2008 Rail Hazardous Commodity Flow Report and Comparative Analysis for Clark County, Nevada

Prepared for:

NUCLEAR WASTE DIVISION
COMPREHENSIVE PLANNING
CLARK COUNTY, NV

by

Urban Transit, LLC.
1120 N. Town Center Dr. Ste 100.
Las Vegas, NV 89144

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EXECUTIVE SUMMARY

This study is an update of the 2005 report on Clark County Hazardous Commodity Flows by rail and compares 2008 data to the year of previous data. The industrial sector of Clark County's economy is relatively small with few large scale manufacturing corporations currently planning to move to the County. In addition, Southern Nevada does not currently export large amounts of raw materials. However, Clark County is adjacent to the greater Los Angeles ports and industrial concentrations. Connected by rail and highway infrastructure to southern California, Clark County experiences considerable volumes of through-transit flows bound from and destined to the Los Angeles area.

This investigation of hazardous commodity flows by rail in, and through Clark County, Nevada estimates rail cargo movements by commodity class tons and number of carload units for the year 2008, and compares them to 2005 estimates. A commercial data source was utilized to derive these estimates. The TRANSEARCH database includes government and other data to estimate sector components of the national economy. An Input-Output model estimates exchanges between producers and consumers, and models the flow of commodities in the transportation of these goods. The hazardous commodities involved in these exchanges are identified by Standard Transportation Commodity Classification codes (STCC).

Detailed information pertaining to rail accidents and hazardous commodity spills was also collected and presented for 2008 and compared to 2005 figures (FRA, 2010). Rail operations in Nevada during 2008 involved 53 incidents with 4 fatalities. Thirteen of these incidents involved hazardous commodities, although no release or fatalities were reported specific to these hazardous material incidents. Trend data for rail accidents/incidents were gathered for future estimates of rail accident probability. Because data is suppressed for most rail performance information below national totals, rail utilization must be estimated from the commercial TRANSEARCH model in characterization efforts. Quantification of accident probability in a risk analysis requires an estimate of rail utilization.

The hazardous commodity flows by rail in and through Clark County during 2008, can be summarized in two broad characterizations. First, most hazardous commodity flows by rail in the County originated or terminated somewhere else. Second, a relative few classes or types of bulk-cargo hazardous and corrosive gases and liquids dominate Clark County rail flows. Movement of these cargoes by rail is conducted in an error-free environment.

The top four commodity classes remained consistent from 2005 to 2008 in terms of tonnage flow estimates. These are Class 3 Liquids (which includes diesel fuel, petroleum crude oil and kerosene), Class 8- Corrosives (which include hydrochloric acid and alkali liquids among other commodities), Class 2 Gases (which includes liquefied petroleum, propane and butane) and Class 9 Miscellaneous commodities. Overall, the tonnage flows of hazardous commodities in, out and through Clark County decreased by 4.5% from 2005 to 2008.

Rail commodity flows of all types will be impacted by future flows of nuclear waste to Yucca Mountain that are shipped by rail. This investigation provides baseline estimates for future efforts to assess the risk of adding those hazardous commodities to current conditions.

1.0 INTRODUCTION

This hazardous commodity flow survey examines shipments of hazardous materials by rail in Clark County, Nevada. Specifically, this report examines movements of hazardous materials to, from, and through Clark County by rail in 2008, which is the latest period for which a complete data set is available. This report also compares flow of each hazardous material by Standard Transportation Commodity Code 4 category to the 2005 Clark County Rail Hazardous Commodity Flow report. The purpose of this report is to characterize commodity flows in 2008 and compare them against the baseline conditions of flows established in 2005. The following sections examine what hazardous commodities move on Clark County railroads, the volume of these flows , the level of use these railroads experience, and the accident rates are on these rail routes. The changes to baseline conditions revealed by this examination of hazardous waste shipments by rail will establish parameters for a future detailed risk assessment.

The report is divided into three major sections. First, there is a brief discussion of the main objective of this report. A discussion of the shipment regulations involved in transporting, reporting, and general compliance is included in this section, as are examples of state and national reporting efforts. The next section presents the methodology and data for the estimation and evaluation of 1) rail infrastructure usage; 2) rail accidents/incidents; and 3) hazardous commodity shipments by rail originating in, passing through, and destined for Clark County, Nevada. Finally, results are presented at the national, state, and county levels allowing a comparative analysis and provide the local and state context to these flows.

The Las Vegas Valley, the economic engine of Clark County and Southern Nevada, is one of the fastest growing metropolitan areas in the United States. The metropolitan area that includes Clark County sits astride an Interstate Highway and a major transcontinental rail route. Hazardous materials are transported by highway, rail, air, and pipeline every day, and there are accidents and incidents involved in the transportation and delivery of federally regulated hazardous materials. This report investigates the regulated flow of these materials in Clark County by rail, and presents results from an analysis of the distribution of these flows. Future estimation of the risk from hazardous commodity flows by rail will use this baseline investigation to evaluate the elevated risk from adding shipments of spent nuclear fuel and other nuclear wastes to the proposed Yucca Mountain Nuclear Waste Repository when, and if, it is constructed.

2.0 BACKGROUND

The purpose of a hazardous commodity flow study is to identify and document the types and volumes of hazardous material moving within, to, through, and from a specific geographic location. Identifying movements of hazardous material is of interest to government agencies responsible for transportation planning, public safety, and emergency response, among others. A hazardous materials (HAZMAT) study is often a component of an integrated risk assessment. The Clark County Department of Comprehensive Planning's Nuclear Waste Division commissioned this report in part not only to comply with Department of Homeland Security directives, but also to support strategic planning goals, and more importantly, to provide a baseline for the study of potential impacts should the shipment of high-level nuclear waste occur through this area. After data for shipments of hazardous substances by all modes of transportation are assembled, assessment of risk can be addressed in future studies.

The Hazardous Materials Transportation Act of 1975 (HMTA) is the major transportation-related statute affecting transportation of hazardous cargoes. Federal regulations for the transportation of hazardous materials are defined in U.S. Code Title 49, Chapter 51, 5101 et seq. Transportation of Hazardous

Material, which is the primary statute regulating these flows in the United States. By regulating these flows, the U.S. Department of Transportation (USDOT) protects life and property from accidents in handling and shipping these materials. Included in this legislation are provisions for federal grants involving emergency preparedness training for response to shipping accidents.

Federal regulations contained in Title 49, Code of Federal Regulations (CFR) Parts 100-180 also outline federal requirements for transporting hazardous materials and include five distinct elements: 1) hazardous materials identification and classification, 2) hazard communication, 3) packaging requirements, 4) operational rules, and 5) training. Each of these components has different requirements for the various sectors of the economy and for different portions of the workforce. In recent developments for operational rules, in response to two industry petitions for rulemaking, a risk-based adjustment of transportation security plan requirements was proposed by the Pipeline and Hazardous Materials Safety Administration (PHMSA) to the Office of Management and Budget (OMB). The new security plan regulations are intended to create a distinction between hazardous materials that present a significant security risk while in transportation and the vast majority of hazardous materials that pose no significant security risk in transportation. Based on an evaluation of the security threats associated with specific types and quantities of hazardous materials, the final rule narrows the list of materials subject to security plan requirements and reduces associated regulatory costs and paperwork burden. The final rule also clarifies certain requirements related to security planning, training, and documentation and will be effective October 1, 2010. Appendix E highlights current threshold quantities and new thresholds by Class as amended by this rule (PHMSA, 2010).

2.1 Commodity Flow Studies

The U.S. Census Bureau conducts national-scale commodity flow surveys (CFSs) for use by government agencies, industry analysts, and private individuals to assess changes in the economy (Bureau of Transportation Statistics [BTS], 2004). These surveys have been conducted at five-year intervals since 1967. These economic census reports utilize samples of establishment data of shipments of commodities. Mining, manufacturing, wholesale trade, and selected retail industry establishments meeting certain criteria report what they are shipping to the federal government within standard guidelines and in standard formats. The reporting entities are commercial establishments within specific sectors of the economy, and exclude private movements of freight and movements by entities not required to report shipments to the Census Bureau. Starting in 1993, the national reports have been augmented by state reports detailing individual state commodity shipments and trends.

Under the Clinton administration, USDOT recognized the need for better quality data to monitor economic activity in the changing global economy (BTS, 1993). Among the deficiencies in data collection identified were the detailed geography of flows of passengers and commodities. Very little information was previously gathered below the level of inter-modal connections. Among the deficiencies regarding flows were details by trucks-for-hire and characteristics of shipments and commodities, particularly related to changes in flows brought about by the North American Free Trade Agreement (NAFTA).

Data tables were added to the 1997 Commodity Flow Survey reporting flows between certain selected states (U.S. Census Bureau, 1999). The states selected for examination included those with a large manufacturing base predicating large commodity exchanges. Nevada was not one of those selected states. Since 1997, these economic census reports have included a supplemental report on the movement of hazardous materials. Again in 2002, national hazardous material flows were available but no detailed information was provided for Nevada (U.S. Census, 2004).

During the same time period, the Nevada Department of Transportation (NDOT) conducted a Goods Movement Study (NDOT, 2000) to estimate state-level commodity flows. This NDOT effort involved the use of estimates from the TRANSEARCH statistical model based on national transportation, commerce, and other economic data. The TRANSEARCH database models all modes of commodity transportation in the United States at state, BEA Area (metropolitan areas and interdependent counties as defined by the BEA, 2004), and county scales. Numerous railroads, trucking carriers, state and federal agencies, and private industry employ this same database for estimating commodity flows at various scales. At the time of the TRANSEARCH model development, it did not include details regarding flows of hazardous commodities. Following the shift in federal focus and its reporting requirements, additional information was included in the TRANSEARCH database related to HAZMAT cargoes.

Subsequent to the 2001 attacks on the World Trade Center, parts of the federal government were reorganized under the Department of Homeland Security. Changes occurred in the attention of the federal government to vulnerability as well as the acquisition and dissemination of information by government. Protection of vital assets and mass population areas altered the emphasis in much of the interaction between the federal agencies and state and local governments. Maintaining federal revenue-sharing eligibility in many programs now requires identifying critical assets and vulnerabilities. Continued economic vitality is directly related to the timely and efficient exchange of goods and services in the market economy composed of these assets.

Two excellent examples of recent studies illustrate the efforts and methods used in investigations of hazardous commodity flows. The U.S. Environmental Protection Agency (EPA) is responsible for chemical emergency planning and prevention efforts at the U.S.-Mexico border. In 2001, EPA examined the characteristics and volumes of hazardous commodity flows at the border near San Diego, identifying the data required to analyze the flows of hazardous commodities (EPA, 2001). The study specifically addressed the different purposes between a commodity flow study and HAZMAT study. Rather than focusing on the planning aspects to enhance business economics, this study directs attention to the evaluation of emergency preparedness and minimizing exposure to life-threatening releases of dangerous substances.

Additionally, Sedgwick County, Kansas conducted a hazardous commodity flow study to specifically evaluate the risk to local populations from the flow of hazardous commodities by all modes (Sedgwick County, 2003). This study not only detailed the characteristics of the commodity flows, but also characterized the population and infrastructure to determine points of vulnerability. Commodity characteristics, transportation infrastructure, traffic densities, natural hazards, and accidents were the primary data elements gathered and evaluated. Particular facilities within a half-mile radius of transportation facilities such as schools, hospitals and health care facilities, amusement and convention facilities, and prisons were identified as facing elevated risk, though that level of risk was not quantified. Based on the evaluation, specific planning recommendations identified discrete locations requiring routing, zoning, and infrastructure modifications to minimize the elevated risk.

Less has been documented regarding the movements of hazardous commodities than the exchange of general commodities. However, the modeling of general commodity flows coupled with reporting requirements for transportation has prompted the addition of hazardous commodities and cargoes to the investigation of the transport of goods. While some measure of regulatory compliance is involved with most hazardous commodity movement studies, significant benefits are realized at many levels of government and society from assembling and sharing the knowledge gained. With the goal of assembling and characterizing flows of hazardous commodities by rail through Clark County as the objective of this report, the following methodology outlines the sources of data in the report and describes how they are prepared and interpreted.

3.0 METHODOLOGY

Guidance on the methodology for conducting hazardous commodity flow surveys comes from the USDOT Research and Special Programs Administration (USDOT, 1995). While much of this guidance document pertains to the estimation and acquisition of cargo characteristics, it also includes recommendations for additional information to collect for estimation of infrastructure use and accident rates.

Specifically, rail flow estimates and rail accident data are the components of interest in addition to the hazardous commodity flows by rail. For this HAZMAT study of Clark County, the TRANSEARCH modeling data, as used by federal agencies, NDOT, numerous railroads, and other commercial firms, are used for baseline estimates of hazardous commodity flows. The commodity flows specify what hazardous materials are shipped to, from, and through the County, and include the volume of flows for each hazardous substance. Detailed accident/incident reports compiled by the Federal Railroad Administration are used for the presentation of rail-related accident and injury data at the national, state, and county level. National rail utilization rates are drawn from BTS reports. Some minimal details of state rail activity are added from the Association of American Railroads (AAR). Because no publicly available estimates currently exist for rail utilization at state or county levels, we present a utilization estimation method drawn from what information is publicly available to use in future efforts.

3.1 Rail Utilization

The BTS compiles annual reports on the national transportation system that contain measures of physical characteristics, safety records, economic performance, and some environmental information (BTS, 2008). Rail system information presented in the National Transportation Statistics report includes track miles, intensity of use, rail accidents, and hazardous materials incidents that are included in this report. The BTS modal profiles contain various estimates at ten-year intervals from 1960 to the present. Trends in system performance and accidents from the rail modal profile are presented as the national context for trends in the current delivery of commodities by rail in the United States.

The AAR compiles annual estimates for U.S. rail performance and includes data for rail-system track mileage and usage intensity (AAR, 2008). The AAR also produces state level reports (AAR, 2007), but the state reports are limited due to data suppression. The state reports do not include any estimate for rail utilization in Nevada or in Clark County. The state reports do provide the number of railroads and miles of track operated, as well as a traffic estimate for tons and carloads, and the top commodities shipped from and received by the state.

Federal law suppresses publication of data that would divulge sensitive financial characteristics of individual companies. Following passage of the Staggers Rail Act deregulating the rail industry in the 1980s, consolidation and mergers between rail companies accelerated (Congressional Budget Office [CBO], 2006). With only a handful of Class 1 railroads remaining in service, virtually all sub-national rail data are suppressed in federal reports. Due to data suppression of rail performance, this report does not include utilization estimates at the state or local level. However, there are alternatives for estimating rail flows. Following this characterization of the transportation of hazardous commodities by rail, we will explore alternative public data sources in subsequent efforts in the estimation of risk. Even a relative measure of utilization that approximates local conditions and constraints would be superior to using national averages to quantify local risk.

3.2 Rail Accident and Injury Reports

The federal agency responsible for railroad safety is USDOT's Federal Railroad Administration (FRA), which collects data on two types of accidents and injuries: accidents and injuries to rail employees, and accidents related to rail equipment and injuries caused by rail equipment failures. Under Title 49, CFR Part 225, FRA prepares monthly reports on railroad mishaps in a standard format. The entire list of reportable events is referred to under the heading of accident/injuries.

Railroad accident/injury reports are divided into three main components. Train accidents and injuries are reported on form FRA F 6180.54, and involve on-track rail equipment. If monetary damage to the rail equipment (stationary or moving) and track is above a prescribed amount ($6,600 as of 1998), the safety infraction must be reported. Highway-rail grade crossing incidents are tabulated for events involving rail and highway user collisions. These events are recorded on form FRA F 6180.57, and involve rail equipment and any user of designated crossing sites such as motor vehicles and pedestrians. Other incidents include accident or injuries not involving "train accidents" or "highway-rail grade crossing incidents," and are reported on form FRA F 6180.55a. Illness and occupational diseases of rail workers are included in this category.

Rail-related mishaps that occurred in 2008 are reported at the national, state, and county level (FRA, 2010). The total number of accidents/incidents is the combined sum of total train accidents, highway-rail incidents, and other incidents categories. The total includes counts for the total of: 1) all rail accidents/incidents; 2) fatal rail accidents/incidents; 3) fatalities resulting from all rail accidents/incidents; and 4) nonfatal conditions resulting from all rail accidents/incidents.

The train accidents include counts for: 1) total train accidents; 2) fatal train accidents; 3) total fatalities; 4) nonfatal conditions; 5) collisions; 6) derailments; 7) other incidents; and 8) accidents resulting in HAZMAT releases.

The highway-rail grade crossing incidents include: 1) the total number of highway-rail incidents; 2) the fatalities resulting from highway-rail incidents; 3) the number of nonfatal conditions; and 4) the number of fatal highway-rail incidents.

Finally, the other incidents reports: 1) the total number of other incidents; 2) the number of other incident fatalities; 3) other incident non-fatal conditions; and 4) the number of fatal other incidents.

3.2.1 HAZMAT Rail Incidents

USDOT's Office of Hazardous Materials Safety (OHMS), within the Pipeline and Hazardous Materials Safety Administration (PHMSA), is responsible for the safe movement of hazardous commodities. OHMS collects data on safety events involving the transportation of hazardous commodities. The PHMSA was established under the Norman Y. Mineta Research and Special Programs Improvement Act (P.L. 108-426) of 2004, specifically to monitor and administer the transportation of hazardous commodities. Accident information related to hazardous material shipments by rail are compiled in the Hazardous Materials Information System (HMIS). HMIS is the USDOT system for data collection involving the

transportation of HAZMAT. Rail accidents and incidents involving HAZMAT are reported on Form 5800.1. These reports include descriptive information specific to the mishap, information pertaining to packaging and the container involved in the mishap, and damages and injuries resulting from hazardous cargo releases. As in the previous report detailing hazardous commodity movements by truck, this rail report presents details and results for the entire nation as well as for the state and county.
This portion of the investigation examines records on rail incidents found in the HMIS. Certain criteria must be met for a HAZMAT mishap to be entered into the HMIS, including circumstances where:

- A person dies,
- An injured person requires hospitalization,
- Property damage related to the incident exceeds $50,000,
- A public safety evacuation lasts more than an hour,
- Major transportation arteries or facilities last more than an hour, or
- Aircraft routine or operations are interrupted.

When any of these criteria are met, or there is a HAZMAT release, USDOT form 5800.1 must be submitted within 30 days detailing the circumstances.

Information included in each record entered in the database includes the name of the chemical involved, the type of container and container capacity, the number of containers in the movement, how many of the containers failed, and the quantity of the HAZMAT released. If more than one chemical is involved, a separate record is entered for each hazardous commodity involved. Additionally, if there is a fire or explosion, immersion in water, environmental consequences, and injury or death, these details also are recorded for the record. Injury or death should be as a consequence of the HAZMAT released, not from the accident itself.

Since 1990, additional information has been gathered regarding what phase of transportation was underway when an incident occurred. Three distinct phases are defined including: 1) en route from origin to destination; 2) loading or unloading; and 3) temporary storage. Because of the low number of rail accidents in Clark County, and the fewer number of those accidents involving hazardous cargos, HAZMAT rail accident data are presented for 2005 and the previous ten years. This ten-year trend provides a measure for estimating the probability of a similar rail safety event to occur in the future, while data from a single, non-event year would not.

3.3 Hazardous Commodity Flows by Rail

Detailed data on existing HAZMAT flows are not aggregated in a manner amenable to analysis at the local level desired for this study. While USDOT does maintain records for individual shipments of commercially transported commodities, these records are deemed proprietary for the information they could reveal about individual firms (U.S. Census Bureau, 1994). While not available to the public, these data have been used for federally mandated reporting on commodity flows and other economic census reports. National and state-level data are prepared, evaluated, and presented in numerous government reports. Sample data on individual shipments are used with other public and private information to model data sets of flow estimates. Such integrated data modeling of origin/destination transportation flows are particularly useful for analysis of commodity flows between counties.

Renewed interest in commodity flows in the early 1990s stimulated development of new federal transportation reports and the gathering of new information to produce these reports (BTS, 1993). The Center for Transportation Analysis (CTA) at Oak Ridge National Laboratory (ONL) constructed an integrated transportation model to matched linked pairs of origin/destination zip codes to calculate distance for the 1993 U.S. Commodity Flow Survey (U.S. Census Bureau, 1993). The Census gathered cargo shipment data from approximately 100,000 establishments of over 800,000 national establishments and used the ONL network model to reliably estimate flows and characterize the delivery of these commodities.

Additional information is included in each Commodity Flow Survey cycle and resulting report, and collection methods are constantly evaluated and refined. The linear network dataset developed by ONL is combined with USDOT and Census data for increasing geographic detail of commodity flows and for reliability in the estimates. All of these data sources are incorporated in the TRANSEARCH model used by NDOT for its State Goods Movement Study. These data are updated annually and have been refined since NDOT began including movements of hazardous commodity cargoes.

We use the TRANSEARCH flow estimates (Global Insight, 2008) to investigate and present information related to the transportation of HAZMAT on the Union Pacific Rail lines from, to, within, and through Clark County, Nevada. Title 49 CFR Part 171 defines HAZMAT in nine classes of substances as shown in Table 1 (with detailed descriptions and definitions for classes and divisions in Appendix D, and a selected list of hazardous commodities in Appendix A).

Table 1: Classes of Hazardous Materials

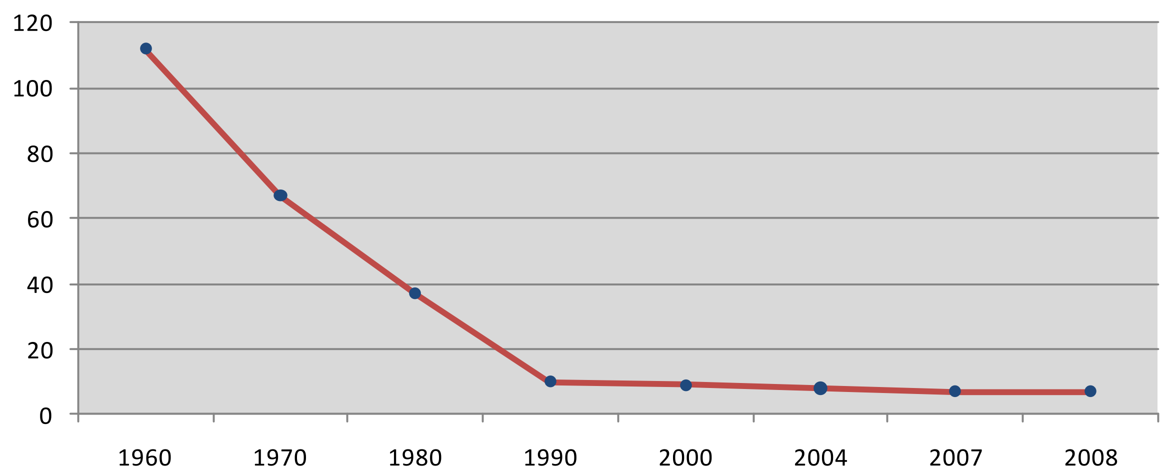
Class	Hazardous Material
1	**Explosives** • Potential for mass detonation likely • Potential for mass detonation unlikely
2	**Gases** • Flammable • Non-Flammable • Poisonous
3	**Liquids** (flammable and combustible)
4	**Flammable solids** • Spontaneously combustible materials • Dangerous when wet materials
5	**Oxidizers and organic peroxides**
6	**Toxic materials and infectious substances**
7	**Radioactive materials**
8	**Corrosive materials**
9	**Miscellaneous dangerous goods**

The data are not information about individual trucks or rail shipments, but a mathematical model estimating flows between senders and receivers in commodity chains. Given a certain amount of data about industrial location and the shipments of raw materials and finished products, accurate predictions of where those commodities will flow is achieved. Care must be taken to remember these numbers represent estimates of network flows on rail and highway segments between origin and destination. Characterizing these flow estimates and tabulating them for further evaluation is our objective.

4.0 RAIL UTILIZATION AND PERFORMANCE

The federal government reports on economic performance are subject to non-disclosure constraints. Data are suppressed when certain companies dominate their region or industry. If the reporting of financial or employment information would reveal details of a particular company's operations, these data are not reported. Such data suppression generally occurs in reports on county characteristics. However, in an industry such as the rail sector, data are also suppressed at the state level.
Railroads traditionally have played a unique role in the development of the American economy, and in the movement of finished goods and commodities. Figure 1 illustrates the concentration in operational control that has occurred in American railroad companies over the past five decades. Over the past 48 years, over 100 Class 1 railroads have dwindled to seven (in 2007 and 2008).

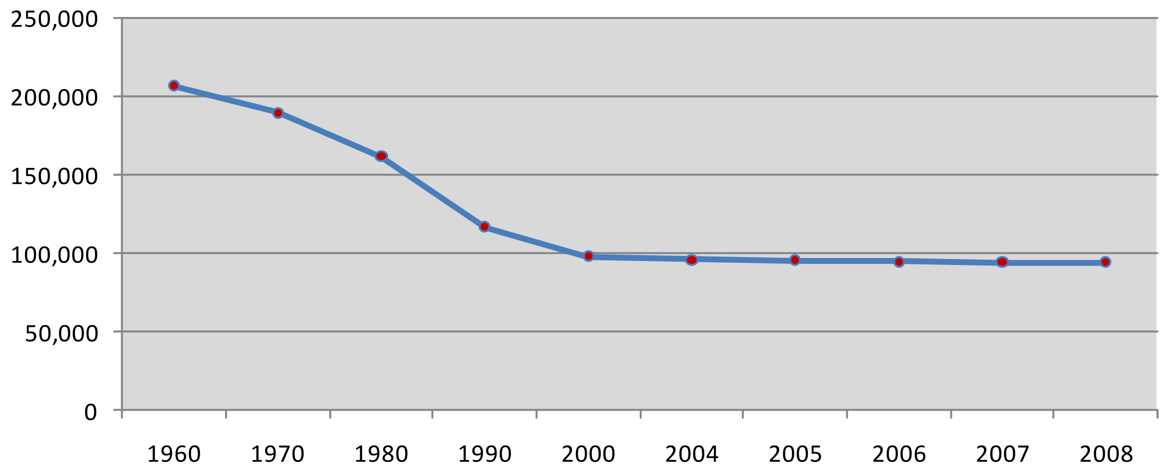
Figure 1: Number of U.S. Class 1 Railroads: 1960-2008



During this modern period of consolidation in the ownership of railroad companies, many segments of under-utilized track segments were shed from the rail system. Prior to passage of the Staggers Act in 1980 that deregulated the U.S. rail industry, railroads were required to provide service at rates controlled by the Interstate Commerce Commission (ICC), and on mandated route segments (CBO, 2006).

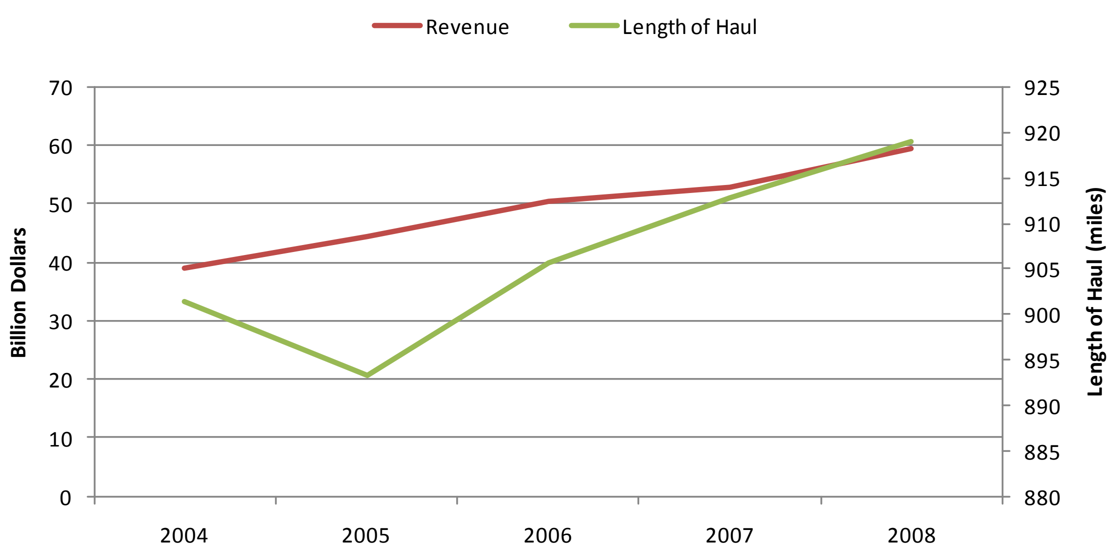
As the number of operational railroads contracted following deregulation of the rail industry, the number of miles on which these railroads operated also shrunk (Figure 2). Profitability rather than regulation determined which routes and segments remained open in the rationalized, modern rail transportation system. The flattening of the curves in both the number of rail companies and the miles of track owned suggests stabilization in ownership and operation. The practical effect of consolidation is largely economies of scale for fewer companies to deliver bulk commodities at a discount to the cost of delivery by highway.

Figure 2: Total Miles of U.S. Class 1 Railroads: 1960-2008



With consolidation of ownership and operations, rail companies were able to use their equipment and facilities more efficiently. Fewer miles of track and longer hauls increased profitability but also resulted in more intensive traffic on the remaining track segments (Figure 3). Longer hauls do decrease the amount of handling than the average shipment requires between origin and destination.

Figure 3: U.S Class 1 Freight Revenue and Average Length of Haul, 2004-2008



4.1 Rail Utilization

Rail utilization data for the year 2005 to 2008 are shown for the nation as a whole and the state of Nevada in Tables 2 and 3, respectively. In 2008, U.S. Class 1 railroads operated over 94,000 miles of track (AAR, 2008). However, there may be more than one railroad operating on any given segment of track. For instance, the Union Pacific Railroad (UPRR) owns the entire operational mainline track in Nevada. The Burlington Northern Santa Fe Railroad leases trackage rights from UPRR to operate their equipment on 805 miles of UPRR track, but does not own any of the tracks. Additionally, miles of road operated are the same as route miles. Numerous track segments with high volumes have been double-tracked (and more in certain locations) to provide more capacity to eliminate bottlenecks. Multiple tracks operating in any given locations are still counted as a single distance in this computation.

Table 2: U.S. Rail Utilization, 2005-2008

U.S. Class 1 Railroads	2005	2006	2007	2008
Miles of Road Operated (less trackage Rights)	95,830	94,942	94,440	94,209
Locomotives in Service	22,779	23,732	24,143	24,003
Carloads Originated (millions)	31.14	32.11	31.46	30.62
Tons Originated (billions)	1.899	1.957	1.949	1.934
Ton-Miles (trillions)	1.696	1.772	1.771	1.777
Freight Revenue per Ton-Mile	$0.02621	$0.02840	$0.02990	$0.03343
Average Tons per Carload	61	60.9	61.7	63.1
Average Tons per Train	3,115	3,163	3,274	3,414
Average Length of Haul (miles)	893.2	905.6	912.8	919.1

Source: Association of American Railroads.

Table 3: Nevada Rail Utilization, 2005-2008

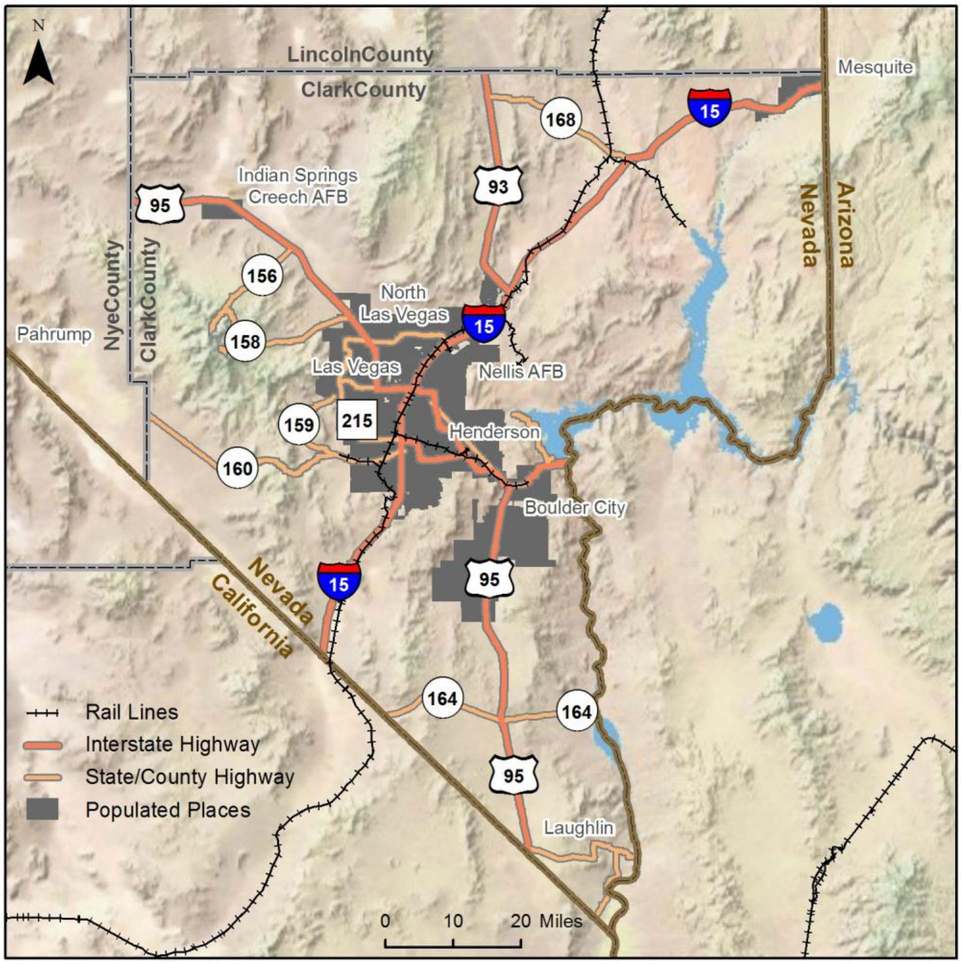
Nevada Rail Characteristics	2005	2006	2007	2008
Number of Freight Railroads	2	2	2	2
Miles Operated (minus trackage rights)	1,200	1,199	1,194	N/A
Total Carloads of Freight Carried	947,683	949,058	1,527,729	N/A
Total Tons of Freight Carried	44,554,735	45,874,497	53,616,618	N/A

Source: Association of American Railroads.

Federal data involving rail operations are suppressed at all levels other than national reports to avoid disclosing sensitive financial information about individual railroad companies. The limited data published regarding rail utilization at the state level is found in the annual reports published by AAR (AAR, 2008). The limited state-level reports do not provide any way to differentiate between commodities and volumes carried by the Burlington Northern Santa Fe line and that carried by the Union Pacific Railroad, for instance, or between the rail flows on the rail route through northern Nevada and those flows through southern Nevada and Clark County.

Global Insights (2008) provides estimates of commodity flows based on Input-Output modeling of national economic activity and commodity exchanges. This methodology links origins and destinations in chains of commodity flows by zip code regions, and distributes these flows over a network model including multiple transportation modes. Data from Global Insight are used in this report for an estimate of hazardous commodities transported by rail to, from, and through Clark County (Figure 4). This source of data will include all commodities moving by rail during the next phase of this investigation for an estimate of rail utilization in Clark County.

Figure 4: Clark County Rail System



5.0 RAIL ACCIDENTS AND INCIDENTS

The railroad accident reports collected by FRA are used primarily to assess trends in safety. The safe transportation of commodities and operation of the nation's rail lines is accomplished through regulation and rules enforcement. Through constant performance evaluation and development of new strategies for operational safety problems, U.S. rail operations are remarkably efficient with few accidents.

Information related to rail accidents and incidents (Table 4) is extracted from the FRA reports for train accidents, highway-rail grade crossing incidents, and other incidents. Rail accident/incidents that occurred in 2005, 2006, 2007 and 2008 are reported at the national, state, and county level. As indicated previously, rail incidents for these years are reported as a total, and by the categories of train accidents, highway-rail incidents, and other incidents not falling into the train accidents or highway-rail incidents categories.

Table 4: 2005-2008 Rail Accident/Incident Summary

January through December	United States		Nevada		Clark County	
	2005	2008	2005	2008	2005	2008
Total accidents/incidents	14,153	12,687	50	53	11	9
Fatal Accidents/Incidents	806	724	5	4	3	1
Total fatalities	886	803	5	4	3	1
Total non-fatal conditions	9,340	8,806	29	33	5	6
Total train accidents	3,245	2,461	14	13	3	1
Fatal train accidents	11	3	0	0	0	0
Total fatalities	33	27	0	0	0	0
Total non-fatal conditions	739	331	0	0	0	0
Collisions	269	190	0	0	0	0
Derailments	2,297	1,777	14	12	3	1
Other accidents	679	494	0	1	0	0
Resulting in HAZMAT release	37	22	0	0	0	0
Highway-rail incidents	3,053	2,407	4	6	0	2
Total fatalities	358	289	1	0	0	0
Total non-fatal conditions	1,015	950	4	3	0	1
Fatal crossing incidents	309	239	1	0	0	0
Other incidents	7,855	7,819	32	34	8	6
Other incident fatalities	495	487	4	4	3	1
Other incident non-fatal conditions	7,586	7,525	29	30	5	5
Fatal other incidents	486	482	4	4	3	1

Source: FRA, 2010

Rail operations in Nevada and Clark County were relatively error free during 2008. Very few rail accidents resulted in fatalities and most of those were reported as other incidents. There were thirteen derailments in the state, but only one of those occurred in Clark County, and none resulted in fatalities or hazardous substance releases.

