Appendix F

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2005 HAZARDOUS MATERIALS COMMODITY FLOW ASSESSMENT

Findings from a Commodity Flow Study Conducted in Okanogan County, Washington

Prepared for:

Okanogan County Sheriff's Department
SCOTT MILLER
Emergency Services Coordinator

Research Conducted by:

Division of Governmental Studies and Services
Department of Political Science and Criminal Justice &
University Extension
Nicholas P. Lovrich, Ph.D., Director
Washington State University
Pullman WA 99164-4870

Report Authors

Jennifer R. Albright, MA
Michael J. Gaffney, JD
Jennifer M. Chiotti, ABD

Field Research Staff:

Jennifer M. Chiotti
Andrew J. Wilson

EXECUTIVE SUMMARY

This report represents the principal findings from analysis of data collected as part of a hazardous materials commodity flow study conducted by researchers from Washington State University in Okanogan County during the Spring of 2005. In addition, this report describes the study design, data collection and analysis efforts, and provides a summary of the data collected. It also sets forth some of the risks that Okanogan County can anticipate and concludes with some implications for future policy formulation derived from this data collection and analysis process.

The findings indicate several potential risks to Okanogan County. These include:

- Proximity of roadways in Okanogan County to the Okanogan River, Columbia River, and the various lakes distributed throughout the county.
- Significant number of vehicles carrying potentially hazardous materials that are not placarded.

These risks are aggravated by the geography and demography of the county. Okanogan County is large, sparsely populated and not easily accessible which could potentially delay an offensive response to a hazardous materials incident. Furthermore, resources (both personnel and equipment) are scarce in the county, limiting both offensive and defensive responses.

PREFACE TO THE REPORT

This report represents the findings and observations from analysis of data collected as part of a hazardous material commodity flow assessment study conducted in the spring of 2005 by a team of field researchers from the Division of Governmental Studies and Services at Washington State University. This team consisted of two graduate students who were trained and experienced in hazardous materials classification and transport. The team conducted observations over a period of four days at six sites in Okanogan County, Washington. Secondary source data were gathered by both the Division of Governmental Studies and Services and Okanogan County Emergency Services. The goal of this study was to obtain a threshold determination of the type and amounts of hazardous materials in transit within Okanogan County. This determination, while based on limited observations, should prove useful as an aid to planning and preparation for "all hazards" events in Okanogan County.

Acknowledgments:
The authors of this report, and the field researchers who collected the field observation data, would like to express their thanks to the Washington State Patrol Commercial Vehicle Division, the United States Border Patrol, Scott Miller with the Okanogan County Sheriff's Department and to the cooperative truck drivers who conversed with the WSU field research staff.

INTRODUCTION

Okanogan County occupies 5,300 square miles in north central Washington State. The Colville Tribal Reservation covers 2,100 square miles straddling both Okanogan and Ferry Counties. The county is bordered to the north by the U.S.-Canadian border, with the Columbia and Okanogan rivers defining the southern border.

U.S. Highway 97, arguably one of the two main north-south highways in Eastern Washington, runs from Oregon through Okanogan County to the Canadian border and is the main route for hazardous materials transportation by truck through the county. There are a number of lesser state highways dissecting the county; however most of the potential risk for the county appears to be centered on U.S. Highway 97.

Okanogan County faces a number of potential risks, most of them stemming from the fact that it is a large and sparsely populated area with a limited defensive infrastructure. Some of the more significant potential risks to Okanogan County are:

- U.S. Highway 97. Primary land route for north-south transportation through Eastern Washington to the Canadian border.
- State Highway 20. Primary land route for heavy equipment used to transport and excavate the rock and minerals located in the county.
- State Highway 155. Primary access to Colville Tribal Reservation that would necessitate collaborative involvement with their independent emergency management plan.

An accident involving any of these points could have significant negative impact on the county. This could involve potentially significant property damage as well as adverse affects on the health and economic well being of the residents of Okanogan County. Depending on the location or magnitude of the accident, residents of any or all of the five

adjoining counties and residents of Osoyoos, Canada could also be impacted. These hazards are especially true of the riparian environment of the Columbia and Okanogan rivers, which could affect wildlife and residents far downstream.

