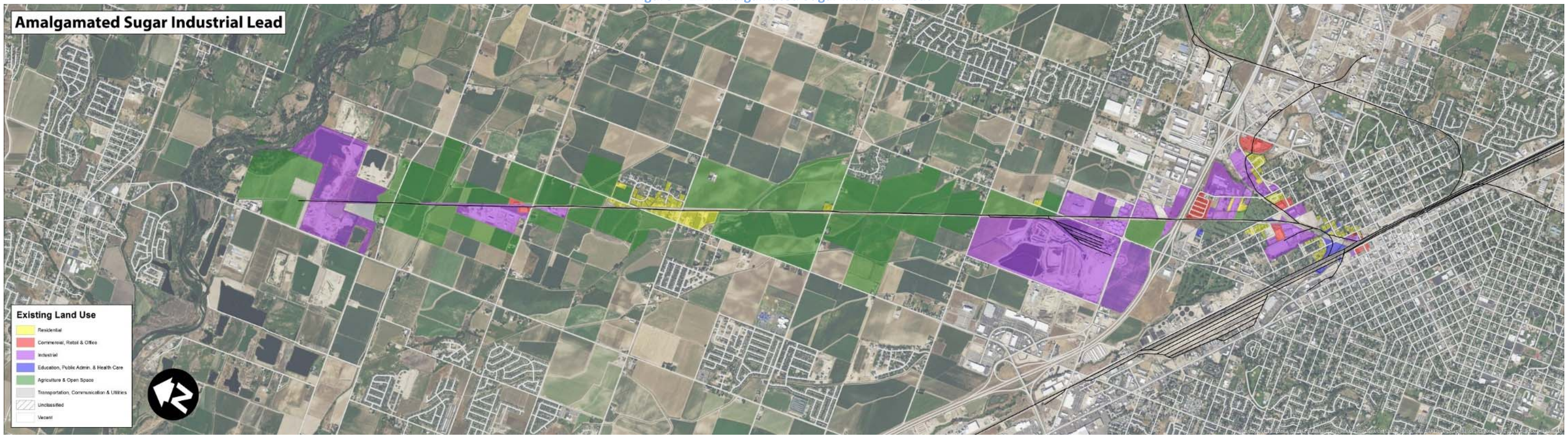


Figure 4-13: Boise Cutoff Section 1

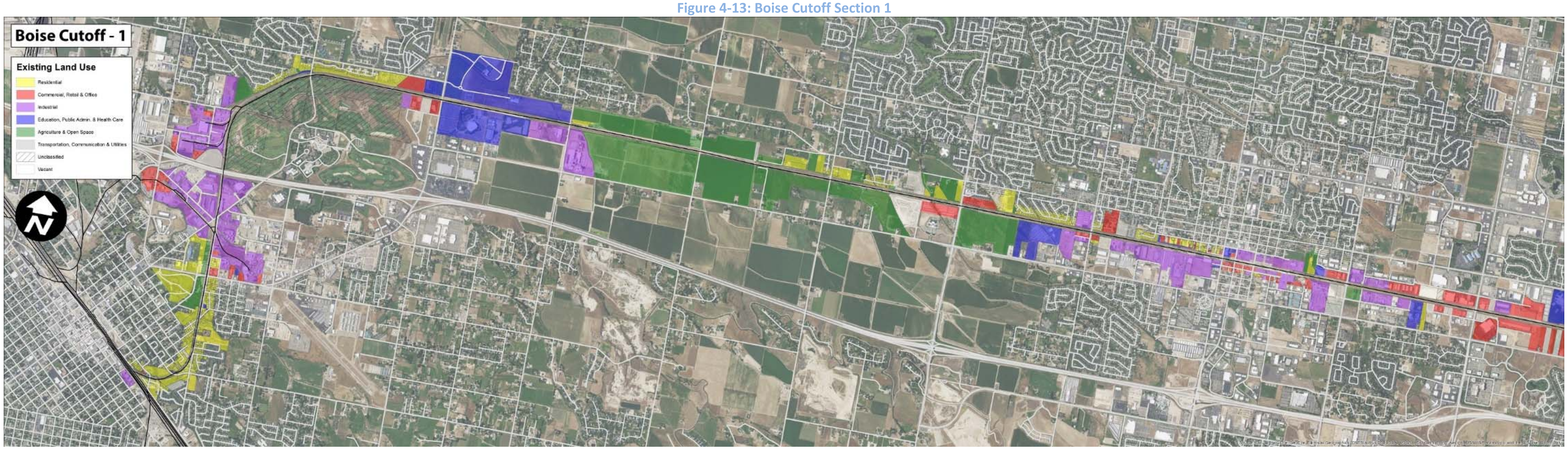


Figure 4-14: Boise Cutoff Section 2

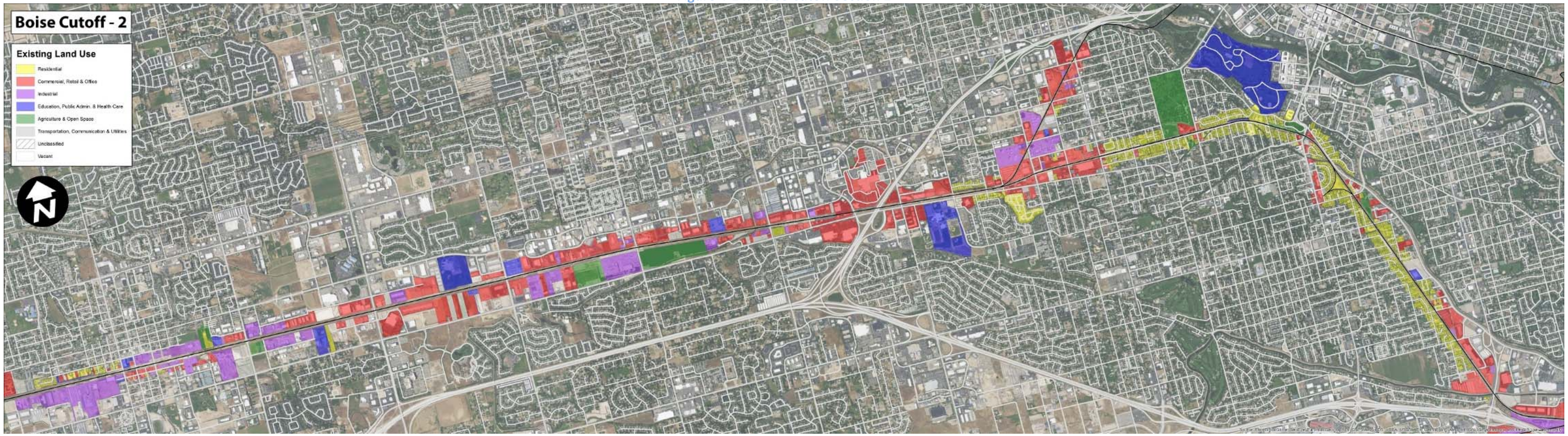


Figure 4-15: Boise Cutoff Section 3

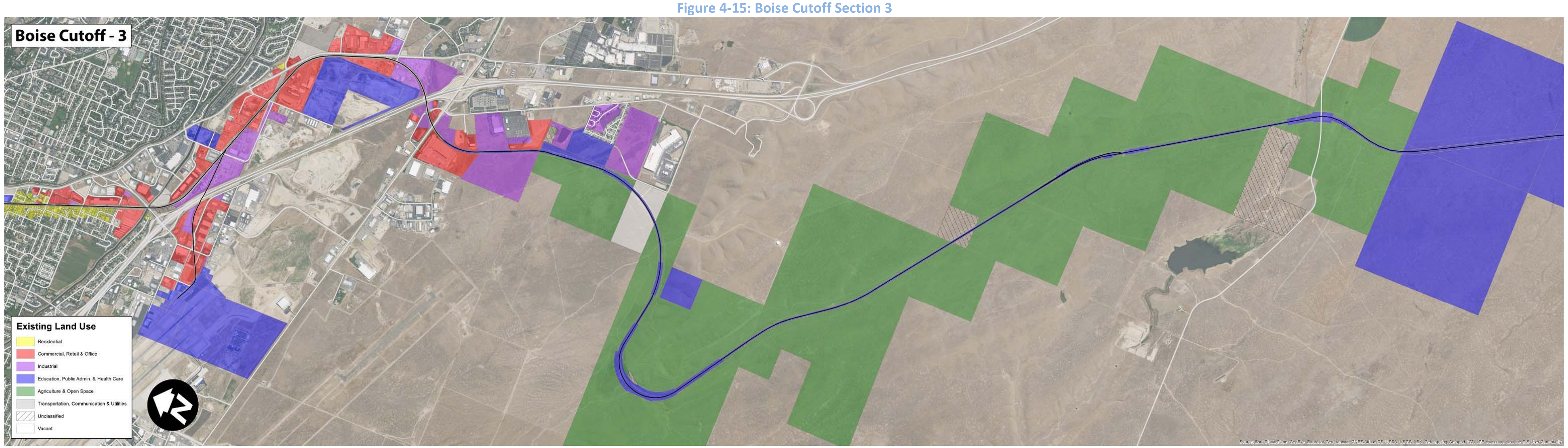


Figure 4-16: Boise Cutoff Section 4

Figure 4-17: Idaho National Guard Spur

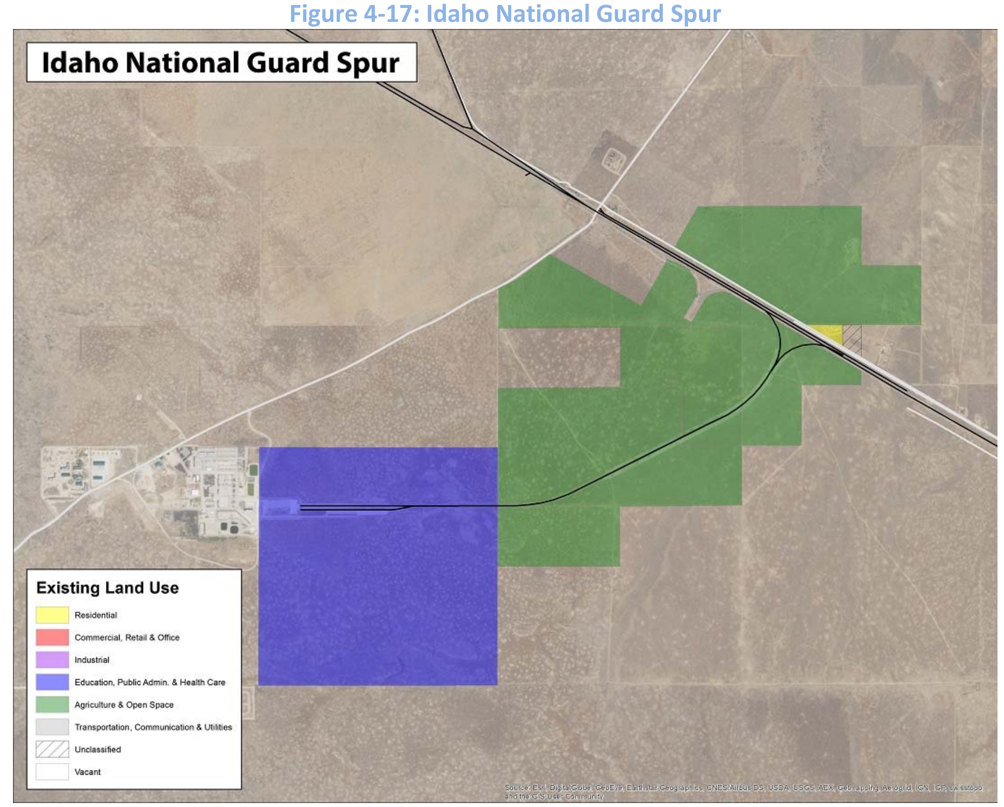


Figure 4-18: Main Line Section 1

Figure 4-19: Main Line Section 2

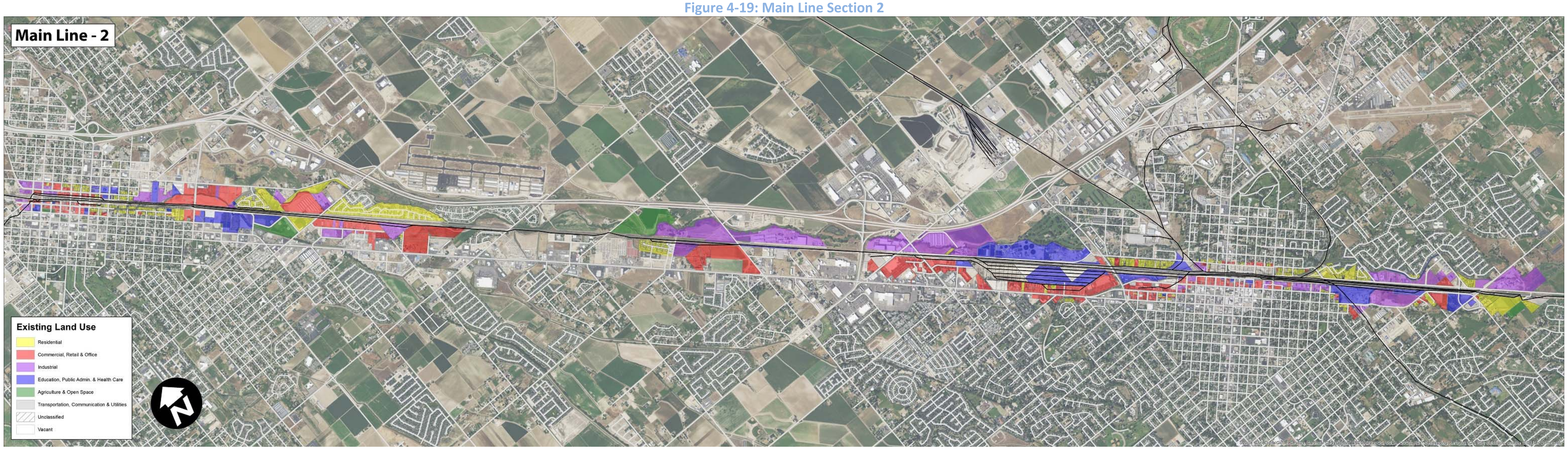


Figure 4-20: Main Line Section 3-4

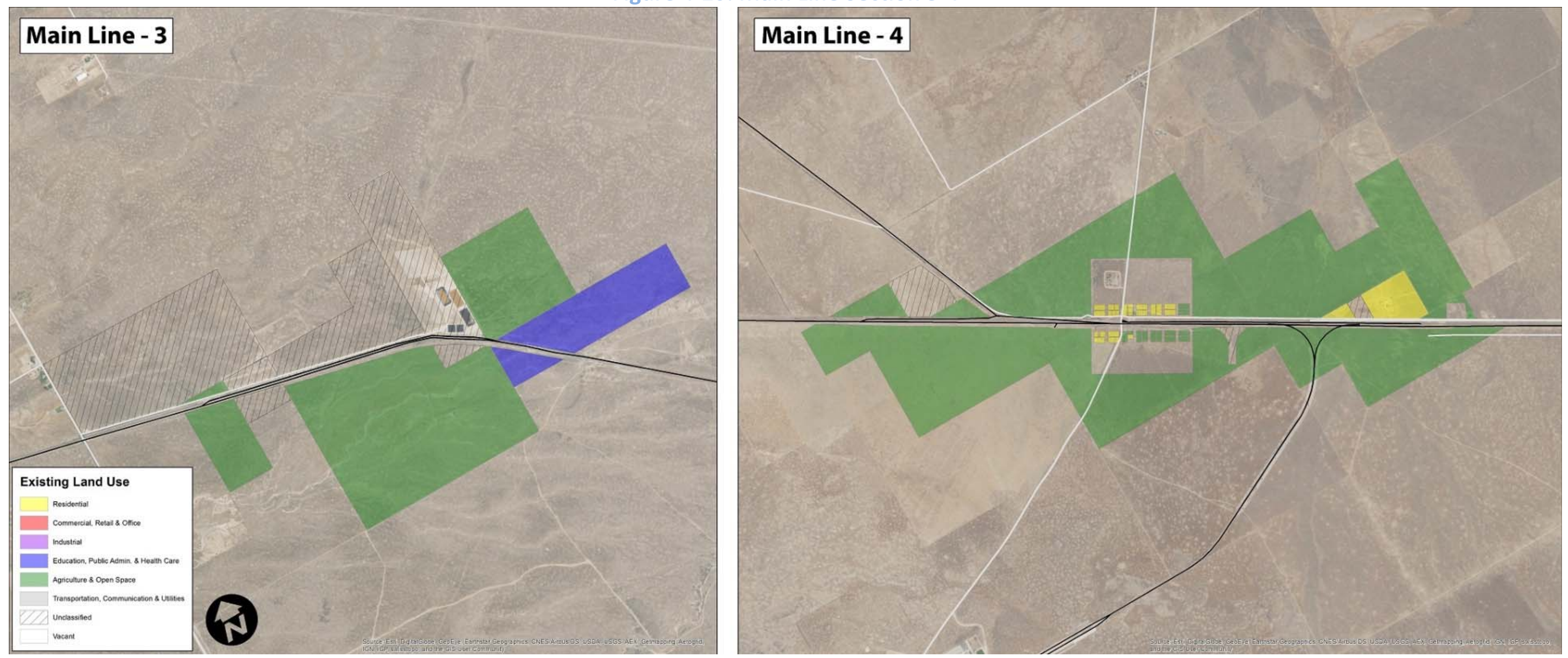
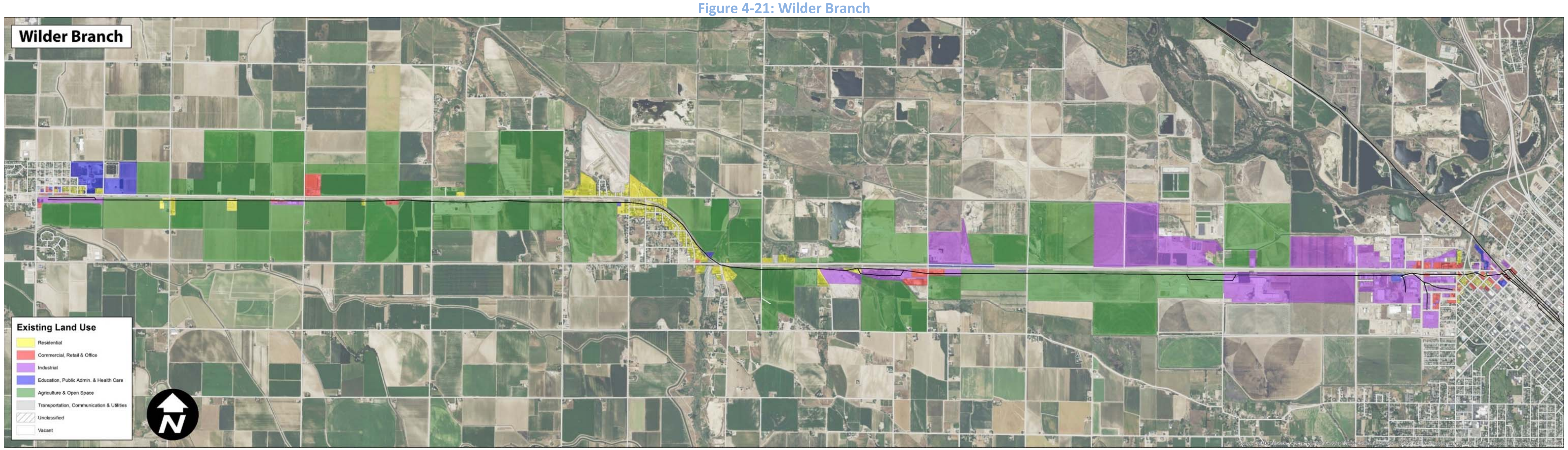


Figure 4-21: Wilder Branch



4.5 Zoning Maps

Figure 4-22 through Figure 4-31 show the zoning along the UP and BVRR spurs in the COMPASS region. The study area was defined as all parcels whose boundary is within 400 feet of an active rail spur.

Figure 4-22: Amalgamated Sugar Industrial Lead

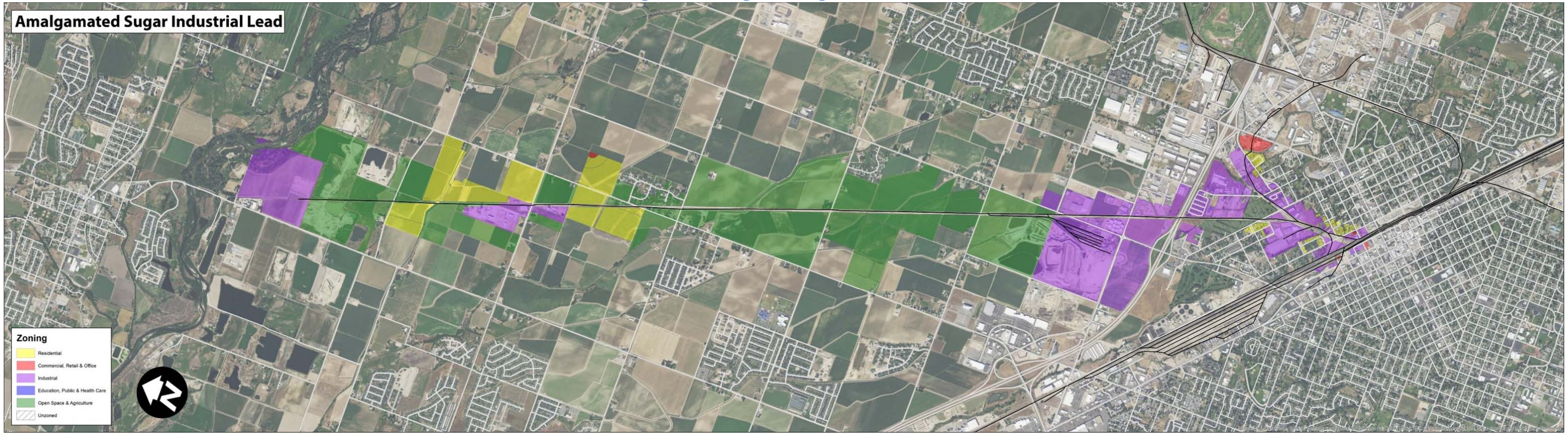


Figure 4-23: Boise Cutoff Section 1

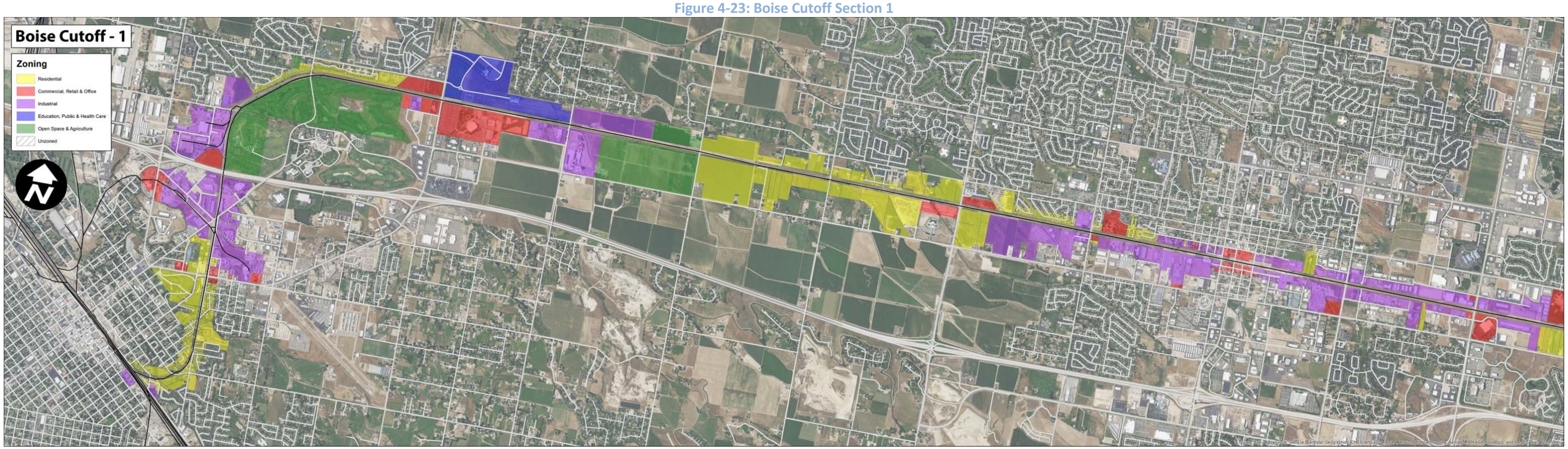


Figure 4-24: Boise Cutoff Section 2

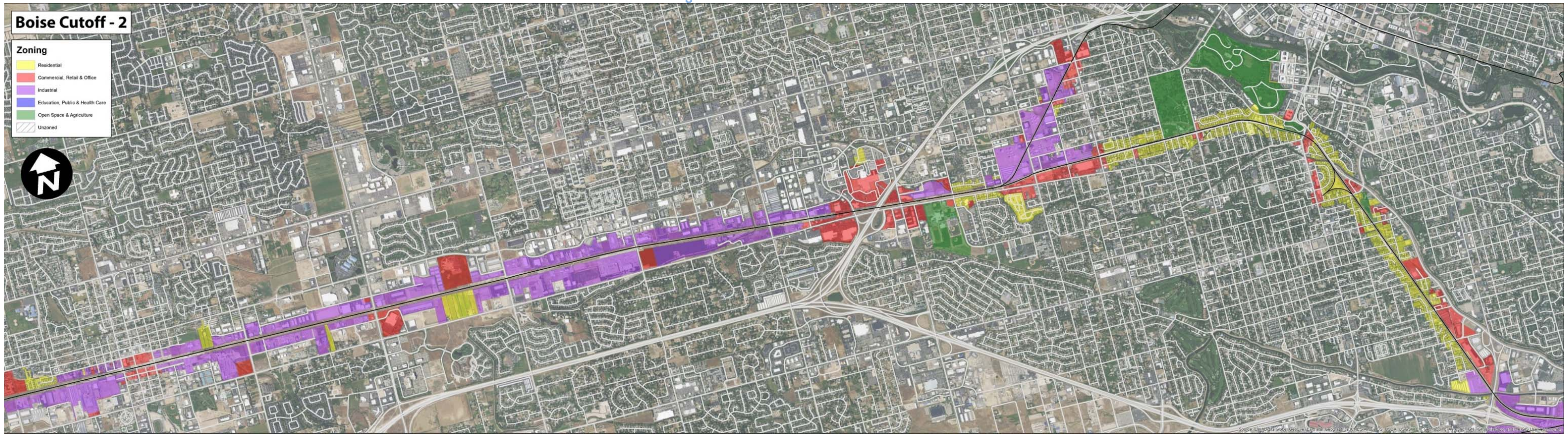


Figure 4-25: Boise Cutoff Section 3

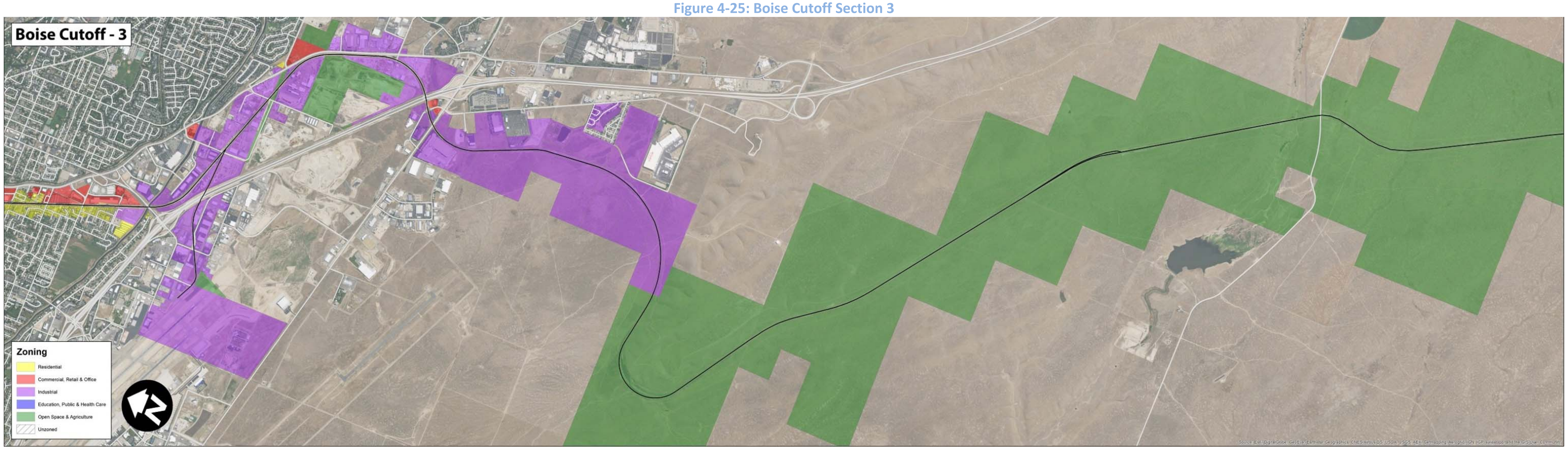


Figure 4-26: Boise Cutoff Section 4

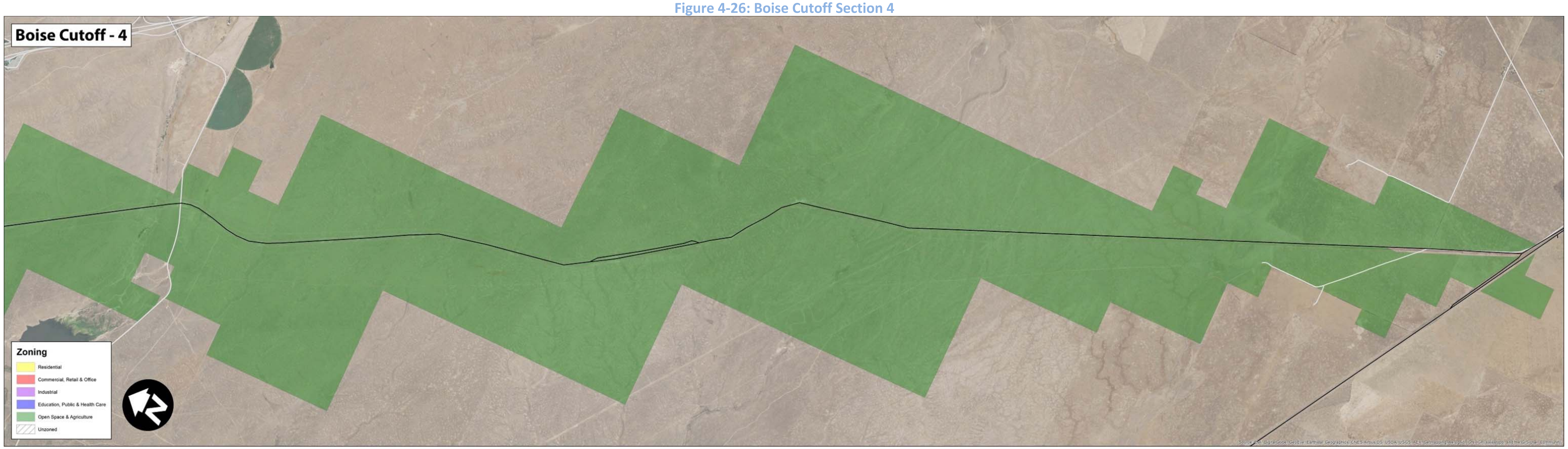


Figure 4-27: Idaho National Guard Spur

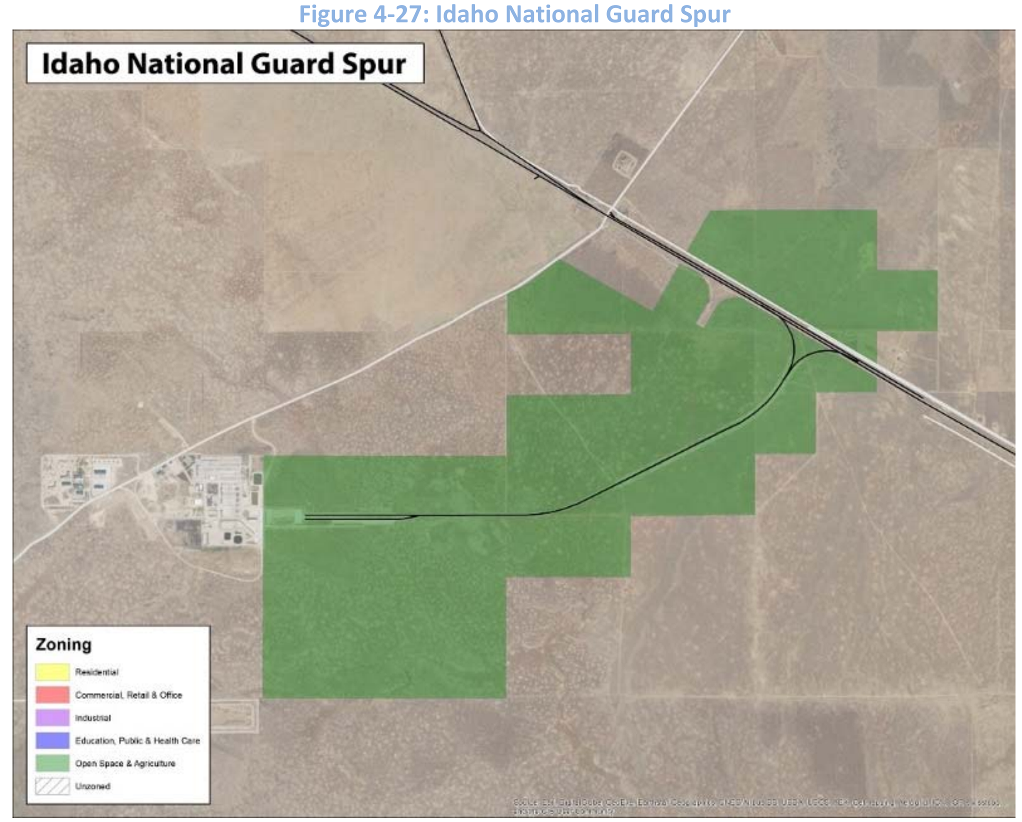


Figure 4-28: Main Line Section 1

Figure 4-29: Main Line Section 2

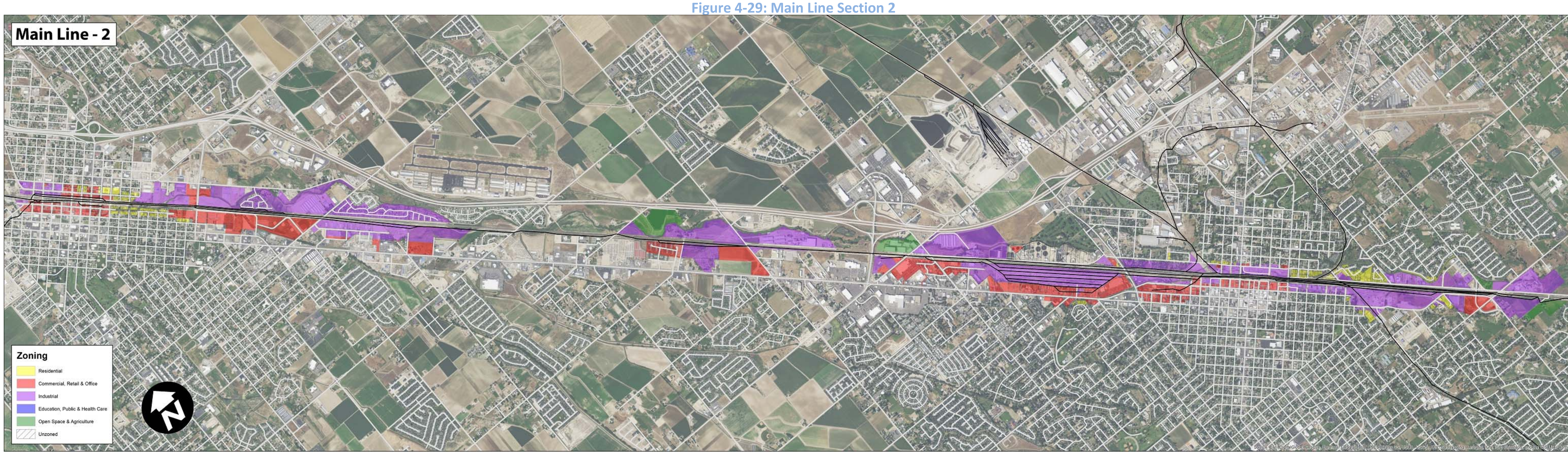


Figure 4-30: Main Line Section 3-4

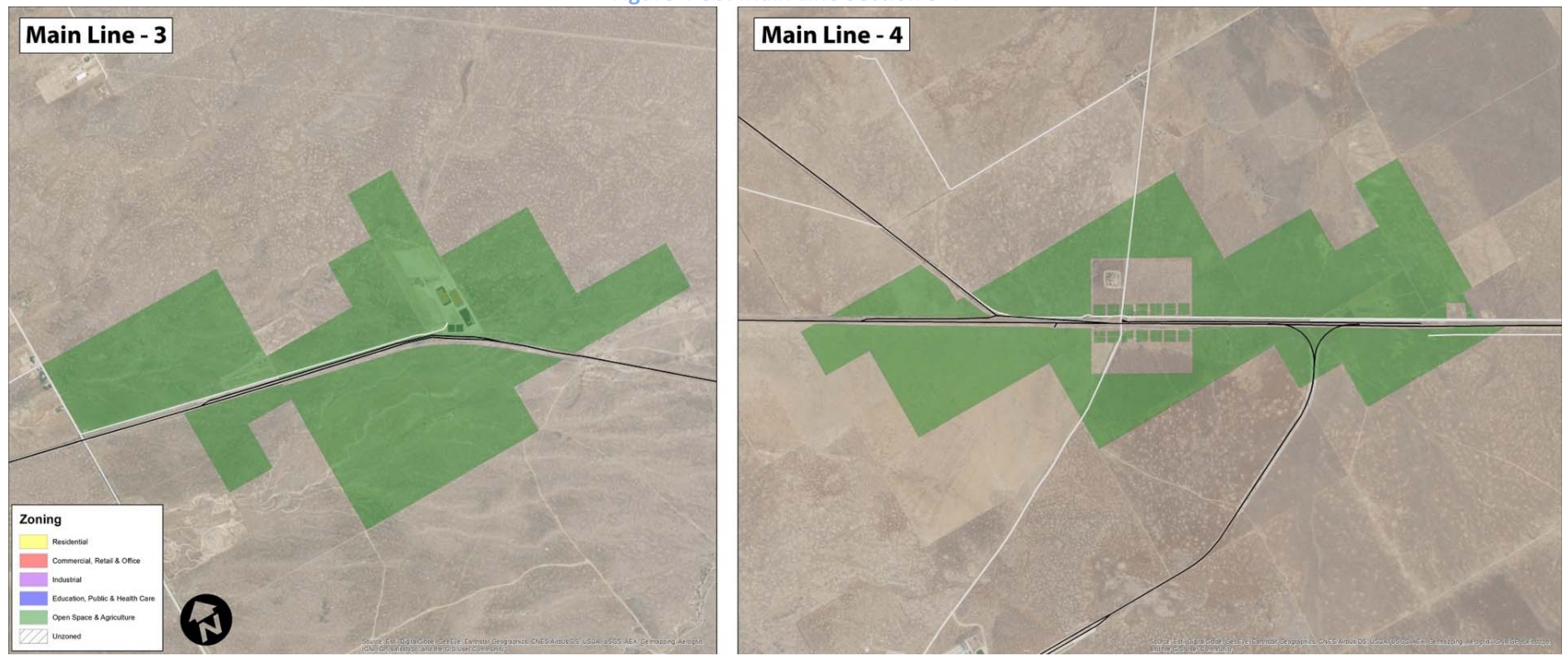
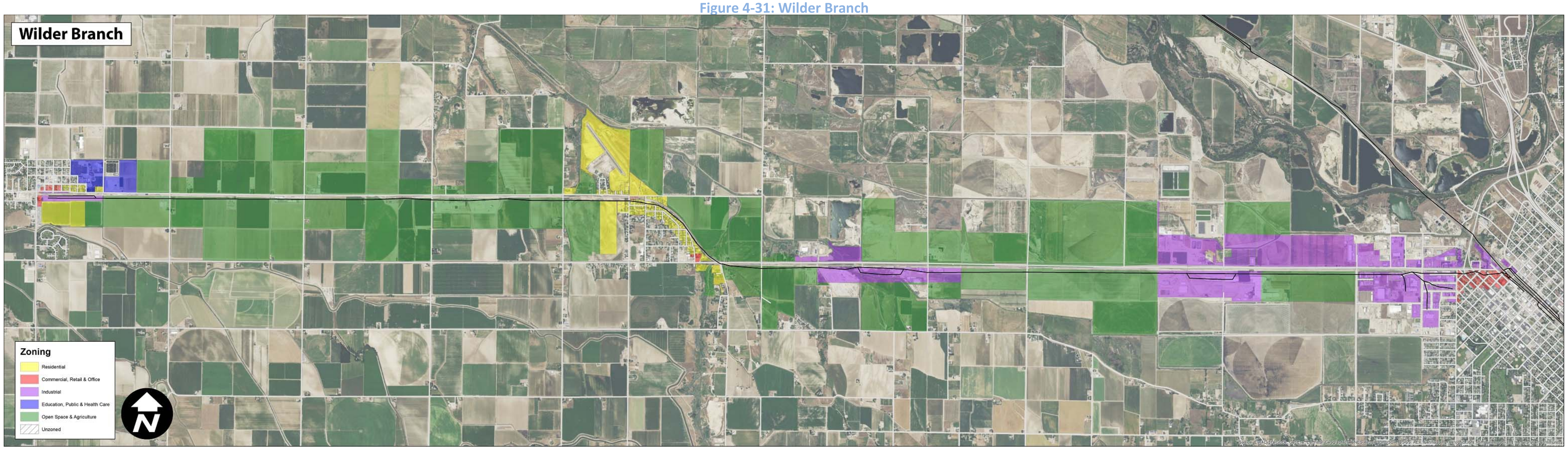


Figure 4-31: Wilder Branch



4.6 Comprehensive Plan Maps

Figure 4-32 through Figure 4-41 show the comprehensive plan future land use along the UP and BVRR spurs in the COMPASS region. The study area was defined as all parcels whose boundary is within 400 feet of an active rail spur.