Over the past decade, the number of rail-related accidents and incidents in the U.S. shows a steep decline (Table 5 and Figure 5.1, 5.2). During a period in which the rail operations have handled considerable increase in the volume of cargo hauled and in the distance that cargo is hauled, the number of accidents on the rail lines sharply declined. While a portion of this decline is attributable to changes in reporting requirements, the continuing overall decline trend in rail accidents/injuries is evident in the period following the latest reporting revision in 2002. The federal focus on safety and industry efforts in profitability each share in contributing to declining accident rates.

Table 5: U.S. Rail Total Accident Trend

Year	Total Accidents/ Incidents	Total Fatalities	Total Nonfatal Conditions
1997	16,698	1,063	11,767
1998	16,501	1,008	11,459
1999	16,776	932	11,700
2000	16,919	937	11,643
2001	16,086	971	10,985
2002	14,403	951	11,103
2003	14,370	865	9,264
2004	14,510	891	9,192
2005	14,255	884	9,511
2006	13,697	903	8,710
2007	13,697	845	9,461
2008	12,687	803	8,806

Source: FRA, 2010

Figure 5.1: Total U.S. Rail Fatalities: 1997-2008

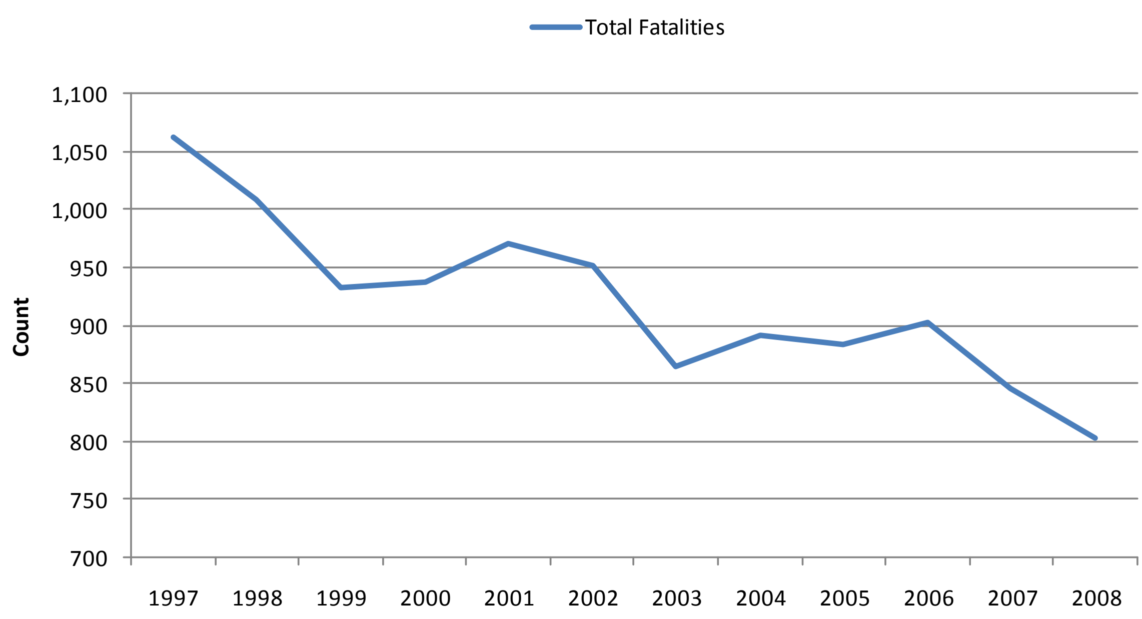
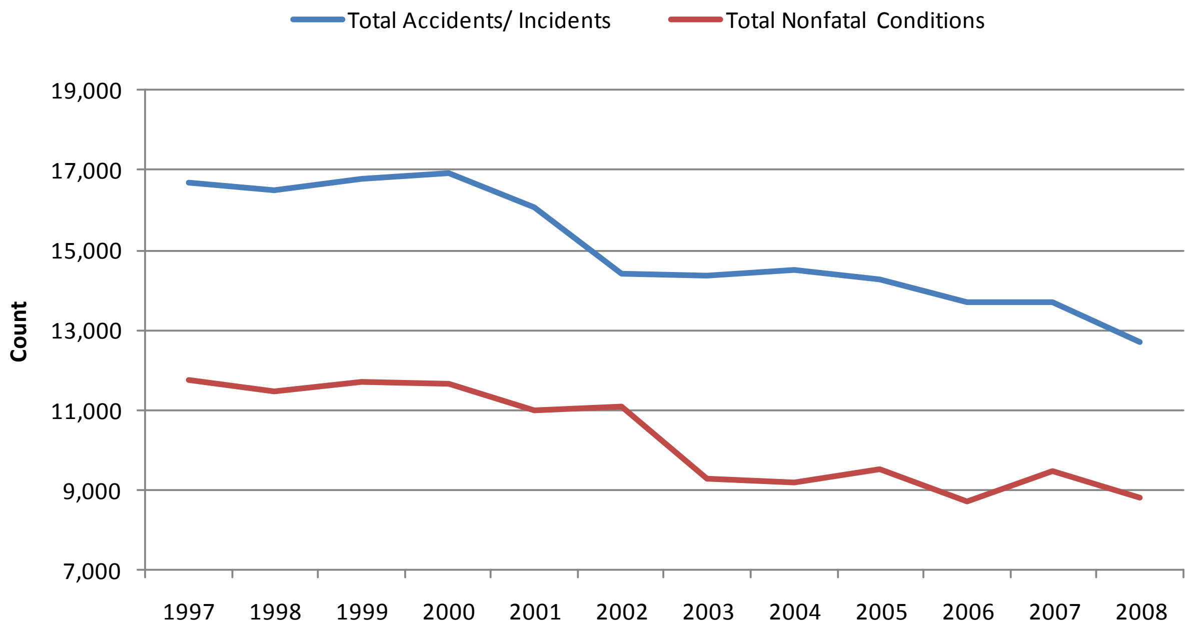


Figure 5.2: Total U.S Rail Accidents/ Incidents and Non-Fatal Conditions: 1997-2008



When examining the trend in train accidents, including those events occurring on track but without the equipment necessarily moving, the more intense use of facilities and equipment is clear in the rising number of operational accidents (Table 6 and Figure 6.1, 6.2). A short decline in the number of accidents occurred subsequent to reporting requirement revisions, but then rose again in 2003 and 2004. The past two years again show declines in on track accidents, though the trend over the decade shows a modest rise in the total number of events.

Table 6: U.S. Train Accident Trend

Year	Train Accidents	Train Accident Deaths	Train Accident Injuries
1997	2,397	17	183
1998	2,575	4	129
1999	2,768	9	130
2000	2,983	10	275
2001	3,023	6	310
2002	2,738	15	1,884
2003	3,019	4	232
2004	3,382	13	347
2005	3,262	33	789
2006	2,984	6	222
2007	2,666	8	297
2008	2,461	27	331

Source: FRA, 2010

Figure 6.1: Total U.S Train Accidents and Accident Injuries: 1997-2008

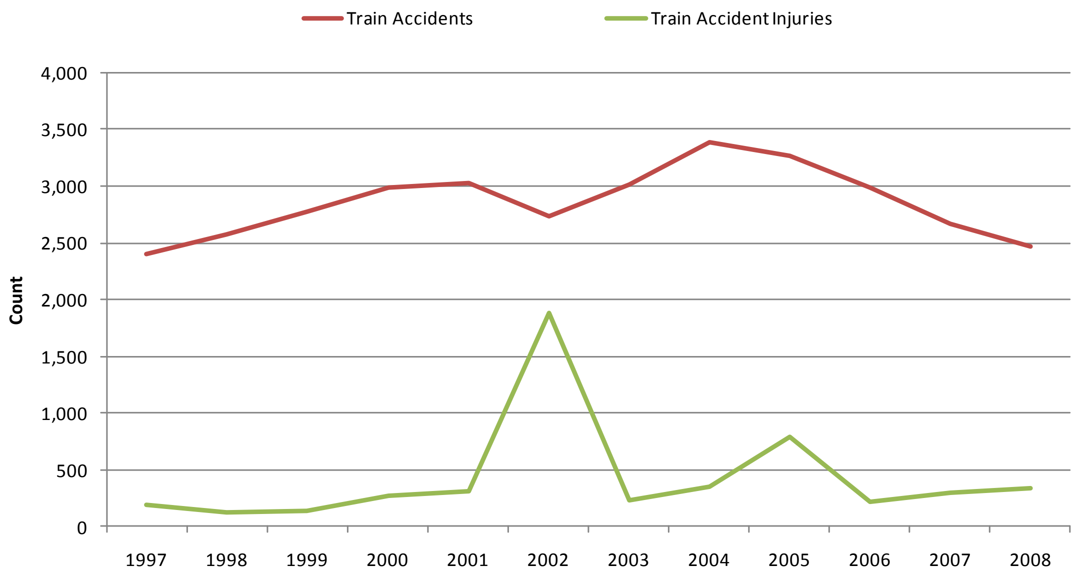
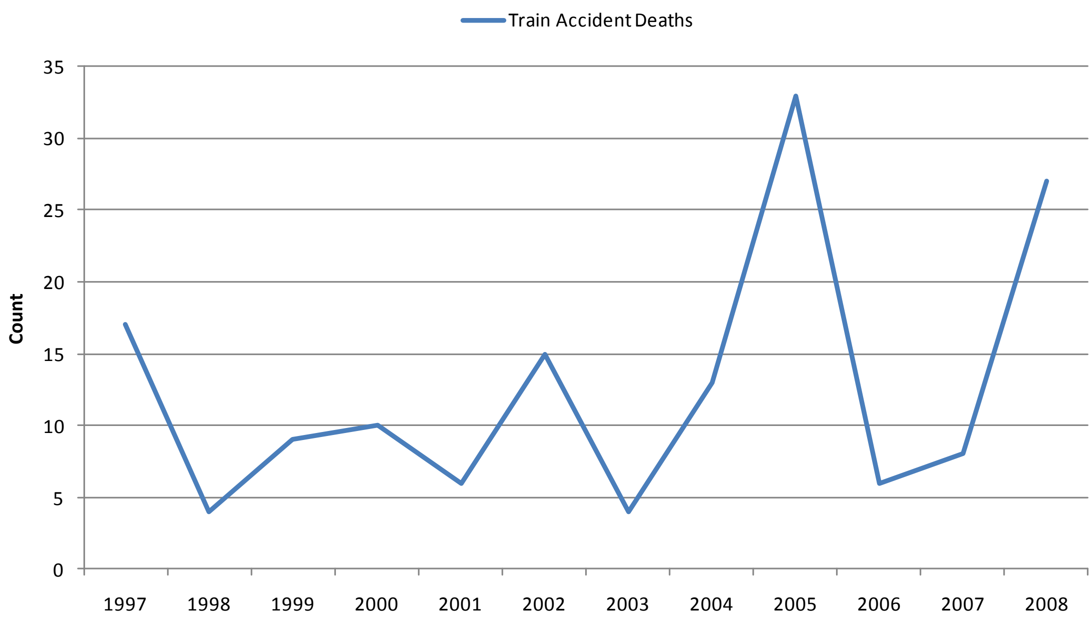


Figure 6.2: Total U.S Train Accident Deaths: 1997-2008



The number of rail accidents involving HAZMAT releases in the United States shows a very similar decline to the total number of events. While the number of HAZMAT releases is a small component of the total accident population, the probability of serious consequences is higher for HAZMAT accidents than for those events without toxic substances involved. FRA expends considerable time and effort investigating these high consequence events to understand and minimize their occurrence. The national trend over the past decade indicates these efforts have been largely successful (Figure 7.1 and 7.2).

It should be noted that in this period when the volume and number of commodities moving on the nation's rail infrastructure have grown considerably, the release of hazardous commodities due to accident/incident has been relatively steady in the past decade and shows a significant downward trend for 2008 (Table 7). As the nation's use of rail for transporting bulk commodities intensified, the number of releases of dangerous substances has remained fairly constant. For year 2008, there is a sharp decrease in events with HAZMAT releases.

Table 7: U.S. Trend in Rail Events with HAZMAT Releases

Year	HAZMAT Releases	HAZMAT Cars Damaged/Derailed	# of Cars Releasing
1997	31	725	38
1998	42	845	66
1999	41	1,000	75
2000	35	984	75
2001	32	931	57
2002	31	980	56
2003	30	1,072	41
2004	31	1,000	49
2005	39	915	52
2006	30	1,040	71
2007	46	1,053	76
2008	22	744	38

Figure 7.1: U.S. Trend in Rail Events: HazMat Cars Damaged/Derailed 1997-2008

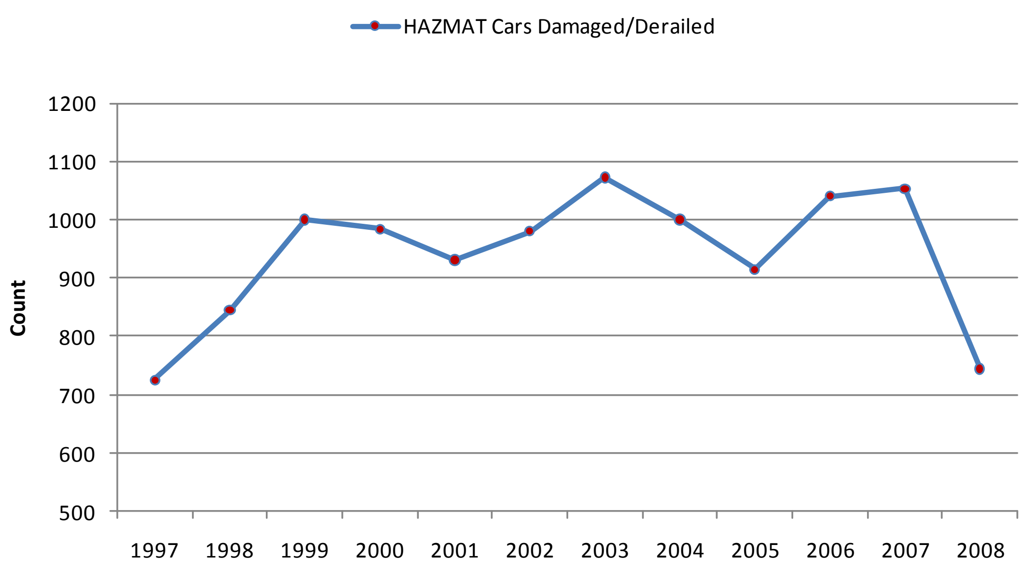
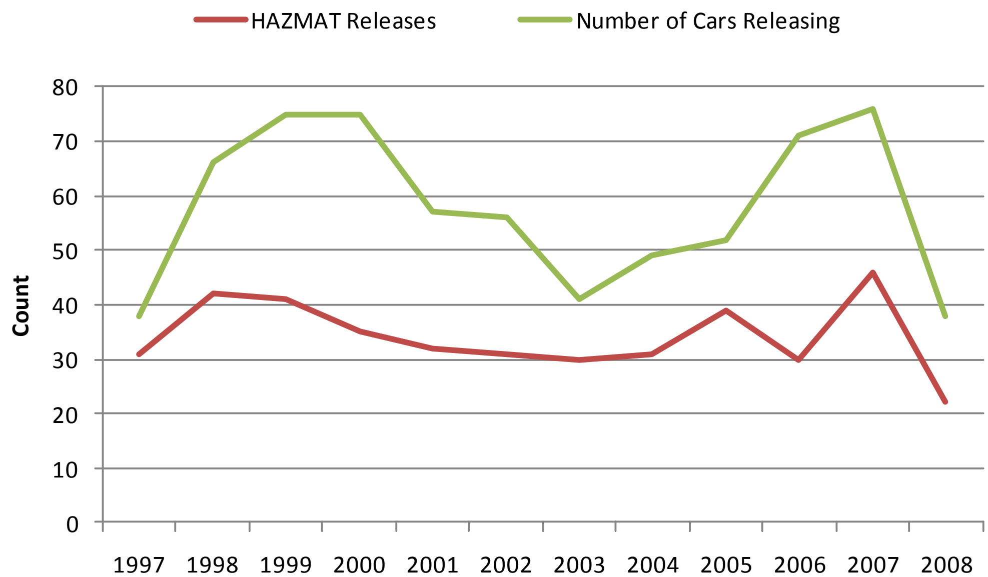


Figure 7.2: U.S Rail Events: Hazmat Releases and Number of Cars Releasing: 1997-2008



The state of Nevada had 13 incidents involving Hazardous Materials in 2008, up from 2 events in 2005. Clark County HAZMAT accidents went up from 28 in 2005 to 53 in 2008, an increase of 89%. Table 8 shows HAZMAT events for all modes and a mode component for rail. Clark County experienced only one reportable incident for rail, but there were no reportable damages.

Table 8: 2005 Hazardous Materials Events

	Incidents	Hospitalized	Non-Hospitalized	Fatalities	Damages
Clark County Rail 2005	1	0	0	0	$2,560
Nevada Rail 2005	2	0	0	0	$8,185
US Rail 2005	767	99	594	10	$16,114,749
Clark County 2005 Total	28	0	0	0	$3,110
Nevada 2005 total	102	0	0	0	$317,415
US 2005 total	116,344	175	780	36	$65,652,941

2008 Hazardous Materials Events

	Incidents	Hospitalized	Non-Hospitalized	Fatalities	Damages
Clark County Rail 2008	1	0	0	0	$0
Nevada Rail 2008	13	0	0	0	$63,490
US Rail 2008	777	7	56	1	$12,401,711
Clark County 2008 Total	53	0	0	0	$ 109,036
Nevada 2008 total	142	0	0	0	$310,663
US 2008 total	16,996	17	210	9	$64,529,863

Source: PHMSA Office of Hazardous Materials Safety

A clear picture emerges of rail operations in southern Nevada through Clark County. Clark County suffered over $100,000 in damages due to HAZMAT material incidents but these were not on account of rail operations. Nevada suffered over $63,000 in damages from rail operations and over $300,000 due to hazardous materials events. The next section identifies what hazardous commodities travel by rail in and through the County.

6.0 HAZARDOUS COMMODITY FLOWS BY RAIL

Flows of hazardous commodities in Clark County exhibit similar characteristics to the County flow by highway and truck mode (Figure 8.1 and 8.2). The overwhelming majority of hazardous substances pass through the County rather than originating or ending in southern Nevada. However, the bulk nature of commodities carried by rail result in cargo composed of different substances than those carried by truck.

Figure 8.1: 2005 Clark County Rail Hazardous Commodity Flow by Direction (Tons)

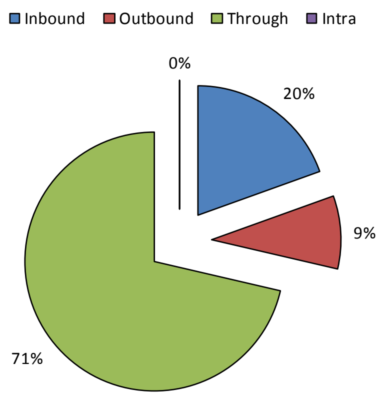
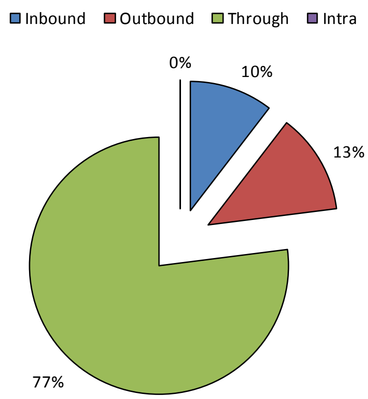


Figure 8.2: 2008 Clark County Rail Hazardous Commodity Flow by Direction (Tons)



Another characteristic of rail flows of hazardous cargoes is that these flows contain a multi-modal element (Figure 9). While very little of this type of rail movement originates or terminates in Clark County, a substantial portion of the through-county movement by rail involves containers on rail cars that will ultimately be transferred to trucks or ships for delivery. Because these multi-modal cargoes require additional handling, there is a higher accident potential for this type of movement. However, this is not a concern at this point because very few of these movements start or end in the County.

Table 9: Clark County Rail Hazardous Commodity Flows by Direction, 2005 and 2008.

	2005		2008	
Direction	**Carload Tons**	**Intermodal Tons**	**Carload Tons**	**Intermodal Tons**
Inbound	350,152	680	174,796	3,532
Outbound	163,945	15	215,439	135
Through	1,098,371	184,814	1,112,521	206,923
Intra	0	0	0	0

Figure 9.1: 2005 Clark County Rail Hazardous Commodity Flow by Mode

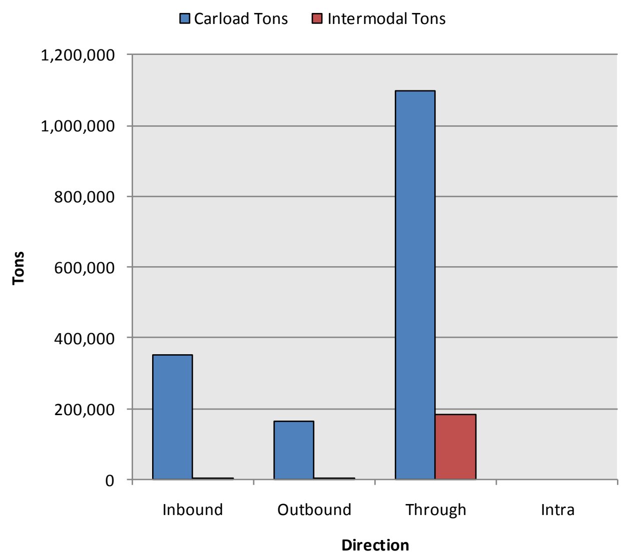
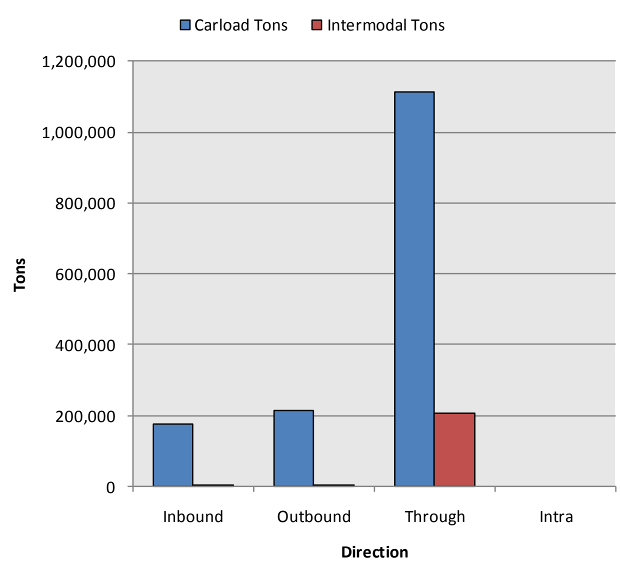


Figure 9.2: 2008 Clark County Rail Hazardous Commodity Flow by Mode



In terms of the total volume of rail flows by hazardous commodity class, in 2005 four categories dominated the movements in Clark County. Hazardous Commodity Class 9, miscellaneous dangerous goods, accounted for over half a million tons of the rail flows in and through Clark County. In 2008, this volume dropped to less than half that amount at about 140,000 tons- a decrease of over 70%. Flammable and combustible liquids (Class 3) were the next highest volume in 2005, which increased by about 31% in 2008. Corrosive materials (Class 8), showed an increase of approximately 12% in 2008, as compared to 2005. The other substantial volume in 2005 was Class 2 (flammable, non-flammable, and poisonous gases) which stood at close to a quarter million tons. In 2008, there was a slight increase in the volume of this class by about 30,000 tons. Overall, the top four Classes contributing the most tonnage were consistent when comparing 2005 and 2008 data. All other categories of hazardous substances were relatively minor in comparison to these large volume flows both in 2005 and 2008.

Figure 10: Clark County Rail hazardous Commodities Class Share (Tons), 2005 and 2008

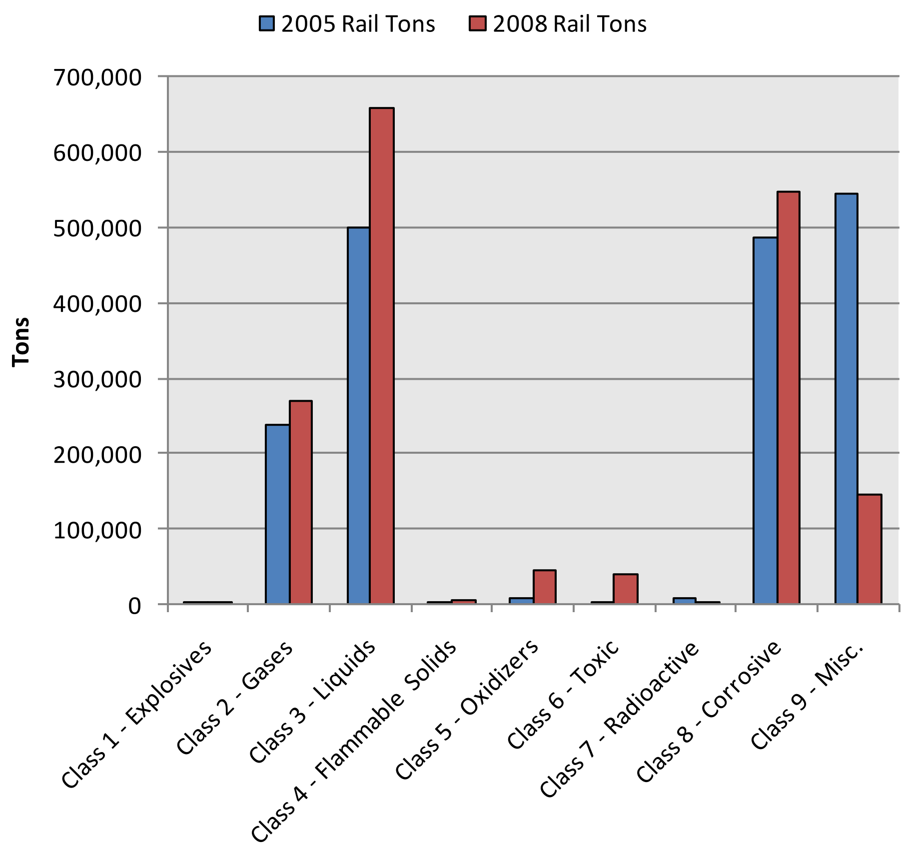
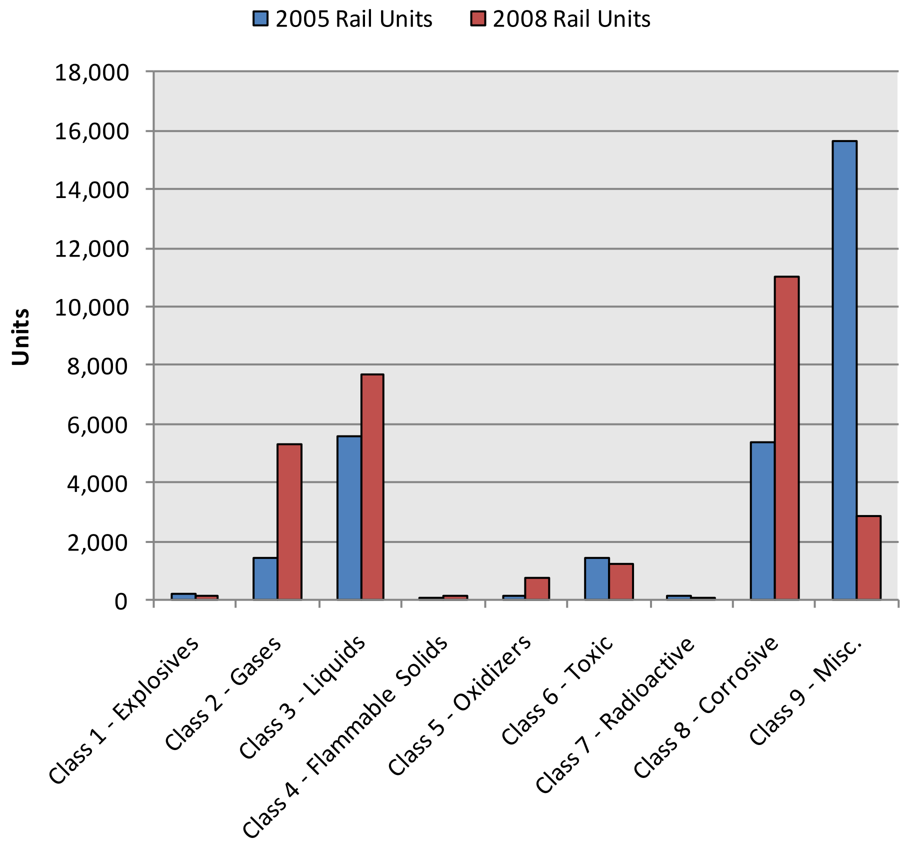


Figure 11.1: Clark County Rail hazardous Commodities Class Share (Units), 2005 and 2008

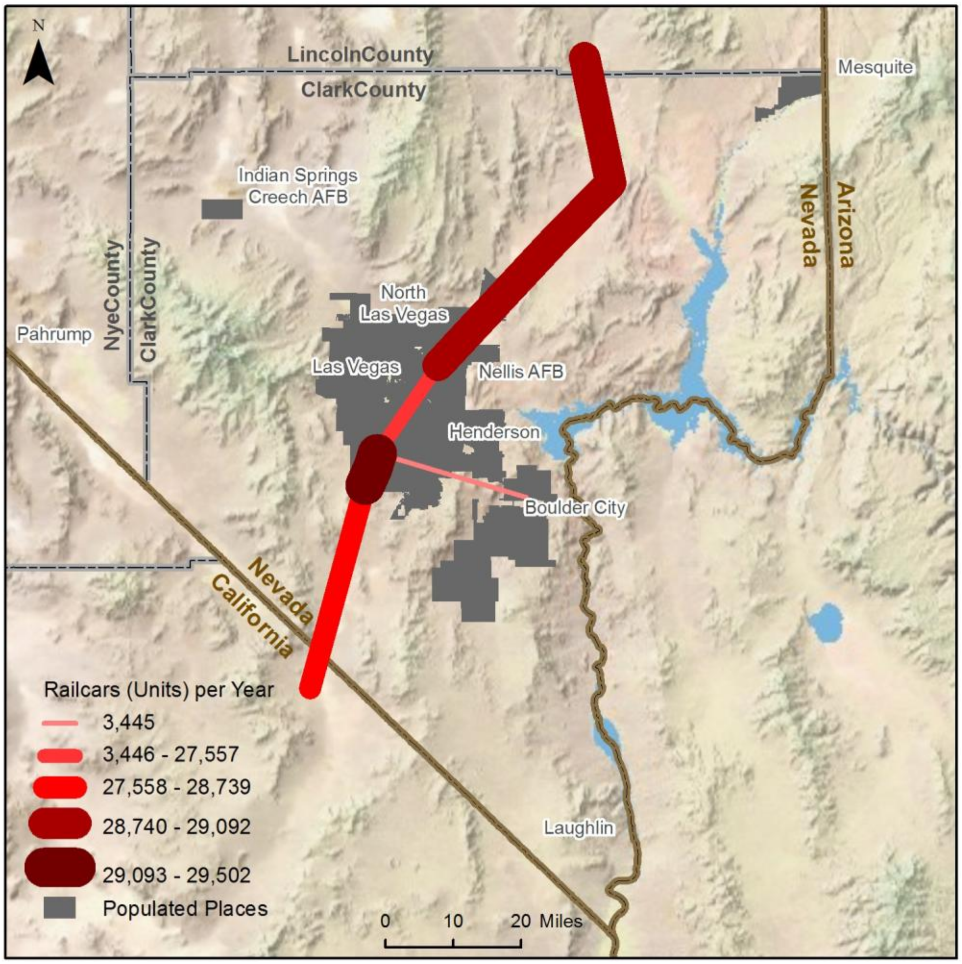


As shown in Figure 11.1, the Clark County rail flows for the miscellaneous dangerous goods (Class 9) showed an interesting difference when viewed by the number of units involved rather than by the total volume of flows in 2005. While the relative distribution is similar for volume and number of units involved for the remaining hazardous commodity classes, there are clearly more units involved in the rail movement of mixed HAZMAT captured in Class 9 cargoes. Many more car units are involved in the rail movements of this category of hazardous commodities. However, this was not the case in 2008.

When examining hazardous commodities by category, the distribution and volume of hazardous materials shipped by rail exhibits very different characteristics than shipments on the highway by truck. While shipments by truck show substantial volumes of most categories, shipments by rail are dominated by a select, few categories. Corrosive materials and gasses as well as several of the Class 9 miscellaneous categories represent large volumes, unlike most other categories.

Fig 11.2 shows railcar unit volume flows for Clark County on different segments of the rail network. As evident in Figure 8.2, hazardous commodities travelling through Clark County account for 77% of the total volume, with the additional flows either originating in Clark County or with their destination in Clark County. This is evident on the map as additional unit volume near the Las Vegas Metropolitan Area.

Figure 11.2: 2008 Clark County Railcar Unit Volume Flows



Comparative Statistical Analysis of Rail Commodities

There was a statistically significant Pearson Correlation between the years 2005 and 2008 with a high correlation coefficient of .970, $p < .0001$, indicating an increase in one year was associated with an increase in the other. In addition, there were percent changes per year with regards to hazardous material. Overall, there was a decrease from 2005 to 2008 (-4.45%). Specifically, decreases from 2005 to 2008 include: Division 1.4 and 1.5 Explosives (-93.22); Class 7 Radioactive Materials (-91.52%); Class 9 Environmentally Hazardous, Other Commodities (-53.6%); Division 9.1 Environmentally Hazardous Commodities (-76.04%); Freight All Kinds Hazardous Materials (-97.39%). Conversely, increases from 2005 to 2008 include: Division 1.1 and 1.2 Hazardous Materials (196.42%); Division 1.3 Explosives (416.41%); Division 2.2 Nonflammable Gases and Gas Mixtures (770.69%); Division 2.1 Flammable Gases (9.67%); Division 2.3 Poisonous or Corrosive Gases (4.03%); Class 3 Flammable Liquids (31.97%); Combustible Liquids (21.82%); Division 4.1 Flammable Solids (1667%); Division 4.2 Spontaneously Combustible and 4.3 Dangerous when Wet (65.18%); Division 5.1 Oxidizers (412.11%); Division 5.2 Organic Peroxides (infinite%, 0 to 7); Division 6.1 Poisonous Material, Hazard Zone A (infinite%, 0 to 46); Division 6.1 Poisonous Material, Packing Group III (6353.32%); Division 6.1 Poisonous Material, Other

Commodities (857.26%); Division 6.2 Etiologic Agents, Infectious Substances (infinite%, 0 to 233); Class 8 Corrosive Materials (12.54%); ORM-D (202.52%); and Division 9.2 Environmentally Hazardous Commodities (373.01%). There was not a statistically significant difference between the years on tons of hazardous material, $F(1,78) = .011$, $p = .918$, with the mean of 2005 being higher ($M = 44,828.20$) than 2008 ($M = 42,833.65$) when all types of hazardous material were taken into account.

A general characterization of the hazardous cargos moving by rail in Clark County could be described as bulk cargoes that do not require rapid or immediate delivery (Figure 12). All STCC4 categories with annual movements in excess of 100,000 tons are either industrial liquids and gases or unspecified waste with little delivery pressure. A detailed comparison of each STCC4 category by tons and units for 2005 and 2008 is shown in Appendix B. Hazardous commodity flow by class and direction for 2005 and 2008 are shown in Figures 13 and 14 respectively. A detailed comparison of each STCC4 category by direction for 2005 and 2008 is shown in Appendix C.