OBJECTIVES AND METHODOLOGY

The U.S. Department of Transportation (DOT) has published a guide for conducting Hazardous Materials Flow Surveys that suggests three critical elements (location, timing and types of observations) in designing and implementing a study. The DOT guidelines are detailed and elaborate – calling for studies extensive in their scope and therefore very time consuming and expensive. While following those guidelines might be the preferred alternative, for most counties or agencies in need of the information gained in a flow study, the cost of this kind of research is prohibitive. Washington State University has modified the DOT guidelines to be more cost effective and responsive to the needs of entities such as Okanogan County, while still maintaining the integrity of the data collection process.

As was the case with the field observations performed in Okanogan County, the first objective of any hazardous materials commodity flow assessment is to identify the sample space within which field researchers are to work. The purpose of establishing a sample space is to draw an adequate number of quality observations that will accurately represent the total population of events being studied. From the observations in this sample space, then, conclusions can be drawn which apply more broadly to the county.

The U.S. DOT suggests that, in order to narrow the scope of the study, roads that are accessible for hazardous materials transportation should be identified first.

This can be done quickly by examining maps of the area and atlases produced for the trucking industry, and consulting with individuals who are familiar with the area. A number of reports are available to aid in this process, such as the Highway Performance Monitoring System (HPMS), the Commodity Transportation Survey (CTS) and the Hazardous Materials Incident Reporting Systems (HMIRS). In this case, U.S. Highway 97 was identified as a primary focus, with secondary points of focus on State Highways 20, 155, 153.

A second theoretical dimension of data collection pertains to the location of observations. The U.S. DOT advises researchers to collect data where it will be minimally disruptive to trucking companies and drivers. They suggest that ports of entry and weigh station sites might be the least disruptive locations for data collection, but warns that data collected in this manner might reflect primarily interstate transportation, missing important intrastate shipments. In general, the DOT recommends that survey teams should set up observations wherever the appropriate combinations of the following are present:

- High truck volumes.
- Adequate space for safe pullover and isolation of trucks from the flow of traffic.
- Good visibility along the highway, in the event it becomes necessary to allow trucks to pass by because of long queues without recording shipping data. In this case, placards could still be read and noted.
- Absence of legal restrictions on survey activity.
- At least one other valid reason for pulling vehicle off the highway. For example, cargo check, safety check, or weight check.

Recommendations from the DOT are meant for state-wide commodity flow studies, and as such, were tailored substantially for use in Okanogan County. The observations in Okanogan County did utilize Washington State Patrol weigh-in-motion sites and border

crossings. Observations in Okanogan County were collected at eight (8) sites around the county including:

- U.S. Highway 97 at Tonasket (junction for State Highway 20)
- U.S. Highway 97 at Okanogan
- U.S. Highway 97 at Omak
- U.S. Highway 97 at Fort Okanogan
- State Highway 155 at Omak
- State Highway 153 at Pateros
- U.S. Highway 97 at the U.S./Canadian Border Crossing
- Washington State Patrol Weigh-in-motion site at State Highway 17

Closely linked to the location of observations is a question of the timing of observations. A thorough study must be able to account for seasonal and daily changes in commercial transportation flows. In periodic national commodity flow studies according to the U.S. DOT, data collection should occur on the 5th, 18th, 31st and 44th weeks of any survey year. At the proposed sites, the researcher should observe for three hour shifts at three different times during a 24-hour period (one morning shift, one late afternoon shift and one evening shift). An adaptation of this multi-shift approach was applied in this study which allows the estimation of the daily and seasonal flows of traffic containing hazardous materials throughout Okanogan County. Given budget constraints which allowed for only one period of observation, observations were conducted during Spring in order to maximize the validity and utility of the data collected under this reduced-cost approach to hazardous materials flow study.

Observers found that transport through Okanogan County peaked during "working hours;" between 7 a.m. and 5 p.m. Data collection times were scheduled in response to this knowledge, with two observers stationed at one or more of the eight observation sites for shifts of between two and four hours beginning at 8 a.m. and ending at 5 p.m. Observations were also scheduled in conjunction with the Washington State Patrol who graciously staffed the State Highway 17 weigh station so that observers were afforded easy access to the trucks and drivers who stopped at the weigh stations. Observations were collected for a four day period in mid-May, in an effort to capture the agricultural traffic as well as peak inter- and intra-state transport times.