Figure 4-32: Amalgamated Sugar Industrial Lead

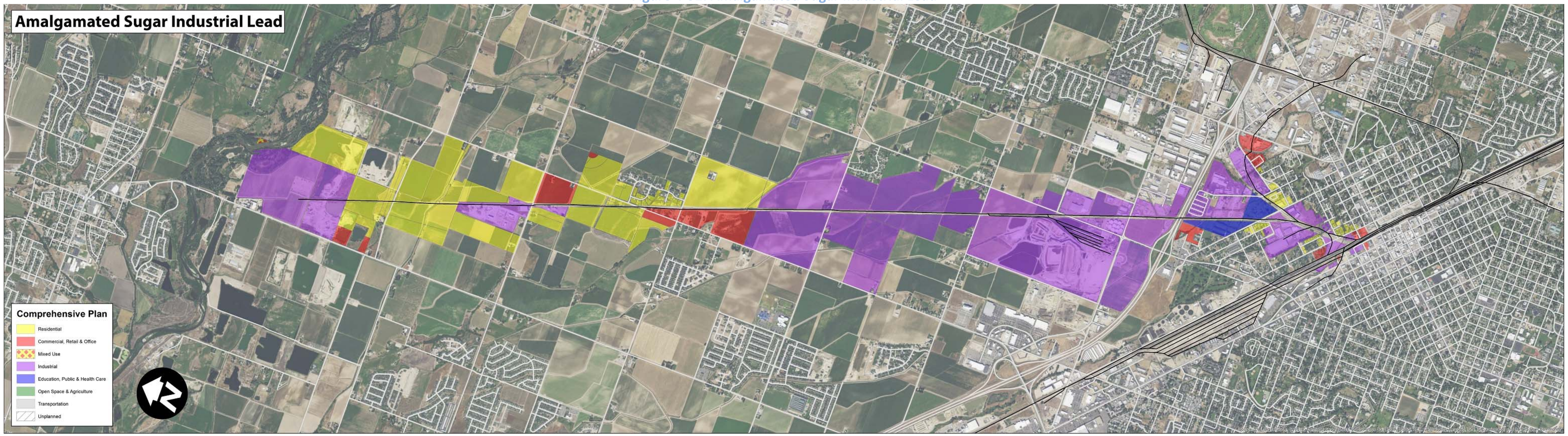


Figure 4-33: Boise Cutoff Section 1

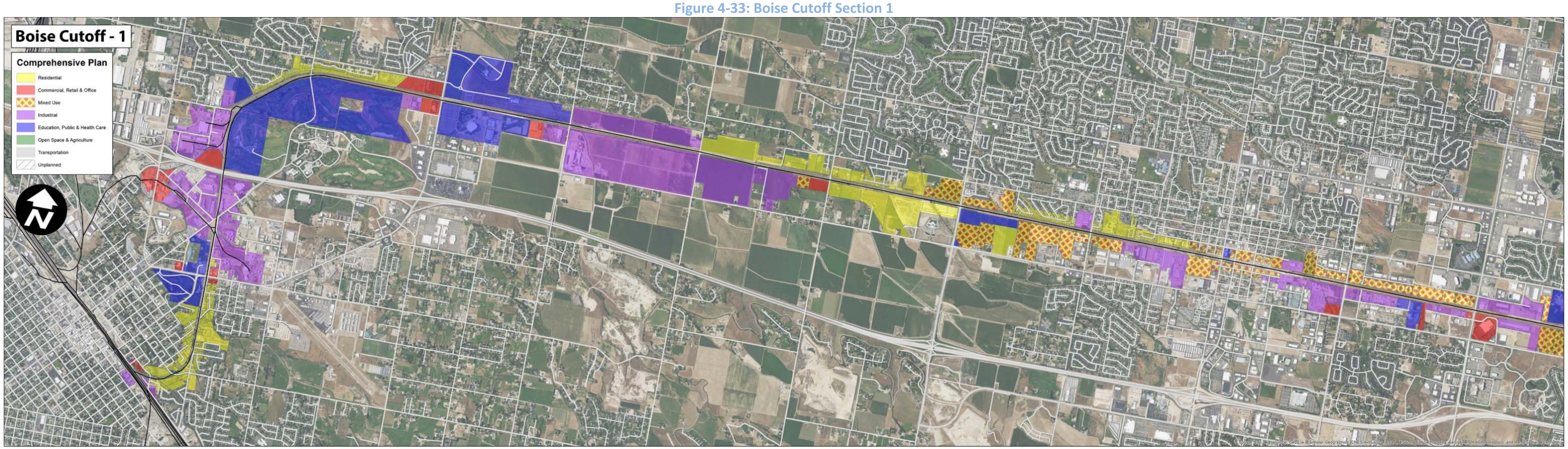


Figure 4-34: Boise Cutoff Section 2

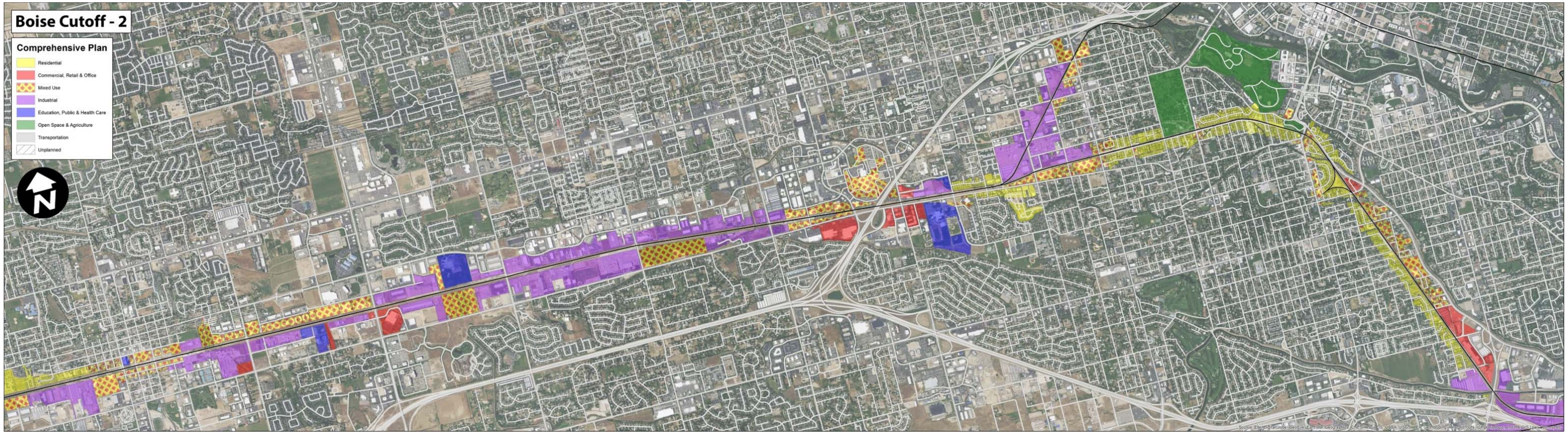


Figure 4-35: Boise Cutoff Section 3

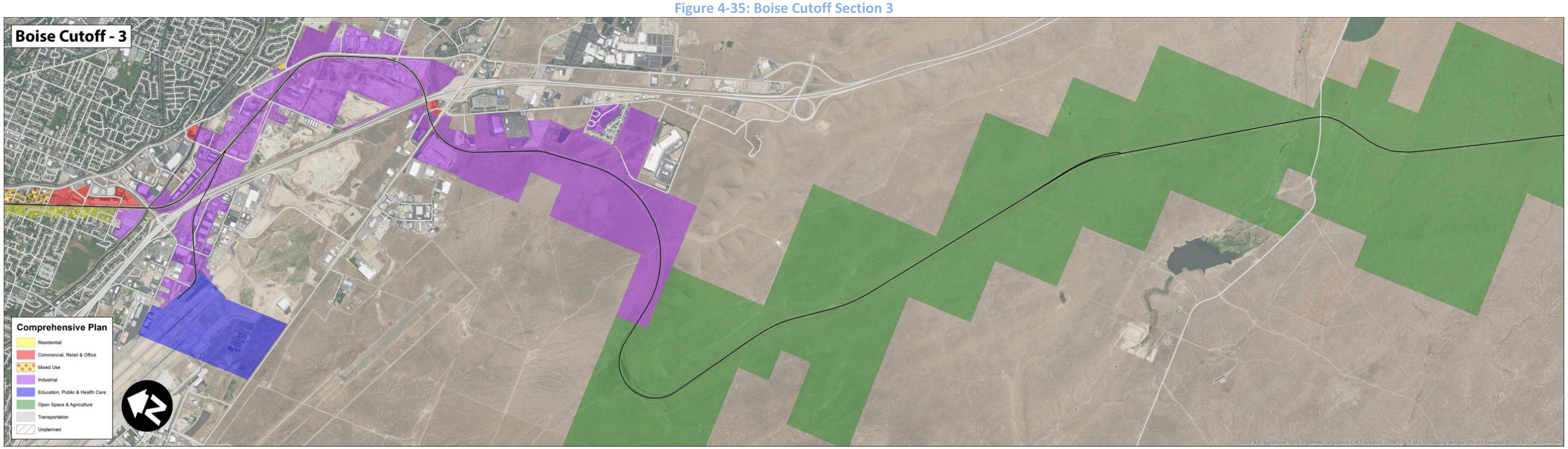


Figure 4-36: Boise Cutoff Section 4

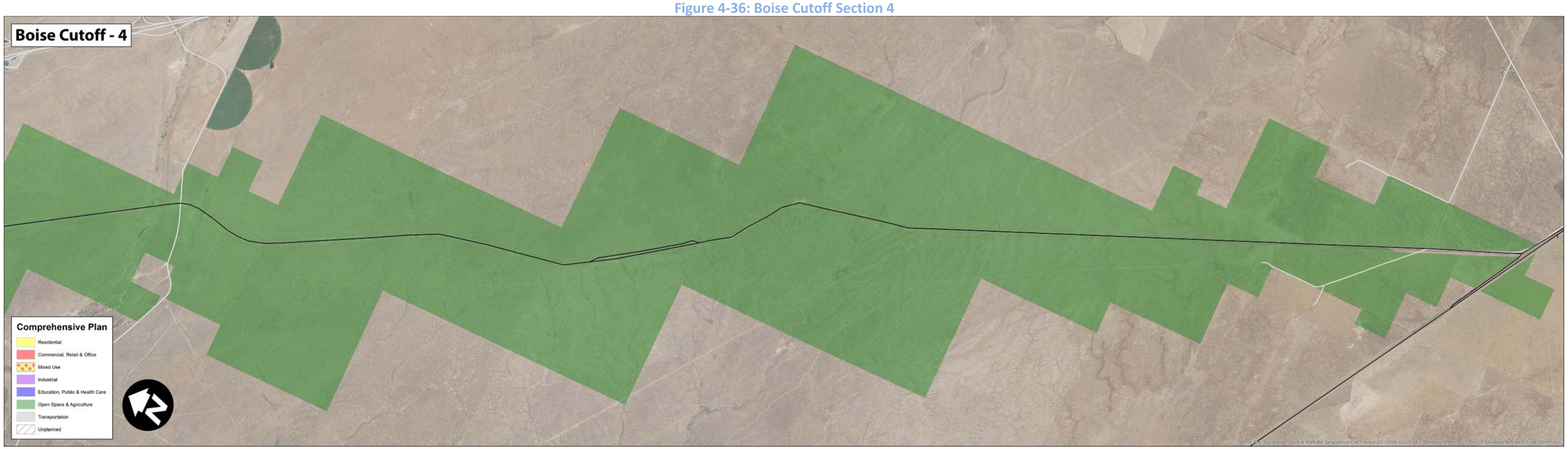


Figure 4-37: Idaho National Guard Spur

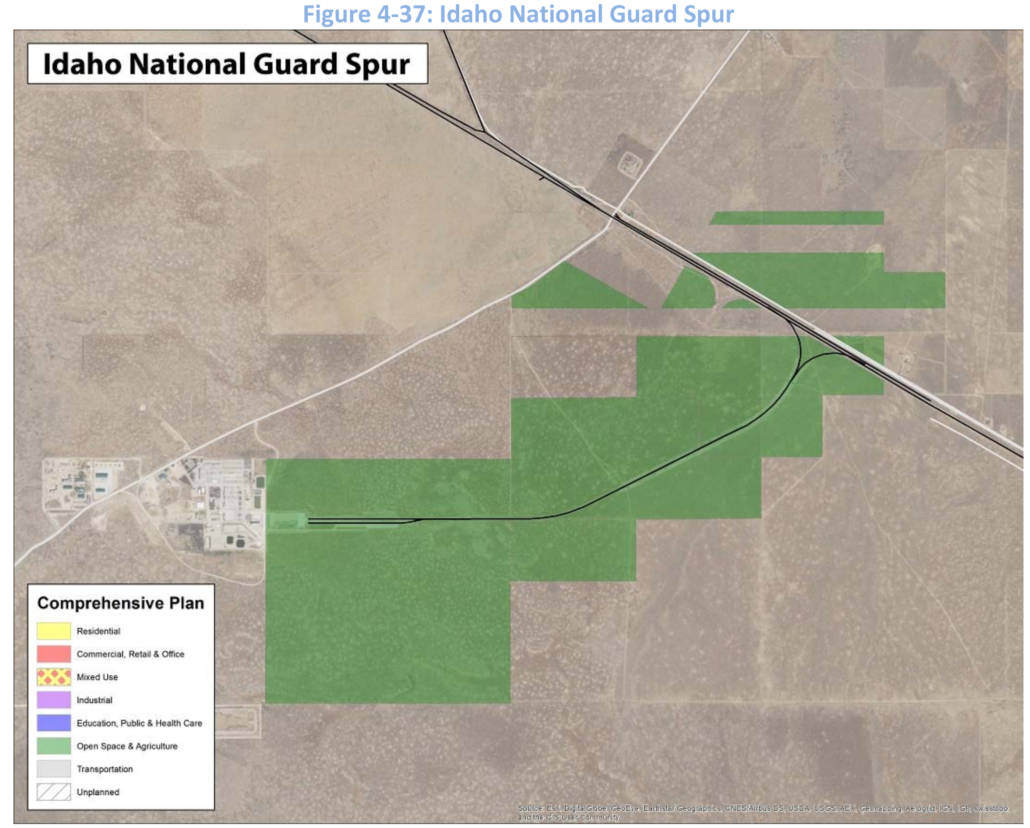


Figure 4-38: Main Line Section 1

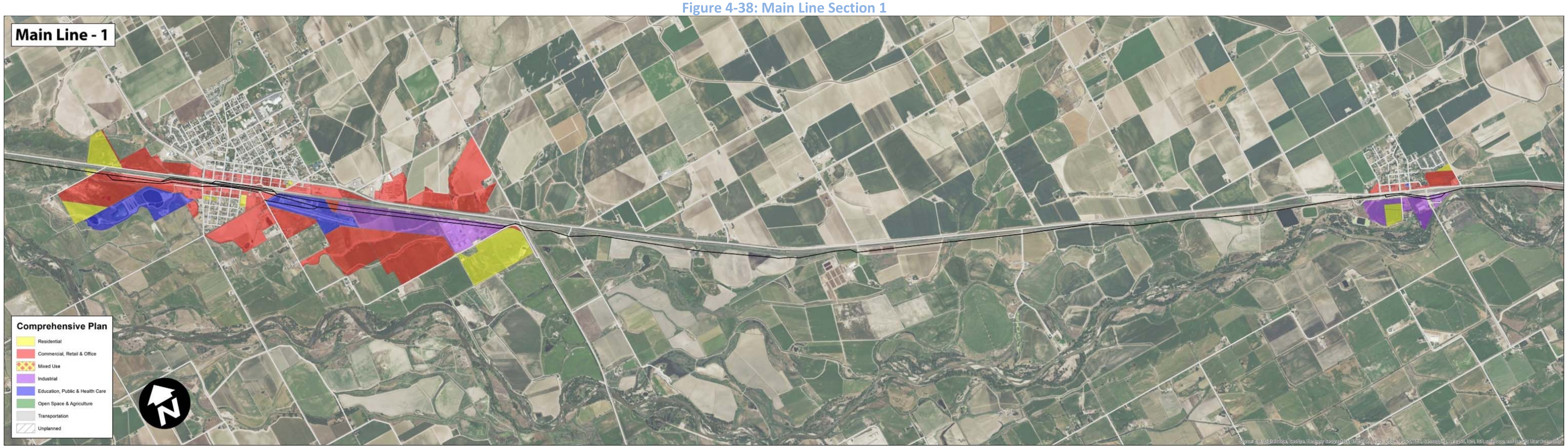


Figure 4-39: Main Line Section 2

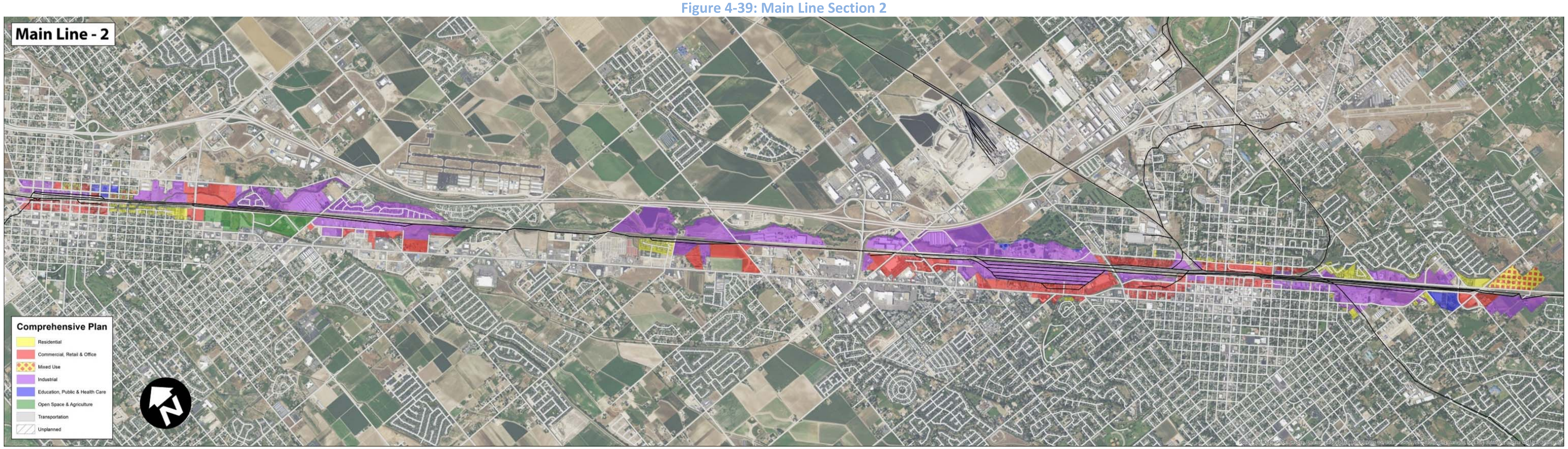


Figure 4-40: Main Line Section 3-4

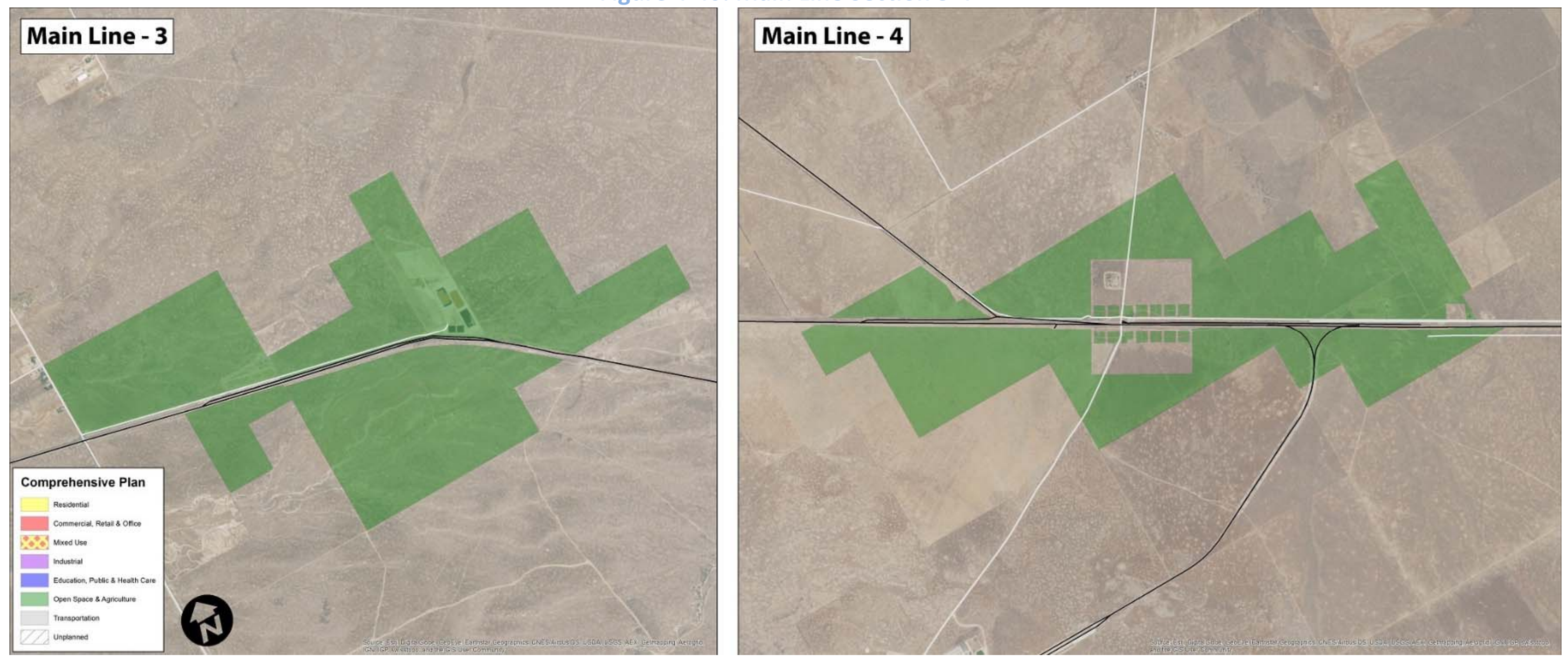
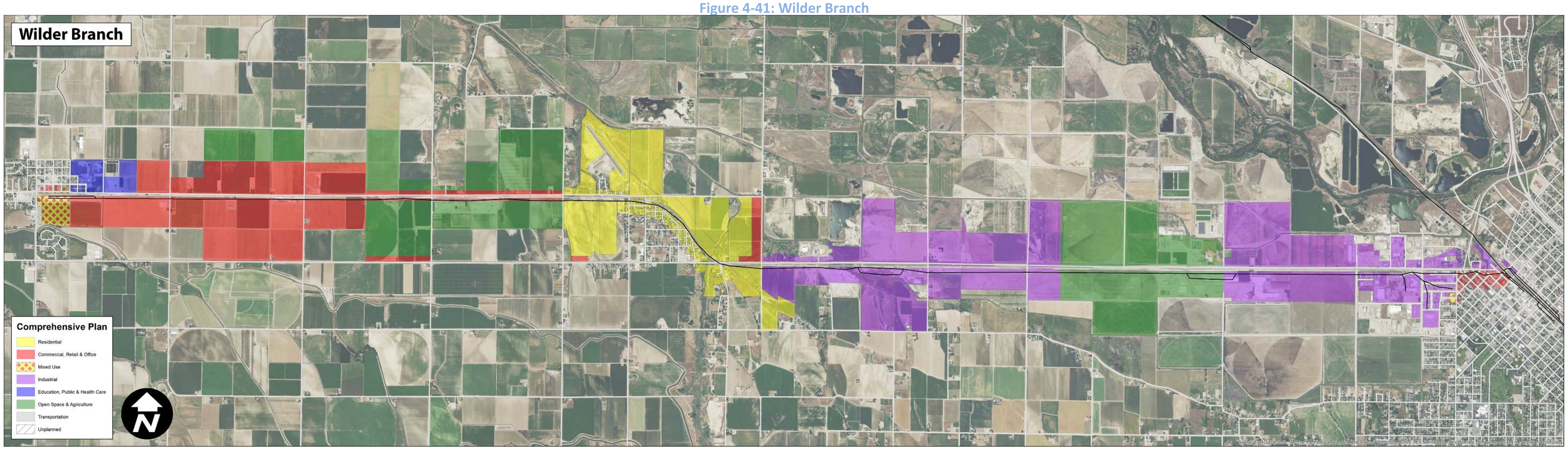


Figure 4-41: Wilder Branch



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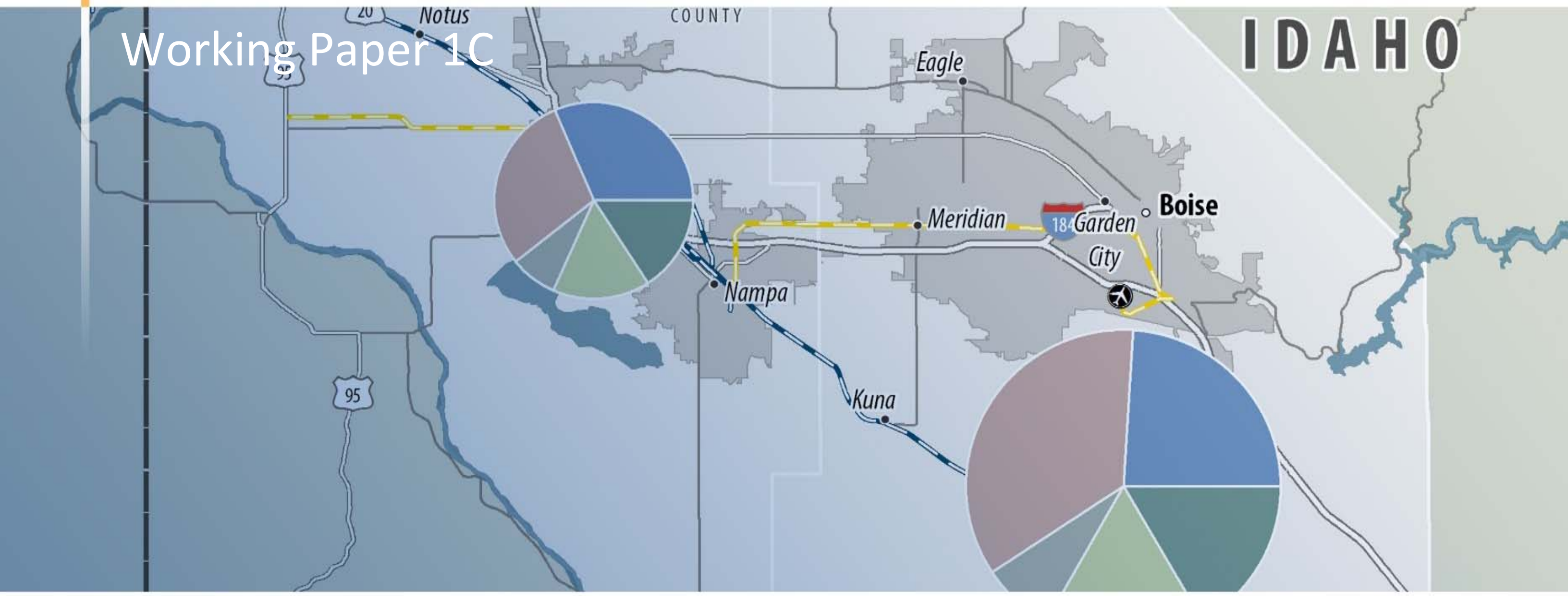

COMPASS Freight Study

Client Reference: RFQ 2017-02

Guidance for Model Freight Corridor Ordinance

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

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This report may include information which is deemed by some to be commercially sensitive and should be treated as confidential, unless otherwise approved for release.

Cover image source: CPCS

Table of Contents

Acronyms / Abbreviations

BVRR	Boise Valley Railroad
CIM	Communities in Motion 2040
COMPASS	Community Planning Organization of Southwest Idaho
CSS	Context Sensitive Solutions
CUFC	Critical Urban Freight Corridors
FAST	Fixing America's Surface Transportation
FAWG	Freight Advisory Working Group
FBC	Form-based Code
FHWA	Federal Highway Administration
ITD	Idaho Transportation Department
MPO	Metropolitan Planning Organization
MUTCD	Manual on Uniform Traffic Control Devices
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
ROW	Right of Way
TIP	Transportation Improvement Program
UP	Union Pacific
UPRR	Union Pacific Railroad
VMT	Vehicle Miles Traveled

Figures

Executive Summary

The Community Planning Association of Southwest Idaho (COMPASS) is conducting a freight study to support its long-range transportation plan, Communities in Motion 2040. The freight study is identifying freight corridors and related land use needs, developing a profile of the regionally most important commodities and supply chains, and identifying projects and/or policies to address maintenance needs, improve safety, and manage congestion.

COMPASS recognizes the importance of connecting land use planning activities to freight transportation planning as a step in improving regional mobility. This working paper is intended to provide knowledge and tools to enable community development agencies in the Treasure Valley region to more fully account for goods movement in planning, zoning, and development. To that end, this Working Paper provides a "model" approach to freight-dependent land use and transportation issues on truck and rail corridors. The intention of the model ordinance guidance is to assist counties and municipalities realize desired land use, zoning, and operation expectations of areas adjacent to freight corridors.

Specifically, the guidance will enable county, municipal, and highway district staff to protect and enhance access to freight activity centers, terminals, and rail-served facilities as well as preserve industrial land along freight rail corridors. This will also serve as a template for establishing freight/truck routes in non-industrial neighborhoods.

This working paper summarizes the following:

- **2.0 Freight Mobility Issues Affecting Land Use.** Freight stakeholders in the region identified regional freight mobility issues through an online survey. The intent of the survey was to identify tools—including zoning ordinance approaches—to preserve freight corridors and improve access and safety. Survey respondents identified and ranked potential freight impacts and barriers to freight mobility including urban encroachment, operational issues such as signal timing and signal synchronization, design impediments such as inadequate turning radii at intersections, and other competing interests in the region.
- **3.0 Freight Corridors**. Railway and roadway freight corridors are the backbone for freight movement in the region. While there are several types of corridors for each mode, each serves a vital purpose in the regional system. Freight mobility is preserved and potentially improved when the corridors are protected from urban encroachment or other incompatible land uses that affect freight-dependent business operations.
- **4.0 Freight Corridor Planning Tools**. After freight corridors are defined, the comprehensive plan guides how a municipality responds to freight corridors. The corresponding zoning ordinance is a tool that may be used to implement policies that promote the protection of freight-centric land uses which will, in turn, promote efficient freight movement. Several physical design characteristics of corridors and adjacent

development may impact freight mobility. These include street design, incompatible land use buffers, site planning that has positioned unoccupied space as a buffer, or multimodal integration. The process of comprehensive plan development presents an opportunity for planners and engineers that are primarily focused on other modes to collaborate on the freight planning process.

1 Introduction

Key Chapter Takeaways

The Community Planning Association of Southwest Idaho (COMPASS) is conducting a freight study to support its long-range transportation plan, Communities in Motion 2040. The freight study is identifying freight corridors and related land use needs, developing a profile of the regionally most important commodities and supply chains, and identifying projects and/or policies to address maintenance needs, improve safety, and manage congestion.

1.1 Background

As the metropolitan planning organization (MPO) for the Boise-Nampa area, COMPASS is focused on integrating freight 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).

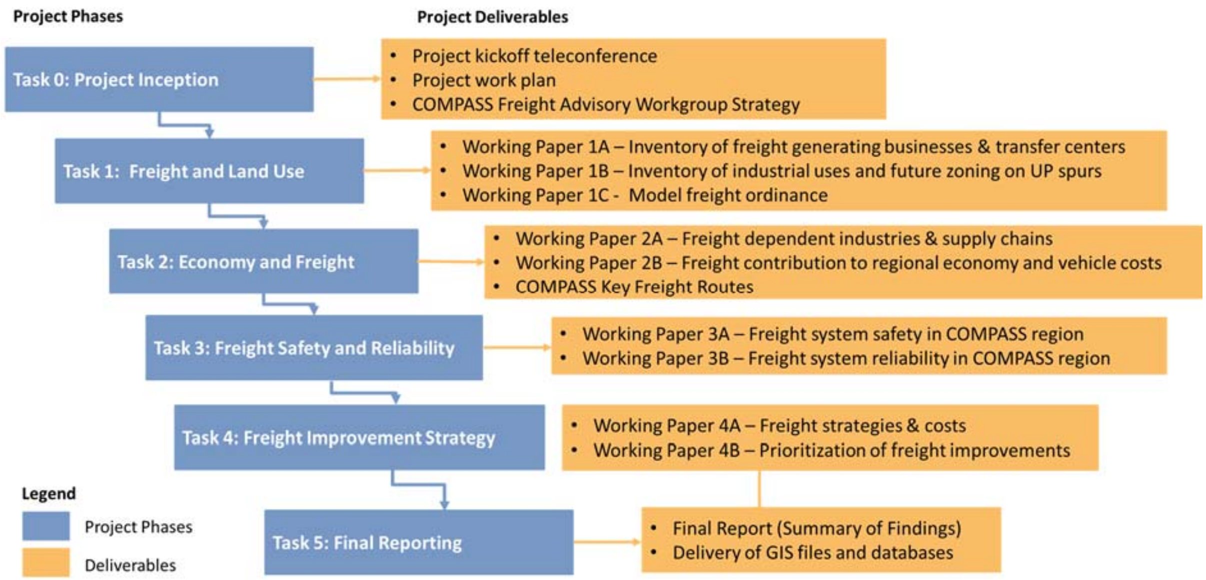
1.2 Objectives

As set out in the RFP, 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 projects and/or policies to address maintenance needs, improve safety, mitigate choke points, and manage congestion

1.3 Project Structure

The project is to be developed in five broad phases, as set out in the graphic below. Each of these phases has a series of deliverables.



1.4 Purpose of this Working Paper

Following Task 1: Freight and Land Use, the purpose of this Working Paper is to answer: *Given current and desired land use, economic, and transportation outcomes, what is the ideal freight ordinance template for freight routes in the COMPASS region?* This deliverable corresponds to Working Paper 1-C. Tasks 1.1, 1.2, 2.1, and 2.3 inform the model ordinance template.

What is the freight ordinance template for freight routes in the COMPASS region?

Figure 1-1: Model Freight Corridor Ordiance Template Related Tasks

Task Number	Task Description
Task 1.1	Identify Freight Activity Centers
Task 1.2	Identify Industrial Land and Facilities Along Union Pacific Spur Lines (UPRR And BVRR)
Task 2.1	Identify Top Freight-Dependent Industries
Task 2.3	Identify Primary Freight Corridors

Specifically, this Working Paper will:

- Develop a template for freight routes and corridors for COMPASS member agencies.
- Determine desired land use, zoning, and operating characteristics that should be embodied in the template after consultation with COMPASS and the freight advisory working group (FAWG).
- Provide process recommendations through which COMPASS can help member municipalities effectively integrate freight planning into their general plans, transportation plans, and zoning ordinances.
- Identify strategies to build stakeholder and elected official buy-in.

This working paper is divided into three chapters:

- Chapter 2: Freight Mobility contains an overview of freight system issues and constraints in the region and an analysis of stakeholder surveys.
- Chapter 3: Freight Corridors contains a discussion about freight corridors; specifically, this chapter will define a typical freight corridor – both rail and road – along with preservation and optimization techniques, universal design guidelines and standards, and access management standards.
- Chapter 4: Freight Corridor Planning presents a framework that incorporates stakeholder involvement into a freight sensitive land-use planning effort. This chapter offers tools for developing freight-compatible development: form-based code, site planning, as well as corridor and intersection design.

This Working Paper is also intended to provide COMPASS with an overview of progress to date and to solicit comments and other feedback on the structure and content of this component part of what will become the final report. Note that revisions to this Working Paper will be reflected in the Draft Final Report.

2 Freight Mobility Issues Affecting Land Use

Key Chapter Takeaways

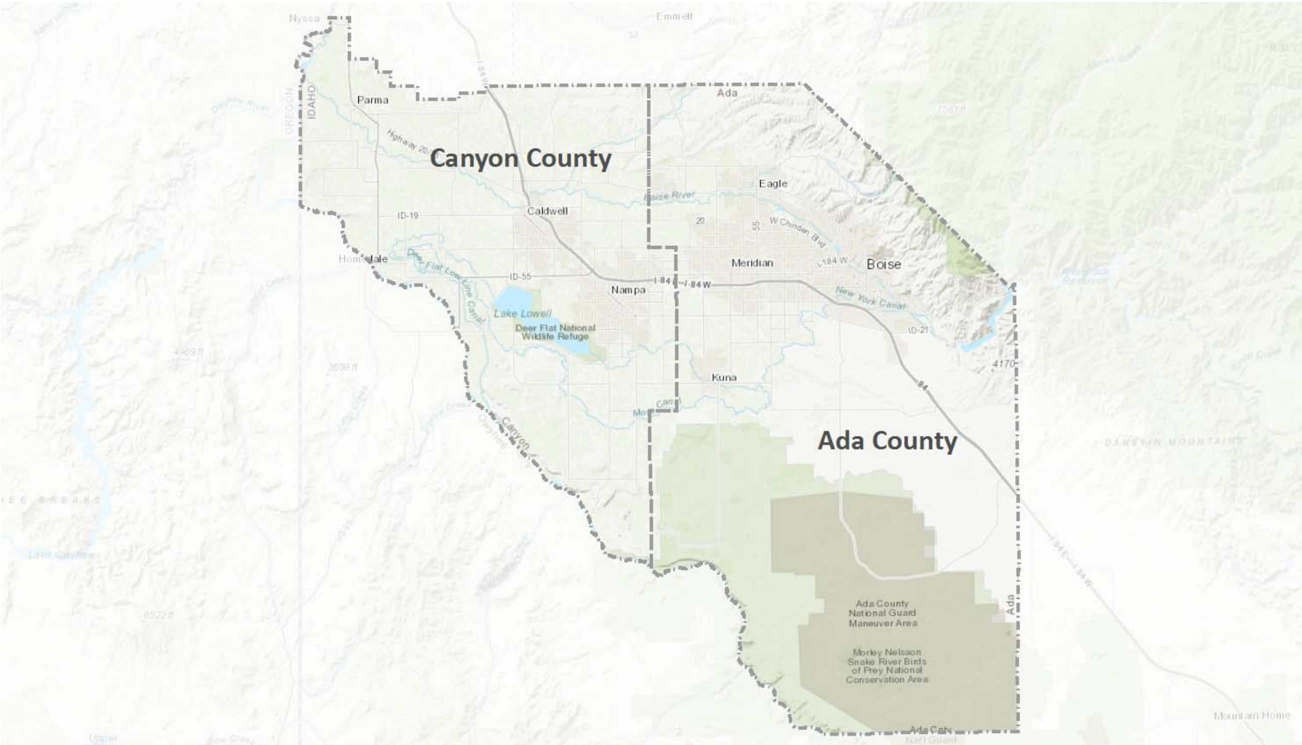
Freight stakeholders in the COMPASS region identified regional freight mobility issues through an online survey. The intent of the survey was to identify tools—including zoning ordinance approaches—to preserve freight corridors and improve access and safety. Survey respondents identified and ranked potential freight impacts and barriers to freight mobility including urban encroachment, operational issues such as signal timing and signal synchronization, design impediments such as inadequate turning radii at intersections, and other competing interests in the region.

2.1 Study Area

The study area is comprised of Canyon and Ada counties as shown in Figure 2-1 (referred to as the Treasure Valley region, COMPASS region, or simply "region.") Important road transportation corridors and routes include Interstate-84, Interstate-184, as well as other US, state, and local highways such as US-95, US-20/26, and ID-55. Working Paper 2-B presents a hierarchy for categorizing truck freight corridors in the region.

Many important freight corridors have already been adopted as Critical Urban Freight Corridors (CUFC), as shown in Figure 2-2. These include: 11th Avenue, Cole Road, Eisenman Road, Federal Way, Franklin Boulevard and Road, Gowen Road, ID-55 (Eagle Road), ID-19 (Simplot Boulevard, Centennial Way), Northside Boulevard, Robinson Road, US-26 (Chinden Boulevard, Front Street, Myrtle Street, and Broadway Avenue), ID-55 (Eagle Road), Meridian Road, Nampa-Caldwell Boulevard, and Victory Road.

Figure 2-1: Study Area



Source: ESRI, COMPASS, Parametrix analysis, 2017

Figure 2-2: Critical Urban Freight Corridors in the Region

Source: ESRI, ITD, COMPASS, Parametrix analysis, 2017

2.2 Survey Results and Discussion

2.2.1 Stakeholder Survey

Stakeholders were invited to participate in a survey that informed the development of this Working Paper. Survey questions are provided below. Complete responses may be found in Appendix A.