Figure 12: Clark County Rail Hazardous Commodities for STCC4 Categories (Tons), 2005 and 2008

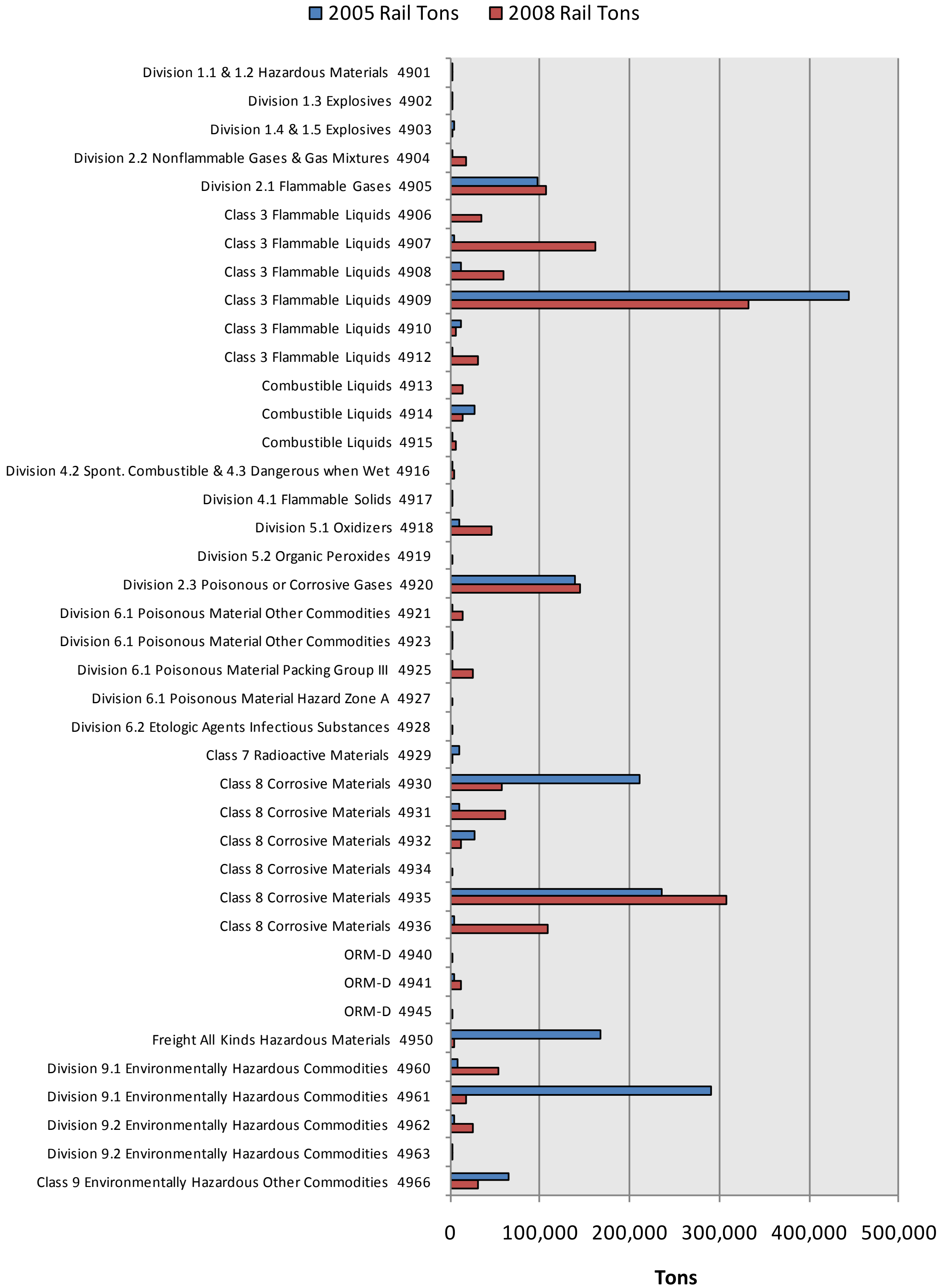


Figure 13: 2005 Clark County Rail Hazardous Commodities Flow by Class and Direction

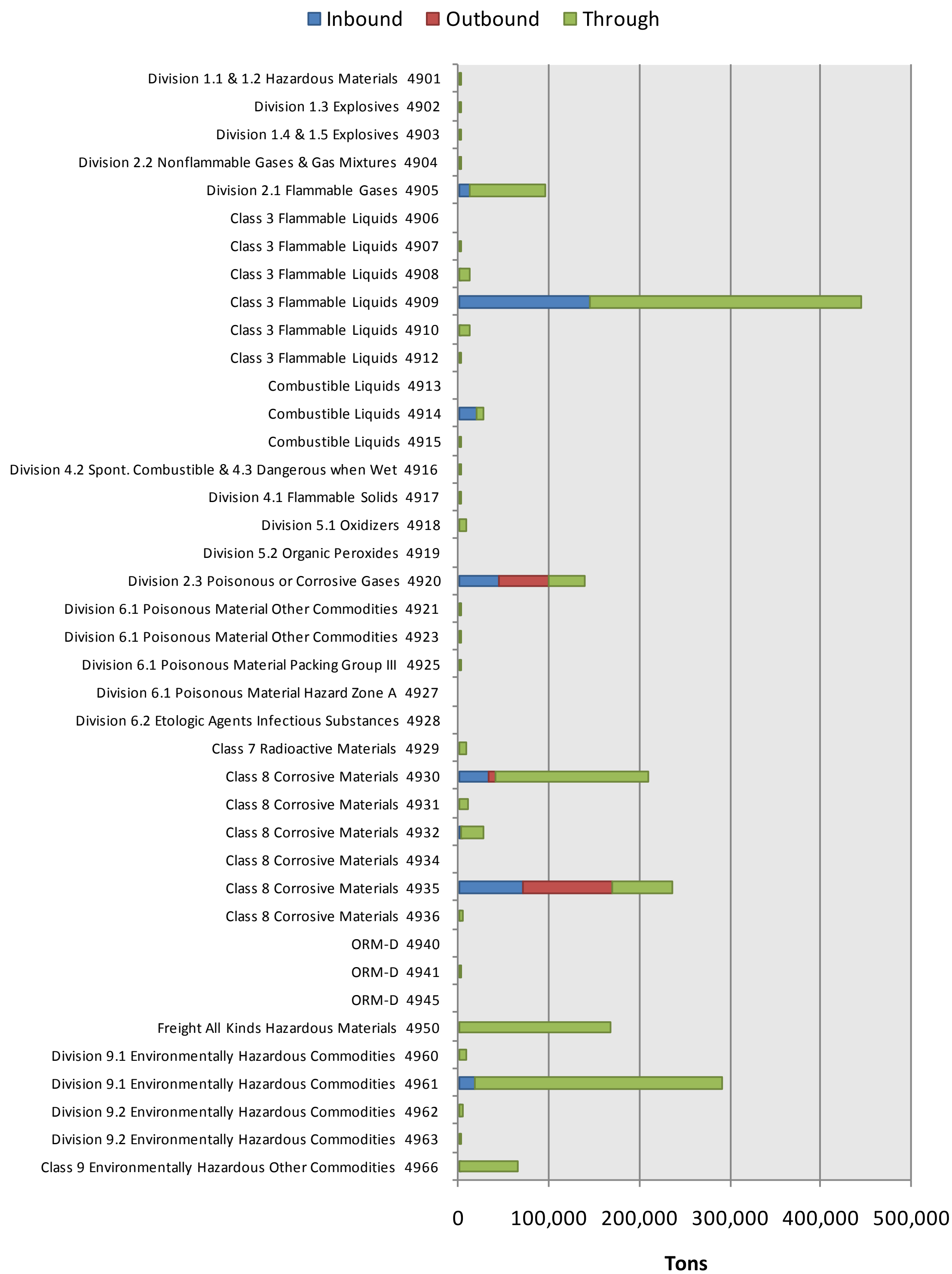
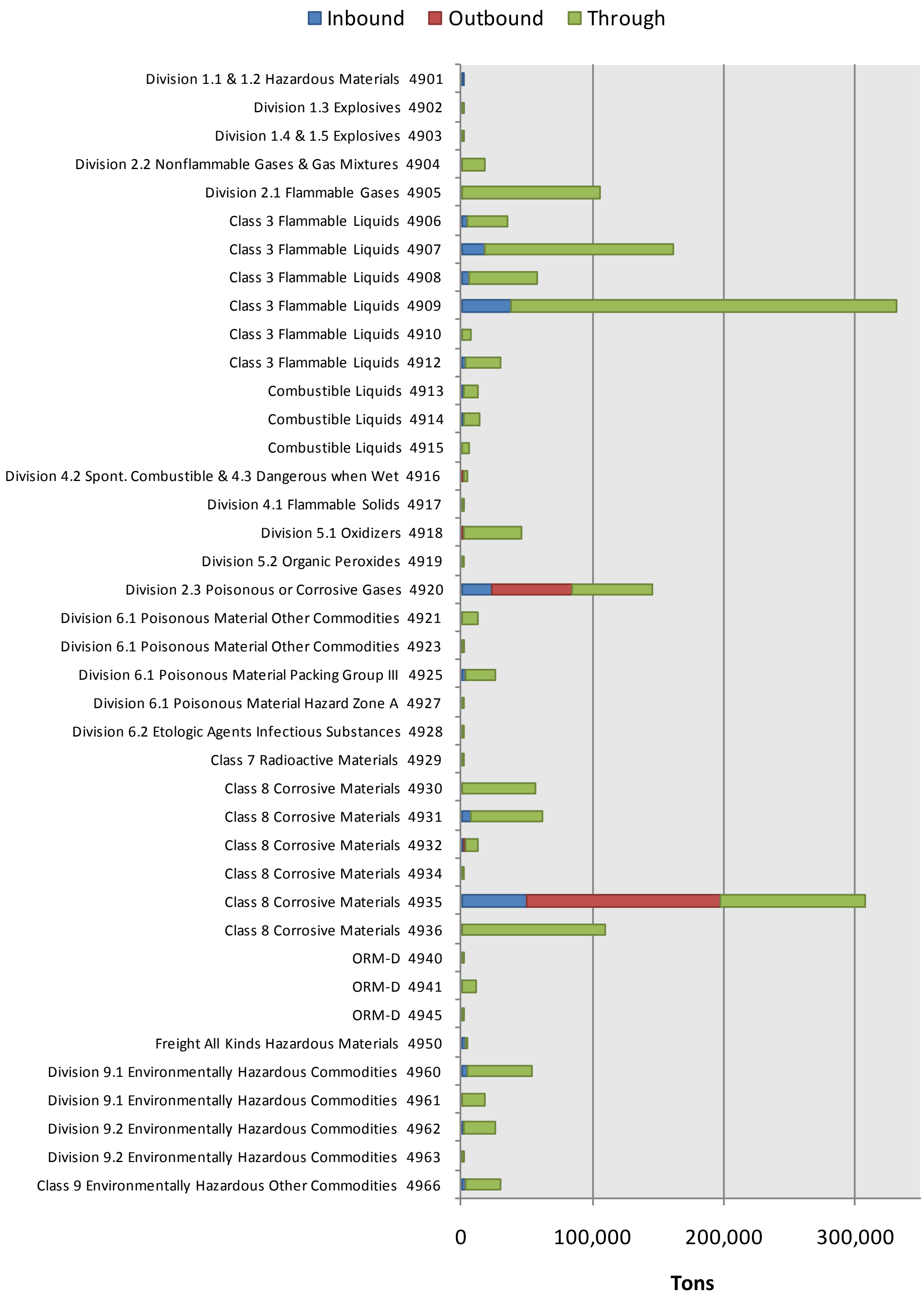


Figure 14: 2008 Clark County Rail Hazardous Commodities Flow by Class and Direction



7.0 CONCLUSION

This characterization of hazardous commodity flows by rail in Clark County quantifies baseline conditions for both tons of these commodities and the number of railcar units carrying these hazardous cargos in the County. This study also details commodities flowing through the County by rail to other destinations. In addition to the rail commodity flows, detailed accident information for rail movements on the national, state, and county level are assembled and presented for 2005 and 2008. Characteristics of the rail system are also presented, though much of that detail is not available for Nevada and Clark County.

Using longitudinal data from FRA, the trend of consolidation in the ownership of railroad companies is shown quite dramatically. The abandonment of unprofitable segments is also quite evident from these data. To fully understand rail transportation today, it is essential to recognize the radical transformation of this industry since the 1960s. Reliability and safety are key elements in this transformation. Streamlined operations of today share little but common rail with the shorter hauls and variety of cargos from the past.

Federal data on rail accidents are particularly detailed and comprehensive. Because the objective of this report is the commodity flows of hazardous substances by rail in Clark County in 2005 and 2008, trend data of each of the preceding 10 years were examined and archived for future investigations requiring greater detail. What is obvious in the 2005 and 2008 results presented in this study remain consistent across the previous four or five decades. Nevada and Clark County host rail operations with an enviable safety record. Operations are conducted with a remarkably low accident rate. While there have been and will continue to be rail accidents in both the State and County, the severity of recent mishaps remains relatively minor, and these accidents/incidents rarely involve HAZMAT under these baseline conditions.

The easy explanation for the decline in rail accidents is government oversight and performance goals. In Nevada, the type of rail flow also contributes to a lower accident total. Most of the rail flows in Clark County are passing through en route to other destinations. These cargos do not require handling where the potential for mishap is higher. The large, bulk flows of hazardous liquids and gases with deliveries that are not time-sensitive compete for space on the rails with specialized multi-modal cargos and containers, as well as the special express trains and Amtrak. Utilization of the existing rail infrastructure is reportedly near capacity within existing operational and safety constraints.

Numerous opportunities deserve exploration to resolve the only data problem identified by this examination. First, a standardized measure for estimating state and local rail utilization must be selected for future quantification and comparability. In addition, a defendable quantification of local and regional accident probability would enhance an assessment of risk in future study.

Clark County rail flows do not presently include substantial flows of Class 7 radioactive materials. Hazardous cargo movements by rail through Clark County are remarkably event free under current conditions. What is not clear is the effect a change in operational conditions would have on these flows and on local accident rates. Adding large volumes of particularly hazardous loads and special trains on an existing network already facing capacity constraints would certainly impact other rail shipments, and raises additional potential safety concerns if existing rail infrastructure was to support transport of radioactive waste to Yucca Mountain (UT, 2010). This study provides a baseline framework with which to conduct a comparative study and to monitor over time.

Another added benefit of this study might emerge in future years. Though not addressed in this investigation, numerous other studies recognize the capacity constraint in rail scheduling when determining mode selection for commodity shipments. Transportation by rail is much more efficient than by truck if examined by fuel consumption and cost. If the price of fuel remains high for an extended period of time, characteristics of commodities by rail might change dramatically.

Finally, this investigation successfully assembles public and private data to examine hazardous commodity flows by rail through the heart of a booming, modern urban metropolis. Baseline results will provide the foundation for future study evaluating operations, shipments, and changes yet to come.

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APPENDIX A: STCC4 CATEGORY, HAZARDOUS COMMODITY CLASS/DIVISION, AND SELECTED HAZMAT COMMODITIES

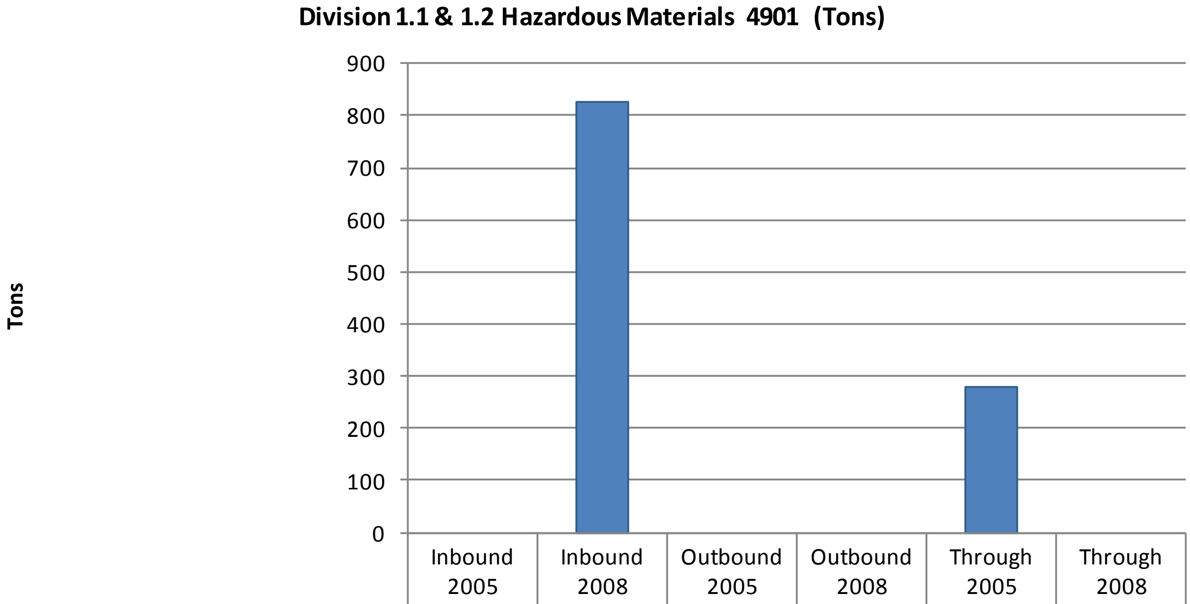
STCC4	Hazardous Commodity Class/Division	Selected Hazardous Materials
4901	1.1, 1.2 Explosives	Cartridges, rockets, nitrocellulose, fuses, bombs, mines, warheads
4902	1.3 Explosives	Rockets, incendiary ammunition, grenades, pyrotechnics
4903	1.4, 1.5 Explosives	Solid propellants, airbag inflators, inert cartridges, toy caps
4904	2.2 Nonflammable Gases	Oxygen-nitrogen mix, ammonia solution, refrigerant gas
4905	2.1 Flammable Gases	Liquefied petroleum, propane, butane, acetylene, compressed gas
4906	3 Flammable Liquids	Aviation gas, pentene
4907	3 Flammable Liquids	Ethyl nitrate, nitrocellulose solution, ethanol, ether, vinyl acetate
4908	3 Flammable Liquids	Acetone, benzene, gasoline, octanes, petroleum distillates
4909	3 Flammable Liquids	Alcohols, pentanols, toluenes, butyl acetates, amyl nitrate
4910	3 Flammable Liquids	Paint, alcoholic beverages, adhesives, medicinal tinctures, tars
4912	3 Flammable Liquids	Naphtha, xylene, formaldehyde solutions, camphor oil
4913	3 Combustible Liquids	Pine oil, naphthalene, isopropyl alcohol, petroleum paraffin
4914	3 Combustible Liquids	Paraffin, aromatic hydrocarbons, coal tars, diesel fuel
4915	3 Combustible Liquids	Petroleum crude oil, kerosene, sulferized hydrocarbons
4916	4.2, 4.3 Spontaneously combustible	Barium alloys, titanium thrichloride, magnesium alkyls, cesium
4917	4.1 Flammable Solids	Safety matches, nitrocellulose films, sulfer, metal hydrides
4918	5.1 Oxidizers, 5.2 Organic Peroxides	Ammonium nitrate, sodium chlorite, organic peroxide
4919	5.2 Organic Peroxides	Organic peroxide
4920	2.3 Poisonous Gases	Arsine, phosphene, compressed fluorine, insecticide gases
4921	6.1 Poisonous Commodities	Phosphorus trichloride, motor fuel anti-knock compounds
4923	6.1 Poisonous Commodities	Arsenic acid, sodium cyanide, beryllium compounds
4925	6.1 Packing Group III	Phenol solutions, triazine pesticides, alkaloids, solid mercury compounds
4927	6.1 Inhalation Hazard A	Nickel carbonyl, methyl vinyl ketone, hydrogen cyanide
4928	6.2 Etiologic Agents	Infectious substances, medical waste
4929	7 Radioactive Material	Uranium hexafluoride, fissile material
4930	8 Corrosive Material	Cupric chloride, hydrochloric acid, sulfuric acid, battery acid
4931	8 Corrosive Material	Nitric acid, acetic acid, copper chloride, liquid amines
4932	8 Corrosive Material	Antimony pentafluoride, sodium hydroxide, lactic acid, sodium silicate
4933	8 Corrosive Material	Butyl acid phosphate, amyl acid phosphate
4934	8 Corrosive Material	Ferric sulfates, phthalic anhydride, propyltrichlorosilane
4935	8 Corrosive Material	Caustic alkali liquids, sodium hydrosulfides, alkali battery fluids
4936	8 Corrosive Material	Fatty acid derived amines, manganese nitrate, non-explosive smoke bombs
4940	9 ORM-D	Carbon dioxide (dry-ice), hydrazine
4941	9 ORM-D	Creosote, self-inflating life-saving devices
4945	9 ORM-D	Ammonium nitrate based fertilizers, polychlorinated biphenyls, castor beans
4950	9 Mixed Loads of Hazardous Materials	Mixed load containing explosives, poison gas, radioactive, or military materials
4960	9 Mixed Loads of Hazardous Materials	Mixed load containing benzoic acid, carbon tetrachloride, lead, ethylene glycol
4961	9 Mixed Loads of Hazardous Materials	Mixed load containing cupric sulfate, formaldehyde, plastic molding compounds
4962	9.1 Environmentally Hazardous Commodities	Zinc dithiophosphate, dimethyl phthalate, asbestos
4963	9.1 Environmentally Hazardous Commodities	Lead sulfide, chromic acetate, sodium bichromate, fertilizing compounds
4966	9 Environmentally Hazardous Commodities	Ammonium bezoate, polycyclic organic matter, arsenic compounds

APPENDIX B: COMPARISON OF HAZARDOUS COMMODITY RAIL TONS AND UNITS FOR 2005/2008

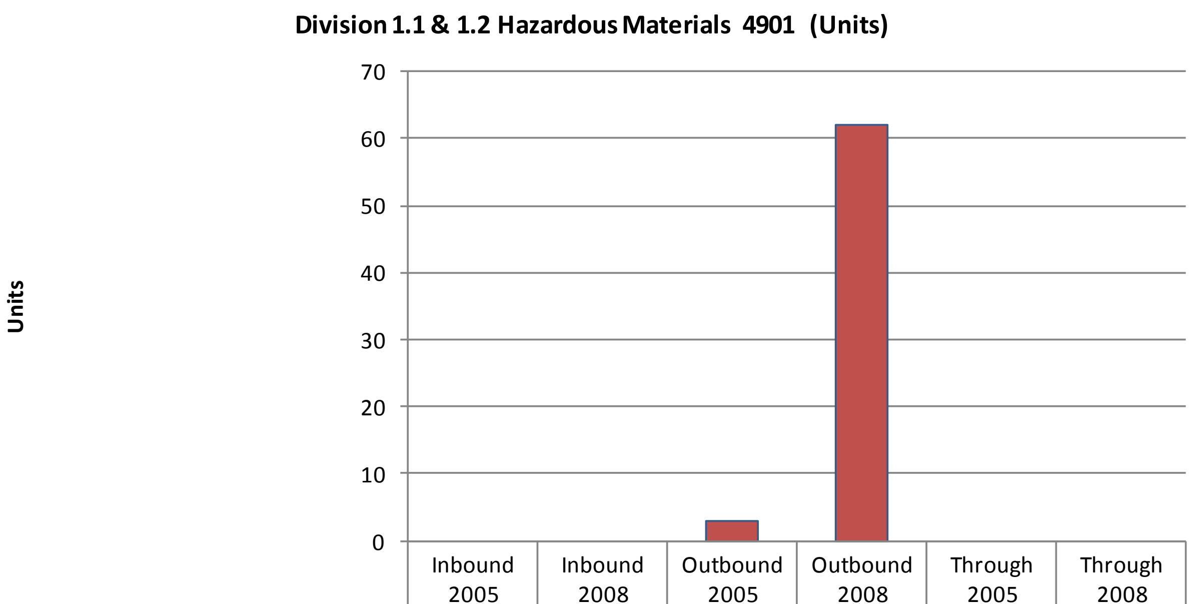
STCC4	Commodity Description	2005 Rail Tons	2008 Rail Tons	2005 Rail Units	2008 Rail Units
4901	Division 1.1 & 1.2 Hazardous Materials	279	827	3	62
4902	Division 1.3 Explosives	128	661	3	49
4903	Division 1.4 & 1.5 Explosives	3,482	236	202	17
4904	Division 2.2 Nonflammable Gases & Gas Mixtures	1,986	17,292	31	1,107
4905	Division 2.1 Flammable Gases	96,608	105,949	1,378	2,512
4906	Class 3 Flammable Liquids	0	35,258	0	368
4907	Class 3 Flammable Liquids	3,657	161,497	43	1,738
4908	Class 3 Flammable Liquids	12,430	58,352	148	705
4909	Class 3 Flammable Liquids	444,604	331,746	4,841	3,513
4910	Class 3 Flammable Liquids	11,482	6,646	174	310
4912	Class 3 Flammable Liquids	637	30,465	24	481
4913	Combustible Liquids	0	13,224	0	152
4914	Combustible Liquids	27,000	13,823	315	271
4915	Combustible Liquids	420	6,356	17	179
4916	Division 4.2 Spont. Combustible & 4.3 Dangerous when Wet	2,817	4,653	31	75
4917	Division 4.1 Flammable Solids	100	1,767	6	91
4918	Division 5.1 Oxidizers	8,959	45,880	168	767
4919	Division 5.2 Organic Peroxides	0	7	0	0
4920	Division 2.3 Poisonous or Corrosive Gases	139,645	145,274	1,415	1,665
4921	Division 6.1 Poisonous Material Other Commodities	1,359	12,766	15	866
4923	Division 6.1 Poisonous Material Other Commodities	169	1,861	5	23
4925	Division 6.1 Poisonous Material Packing Group III	392	25,297	21	313
4927	Division 6.1 Poisonous Material Hazard Zone A	0	46	0	1
4928	Division 6.2 Etiologic Agents Infectious Substances	0	233	0	16
4929	Class 7 Radioactive Materials	9,219	782	104	27
4930	Class 8 Corrosive Materials	210,422	56,833	2,236	1,030
4931	Class 8 Corrosive Materials	9,875	62,046	265	739
4932	Class 8 Corrosive Materials	26,955	12,139	306	156
4934	Class 8 Corrosive Materials	0	4	0	0
4935	Class 8 Corrosive Materials	235,446	308,131	2,472	3,563
4936	Class 8 Corrosive Materials	4,442	109,082	74	5,509
4940	ORM-D	0	101	0	1
4941	ORM-D	3,654	10,876	178	448
4945	ORM-D	0	77	0	4
4950	Freight All Kinds Hazardous Materials	167,077	4,359	11,121	285
4960	Division 9.1 Environmentally Hazardous Commodities	7,814	54,450	117	944
4961	Division 9.1 Environmentally Hazardous Commodities	291,682	17,316	3,407	438
4962	Division 9.2 Environmentally Hazardous Commodities	4,191	25,657	51	389
4963	Division 9.2 Environmentally Hazardous Commodities	1,523	1,371	19	26
4966	Class 9 Environmentally Hazardous Other Commodities	64,674	30,006	669	326

STCC4	Commodity Description	2005 Rail Tons	2008 Rail Tons	2005 Rail Units	2008 Rail Units
4901	Division 1.1 & 1.2 Hazardous Materials	0.02%	0.05%	0.01%	0.21%
4902	Division 1.3 Explosives	0.01%	0.04%	0.01%	0.17%
4903	Division 1.4 & 1.5 Explosives	0.19%	0.01%	0.68%	0.06%
4904	Division 2.2 Nonflammable Gases & Gas Mixtures	0.11%	1.01%	0.10%	3.79%
4905	Division 2.1 Flammable Gases	5.39%	6.18%	4.62%	8.61%
4906	Class 3 Flammable Liquids	0.00%	2.06%	0.00%	1.26%
4907	Class 3 Flammable Liquids	0.20%	9.43%	0.14%	5.96%
4908	Class 3 Flammable Liquids	0.69%	3.41%	0.50%	2.42%
4909	Class 3 Flammable Liquids	24.79%	19.36%	16.21%	12.05%
4910	Class 3 Flammable Liquids	0.64%	0.39%	0.58%	1.06%
4912	Class 3 Flammable Liquids	0.04%	1.78%	0.08%	1.65%
4913	Combustible Liquids	0.00%	0.77%	0.00%	0.52%
4914	Combustible Liquids	1.51%	0.81%	1.05%	0.93%
4915	Combustible Liquids	0.02%	0.37%	0.06%	0.61%
4916	Division 4.2 Spont. Combustible & 4.3 Dangerous when Wet	0.16%	0.27%	0.10%	0.26%
4917	Division 4.1 Flammable Solids	0.01%	0.10%	0.02%	0.31%
4918	Division 5.1 Oxidizers	0.50%	2.68%	0.56%	2.63%
4919	Division 5.2 Organic Peroxides	0.00%	0.00%	0.00%	0.00%
4920	Division 2.3 Poisonous or Corrosive Gases	7.79%	8.48%	4.74%	5.71%
4921	Division 6.1 Poisonous Material Other Commodities	0.08%	0.75%	0.05%	2.97%
4923	Division 6.1 Poisonous Material Other Commodities	0.01%	0.11%	0.02%	0.08%
4925	Division 6.1 Poisonous Material Packing Group III	0.02%	1.48%	0.07%	1.07%
4927	Division 6.1 Poisonous Material Hazard Zone A	0.00%	0.00%	0.00%	0.00%
4928	Division 6.2 Etiologic Agents Infectious Substances	0.00%	0.01%	0.00%	0.05%
4929	Class 7 Radioactive Materials	0.51%	0.05%	0.35%	0.09%
4930	Class 8 Corrosive Materials	11.73%	3.32%	7.49%	3.53%
4931	Class 8 Corrosive Materials	0.55%	3.62%	0.89%	2.53%
4932	Class 8 Corrosive Materials	1.50%	0.71%	1.02%	0.53%
4934	Class 8 Corrosive Materials	0.00%	0.00%	0.00%	0.00%
4935	Class 8 Corrosive Materials	13.13%	17.98%	8.28%	12.22%
4936	Class 8 Corrosive Materials	0.25%	6.37%	0.25%	18.89%
4940	ORM-D	0.00%	0.01%	0.00%	0.00%
4941	ORM-D	0.20%	0.63%	0.60%	1.54%
4945	ORM-D	0.00%	0.00%	0.00%	0.02%
4950	Freight All Kinds Hazardous Materials	9.32%	0.25%	37.25%	0.98%
4960	Division 9.1 Environmentally Hazardous Commodities	0.44%	3.18%	0.39%	3.24%
4961	Division 9.1 Environmentally Hazardous Commodities	16.27%	1.01%	11.41%	1.50%
4962	Division 9.2 Environmentally Hazardous Commodities	0.23%	1.50%	0.17%	1.33%
4963	Division 9.2 Environmentally Hazardous Commodities	0.08%	0.08%	0.06%	0.09%
4966	Class 9 Environmentally Hazardous Other Commodities	3.61%	1.75%	2.24%	1.12%

APPENDIX C: HAZARDOUS COMMODITY FLOW BY STCC4 CATEGORY: TONS, UNITS, AND DIRECTION

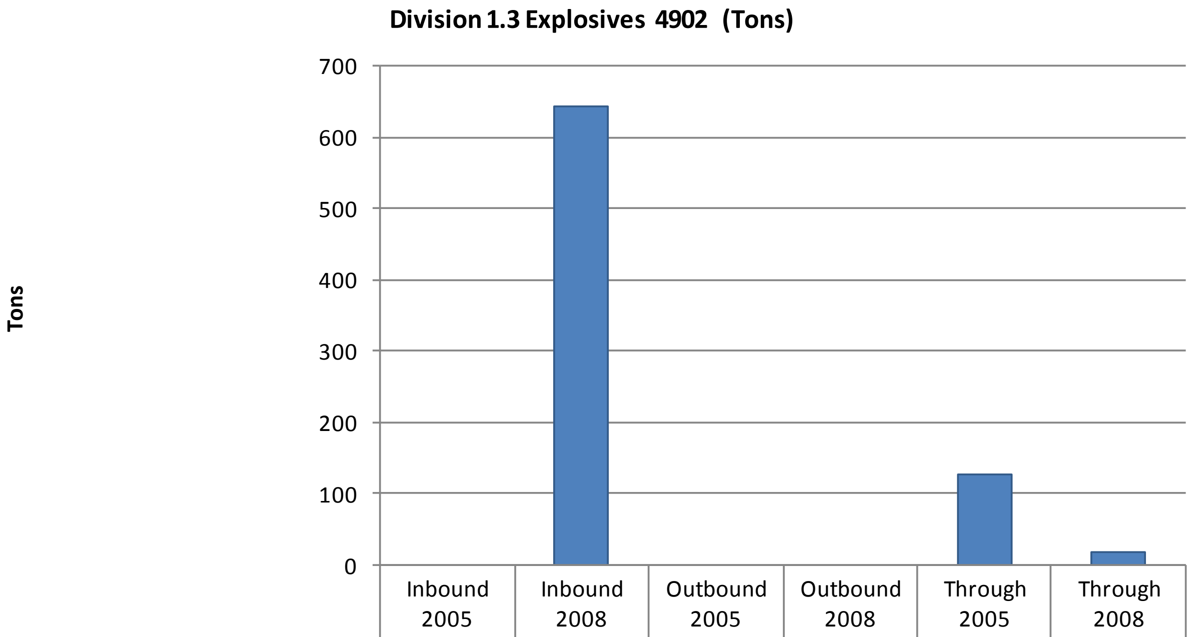


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 1.1 & 1.2 Hazardous Materials 4901 (Tons)	0	827	0	0	279	0



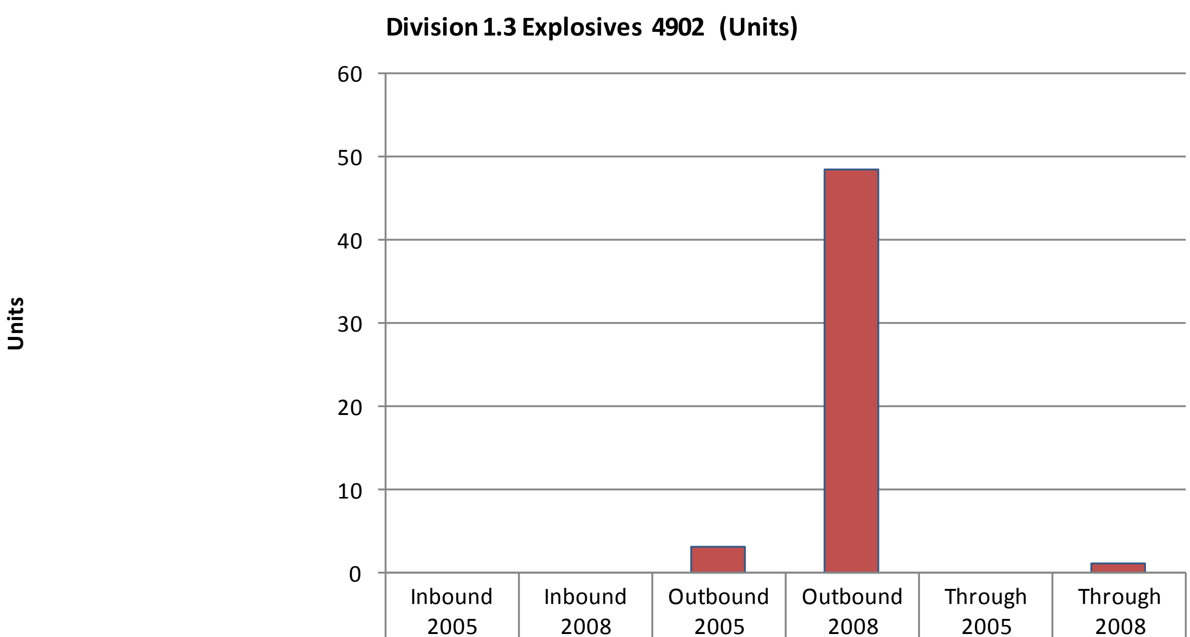
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 1.1 & 1.2 Hazardous Materials 4901 (Units)	0	0	3	62	0	0

Division 1.3 Explosives 4902 (Tons)



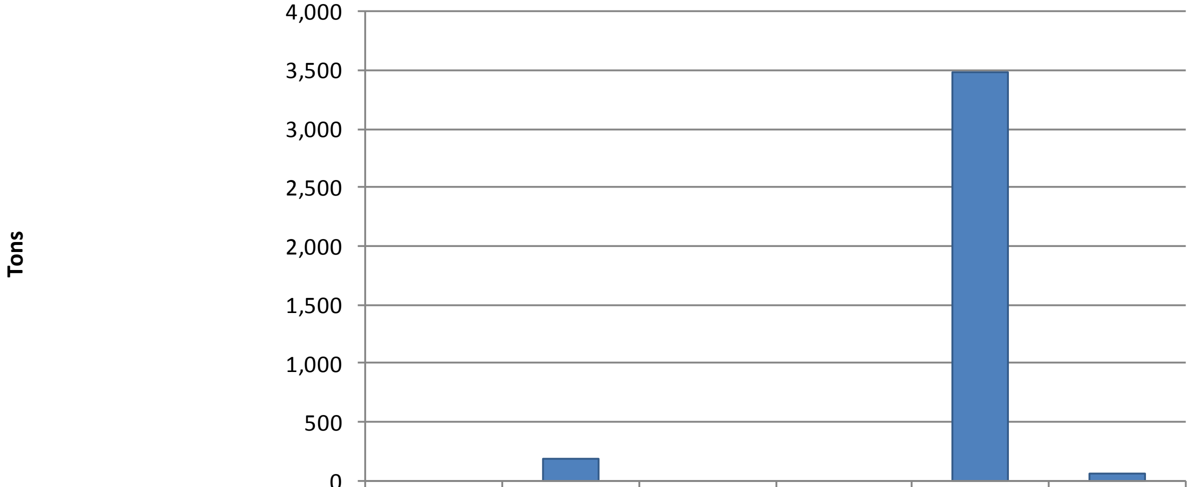
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 1.3 Explosives 4902 (Tons)	0	645	0	0	128	17