The third conceptual question in designing methodology for data collection concerns the types of observations that would make up the data to be processed. For the most part, observations for this study consisted of rolling observation, supplemented by more in-depth data collection at the SR 17 weigh station. At each of the proposed sites, the field researcher would record the number of placards, placard class, material ID number and vehicle types. This data would be used to estimate the various amounts, classes and types of hazardous materials flowing through Okanogan County. Observers at the weigh stations would have the opportunity to request a bill of lading from these truck types as well. Using the information on the bill of lading, the researcher would be able to record (see Appendix A) whether or not the vehicle is transporting hazardous materials, the type of material in transit, and the amount of material being transported. Through understanding both the potential of placarding violations and the volume of non-placarded, nondescript commercial transport vehicles, the danger potential can be established and necessary precautions and policies can be developed and enforced.

Some limitations of the study include the fact that late evening and nighttime observations were limited due to the observers' safety concerns for being in dark areas on the roadside at night which could inhibit their ability to accurately depict the nighttime travel of potentially hazardous materials. In addition, the lack of an adequate weigh station north of Omak may tend to lead hazardous trucks to utilize State Highway 155 or State Highway 20 to avoid any delays on their northbound route to the U.S./Canadian Border.

Hazardous Materials

The hazardous materials which are the subject of this study are those which are both identified and subject to placarding rules by Federal and State laws. They include the following categories:

A more thorough description of these classifications and the placarding requirements can be found in the U.S. DOT's 2004 Emergency Response Guidebook.

Data Analysis

The various forms of data collected in this process of systematic observation and research represent the hazardous material commodity flow for road vehicle transport in Okanogan County. Data were entered into data sets using SPSS (Statistical Package for the Social Sciences) so that descriptive analyses could be conducted. Both narrative discussion and tabular/graphic representations of these data and the implications from data analysis are set forth in the body of the report, below.

VEHICLE HAZARDOUS MATERIALS STUDY

Roads in Okanogan County range from small dirt roads to heavily traveled U.S. Highways. In total, there is one primary north-south route through the county and three east-west routes. U.S. Highway 97 travels north-south through the county and State Highways 20, 155, and 153 travel east-west through the county. From the observations collected over the research period, a total of 15 placarded vehicles were observed on State Highway 20, three vehicles were observed on State Highway 155, and zero were observed on Highway 153. Of these vehicles, all of the vehicles were carrying gas or flammable liquids. This would seem to indicate a low risk of a significant hazmat incident involving traffic on these three roadways. The time of greatest congestion on all roads observed in Okanogan County is between the hours of 7 a.m. and 6 p.m. on weekdays. This also coincides with the times of greatest hazardous materials vehicular transport traffic (when most business deliveries are made).

Therefore, it can be surmised that the greatest potential for loss of property or life and/or environmental damage could occur during this time.

U.S. Highway 97 is the most heavily traveled road in Okanogan County, and also carries the highest risk of exposure from hazardous materials incidents. The majority (76%) of the observed placarded vehicles in this study were observed either at the weigh station on State Highway 17 or directly from traffic on U.S. Highway 97 heading north and south. The vehicles observed on U.S. 97 were also carrying primarily gas and liquid flammable materials in coordination with the materials transported on the tributary roads in Okanogan County.