Figure 2-3: Survey Questions

1	**What are the three most important roadway freight mobility issues affecting freight corridors in Ada and Canyon Counties?**
	• Inadequate turning radii at interchanges • Inadequate turning radii at intersections • Inadequate turning radii at business accesses • Congestion due to poor signal timing • Insufficient left-turn lane lengths • Insufficient right-turn lane lengths • Lack of acceleration/deceleration lanes • Lack of full-width paved shoulders • Insufficient parking for loading/unloading zones • Insufficient passing lanes on rural two-lane highways • Not enough long-term (overnight) truck parking
2	**What are the three least important roadway freight mobility issues affecting freight corridors in Ada and Canyon Counties?**
	• Inadequate turning radii at interchanges • Inadequate turning radii at intersections • Inadequate turning radii at business accesses • Congestion due to poor signal timing • Insufficient left-turn lane lengths • Insufficient right-turn lane lengths • Lack of acceleration/deceleration lanes • Lack of full-width paved shoulders • Insufficient parking for loading/unloading zones • Insufficient passing lanes on rural two-lane highways • Not enough long-term (overnight) truck parking
3	**What are the three most significant negative impacts of freight activity in Ada and Canyon Counties (e.g. freight terminals/clusters and freight modes (truck, rail, pipeline, and aviation))?**
	• Air pollution • Light pollution • Noise pollution • Water pollution • Effects from vibration • Odors • Safety issues • Congestion issues • Impact of freight on roadway maintenance

	• Environmental justice issues (minority or low-income populations disproportionately affected by freight activity)
4	**What are the three least significant negative impacts of freight activity in Ada and Canyon Counties (e.g. freight terminals/clusters and freight modes (truck, rail, pipeline, and aviation))?**
	• Air pollution • Light pollution • Noise pollution • Water pollution • Effects from vibration • Odors • Safety issues • Congestion issues • Impact of freight on roadway maintenance • Environmental justice issues (minority or low-income populations disproportionately affected by freight activity)
5	**What are the three most significant barriers to freight mobility in Ada and Canyon Counties?**
	• Speed restrictions • Limitations on hours of operation • Height, weight, and clearance issues on roadways • Height, weight, and clearance issues on railroads • Corridor design impacts • Interaction of freight vehicles with non-motorized users • Traffic congestion • Environmental permitting • Designated truck routes • Lack of zoning for freight/industrial uses • Lack of truck parking spaces (e.g. decreasing truck productivity in search of space) • Hazardous material routing • Lack of redundancy (only one interstate, minimal river crossings) and the impact of nonrecurring events (e.g. crashes, weather, flooding) • Redevelopment that displaces, impedes or increases the cost of freight transportation
6	**What are the three least significant barriers to freight mobility in Ada and Canyon Counties?**
	• Speed restrictions • Limitations on hours of operation • Height, weight, and clearance issues on roadways • Height, weight, and clearance issues on railroads • Corridor design impacts • Interaction of freight vehicles with non-motorized users • Traffic congestion • Environmental permitting • Designated truck routes • Lack of zoning for freight/industrial uses • Lack of truck parking spaces (e.g. decreasing truck productivity in search of space) • Hazardous material routing • Lack of redundancy (only one interstate, minimal river crossings) and the impact of nonrecurring events (e.g. crashes, weather, flooding) • Redevelopment that displaces, impedes or increases the cost of freight transportation

7	**Considering tools to preserve and improve mobility on roadway freight corridors, what are the most important tools that would have the greatest impact? Please rank in order of most important (1) to least important (6).**
	• Comprehensive planning (policies, goals, and objectives that prohibit incompatible land uses near freight facilities and vice versa) • Zoning and design (ordinances that prohibit the rezone of industrial land to other uses and the protection of existing freight corridors/facilities) • Mitigation of conflicts between freight and other land uses (strategies that mitigate freight externalities such as noise, light, vibration, odors, congestion, safety, etc.) • Education and outreach (community round tables and freight fact sheets) • Regional collaboration of planning efforts (freight task forces and working groups)
8	**Considering tools to preserve rail-served freight businesses, what are the most important tools that would have the greatest impact? Please rank in order of most important (1) to least important (6).**
	• Comprehensive planning (policies, goals, and objectives that prohibit incompatible land uses near freight facilities and vice versa) • Zoning and design (ordinances that prohibit the rezone of industrial land to other uses and the protection of existing freight corridors/facilities) • Mitigation of conflicts between freight and other land uses (strategies that mitigate freight externalities such as noise, light, vibration, odors, congestion, safety, etc.) • Education and outreach (community round tables and freight fact sheets) • Regional collaboration of planning efforts (freight task forces and working groups)
9	**Are there other issues that you would like addressed in the model freight corridor ordinances not discussed in the previous questions?**

2.2.2 Survey Results

Twelve stakeholders participated in a survey that informed the development of the COMPASS Model Ordinance. Selected highlights are included.

The top three most important roadway freight mobility issues affecting freight corridors in Ada and Canyon Counties (Question 1) were identified as:

1. Congestion due to poor signal timing
2. Inadequate turning radii at intersections (tie)
3. Lack of acceleration/deceleration lanes (tie)

Conversely, the three least important roadway issues (Question 2) were identified as:

1. Inadequate turning radii at interchanges
2. Inadequate turning radii at business accesses (tie)
3. Lack of full-width paved shoulders (tie)
4. Insufficient passing lanes on rural two-lane highways (tie)
5. Not enough long-term (overnight) truck parking (tie)

Survey respondents identified the three most significant negative impacts of freight activity in the COMPASS region (Question 3) as:

1. Impact of freight on roadway maintenance
2. Safety issues
3. Congestion issues

Conversely, the three least significant negative impacts (Question 4) were identified as:

1. Light pollution (tie)
2. Odors (tie)
3. Water pollution

COMPASS stakeholders were also asked to identify the three most and least significant barriers to freight mobility (Question 5). They said the most significant barriers were:

1. Redevelopment that displaces, impedes, or increases the cost of freight transportation
2. Interaction of freight vehicles with non-motorized users (tie)
3. Traffic congestion (tie)

According to respondents, the least significant barriers to freight mobility (Question 6) are:

1. Speed restrictions
2. Environmental permitting
3. Limitations on hours of operation (tie)
4. Interaction of freight vehicles with non-motorized users (tie)
5. Hazardous material routing (tie)

Interestingly, "Interaction of freight vehicles with non-motorized users" appeared in both the most and least significant barriers to freight mobility as some respondents felt this issue was not important and others felt it was important.

Following questions asking survey respondents to identify important/non-important issues, they were asked about **possible tools to improve mobility in freight corridors (Questions 7 and 8)**. Comprehensive planning that prohibits incompatible land uses near freight facilities (and vice versa) was the preferred strategy for roadway facilities. For railway facilities, comprehensive planning was the second preferred strategy with Zoning and Design (ordinances that prohibit the rezoning of industrial land to other uses and the protection of existing freight corridors/facilities) as the preferred strategy.

The COMPASS stakeholder survey was closed by asking respondents to **identify other possible issues that were not addressed in the survey (Question 9)**. Some responses are included below:

- "I would like to see an intermodal station built in Boise, out near the airport area"
- "Industrial zoning through Ada County appears to take place next to a minimal use railway line. This land could attract many industrial businesses if planned correctly regionally."

- "Need to make sure ped *(sic)* and bike facilities are allowed in freight corridor, especially the regional network and future rails with trails plan."
- "Trucking is emphasized too much in this community. Rail should be better utilized"

Redevelopment that impedes and leads to displacement of freight operations was the most important barrier to freight mobility identified by survey respondents.

2.2.3 Survey Discussion

The survey results present diverse perspectives on many issues. While some issues are land use-dependent and may be addressed through zoning ordinance tools, other are operational in nature and not amenable to changes to the zoning ordinance.

For example, signal timing and progression is a thematic response throughout the survey and is not able to be regulated through code. It is, however, rectifiable administratively through traffic analysis and possible signal upgrades where warranted. Similarly, roadway maintenance and state of good repair status are not able to be regulated through a zoning ordinance. These are administrative actions and may be implemented and adjusted as needed.

Corner turning radii at intersections are not commonly addressed in conventional zoning but may be guided through the design guidelines of form-based code (FBC). Conventional Euclidean zoning regulates land use and promotes the segregation of uses while FBC regulates physical form rather than strictly land use. Guidelines are commonly included for structure form and mass, building envelope, as well as public realm spaces such as the street and building frontages. Intersection design guidelines are discussed further in Chapter 4.

2.3 Freight Mobility Issues and Competing Interests

Several issues were identified by stakeholders with the freight mobility survey previously discussed. Some of these issues may be addressed through code. These include: protection from incompatible land-use encroachment, incompatible land-use buffers, noise mitigation guidelines, and access management standards. These issues are the focus of the guidance for model freight corridor ordinance development and are explored further in Chapter 4.

The primary issues identified that are possible to resolve by zoning ordinance include the following:

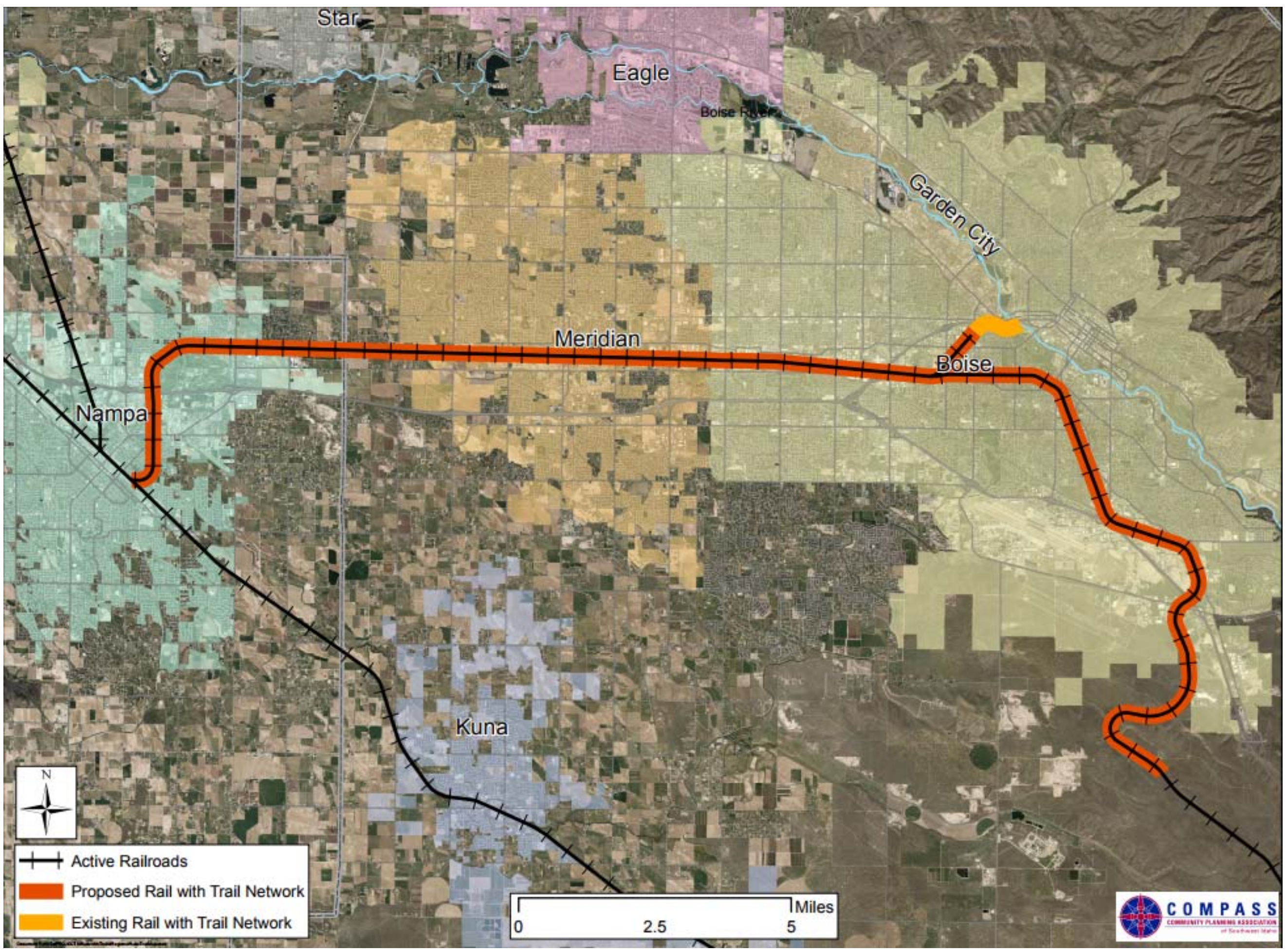
- Redevelopment that displaces, impedes, or increases the cost of freight transportation
- Interaction of freight vehicles with non-motorized users

- Pollution: air (odors), light, and noise
- 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 in the COMPASS region. For example, some may favor multiuse freight corridors (highway or freight) while other interests may promote the exclusivity for either freight, passenger, or non-motorized transportation.

For example, these competing interests will affect the way that communities plan, zone, and develop land along the Union Pacific (UP) freight rail corridor right-of-way (ROW), which traverses the COMPASS region through a number of municipalities (see Figure 2-4). The ROW varies in width from approximately 50 feet to 150 feet. Because the current rail configuration occupies only a portion of the full corridor ROW width, it appears to offer capacity for other linear uses such as a multi-use path or a transitway.

Figure 2-4: Rail Corridors in Canyon and Ada Counties with Proposed Trail Network



Source: COMPASS, 2017

This has led to the belief that the corridor is capable of multiple uses. For example, a recent plan from the City of Meridian sought "to identify any potential short and long-term opportunities for locating a trail within the Treasure Valley corridor, without negatively impacting any current or potential future uses." The study examined opportunities and constraints, roadway crossings, analyzed fatal flaws analysis and recommended next steps. (Meridian Rail with Trail Action Plan, 2017).

This private ROW has the appearance of underutilization and seems 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.

- *Safety:* The primary concern with rail facilities is safety. Historically, use segregation and restricted access were the primary methods of promoting safety in rail corridors. 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 have been shown to increase in rail corridors that are adjacent to other incompatible uses.

- *Freight operation impacts:* Incompatible uses that are located within freight rail corridors also affect the efficiency of freight movement and overall mobility. A multi-use path adjacent to freight rail may cut off access to freight users on one side of the corridor. This results in the potential loss of businesses that are rail-dependent.
- *Transit operations requirements:* Precedence exists for the co-location of transit rail and freight rail is the same ROW. This configuration requires additional systems investment to monitor corridor conditions and guarantee safe passage of all vehicles. When freight rail coexists with transit, the hours of operation for freight rail become limited and may affect the efficient movement of freight and rail freight operations for businesses.
- *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. Transportation and warehousing 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 household-sustaining wage earners.
- *Safety, air quality, and environmental impacts.* 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 impacts.

3 Freight Corridors

Key Chapter Takeaways

Railway and roadway freight corridors are the backbone for freight movement in the region. While there are several types of corridors for each mode, each serves a vital purpose in the regional system. Freight mobility is preserved and potentially improved when the corridors are protected from urban encroachment or other incompatible land uses that affect freight-dependent business operations.

3.1 Identifying Freight Corridors

What is a Freight Corridor?

A freight corridor is not formally defined in the United States. However, for the context of this Working Paper, a freight corridor is one that is designated as a truck freight route or one whose primary purpose is the movement of goods between two or more freight terminals. The importance of defining a freight corridor is to enable land use planners to align the freight ordinance approaches to the land uses along the corridors. For the purposes of this Working Paper, the zoning tools are designed to address freight land uses on either rail freight corridors or road freight corridors, each comprised of four subtypes. Rail freight corridors include:

- *Main line:* The principal track that connects two points: it usually has sidings, spurs, and yards at a number of locations to serve customers and to hold freight cars.
- *Branch line:* A rail track which connects into a railroad main line
- *Spur:* A stretch of rail that branches off the main line. Different from a siding or a stub, spurs can be miles in length, and usually have one destination at the end.
- *Siding:* A section of track adjacent to a mainline used for passing trains on single track routes or switching moves. Sidings are sometimes used for storing rolling stock or freight. A siding is also used as a form of rail access for warehouses and other businesses.

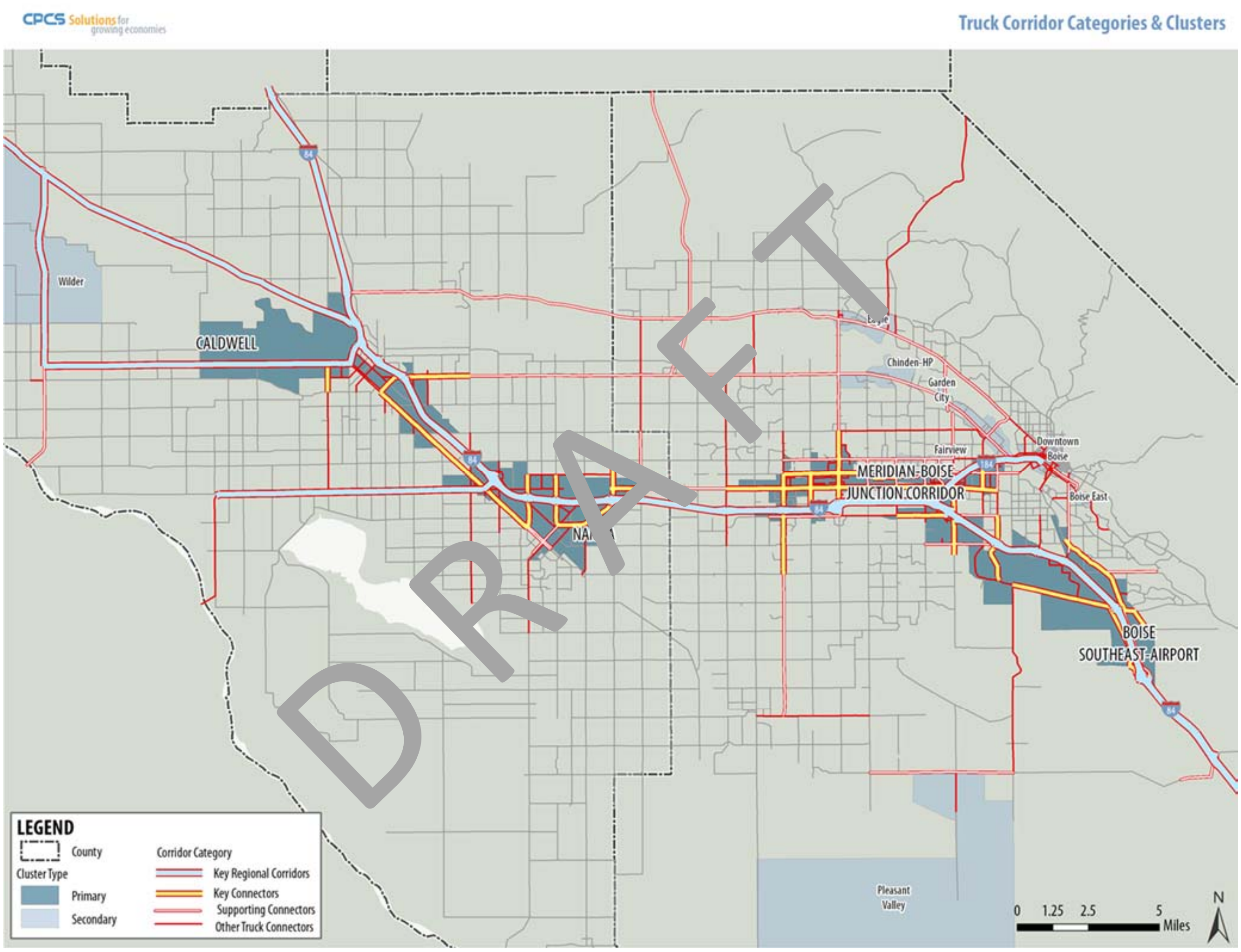
Roadway freight corridors include:

- *Key regional truck corridors*: Key regional truck corridors support through-movement of vehicles. These facilities include interstates, state highways, and other limited access facilities.

- *Key connectors:* An arterial street serving connections to the regional network, between and through industrial land uses (manufacturing/industrial centers and intermodal terminals), commercial districts, and urban centers.
- *Supporting truck corridors:* These streets make connections for goods delivery to urban villages and neighborhood commercial districts. They also provide secondary connections to the major truck street network, thereby creating system redundancy and resiliency.
- *Other truck corridors:* These can include first-and-last mile connectors – locations where short truck movements are required for access to/from key freight activity centers. These connections are all within the designated manufacturing/industrial centers.

Figure 3-1 illustrates the draft truck corridor categories for the study region (subject to revision in future Working Papers).

Figure 3-1: Draft Truck Corridor Categories



Source: CPCS Analysis of COMPASS Truck Corridors, 2017

3.2 Freight Corridor Preservation

3.2.1 Preservation Overview

Adjacent land uses that conflict with industrial uses are a primary barrier to freight operations. 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 use other growth management tools.

3.2.2 Potential Threats to Freight Activity in Growing Areas

The principal threats affecting freight corridors and freight-dependent land uses include:

- **Encroachment of incompatible land uses.** From the freight operator's perspective, incompatible land use adjacent to freight facilities may affect their ability to expand capacity to respond to growing freight demand.
- **Operational restrictions on corridors serving freight-dependent businesses.** 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.

Incompatible adjacent land uses also present a safety concern for residents. Furthermore, impacts that regularly and customarily accompany freight or other industrial 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, pollution that may reduce the ability for residents and property owners to access quiet enjoyment of their property. Ultimately, the goal of coordinating land uses with freight corridors is to protect the economic viability of freight-dependent businesses, provide a safe operating environment for people and goods movement, and reduce negative social impacts (e.g. noise, pollution). Appropriate land-use planning strategies to preserve freight corridors are explored further in Chapter 4.

4 Freight Corridor Planning Tools

Key Chapter Takeaways

After freight corridors are defined, the comprehensive plan guides how a municipality responds to freight corridors. The corresponding zoning ordinance is a tool that may be used to implement policy that promotes the protection of freight-centric land uses which will in turn promote efficient freight movement. Several physical design characteristics of corridors and adjacent development may impact freight mobility. These include street design, incompatible land use buffers, site planning that has positioned unoccupied space as a buffer, or multimodal integration. The process of comprehensive plan development presents an opportunity for planners and engineers that are primarily focused on other modes to collaborate on the freight planning process.

4.1 Overview

The integration of freight considerations into state and 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 level (COMPASS) and the state (Idaho Transportation Department) to understand the nature of goods movement in their communities.

The following text box "Freight Planning: Guiding Documents" summarizes the federally required and recommended freight planning activities at the state and MPO level.

4.2 Corridor Designation

Many local freight impacts may be mitigated through effective land use plans: zoning and appropriate site planning. This process is executed at the local level with input from regional stakeholders as well as the state freight plan, and begins with the designation of freight corridors.

Municipalities may formally designate roadway corridors for freight by recognizing and delineating truck routes.[1] Formally designating a freight corridor (e.g., truck routes) 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.

Freight route designation includes a study of route segments for consideration where each segment is assessed to determine adjacent land uses, bridge locations and capacity, and roadway functional classification. Similarly, planning for freight rail corridors will largely focus on adjacent land uses. Land use adjacent to all freight corridors (roadway and rail) is an important aspect of planning for freight and is covered extensively in this chapter. A traffic impact analysis will inform potential impact on route capacity from additional truck freight traffic. It is also imperative that pedestrian and bicycle facility integration be thoughtfully executed.

Through this study, COMPASS has designated a hierarchy of freight corridors which may form a base from which regional counties and municipalities may make additional designations. These include:

- Key regional truck corridors
- Key connectors

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 act, Fixing America's Surface Transportation (FAST), is a state level plan guiding development of freight facilities for the state and provides 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.

[1] 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.

- Supporting truck corridors
- Other truck corridors

The process of designating freight corridors begins with routes that are designated on the state freight plan. Next, stakeholders evaluate potential route segments based on truck volume, proximity to freight centers and other freight facilities, freight connectivity, as well as other corridor studies. Segment attributes are evaluated based on the criteria previously mentioned.

The route designation process is also informed by the mapping of freight facilities. This may include truck stops, distribution facilities, warehouses, ports, drayage facilities, rail yards and terminals, etc. All associated and ancillary freight facilities should be mapped. Data should also be collected concurrently that includes information pertaining to volume, hours of operation, type of facility, and impacts (both potential and existing). Figure 4-1 illustrates the initial phases of facility mapping with the collection of truck stops in the COMPASS region. Much of this process has been completed as part of previous Working Papers. The COMPASS Freight Study will ultimately provide the foundation for which municipal land use zoning ordinances may be built upon.

Figure 4-1: Truck Stops in the COMPASS Region

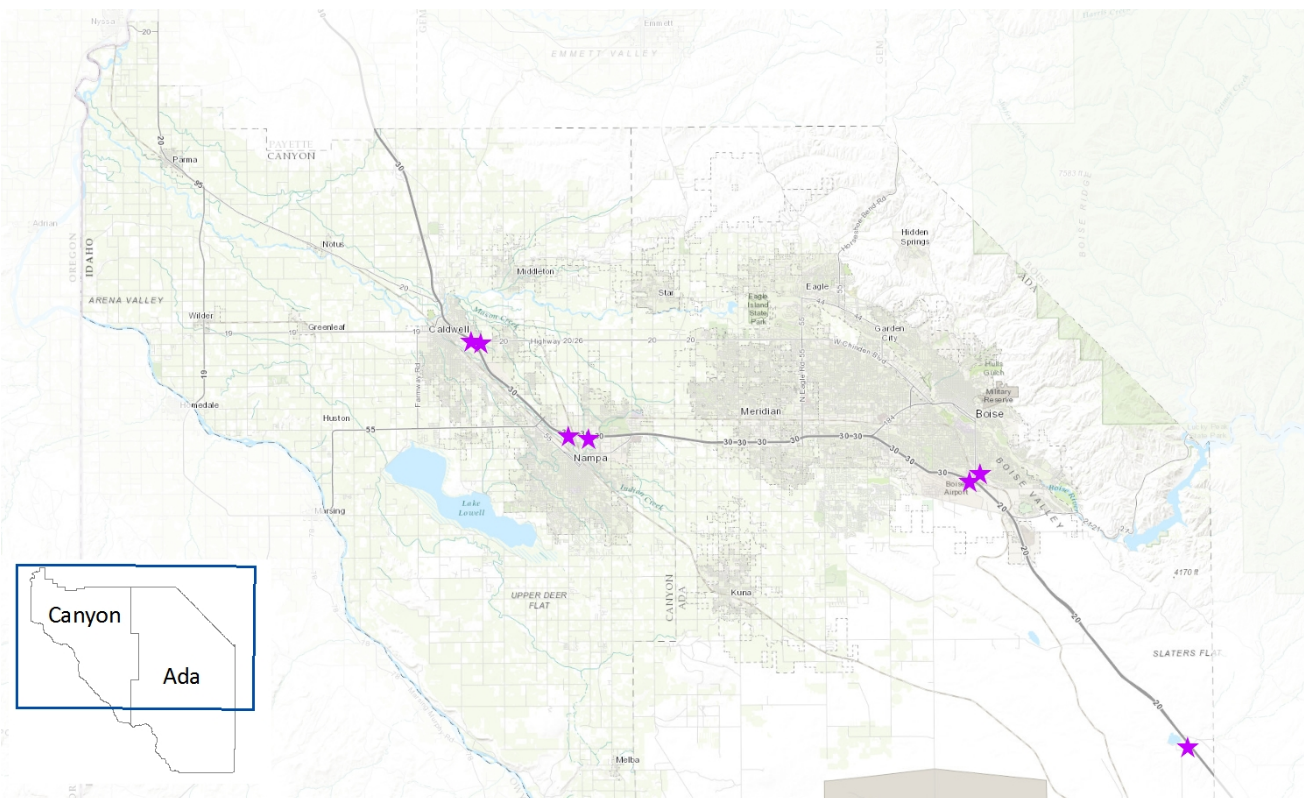


Figure 4-2: Truck Stops in the COMPASS Region

Truck Stop Name	Location
Boise Stage Stop	Ada County
Flying J	Caldwell
Flying J	Boise
Jackson's	Nampa
Pacific Pride	Nampa
Sage Travel Plaza	Caldwell
TA Boise	Boise

4.3 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. Engaging appropriate stakeholders from the trucking and freight rail industries, government, as well as the general community together will lead to the best possible outcome in an effort to preserve mobility for all roadway and corridor users. Stakeholder representation should generally cover private-sector freight operators, state government, regional agencies, and local governments. Transportation planning is not governed by one agency so it is important to involve several levels of government. Possible stakeholders in the Treasure Valley region may include: shippers and receivers, trade associations, large freight operators, railroads, FAWG, ITD, COMPASS, Ada and Canyon Counties, as well as representation from the cities.

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. Active transportation is experiencing an increasing trend nationally as more residents ask for increased bicycle and pedestrian facilities. 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 COMPASS region.

4.4 Land-Use Planning for Freight

There is an increasing recognition among policymakers of the importance of coordinating land-use planning and freight planning. This is reflected in recent federal guidance for integrating freight and land-use planning, studies by the Transportation Research Board (TRB), and the integration of land use considerations into freight plans. Yet efforts to integrate freight and land use are difficult due to the many stakeholders involved across multiple agencies and jurisdictions. Overcoming the obstacles can lead to tremendous benefits that are experienced locally and regionally.

COMPASS is leading the freight planning effort through broader transportation planning in the region. Regional agencies, such as COMPASS, are well-positioned to guide local municipalities through the process of integrating freight into general plans, comprehensive plans, and transportation plans. This work is also informed by a private-sector partnership with freight operators, industrial land owners/developers, and shipping and receiving businesses.

4.4.1 Zoning for Freight-Compatible Developments

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 access.

Zoning for freight-dependent corridors and land uses may seek to (FHWA & NCFRP, 2012):

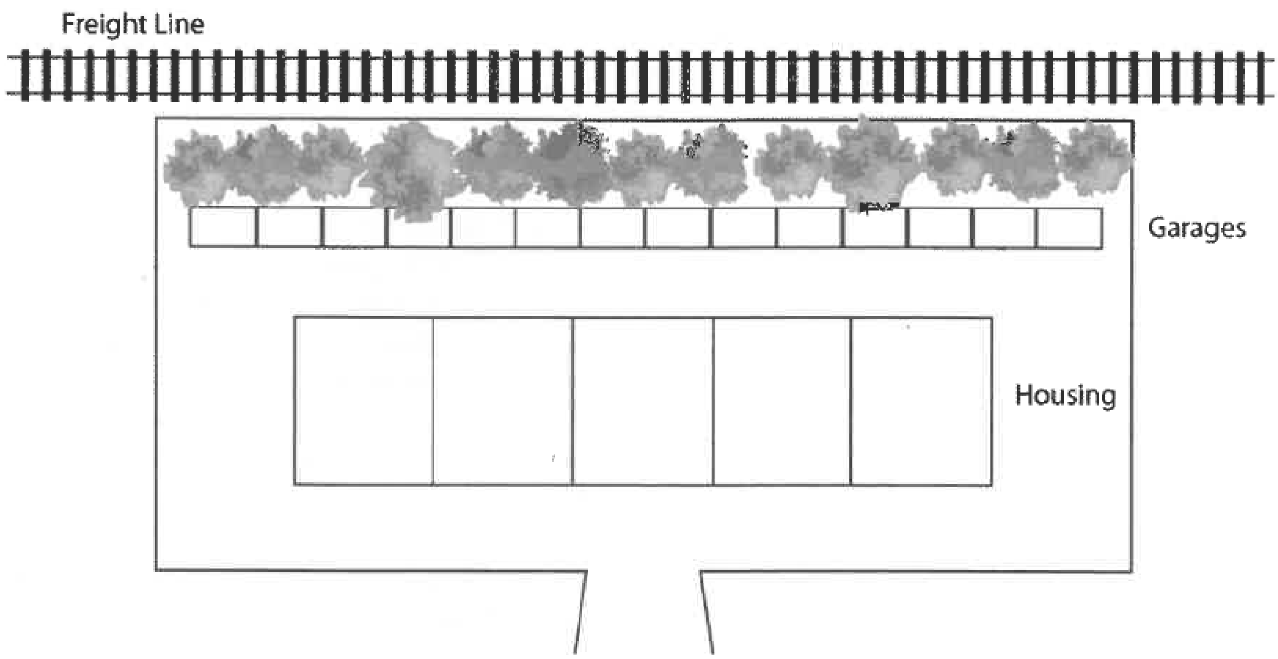
- Protect undeveloped land near freight facilities to prevent incompatible encroachment through zoning, easements, or purchase
- Establish adequate buffers between incompatible land uses
- Create non-access easements (prevents development in buffers)
- Channel development of warehouses and distribution centers to sites with freight rail access, as relevant
- Outline noise abatement design criteria
- Promote light pollution abatement through design criteria

For example, a Chicago neighborhood employed both designated industrial districts and corridors. The city has successfully maintained its existing manufacturing sector and attracted new development to the industrial district (FHWA, 2012). Notably, the Chicago strategy worked to preserve existing freight operations in addition to growing economic development.

4.4.2 Site Planning

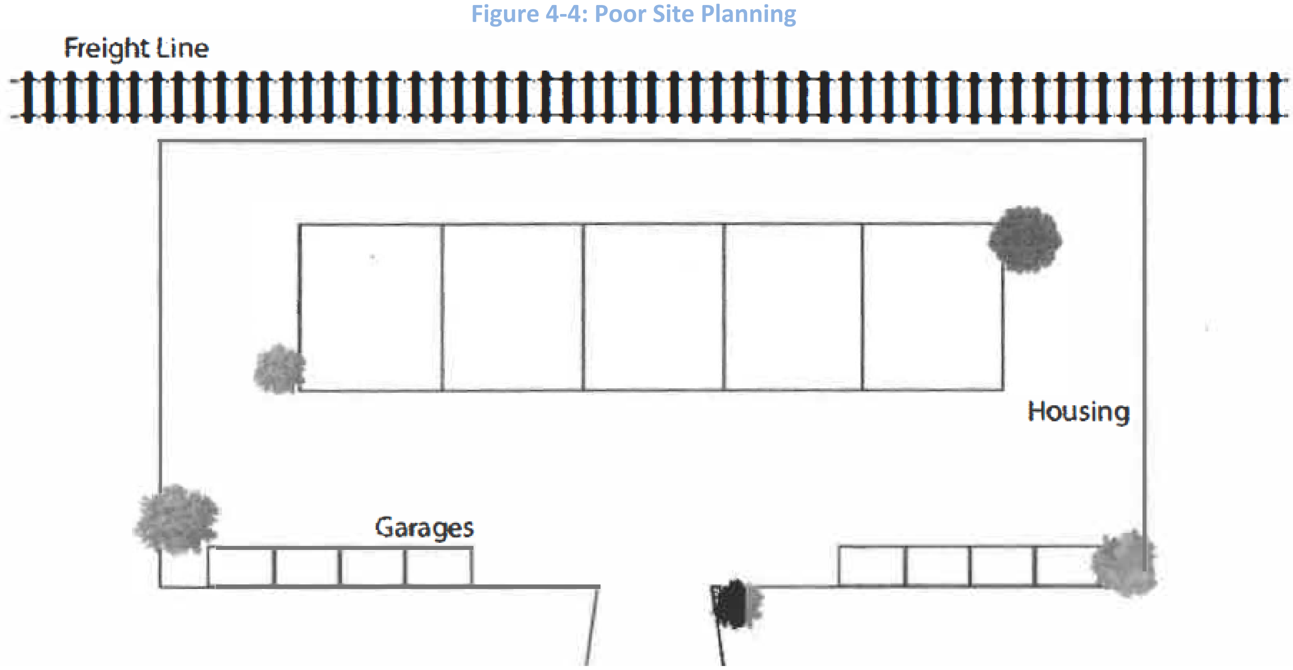
Another freight impact mitigation strategy is to optimize lot orientation of adjacent incompatible land uses and to fully capitalize on potential buffers. Effective site planning optimizes lot orientation to place garages, carports, and other uninhabited spaces between living spaces and the incompatible use. Examples of site planning include: parking placement (see Figure 4-3 and Figure 4-4); clustered development (both freight village and residential - Figure 4-7 and Figure 4-8); and landscaping buffer (Figure 4-3).

Figure 4-3: Optimal Site Planning and Lot Orientation With Landscaped Buffer



Source: NCFRP, 2012

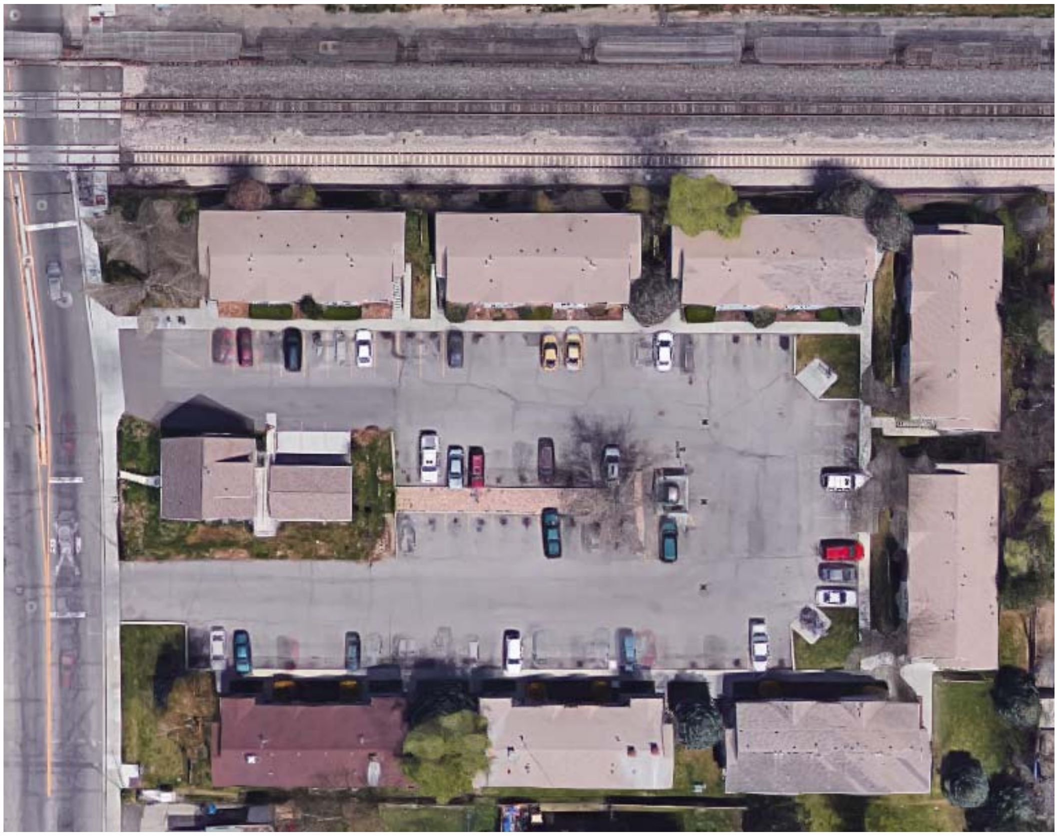
Figure 4-4: Poor Site Planning



Source: NCFRP, 2012

Figure 4-5 illustrates poor site planning. Notice that the structures are placed immediately adjacent to the rail corridor. This configuration missed an opportunity to place parking adjacent to the rail corridor and provide a buffer.

Figure 4-5: Example of Poor Lot Orientation (Below Rail Corridor).

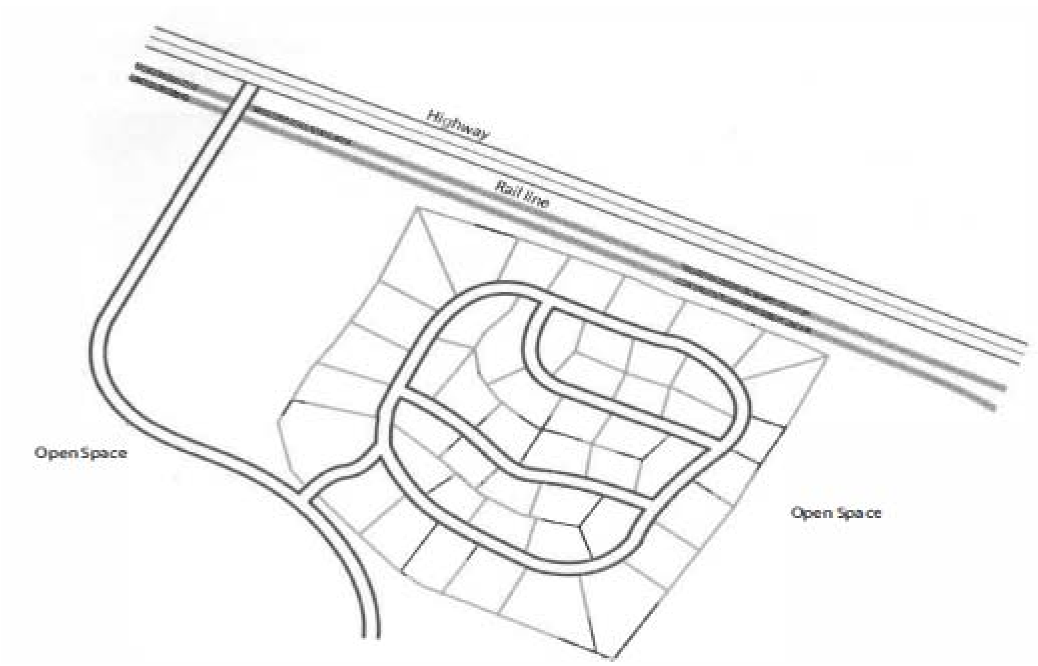


Source: GOOGLE, Parametrix Analysis, 2017

Figure 4-6: Rail Corridor Adjacent to Residential Neighborhood Buffered by Golf Course

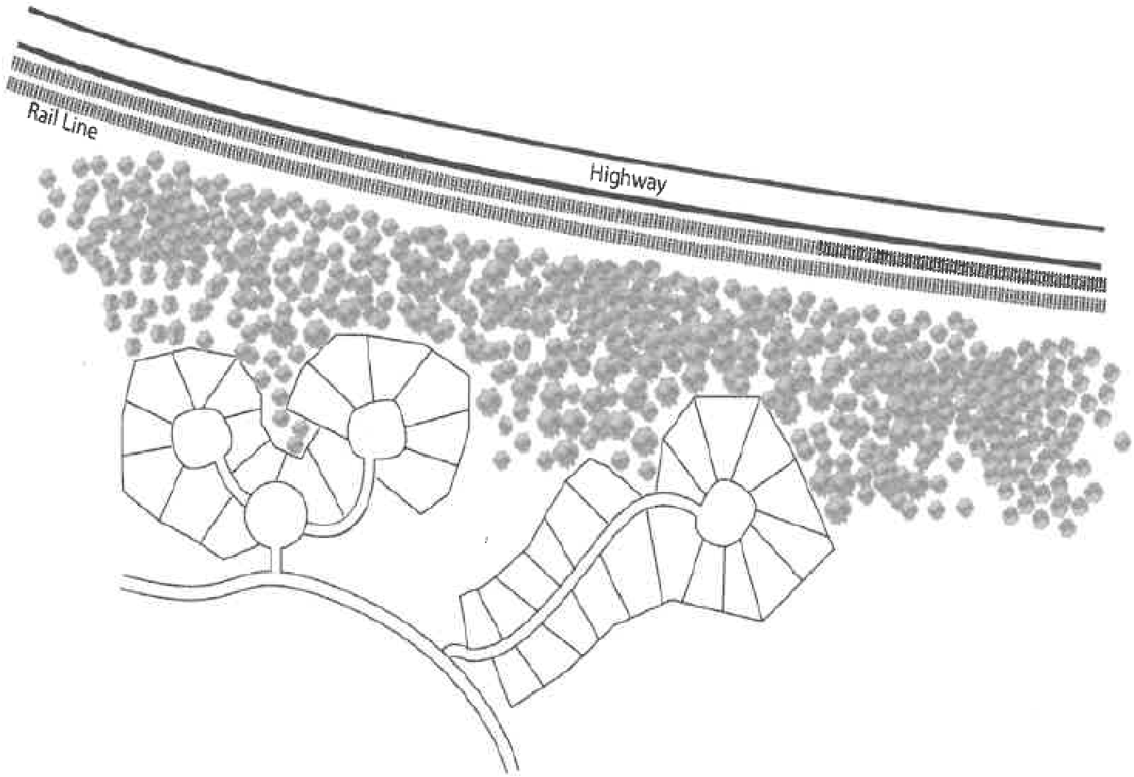
Source: GOOGLE, Parametrix Analysis, 2017

Figure 4-7: Poor Site Planning of Residential Area Adjacent to Freight Corridor



Source: NCFRP, 2012

Figure 4-8: Example of Clustered Development and Improved Residential Area



Source: NCFRP, 2012

Conventional zoning does not generally regulate site planning beyond setback requirements. Form-based code (FBC) may be used to regulate the entire building envelope. This includes 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.