Division 1.3 Explosives 4902 (Units)



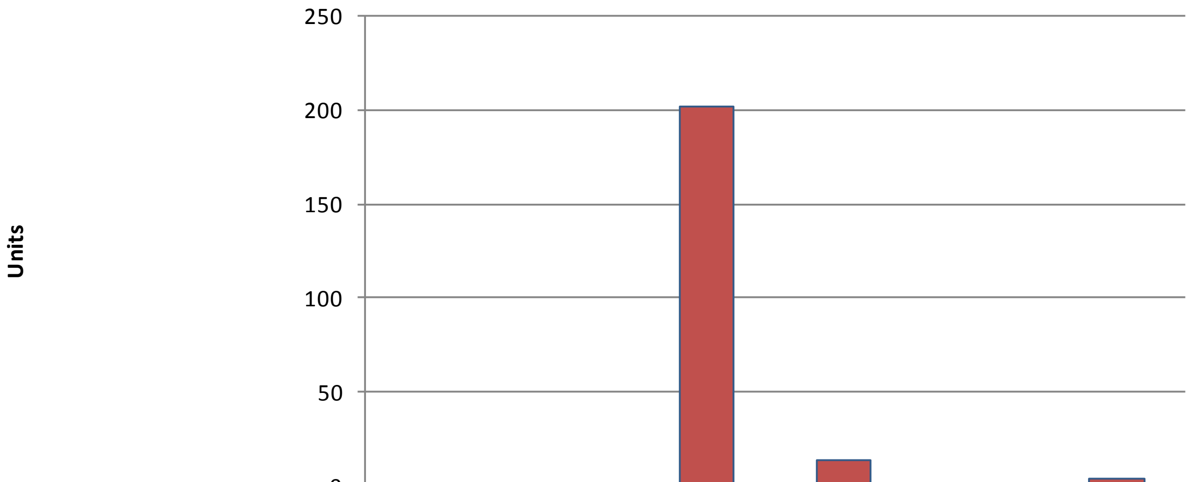
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 1.3 Explosives 4902 (Units)	0	0	3	48	0	1

Division 1.4 & 1.5 Explosives 4903 (Tons)



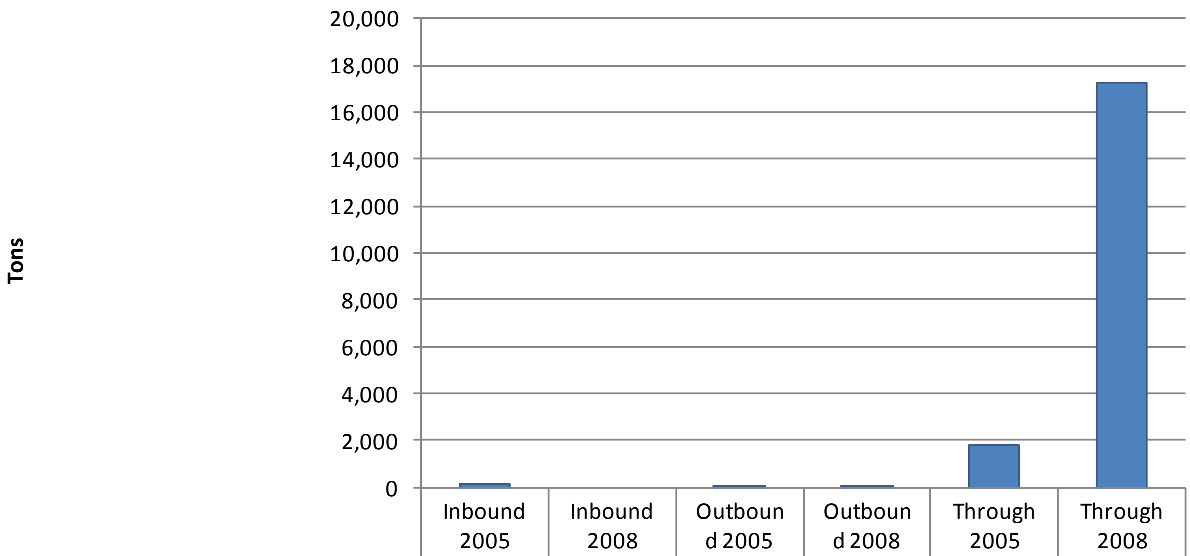
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 1.4 & 1.5 Explosives 4903 (Tons)	0	176	0	0	3,482	61

Division 1.4 & 1.5 Explosives 4903 (Units)



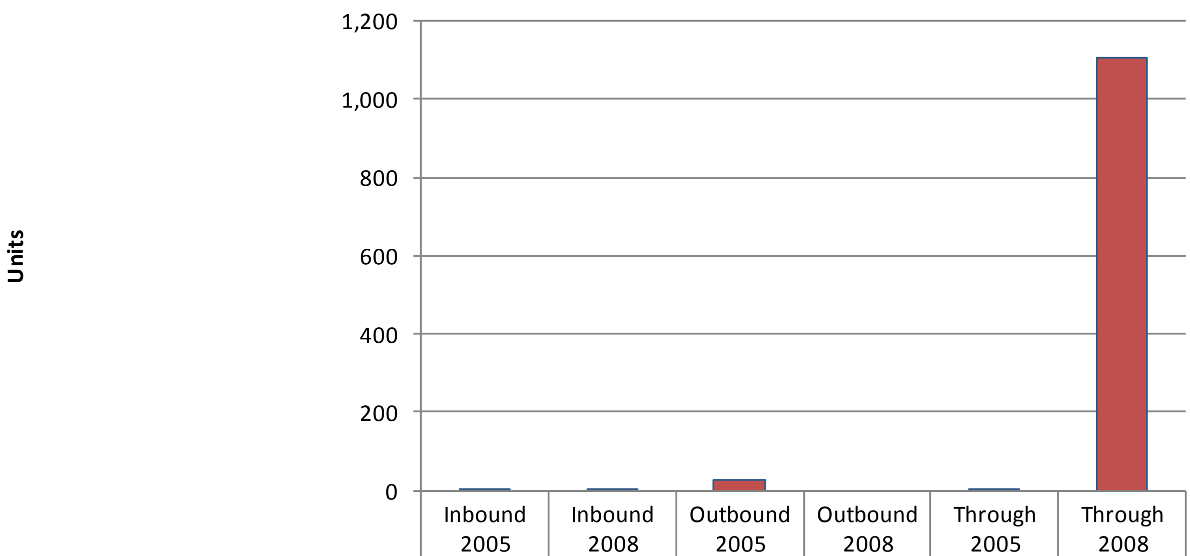
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 1.4 & 1.5 Explosives 4903 (Units)	0	0	202	13	0	4

Division 2.2 Nonflammable Gases & Gas Mixtures 4904 (Tons)



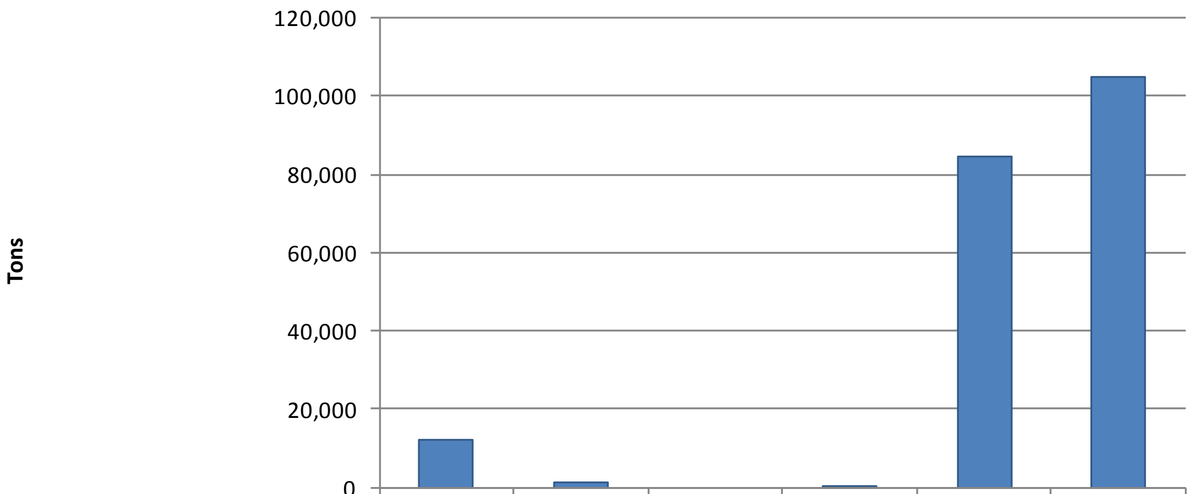
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 2.2 Nonflammable Gases & Gas Mixtures 4904 (Tons)	162	0	33	30	1,791	17,262

Division 2.2 Nonflammable Gases & Gas Mixtures 4904 (Units)



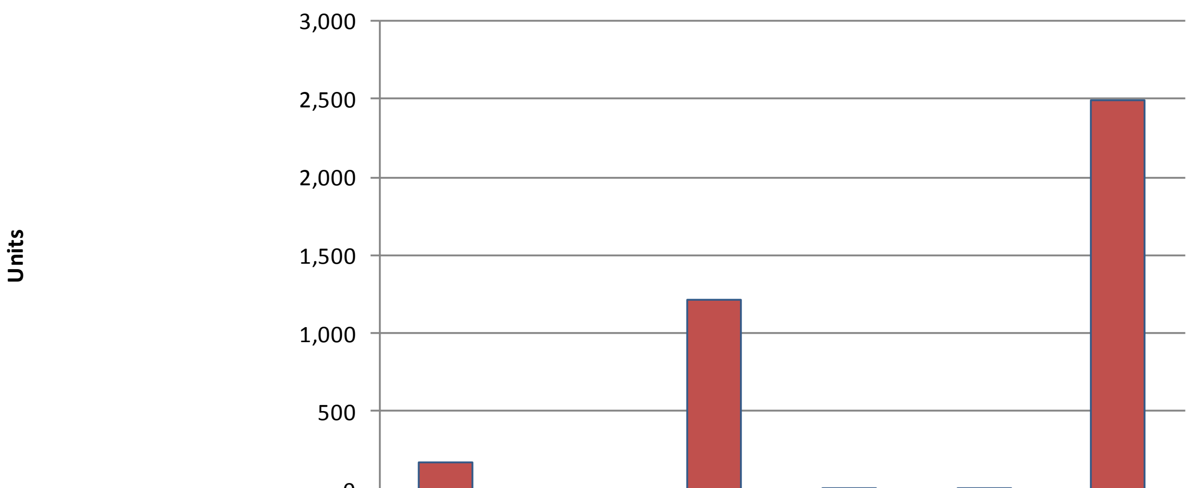
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 2.2 Nonflammable Gases & Gas Mixtures 4904 (Units)	2	1	28	0	2	1,104

Division 2.1 Flammable Gases 4905 (Tons)

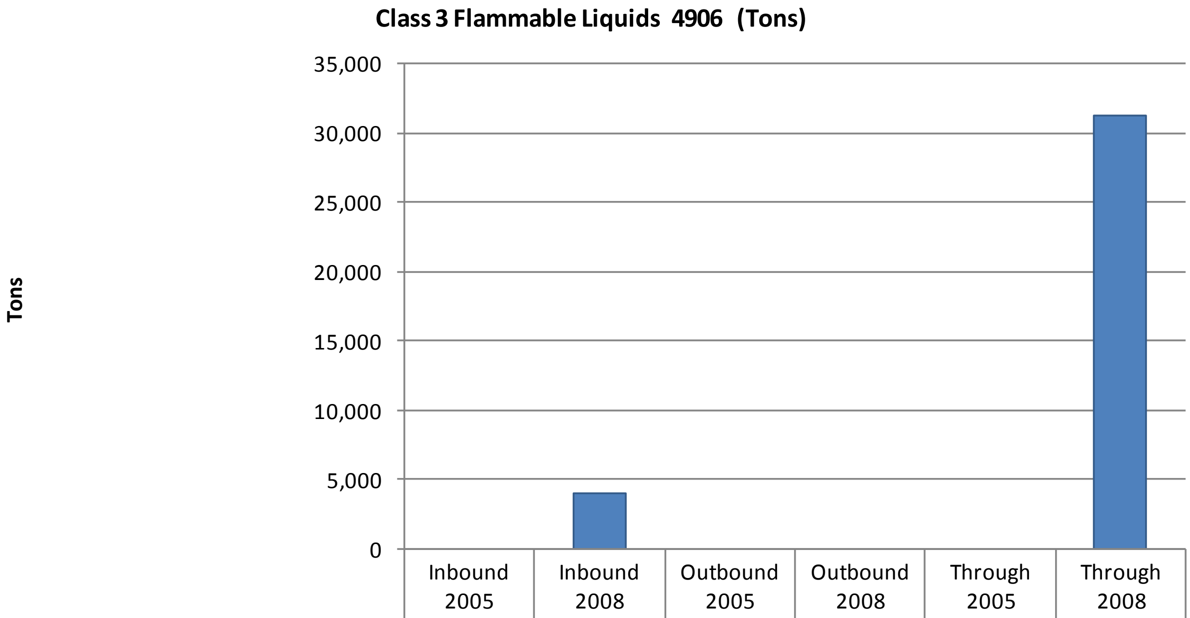


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 2.1 Flammable Gases 4905 (Tons)	11,903	1,043	0	79	84,705	104,827

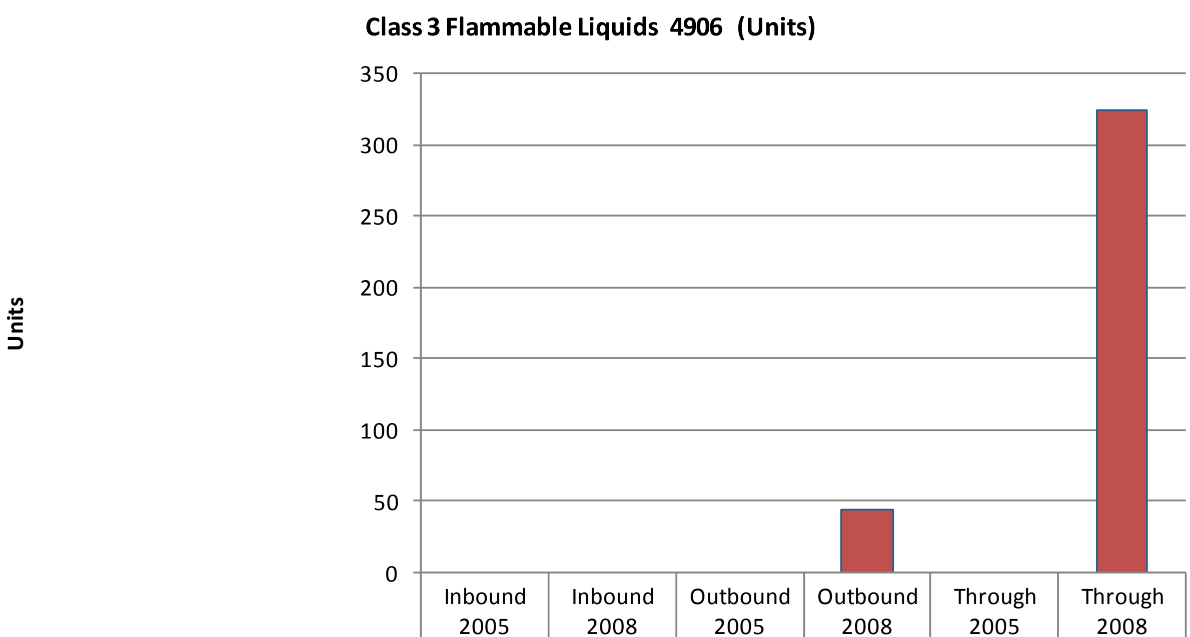
Division 2.1 Flammable Gases 4905 (Units)



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 2.1 Flammable Gases 4905 (Units)	169	0	1,209	11	7	2,494

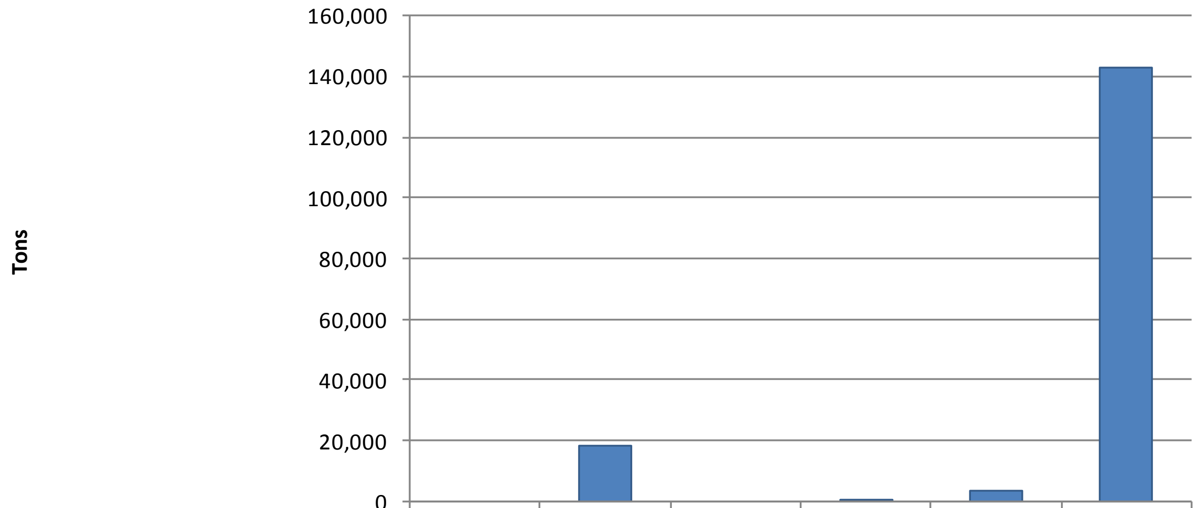


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4906 (Tons)	0	3,998	0	0	0	31,260



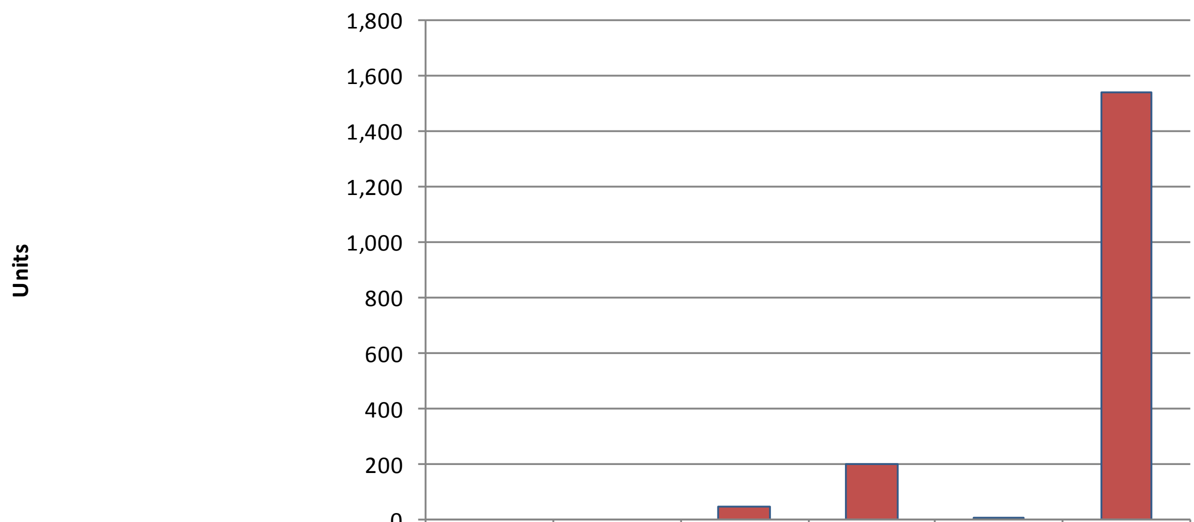
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4906 (Units)	0	0	0	43	0	325

Class 3 Flammable Liquids 4907 (Tons)

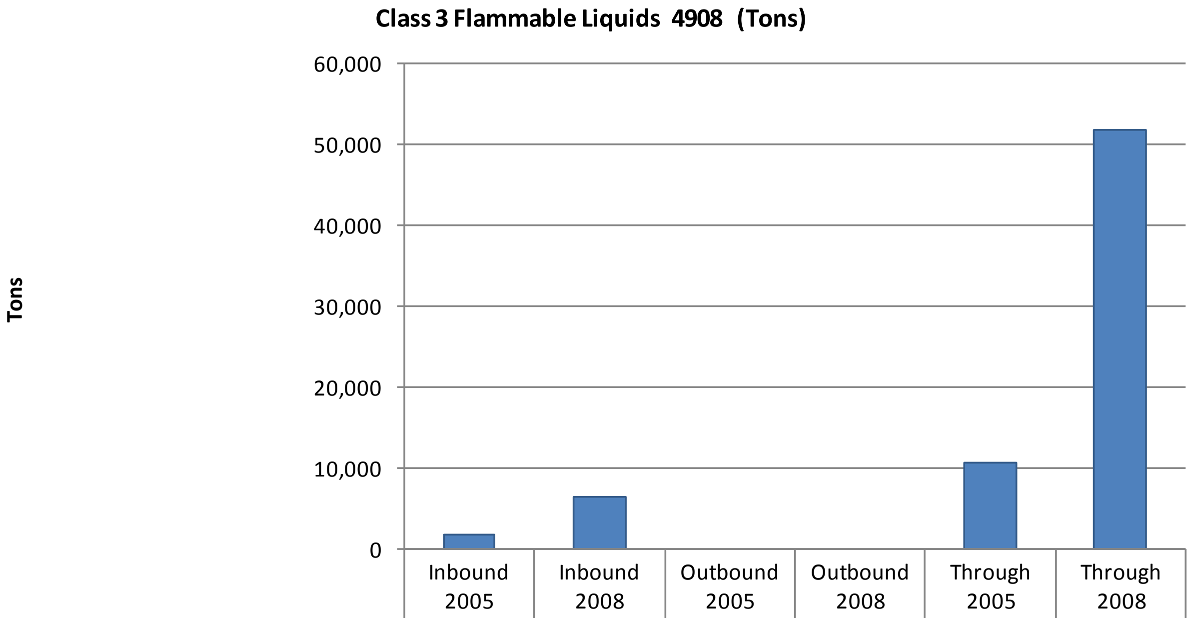


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4907 (Tons)	0	18,256	0	43	3,657	143,198

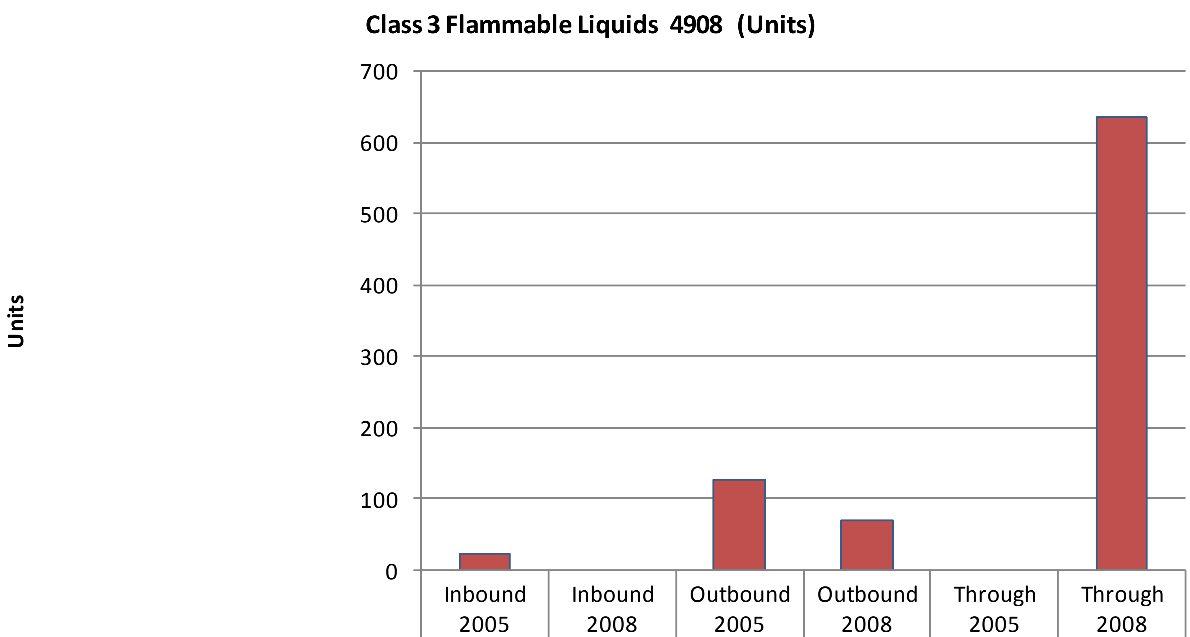
Class 3 Flammable Liquids 4907 (Units)



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4907 (Units)	0	0	43	198	0	1,539

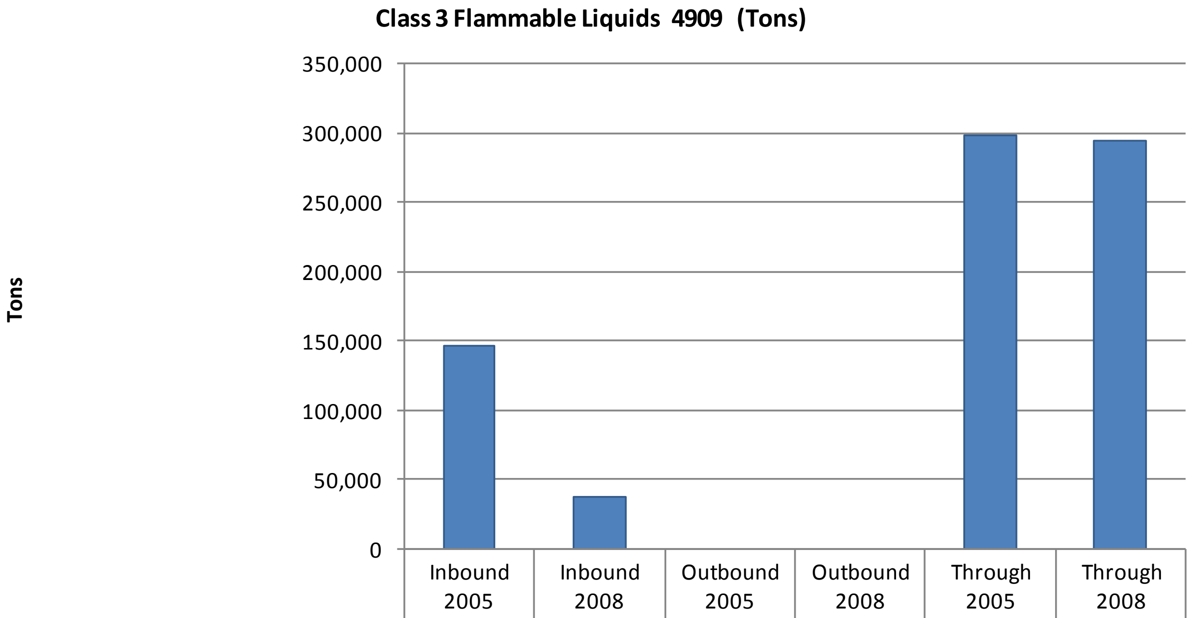


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4908 (Tons)	1,672	6,469	0	0	10,757	51,883



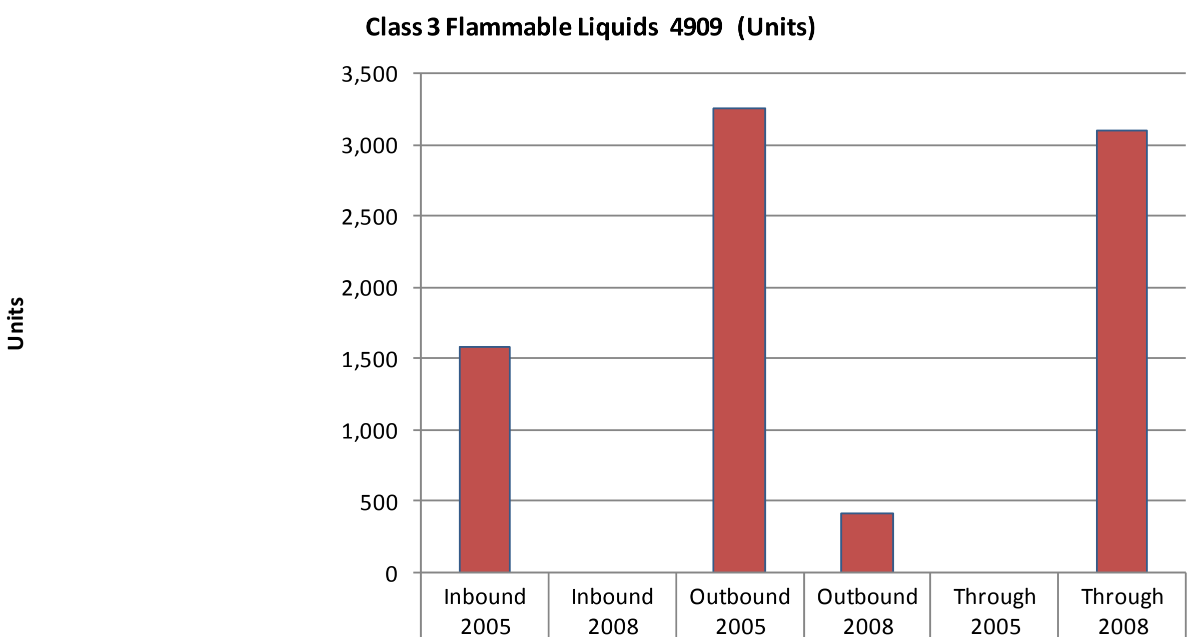
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4908 (Units)	22	0	126	70	0	635

Class 3 Flammable Liquids 4909 (Tons)

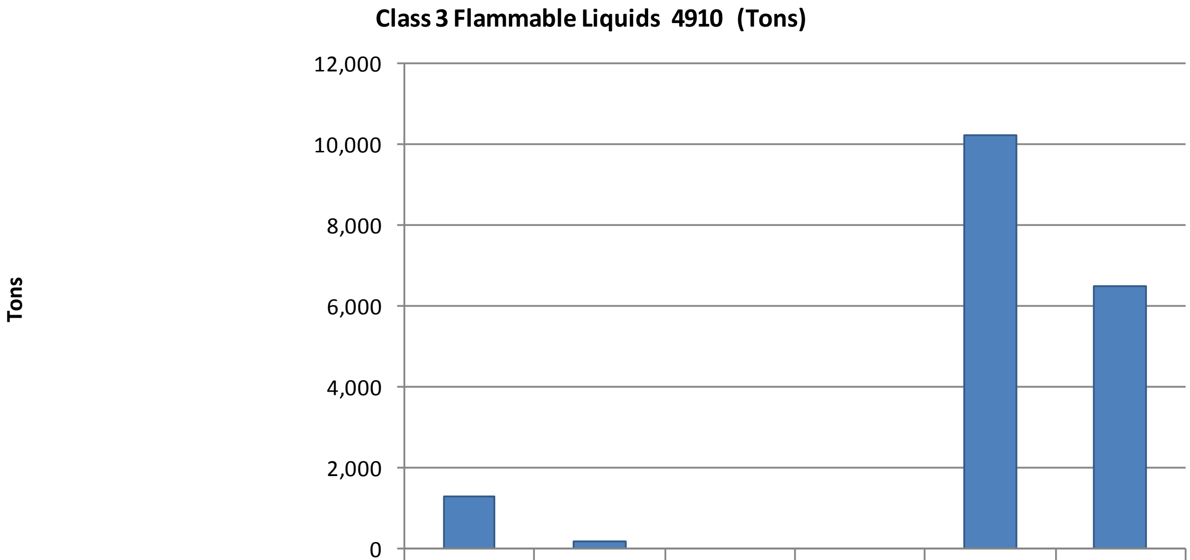


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4909 (Tons)	145,895	37,622	0	0	298,710	294,123

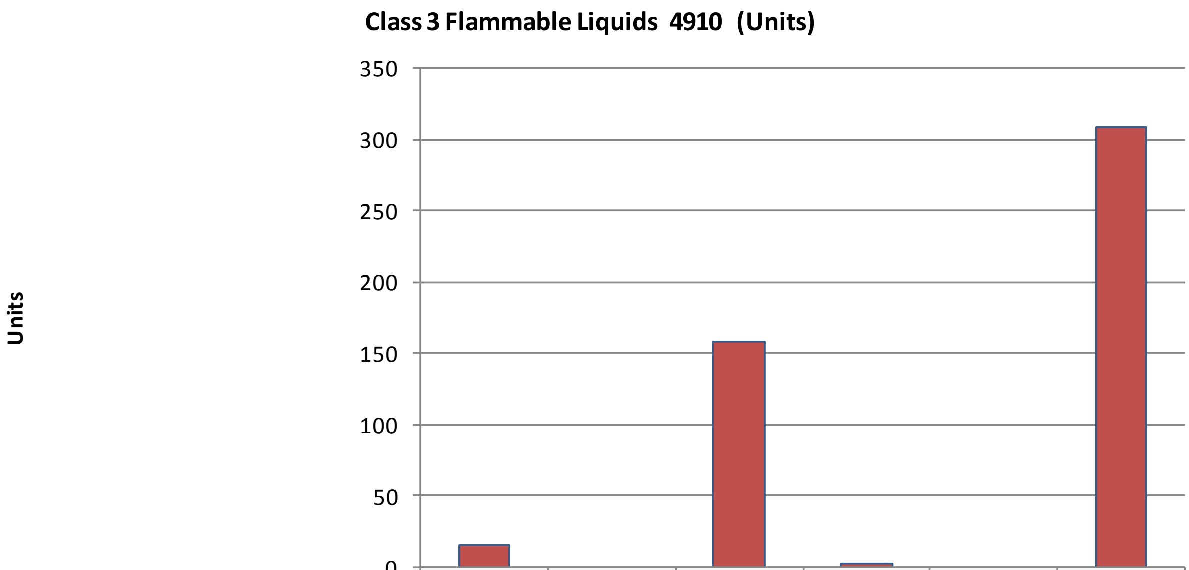
Class 3 Flammable Liquids 4909 (Units)



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4909 (Units)	1,583	0	3,258	408	0	3,106

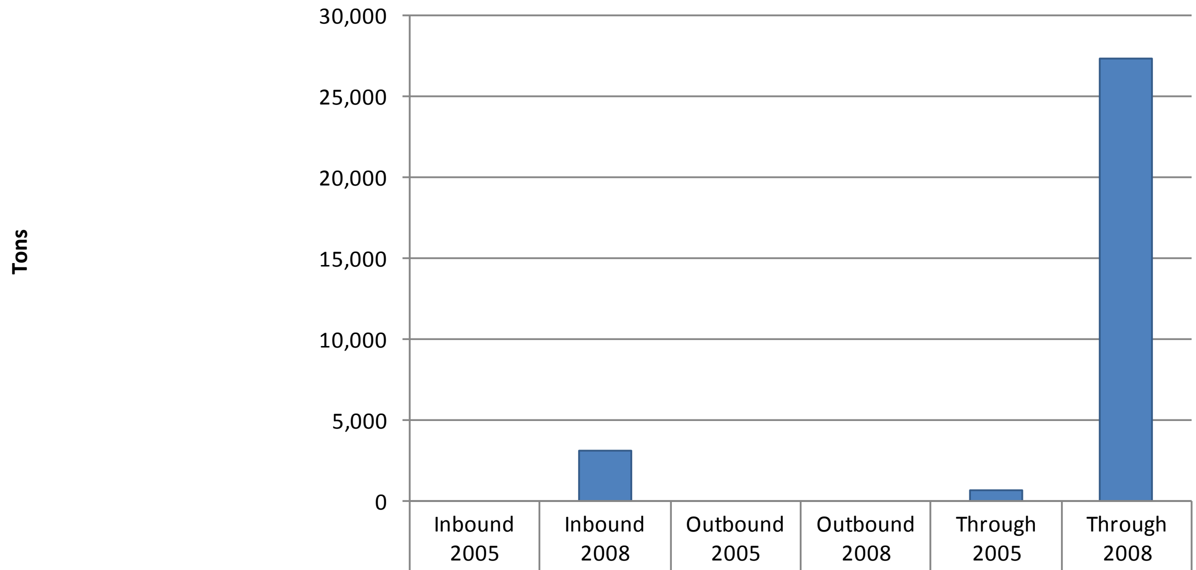


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4910 (Tons)	1,267	162	0	0	10,214	6,484