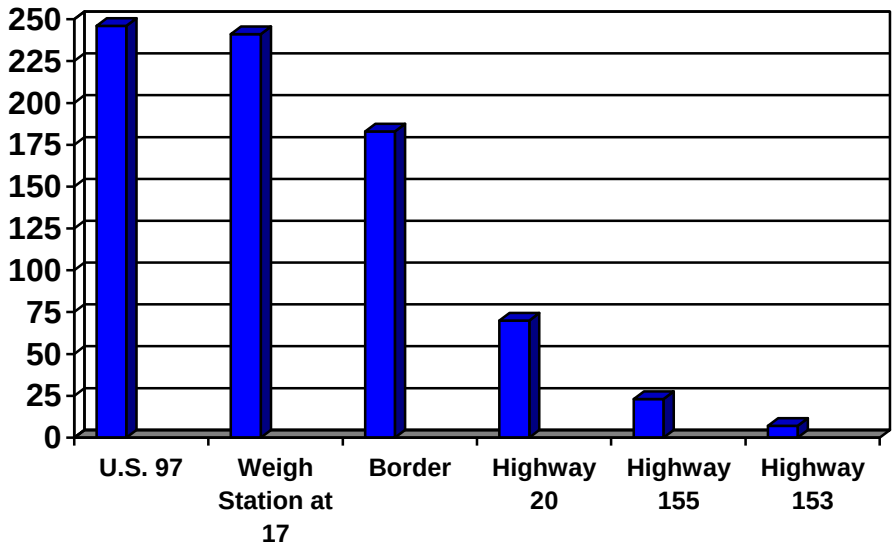
Summary of Observations

Field researchers assessed the quantity and class type of hazardous materials being transported in placarded vehicles traveling through Okanogan County. As noted, the locations of the study were the U.S./ Canadian border, U.S. 97 at Tonasket, Omak, Fort Okanogan, and Okanogan; State Highway 153 at Pateros; State Highway 155 at Omak; State Highway 20 at the junction in Tonasket, and the Washington State Patrol's weigh station at State Highway 17. Hazardous material was observed at each observation point during the study.

Details of the observations are provided in graphic form below with some accompanying discussion. In addition, a complete rendering of the frequencies of observations is set forth at the conclusion of this narrative.

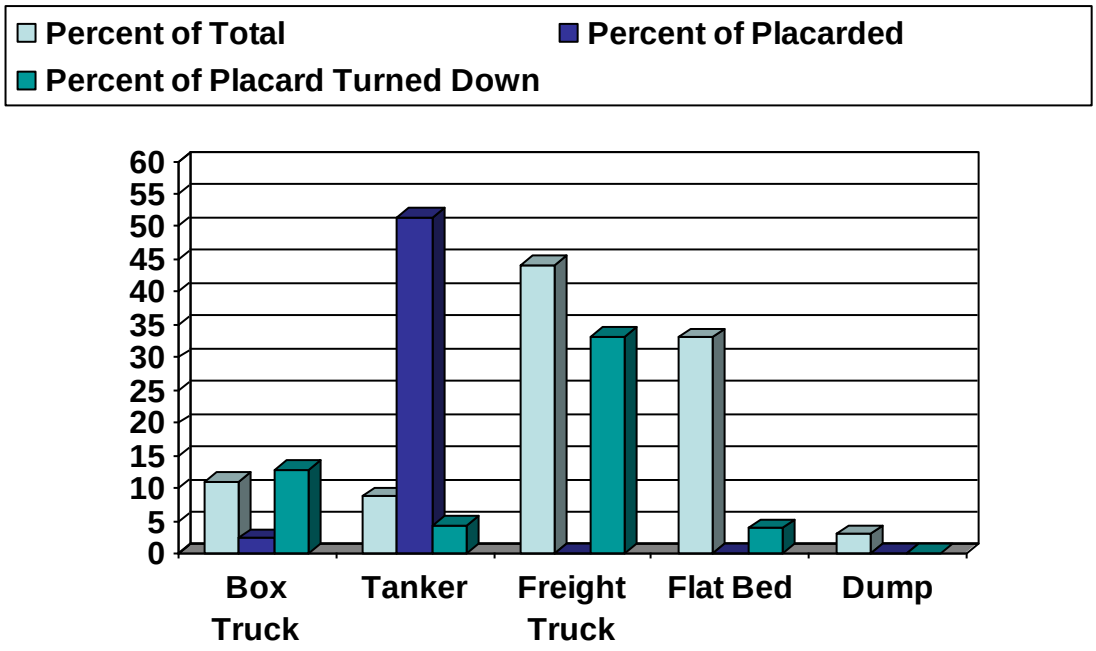
MOTOR VEHICLE/HIGHWAY STUDY

Total Observations Obtained by Location:



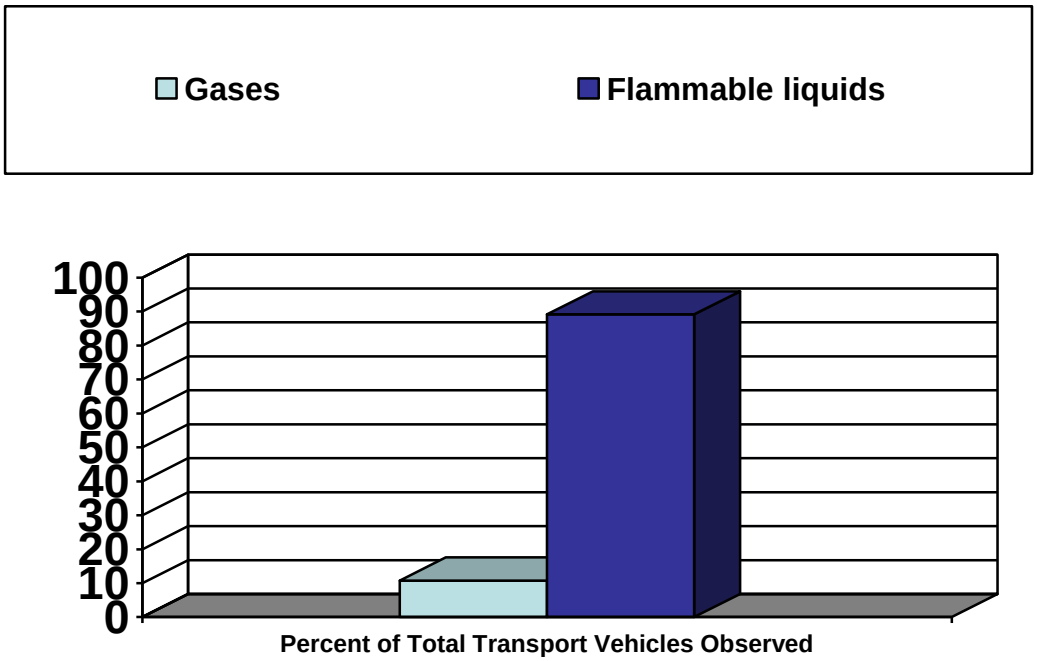
*The bar chart above confirms the report finding that a majority of transport vehicles observed were **traveling along U.S. Highway 97.***

Trucks Observed (by Percent) and Percent of Observed Trucks with a Placard:



*The bar chart above summarizes the finding that an overwhelming majority of transport vehicles observed were **Freight Trucks**. It should be noted that Freight Trucks pose a unique hazardous materials threat. Given that freight trucks make up the majority of the commercial traffic on the road in Okanogan County, and that freight trucks are the most likely of the types to be carrying hazardous material (lawfully, for the most part) without placards, these pose both a serious question as to types and amounts of hazardous materials contained AND pose an unquantified risk. Hazardous materials, perhaps in significant quantity, may be contained in these unplacarded trucks because the packaging or amounts remove the materials from placarding requirements. The risks associated with such materials are nonetheless quite real.*

Types of Hazardous Materials Observed, by Percent of Total Observed Trucks:



The above bar chart shows that most of the total numbers of transport vehicles carrying placarded hazardous materials were carrying ***flammable liquids. Again, a cautionary note should be sounded with regard to unplacarded (primarily freight) trucks. These trucks may still pose risks for hazardous materials incidents requiring response despite the absent legal requirement for placarding.***

CONCLUSION

The team of researchers from WSU was able to derive the following conclusions from this study:

First, due to Okanogan County's roadways and their proximity to the Columbia River, the Okanogan River and the various lakes distributed throughout the county, the potential risks to property, human and ecological health in case of a hazardous materials spill are substantial. The risks are exacerbated due to the logistical difficulties associated with a large, sparsely populated and not-easily-accessible geographic area, and have the potential to significantly delay defensive response to a hazardous materials incident. While the study found a relatively low flow of traffic carrying hazardous materials into Okanogan County, significant risks to the livelihood of the county would be imposed if a materials-releasing incident were to occur; given the proximity of so many natural resources, especially the natural features that are the backbone of the county's economic well-being.

Second, the observations and interviews with truck drivers, Okanogan County personnel, and border patrol agents revealed that there is a second possible threat category represented in the materials which are leaving and entering Okanogan County without placards. It is difficult to determine exactly what material might be traveling the roads of Okanogan County that may or may not pose a threat to the ecology of the county, and that is not placarded. General transport by common carrier of material which (alone or when mixed) might constitute hazards if released, despite being below the placarding threshold due to quantity or packaging, may well pose another significant risk.