4.4.3 Freight as a Good Neighbor

Freight volume is projected to increase approximately 60 percent over the next 20 years (FHWA, 2012). 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.

Established neighborhood impact mitigation strategies serve as a point of departure for action. Strategies to consider may include:

- Anti-idling rules for trucks
- Rail quiet zones
- Operations restrictions
- Restricted delivery times

While restrictions to freight operations are not ideal, they do serve to promote neighborly harmony and can be incorporated into zoning ordinances or county/municipal statutes.

4.5 Freight Corridor Design

4.5.1 Design Overview

Successful corridors are based on context-sensitive design concepts with respect to a broad range of roadway user types. Truck routes may incorporate design features that ease the movement of larger vehicles such as mountable curbs, larger turning radii, and bicycle and pedestrian facilities that are physically separated. This section is primarily focused on roadway freight corridor design: geometry, street configuration, and functional classification.

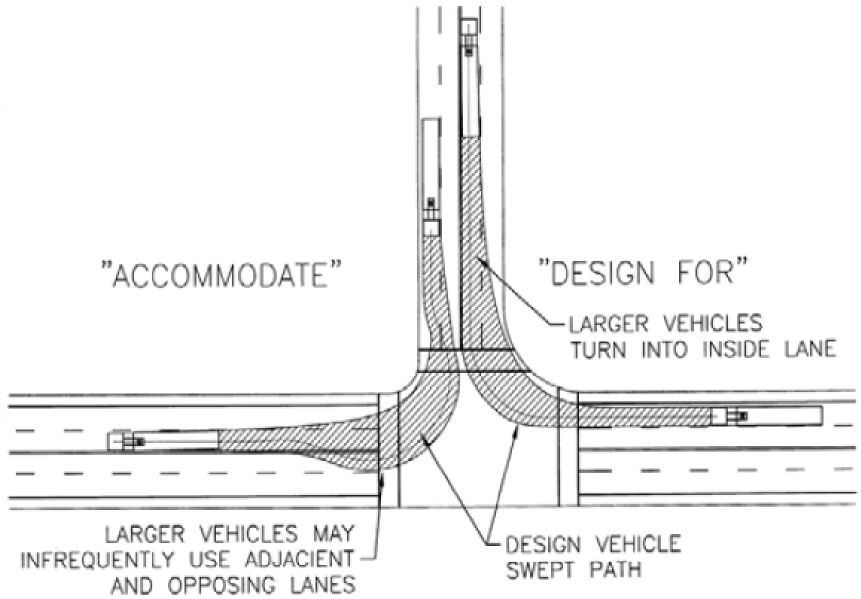
4.5.2 Context Sensitive Solutions (CSS)

Context sensitive solutions (CSS) is a transportation planning framework that responds to adjacent land use variation. In the context of freight planning CSS respects land uses adjacent to freight corridors by modifying the road design as appropriate. 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.

4.5.3 Intersection and Interchange Design

Some cities have integrated a "design for" versus a "design to accommodate" approach to truck route planning (Portland, 2006). This design framework results in a facility that is designed for a larger vehicle (specified) to perform all turning maneuvers while maintaining the vehicle lane or a design that occasionally accommodates a larger vehicle (specified) on a tighter street environment, see Figure 4-9. "When seeking to accommodate larger vehicles in tight street environments, the designer often assumes a truck driver will shift to the left, hugging the lane line, before beginning a right turn, and will use all available lanes moving in their direction to begin and complete the turn" (Portland, 2006).

Figure 4-9: Example of "Design for" and "Design to Accommodate"



Source: City of Portland Freight Master Plan, 2006

Intersection and interchange design were identified as an issue in the stakeholder survey in the COMPASS region. In response, other design considerations should include intersection approach and turning radii. NCFRP offers the following low-cost improvement suggestions for intersections and interchanges (NCFRP, 2010):

- Auxiliary lanes between interchanges to reduce weaving
- Selected improvements at system interchanges to eliminate at-grade merges or inside merge conditions, grade separation
- Addition of turn slots
- Consolidation of driveways to reduce conflict points
- Shoulder usage, especially on interchange ramps and intersections permitting turn movements of large vehicles
- Re-striping merge/diverge areas to better serve demand
- Modifying weaving: clear signage for merges and weaves.

4.5.4 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. Otherwise ten feet to eleven feet is preferred.

Other considerations to roadway design include (FHWA, 2012):

- *Vertical clearance:* This varies by location. FHWA recommends a minimum clearance for twelve feet, six inches for sites that are served by trucks. Rail freight will require clearances of fifteen feet for single-stacked cars and up to twenty-two feet, six inches for double-stack cars.
- *Crest/Sag:* account for line of sight visibility of other vehicles as well as maneuverability of vehicle through vertical curve.

4.5.5 Multimodal Integration

Roadway freight traffic, bicycle traffic, and pedestrians may safely coexist with proper design. As bicycles and large freight vehicles are inherently incompatible, these modes must be physically separated. It is not recommended to place a conventional bike lane on a truck route without an appropriate buffer, see Figure 4-10 and Figure 4-11 for possible bike facility configuration.

Figure 4-10: Buffered Bike Lane

Source: NACTO, 2017

Figure 4-11: Buffered Bike Lane

Source: NACTO, 2017

4.5.6 Wayfinding

Placement of signs that indicate truck routes help drivers navigate through and within municipalities. Examples of Manual on Uniform Traffic Control Devices (MUTCD)-compliant truck signs are shown in Figure 4-12.

Figure 4-12: Examples of Truck Signs

Source: Manual on Uniform Traffic Control Devices, 2017

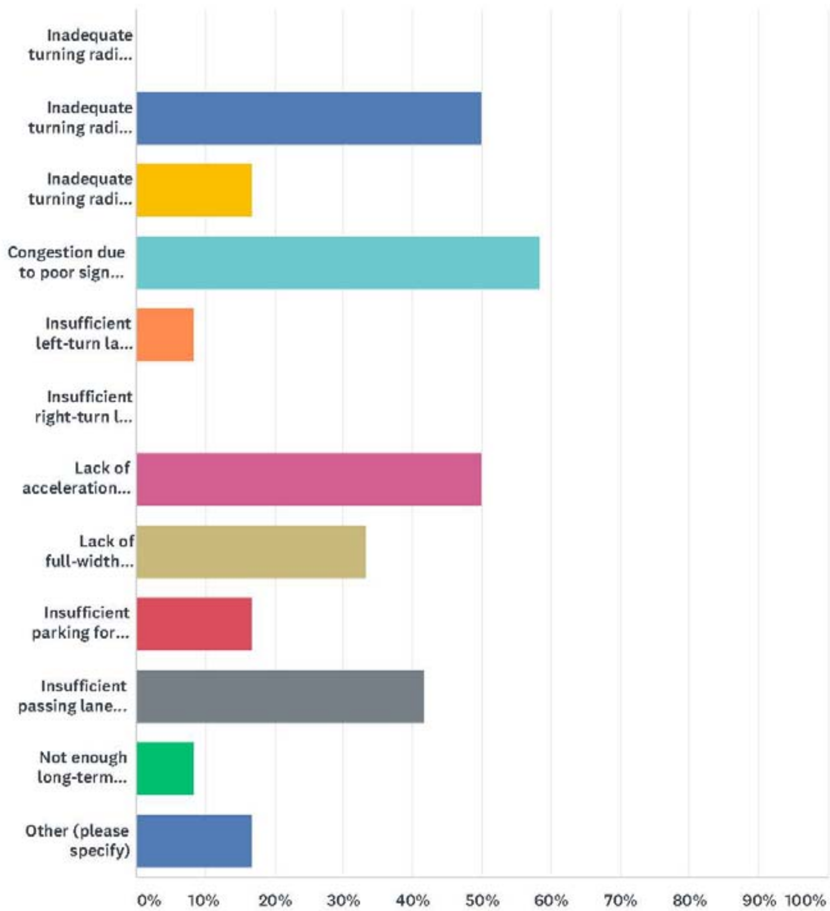
4.6 Access Management Standards

Access

Appendix A: Stakeholder Survey

Q1 What are the three most important roadway freight mobility issues affecting freight corridors in Ada and Canyon Counties?

Answered: 12 Skipped: 0



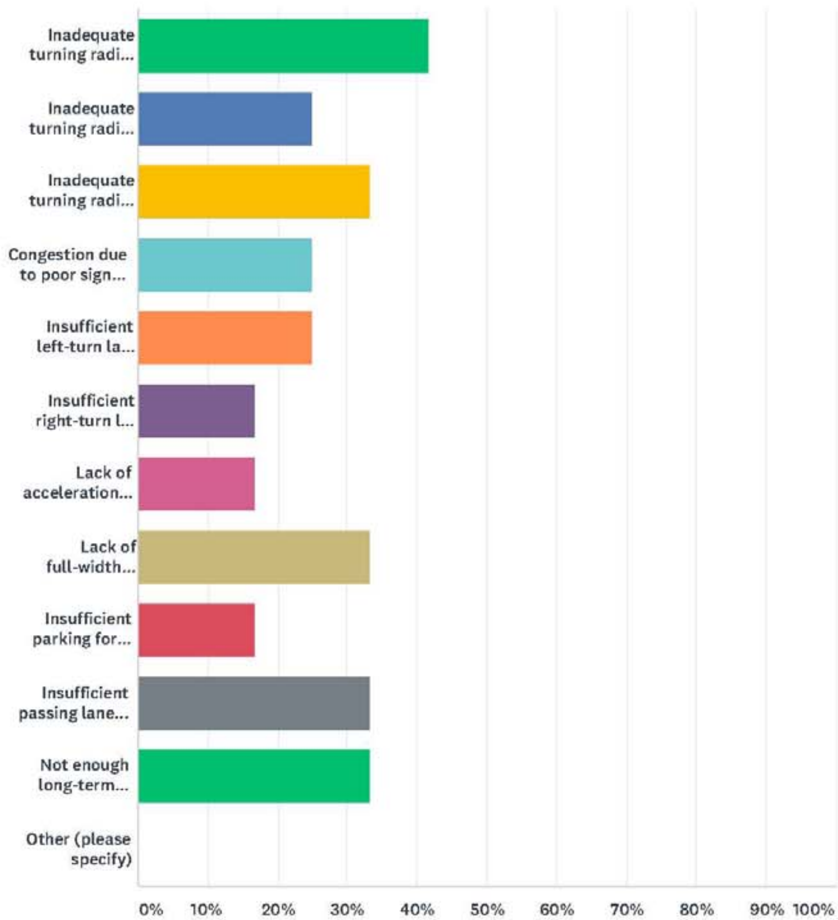
ANSWER CHOICES	RESPONSES	
Inadequate turning radii at interchanges	0.00%	0
Inadequate turning radii at intersections	50.00%	6
Inadequate turning radii at business accesses	16.67%	2
Congestion due to poor signal timing	58.33%	7
Insufficient left-turn lane lengths	8.33%	1
Insufficient right-turn lane lengths	0.00%	0
Lack of acceleration/deceleration lanes	50.00%	6

Lack of full-width paved shoulders	33.33%	4
Insufficient parking for loading/unloading zones	16.67%	2
Insufficient passing lanes on rural two-lane highways	41.67%	5
Not enough long-term (overnight) truck parking	8.33%	1
Other (please specify)	16.67%	2
Total Respondents: 12		

#	OTHER (PLEASE SPECIFY)	DATE
1	Poor land use planning and network design forcing local traffic onto arterials needed for freight	9/7/2017 3:54 PM
2	Lack of frontage and backage roads parallel to principal arterials	9/5/2017 1:23 PM

Q2 What are the three least important roadway freight mobility issues affecting freight corridors in Ada and Canyon Counties?

Answered: 12 Skipped: 0



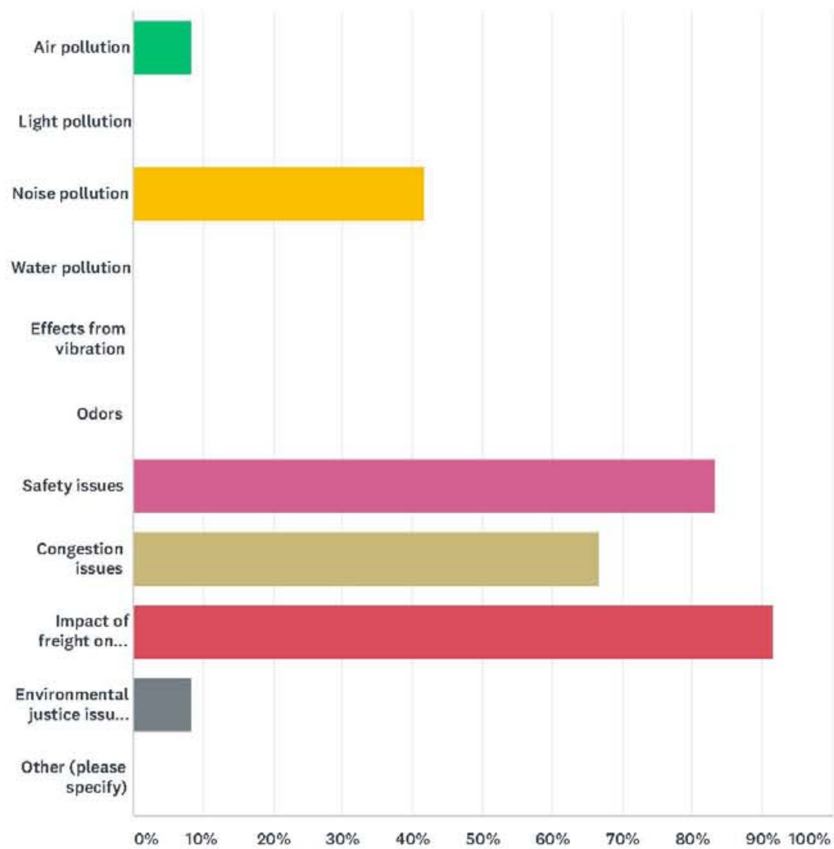
ANSWER CHOICES	RESPONSES	
Inadequate turning radii at interchanges	41.67%	5
Inadequate turning radii at intersections	25.00%	3
Inadequate turning radii at business accesses	33.33%	4
Congestion due to poor signal timing	25.00%	3
Insufficient left-turn lane lengths	25.00%	3
Insufficient right-turn lane lengths	16.67%	2
Lack of acceleration/deceleration lanes	16.67%	2

Lack of full-width paved shoulders	33.33%	4
Insufficient parking for loading/unloading zones	16.67%	2
Insufficient passing lanes on rural two-lane highways	33.33%	4
Not enough long-term (overnight) truck parking	33.33%	4
Other (please specify)	0.00%	0
Total Respondents: 12		

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q3 What are the three most significant negative impacts of freight activity in Ada and Canyon Counties (e.g. freight terminals/clusters and freight modes (truck, rail, pipeline, and aviation))?

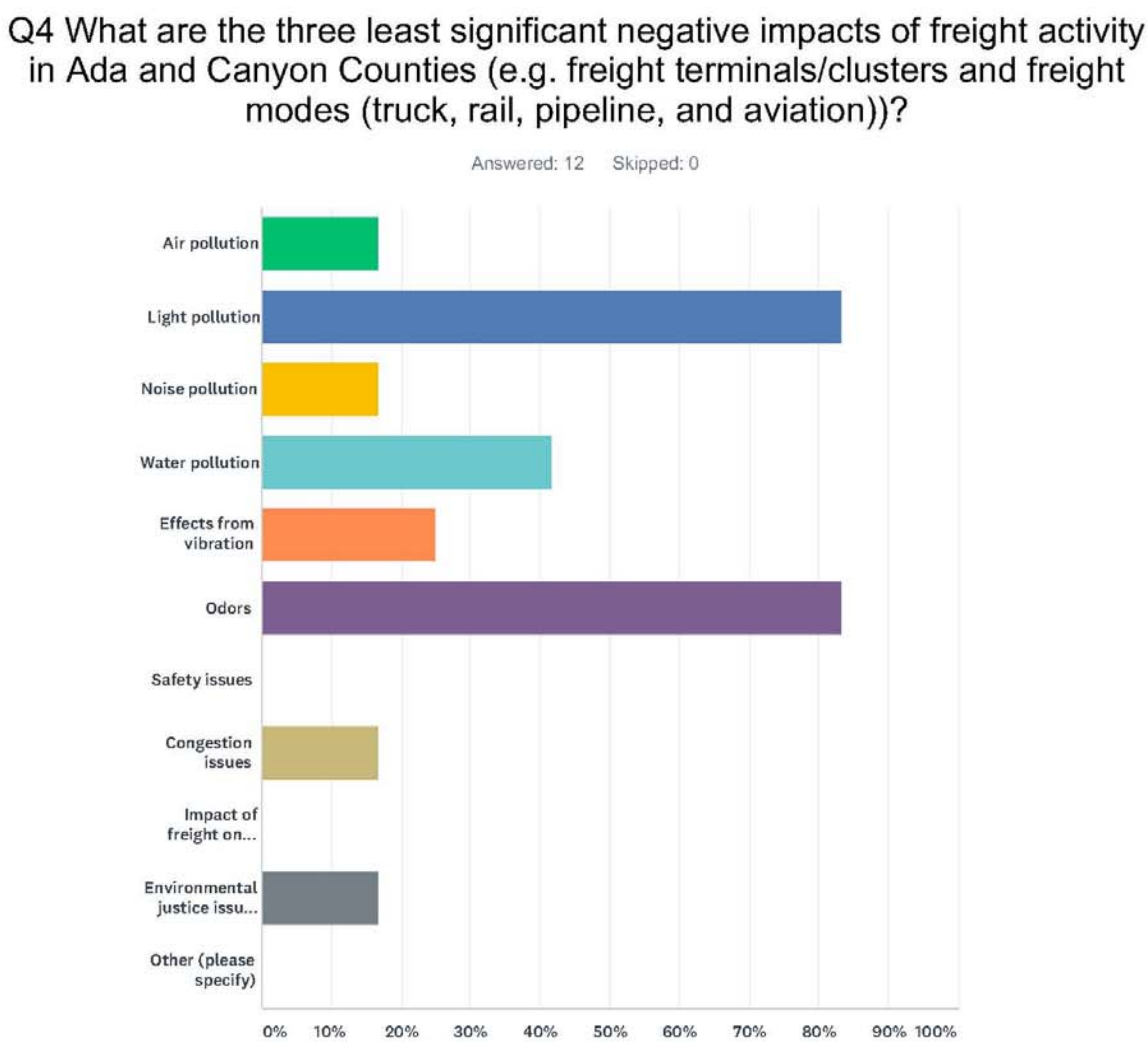
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Air pollution	8.33%	1
Light pollution	0.00%	0
Noise pollution	41.67%	5
Water pollution	0.00%	0
Effects from vibration	0.00%	0
Odors	0.00%	0
Safety issues	83.33%	10
Congestion issues	66.67%	8

Impact of freight on roadway maintenance	91.67%	11
Environmental justice issues (minority or low-income populations disproportionately affected by freight activity)	8.33%	1
Other (please specify)	0.00%	0
Total Respondents: 12		

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	



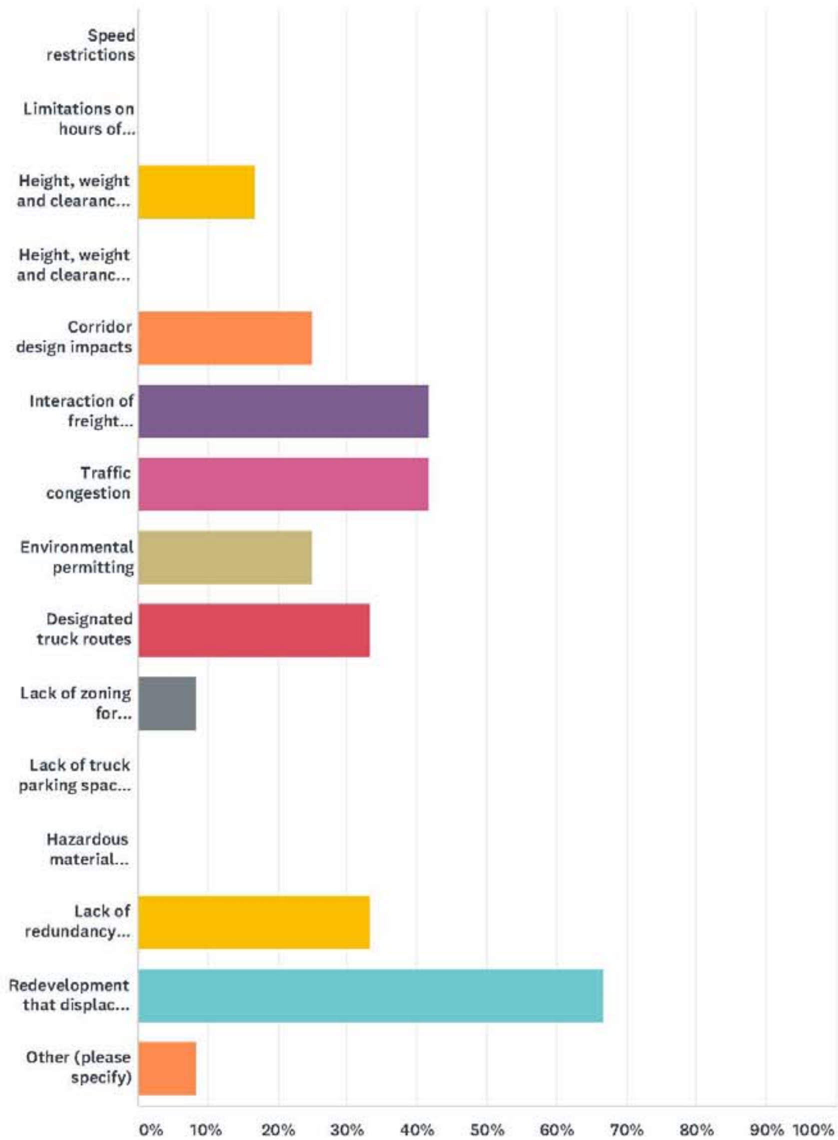
ANSWER CHOICES	RESPONSES	
Air pollution	16.67%	2
Light pollution	83.33%	10
Noise pollution	16.67%	2
Water pollution	41.67%	5
Effects from vibration	25.00%	3
Odors	83.33%	10
Safety issues	0.00%	0
Congestion issues	16.67%	2

Impact of freight on roadway maintenance	0.00%	0
Environmental justice issues (minority or low-income populations disproportionately affected by freight activity)	16.67%	2
Other (please specify)	0.00%	0
Total Respondents: 12		

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q5 What are the three most significant barriers to freight mobility in Ada and Canyon Counties?

Answered: 12 Skipped: 0



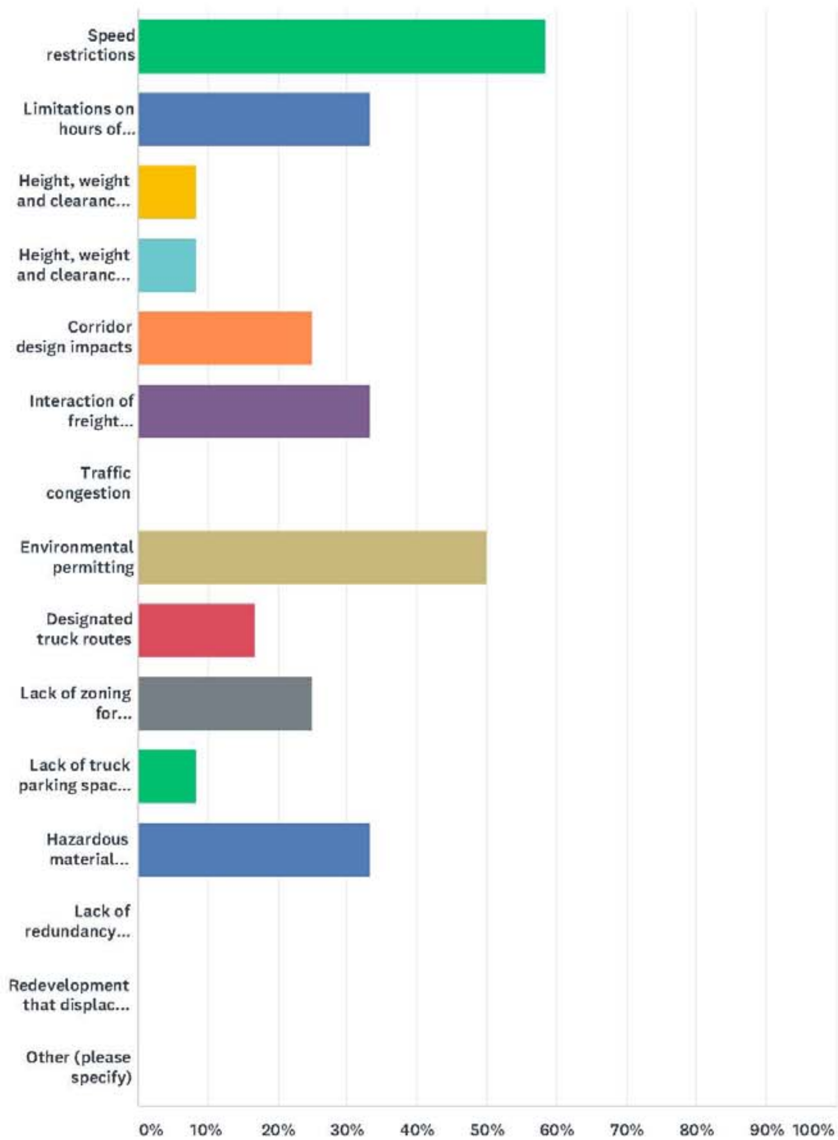
ANSWER CHOICES	RESPONSES	
Speed restrictions	0.00%	0
Limitations on hours of operation	0.00%	0

Height, weight and clearance issues on roadways	16.67%	2
Height, weight and clearance issues on railroads	0.00%	0
Corridor design impacts	25.00%	3
Interaction of freight vehicles with non-motorized users	41.67%	5
Traffic congestion	41.67%	5
Environmental permitting	25.00%	3
Designated truck routes	33.33%	4
Lack of zoning for freight/industrial uses	8.33%	1
Lack of truck parking spaces (e.g. decreasing truck productivity in search of space)	0.00%	0
Hazardous material routing	0.00%	0
Lack of redundancy (only one interstate, minimal river crossings) and the impact of nonrecurring events (e.g. crashes, weather, flooding)	33.33%	4
Redevelopment that displaces, impedes, or increases the cost of freight transportation	66.67%	8
Other (please specify)	8.33%	1
Total Respondents: 12		

#	OTHER (PLEASE SPECIFY)	DATE
1	Industrial zoned land being used for non-industrial uses, since the land is less expensive.	9/6/2017 3:46 PM

Q6 What are the three least significant barriers to freight mobility in Ada and Canyon Counties?

Answered: 12 Skipped: 0



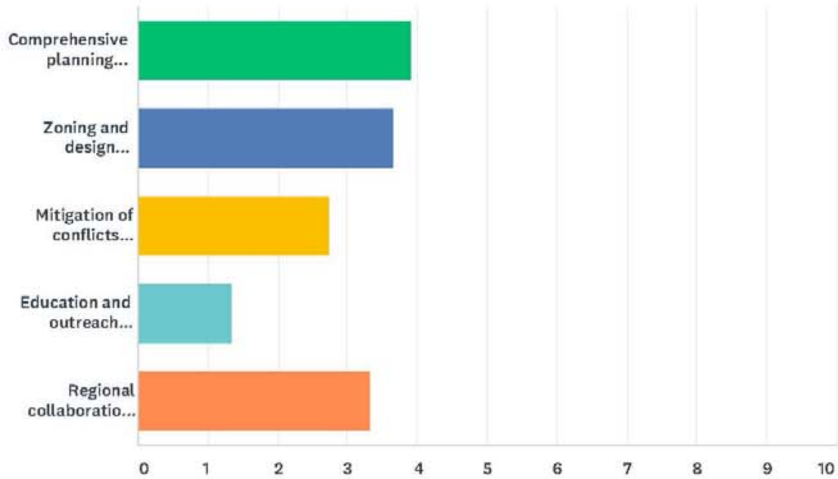
ANSWER CHOICES	RESPONSES	
Speed restrictions	58.33%	7
Limitations on hours of operation	33.33%	4

Height, weight and clearance issues on roadways	8.33%	1
Height, weight and clearance issues on railroads	8.33%	1
Corridor design impacts	25.00%	3
Interaction of freight vehicles with non-motorized users	33.33%	4
Traffic congestion	0.00%	0
Environmental permitting	50.00%	6
Designated truck routes	16.67%	2
Lack of zoning for freight/industrial uses	25.00%	3
Lack of truck parking spaces (e.g. decreasing truck productivity in search of space)	8.33%	1
Hazardous material routing	33.33%	4
Lack of redundancy (only one interstate, minimal river crossings) and the impact of nonrecurring events (e.g. crashes, weather, flooding)	0.00%	0
Redevelopment that displaces, impedes, or increases the cost of freight transportation	0.00%	0
Other (please specify)	0.00%	0
Total Respondents: 12		

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q7 Considering tools to preserve and improve mobility on roadway freight corridors, what are the most important tools that would have the greatest impact? Please rank in order of most important (1) to least important (6).

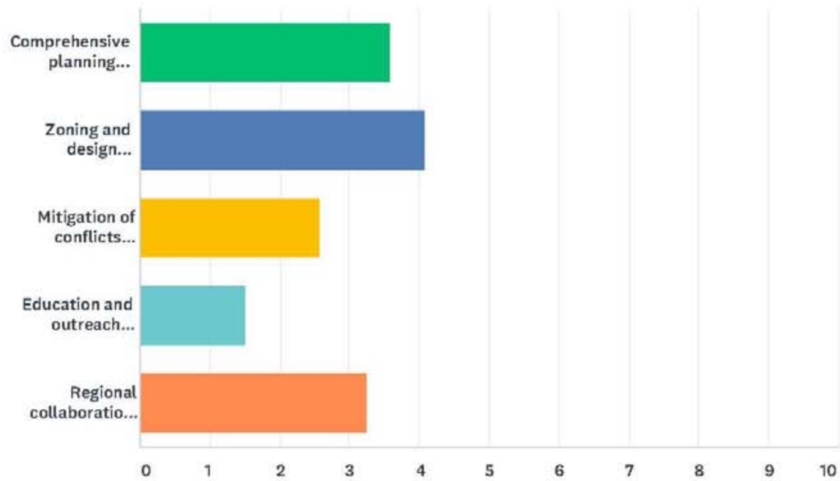
Answered: 12 Skipped: 0



	1	2	3	4	5	TOTAL	SCORE
Comprehensive planning (policies, goals and objectives that prohibit incompatible land uses near freight facilities and vice versa)	41.67% 5	33.33% 4	8.33% 1	8.33% 1	8.33% 1	12	3.92
Zoning and design (ordinances that prohibit the rezone of industrial land to other uses and the protection of existing freight corridors/facilities)	16.67% 2	41.67% 5	33.33% 4	8.33% 1	0.00% 0	12	3.67
Mitigation of conflicts between freight and other land uses (strategies that mitigate freight externalities such as noise, light, vibration, odors, congestion, safety, etc.)	8.33% 1	16.67% 2	25.00% 3	41.67% 5	8.33% 1	12	2.75
Education and outreach (community round tables and freight fact sheets)	0.00% 0	0.00% 0	0.00% 0	33.33% 4	66.67% 8	12	1.33
Regional collaboration of planning efforts (freight task forces and working groups)	33.33% 4	8.33% 1	33.33% 4	8.33% 1	16.67% 2	12	3.33

Q8 Considering tools to preserve rail-served freight businesses, what are the most important tools that would have the greatest impact? Please rank in order of most important (1) to least important (6).

Answered: 12 Skipped: 0



	1	2	3	4	5	TOTAL	SCORE
Comprehensive planning (policies, goals and objectives that discourage incompatible land uses near freight facilities and vice versa)	33.33% 4	16.67% 2	25.00% 3	25.00% 3	0.00% 0	12	3.58
Zoning and design (ordinances that prohibit the rezone of industrial land to other uses and the protection of existing freight corridors/facilities)	41.67% 5	33.33% 4	16.67% 2	8.33% 1	0.00% 0	12	4.08
Mitigation of conflicts between freight and other land uses (strategies that mitigate freight externalities such as noise, light, vibration, odors, congestion, safety, etc.)	0.00% 0	25.00% 3	25.00% 3	33.33% 4	16.67% 2	12	2.58
Education and outreach (community round tables, freight fact sheets, Operation Lifesaver, etc.)	0.00% 0	0.00% 0	8.33% 1	33.33% 4	58.33% 7	12	1.50
Regional collaboration of planning efforts (freight task forces and working groups)	25.00% 3	25.00% 3	25.00% 3	0.00% 0	25.00% 3	12	3.25

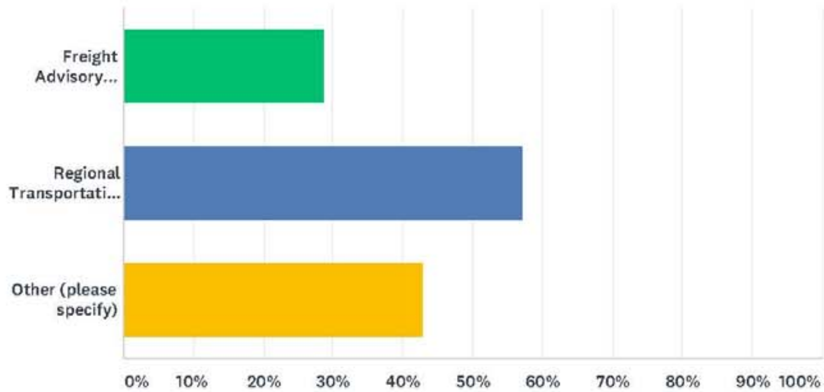
Q9 Are there other issues that you would like addressed in the model freight corridor ordinances not discussed in the previous questions?

Answered: 5 Skipped: 7

#	RESPONSES	DATE
1	no	9/11/2017 7:31 AM
2	I would like to see an intermodal station built in Boise, out near the airport area.	9/6/2017 8:53 AM
3	Industrial zoning through Ada County appears to take place next to a minimal use railway line. This land could attract many industrial businesses if planned correctly regionally.	9/5/2017 5:32 PM
4	Need to make sure ped and bike facilities are allowed in freight corridor, especially the regional network and future rails with trails plan.	9/5/2017 1:23 PM
5	Trucking is emphasized too much in this community. Rail should be better utilized.	9/5/2017 12:53 PM

Q10 Please indicate whether you are a member of the following:

Answered: 7 Skipped: 5



ANSWER CHOICES	RESPONSES	
Freight Advisory Working Group (FAWG)	28.57%	2
Regional Transportation Advisory Committee (RTAC)	57.14%	4
Other (please specify)	42.86%	3
Total Respondents: 7		

#	OTHER (PLEASE SPECIFY)	DATE
1	Meridian Transportation Commission.	9/6/2017 8:53 AM
2	Meridian Transportation Commission	9/5/2017 10:13 PM
3	Meridian Transportation Advisory Committee	9/5/2017 5:32 PM

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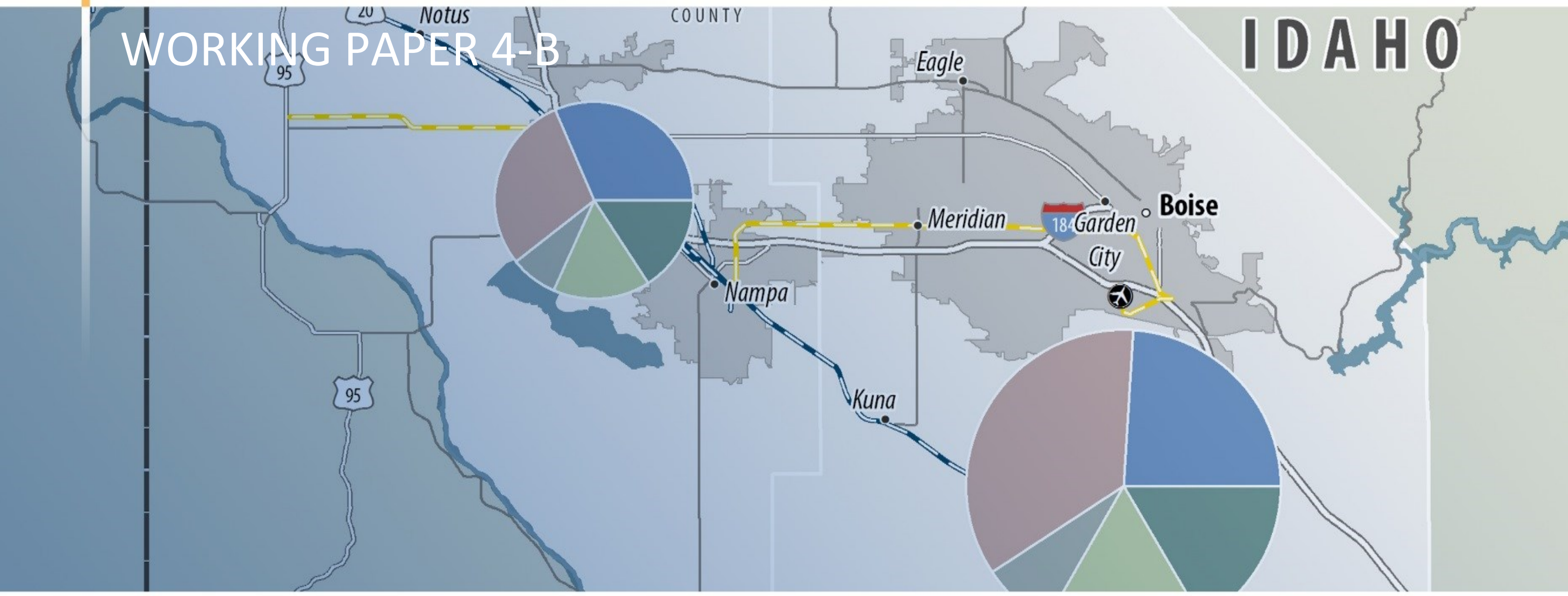
WORKING PAPER 4-B



COMPASS Freight Study

Client Reference: RFQ 2017-02

Prioritization of Freight Improvements

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

April 19, 2018
CPCS Ref: 16629

Acknowledgments / Confidentiality

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

Cover image source: CPCS

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Table of Contents

Acronyms / Abbreviations

ATRI	American Transportation Research Institute
CIM	Communities in Motion
COMPASS	Community Planning Association of Southwest Idaho
CRFC	Critical Rural Freight Corridor
CUFC	Critical Urban Freight Corridor
EB	Eastbound
GIS	Geographic Information System
GPS	Global Positioning System
ITA	Idaho Trucking Association
ITD	Idaho Transportation Department
ITIP	Idaho Transportation Investment Program
Mph	Miles per Hour
MPO	Metropolitan Planning Organization
NB	Northbound
NHFN	National Highway Freight Network
NHFP	National Highway Freight Program
OCN	Other Connector
PHFS	Primary Highway Freight System
RCN	Regional Connector
RCR	Regional Corridor
RTAC	Regional Transportation Advisory Committee
SB	Southbound
SCN	Supplementary Connector
SH	State Highway
STIP	Statewide Transportation Improvement program
TIP	Transportation Improvement Program
US	United States
VMT	Vehicle Miles Traveled
WB	Westbound

Executive Summary

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.