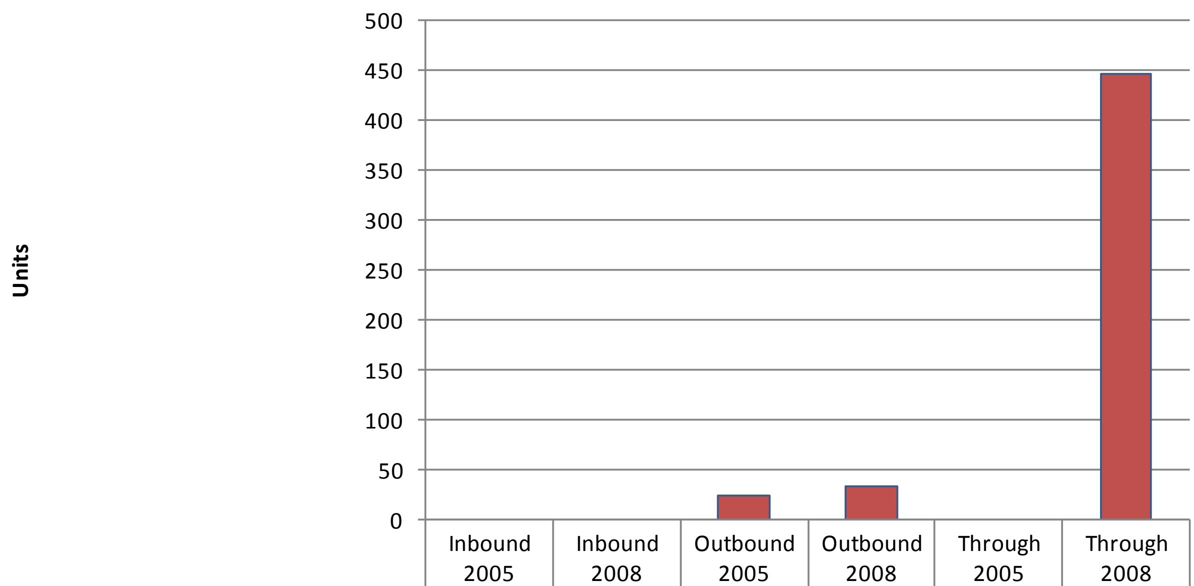
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4910 (Units)	16	0	158	2	0	308

Class 3 Flammable Liquids 4912 (Tons)

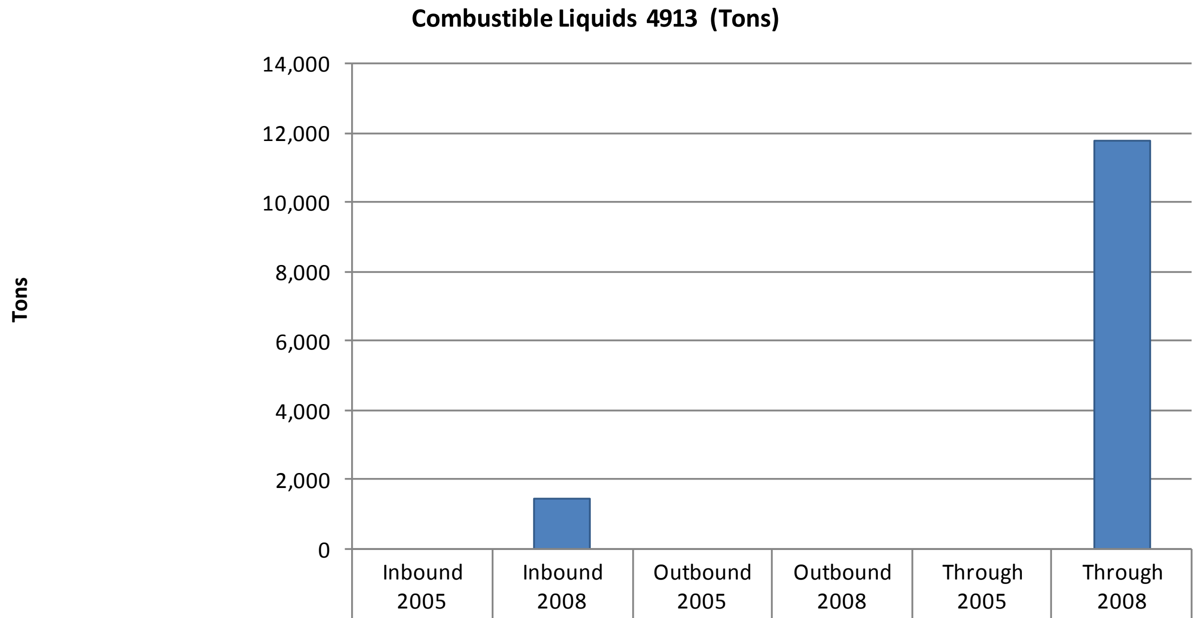


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4912 (Tons)	0	3,078	0	0	637	27,388

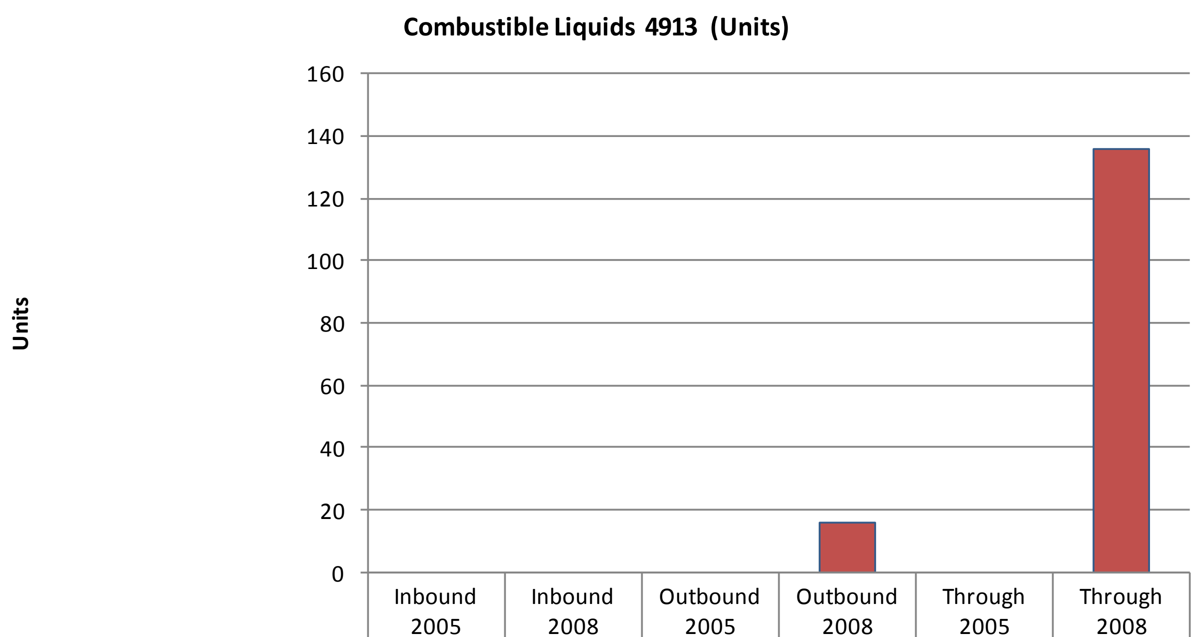
Class 3 Flammable Liquids 4912 (Units)



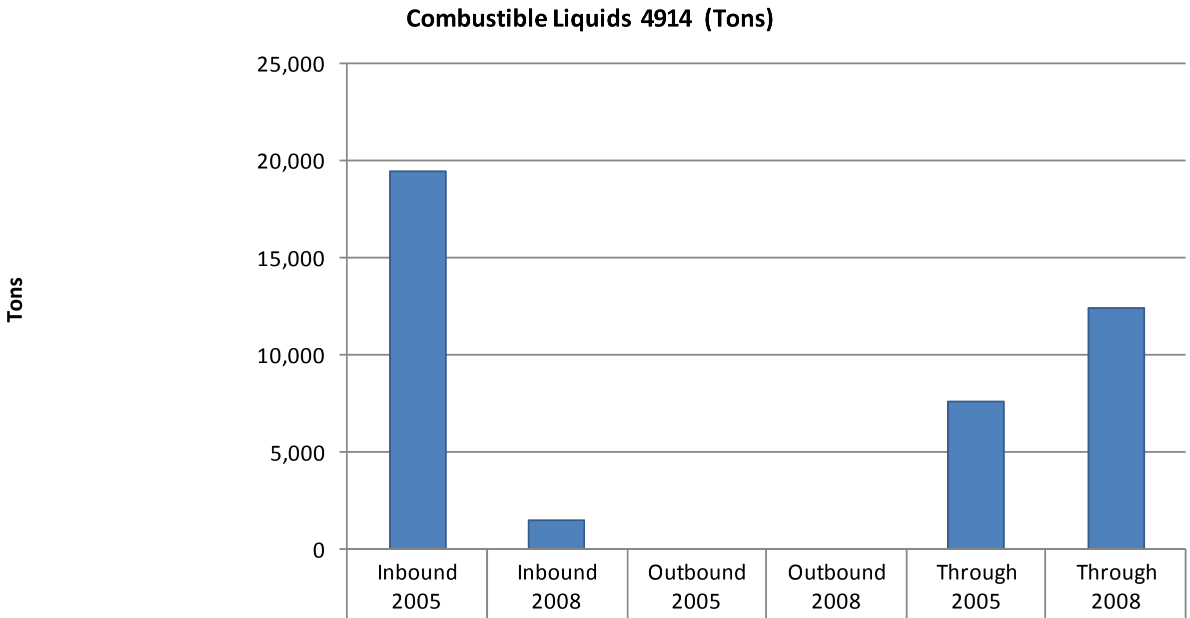
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 3 Flammable Liquids 4912 (Units)	0	0	24	33	0	447



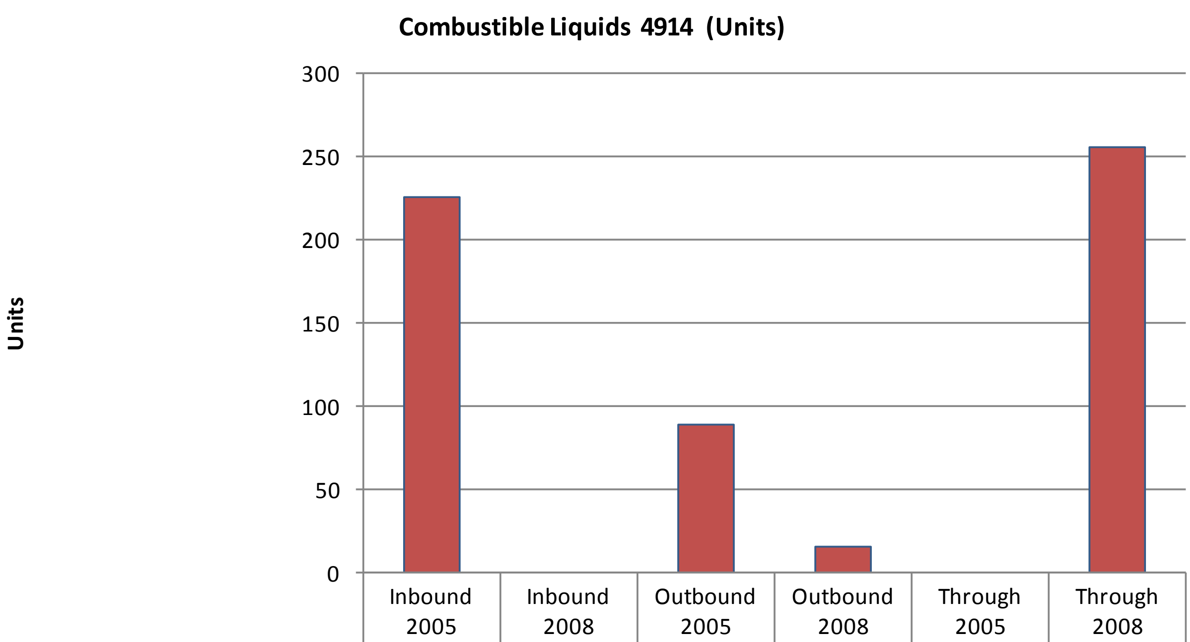
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Combustible Liquids 4913 (Tons)	0	1,451	0	0	0	11,773



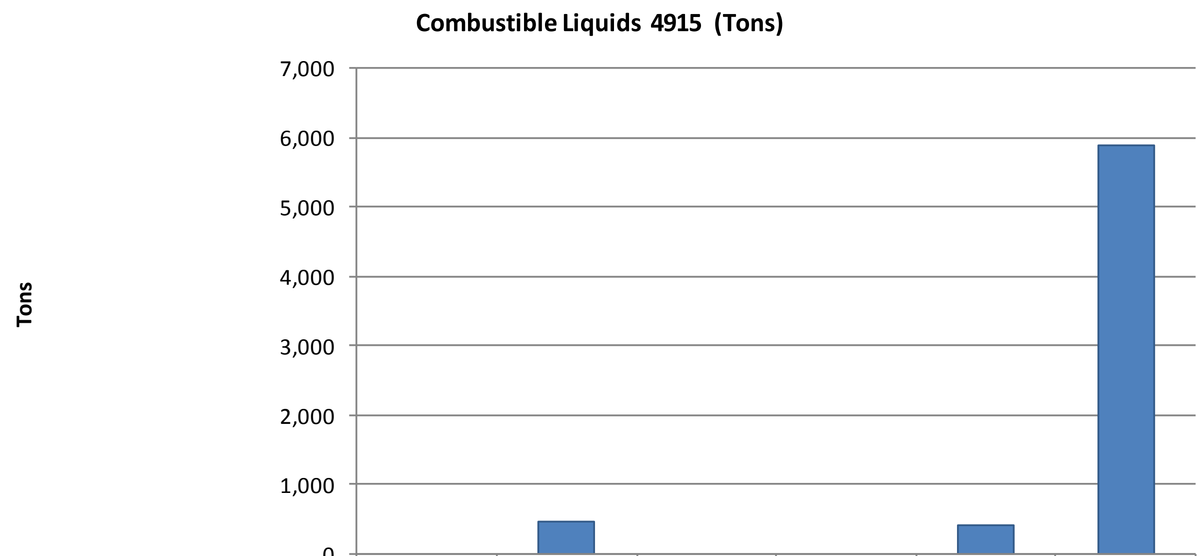
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Combustible Liquids 4913 (Units)	0	0	0	16	0	136



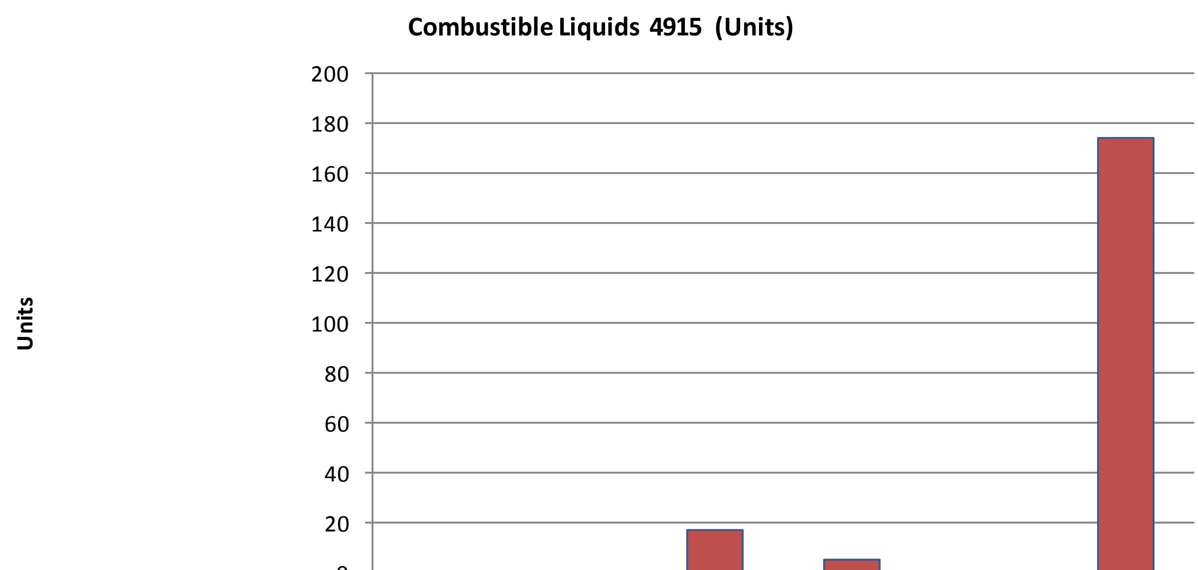
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Combustible Liquids 4914 (Tons)	19,439	1,430	0	0	7,560	12,393



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Combustible Liquids 4914 (Units)	226	0	89	16	0	256

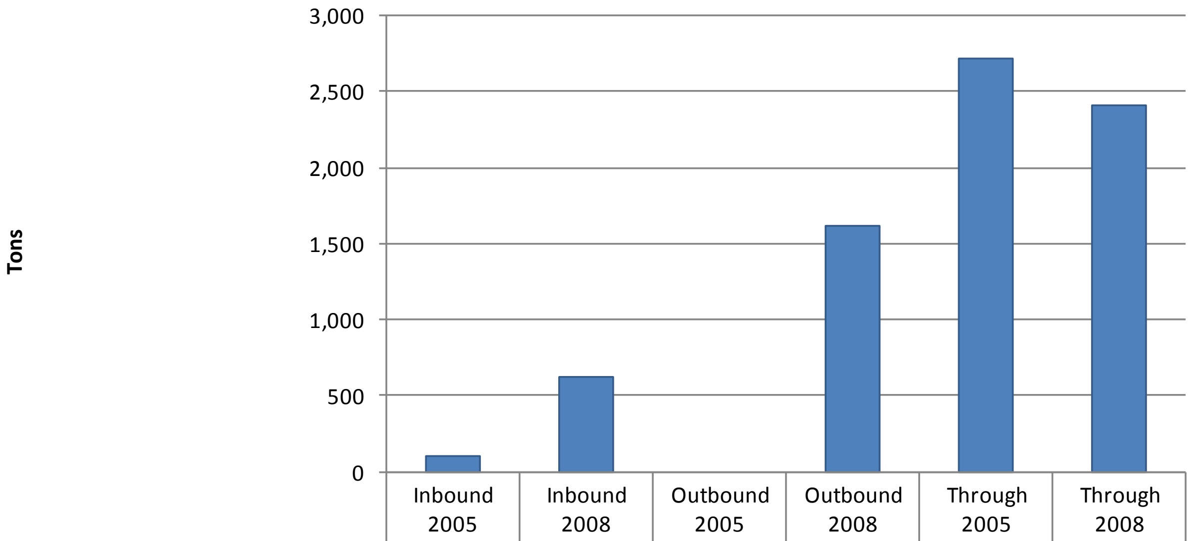


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Combustible Liquids 4915 (Tons)	0	464	0	0	420	5,892



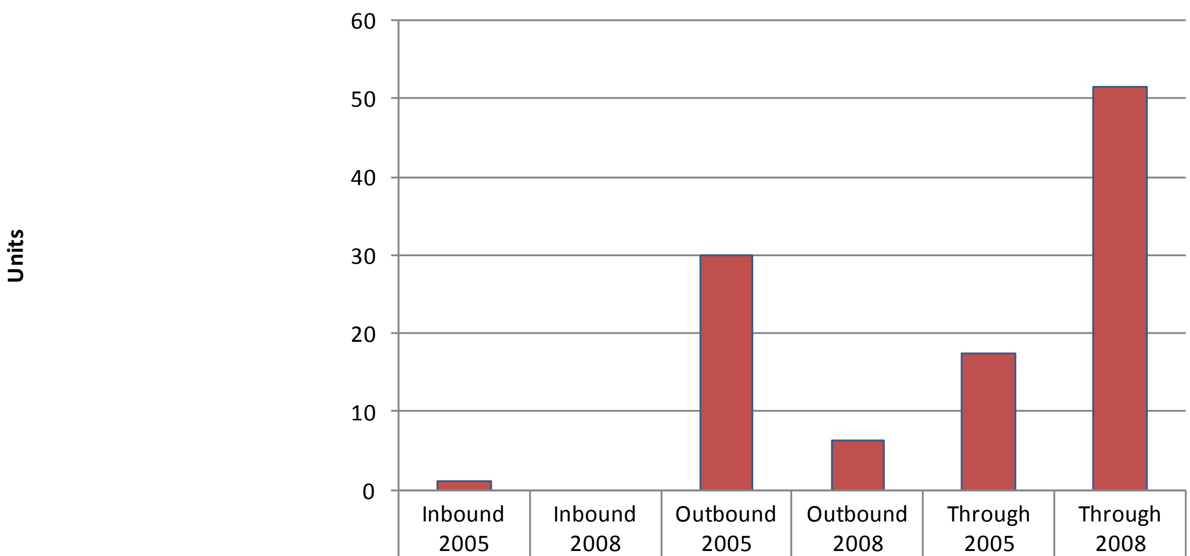
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Combustible Liquids 4915 (Units)	0	0	17	5	0	174

Division 4.2 Spont. Combustible & 4.3 Dangerous when Wet 4916 (Tons)



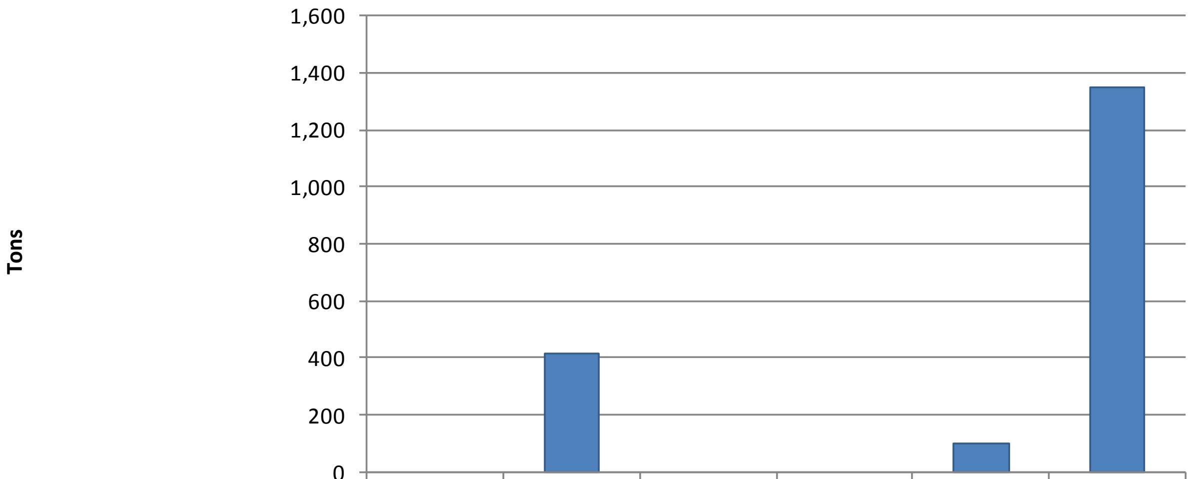
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 4.2 Spont. Combustible & 4.3 Dangerous when Wet 4916 (Tons)	99	625	0	1,614	2,718	2,414

Division 4.2 Spont. Combustible & 4.3 Dangerous when Wet 4916 (Units)



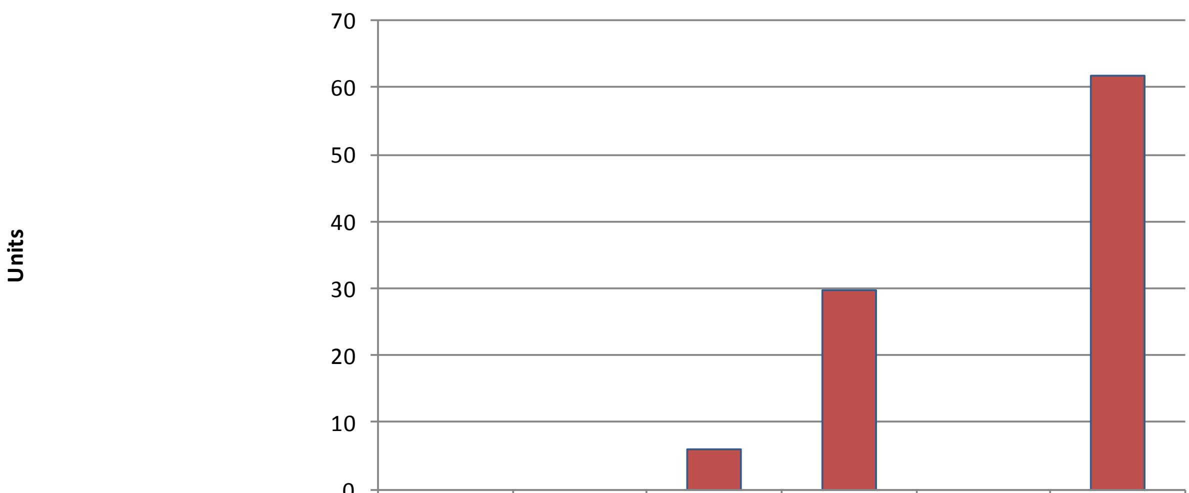
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 4.2 Spont. Combustible & 4.3 Dangerous when Wet 4916 (Units)	1	0	30	6	17	51

Division 4.1 Flammable Solids 4917 (Tons)

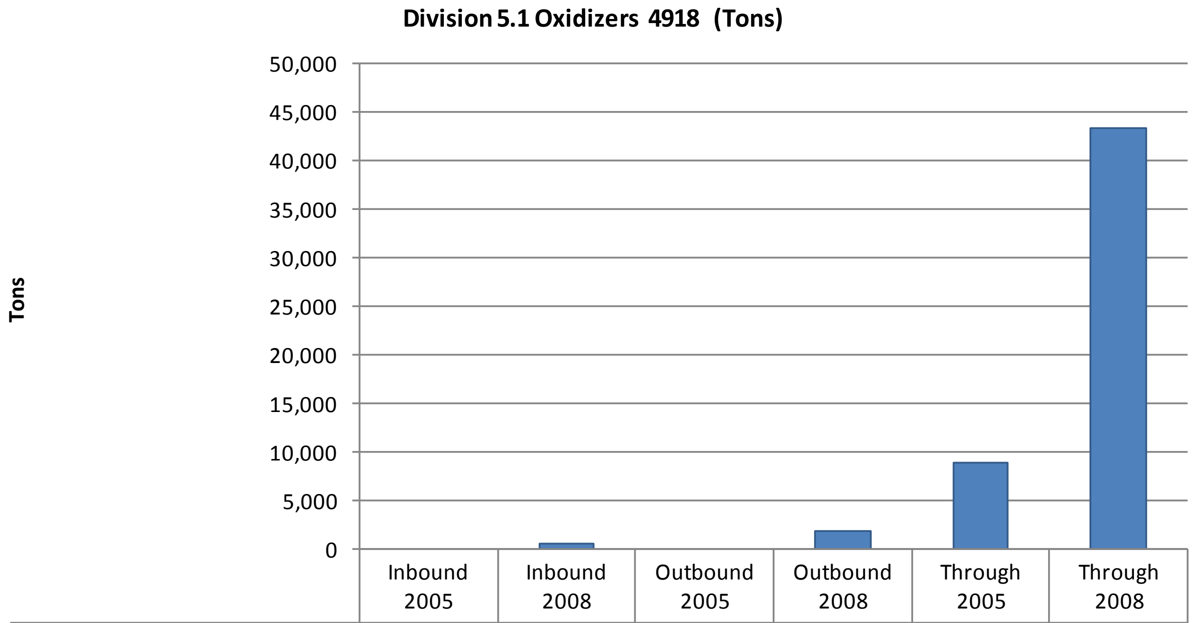


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 4.1 Flammable Solids 4917 (Tons)	0	417	0	0	100	1,350

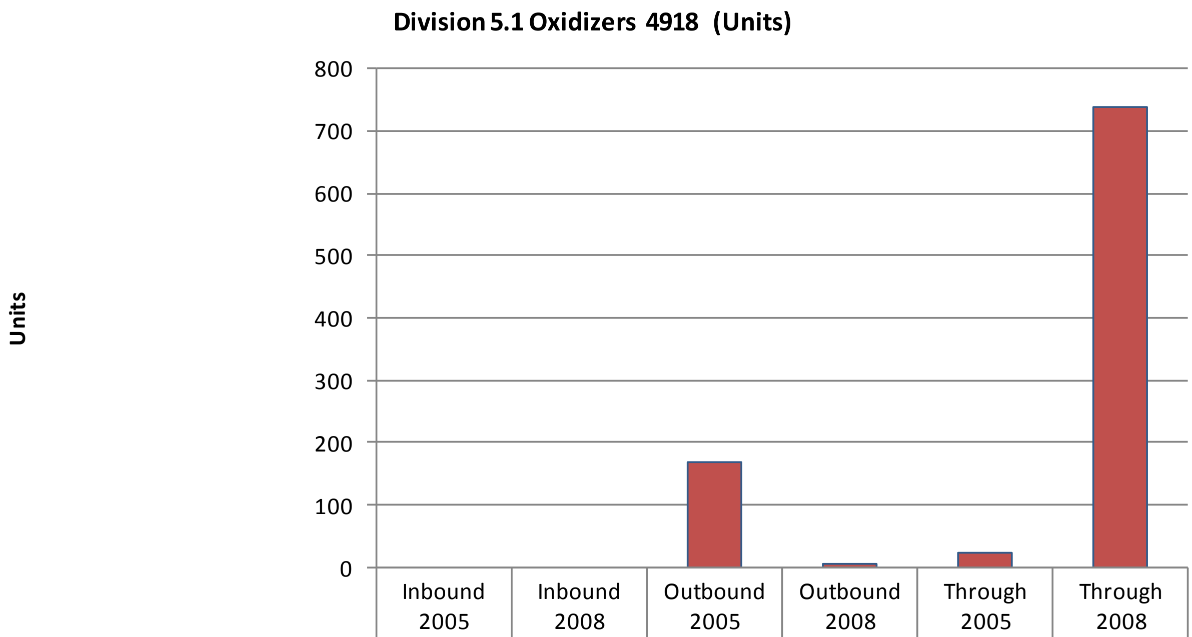
Division 4.1 Flammable Solids 4917 (Units)



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 4.1 Flammable Solids 4917 (Units)	0	0	6	30	0	62



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 5.1 Oxidizers 4918 (Tons)	0	591	0	1,873	8,959	43,415



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 5.1 Oxidizers 4918 (Units)	0	0	168	6	22	739

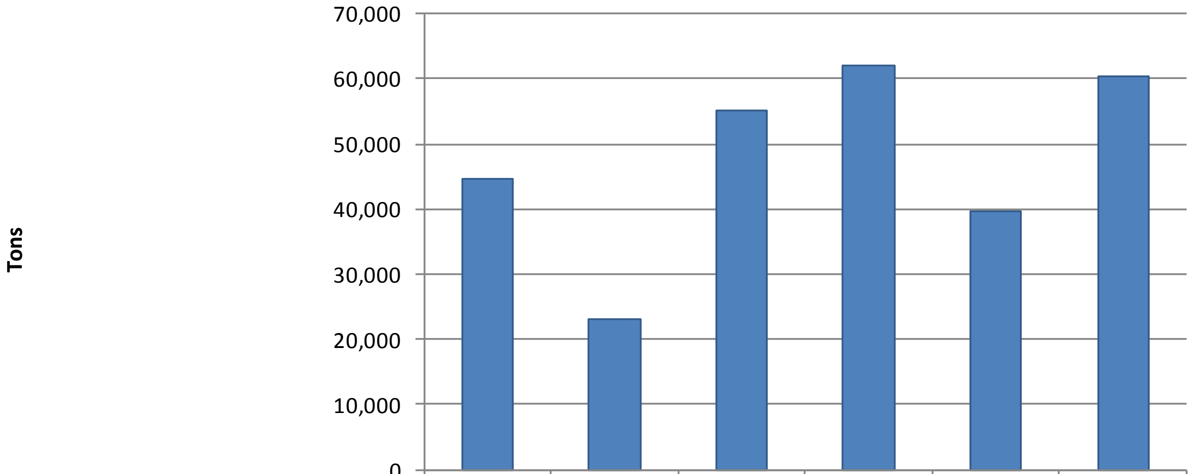
Division 5.2 Organic Peroxides 4919 (Tons)

	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 5.2 Organic Peroxides 4919 (Tons)	0	0	0	0	0	7

Division 5.2 Organic Peroxides 4919 (Units)

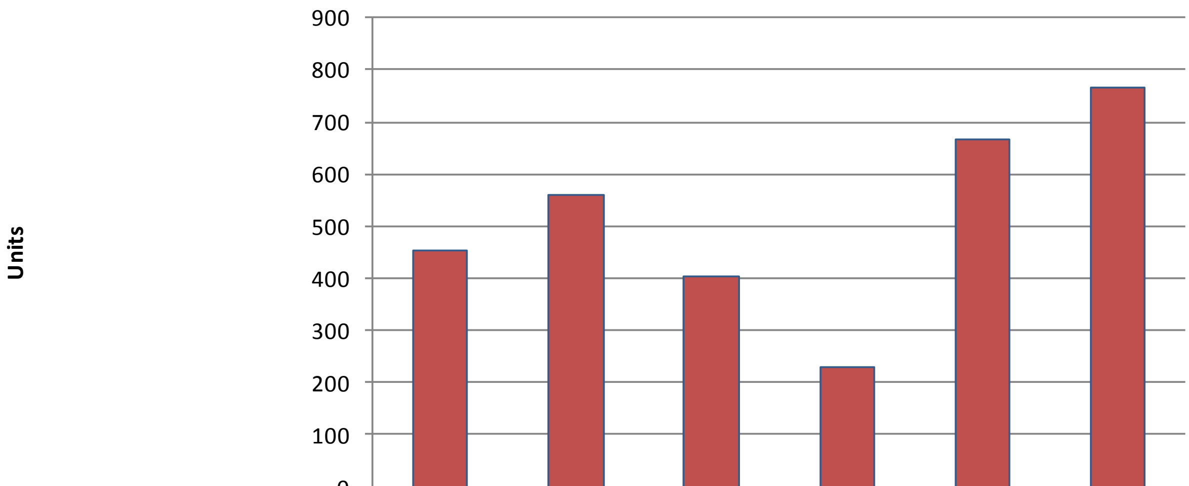
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 5.2 Organic Peroxides 4919 (Units)	0	0	0	0	0	0

Division 2.3 Poisonous or Corrosive Gases 4920 (Tons)

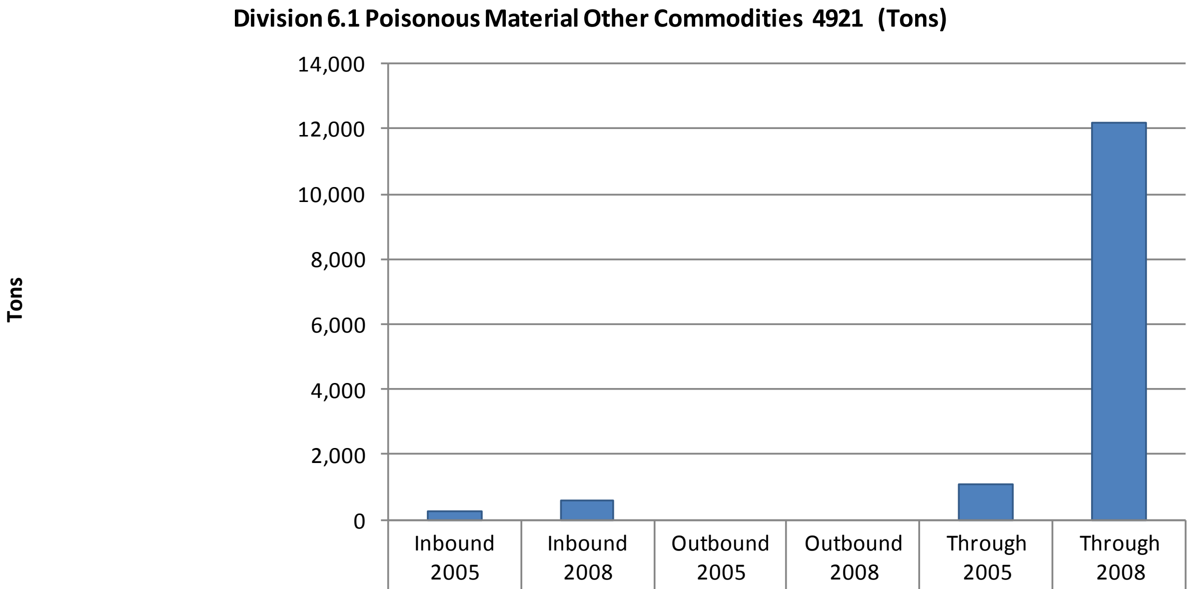


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 2.3 Poisonous or Corrosive Gases 4920 (Tons)	44,765	23,033	55,277	61,915	39,603	60,326