Finally, the observation and recording of placarded vehicles, in combination with interviews of truck drivers stopped at the weigh stations, and examination of the bills of

lading provided by the driver, combined with the archival data obtained by researchers, provided an excellent understanding of the flow of hazardous materials inside and in proximity to the county. The study also provided a timeframe (8:00 a.m. to 5:00 p.m.) when the greatest traffic congestion and transportation of hazardous materials occurs. This information will assist community planners and other emergency response personnel devise both defensive and offensive plans that may help the citizens of Okanogan County and its neighboring counties effectively prepare for and deal with such eventualities. Full reporting of the materials and amount observed is contained in Appendix A.

In short, Okanogan County emergency responders should anticipate and prepare for spills or other hazardous materials releases which:

A) May involve rivers,

B) Likely will involve highways

C) Likely will involve gases or flammable liquids,

D) May well occur some distance from response centers,

E) Will disrupt travel and commerce, and

F) Will have significant environmental impact.

APPENDIX A

Frequency Tables

Date of Observation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	05/09/05	211	27.4	27.4	27.4
	05/10/05	235	30.5	30.5	57.9
	05/11/05	176	22.9	22.9	80.8
	05/12/05	148	19.2	19.2	100.0
	Total	770	100.0	100.0	

Location of Observation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	155 @ Omak	23	3.0	3.0	3.0
	155 @ Omak 97 N	16	2.1	2.1	5.1
	155 @ Omak 97 S	6	.8	.8	5.8
	20 @ Tonasket	9	1.2	1.2	7.0
	20 @ Tonasket 97 N	78	10.1	10.1	17.1
	20 @ Tonasket 97 S	100	13.0	13.0	30.1
	20 @ Tonasket off 20	25	3.2	3.2	33.4
	20 @ Tonasket on 20	36	4.7	4.7	38.1
	97 @ Pateros 97 N	20	2.6	2.6	40.6
	97 @ Pateros 97 S	23	3.0	3.0	43.6
	97 @ Pateros off 153	2	.3	.3	43.9
	97 @ Pateros on 153	5	.6	.6	44.5
	Border North	64	8.3	8.3	52.9
	Border South	119	15.5	15.5	68.3
	Omak Truck Stop	3	.4	.4	68.7
	Weigh Station @ 17	241	31.3	31.3	100.0
	Total	770	100.0	100.0	

Type of Truck

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Box Truck	85	11.0	11.0	11.0
	Tanker	68	8.8	8.8	19.9
	Freight Truck	340	44.2	44.2	64.0
	Flat Bed	254	33.0	33.0	97.0
	Dump Truck	23	3.0	3.0	100.0
	Total	770	100.0	100.0	

Was Vehicle Placarded?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Placarded	37	4.8	4.8	4.8
	Non-Placarded	596	77.4	77.4	82.2
	Placard Turned Down	137	17.8	17.8	100.0
	Total	770	100.0	100.0	

What Class was the Placard?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Gases	4	.5	10.8	10.8
	Flammable & Combustible Liquids	33	4.3	89.2	100.0
	Total	37	4.8	100.0	
Missing*	999*	733	95.2		
Total		770	100.0		

Placard ID#

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1075	3	.4	8.1	8.1
	1203	26	3.4	70.3	78.4
	1866	5	.6	13.5	91.9
	1977	2	.3	5.4	97.3
	1993	1	.1	2.7	100.0
	Total	37	4.8	100.0	
Missing*	999*	733	95.2		
Total		770	100.0		

* 999 is DGSS coding for “Missing Information”, meaning that for a particular observation the information sought for a variable was unavailable or non-applicable. For instance, the 733 vehicles that were observed as Non-Placarded or Placard Turned Down had the variables Class of Placard and Placard ID # coded as 999.