This study supports COMPASS's decision-making processes by explicitly integrating freight and goods movement into the decision-making framework for prioritization. Specifically, 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.

More generally, the study team recommends that COMPASS:

1) Use the findings from this study to inform COMPASS's long-range transportation planning efforts and other work relevant to freight and goods movement
2) Integrate freight into its multicriteria 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 CUFC definitions with ITD 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 to convene public- and private-sector stakeholders to discuss and develop solutions to regional freight issues

1 Introduction

Key Chapter Takeaways

The Community Planning Association of Southwest Idaho (COMPASS) is conducting a freight study to support its long-range transportation plan, *Communities in Motion 2040*. The freight study is identifying freight corridors and related land use needs, developing a profile of the regionally most important commodities and supply chains, and identifying projects and/or policies to address maintenance needs, improve safety, and manage congestion. This present working paper aims to identify freight related performance issues within the COMPASS region.

1.1 Background

As the metropolitan planning organization (MPO) for the Boise-Nampa area, COMPASS is focused on integrating freight 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

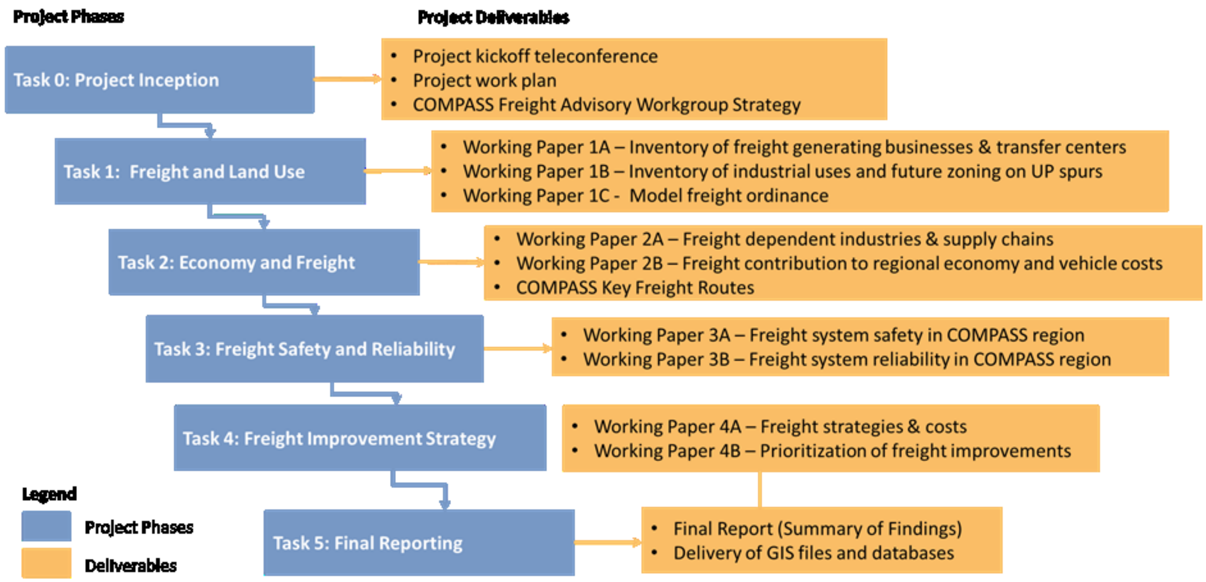
As set out in the RFP, the key outcomes of this study are:

- 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 projects and/or policies to address maintenance needs, improve safety, mitigate choke points, and manage congestion

1.3 Project Structure

The project is to be developed in five broad phases, as set out in Figure 1-1. Each of these phases has a series of deliverables.

Figure 1-1: Project Tasks



1.4 Purpose of this Working Paper

As part of Task 4: Freight Improvement Strategy, the purpose of this Working Paper is to make recommendations on freight prioritization for COMPASS. The bulk of this Working Paper is in Chapter 2, while Chapter 3 includes next steps.

This Working Paper is also intended to provide COMPASS with an overview of progress to date and to solicit comments and other feedback on the structure and content of this component part of what will become the final report. Note that revisions to this Working Paper will be reflected in the Draft Final Report.

1.5 Methodology and Limitations

The study team prepared this working paper with information from various data sources as previously outlined in past Working Papers (including GPS data, safety data from ITD, and consultations with industry stakeholders). While the study team makes efforts to validate data, the study team cannot warrant the accuracy of third-party data.

2 Freight Prioritization

Key Chapter Takeaways

- This study addresses many specific data gaps related to freight and goods movement, using a quantitative yet intuitive approach to define freight clusters, truck volumes, truck corridors, and the regional economic importance of freight, among many others.
- This study recommends integrating the freight corridors into a **multicriteria framework**, which 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.
- Specifically, proposed projects that are on freight corridors identified in this study can receive extra consideration, reflecting the amplified importance of these corridors for freight mobility.
- This study also 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.

2.1 Background on State and Federal Funding

2.1.1 Overview of Regional Programming

Funding programs relevant to freight transportation in the region include:[1]

Transportation Improvement Program (TIP): This is a short-range budget (5 years, plus 2 years of preliminary development) of multimodal "regionally significant" transportation projects put together by metropolitan planning organizations (MPO), such as COMPASS. The TIP is consistent with federal regulations as well as with the regional long-range transportation plan (CIM 2040), and is based on significant consultations and outreach. COMPASS' FY2018-2022 Regional Transportation Improvement Program was adopted by the COMPASS Board of Directors on October 16, 2017.

Currently, regional project prioritization is on the basis of a paired comparison system. Members of the Regional Transportation Advisory Committee (RTAC) review the technical/analytical details of two proposed projects at a time, and select the more deserving project – each RTAC member then repeats this process many times across multiple projects, with the end result that the projects selected the most frequently score highest.

CIM 2040 includes 56 performance measures, against which projects in the TIP are measured. One of these is specifically related to freight: "Freight Movement and Economic Vitality," described as "safety or capacity improvements to decrease congestion on freight routes."[2]

Idaho Transportation Investment Program (ITIP): This state document compiled by the Idaho Transportation Department (ITD) contains seven years of individually identified projects across all modes of transportation. The investments are through various funding programs, including state and federal funds. The program is approved by the Idaho Transportation Board.

The ITIP includes a Freight Program. The most recent approved ITIP (FY2018-2024), approved in September 2017, includes eight projects, including relating to issues such as ports of entry. One of the projects is in District 3, although outside the COMPASS region (I-84 at Hammett Hill east of Mountain Home).[3]

Statewide Transportation Improvement Program (STIP): This document is a federally-oriented document that includes seven years of federally funded projects. Projects within MPO planning areas are included in whole by reference and approved jointly by the regional MPO. The STIP is approved by the Idaho Transportation Board and the approved plan is submitted to the Federal Highway Administration, Federal Transit Administration and Environment Protection Agency for their approvals.

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[1] Differences between the funding programming documents are explained in ITD's briefing "ITIP – STIP – TIP: What's the difference?"

[2] COMPASS, "CIM 2040 Performance Measures and Targets"

[3] ITD, "Approved FY2018-2024 Idaho Transportation Investment Program (ITIP)"

2.1.2 Federal Freight Funding

National Highway Freight Program: The Fixing America's Surface Transportation (FAST) Act established a new National Highway Freight Program (NHFP) to improve the efficient movement of freight on the National Highway Freight Network (NHFN). The NHFN consists of the entire interstate highway system, as well as the Primary Highway Freight System (PHFS), which is itself comprised of much of the interstate system plus a smaller portion of important non-interstate corridors. In addition, the NHFN also includes Critical Urban Freight Corridors (CUFCs) and Critical Rural Freight Corridors (CRFC), which are designated by states and MPOs based on fairly broad criteria and state maximum mileages set federally. Specifically, the CRFC mileage limit for each state is equal to 150 miles or 20% of PHFS mileage in the state, and the CUFC mileage limit for each state is 75 miles or 10% of PHFS mileage in the state. Idaho's maximum mileage limits are 150 miles and 75 miles for CRFC and CUFC, respectively.[4]

The types of activities that can be funded through NHFP funds is quite broad and includes the selected examples shown in Figure 2-1, among others.

Figure 2-1: Selected Examples of Eligible Activities under the FAST Act for the NHFP

Selected Examples of Eligible Activities		
Development activities (planning, feasibility analysis, revenue forecasting)	Construction, rehabilitation, property acquisition	Intelligent Transportation Systems and traffic signal optimization
Environmental mitigation	Grade separations	Geometric improvements
Truck-only lanes	Climbing and runaway truck lanes	Truck parking facilities
Real-time information systems	Electronic screening systems (e.g. weigh-in-motion)	Other highway and road projects

Source: FHWA, "FAST Act: National Highway Freight Program" (Fact Sheet)

ITD designated CUFCs as part of its State Freight Plan, completed in early 2017. The urbanized areas of Boise and Nampa collectively have over half (55%) of the state's CUFC mileage, as shown in Figure 2-2.

Figure 2-2: 2017 CUFC Designation for Idaho

Urbanized Area	Miles of CUFC	Share of State CUFC
Boise	21.59	29%
Nampa	19.08	26%
Coeur d'Alene	10.65	14%
Lewiston	9.32	13%
Pocatello	7.97	11%
Idaho Falls	5.67	8%
TOTAL	**74.28**	**100%**

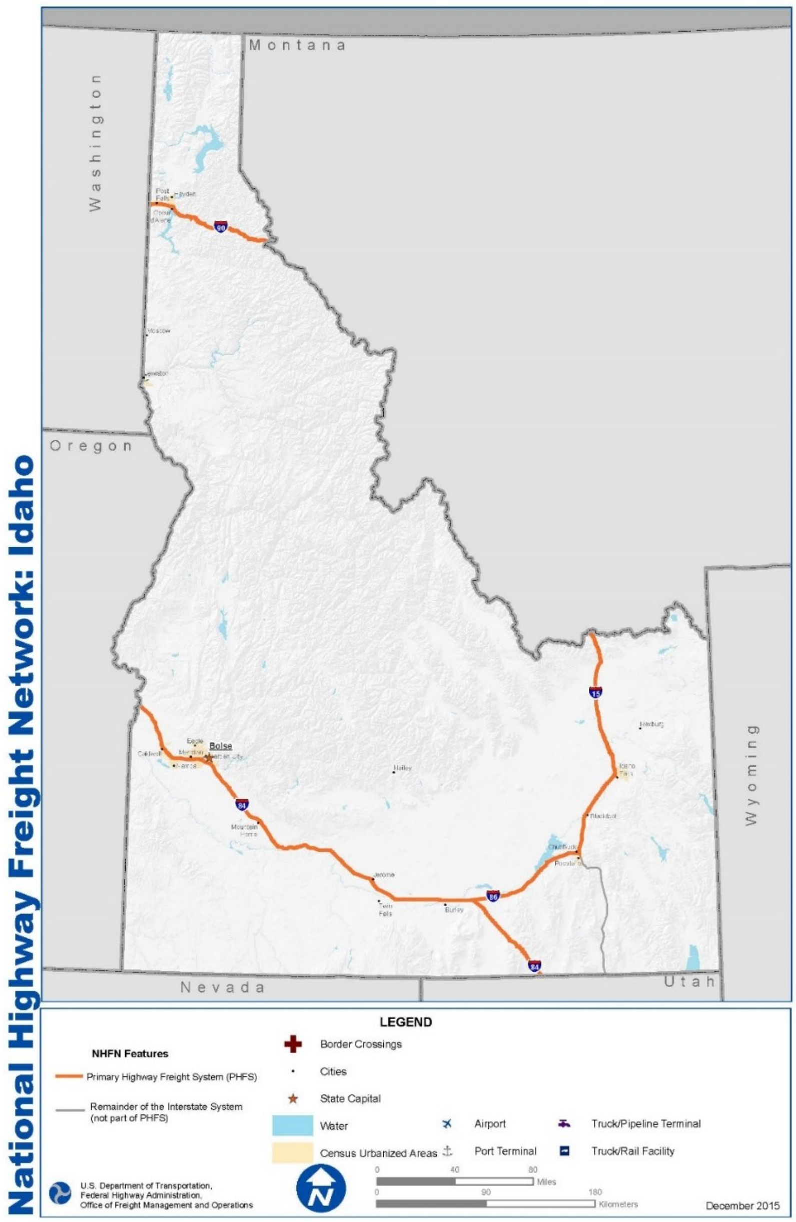
Source: Table 6.5, ITD, "Idaho Transportation Department Statewide Freight Strategic Plan" (2017)

[4] FHWA, "Fast Act, Section 1116 National Highway Freight Program (NHFP) Guidance" (2016)

According to the FHWA, designations for CRFCs and CUFCs may occur at any time and may be provided to FHWA on a rolling basis. This means that these designations are not static and can be revisited regularly. However, no NHFP funding can be spent on CRFCs or CUFCs before these routes are designated and certified.

Figure 2-3 displays the NFHN for Idaho, excluding CUFC and CRFC (in other words, the PHFS plus remaining interstates). Most of the interstate network in Idaho is included in the PHFS, with the exception of I-15 south from Pocatello and I-184 in Boise.

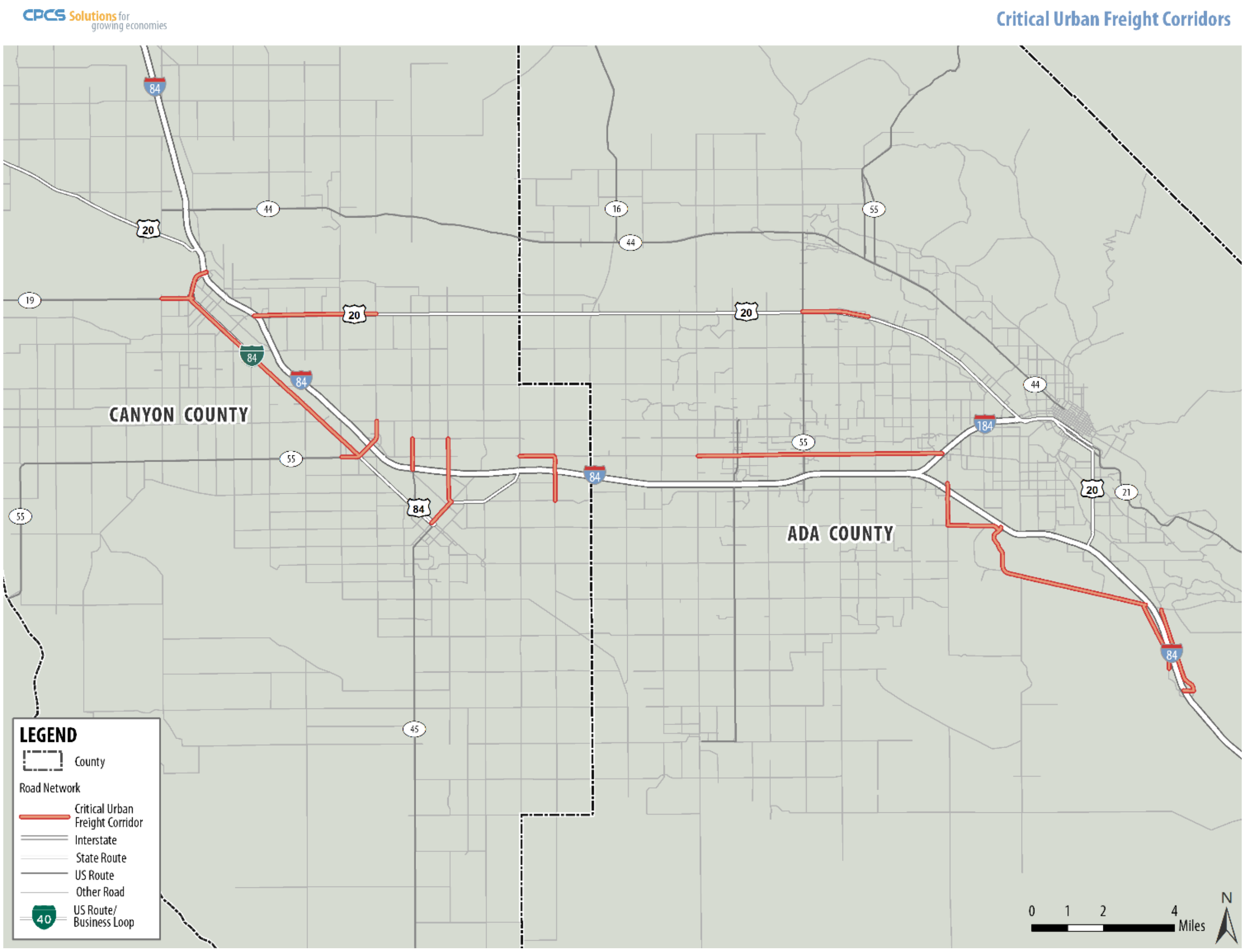
Figure 2-3: NHFN in Idaho (Excluding CUFC and CRFC)



Source: FHWA, "National Highway Freight Network Map and Tables for Idaho" (2015)

The current CUFC network is shown in Figure 2-4. There are sixteen discrete corridor segments on the CUFC network totaling just over 40 miles – these are approximately equally divided (in terms of both segments and miles) between Ada and Canyon counties.

Figure 2-4: Current Critical Urban Freight Corridors in Study Region



Source: Table 6.5, ITD, "Idaho Transportation Department Statewide Freight Strategic Plan" (2017)

2.2 What this Study Provides

This study addresses a number of specific existing data and knowledge gaps relating to understanding how the freight industry works in the region, and applying this knowledge to impact regional decision-making. Figure 2-5 outlines notable ways in which this study addresses these gaps.

Figure 2-5: How this Study Addresses Existing Data and Knowledge Gaps in the Region

Issue	Existing Gap	How Study Addresses
Freight Clusters	The region was in need of a consistent, methodologically sound, and easily applicable method of describing the geospatial distribution of freight activity across the region.	Study uses business establishment data, IDOL employment data and truck GPS "trip end" data to define primary and secondary freight clusters – showing where freight activity is concentrated.
Truck Volumes	The region had truck volume data for only a subset of roads where truck counts had been performed.	Study provides truck volume data across the entire road network based on recent truck GPS data – reflecting how trucks use the road system in real life.
Freight Performance Issues	The region was lacking a comprehensive analysis of regionally important truck freight issues, backed by data and industry stakeholder feedback.	Study identifies truck delay hotspots (bottlenecks) using GPS data, truck-involved safety hotspots using crash data, and other issues identified in approximately two dozen interviews with leading freight industry stakeholders.
Freight Corridors	The region lacked a full understanding of which road and highway corridors are currently most important for the freight industry.	Study uses a variety of sources, including truck volumes and access to clusters, to define a clear, consistent, and data-driven hierarchy of truck freight corridors – based on how trucks actually use the region's road system.
Freight Needs	The region had a limited picture of the freight industry's needs and how existing or future projects could help the freight industry.	Study provides an analytical framework for evaluating and ranking freight needs, and lays the groundwork for more detailed analyses of solutions by providing examples of preliminary solutions and associated high-level costs.
Freight Framework	The region did not have a detailed methodological framework for integrating freight issues into its regional planning and programming structures.	Study provides an easy-to-understand framework for incorporating freight, and provides recommendations on how this framework can be updated or extended in the future.
Other Issues	The region was in need of a more comprehensive understanding of how the freight industry operates in the region, the freight industry's needs and contribution to the economy, and recommendations on how to improve the movement of freight in the region.	Study provides insight on a variety of freight-related issues, including regional supply chains, the economic importance of freight, commodity flows, freight rail, freight and land use, and maintenance needs of road and highway corridors.

Source: CPCS

2.3 Conceptualizing Freight Prioritization

At a conceptual level, freight prioritization can be viewed as representing the nexus between *freight corridors* on the one hand, and *performance* on the other hand. In other words, the roads that are prioritized are those that are:

a) Among the most important corridors for facilitating freight transportation, and

b) Subject to performance issues that limit or reduce the proper function of those corridors.

This concept is displayed in a simplistic graphical form in Figure 2-6, with the highlighted box representing the nexus of important freight corridors and significant performance issues.

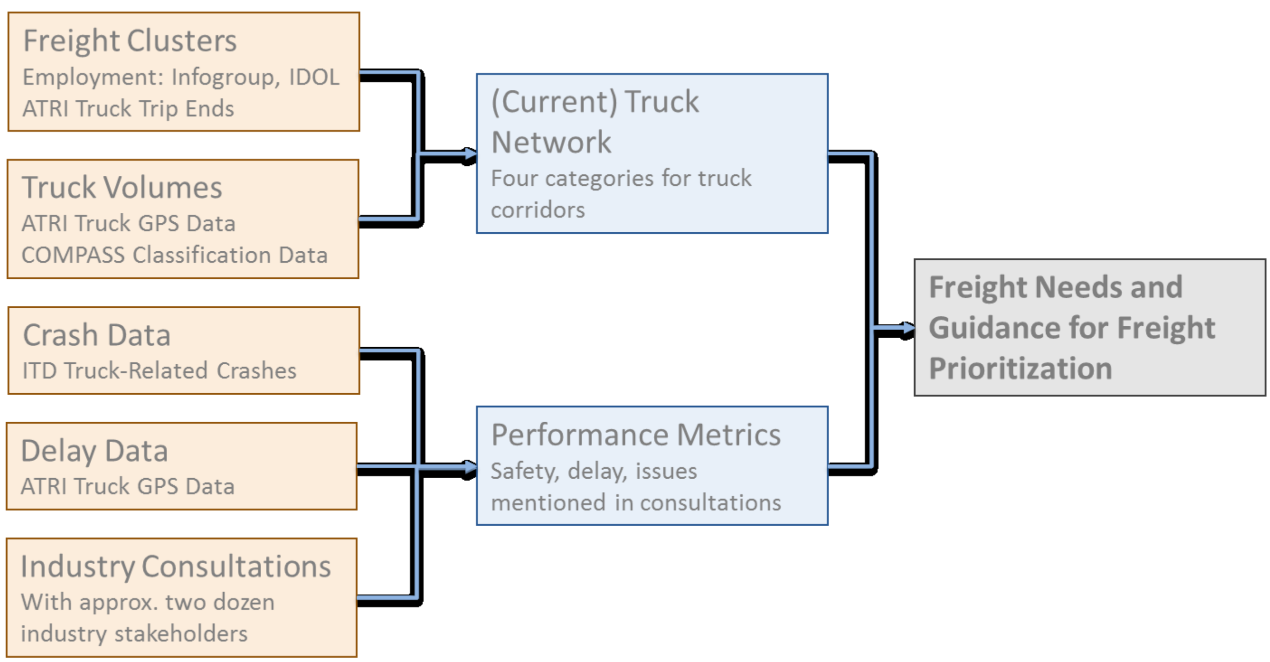
Figure 2-6: Conceptual Nexus Informing Freight Prioritization

		Significant Performance Issues?	
		Yes	No
Important Freight Corridor?	Yes	**Rank high for freight prioritization**	Important to monitor but not in need of major interventions
	No	May be prioritized for other reasons but not freight	No prioritization implications

Source: CPCS

Although all freight prioritization essentially follows the above concept, in practice there are many ways to implement this principle. Figure 2-7 displays the approach used in this study. The current truck corridor network is defined based on truck volumes and access to freight clusters, using new and emerging data sources. Performance issues are identified through analysis of safety and delay data as well as through industry consultations.

Figure 2-7: Prioritization Approach Used in This Study



Source: CPCS

There are also multiple different applications for freight prioritization. To date the most significant attempt to prioritize freight corridors in the region has been the recent process pursued to identify CUFCs, which predated this study. This Working Paper compares the currently defined CUFCs in the region to the analysis conducted in this study (Section 2.4) and goes on to make recommendations on other ways that freight prioritization can be pursued by COMPASS and other freight stakeholders in the region (Section 2.5).

2.4 Comparing Freight Study to Existing Freight Corridors

Figure 2-8 compares the existing Critical Urban Freight Corridors from ITD's Statewide Freight Strategic Plan to the current truck corridors identified in this study. (Figure 2-9 and Figure 2-10 display CUFCs and current truck corridors in map form).

Notably, all of the present CUFCs are on a freight corridor. The table below also differentiates between different classes of corridors (RCR – regional corridor, RCN – regional connector, SCN – supplementary connector, OCN – other connector).

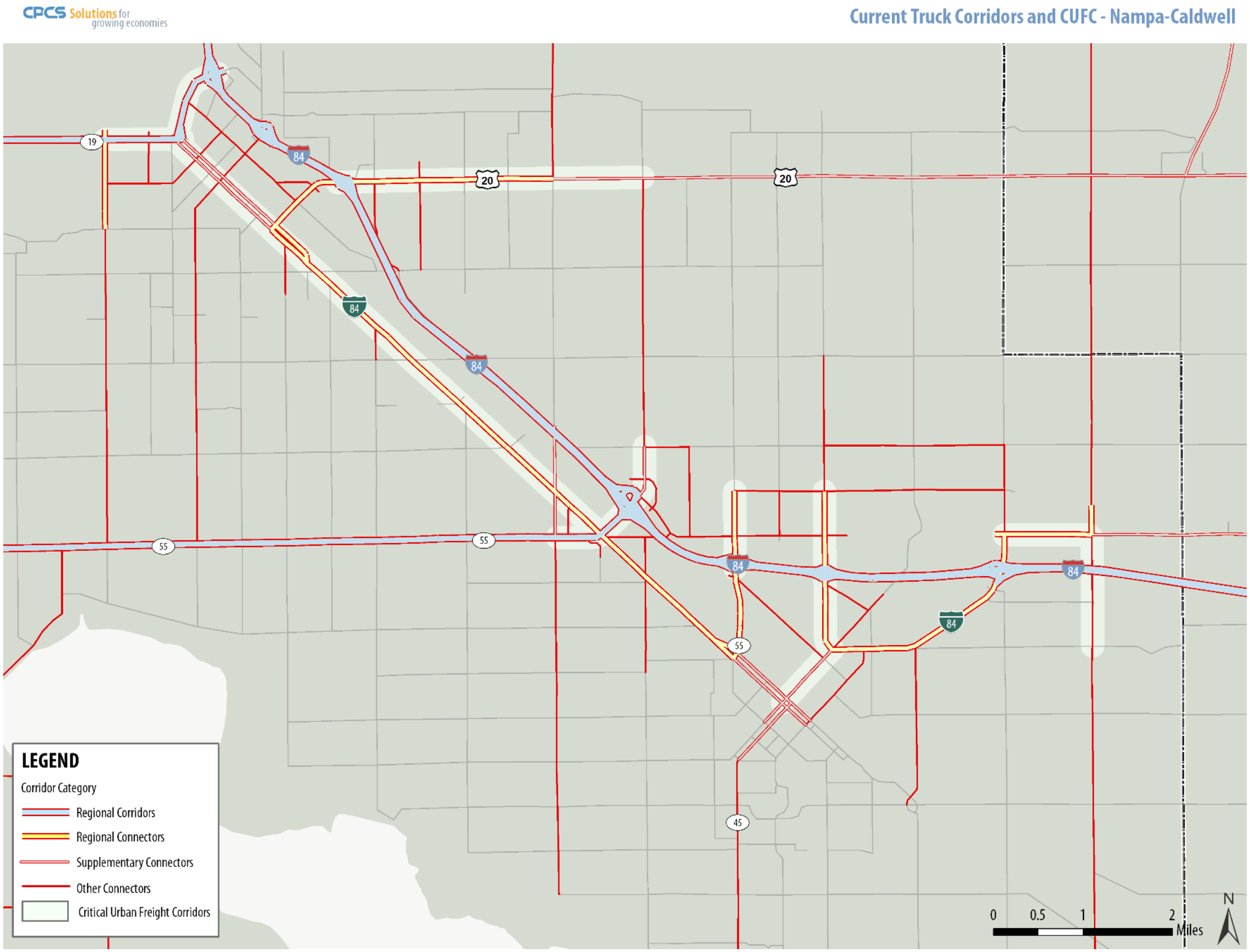
- Most of the regional corridor mileage is taken up by interstate highways and state highways (much of which mileage is outside the urbanized area). Hence, it is unsurprising that only a few parts of the CUFC network overlap with regional corridors.
- The strongest overlap is with regional connectors. These roads provide primary connectivity between freight clusters and regional corridors and are therefore very well suited as CUFCs. The strong overlap with the CUFC network validates in a general sense the logic that was applied in determining CUFCs.
- A lesser number of CUFCs overlap with secondary connectors or other connectors. Although not as high on the hierarchy as regional corridors, these roads may be properly suited as CUFCs, particularly if they have identified freight needs.

Figure 2-8: Cross-Referencing Current CUFCs versus Freight Corridors

CUFC	Freight Corridor Identified
7.42 miles of I-84 Business Route (Caldwell Blvd / Centennial Way) from I-84 to Midland Blvd	Yes – RCR, RCN, SCN
0.86 miles of Northside Blvd (Birch Ln to I-84)	Yes – RCN
1.80 miles of Franklin Blvd from Birch Ln to Garrity Blvd	Yes – RCN
0.83 miles of 11th Ave from Franklin Blvd to 3rd St	Yes – SCN
3.41 miles of Chinden Blvd/US-20/26 from Midland Blvd to I-84	Yes – RCN, SCN
1.86 miles of Chinden Blvd/US-20/26 from Five Mile Rd to Eagle Rd	Yes – SCN
0.98 miles of Franklin Rd from Star Rd to Idaho Center Rd	Yes – RCN
1.71 miles of SH 55 from Middleton Rd to Cherry Ln	Yes – RCR, SCN
0.86 miles of SH 19 from Farmway Rd to Centennial Rd	Yes – RCR
1.21 miles of Robinson Blvd from Airport Rd to Franklin Rd	Yes – OCN
5.47 miles of Gowen Rd from Gowen IC to Orchard IC	Yes – RCN
1.19 miles of Cole Rd from Victory Rd to I-84	Yes – RCN
6.85 miles of Franklin Rd from Linder Rd to I-184	Yes – RCN, SCN
1.49 miles of Victory Rd from Cole Rd to Orchard St	Yes – RCN
1.97 miles of Eisenman Rd from Gowen Rd to Freight St	Yes – RCN
2.76 miles of S Federal Way from SH 21 to Memory Ln	Yes – SCN

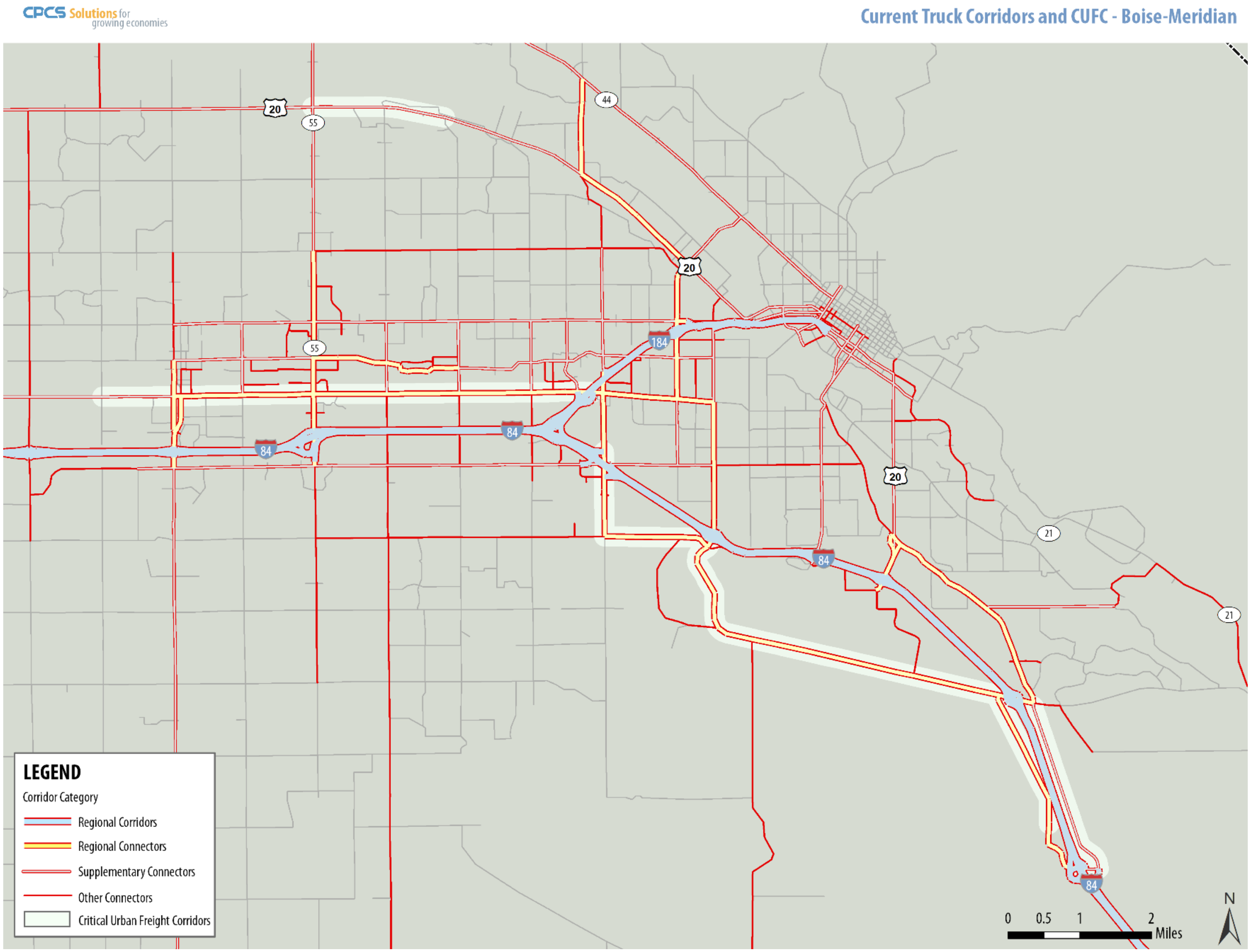
Source: Idaho Transportation Department Statewide Freight Strategic Plan (2017), CPCS analysis

Figure 2-9: Current Truck Corridors Overlaid with Current CUFC – Nampa-Caldwell Area



Source: CPCS, ITD

Figure 2-10: Current Truck Corridors Overlaid with Current CUFC – Boise-Meridian Area



Source: CPCS, ITD

Of note, the FHWA's guidance on CUFC designation includes the following criteria, at least one of which needs to be met for designation:[5]

- Connects an intermodal facility to the PHFS, interstate system, or another intermodal freight facility
- Is located within a corridor of a route on the PHFS and provides an alternative highway option important to goods movement
- Serves a major freight generator, logistic center, or manufacturing and warehouse industrial land
- Is important to the movement of freight within the region, as determined by the MPO or State

The procedure used in this study for defining a network of freight corridors in Ada and Canyon Counties strongly match the principles and the official CUFC criteria, hence the results of this study can support future efforts to designate CUFCs.

Also, all of the CUFC criteria pertain to the *freight importance* of corridors rather than their performance in terms of delay, safety or other issues. However, for practical purposes, since the CUFC network's primary value is in obtaining federal funding to support freight-important projects to solve existing issues, it may also be advantageous for future definitions of CUFC networks in the COMPASS region to systematically take into account the performance angle.

It is also worth noting that planned roadways and freight facilities can be included in CUFC designations. As well, the above recommendations apply also to CRFC designations, for which FHWA has similar but somewhat different criteria. To the extent that roads identified in this study are located outside the official Boise/Nampa urbanized areas, this study could support ITD's consideration of some of these roads for CRFC inclusion.

2.5 Applying Study Results to Regional Processes

2.5.1 Recommended Approach for Integrating this Study

Integrating Freight into Multicriteria Framework

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 value to a wide range of variables or metrics, and can help determine a hierarchy of project needs. This also provides a mechanism for integrating freight needs.

[5] CUFC Guidance is from FHWA, Freight Management and Operations

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

Expanding the Master List of Projects

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.

2.5.2 Alternative Conceptual Approaches

Alternative or supplementary approaches to a multicriteria framework can include benefit-cost analysis and a top freight projects list. This study would also support either of these approaches, should COMPASS decide to pursue these in the future.

Benefit-Cost Framework

A benefit-cost analysis is a more quantitatively rigorous approach compared to a multicriteria framework. In the benefit-cost analysis, the goal is to monetize all or most benefits and costs so as to distill each project down to a net benefit, or benefit/cost ratio (BCR). Projects can then be ranked on either of these bases and the top projects prioritized. This analysis can be performed in two ways. Some agencies use a crude benefit-cost approach with modeled data for an initial, wider scan – as an alternative to multicriteria analysis. More typically, benefit-cost analysis is used for a smaller, more limited number of projects for in-depth evaluation. In either case, this type of analysis requires detailed and consistent data for proper evaluations. This study could help support such analysis, through the quantification of truck delay (which can be monetized using standard industry values for truck value of time).

Ranking Freight Solutions

A list of top freight projects is potentially useful, particularly as relates to securing freight-specific funding. This type of list is particularly valuable where funding is allocated specifically for freight, or where the top freight projects are clearly distinct from non-freight priorities (e.g. roads near an intermodal terminal or marine port which are not meaningful for passenger traffic, but are highly important for freight). The study team's analysis suggests that most or all of the top freight needs in the Treasure Valley are not unique to freight, and although the freight angle is significant, so are other considerations such as passenger mobility. In other words, simply ranking the top "freight" projects might not give a complete or accurate assessment of the "top projects" overall. Given this reality, the study recommendation is to evaluate freight needs in parallel to, rather than separate from, other regional needs. Nonetheless, should COMPASS find it advantageous to develop a list of top freight projects, the quantitative methodologies used in this study can provide a valuable base.

2.5.3 Possible Variations in Implementation

In support of a multicriteria approach described above, there are a number of technical ways that the study findings could be integrated now or in the future, as outlined in Figure 2-11. This study recommends considering using freight corridors (highlighted in light orange), either as a flat or graduated score, as this would be the most straightforward variable to "plug and play" into the existing framework.

Using freight issues or needs introduces an extra step of interpretation, i.e. *whether a proposed project specifically addresses the identified freight issue or need*. Subjecting the full list of projects to this assessment is likely a more challenging and intensive endeavor, subject to some technical judgment. Alternatively, projects could be scored not based on whether they *address* an issue or need, but simply whether an identified freight issue or need is located in close proximity to the proposed project. This would have the advantage of introducing more quantifiable freight-supportive metrics into the decision-making process without too much need for further analysis, which may be worthwhile despite is drawbacks. However, it would also have the main drawback that the project being proposed may not be directly related to, or help address, the specific issue or need identified (for example, a resurfacing project may not help to address delay/congestion much, if at all). COMPASS should consider these merits and drawbacks in electing whether to integrate freight issues and needs directly into its multicriteria framework, or simply to use these in other ways (e.g. in helping to motivate and develop new projects).

Figure 2-11: Possible Variations in Implementation of Multicriteria Framework

	Flat Score	Graduated Score
Freight Corridors	Assign points based on whether a project is on an identified freight corridor	Assign points based on the hierarchy of the corridor (more points for higher-order corridors)
Freight Issues	Assign points based on whether a project addresses a specific freight-related issue (e.g. truck delay, truck safety)	Assign points based on the severity of the freight-related issue (e.g. hours of truck delay on the given corridor)
Freight Needs	Assign points based on whether a project addresses a specific identified freight need	Assign points based on the class of freight need (1 to 3)

Source: CPCS. Note: recommended approach highlighted

The approach developed in this study provides COMPASS and other decision-making agencies some flexibility in application, enabling informed decision-making that explicitly accounts for freight and allowing COMPASS or other agencies to better weigh freight versus non-freight considerations.

2.6 Updating the Framework over Time

The approach used in this study is designed so as to be updatable over time as conditions or data change. This section outlines recommendations for keeping the key aspects of the study updated over time.

Underlying Data for Truck Corridors

Figure 2-12: Guidance for Updating Underlying Data for Truck Corridors

Type of Data	Considerations	Recommended Timing
Freight Clusters	Not likely to change much in short or medium term. In particular, the four primary clusters are likely to remain very stable. Requires data purchase to update (trip ends, business establishment data) although lower-cost approach would be to simply use IDOL data. Recommend updating on 5-10 year basis.	Medium-Long Run
Truck Volumes	Can change year-to-year, especially with new trip generators. GPS data must be purchased. GPS-based volumes can be updated on a 1-5 year basis depending on need for up-to-date data – however, the methodology for updating data can be complex as GPS data providers often do not provide this "off-the-shelf" (requires hybrid approach using local truck counts). Aside from GPS data considerations, volumes can be updated annually as new truck counts are performed (case-by-case basis).	Annual-Medium Run
Crash Data	New data available on an annual basis. However, trends generally do not become apparent in a single year. Can be updated on a 1-5 year basis.	Medium Run
Delay Data	Requires purchase of GPS data. Generally, delay data are easier to obtain than volume data as GPS data providers are more likely to provide it off-the-shelf. Can be updated on 1-5 year basis depending on need.	Medium Run
Industry Consultations	Regular engagement of industry stakeholders is recommended, especially through the Freight Advisory Work Group. A concerted effort to seek industry input on location-specific issues should be coordinated with timelines for other data updates (i.e. in general more frequent consultations are beneficial, but only if the findings are being applied in a specific, actionable way – otherwise there is a risk of consultee disengagement and perception that they are saying "the same things every time.")	Medium Run

Source: CPCS.