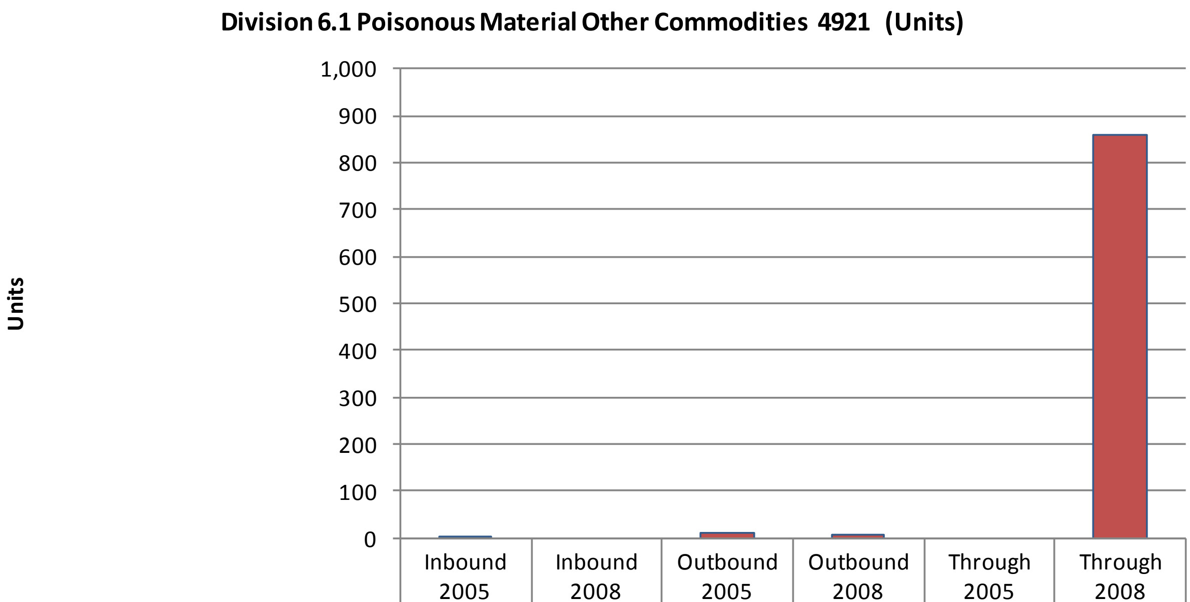
Division 2.3 Poisonous or Corrosive Gases 4920 (Units)



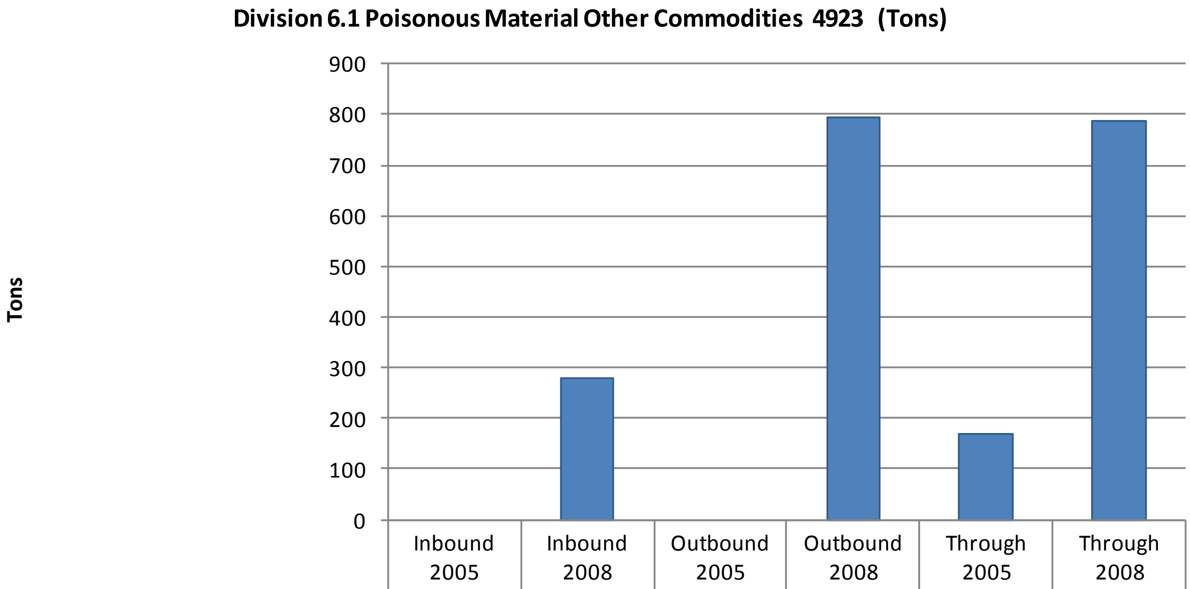
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 2.3 Poisonous or Corrosive Gases 4920 (Units)	453	560	402	231	668	767



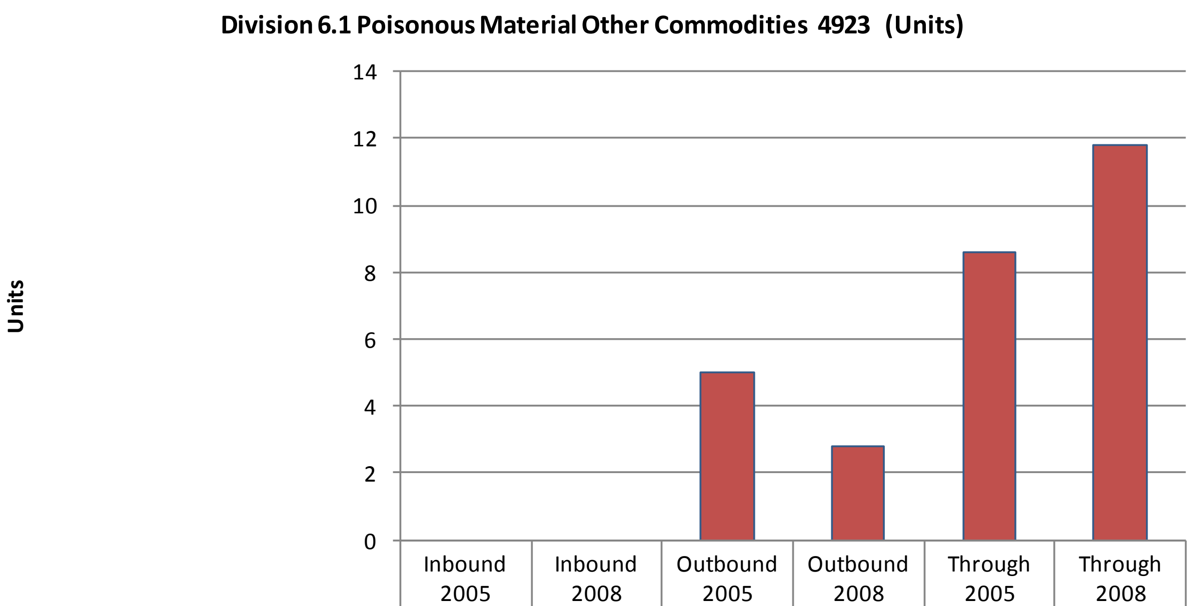
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.1 Poisonous Material Other Commodities 4921 (Tons)	272	569	0	0	1,087	12,196



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.1 Poisonous Material Other Commodities 4921 (Units)	3	0	12	6	0	860

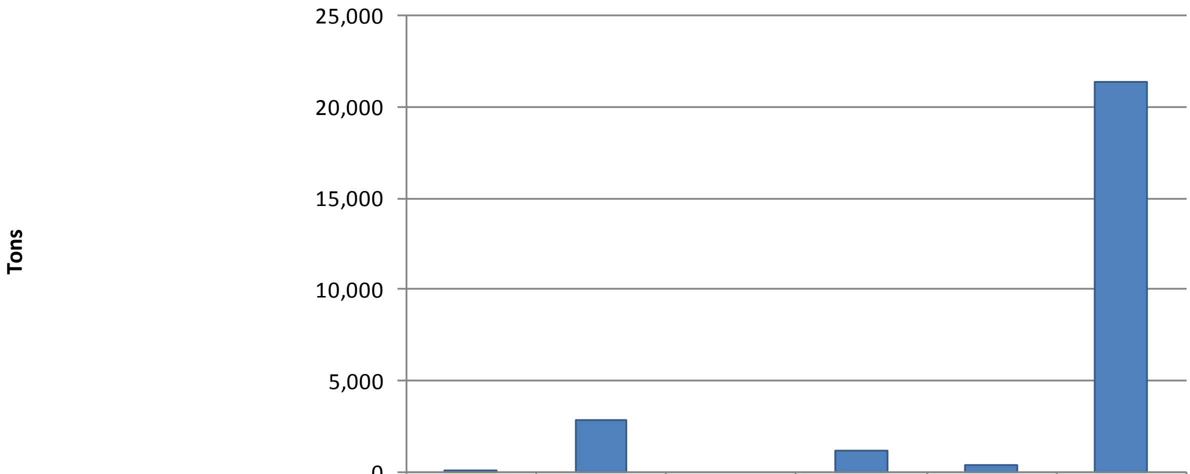


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.1 Poisonous Material Other Commodities 4923 (Tons)	0	278	0	796	169	787



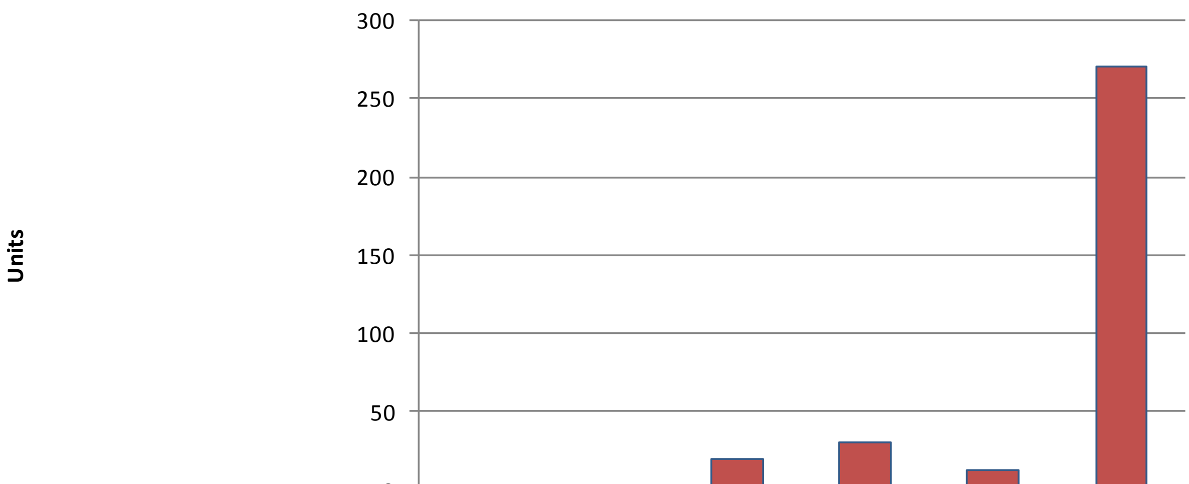
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.1 Poisonous Material Other Commodities 4923 (Units)	0	0	5	3	9	12

Division 6.1 Poisonous Material Packing Group III 4925 (Tons)



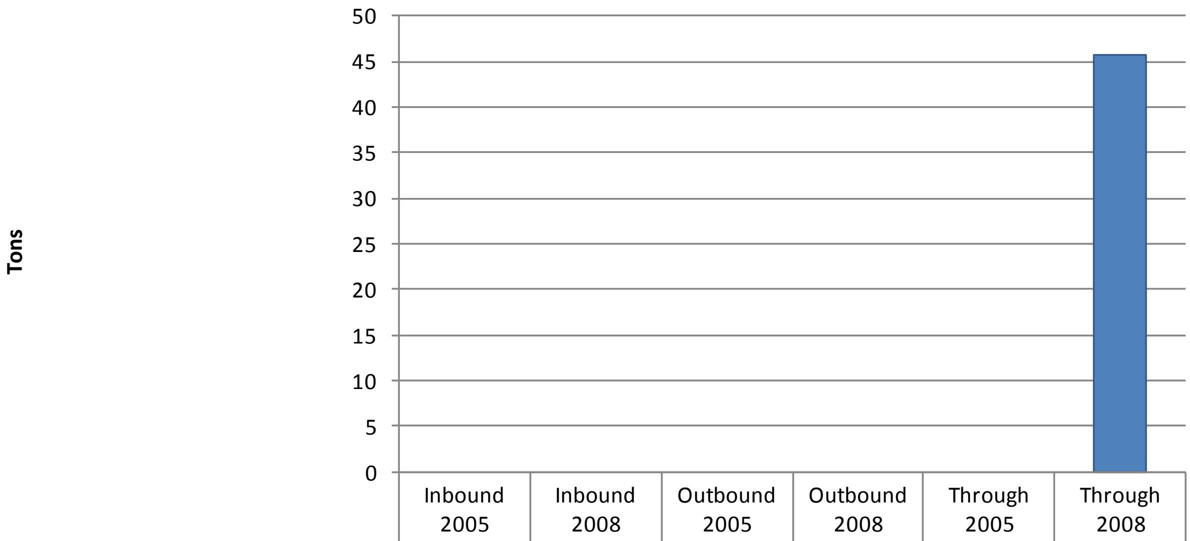
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.1 Poisonous Material Packing Group III 4925 (Tons)	21	2,862	0	1,113	371	21,322

Division 6.1 Poisonous Material Packing Group III 4925 (Units)



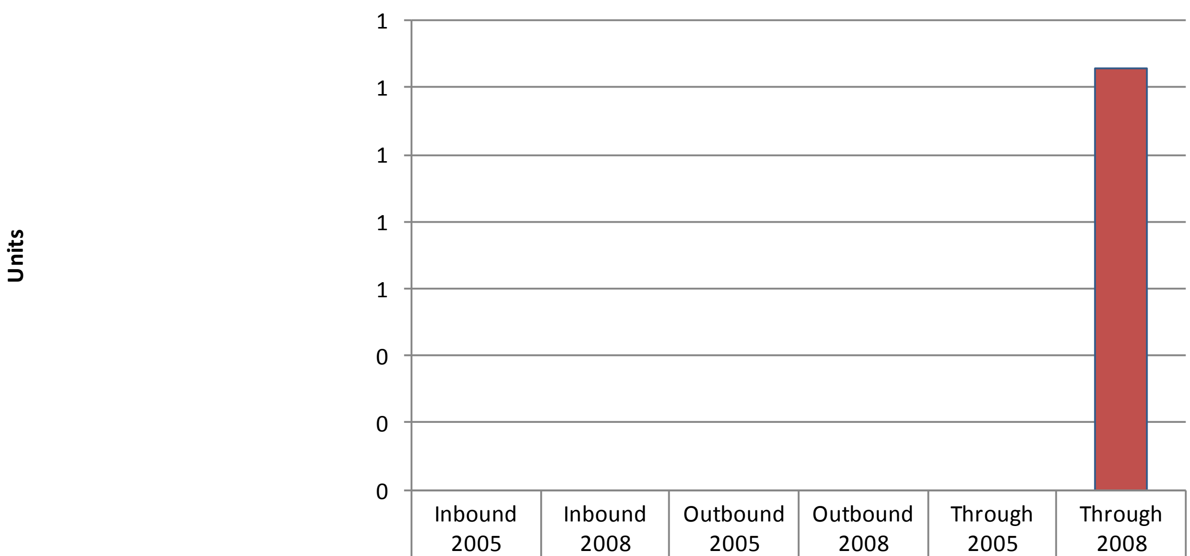
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.1 Poisonous Material Packing Group III 4925 (Units)	1	0	20	31	12	271

Division 6.1 Poisonous Material Hazard Zone A 4927 (Tons)



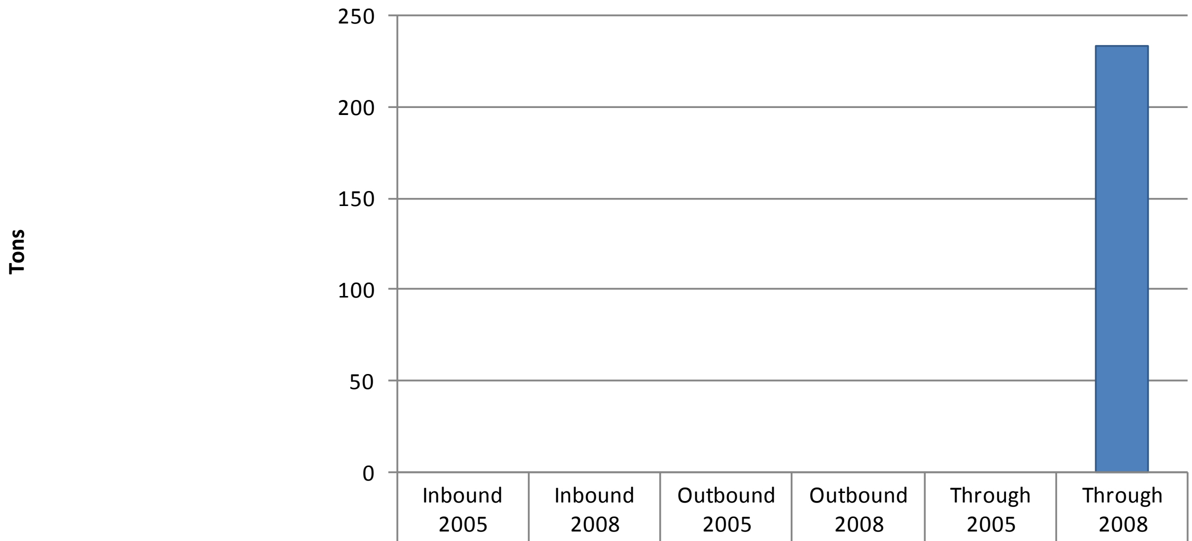
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.1 Poisonous Material Hazard Zone A 4927 (Tons)	0	0	0	0	0	46

Division 6.1 Poisonous Material Hazard Zone A 4927 (Units)



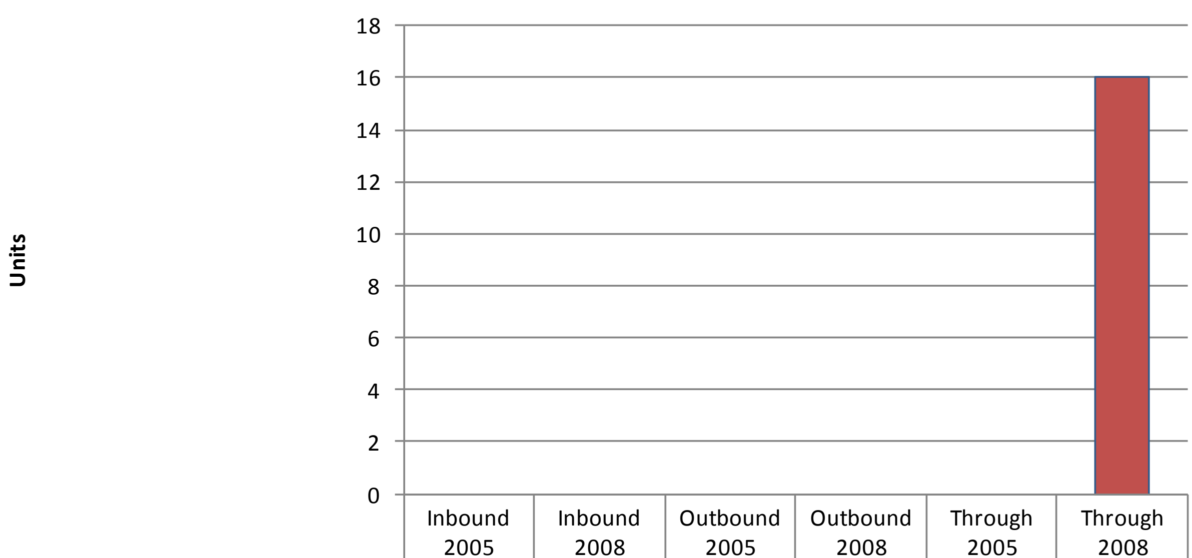
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.1 Poisonous Material Hazard Zone A 4927 (Units)	0	0	0	0	0	1

Division 6.2 Etiologic Agents Infectious Substances 4928 (Tons)

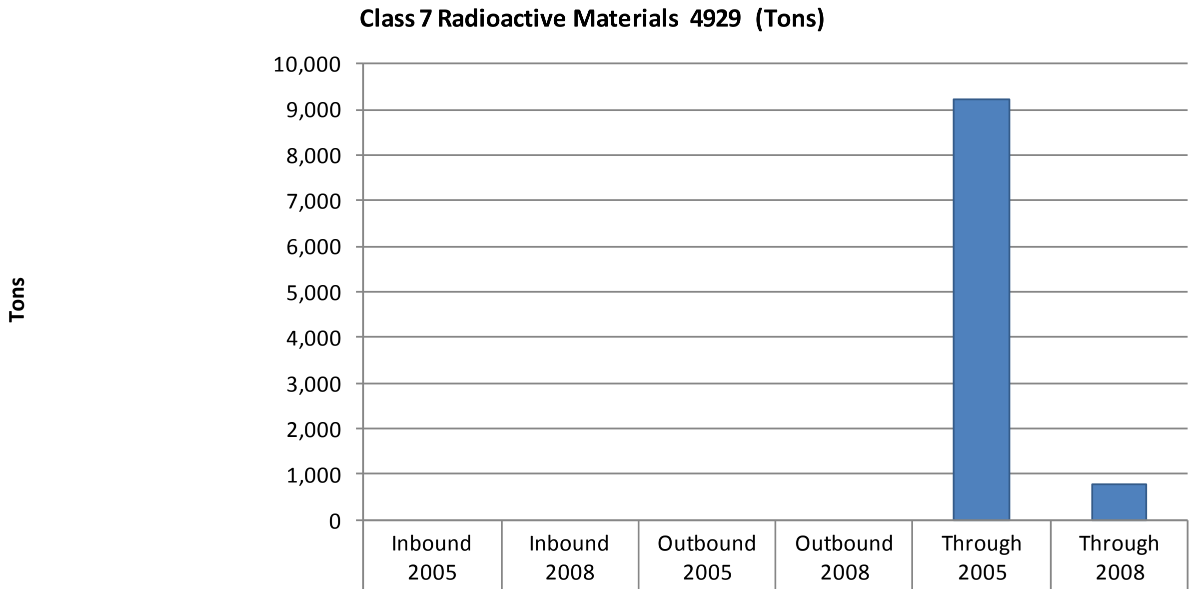


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.2 Etiologic Agents Infectious Substances 4928 (Tons)	0	0	0	0	0	233

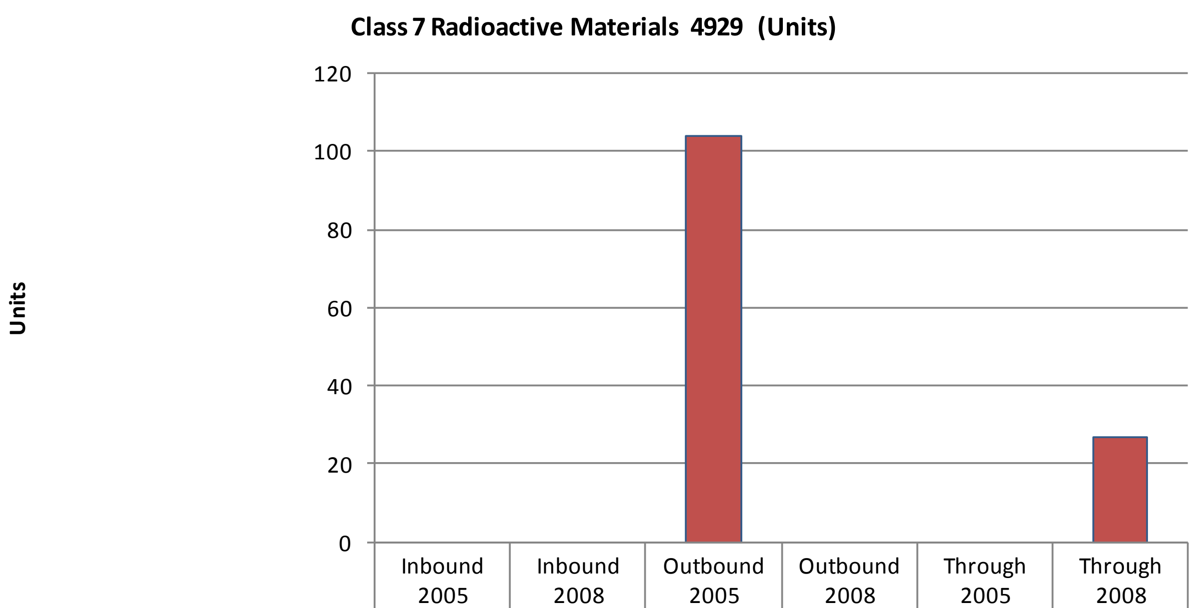
Division 6.2 Etologic Agents Infectious Substances 4928 (Units)



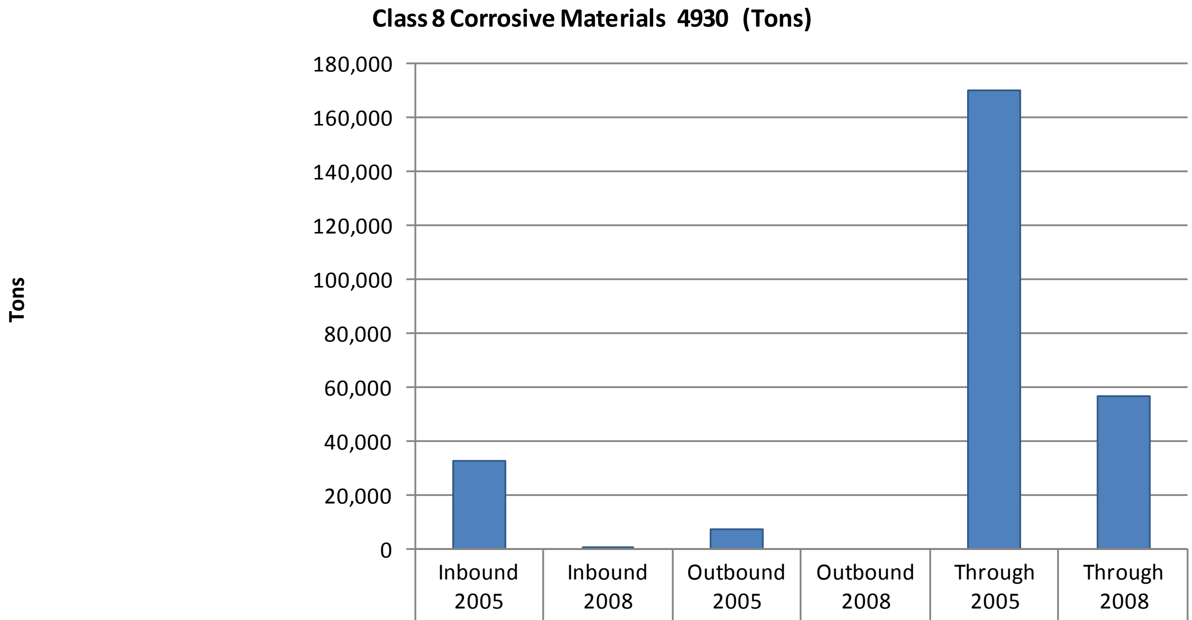
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 6.2 Etologic Agents Infectious Substances 4928 (Units)	0	0	0	0	0	16



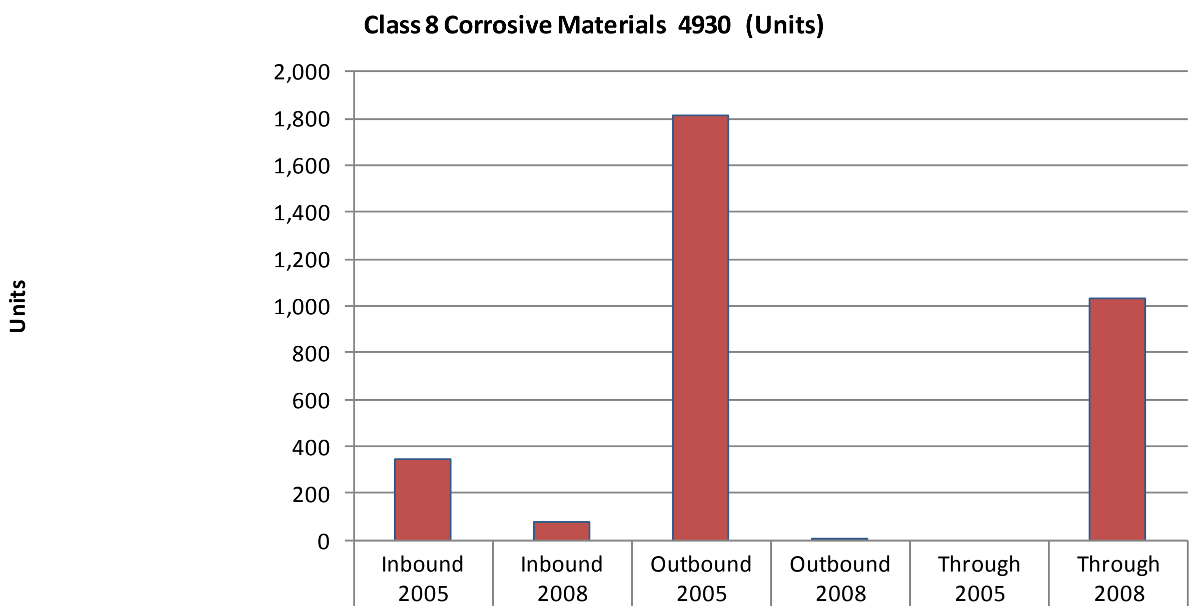
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 7 Radioactive Materials 4929 (Tons)	0	0	0	0	9,219	782



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 7 Radioactive Materials 4929 (Units)	0	0	104	0	0	27

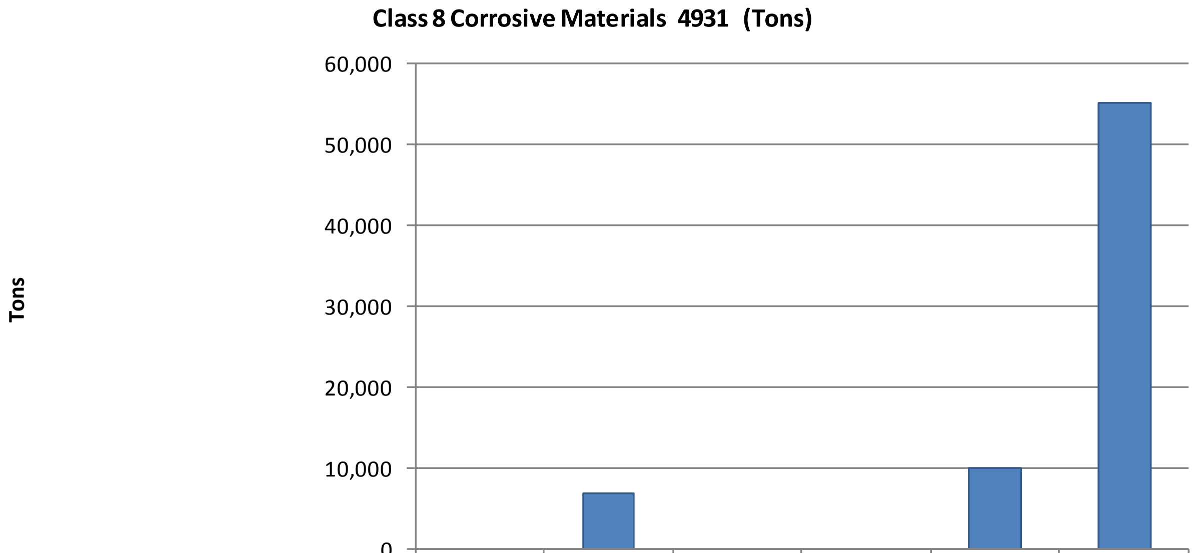


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4930 (Tons)	32,734	15	7,457	0	170,230	56,819



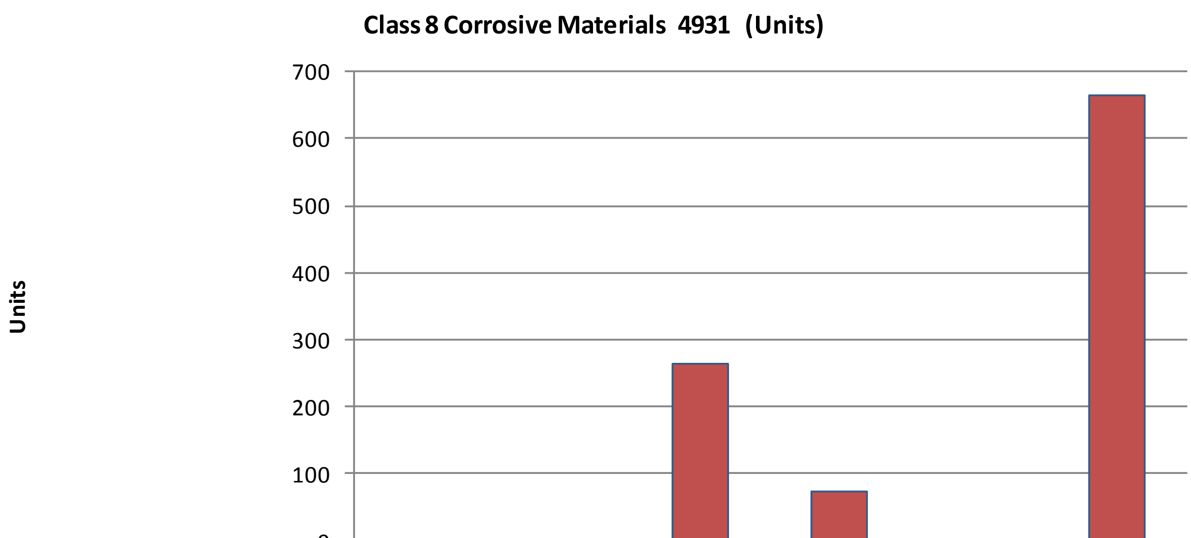
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4930 (Units)	345	79	1,812	1	0	1,029

Class 8 Corrosive Materials 4931 (Tons)

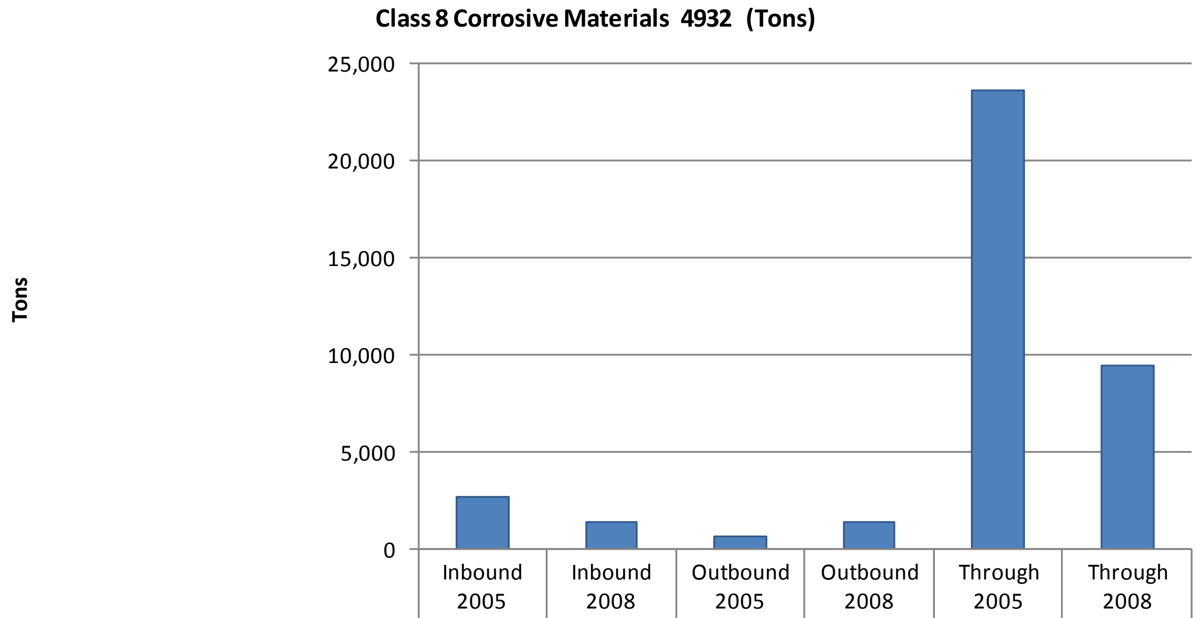


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4931 (Tons)	0	6,822	0	0	9,875	55,224