Material Name

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	999*	749	97.3	97.3	97.3
	Apples	1	.1	.1	97.4
	Bear Foot Monster Truck	1	.1	.1	97.5
	Empty	1	.1	.1	97.7
	Frozen Cattle Semen (Nitrogen Refrigerated Liquid)	1	.1	.1	97.8
	Gasoline	4	.5	.5	98.3
	Gasoline and Diesel	1	.1	.1	98.4
	Insulation Rolls	1	.1	.1	98.6
	Isopropenol	1	.1	.1	98.7
	Light Pole	1	.1	.1	98.8
	Lumber	1	.1	.1	99.0
	Particle Board	1	.1	.1	99.1
	Polyester Resin	1	.1	.1	99.2
	Polyester Resin Solution	1	.1	.1	99.4
	Refrigerated Liquid Nitrogen	1	.1	.1	99.5
	Regular Unleaded	1	.1	.1	99.6
	Silica Buckets	1	.1	.1	99.7
	Tesoro Low Sulfur Diesel	1	.1	.1	99.9
	Various (including a casket)	1	.1	.1	100.0
	Total	770	100.0	100.0	

* 999 is DGSS coding for “Missing Information”, meaning that for a particular observation the information sought for a variable was unavailable or non-applicable.

Point of origin

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	999*	748	97.1	97.1	97.1
	Brewster, WA	2	.3	.3	97.4
	California	1	.1	.1	97.5
	Chelan, WA	1	.1	.1	97.7
	Ellensburg, WA	1	.1	.1	97.8
	Ephrata, WA	1	.1	.1	97.9
	Fidalgo, WA	1	.1	.1	98.1
	Grand Junction, CO	1	.1	.1	98.2
	Kelona, B.C.	1	.1	.1	98.3
	Kent, WA	1	.1	.1	98.4
	La Grande, OR	1	.1	.1	98.6
	Lavington, B.C.	1	.1	.1	98.7
	Okanogan, WA	2	.3	.3	99.0
	Omak, WA	1	.1	.1	99.1
	Oroville, WA	1	.1	.1	99.2
	Phoenix, AZ	1	.1	.1	99.4
	Puyallup, WA	1	.1	.1	99.5
	Smelterville, ID thru Spokane	1	.1	.1	99.6
	Tonasket, WA	1	.1	.1	99.7
	Wenatchee, WA	2	.3	.3	100.0
	Total	770	100.0	100.0	

* 999 is DGSS coding for “Missing Information”, meaning that for a particular observation the information sought for a variable was unavailable or non-applicable.

Point of destination

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	999*	748	97.1	97.1	97.1
	Boardman, OR	1	.1	.1	97.3
	Bridgeport	1	.1	.1	97.4
	Chico, CA	1	.1	.1	97.5
	Kelona, B.C.	1	.1	.1	97.7
	Los Angeles, CA	1	.1	.1	97.8
	McCallen, TX	1	.1	.1	97.9
	Okanogan, WA	1	.1	.1	98.1
	Omak	1	.1	.1	98.2
	Omak, WA	2	.3	.3	98.4
	Pentiction, B.C.	3	.4	.4	98.8
	Republic	1	.1	.1	99.0
	Seattle thru Omak (drop)	1	.1	.1	99.1
	Spokane, WA	1	.1	.1	99.2
	Springfield, OR	1	.1	.1	99.4
	Tonasket, WA	2	.3	.3	99.6
	Various	3	.4	.4	100.0
	Total	770	100.0	100.0	

Is this a regular delivery?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	1.9	75.0	75.0
	No	5	.6	25.0	100.0
	Total	20	2.6	100.0	
Missing*	999*	750	97.4		
Total		770	100.0		

How often is this delivery made?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Daily	8	1.0	40.0	40.0
	Weekly	4	.5	20.0	60.0
	Monthly	2	.3	10.0	70.0
	Annually	1	.1	5.0	75.0
	Not regularly	5	.6	25.0	100.0
	Total	20	2.6	100.0	
Missing*	999*	750	97.4		
Total		770	100.0		

* 999 is DGSS coding for “Missing Information”, meaning that for a particular observation the information sought for a variable was unavailable or non-applicable.

Percent of placarded deliveries?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	.6	26.3	26.3
	1	1	.1	5.3	31.6
	5	2	.3	10.5	42.1
	100	11	1.4	57.9	100.0
	Total	19	2.5	100.0	
Missing*	999*	751	97.5		
Total		770	100.0		

* 999 is DGSS coding for “Missing Information”, meaning that for a particular observation the information sought for a variable was unavailable or non-applicable.

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