Key Study Outputs

Figure 2-13: Guidance for Updating Key Study Outputs

Type of Output	Considerations	Recommended Timing
Current Truck Corridor Network	Can be informally updated as any underlying data change (e.g. truck counts). Formal updates could be done in line with updates to the freight clusters and truck volumes as a 5-10 year update.	Medium-Long Run
Prioritized Freight Needs	Can be updated as frequently as performance metrics are revised (i.e. based on availability of updated crash, delay, industry consultation data).	Medium Run

Type of Output	Considerations	Recommended Timing
Freight Solutions	Should be further pursued as a follow-up item to this study. Formal process of identifying new freight solutions could be done on a medium-term basis (e.g. in line with updating performance metrics and freight needs) – however in principle new freight-supportive projects can be identified annually whether or not this formal process is followed.	Short-Medium Run
Economic Importance of Freight	Data are available through COMPASS's subscription to TREDIS. Can be updated annually or as often as needed. General freight trends typically do not vary much year-to-year so there is flexibility in approach.	Short-Medium Run
Land Use Findings	Analysis of use of zoned, planned, and used land can be done annually using available data; however, again these patterns generally do not swing year-to-year. At a minimum this should be revisited on a 5-year basis to ensure sufficient industrial land remains available in the right locations (or more frequently, if there are known issues).	Short-Medium Run
Model Ordinance	At the discretion of local jurisdictions how to apply model ordinance guidance. Each of these jurisdictions will have differing needs and some follow-up effort will be necessary for jurisdictions to determine how some of these findings can be best applied locally.	Medium-Long Run
Rail Usage Findings	Requires consultations and/or site visits for a formal update. However, understanding the needs of rail-dependent shippers should be a priority and it is recommended that affected shippers and operators continue to be engaged as decisions are contemplated regarding future possible uses of the rail spurs in the region.	Medium Run

2.7 Future Project Directions

In addition to keeping freight analysis in the region current and up-to-date, there are a number of follow up items that COMPASS should consider as next steps subsequent to this study:

- **Rail transload facility study:** In the course of consultations with rail shippers in the region, some shippers revealed that it may be worthwhile to study a rail transload facility that would be less than a full intermodal terminal but could be used to ship project cargo and similar freight to shippers lacking rail access of their own. This is a topic COMPASS may wish to further explore in the future.

- **Ongoing data improvement:** Currently, COMPASS's traffic modeling does not explicitly take into account trucks. The outputs of this study could be used to help refine the COMPASS's models, particularly in locations such as Nampa where discrepancies have been known to occur between modeled and observed data. It should be noted, however, that the truck volume data for this study are based on a sample which – while deemed sufficiently large for the primary purpose of this study (i.e. identifying with high confidence the most heavily trafficked truck corridors) – may not be large enough to distinguish with high confidence between roads with low-to-moderate truck volumes. For example, for the purpose of this study the difference between 900 and 1000 trucks per day is not considered to be a significant discrepancy; neither is the difference between 10 and 100 trucks, as these last two would both be considered fairly low-volume roads. However, for different (e.g. local) applications the fact that the study may not reliably distinguish between roads with 10 and 100 trucks per day may be considered more of a problem, and hence caution should be exercised when applying these volumes at a local level for other studies. The methodology used in the study cannot be considered a replacement for actual truck counts in such scenarios.

- **Ongoing education on the importance of freight:** This study has provided a number of specific data pieces that help draw attention to the importance of freight – including importance to the regional economy and the importance of rail access to many high-volume and low-volume shippers. In many cases, members of the public and even policymakers perceive the negative impacts of freight transportation (noise, heavy vehicles, etc.) without making the connection to regional economic performance and quality of life. Continued ongoing education is required to remind residents and decision-makers that trucks, trains, airplanes and pipelines are responsible for getting consumer goods on to store shelves, delivering food to restaurants, transporting critical medical and other just-in-time shipments, opening regional exporters to national and global markets, and supporting well-paying jobs that underpin the regional economy. COMPASS can assume an important role in ensuring these considerations are not forgotten or diminished as regional priorities are weighed and balanced.

2.8 Summary of Recommendations

The study team recommends that COMPASS:

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

2) Integrate freight into its multicriteria 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 CUFC definitions with ITD 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 to convene public- and private-sector stakeholders to discuss and develop solutions to regional freight issues

3 Conclusions and Next Steps

This Working Paper described and assessed recommendations for integrating the findings of this study into regional prioritization processes, as well as other recommendations related to updating study findings in the future and pursuing other follow-up studies/items.

As the next step in this study, the key findings of this and other Working Papers will be integrated into the Draft Final Report.

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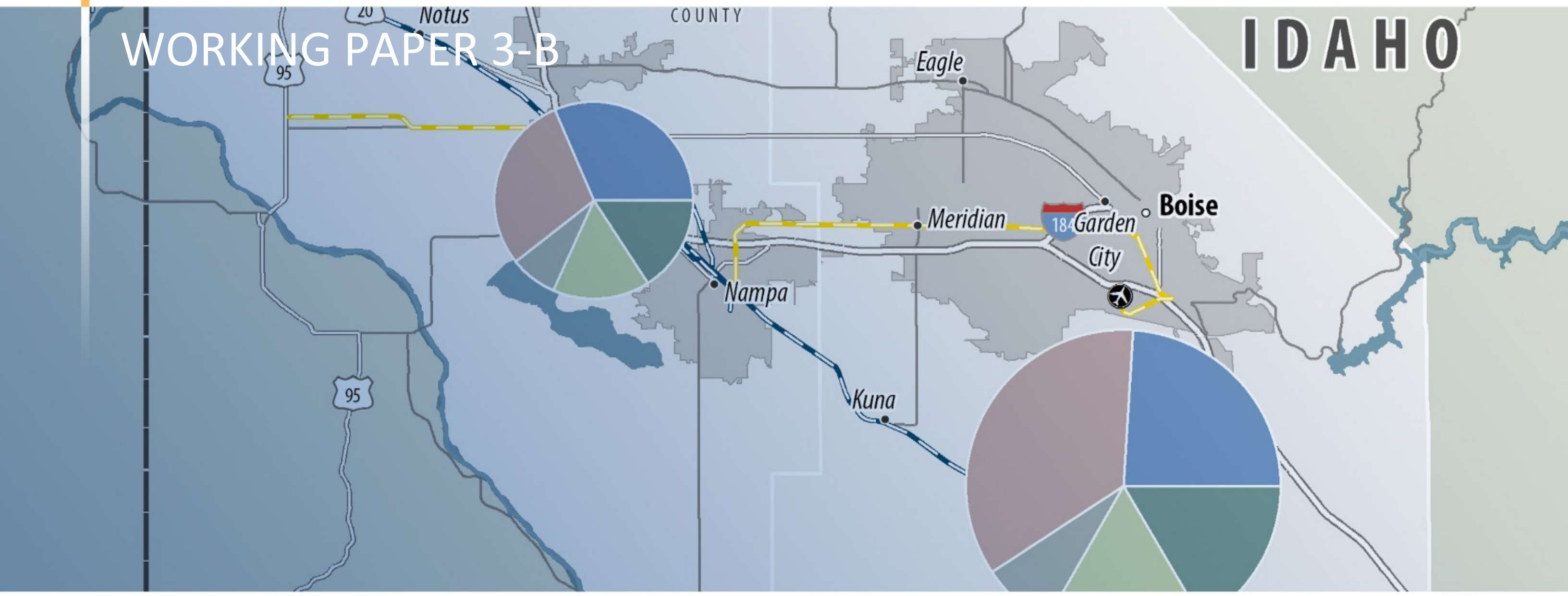
WORKING PAPER 3-B



COMPASS Freight Study

Client Reference: RFQ 2017-02

Freight System Reliability in COMPASS Region

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

January 19, 2018
CPCS Ref: 16629

Acknowledgments / Confidentiality

The study team acknowledges and is thankful for input provided by COMPASS, the Idaho Transportation Department and the many industry stakeholders consulted in the development of this report; and the Idaho Trucking Association for connecting us with stakeholders.

Cover image source: CPCS

CPCS

Table of Contents

Acronyms / Abbreviations

ATRI	American Transportation Research Institute
CIM	Communities in Motion
COMPASS	Community Planning Association of Southwest Idaho
EB	Eastbound
GIS	Geographic Information System
GPS	Global Positioning System
ITA	Idaho Trucking Association
ITD	Idaho Transportation Department
ITIP	Idaho Transportation Investment Program
Mph	Miles per Hour
MPO	Metropolitan Planning Organization
NB	Northbound
SB	Southbound
SH	State Highway
US	United States
VMT	Vehicle Miles Traveled
WB	Westbound

Executive Summary

The reliability of the transportation system is critical to the freight industry. Businesses – whether in agriculture, manufacturing, raw materials or consumer products – rely on fast, safe, and efficient transportation connections for timely deliveries and to get goods to market.

This report identifies three types of performance issues that affect trucks on the region's road network.

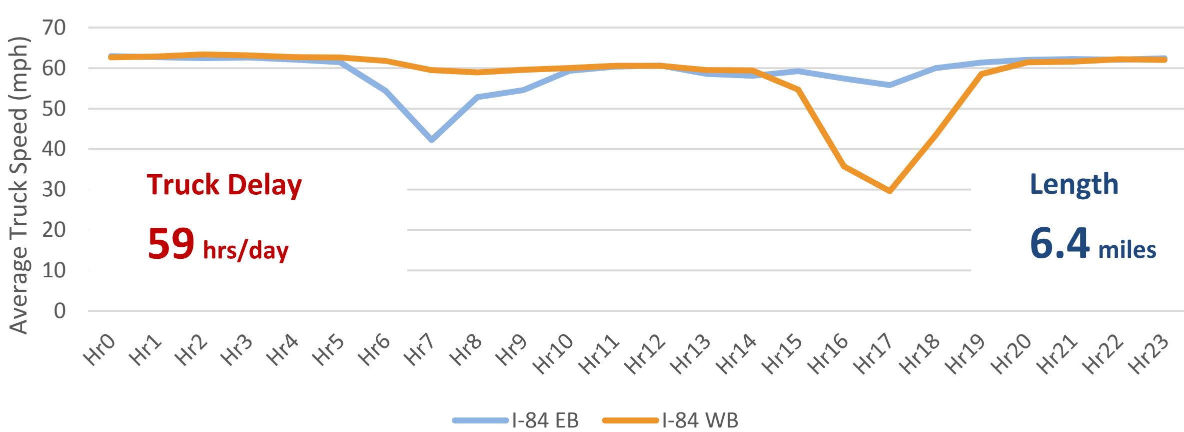
Truck delay leads to lost productivity, wasted fuel, and supply chain unreliability. Although congestion in the Treasure Valley is not at the level of the densest large cities in the US, there are several notable bottlenecks with consistently slow travel speeds, and these routes are important corridors for trucks in the region. The delay analysis in this study relies on truck GPS data from the American Transportation Research Institute (ATRI), a member of the study team.

Safety hotspots were described in detail in Working Paper 3A and draw attention to high-intensity truck-related crash locations.

Location-Specific Issues. Interviews and surveys of two dozen stakeholder representing trucking companies and major shippers in a variety of industries (e.g. heavy industry, petroleum, manufacturing, grocery, courier) identified location-specific freight issues in the region, including signal timing and intersection geometry, amongst others.

The most severe truck bottleneck in the region is I-84 in Nampa, where the road is reduced to four lanes from six.

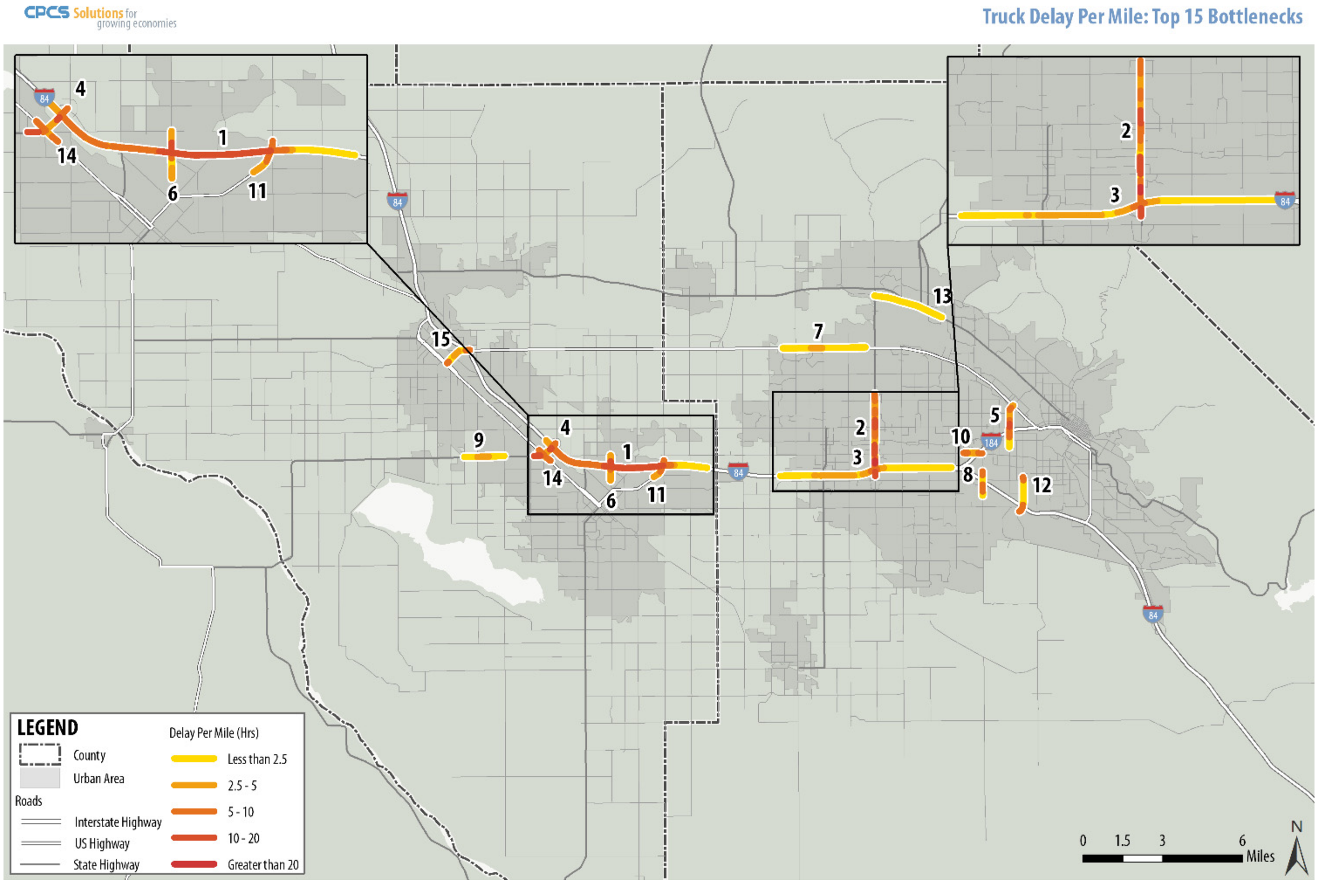
Figure ES-1: Weekday Speed Profile of Top-Ranked Truck Bottleneck – I-84 in Nampa



Source: CPCS analysis of ATRI data

This bottleneck causes 59 hours of truck delay per weekday – or tens of thousands of hours per year. Other top truck bottlenecks include Eagle Road north of I-84, and I-84 between Meridian and the I-184 split (Figure ES-2).

Figure ES-2: Top Truck Delay Bottlenecks

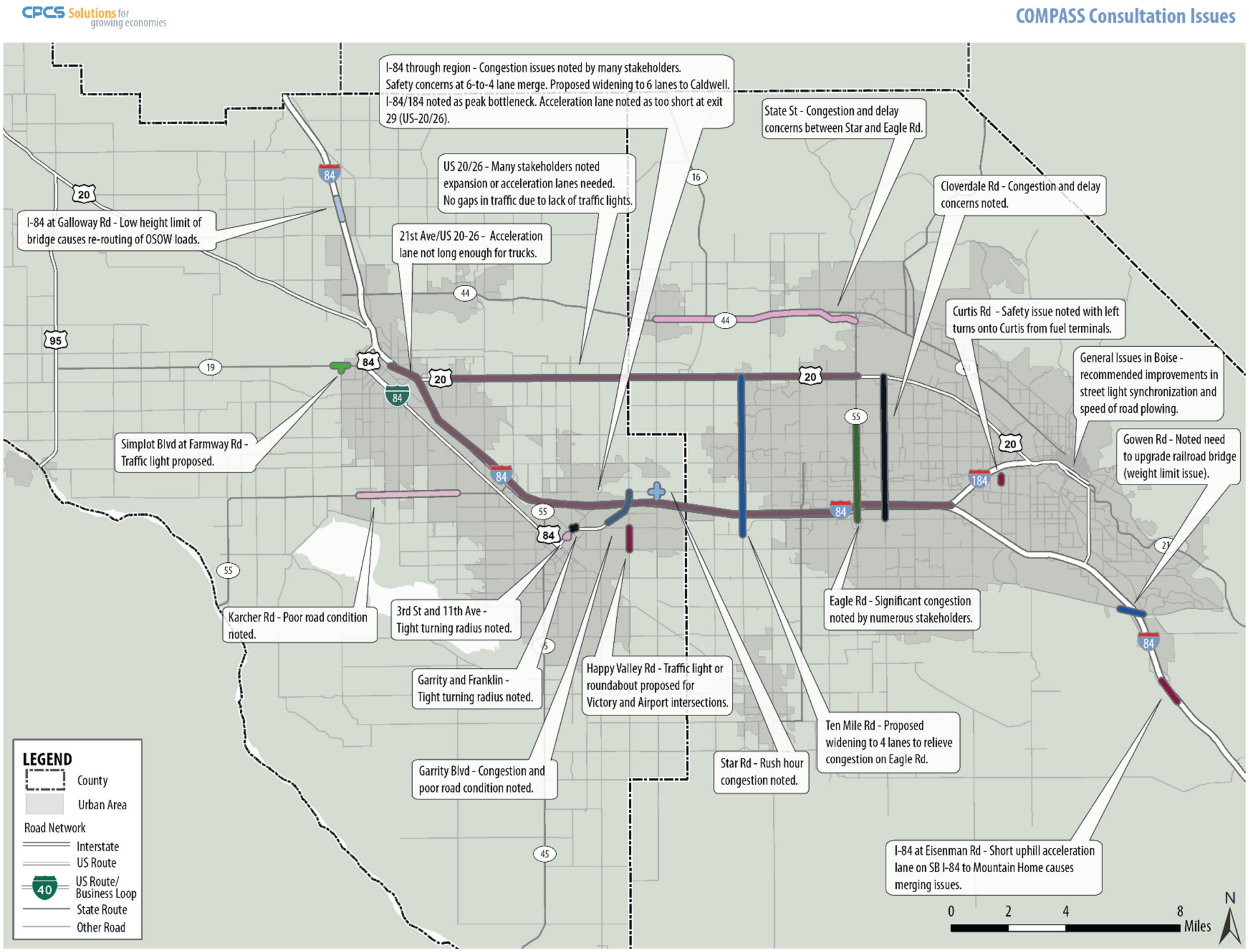


Source: CPCS analysis of ATRI data

Figure ES-3 summarizes issues raised by industry stakeholders. The industry consultations help validate analytical findings (such as the use of truck GPS speed data to identify bottlenecks), and provide deeper insight into the issues identified with the data.

The specific issues identified through delay analysis, safety analysis, and industry consultations will be consolidated into a single freight needs list, to serve as part of the forthcoming Working Paper 4A. These needs will then be used to identify (existing) proposed or new solutions and recommendations on how these should be prioritized (Working Paper 4B).

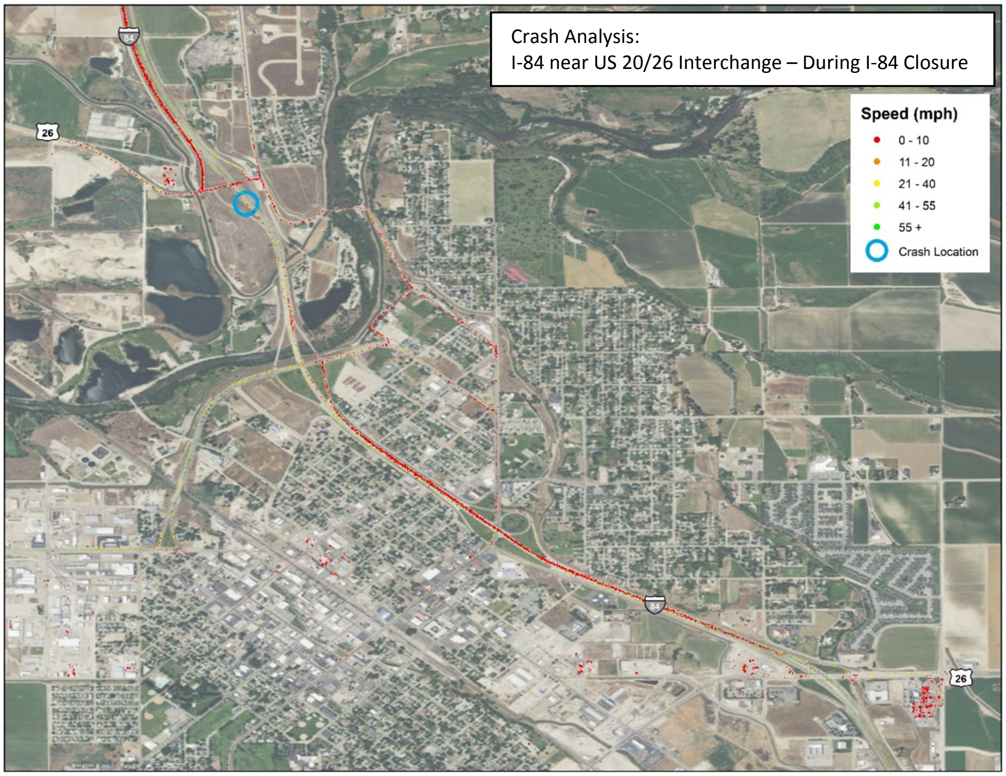
Figure ES-3: Issues Raised in Industry Consultations



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

The availability of effective detour routes is important for network redundancy. Truck detour analysis can help shed light on whether existing detour routes are working, practical or sufficient. For example, one closure on I-84 in Caldwell near the Boise River resulted in trucks diverting onto local and residential streets (Figure ES-4).

Figure ES-4: Detour Analysis for I-84 near Boise River



Source: ATRI analysis

1 Introduction

Key Chapter Takeaways

The Community Planning Association of Southwest Idaho (COMPASS) is conducting a freight study to support its long-range transportation plan, *Communities in Motion 2040*. The freight study is identifying freight corridors and related land use needs, developing a profile of the regionally most important commodities and supply chains, and identifying projects and/or policies to address maintenance needs, improve safety, and manage congestion. This present working paper aims to identify freight related performance issues within the COMPASS region.

1.1 Background

As the metropolitan planning organization (MPO) for the Boise-Nampa area, COMPASS is focused on integrating freight 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

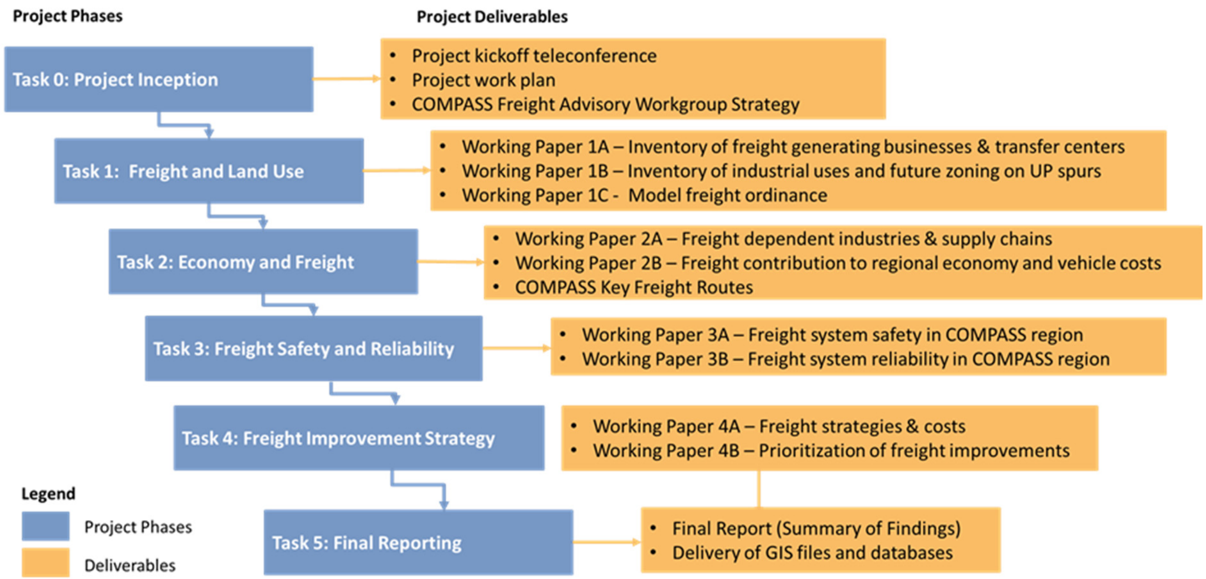
As set out in the RFP, the key outcomes of this study are:

- 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 projects and/or policies to address maintenance needs, improve safety, mitigate choke points, and manage congestion

1.3 Project Structure

The project is to be developed in five broad phases, as set out in Figure 1-1. Each of these phases has a series of deliverables.

Figure 1-1: Project Tasks



1.4 Purpose of this Working Paper

As part of Task 3: Freight Safety and Reliability, the purpose of this working paper is to identify freight performance issues that impact the successful operation of regional corridors from the perspective of freight transportation. This deliverable corresponds to Working Paper 3B.

Specifically, this working paper is divided into the following three chapters:

- Chapter 2 identifies the truck delay bottlenecks throughout the study area.
- Chapter 3 describes the truck performance issues in the network based on major safety and delay hotspots gathered from the truck data and consultation with stakeholders
- Chapter 4 consists of truck detour analysis that provides some perspective on route redundancy in a few parts of the region and a comparison of ATRI's detour findings with COMPASS's ongoing truck detour study.

This working paper is also intended to provide COMPASS with an overview of progress to date and to solicit comments and other feedback on the structure and content of this component part of what will become the final report. Note that revisions to this working paper will be reflected in the Draft Final Report.

1.5 Methodology and Limitations

The study team prepared this working paper with information from two sources: analysis of truck performance data (truck GPS speed data) and consultations and surveys with industry stakeholders. The study team is thankful for the insights and perspectives offered by the stakeholders. The perspectives offered by the stakeholders are theirs and are represented as such. While the study team makes efforts to validate data, the study team cannot warrant the accuracy of third-party data.

2 Truck Delay Bottlenecks

Key Chapter Takeaways

- The most significant truck bottleneck in the region – based on truck GPS data from ATRI – is on I-84 in Nampa, where the interstate goes from six lanes to four. This bottleneck is 6.4 miles long and leads to 59 hours of truck delay per weekday – costing the region approximately $1.1 million annually in additional costs for trucking companies (costs that are ultimately passed through the supply chain)
- Other significant truck bottlenecks are Eagle Road north of I-84, and I-84 between Meridian and the I-184 split. Corridors with higher truck volumes and greater variability in travel times have the most truck delay.
- Truck bottlenecks lead to lost productivity, wasted fuel, and supply chain unreliability – especially when congested corridors have few viable alternative routes.

2.1 Background and Methodology

According to COMPASS's regional transportation plan *Communities in Motion*, the Treasure Valley's population is forecasted to increase from 600,000 in 2013 to roughly double (1,022,000) by 2040. This is the equivalent of adding almost two new cities the size of Boise or five the size of Nampa.

The population growth will be accompanied by an increase in travel – vehicle miles traveled (VMT) are projected to more than double from 12.1 million in 2013 to 27.2 million in 2040. This increased demand for road space will cause delay to soar from 27,670 hours in 2013 to 430,350 hours in 2040.[1]

The Treasure Valley region is already starting to feel the effects of increased highway congestion and delay. While the level of severity of bottlenecks in the region is low compared to larger population centers in the Western United States, the delays experienced by passenger vehicles and trucks are real, tangible, and measurable.

This section utilizes the latest analytical approach to quantify the delay and bottlenecks affecting freight corridors in the COMPASS region. Specifically, the section outlines the study team's approach to calculating the amount of truck delay on roads in the COMPASS region, and to identify the top truck freight bottlenecks.

2.1.1 Data Source

Delay is measured in hours, and is dependent on two factors:

- Truck Speeds (Relative to Baseline)
- Truck Volumes

The study team obtained truck global positioning system (GPS) data 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.

Truck volumes are a synthesis of classification count data and ATRI GPS data. This synthesis is a novel method that relies on vehicle classification counts where available, and supplements these with ATRI truck GPS data. In other words, the ATRI data contribute a level of geographic coverage that would be expensive and impractical to achieve with truck counts alone. Further details of how these estimates are developed are provided in Working Paper 2B.[2]

[1] COMPASS (2014), "Communities in Motion: Chapter 6: Future Transportation System Priorities and Needs"

[2] ATRI's GPS dataset is a sample of trucks, so the volumes developed through this approach are "relative volumes." These are scaled up to effective volumes by developing a multiplier using locations where both truck counts and GPS data are available.

ATRI provided data for the COMPASS region for four two-week[3] time periods in 2016, taken at different times of the year to account for seasonality:

- First two weeks of March
- Last two weeks of September[4]
- First two weeks of June
- First two weeks of December

2.1.2 General Methodology

Delay is calculated initially at the level of a road segment. For any individual segment, the truck delay for a given hour is computed according to the formula:

$$Truck\ Delay\ = Truck\ Volume\ \times \left(\frac{Segment\ Distance}{Truck\ Speed} - \frac{Segment\ Distance}{Truck\ Target\ Speed}\right)$$

where:

- Truck volume is computed for each segment on an hourly basis[5]
- Segment distance is in miles
- Truck speed, in miles per hour, is the average travel speed for all trucks on the segment for the given hour of day
- Truck target speed is 90% of the free-flow speed for the given segment, taken as equal to the overnight speed.

Hourly truck delay is then aggregated over 24 hours for an estimate of daily truck delay.

Strengths and Limitations

The primary strengths of this approach include:

- Based on real, observed truck GPS data
- Relies on the best available truck speed data and best available volume data
- Gives greater weight to periods of the day when truck volumes are greatest
- The target speed is a baseline unique to each individual segment – based on real, observed data. Thus, for example, trucks traveling at 10 mph are delayed much more on a road where the baseline speed is 50 mph, as opposed to one where the baseline speed is 15 mph. This approach also ensures factors like road geometry (curves, inclines) that are specific to each segment, factor into the baseline for that segment. (An alternate

[3] Weekdays only – 10 weekdays per two-week period, 40 weekdays total.

[4] Last two weeks selected for September so as to avoid Labor Day

[5] The daily volume for each segment is weighted by an average hourly truck volume profile developed by analyzing hourly truck volumes across the region.

approach using a constant target speed for all roads, or using the speed limit as target speed – would not have these advantages).

- Using 90% of the free-flow speed as the target reflects that there is generally some amount of regular friction on roads that the trucking industry is flexible enough to adjust to. This is consistent with the approach used by ATRI in its national Cost of Congestion reports.[6] Also, "negative delay" (trucks traveling above the baseline speed) is not credited against actual delay.

The primary limitations of the approach are:

- For some low-truck volume roads, there are very few speed observations, potentially leading to a few anomalous speeds influencing the delay estimates. To correct for this, delay is assumed to be zero below a minimum threshold of 10 observations per hour (over the entire time period). This is not likely to be a significant issue since these roads with low truck volumes are extremely unlikely to be truck bottlenecks no matter how significant traffic congestion is – simply because few trucks are affected by any delay.

- Because overnight speed is used in setting the baseline speed, any potential to improve truck travel speeds *at all hours of the day*, including the overnight period, is not identified. There is no obvious practical solution to this limitation, but for the purpose of this study, the most practical recommendations on solving truck bottlenecks can be identified with the method used in this study.

- There are occasional road segments with aberrant speed measurements due to various non-obvious (and possibly random) factors that the data do not identify (such as, potentially, presence of different types of trucks on the road at different hours of day, or different utilization patterns at different hours of day – e.g. more turns into a truck facility at certain hours). Cases of non-logical speed patterns require manual identification and removal later in the process, as described later in this section.

Quantifying truck delay in hours per day makes it possible to identify and rank truck bottlenecks.

2.1.3 Identification of Bottlenecks

The study team identified truck bottlenecks using a semi-automated geographic information systems (GIS) process, the details of which are described in this section. The objective of this approach was to identify continuous sections of roads with large and consistent evidence of truck delays. For simplicity, each bottleneck was taken as a single (linear) continuous road.

First, road segments were screened by a Truck Delay per Mile metric, which essentially reflects the *intensity* of truck delay within a particular segment. All segments passing a first threshold (Threshold #1) were identified as potential very-high delay locations. Bottlenecks were then constructed by linking together adjacent segments that had a Delay per Mile value passing a second, lower threshold (Threshold #2) with at least one of the segments within that bottleneck

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[6] ATRI (2017), "Cost of Congestion to the Trucking Industry: 2017 Update"

passing Threshold #1. In a few cases, judgment was used to incorporate additional segments into the bottleneck for continuity (e.g. if a single segment did not meet either threshold, but was surrounded on both ends with segments that did). For the purpose of this study, Threshold # 1 was set at 2.5 hours of daily truck delay per mile, and Threshold #2 was set at 1 hour of daily truck delay per mile.

Total truck delay was then aggregated across each of the bottlenecks, and the bottlenecks were ranked in order of delay (highest to lowest). Subsequently, a manual check was used to identify erroneous bottlenecks, by checking the speed profile of the bottleneck for validity and validating against other contextual knowledge. Within the top 15 bottlenecks, two were rejected at this stage (both had highly erratic hour-to-hour speed data, of which one was a portion of a highway beside a truck weigh station in a rural part of the region).

2.1.4 Valuation of Truck Delay

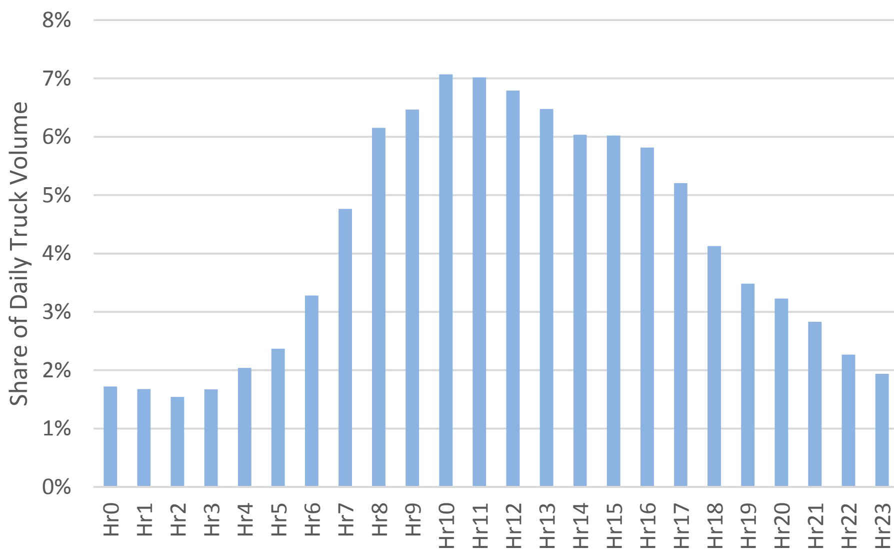
The national average operational cost per hour of $63.70 is used in this report, consistent with ATRI's 2017 Cost of Congestion study. This is the extra cost the trucking industry pays (including in labor, capital, fuel and other inputs) due to traffic congestion – derived from financial data obtained directly from representative motor carriers throughout the country. An approximate annualization factor of 300 is used to convert weekday delays to annual delays. The congestion costs presented are intended as an order of magnitude estimate and represent the impacts on trucks only (not passenger vehicles).

2.2 Profiles of Volume, Speed, and Delay

2.2.1 Truck Volumes

Figure 2-1 shows the average weekday distribution of truck volumes on roads in the region. Unlike typical passenger vehicle volumes (which often have two peaks), truck volumes have a single peak around 10-11 a.m. In the figure, Hr0 refers to the time period from 12 a.m. to 1 a.m., and so on.

Figure 2-1: Weekday Distribution of Truck Volumes



Source: CPCS analysis of GPS data

2.2.2 Average Truck Travel Speeds

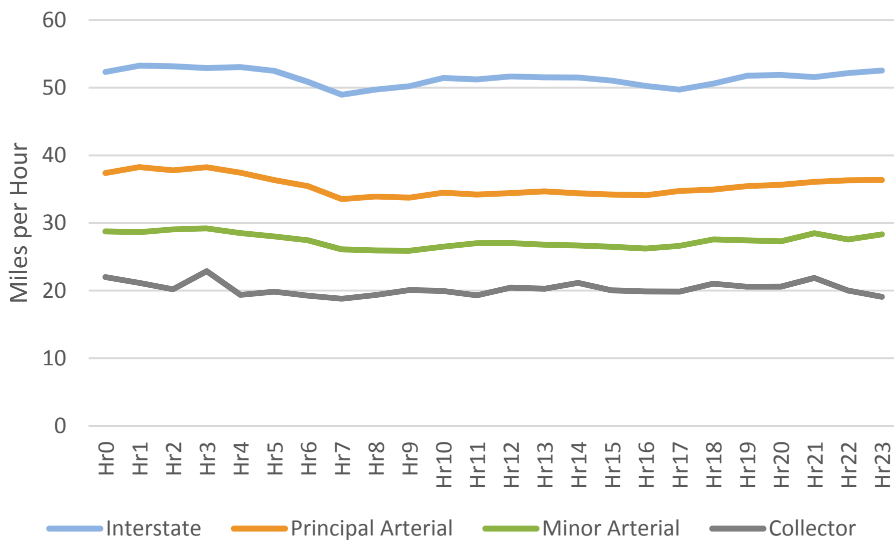
Figure 2-2 shows truck travel speeds across the region. As expected, truck speeds are highest on the interstate network (I-84 and I-184), at an average 51 mph. The average truck speed is 35 mph for principal arterials, 27 mph for minor arterials, and 20 mph for collectors.

The daily speed profile for interstate corridors reflects (light) dips in speed around the a.m. and p.m. peak periods, due to commuter traffic. In contrast, principal arterials and minor arterials have generally higher speeds at night and lower speeds in the daytime. This slower daytime speed may be a reflection of extra caution on the part of truck drivers when the roadways are somewhat full (whether or not they are entirely congested), compared to the overnight period when there are very few other vehicles (and bicycles, pedestrians, etc.) that could distract the driver.

These figures suggest that in the aggregate, road congestion is not a ubiquitous issue in the region.[7] However, the aggregate data hide localized pockets of congestion, some of which are quite significant.

[7] As well, the state of Idaho does not have any of the top 100 national truck bottlenecks, according to ATRI's annual ranking of top truck bottlenecks for 2017. Source: ATRI, "2017 Top 100 Truck Bottleneck List"

Figure 2-2: Average Weekday Truck Travel Speeds



Source: CPCS analysis of GPS data

2.2.3 Truck Delay

Figure 2-3 shows the distribution of truck delay by type of road. Trucks on interstate corridors experience 29% of total delay. The largest amount of truck delay is on principal arterials, at 55%.

For reference, the distribution of centerline mileage is shown in Figure 2-4.