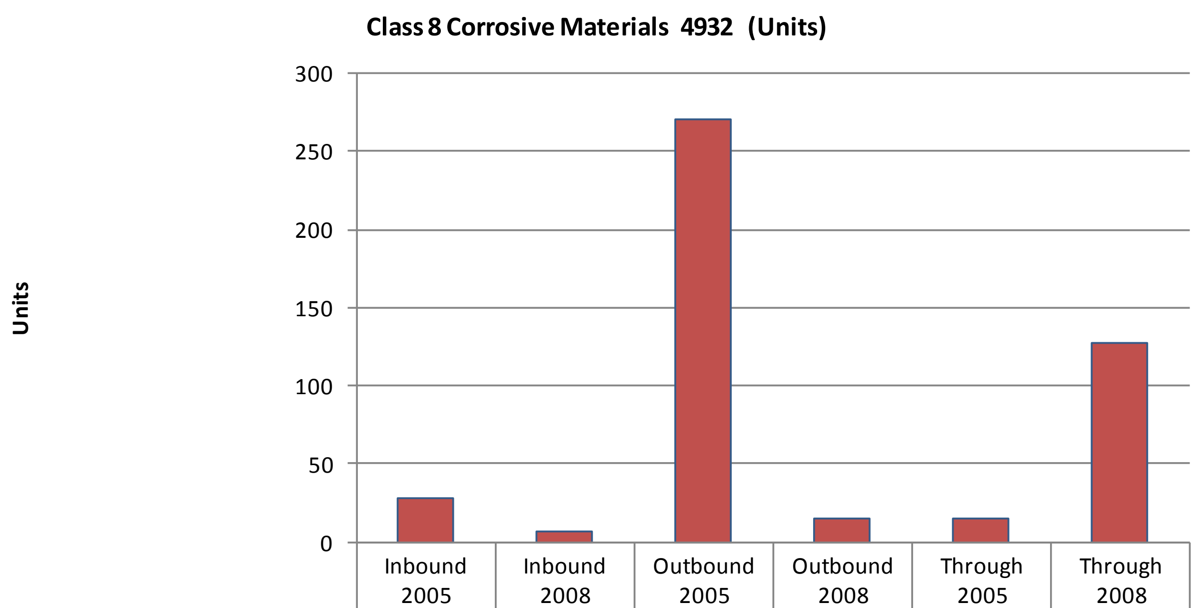
Class 8 Corrosive Materials 4931 (Units)



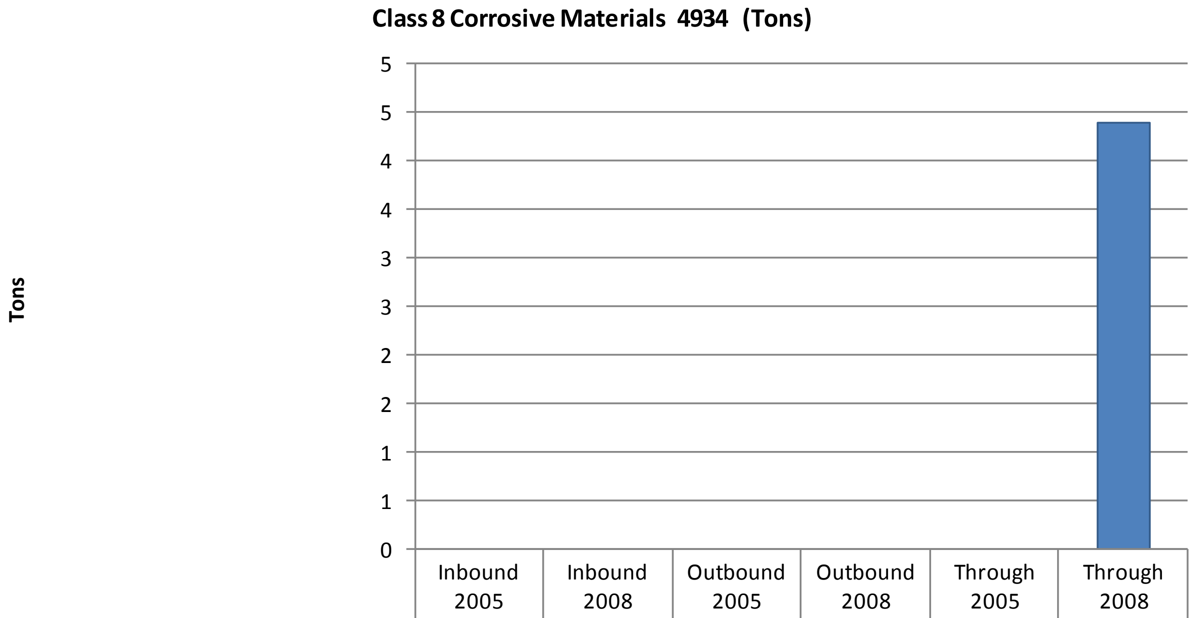
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4931 (Units)	0	0	265	74	0	665



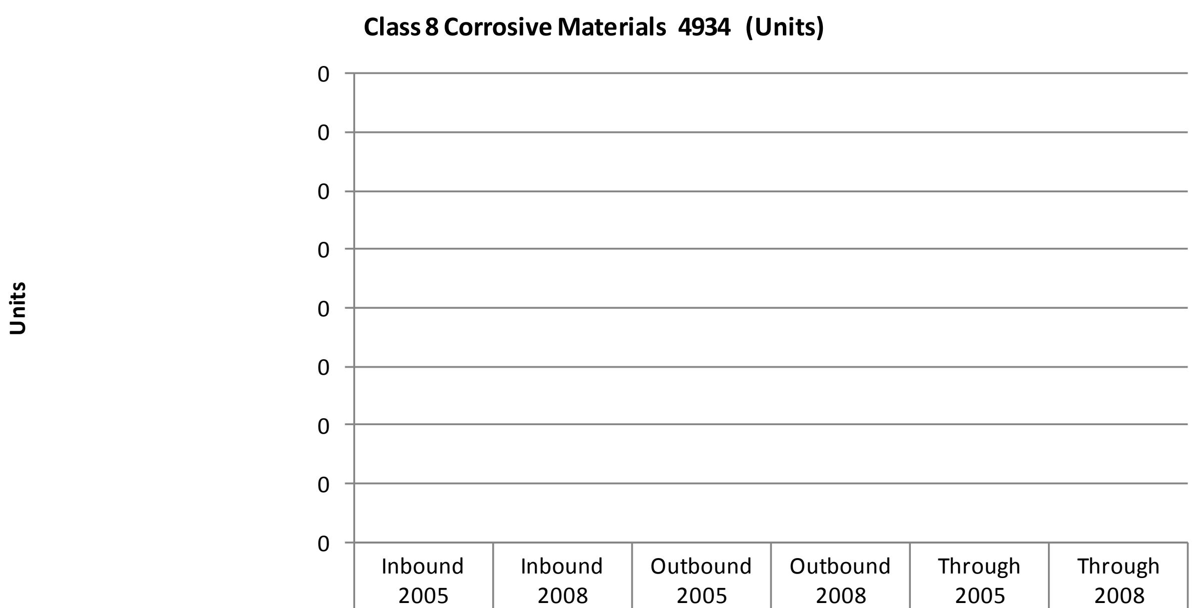
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4932 (Tons)	2,693	1,364	625	1,356	23,637	9,419



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4932 (Units)	28	7	271	14	15	127

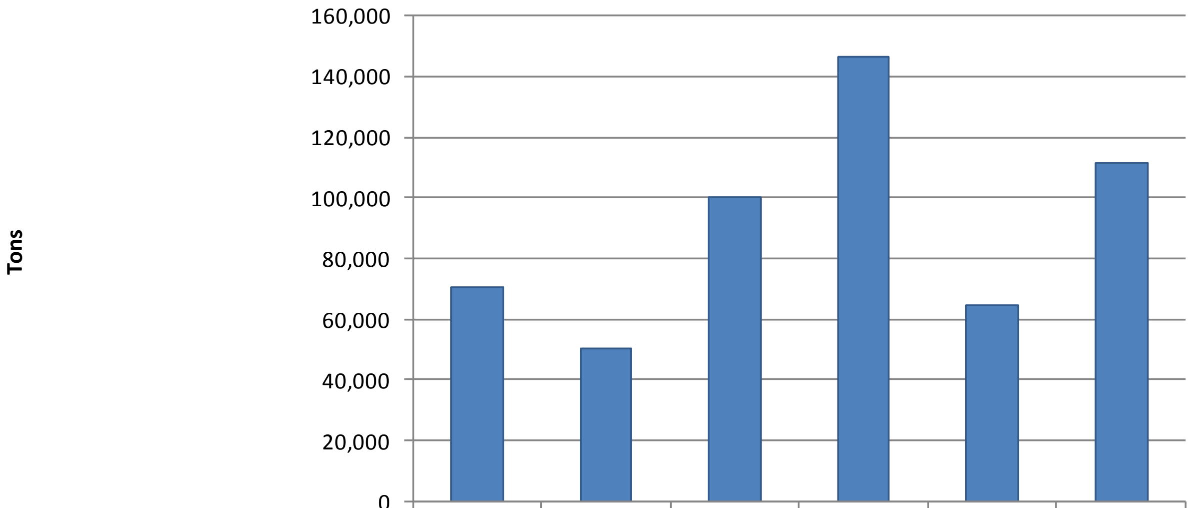


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4934 (Tons)	0	0	0	0	0	4



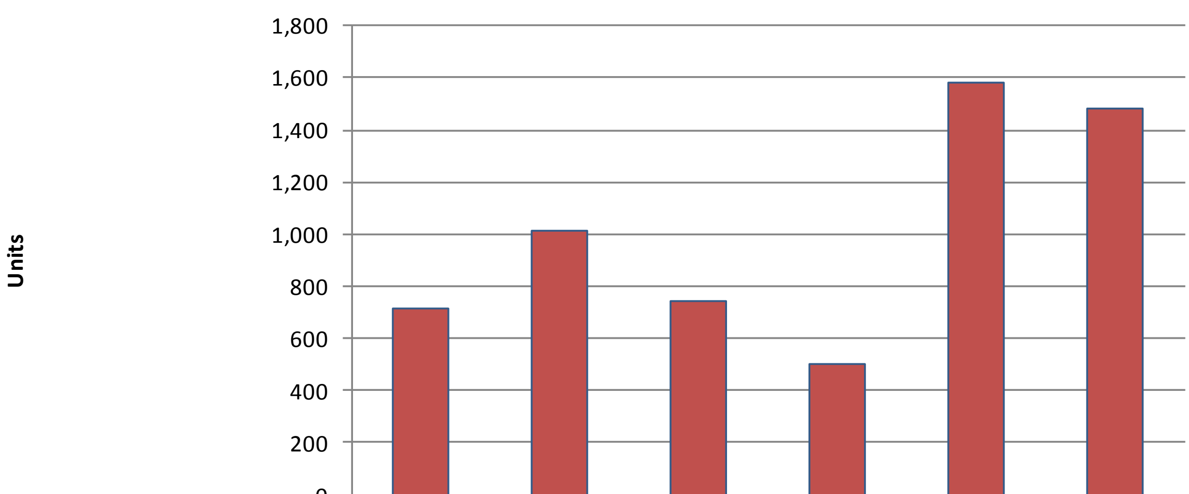
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4934 (Units)	0	0	0	0	0	0

Class 8 Corrosive Materials 4935 (Tons)



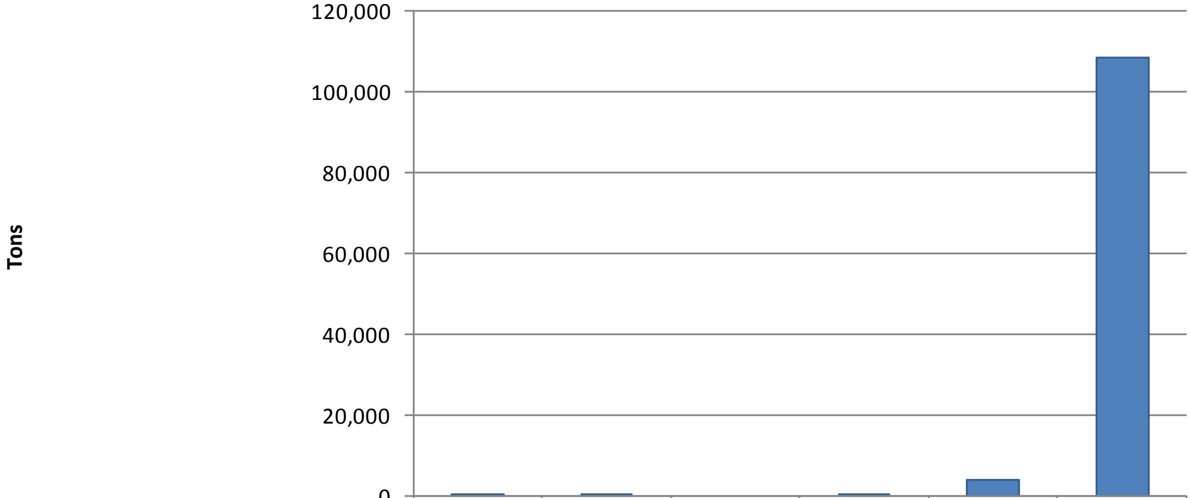
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4935 (Tons)	70,781	50,290	99,971	146,340	64,694	111,501

Class 8 Corrosive Materials 4935 (Units)



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4935 (Units)	717	1,012	743	500	1,578	1,485

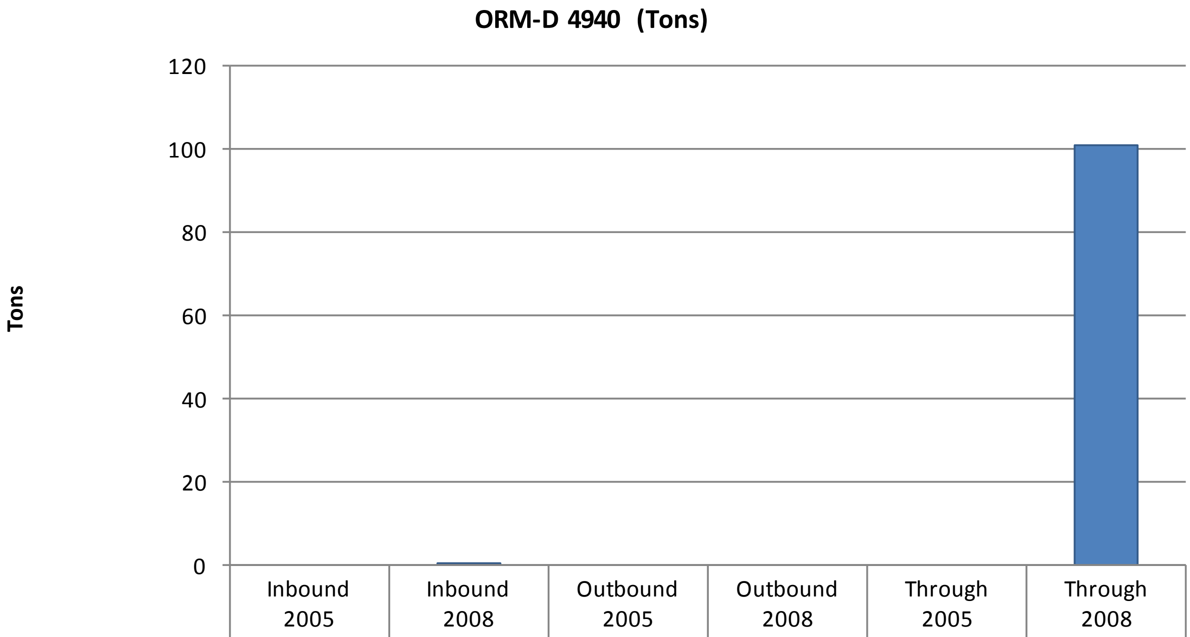
Class 8 Corrosive Materials 4936 (Tons)



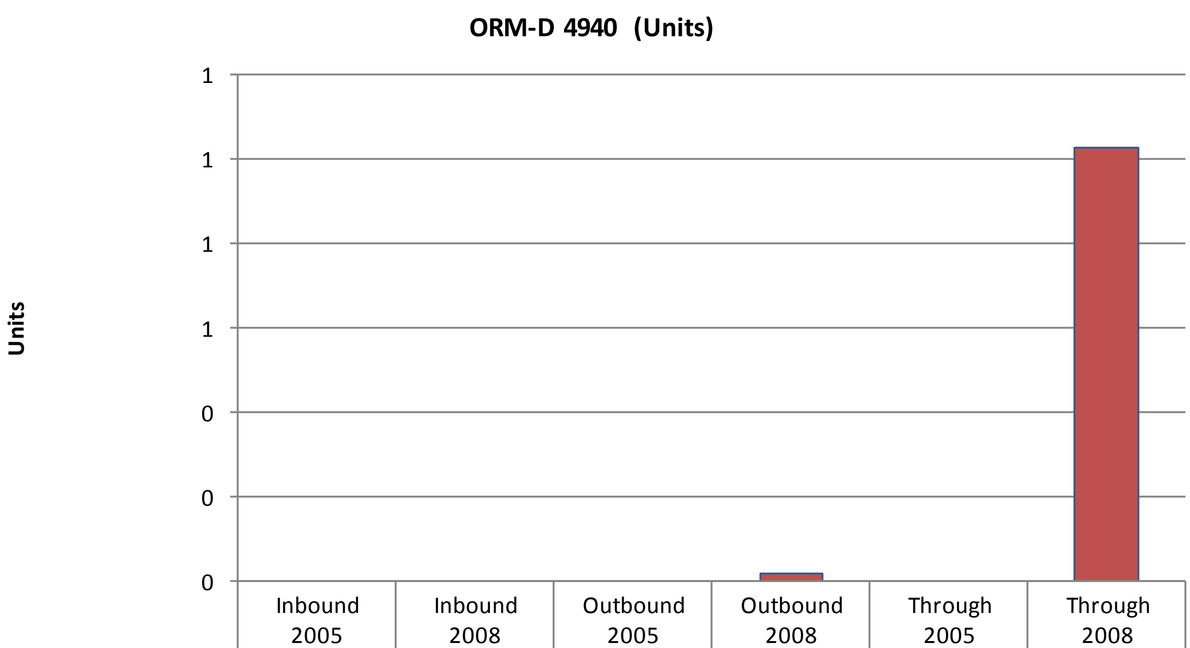
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4936 (Tons)	569	472	0	80	3,873	108,529

Class 8 Corrosive Materials 4936 (Units)

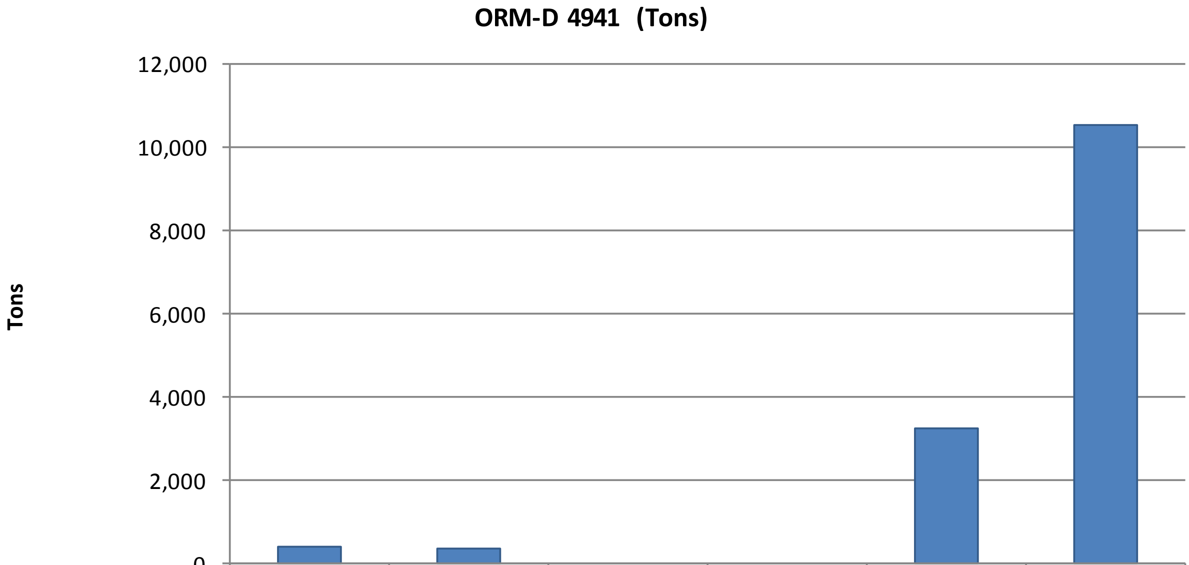
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 8 Corrosive Materials 4936 (Units)	6	0	68	26	1	5,483



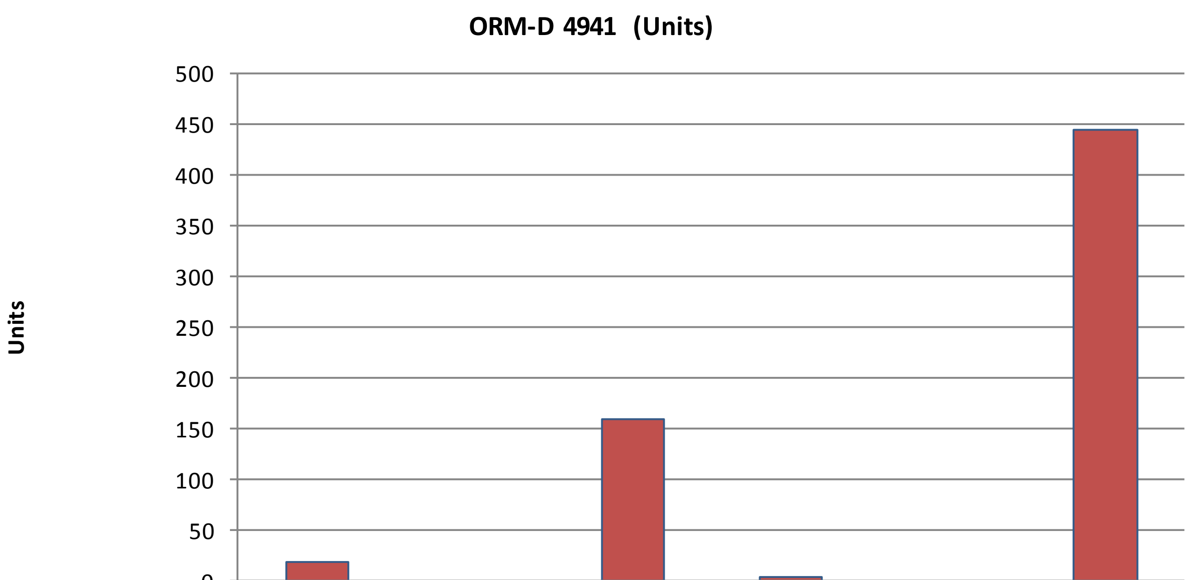
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
ORM-D 4940 (Tons)	0	0	0	0	0	101



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
ORM-D 4940 (Units)	0	0	0	0	0	1

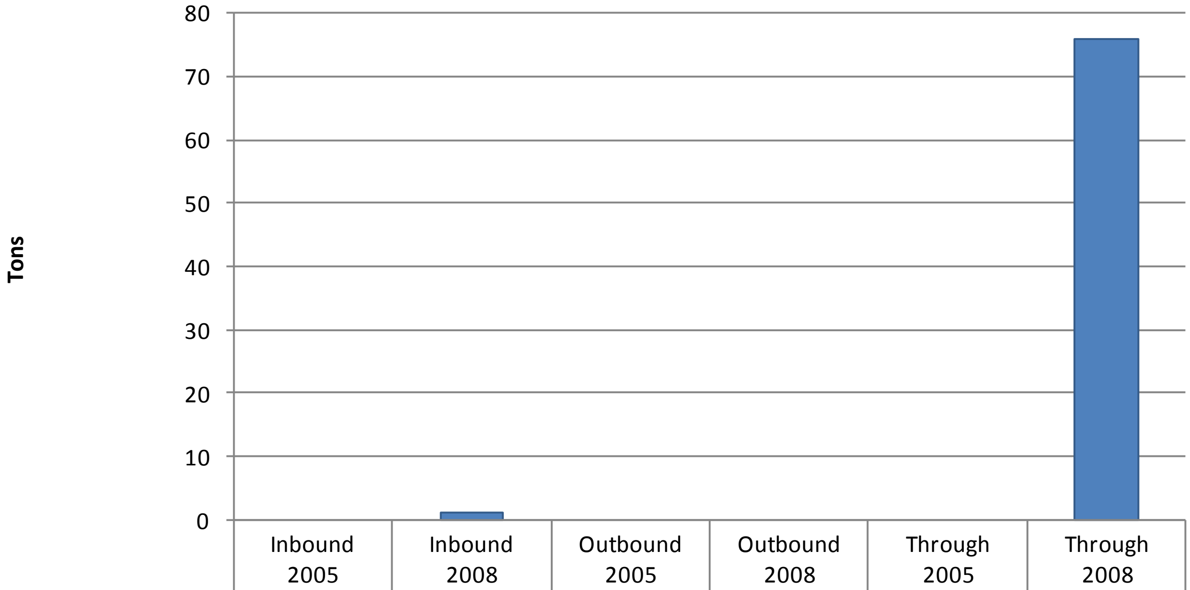


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
ORM-D 4941 (Tons)	401	333	0	0	3,253	10,542



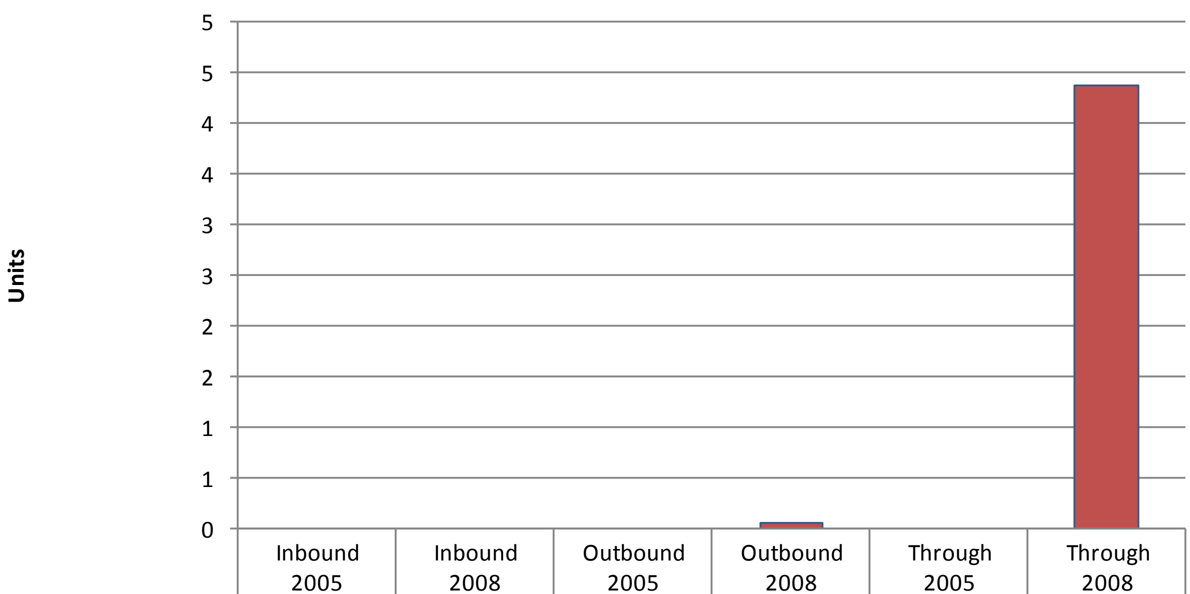
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
ORM-D 4941 (Units)	19	0	159	4	0	444

ORM-D 4945 (Tons)



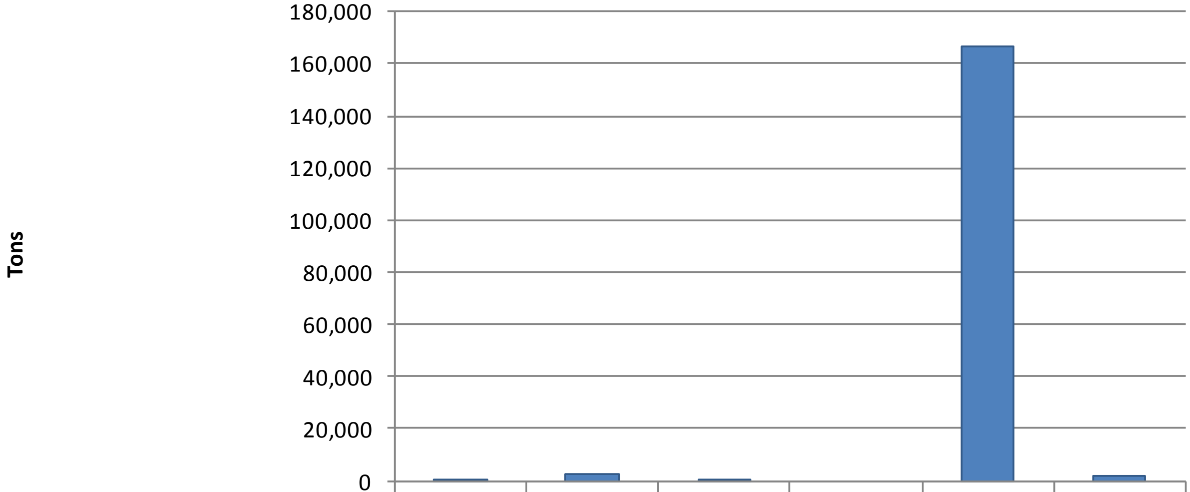
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
ORM-D 4945 (Tons)	0	1	0	0	0	76

ORM-D 4945 (Units)



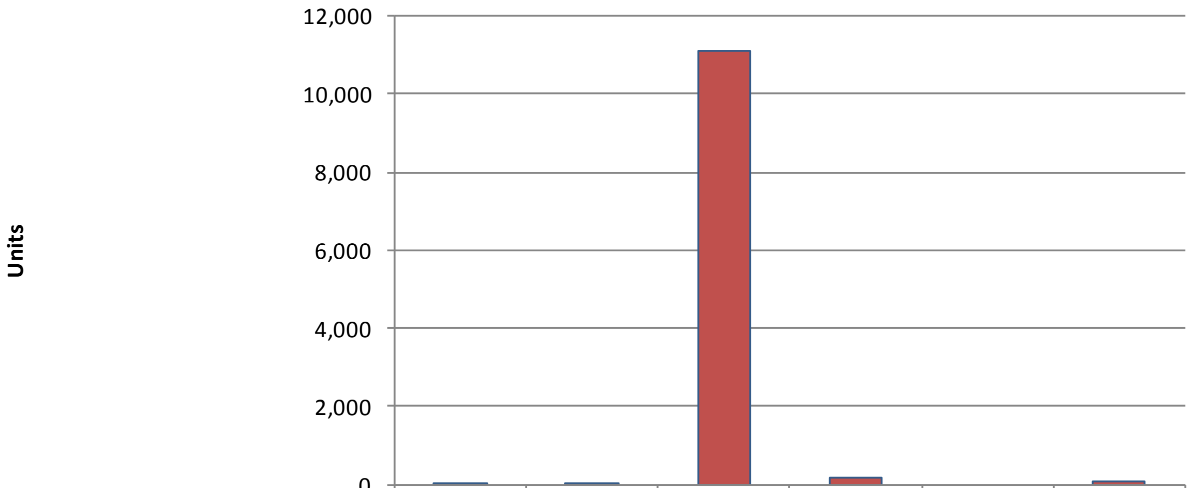
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
ORM-D 4945 (Units)	0	0	0	0	0	4

Freight All Kinds Hazardous Materials 4950 (Tons)



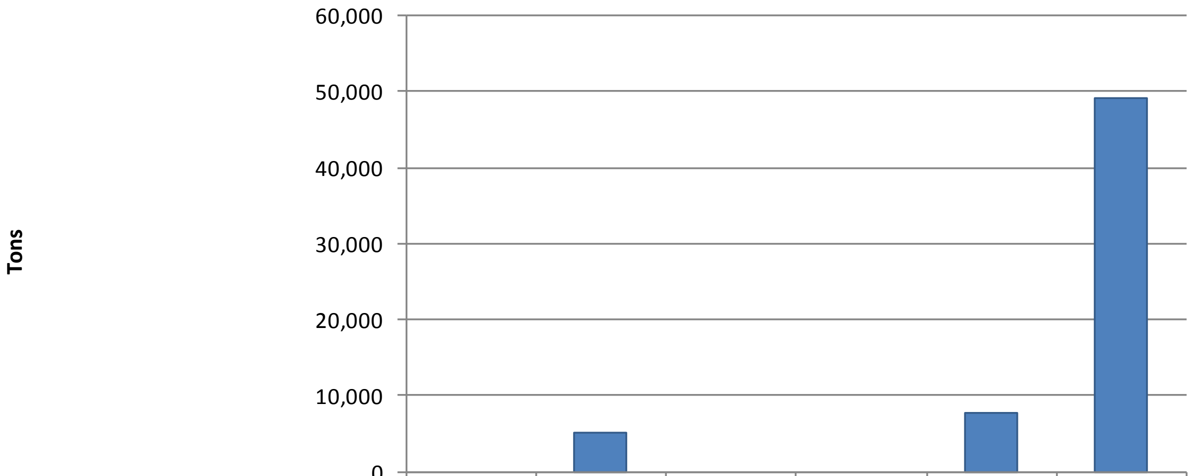
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Freight All Kinds Hazardous Materials 4950 (Tons)	380	2,675	21	0	166,676	1,684

Freight All Kinds Hazardous Materials 4950 (Units)



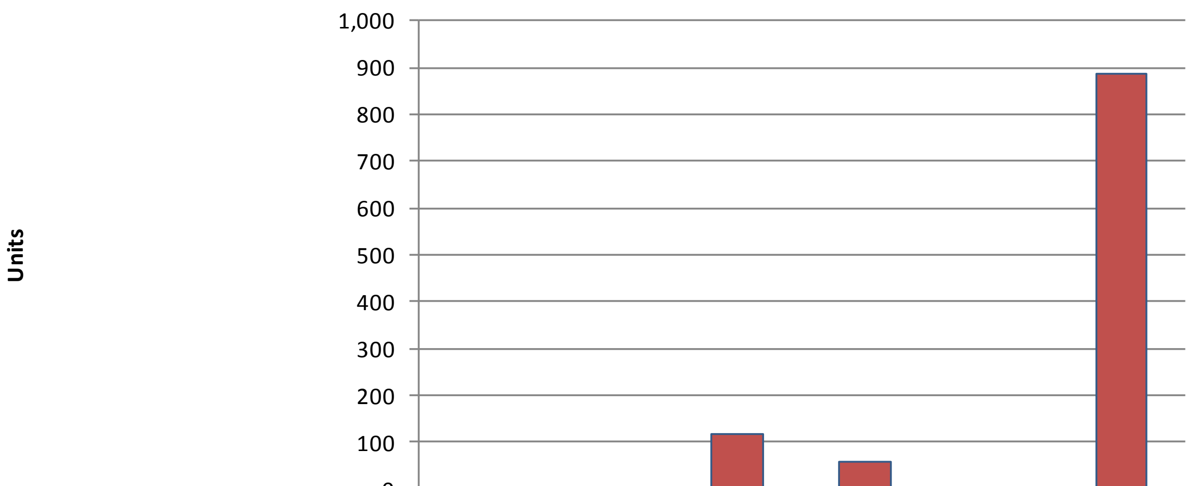
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Freight All Kinds Hazardous Materials 4950 (Units)	17	1	11,103	193	0	92

Division 9.1 Environmentally Hazardous Commodities 4960 (Tons)