Figure 2-3: Distribution of Truck Delay

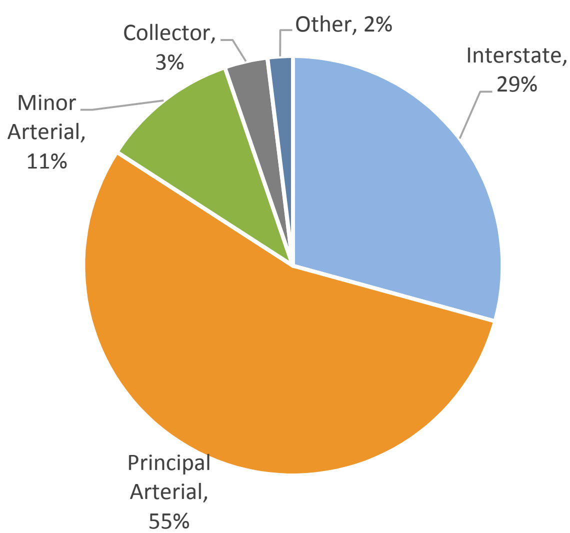
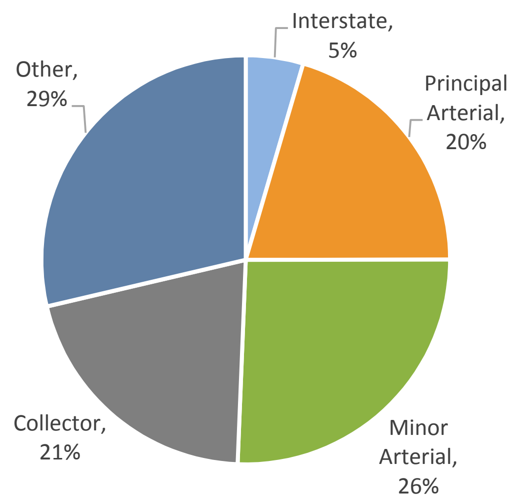


Figure 2-4: Distribution of Centerline Miles



Source: CPCS analysis of GPS data

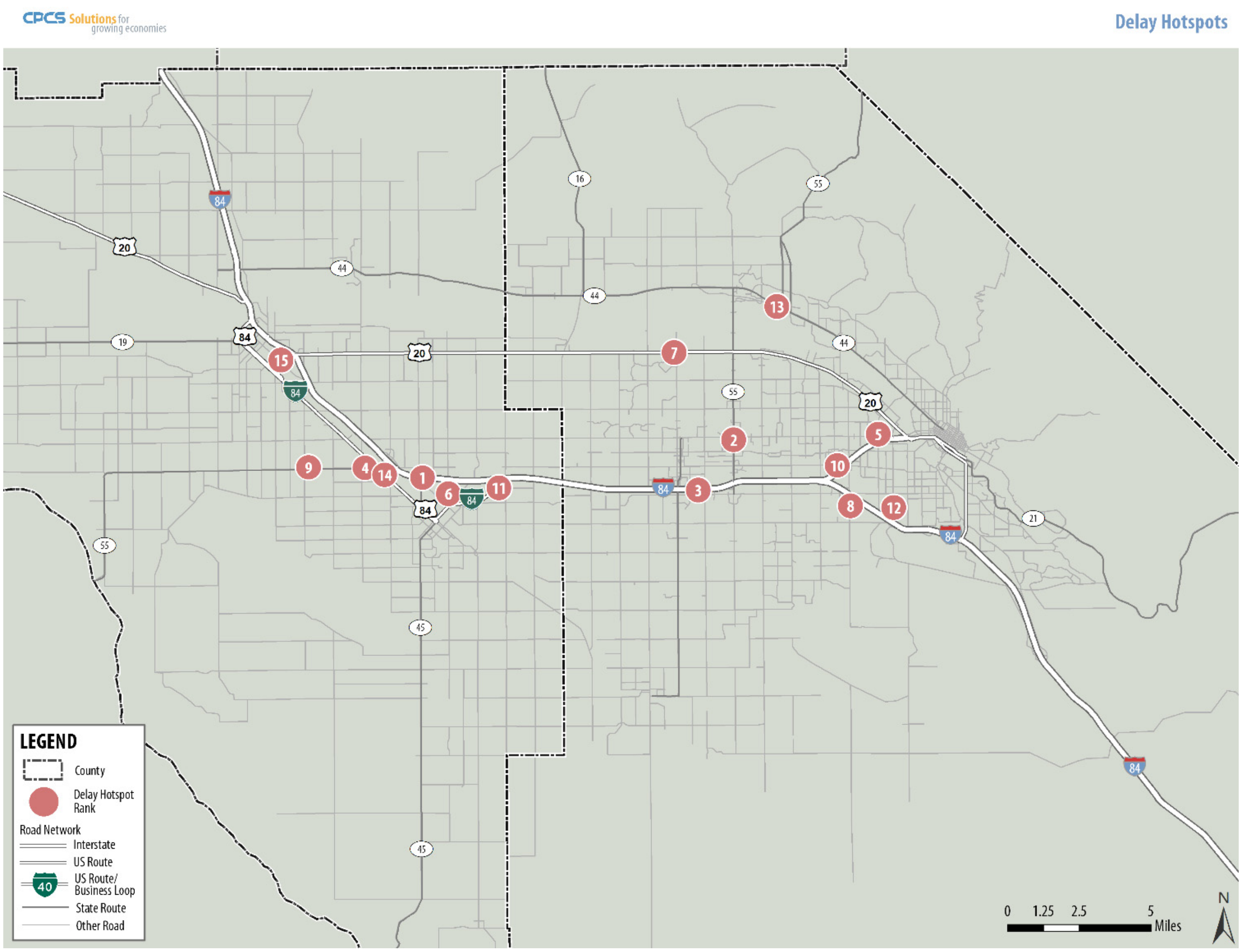
Principal arterials have significant delay compared to the proportion of mileage since these corridors have many bottlenecks as well as relatively high truck volumes. Interstate highways have 29% of truck delay but only 5% of mileage – due to several notable bottlenecks and overall high truck volumes. In contrast, minor arterials and other lower-order roads tend to have smaller truck volumes and thus less truck delay.

2.3 Delay Hotspots

Figure 2-5 shows a map of the top 15 truck bottlenecks in the COMPASS study area, according to the methodology described in 2.1.

As the map indicates, many of these hotspots are clustered in a few geographic areas, especially along the I-84 and some of the corridors connecting to it such as Eagle Rd. and Franklin Blvd. among other locations.

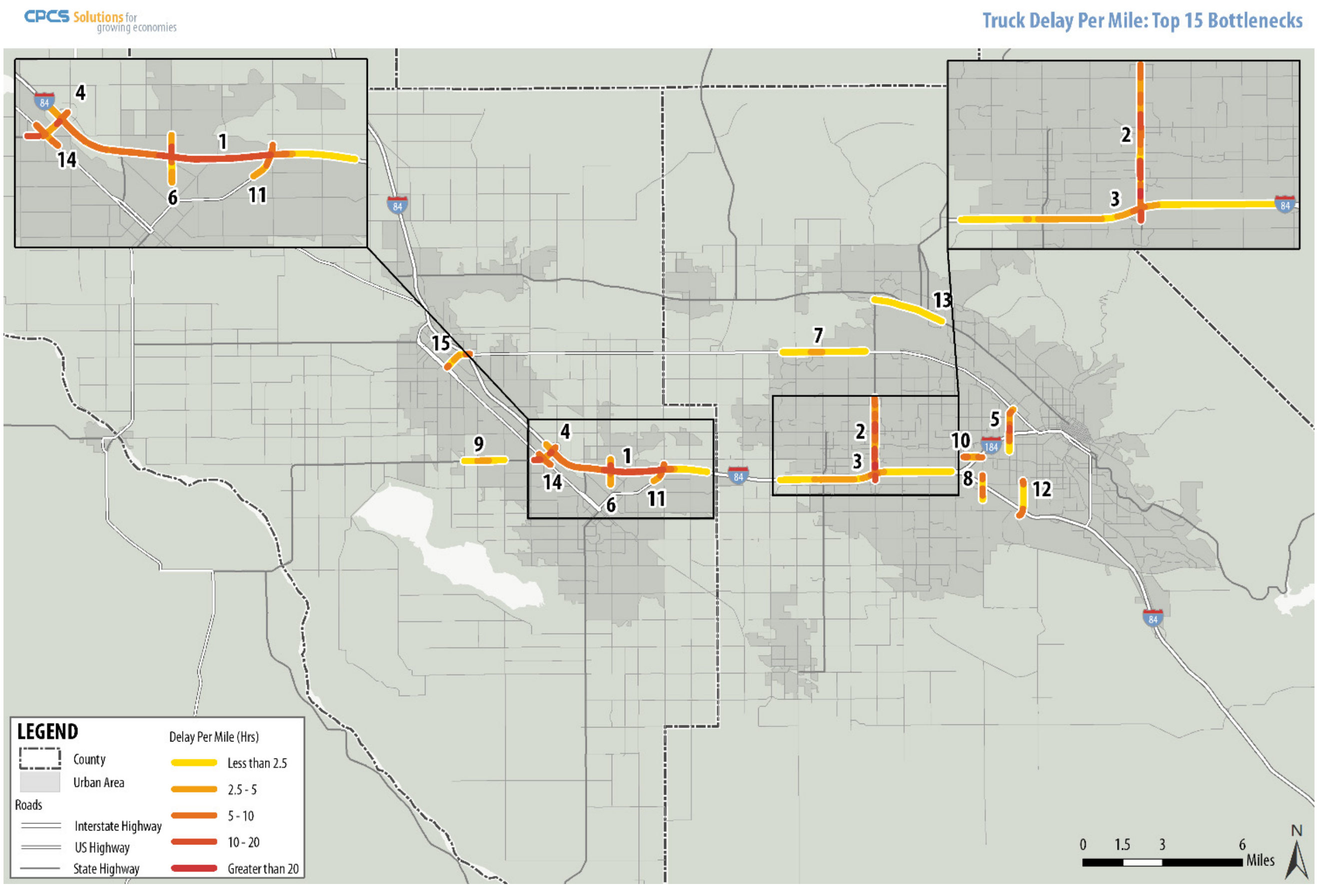
Figure 2-5: Truck Delay Bottlenecks



Source: CPCS analysis of ATRI data

Figure 2-6 shows greater detail around each bottleneck – including the locations of greatest delay intensity within each bottleneck.

Figure 2-6: Truck Delay Bottlenecks: Delay Intensity



Source: CPCS analysis of ATRI data

Figure 2-7 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 2-7: 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

2.4 Delay Hotspot Profiles

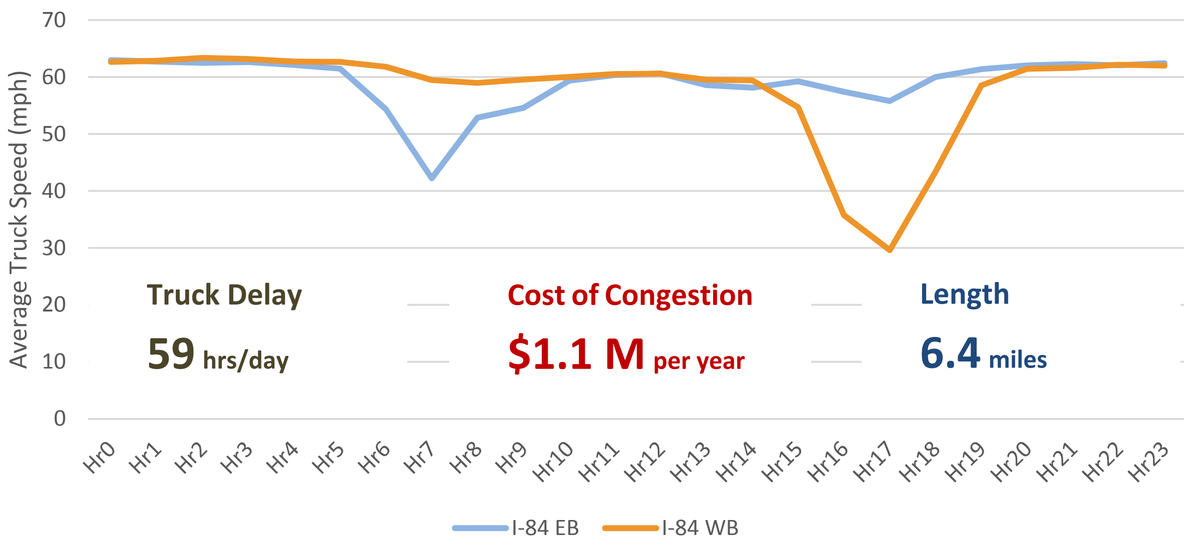
The top five hotspots identified in the previous section are profiled in greater depth below. Note that directional speed data were available for interstate corridors, but not for other corridors (therefore the combination of both directions is used).

Bottleneck 1: I-84 in Nampa

The most severe truck bottleneck is I-84 in Nampa, where the interstate decreases to four lanes from six lanes. Peak p.m. truck speeds decrease to around 30 miles per hour in the westbound direction – which is less than 50% of the baseline speed. Drivers also experience an eastbound bottleneck in the a.m. peak period where truck speeds drop to around 40 mph. Although these speed reductions are fairly concentrated in terms of time, the large number of trucks using this corridor means that this bottleneck has easily the most delay of all bottlenecks in the region.

This bottleneck costs trucks in the region approximately $1.1 million annually (note this is just the cost of truck congestion and does not include the cost of passenger vehicles).

Figure 2-8: Bottleneck #1 Speed Profile

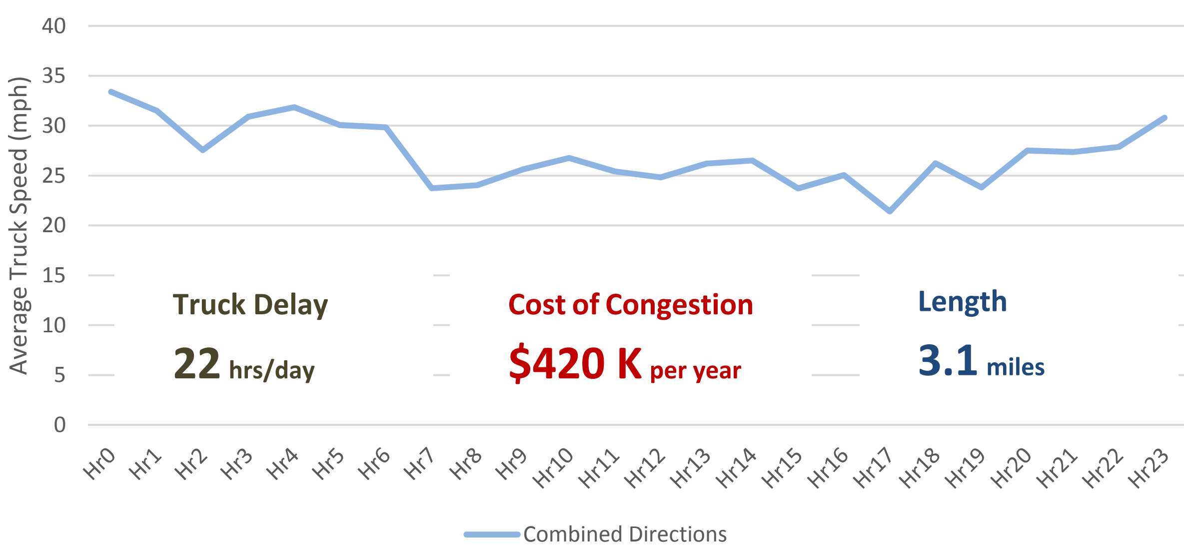


Source: CPCS analysis of ATRI data. Note: Cost of Congestion is for trucks only (not all vehicles)

Bottleneck 2: Eagle Rd.

The second-ranked bottleneck is Eagle Rd. north of I-84. In contrast to I-84 which correlates clearly with commuter peak hour traffic, truck speeds on Eagle Road are reduced all day, with the lowest speed being 21 mph in the 5 p.m. hour (compared to 30-35 mph overnight). Eagle Road is a bottleneck not only because of that significant reduction in speed but also because of the large number of trucks that rely on this corridor, with few alternative north-south nearby options. The bottleneck is 3.1 miles in length.

Figure 2-9: Bottleneck #2 Speed Profile

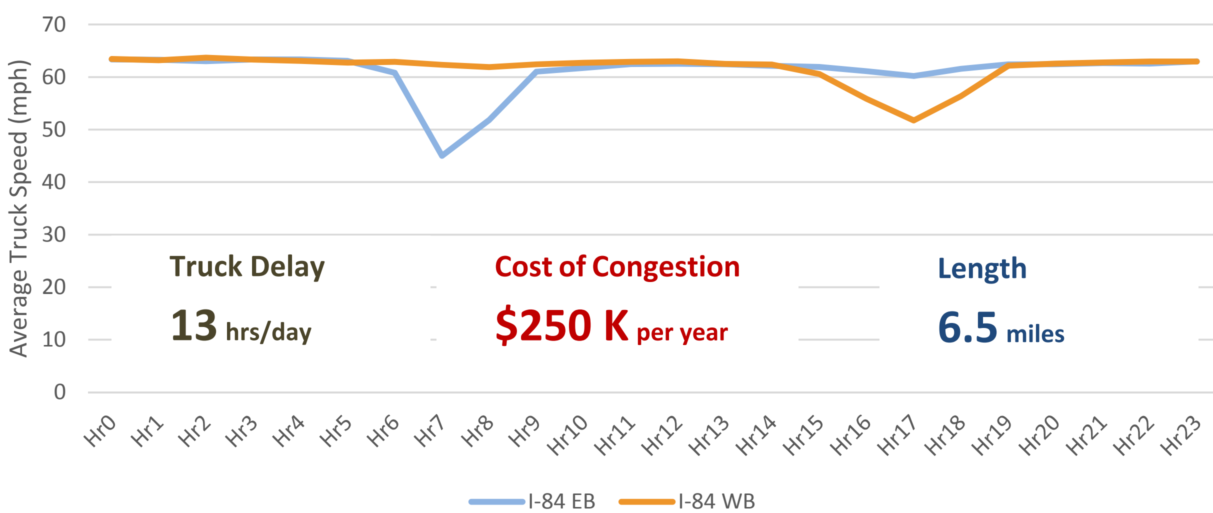


Source: CPCS analysis of ATRI data. Note: Cost of Congestion is for trucks only (not all vehicles)

Bottleneck 3: I-84 in Meridian-Boise

The third-ranked bottleneck is I-84 in Meridian-Boise (west of the I-184 merge). Clear commuter patterns are evident as truck speeds drop to 45 mph eastbound in the a.m. peak. and 52 mph westbound in the p.m. peak. Although not as large a speed difference as I-84 in Nampa, the large number of trucks using the interstate makes this a regionally significant bottleneck.

Figure 2-10: Bottleneck #3 Speed Profile

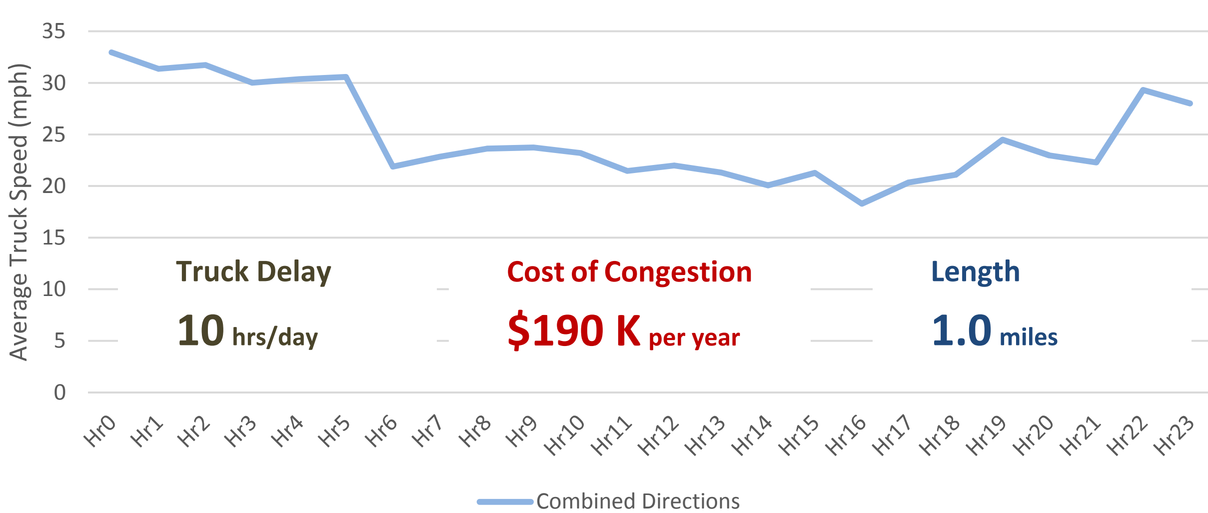


Source: CPCS analysis of ATRI data. Note: Cost of Congestion is for trucks only (not all vehicles)

Bottleneck 4: SH 55 (Karcher Blvd.)

The fourth-ranked bottleneck is Karcher Blvd. in Nampa near the highway interchange. Similar to Eagle Rd. in Meridian, this bottleneck has reduced speeds through the whole day, with a low of 18 mph in the 4 p.m. hour. The bottleneck is intense but somewhat short at 1.0 miles.

Figure 2-11: Bottleneck #4 Speed Profile

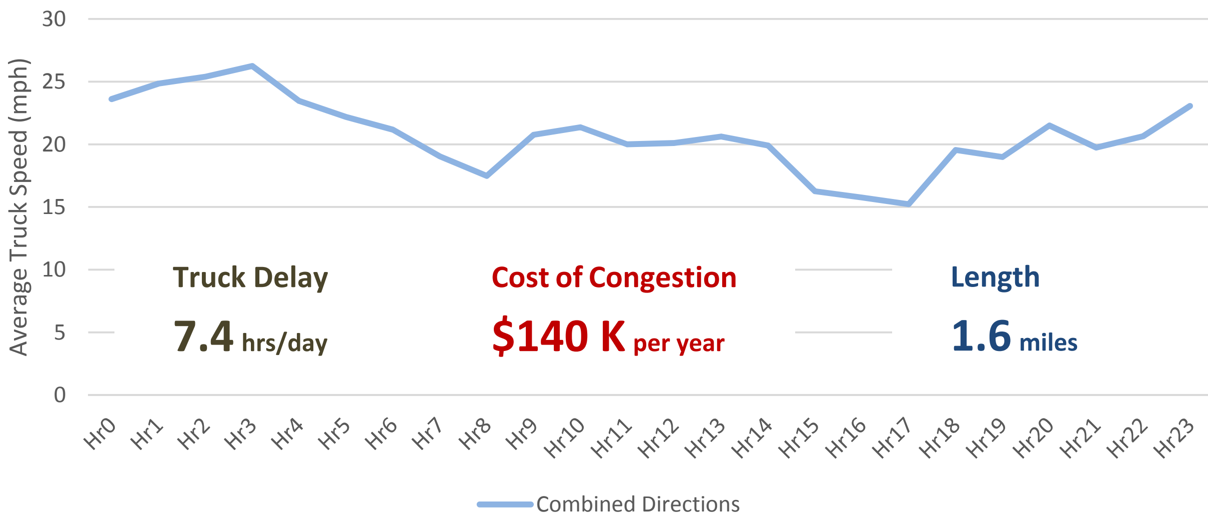


Source: CPCS analysis of ATRI data. Note: Cost of Congestion is for trucks only (not all vehicles)

Bottleneck 5: Curtis Rd.

The fifth-ranked bottleneck is Curtis Rd. in Boise. Truck speeds drop to a low of 15 mph, compared to overnight speeds around 25 mph – with notable drops in speed corresponding to the a.m. peak period and particularly the p.m. peak period.

Figure 2-12: Bottleneck #5 Speed Profile



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

3 Truck Performance Issues

Key Chapter Takeaways

- This study assesses two quantitative issues (delay and safety), supplemented by a qualitative survey of industry stakeholders. Among the approximately two dozen stakeholders that provided input into location-specific freight issues in the region were representatives of trucking companies and major shippers in a variety of industries (e.g. heavy industry, petroleum, manufacturing, grocery, courier).
- The top corridors noted by stakeholders as having freight issues were I-84, Eagle Rd., and US-20/26. Congestion was the top issue cited by numerous stakeholders for each of these three corridors. Safety was also cited as a concern, especially on I-84 in Nampa (at the merge from 6 to 4 lanes.)

3.1 Types of Performance Issues

This study assesses performance issues using a three-pronged approach:

- Delay Hotspots (Bottlenecks)
- Safety Hotspots
- Consultation Issues

Delay Hotspots

The top fifteen delay hotspots were identified in Section 2.3.

Safety Hotspots

As part of the COMPASS freight study, an analysis of truck-involved crashes was reported in Working Paper 3A. This analysis included a study of both absolute and volume-normalized crash rates. The study team used the Idaho Transportation Department (ITD) data for Canyon and Ada counties over the last five years to analyze truck-involved crashes. This deliverable involved an examination of concentrations of truck-involved crashes, their primary contributing factors, and associated road geometry, along with some potential safety improvements.

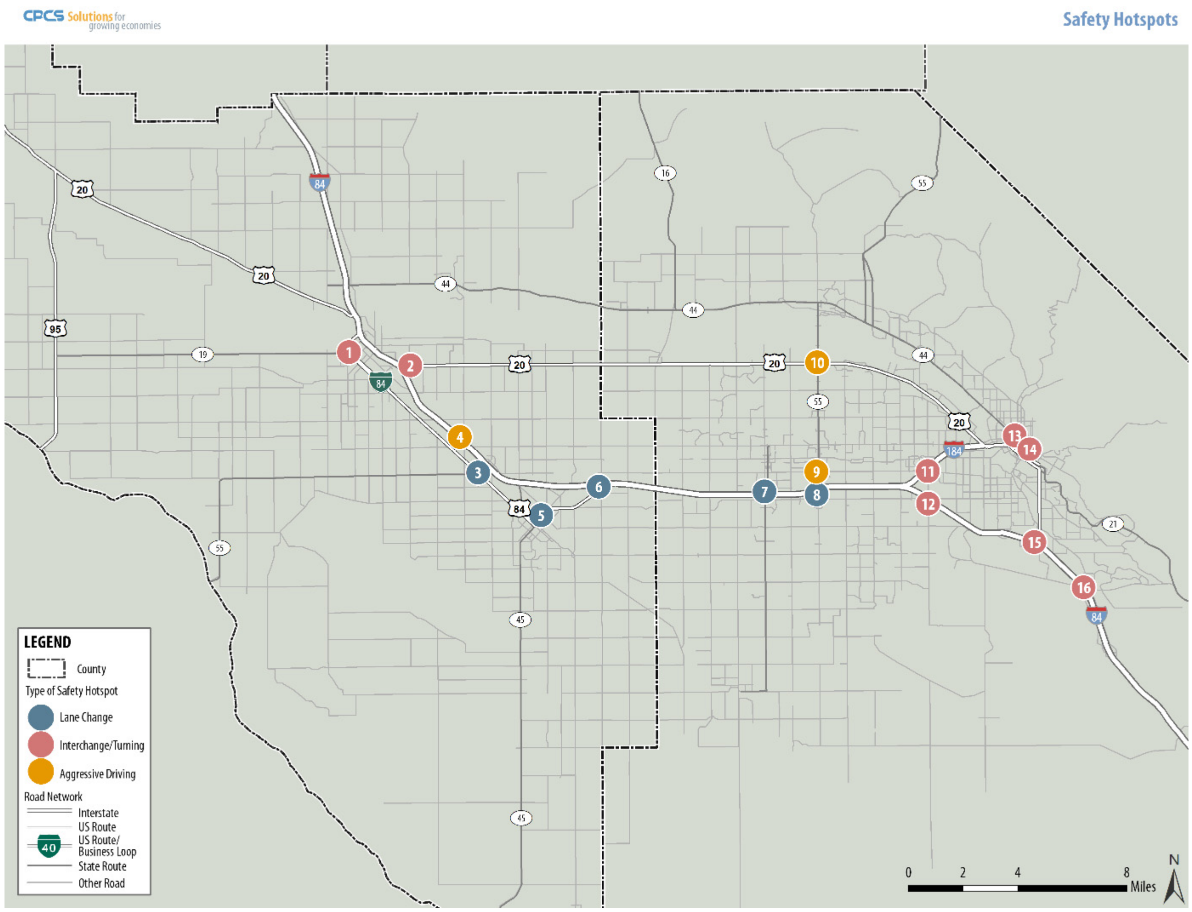
The top safety hotspots were identified by analyzing concentrations of crashes, segmenting into three categories (contributing factors):

- Intersection/Turning Issues
- Lane Change Issues
- Aggressive Driving Issues

Identifying hotspots through this causal approach has the benefit of allowing for truck hotspots to be more accurately tied to specific solutions that would improve safety.

Figure 3-1 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 detailed review of the crash patterns revealed that intersection/turning issues crashes cluster at major intersections and are infrequent on freeway corridors. Crashes related to lane change issues tend to cluster on freeway corridors. Aggressive driving crashes are more evenly spread through the study area, occurring on arterials and freeways, on road segments and at intersections. A more in-depth analysis of crash hotspots and safety-related issues can be found in Working Paper 3A.

Figure 3-1: Truck Safety Hotspots



Source: Parametrix analysis of ITD crash data

Consultation Issues

In addition to the two quantitative approaches described, performance issues were also identified through outreach to industry stakeholders. This qualitative approach served to supplement the data analysis, and identify any gaps that the data do not (e.g. non-congestion and non-safety issues such as issues with roadway geometry and access).

3.2 Industry Consultations

3.2.1 Consultation Process

In order to identify problematic corridor locations in Ada and Canyon Counties, the study team reached out to freight stakeholders across the COMPASS region. The study team identified major freight-reliant companies and also reached out to industry associations (including the Idaho Trucking Association) and local development agencies to obtain contact information for the region's major freight stakeholders. Questionnaires were sent out to the outreach lists.

The questionnaires aimed to identify current and future needs of stakeholders that were related to freight mobility. After asking the stakeholders about the freight mode and their required services, the consultations focused on potential improvements to the system and freight reliability issues. Examples of issues were travel time delay, congestion, poor pavement condition, safety concerns, tight turns, and access to facilities. We were particularly interested in state, county, and local streets and roads because COMPASS and local governments had a greater ability to make timely improvements to these roads.

In total, the study team received information on location-specific freight issues from approximately two dozen companies, many of them indicating multiple issues. Industry stakeholders included trucking companies and major shippers in a variety of industries (e.g. heavy industry, petroleum, manufacturing, grocery, courier).

3.2.2 Stakeholder Consultation Summary

The following figure presents the results of consulting local freight stakeholders about the most problematic locations within the COMPASS region. Note that the study team is presenting these "as is," so as to provide the most accurate picture of industry perspectives.

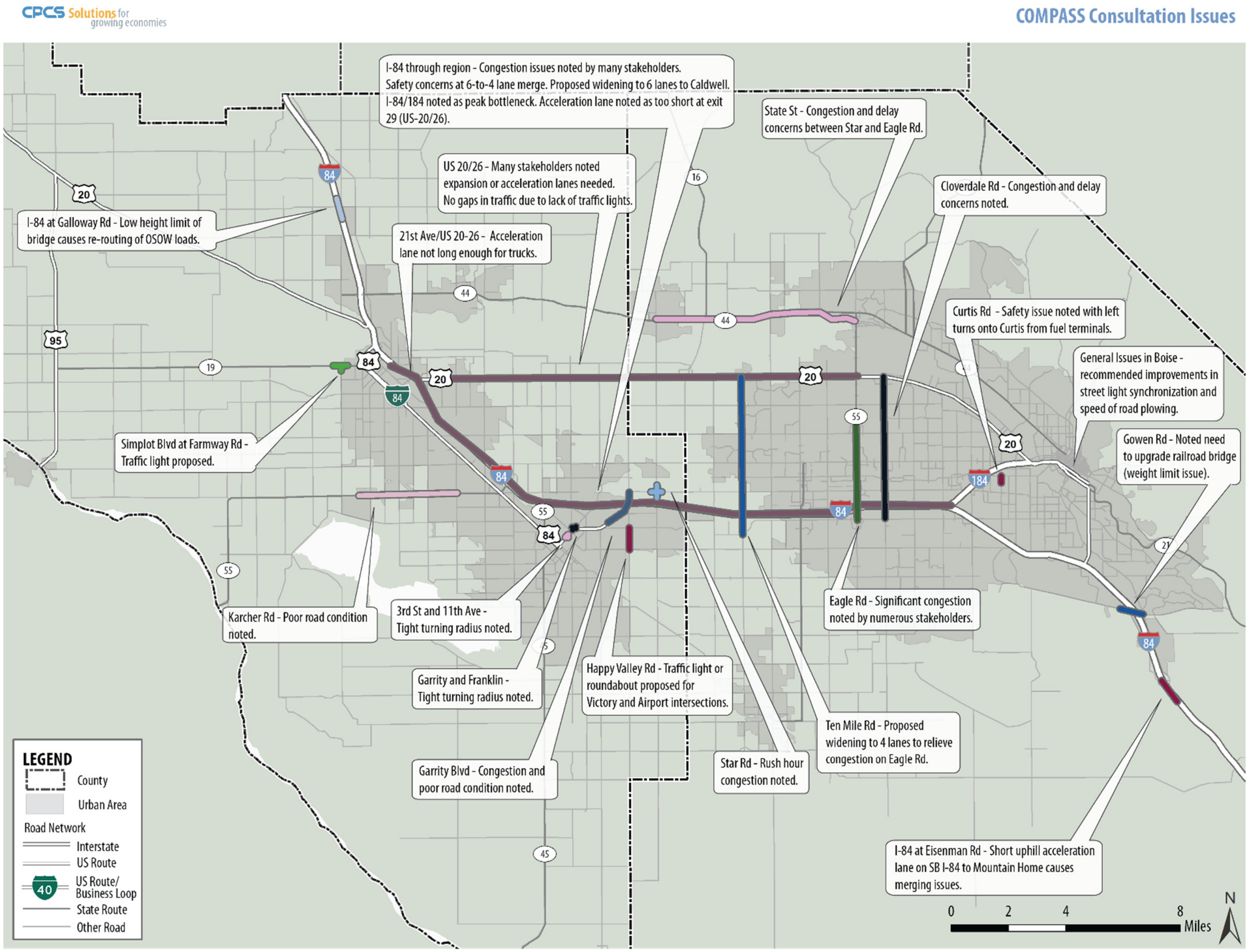
Figure 3-2: Freight Performance Issues Identified Through Consultation With Stakeholders

Consultation Hotspots	Issue
Eagle Rd.	Significant congestion noted by numerous stakeholders
I-84 at Nampa	Congestion noted by many stakeholders, safety concerns with truck merging.
I-84 between Boise and Nampa	Congestion noted by multiple stakeholders - would like to see traffic flow managed better.
I-84 between Nampa and Caldwell	Competition between general traffic and freight traffic. Several stakeholders indicated they would benefit from widening to 3 lanes (all the way to Caldwell)
US-20/26	Congestion problem. Many stakeholders noted expansion or acceleration lanes needed. No gaps in traffic due to lack of traffic lights.
Curtis Rd.	Safety issues with left turns onto Curtis from fuel terminals
Star Rd.	Rush hour congestion noted
Garrity Blvd.	Congestion (near I-84) and poor road condition noted
Happy Valley Rd.	Traffic lights or roundabouts proposed at Victory and Airport intersections
Garrity Blvd and Franklin Blvd	Tight turning radius noted - especially with traffic bollards installed as lane dividers

Consultation Hotspots	Issue
3rd St. and 11th Ave. (Nampa)	Tight turning radius at intersection
ID-19 and Farmway Rd.	Traffic light proposed – "turning from Farmway is dangerous."
Gowen Rd.	Noted need to upgrade railroad bridge to handle heavy loads
I-84/ I-184 split	Bottleneck at peak times
I-84 at US-20/26/21st Ave.	Acceleration lane not long enough for trucks
I-84 at Galloway Rd.	Height limit on NB traffic where crosses over I-84 – difficult for oversize/overweight loads
I-84 SB to Mountain Home	Noted need for 3rd lane for uphill acceleration on S/E bound I-84 to facilitate truck movement
Boise Surface Streets	Improving street light timings/synchronization. Plowing roads sufficiently quickly in winter
ID-55 (Karcher Rd.) west of Nampa	Poor pavement condition noted
State St. between Star and Eagle	Congestion and delays noted
Cloverdale Rd.	Congestion and delays noted
Ten Mile Rd.	Could consider expanding to 4 lanes to relieve congestion on Eagle Rd.

Source: CPCS consultations.

Figure 3-3: Issues Raised in Industry Consultations



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

3.3 Summary of Performance Issues

Many of the issues raised in consultations refer to locations that are already identified in the delay or safety analysis, helping to validate key findings. For example, congestion noted by many stakeholders on both I-84 and Eagle Rd. parallels the findings of the quantitative truck delay analysis, which found these corridors to have the top bottlenecks in the region.

In some cases, issues noted in consultations are not directly supported by data, although this does not make them invalid. For example, although 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). This may suggest, for example, that the trucking industry wishes 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, improved access).

Finally, in some other cases, some issues noted in the consultations refer to issues that could not have been identified by the delay and safety analysis carried out. For example, issues with roadway geometry or access would not have been picked up in the quantitative analysis. In these cases, the consultations serve to fill in "gaps" to which the data analysis alone is blind.

It should be stressed that the objective of gathering performance issues through consultations is not to vet these as the most significant issues, nor to "approve" these as necessarily being significant issues at all. Notably, in some cases, there will be trade-offs between solving a freight issue and fulfilling other regional goals. For example, in some urban areas, there is a trade-off between wider intersection turning radii (being more favorable to trucks) and narrower turning radii (being more favorable to pedestrians). In these cases, municipalities must weigh these competing needs in determining the appropriate solution. This study supports informed decision-making by providing the freight perspective on these issues.

As discussed in Chapter 5, the next phase of this study uses the performance issues identified in this report to develop a regional freight needs list, and corresponding freight solutions.

4 Truck Detour Analysis

Key Chapter Takeaways

- The routes truck drivers take when diverted from freight corridors due to closures can be retroactively studied using historical GPS data.
- One closure on I-84 in Caldwell near the Boise River resulted in trucks diverting onto local and residential streets – since there was no immediately available nearby detour route.
- For another closure on I-84 in Meridian, the majority of trucks followed Franklin Rd. – the closure indicated as a detour route – although some also diverted to Cherry Lane.
- Truck detour analysis can help shed light on whether existing detour routes are working, practical or sufficient. The availability of effective detour routes is important for network redundancy.

4.1 Introduction

The study team used ATRI's historical truck GPS database (which has detailed records for the last five years) to assess how trucks change their travel patterns during periods of traffic disruption. This approach can be helpful in understanding system redundancy and identifying locations were detour routes could in the future be updated or improvements undertaken. For example, seeing how trucks have actually diverted during incidents can help shed light on whether existing detour routes are working, practical, or sufficient.

4.2 Methodology

The detour analysis involves using ATRI's truck GPS data to review normal truck operations at each accident location for a 48-hour time period. This period includes time during which the disruption is in effect and time during which the disruption is not in effect (normal conditions). By comparing normal to disrupted conditions, is the study team was able to map out the location and speed of the trucks affected and observe differences.

The study team used multiple sources to identify potential candidate locations. This included analysis of major roadworks projects on the interstate network (obtained from ITD via COMPASS), analysis of truck safety data (particularly fatal crashes), and a web search of significant road closures in recent years. Figure 4-1 shows recent major highway projects.

Figure 4-1: Recent Interstate Construction-Related Closures

Location	Description
Meridian interchange	• utilized 7 full directional I-84 mainline closures. All closures were from 10 pm to 5 am. • WB was shut down on 8-3-14, 10-24-14, and 2-20-15. EB was shut down on 8-4-14, 8-5-14, 10-24-14 and 2-21-15.
Orchard interchange	• closed the entire interstate after nine p.m. to demolish the old structure • traffic was detoured off the orchard off ramps, through the ramp signals and back on to the interstate using the Orchard on ramps. • this method of traffic control worked well and could only be accommodated in the evening once traffic volumes dropped off • done over two evenings (project was completed in April 2009)
I-84 before Broadway and Gowen	• closed for blasting at the Gowen interchange • the closures were set after seven p.m. immediately following the evening traffic peak • did stack traffic on the interstate. Blasting needed to occur during daylight hours; needed to get out there early in the day • traffic was detoured down Broadway to Federal Way all the way out to Eisenman IC. This configuration was set for both lanes for short intervals during blasting (project was completed in Sept 2015)
Repaving on I-84	• from the Franklin Boulevard Interchange in Nampa to the Franklin Road Interchange in Caldwell • crossovers were completed on June 2-5, June 16-19, June 23-26, and July 7-10, 2017. During the crossover, all I-84 traffic shifted to one side of the interstate with one lane of traffic open in each direction.

Source: ITD, via COMPASS

One issue with using these construction-related closures is that detour routes are planned in advance and thus, the detour is often fairly simple (as in the case of a bridge reconstruction where traffic was diverted on and off the highway by way of a simple off-ramp/on-ramp configuration). For this reason, the selection of detour analysis sites instead relied on unexpected closures due to crashes.

The fatal crash locations considered are shown in Figure 4-2. In general fatal crashes result in larger disruptions compared to non-fatal crashes, but it is still difficult to determine from this information alone the level of disruption.

Figure 4-2: Fatal Crash Locations Considered

Road	Date	Time
I-84; WB between Garrity Blvd and Franklin Blvd	7/11/2012	17:50
I-84/Ten Mile Road Interchange signal	5/16/2012	8:24
I-84; EB off-ramp at Ten Mile Road	10/16/2012	12:11
I-84; WB between Midland Blvd and US-26 (Caldwell)	4/22/2015	12:25
I-84; EB between 10th Ave and US-26 (Caldwell)	12/30/2015	9:41
US-26 (Chindon Blvd); at Eagle Road	3/31/2015	12:02
US-20; at Middleton Road (Caldwell)	10/10/2013	9:10
Hwy 19 (Simplot Blvd) at Centennial Way (Caldwell)	10/24/2013	16:43
Hwy 19 (Simplot Blvd); W of Wagner Rd (Caldwell)	10/31/2014	11:15
Federal Way at US-20 (Broadway Ave) SB Ramp intersection	10/7/2013	13:28

Source: Parametrix analysis of ITD data

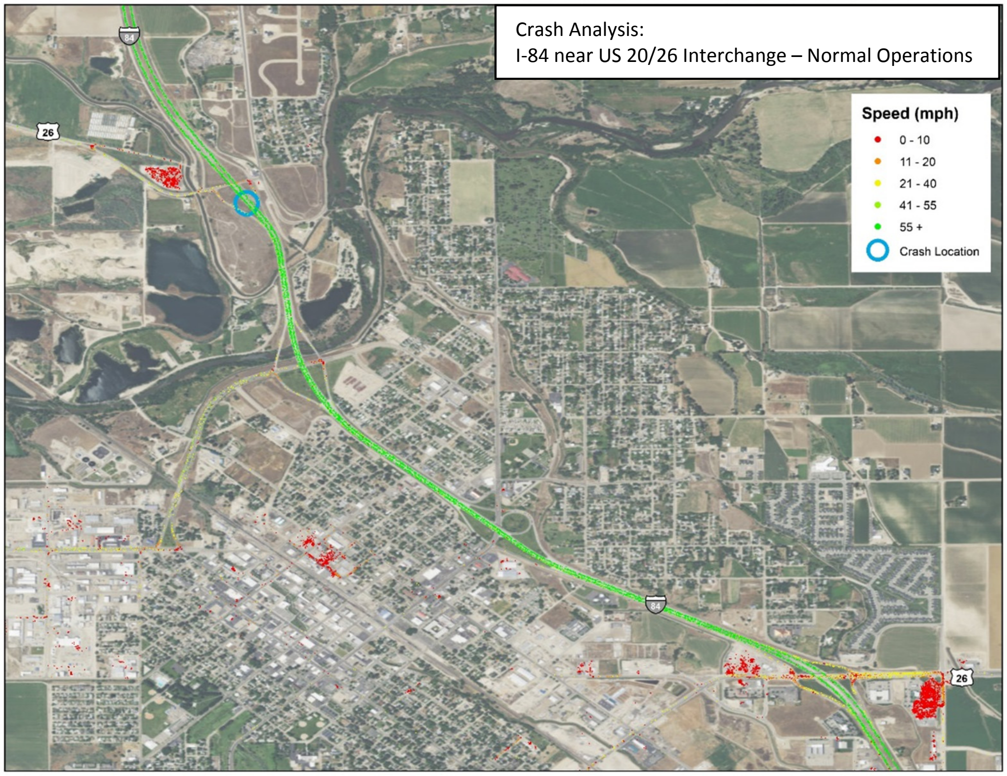
Figure 4-3 shows the locations selected for the detour analysis, based on a combination of the crash data and web searches. These locations were mapped using ATRI's historical truck database. The first two locations yielded significant identifiable detour trends, which are described below. The remaining three yielded data but not enough to determine clear trends in diversion routes.

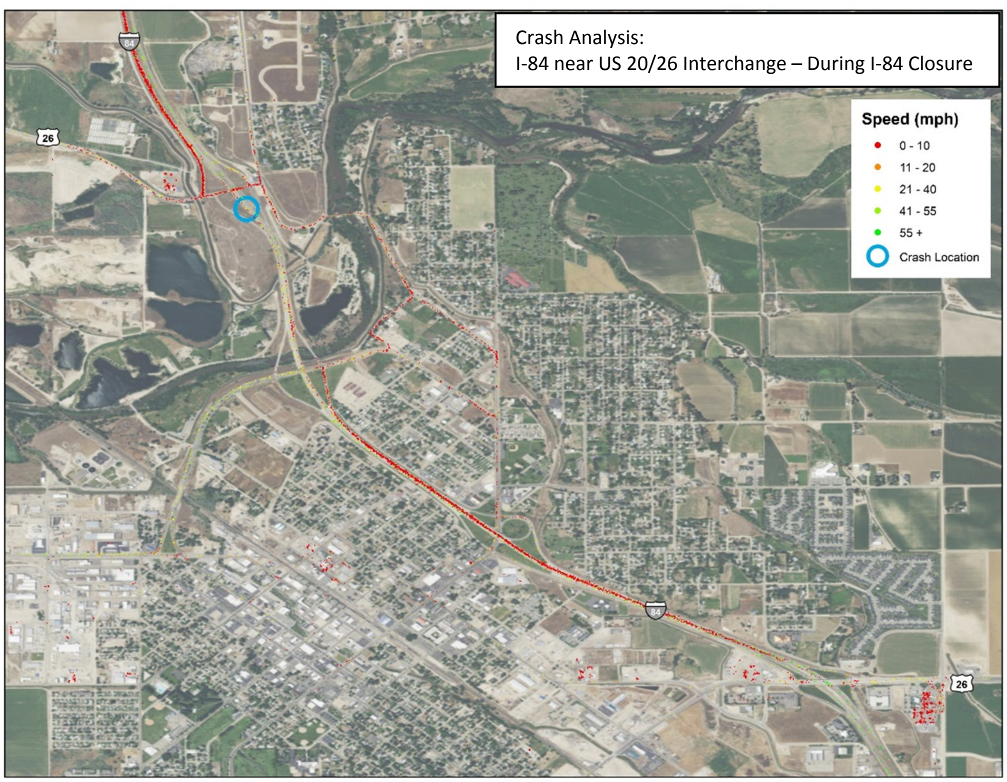
Figure 4-3: Selected Locations for Detour Analysis

Number	Location	Date/Time	Description
1	I-84 near US 20/26 interchange	12/4/2015 at 13:35	I-84 closed both directions for 4 hrs
2	I-84 just west of 10-Mile Rd.	1/9/2014 at 9:00	I-84 closed due to 40-car pileup
3	I-84 between 10th Ave and US-26 in Caldwell	12/30/2015 at 9:41	Fatal accident from crash database on EB I-84
4	I-84 between US-26 and Midland Blvd	4/22/2015 at 12:25	Fatal accident from crash database on EB I-84
5	US-26 (Chinden Blvd) and Eagle Rd intersection	3/31/2015 at 12:02	Fatal accident from crash database at intersection

Source: CPCS

4.3 Detour Analysis





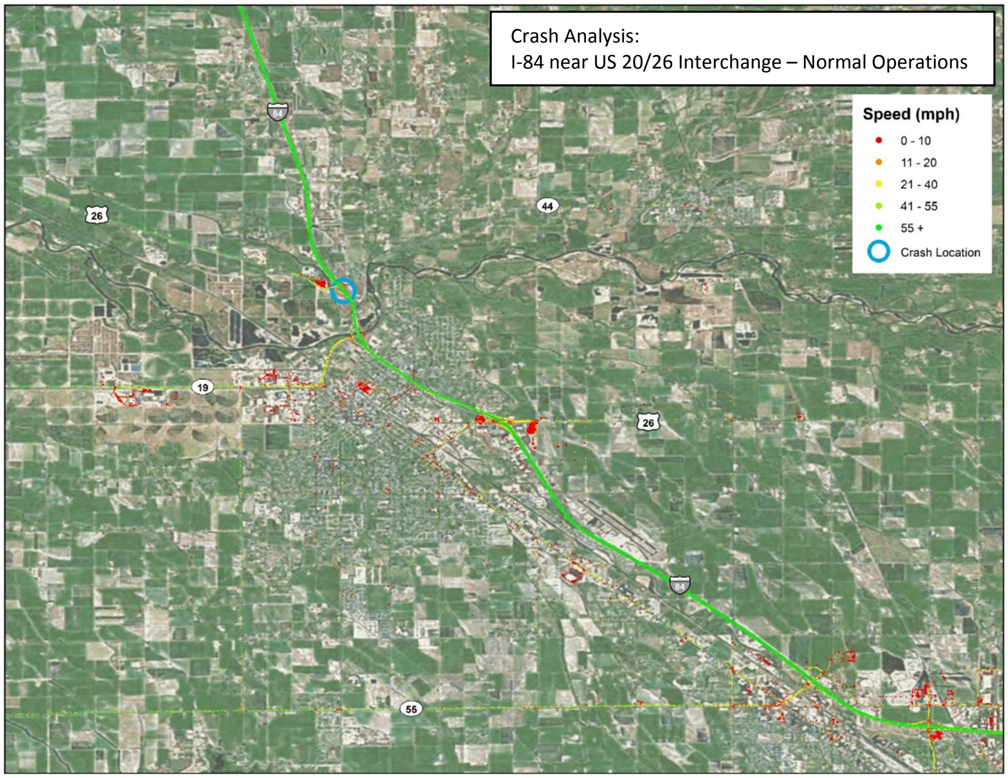
Site 1

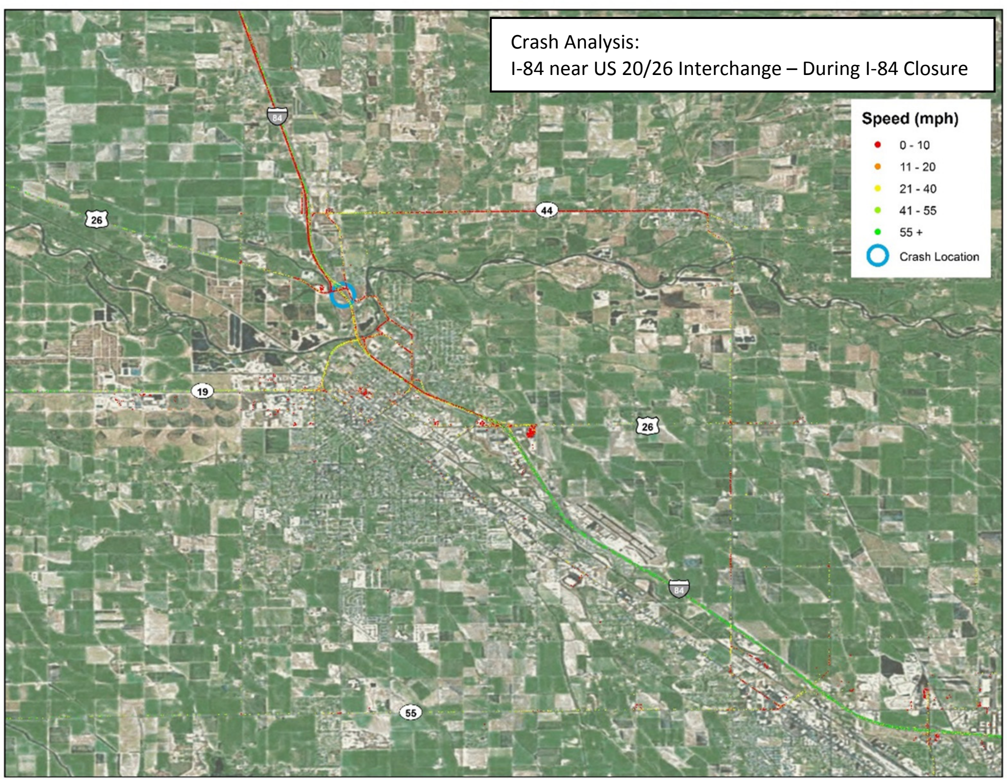
I-84 near US 20/26 Interchange

Traffic impacted in both directions.

The data show a clear pattern of diversion via local roads such as: Old Hwy 30, Plymouth St, Boise Ave, Madison St, and Illinois Ave.

Source: ATRI analysis





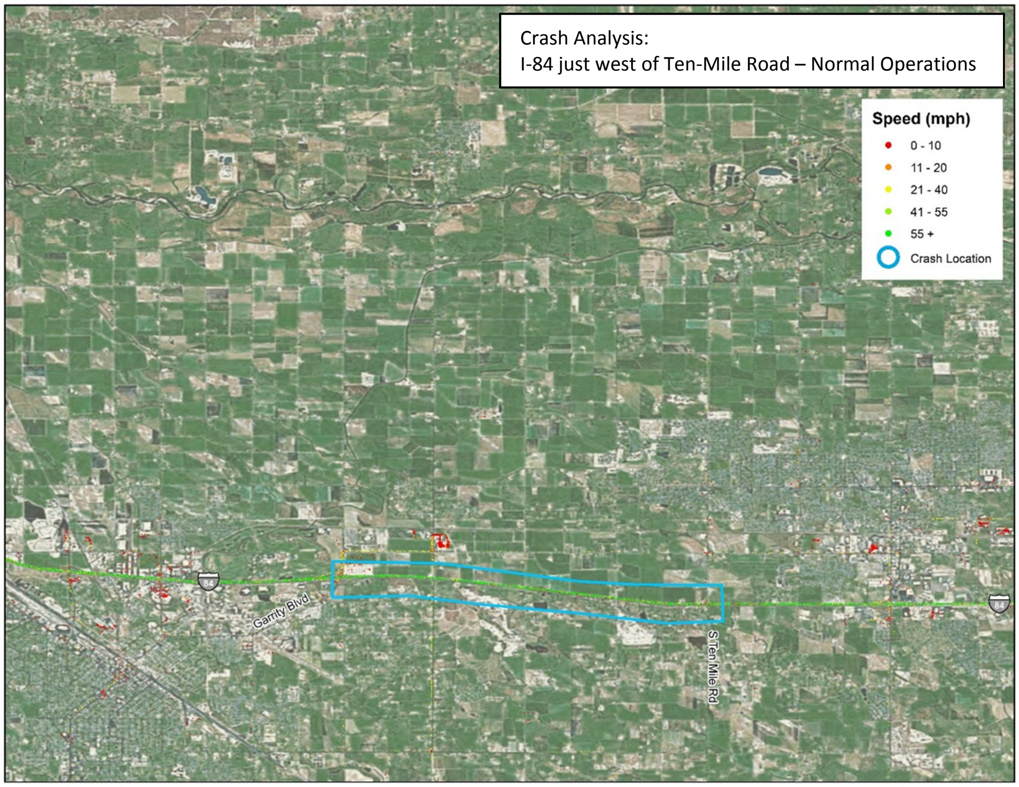
Source: ATRI analysis

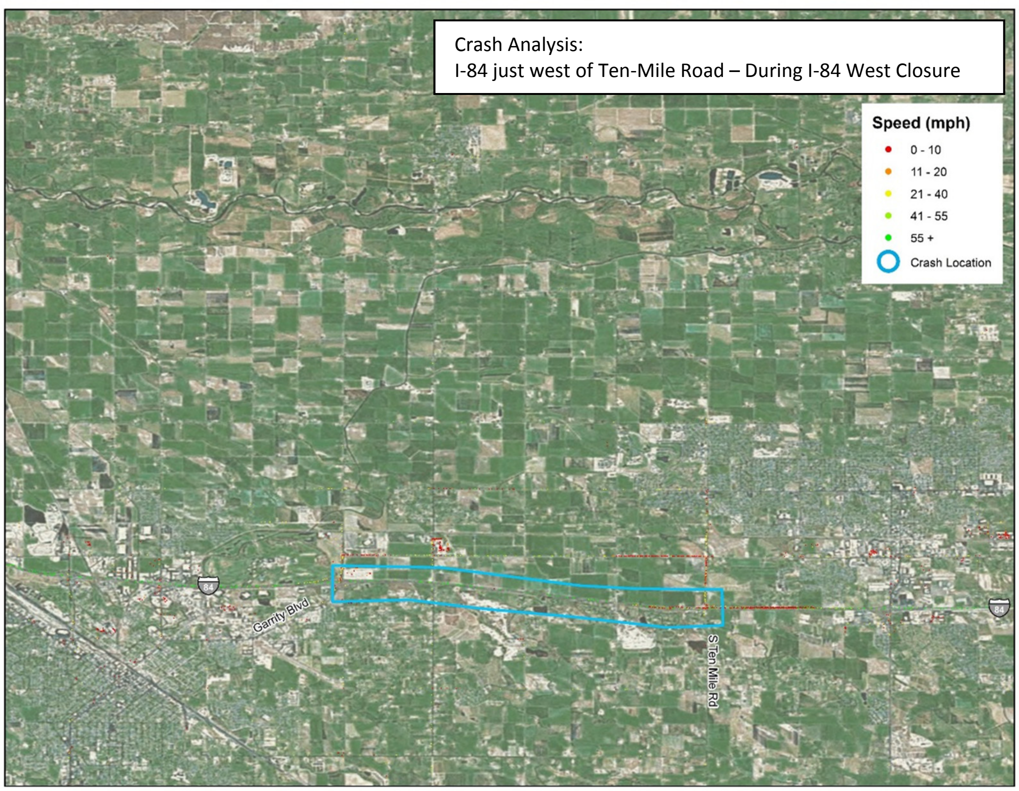
Site 1

I-84 near US 20/26 Interchange

Zooming out from initial frame.

Trucks also divert along SH 44 and Middleton Rd.



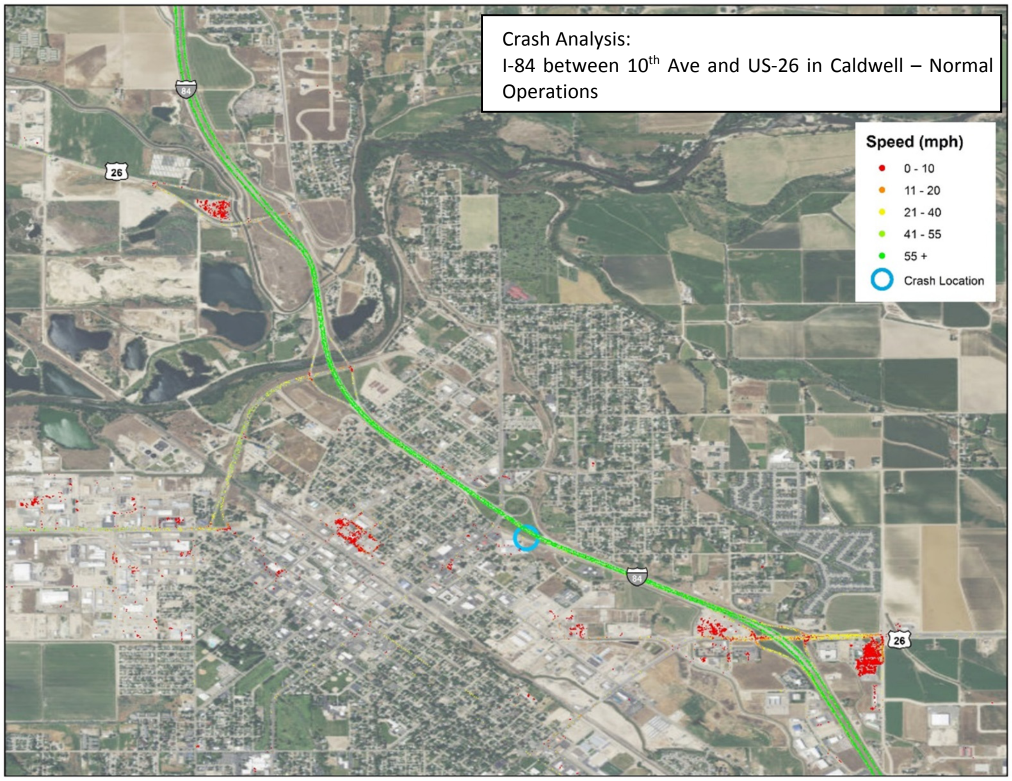


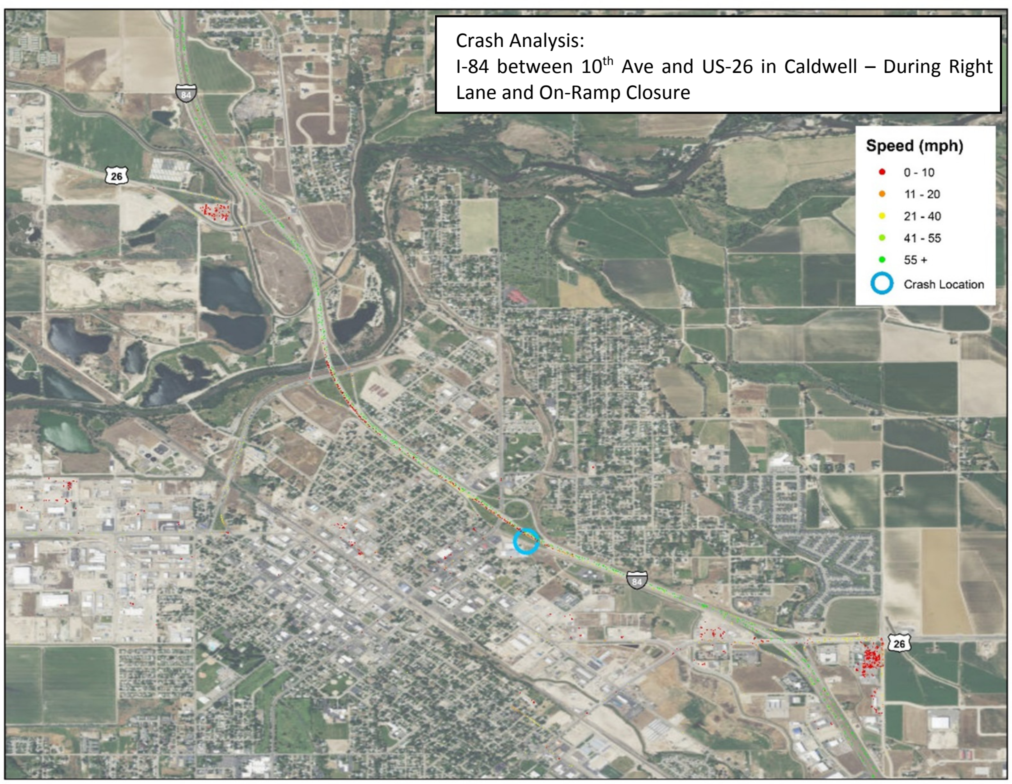
Source: ATRI analysis

Site 2

I-84 just west of Ten Mile Road

Diversions seen along Cherry Ln and, in particular, Franklin Rd.





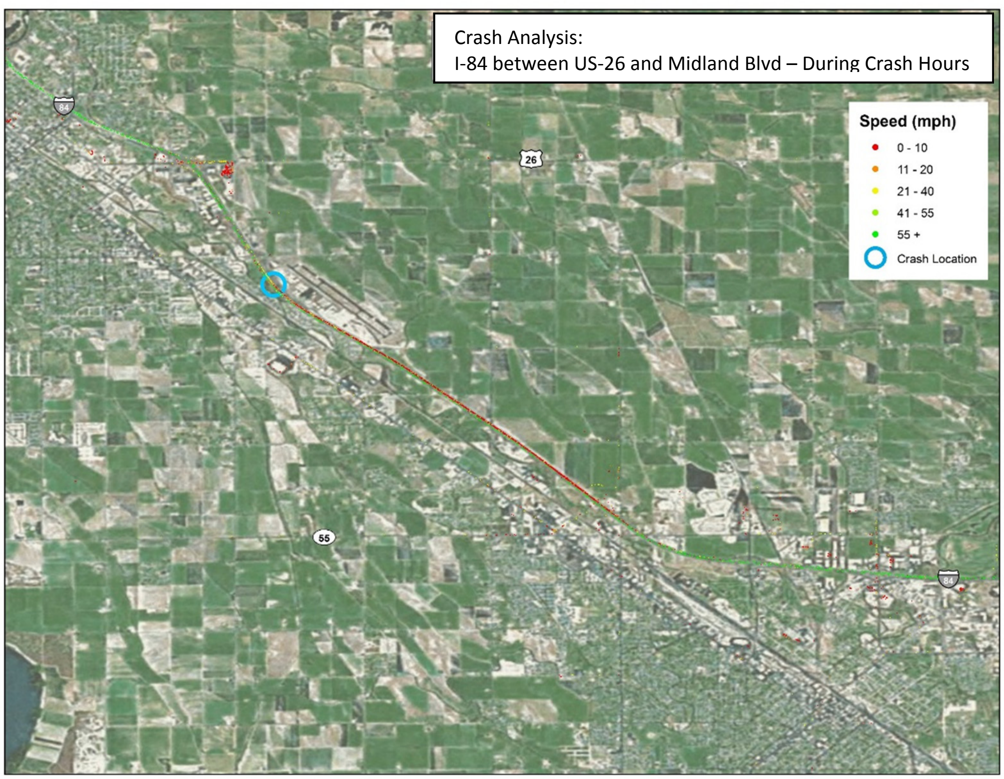
Source: ATRI analysis

Site 3

I-84 between 10th Ave and US-26 in Caldwell

The right lane of I-84 and the on-ramp were blocked, but some eastbound lanes were still operational. This likely resulted in less traffic rerouting and more of a “crawl” by the accident scene.

Note: for several of these sites, a low density of dots in the lower (Closure) image indicates a low number of observations, likely due to the closure not lasting quite as long.



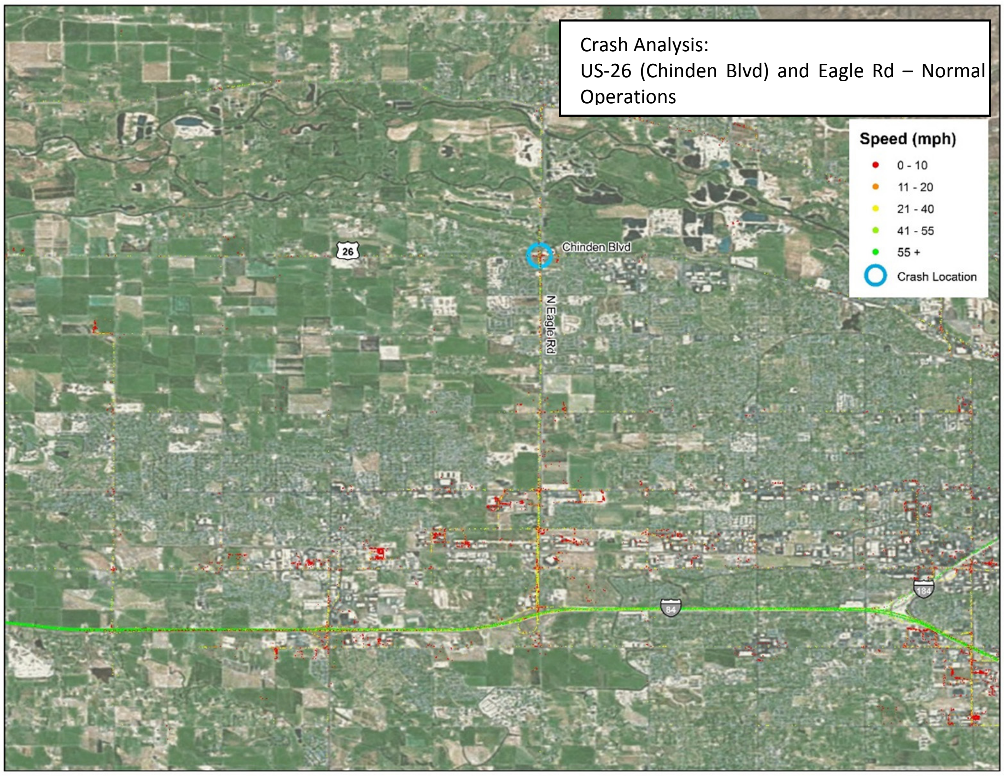
Source: ATRI analysis

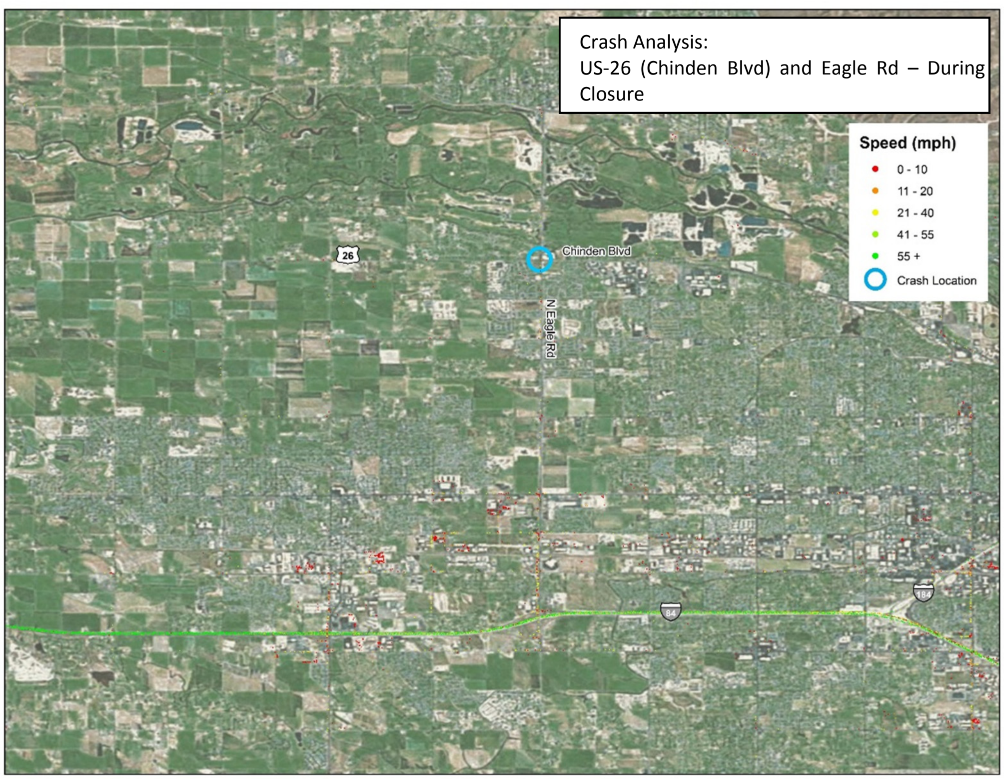
Site 4

I-84 between US-26 and Midland Blvd.

Idaho State Police news release did not indicate whether lanes were blocked during the accident duration.

From visual inspection it seems this accident resulted in slowdowns rather than diversions.





Source: ATRI analysis

Site 5

US-20/26 (Chinden Blvd) and Eagle Rd. Intersection

Southbound Eagle Rd lanes were closed according to the Idaho State Police News Release. However, these roads did not have sufficient truck volumes during this time period in order to discern an alternate route.

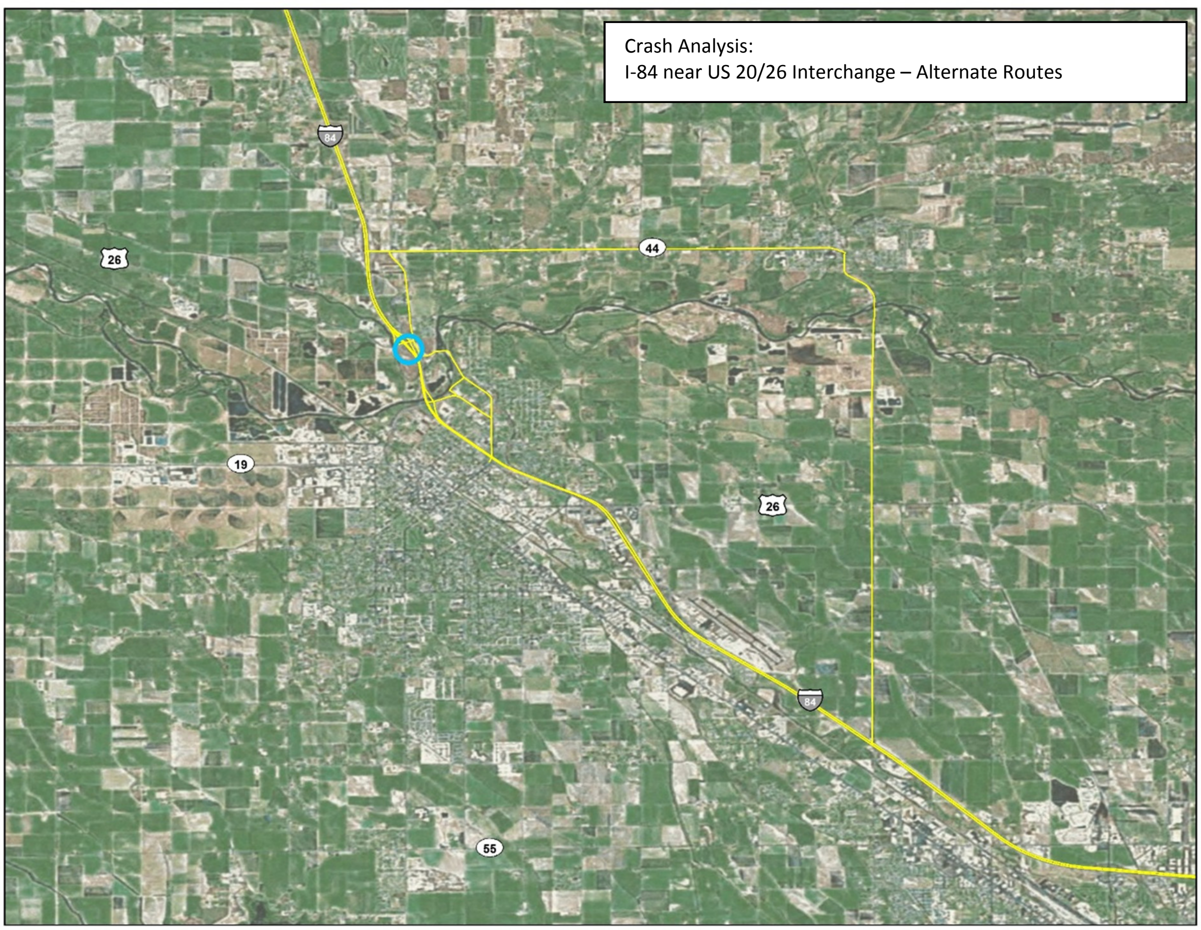
4.4 Conclusions on Detour Analysis

4.4.1 Diversion Routes compared to COMPASS Detour Routes

ATRI's analysis identified diversion routes for Site 1 – shown in Figure 4-4. The data show trucks chose to divert onto North Illinois Ave. and West Plymouth St. to get past the closure. As route users were informed of the incident, some truck drivers exited I-84 at SH 44 and undertook a lengthier bypass. This example shows that often, closures can have both a localized impact and a more regional impact on truck travel patterns.

COMPASS's existing detour routes[8] include SH 44 to Middleton Rd, and Middleton Rd down to US-20/26 (Figure 4-5). From that point, the detour route continues via US 209/26 and Midland Blvd back to I-84. The ATRI data suggest that while some trucks did use this route, many others continued directly along Middleton Rd (even though there is no interchange there).

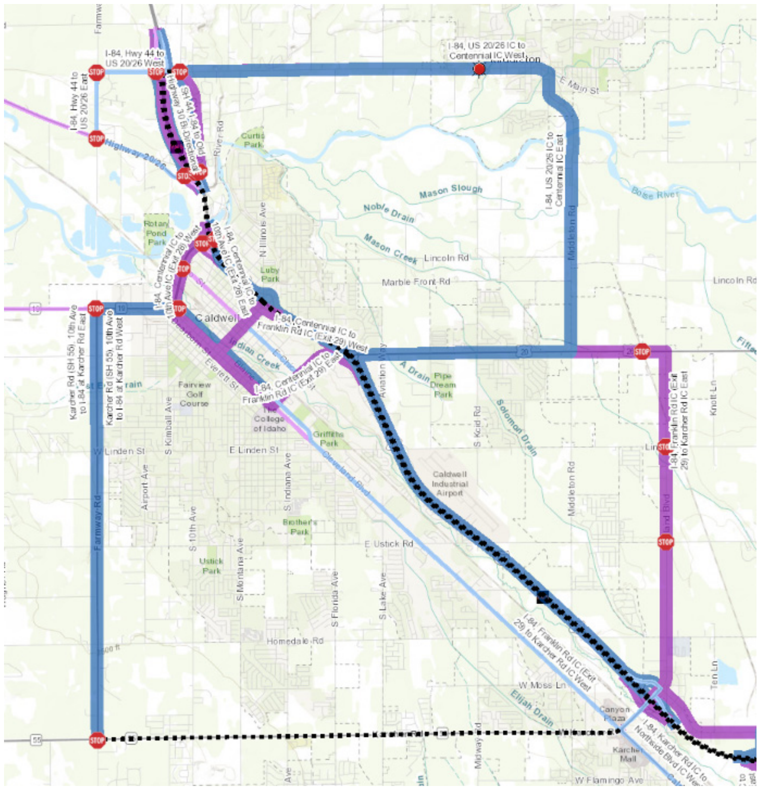
Figure 4-4: Diversion Routes for I-84 Disruption (Site 1)



Source: ATRI analysis

[8] COMPASS online Incident Detour Map

Figure 4-5: Detour Route Map for I-84 near US 20/26.

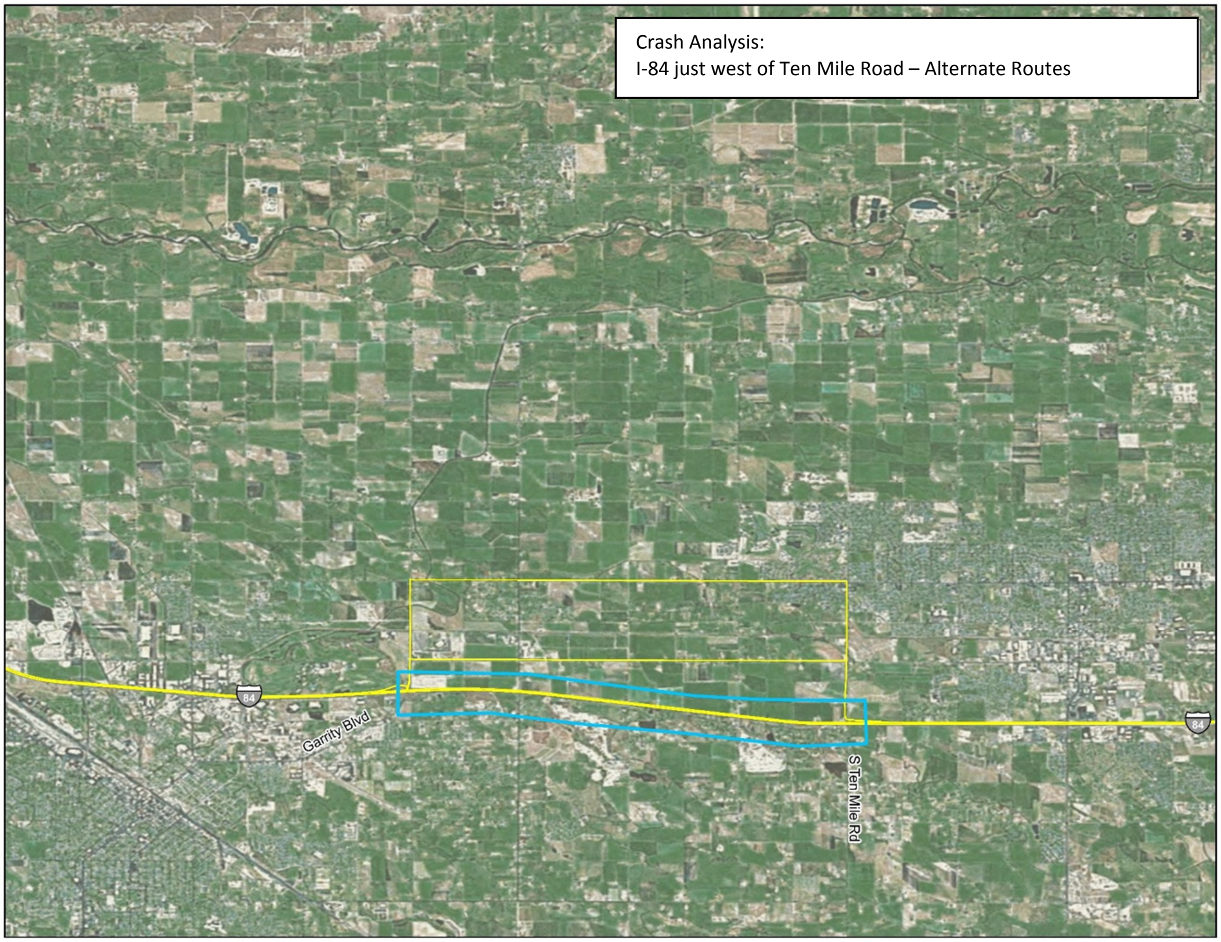


Source: COMPASS online Incident Detour Map

There are presently no truck detour routes in the immediate vicinity of the Boise River (meaning for disruptions between Centennial Way and US-26). While this is a short stretch of highway, the ATRI data show that trucks that were diverted from the highway due to a disruption in this segment ended up on residential streets such as Boise Ave. in Caldwell.

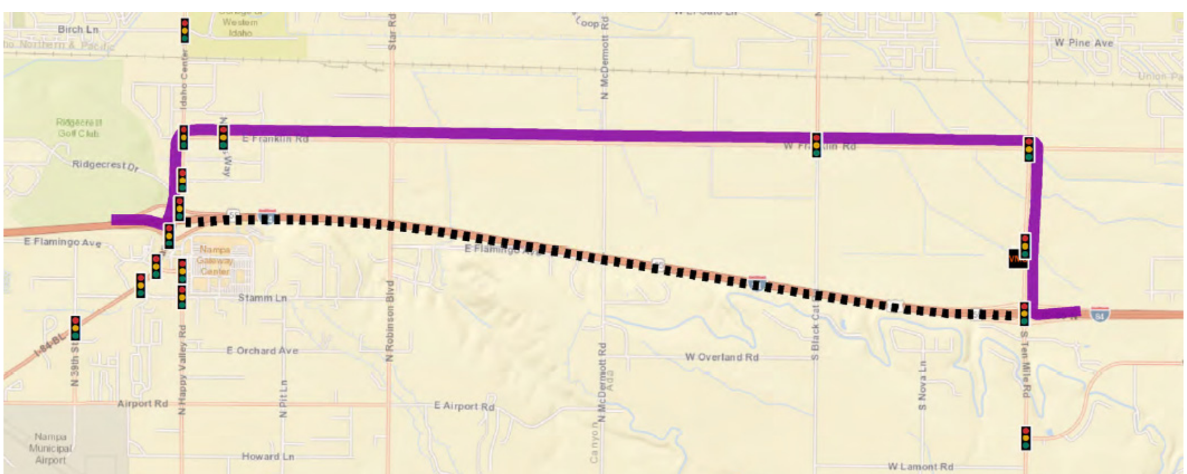
A set of diversion routes was also identified for an incident on I-84 between Meridian and Nampa (Figure 4-6). In this case, truck traffic diverted to Franklin Rd. and Cherry Ln. north of the interstate. Franklin Rd., which received most of the diverted trucks, is indeed an official detour route (Figure 4-7), indicating the route matches patterns of actual, observed driver behavior.

Figure 4-6: Diversion Routes for I-84 Disruption (Site 2)



Source: ATRI analysis

Figure 4-7: Detour Route Map for I-84 segment between Garrity Blvd and Ten Mile Rd.



Source: COMPASS Study of I-84 Detour Maps City of Caldwell to Boise City

4.2 Conclusions

The ongoing detour analysis by COMPASS utilizes the current traffic demand data combined with stakeholder consultation to identify potential detours. This demand-based approach provides a straightforward framework to identify potential detours and provide timely disseminated warnings to the travelers on the corridor.

ATRI's truck path mapping provides a validation and test of detour routes by using truck GPS data to assess which corridors truck drivers have used during real-life incidents. It can help identify locations where existing detour routes are insufficient or are working as anticipated.

In order for the ATRI detour approach to be applied to a specific location, it is necessary that there has been a significant disruptive incident at that location. Thus, the geographic coverage of this approach is necessarily somewhat limited. Nonetheless, where available, the approach can provide valuable insights. Importantly, this approach is best applied to interstate routes with high truck volumes and cases of very significant disruption (e.g. entire highway closed). Arterial roads with lower truck volumes require a much longer period of disruption in order to have the same number of data points for analysis.

5 Conclusions and Next Steps

This Working Paper assessed performance issues on truck corridors in the region, focusing particularly on truck delay.

The truck performance issues identified in this Working Paper will lead directly into the regional freight needs list, to be included as part of Working Paper 4A. The needs list will consolidate performance issues related to safety, delay, and issues identified in consultations, and identify overlaps between the issues identified through these different sources.

Subsequently, the needs list will be used to develop freight solutions. In some cases, the solutions to freight issues are already part of the Idaho Transportation's Idaho Transportation Investment Program (ITIP) or other programs identified by COMPASS; in other cases, there may not be an existing proposed solution and new solutions will have to be considered. Identification of solutions will be presented in Working Paper 4A, while Working Paper 4B will suggest recommended approaches to project prioritization.