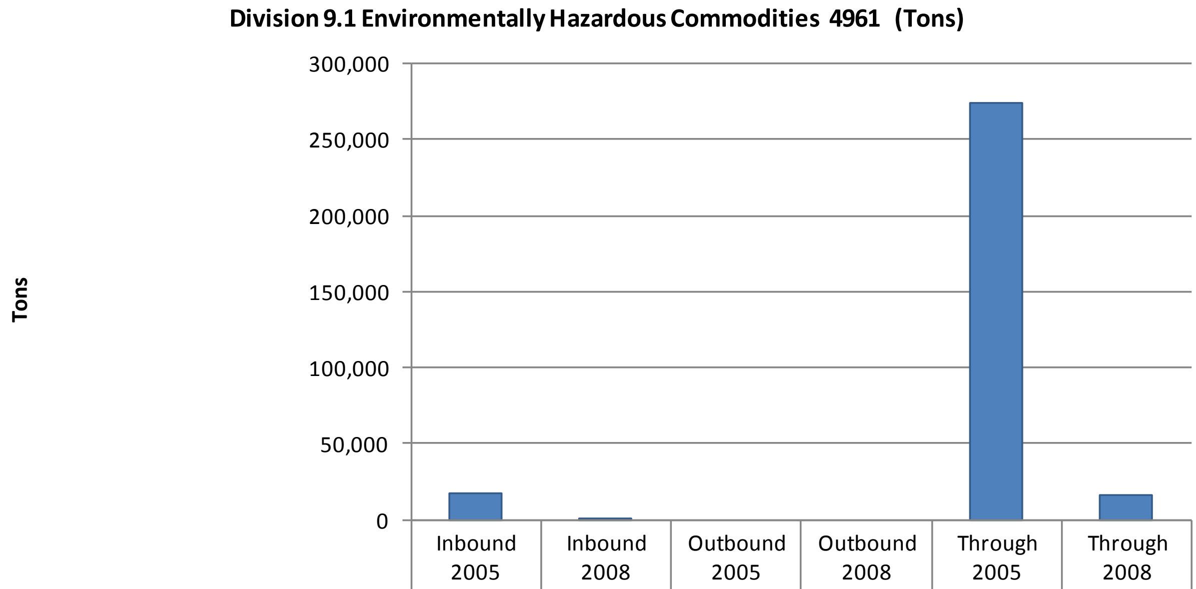


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 9.1 Environmentally Hazardous Commodities 4960 (Tons)	0	5,224	0	0	7,814	49,226

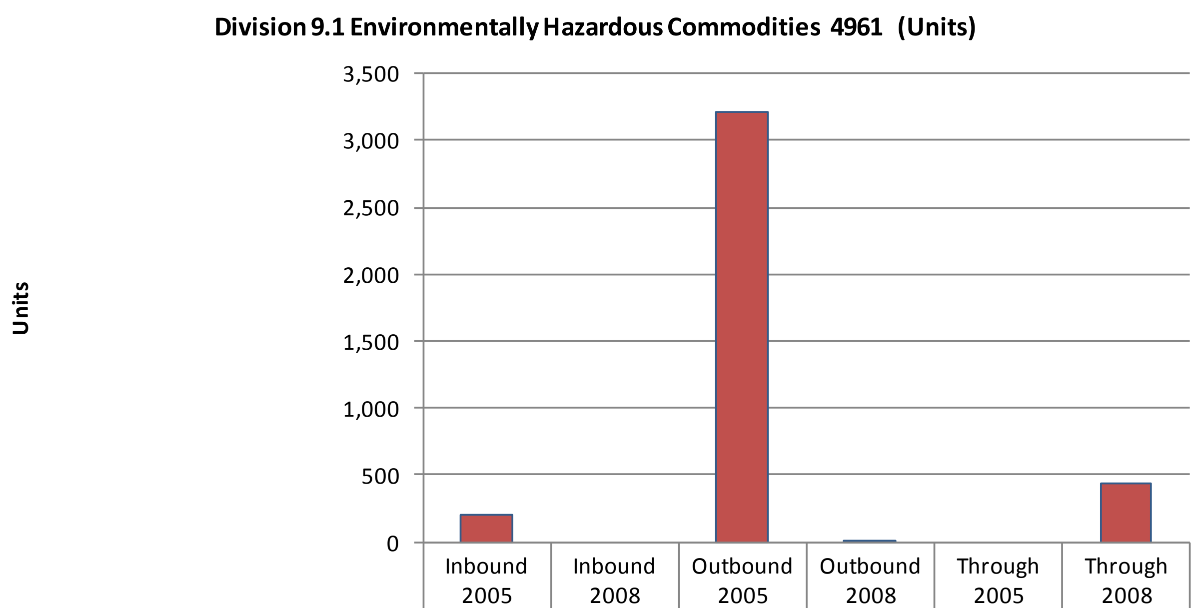
Division 9.1 Environmentally Hazardous Commodities 4960 (Units)



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 9.1 Environmentally Hazardous Commodities 4960 (Units)	0	0	117	57	0	887

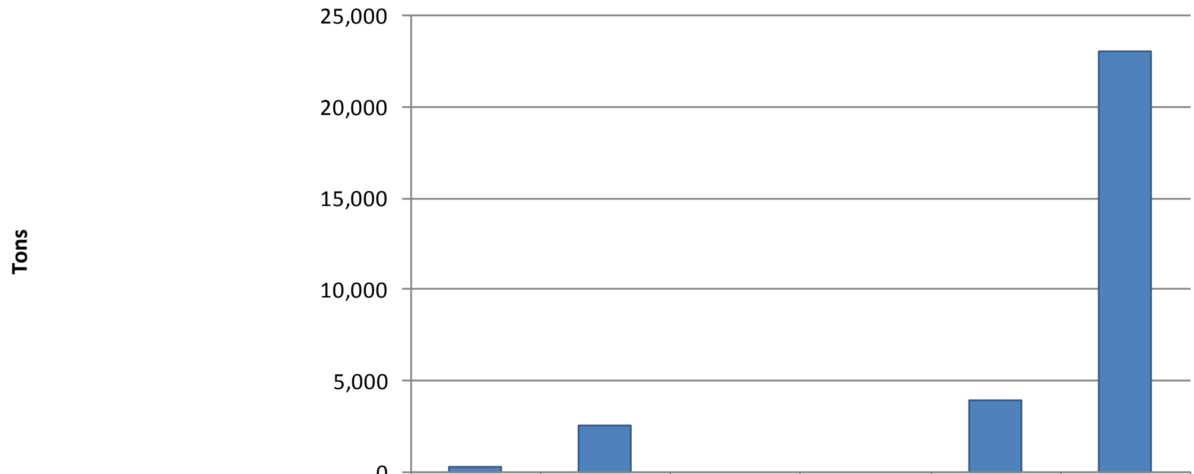


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 9.1 Environmentally Hazardous Commodities 4961 (Tons)	17,243	624	0	0	274,440	16,692



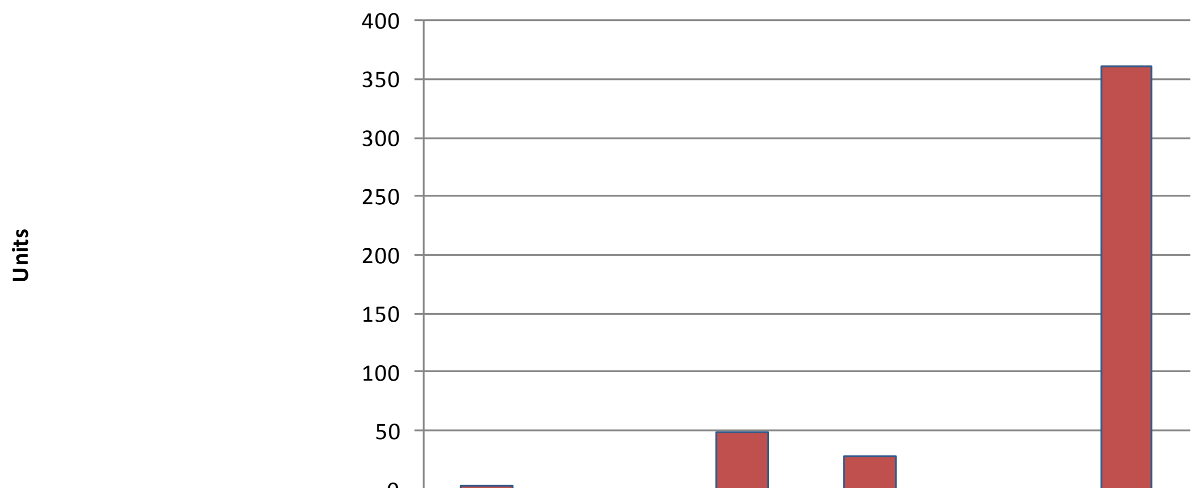
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 9.1 Environmentally Hazardous Commodities 4961 (Units)	201	0	3,206	7	0	431

Division 9.2 Environmentally Hazardous Commodities 4962 (Tons)

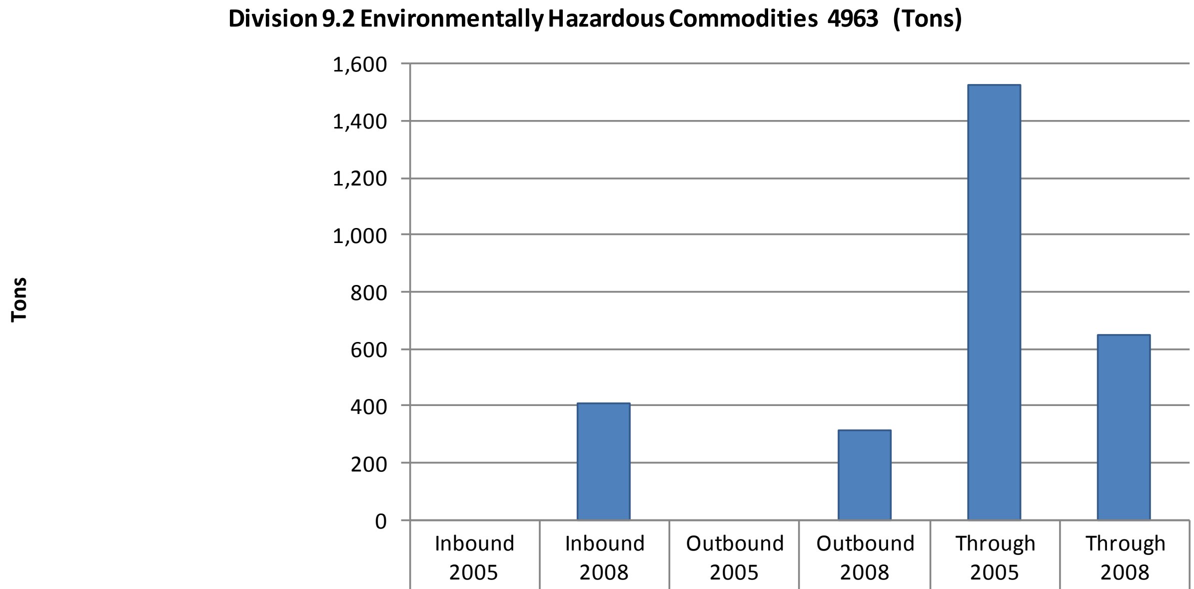


	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 9.2 Environmentally Hazardous Commodities 4962 (Tons)	277	2,561	0	0	3,914	23,097

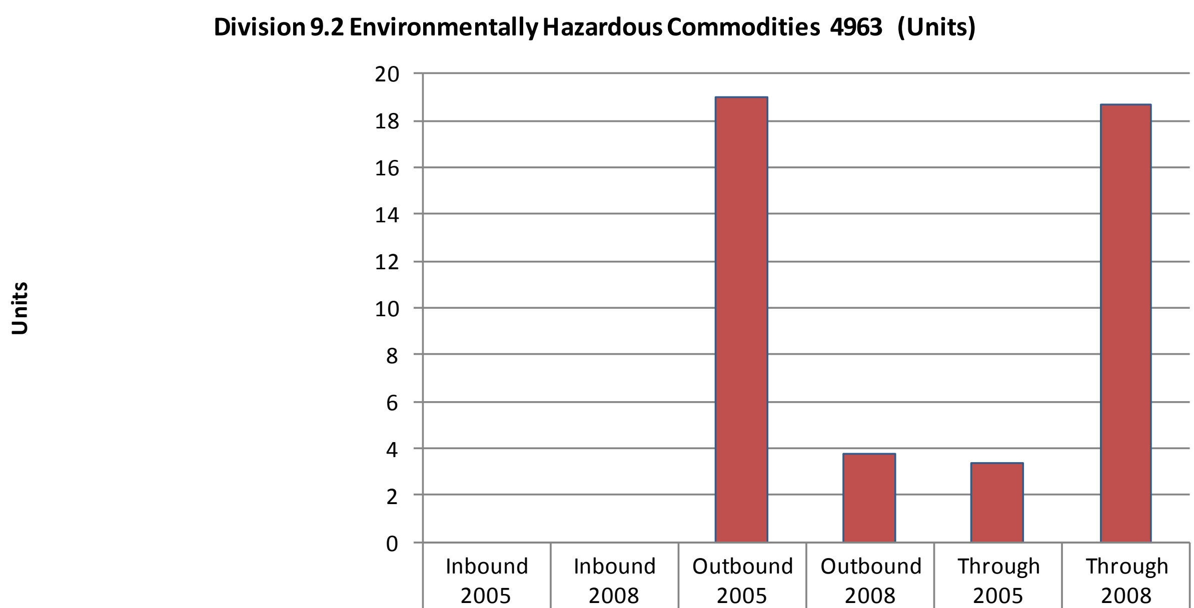
Division 9.2 Environmentally Hazardous Commodities 4962 (Units)



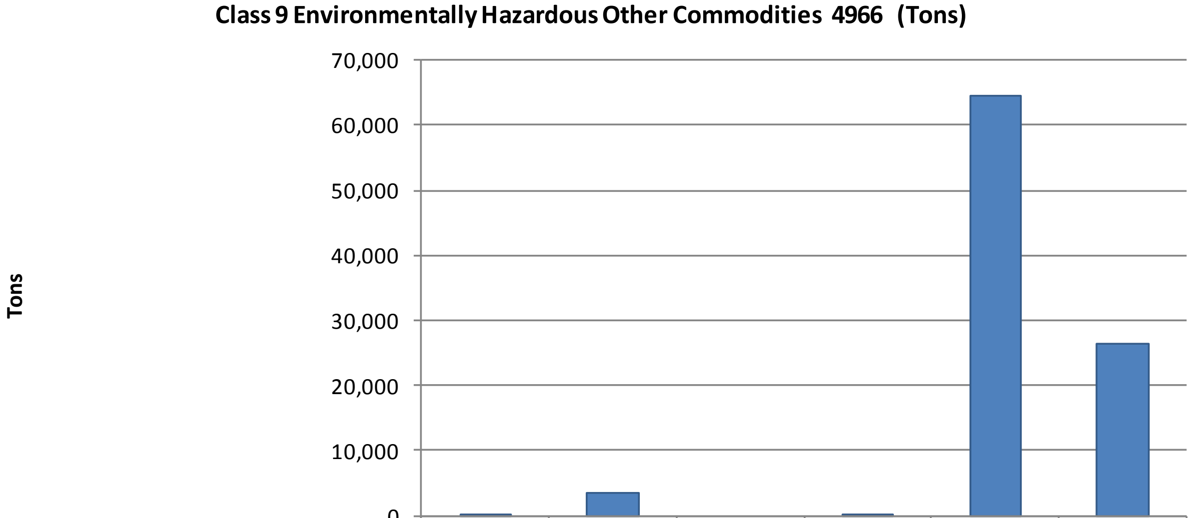
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 9.2 Environmentally Hazardous Commodities 4962 (Units)	3	0	48	28	0	361



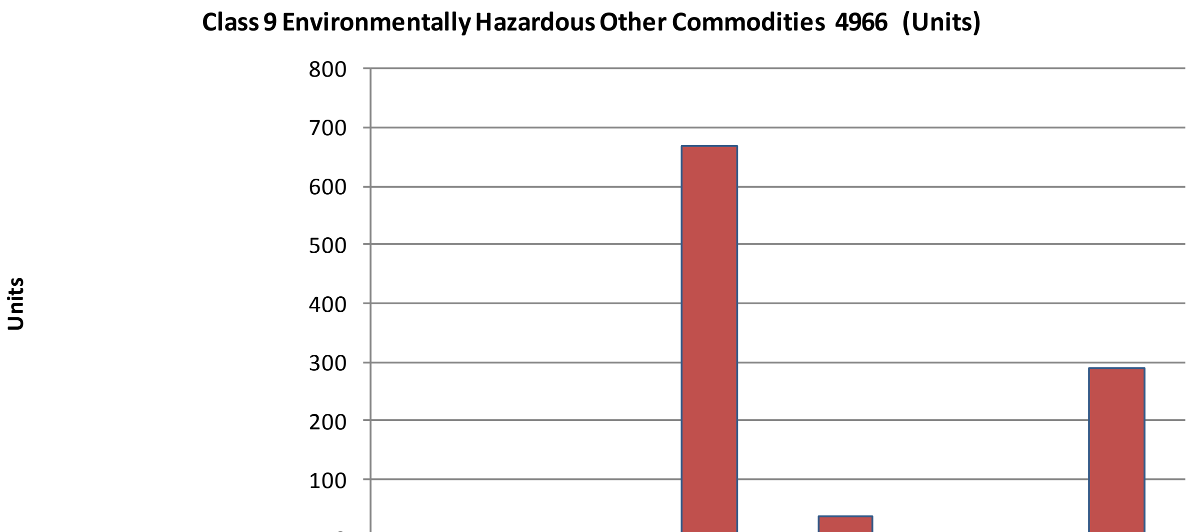
	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 9.2 Environmentally Hazardous Commodities 4963 (Tons)	0	408	0	312	1,523	651



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Division 9.2 Environmentally Hazardous Commodities 4963 (Units)	0	0	19	4	3	19



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 9 Environmentally Hazardous Other Commodities 4966 (Tons)	97	3,543	0	24	64,577	26,438



	Inbound 2005	Inbound 2008	Outbound 2005	Outbound 2008	Through 2005	Through 2008
Class 9 Environmentally Hazardous Other Commodities 4966 (Units)	1	0	668	38	0	288

APPENDIX D: STATUTORY DEFINITIONS AND DESCRIPTIONS FOR CLASSES AND DIVISIONS OF HAZARDOUS MATERIALS

§ 173.50 Class 1—Definitions.

(a) *Explosive.* For the purposes of this subchapter, an *explosive* means any substance or article, including a device, which is designed to function by explosion (*i.e.,* an extremely rapid release of gas and heat) or which, by chemical reaction within itself, is able to function in a similar manner even if not designed to function by explosion, unless the substance or article is otherwise classed under the provisions of this subchapter. The term includes a pyrotechnic substance or article, unless the substance or article is otherwise classed under the provisions of this subchapter.

(b) Explosives in Class 1 are divided into six divisions as follows:

(1) *Division 1.1* consists of explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.

(2) *Division 1.2* consists of explosives that have a projection hazard but not a mass explosion hazard.

(3) *Division 1.3* consists of explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

(4) *Division 1.4* consists of explosives that present a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

(5) *Division 1.5* [1] consists of very insensitive explosives. This division is comprised of substances which have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

[1] The probability of transition from burning to detonation is greater when large quantities are transported in a vessel.

(6) *Division 1.6* [2] consists of extremely insensitive articles which do not have a mass explosive hazard. This division is comprised of articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

[2] The risk from articles of Division 1.6 is limited to the explosion of a single article.

§ 173.115 Class 2, Divisions 2.1, 2.2, and 2.3—Definitions.

(a) *Division 2.1 (Flammable gas).* For the purpose of this subchapter, a *flammable gas* (Division 2.1) means any material which is a gas at 20 °C (68 °F) or less and 101.3 kPa (14.7 psia) of pressure (a material which has a boiling point of 20 °C (68 °F) or less at 101.3 kPa (14.7 psia)) which—

(1) Is ignitable at 101.3 kPa (14.7 psia) when in a mixture of 13 percent or less by volume with air; or

(2) Has a flammable range at 101.3 kPa (14.7 psia) with air of at least 12 percent regardless of the lower limit. Except for aerosols, the limits specified in paragraphs (a)(1) and (a)(2) of this section shall be determined at 101.3 kPa (14.7 psia) of pressure and a temperature of 20 °C (68 °F) in accordance with the ASTM E681–85, Standard Test Method for Concentration Limits of Flammability of Chemicals or other equivalent method approved by the Associate Administrator. The flammability of aerosols is determined by the tests specified in §173.115 (k) of this section.

(b) *Division 2.2 (non-flammable, nonpoisonous compressed gas—including compressed gas, liquefied gas, pressurized cryogenic gas, compressed gas in solution, asphyxiant gas and oxidizing gas).* For the purpose of this subchapter, a non-flammable, nonpoisonous compressed gas (Division 2.2) means any material (or mixture) which—

(1) Exerts in the packaging an absolute pressure of 280 kPa (40.6 psia) or greater at 20 °C (68 °F), or is a cryogenic liquid, and

(2) Does not meet the definition of Division 2.1 or 2.3.

(c) *Division 2.3 (Gas poisonous by inhalation).* For the purpose of this subchapter, a *gas poisonous by inhalation* (Division 2.3) means a material which is a gas at 20 °C (68 °F) or less and a pressure of 101.3 kPa (14.7 psia) (a material which has a boiling point of 20 °C (68 °F) or less at 101.3 kPa (14.7 psia)) and which—

(1) Is known to be so toxic to humans as to pose a hazard to health during transportation, or

(2) In the absence of adequate data on human toxicity, is presumed to be toxic to humans because when tested on laboratory animals it has an LC_{50} value of not more than 5000 mL/m ^{3} (see §173.116(a) of this subpart for assignment of Hazard Zones A, B, C or D). LC50 values for mixtures may be determined using the formula in §173.133(b)(1)(i) or CGA Pamphlet P–20 (IBR, see §171.7 of this subchapter).

(d) *Non-liquefied compressed gas.* A gas, which when packaged under pressure for transportation is entirely gaseous at −50 °C (−58 °F) with a critical temperature less than or equal to −50 °C (−58 °F), is considered to be a non-liquefied compressed gas.

(e) *Liquefied compressed gas.* A gas, which when packaged under pressure for transportation is partially liquid at temperatures above −50 °C (−58 °F), is considered to be a liquefied compressed gas. A liquefied compressed gas is further categorized as follows:

(1) *High pressure liquefied gas* which is a gas with a critical temperature between −50 °C (−58 °F) and + 65 °C (149 °F), and

(2) *Low pressure liquefied gas* which is a gas with a critical temperature above + 65 °C (149 °F).

(f) *Compressed gas in solution.* A *compressed gas in solution* is a non-liquefied compressed gas which is dissolved in a solvent.

(g) *Cryogenic liquid.* A *cryogenic liquid* means a refrigerated liquefied gas having a boiling point colder than −90 °C (−130 °F) at 101.3 kPa (14.7 psia) absolute. A material meeting this definition is subject to requirements of this subchapter without regard to whether it meets the definition of a non-flammable, non-poisonous compressed gas in paragraph (b) of this section.

(h) *Flammable range.* The term *flammable range* means the difference between the minimum and maximum volume percentages of the material in air that forms a flammable mixture.

(i) *Service pressure.* The term *service pressure* means the authorized pressure marking on the packaging. For example, for a cylinder marked “DOT 3A1800”, the service pressure is 12410 kPa (1800 psig).

(j) *Refrigerant gas or Dispersant gas.* The terms *Refrigerant gas* and *Dispersant gas* apply to all nonpoisonous refrigerant gases; dispersant gases (fluorocarbons) listed in §172.101 of this subchapter and §§173.304, 173.314(c), 173.315(a), and 173.315(h) and mixtures thereof; and any other compressed gas having a vapor pressure not exceeding 260 psia at 54 °C(130 °F), used only as a refrigerant, dispersant, or blowing agent.

(k) The following applies to aerosols (see §171.8 of this subchapter):

(1) An aerosol must be assigned to Division 2.1 if the contents include 85% by mass or more flammable components and the chemical heat of combustion is 30 kJ/g or more;

(2) An aerosol must be assigned to Division 2.2 if the contents contain 1% by mass or less flammable components and the heat of combustion is less than 20 kJ/g.

(3) Aerosols not meeting the provisions of paragraphs (a) or (b) of this section must be classed in accordance with the appropriate tests of the UN Manual of Tests and Criteria (IBR, see §171.7 of this subchapter). An aerosol which was tested in accordance with the requirements of this subchapter in effect on December 31, 2005 is not required to be retested.

(4) Division 2.3 gases may not be transported in an aerosol container.

(5) When the contents are classified as Division 6.1, PG III or Class 8, PG II or III, the aerosol must be assigned a subsidiary hazard of Division 6.1 or Class 8, as appropriate.

(6) Substances of Division 6.1, PG I or II, and substances of Class 8, PG I are forbidden from transportation in an aerosol container.

(7) Flammable components are Class 3 flammable liquids, Class 4.1 flammable solids, or Division 2.1 flammable gases. The chemical heat of combustion must be determined in accordance with the UN Manual of Tests and Criteria (IBR, see §171.7 of this subchapter).

§ 173.120 Class 3—Definitions.

(a) *Flammable liquid.* For the purpose of this subchapter, a *flammable liquid* (Class 3) means a liquid having a flash point of not more than 60 °C (140 °F), or any material in a liquid phase with a flash point at or above 37.8 °C (100 °F) that is intentionally heated and offered for transportation or transported at or above its flash point in a bulk packaging, with the following exceptions:

(1) Any liquid meeting one of the definitions specified in §173.115.

(2) Any mixture having one or more components with a flash point of 60 °C (140 °F) or higher, that make up at least 99 percent of the total volume of the mixture, if the mixture is not offered for transportation or transported at or above its flash point.

(3) Any liquid with a flash point greater than 35 °C (95 °F) that does not sustain combustion according to ASTM D 4206 (IBR, see §171.7 of this subchapter) or the procedure in appendix H to Part 173.

(4) Any liquid with a flash point greater than 35 °C (95 °F) and with a fire point greater than 100 °C (212 °F) according to ISO 2592 (IBR, see §171.7 of this subchapter).

(5) Any liquid with a flash point greater than 35 °C (95 °F) which is in a water-miscible solution with a water content of more than 90 percent by mass.

(b) Combustible liquid. (1) For the purpose of this subchapter, a *combustible liquid* means any liquid that does not meet the definition of any other hazard class specified in this subchapter and has a flash point above 60 °C (140 °F) and below 93 °C (200 °F).

(2) A flammable liquid with a flash point at or above 38 °C (100 °F) that does not meet the definition of any other hazard class may be reclassed as a combustible liquid. This provision does not apply to transportation by vessel or aircraft, except where other means of transportation is impracticable. An elevated temperature material that meets the definition of a Class 3 material because it is intentionally heated and offered for transportation or transported at or above its flash point may not be reclassed as a combustible liquid.

(3) A combustible liquid that does not sustain combustion is not subject to the requirements of this subchapter as a combustible liquid. Either the test method specified in ASTM D 4206 or the procedure in appendix H to Part 173 may be used to determine if a material sustains combustion when heated under test conditions and exposed to an external source of flame.

(c) Flash point. (1) *Flash point* means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. It shall be determined as follows:

(i) For a homogeneous, single-phase, liquid having a viscosity less than 45 S.U.S. at 38 °C (100 °F) that does not form a surface film while under test, one of the following test procedures shall be used:

(A) Standard Method of Test for Flash Point by Tag Closed Tester, (ASTM D 56);

(B) Standard Methods of Test for Flash Point of Liquids by Setaflash Closed Tester, (ASTM D 3278); or

(C) Standard Test Methods for Flash Point by Small Scale Closed Tester, (ASTM D 3828).

(ii) For a liquid other than one meeting all of the criteria of paragraph (c)(1)(i) of this section, one of the following test procedures shall be used:

(A) Standard Method of Test for Flash Point by Pensky—Martens Closed Tester, (ASTM D 93). For cutback asphalt, use Method B of ASTM D 93 or alternate tests authorized in this standard; or

(B) Standard Methods of Test for Flash Point of Liquids by Setaflash Closed Tester (ASTM D 3278).

(2) For a liquid that is a mixture of compounds that have different volatility and flash points, its flash point shall be determined as specified in paragraph (c)(1) of this section, on the material in the form in which it is to be shipped. If it is determined by this test that the flash point is higher than −7 °C (20 °F) a second test shall be made as follows: a portion of the mixture shall be placed in an open beaker (or similar container) of such dimensions that the height of the liquid can be adjusted so that the ratio of the volume of the liquid to the exposed surface area is 6 to one. The liquid shall be allowed to evaporate under ambient pressure and temperature (20 to 25 °C (68 to 77 °F)) for a period of 4 hours or until 10 percent by volume has evaporated, whichever comes first. A flash point is then run on a portion of the liquid remaining in the evaporation container and the lower of the two flash points shall be the flash point of the material.

(3) For flash point determinations by Setaflash closed tester, the glass syringe specified need not be used as the method of measurement of the test sample if a minimum quantity of 2 mL (0.1 ounce) is assured in the test cup.

(d) If experience or other data indicate that the hazard of a material is greater or less than indicated by the criteria specified in paragraphs (a) and (b) of this section, the Associate Administrator may revise the classification or make the material subject or not subject to the requirements of parts 170–189 of this subchapter.

§ 173.124 Class 4, Divisions 4.1, 4.2 and 4.3—Definitions.

(a) *Division 4.1 (Flammable Solid).* For the purposes of this subchapter, *flammable solid* (Division 4.1) means any of the following three types of materials:

(1) Desensitized explosives that—

(i) When dry are Explosives of Class 1 other than those of compatibility group A, which are wetted with sufficient water, alcohol, or plasticizer to suppress explosive properties; and

(ii) Are specifically authorized by name either in the §172.101Table or have been assigned a shipping name and hazard class by the Associate Administrator under the provisions of—

(A) A special permit issued under subchapter A of this chapter; or

(B) An approval issued under §173.56(i) of this part.

(2)(i) Self-reactive materials are materials that are thermally unstable and that can undergo a strongly exothermic decomposition even without participation of oxygen (air). A material is excluded from this definition if any of the following applies:

(A) The material meets the definition of an explosive as prescribed in subpart C of this part, in which case it must be classed as an explosive;

(B) The material is forbidden from being offered for transportation according to §172.101 of this subchapter or §173.21;

(C) The material meets the definition of an oxidizer or organic peroxide as prescribed in subpart D of this part, in which case it must be so classed;

(D) The material meets one of the following conditions:

(*1*) Its heat of decomposition is less than 300 J/g; or

(*2*) Its self-accelerating decomposition temperature (SADT) is greater than 75 °C (167 °F) for a 50 kg package; or

(*3*) It is an oxidizing substance in Division 5.1 containing less than 5.0% combustible organic substances; or

(E) The Associate Administrator has determined that the material does not present a hazard which is associated with a Division 4.1 material.

(ii) *Generic types.* Division 4.1 self-reactive materials are assigned to a generic system consisting of seven types. A self-reactive substance identified by technical name in the Self-Reactive Materials Table in §173.224 is assigned to a generic type in accordance with that table. Self-reactive materials not identified in the Self-Reactive Materials Table in §173.224 are assigned to generic types under the procedures of paragraph (a)(2)(iii) of this section.

(A) *Type A.* Self-reactive material type A is a self-reactive material which, as packaged for transportation, can detonate or deflagrate rapidly. Transportation of type A self-reactive material is forbidden.

(B) *Type B.* Self-reactive material type B is a self-reactive material which, as packaged for transportation, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in a package.

(C) Performance of the self-reactive material under the test procedures specified in the UN Manual of Tests and Criteria (IBR, see §171.7 of this subchapter) and the provisions of paragraph (a)(2)(iii) of this section; and

(D) *Type D.* Self-reactive material type D is a self-reactive material which—

(*1*) Detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement;

(*2*) Does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or

(*3*) Does not detonate or deflagrate at all and shows a medium effect when heated under confinement.

(E) *Type E.* Self-reactive material type E is a self-reactive material which, in laboratory testing, neither detonates nor deflagrates at all and shows only a low or no effect when heated under confinement.

(F) *Type F.* Self-reactive material type F is a self-reactive material which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power.

(G) *Type G.* Self-reactive material type G is a self-reactive material which, in laboratory testing, does not detonate in the cavitated state, will not deflagrate at all, shows no effect when heated under confinement, nor shows any explosive power. A type G self-reactive material is not subject to the requirements of this subchapter for self-reactive material of Division 4.1 provided that it is thermally stable (self-accelerating decomposition temperature is 50 °C (122 °F) or higher for a 50 kg (110 pounds) package). A self-reactive material meeting all characteristics of type G except thermal stability is classed as a type F self-reactive, temperature control material.

(iii) *Procedures for assigning a self-reactive material to a generic type.* A self-reactive material must be assigned to a generic type based on—

(A) Its physical state (i.e. liquid or solid), in accordance with the definition of liquid and solid in §171.8 of this subchapter;

(B) A determination as to its control temperature and emergency temperature, if any, under the provisions of §173.21(f);

(C) Performance of the self-reactive material under the test procedures specified in the UN Recommendations on the Transport of Dangerous Goods, Tests and Criteria (see §171.7 of this subchapter) and the provisions of paragraph (a)(2)(iii) of this section; and

(D) Except for a self-reactive material which is identified by technical name in the Self-Reactive Materials Table in §173.224(b) or a self-reactive material which may be shipped as a sample under the provisions of §173.224, the self-reactive material is approved in writing by the Associate Administrator. The person requesting approval shall submit to the Associate Administrator the tentative shipping description and generic type and—

(*1*) All relevant data concerning physical state, temperature controls, and tests results; or

(*2*) An approval issued for the self-reactive material by the competent authority of a foreign government.

(iv) *Tests.* The generic type for a self-reactive material must be determined using the testing protocol from Figure 14.2 (Flow Chart for Assigning Self-Reactive Substances to Division 4.1) from the UN Manual of Tests and Criteria.

(3) Readily combustible solids are materials that—

(i) Are solids which may cause a fire through friction, such as matches;

(ii) Show a burning rate faster than 2.2 mm (0.087 inches) per second when tested in accordance with the UN Manual of Tests and Criteria (IBR, see §171.7 of this subchapter); or

(iii) Any metal powders that can be ignited and react over the whole length of a sample in 10 minutes or less, when tested in accordance with the UN Manual of Tests and Criteria.

(b) *Division 4.2 (Spontaneously Combustible Material).* For the purposes of this subchapter, *spontaneously combustible material* (Division 4.2) means—

(1) A pyrophoric material. A pyrophoric material is a liquid or solid that, even in small quantities and without an external ignition source, can ignite within five (5) minutes after coming in contact with air when tested according to UN Manual of Tests and Criteria.

(2) A self-heating material. A self-heating material is a material that, when in contact with air and without an energy supply, is liable to self-heat. A material of this type which exhibits spontaneous ignition or if the temperature of the sample exceeds 200 °C (392 °F) during the 24-hour test period when tested in accordance with UN Manual of Tests and Criteria, is classed as a Division 4.2 material.

(c) *Division 4.3 (Dangerous when wet material).* For the purposes of this chapter, *dangerous when wet material* (Division 4.3) means a material that, by contact with water, is liable to become spontaneously flammable or to give off flammable or toxic gas at a rate greater than 1 L per kilogram of the material, per hour, when tested in accordance with UN Manual of Tests and Criteria.

§ 173.127 Class 5, Division 5.1—Definition and assignment of packing groups.

(a) *Definition.* For the purpose of this subchapter, *oxidizer* (Division 5.1) means a material that may, generally by yielding oxygen, cause or enhance the combustion of other materials.

(1) A solid material is classed as a Division 5.1 material if, when tested in accordance with the UN Manual of Tests and Criteria (IBR, see §171.7 of this subchapter), its mean burning time is less than or equal to the burning time of a 3:7 potassium bromate/cellulose mixture.

(2) A liquid material is classed as a Division 5.1 material if, when tested in accordance with the UN Manual of Tests and Criteria, it spontaneously ignites or its mean time for a pressure rise from 690 kPa to 2070 kPa gauge is less then the time of a 1:1 nitric acid (65 percent)/cellulose mixture.

(b) *Assignment of packing groups.* (1) The packing group of a Division 5.1 material which is a solid shall be assigned using the following criteria:

(i) Packing Group I, for any material which, in either concentration tested, exhibits a mean burning time less than the mean burning time of a 3:2 potassium bromate/cellulose mixture.

(ii) Packing Group II, for any material which, in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 2:3 potassium bromate/cellulose mixture and the criteria for Packing Group I are not met.

(iii) Packing Group III for any material which, in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 3:7 potassium bromate/cellulose mixture and the criteria for Packing Group I and II are not met.

(2) The packing group of a Division 5.1 material which is a liquid shall be assigned using the following criteria:

(i) Packing Group I for:

(A) Any material which spontaneously ignites when mixed with cellulose in a 1:1 ratio; or

(B) Any material which exhibits a mean pressure rise time less than the pressure rise time of a 1:1 perchloric acid (50 percent)/cellulose mixture.

(ii) Packing Group II, any material which exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 aqueous sodium chlorate solution (40 percent)/cellulose mixture and the criteria for Packing Group I are not met.

(iii) Packing Group III, any material which exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 nitric acid (65 percent)/cellulose mixture and the criteria for Packing Group I and II are not met.

§ 173.128 Class 5, Division 5.2—Definitions and types.

(a) *Definitions.* For the purposes of this subchapter, *organic peroxide (Division 5.2)* means any organic compound containing oxygen (O) in the bivalent -O-O- structure and which may be considered a derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals, unless any of the following paragraphs applies:

(1) The material meets the definition of an explosive as prescribed in subpart C of this part, in which case it must be classed as an explosive;

(2) The material is forbidden from being offered for transportation according to §172.101 of this subchapter or §173.21;

(3) The Associate Administrator has determined that the material does not present a hazard which is associated with a Division 5.2 material; or

(4) The material meets one of the following conditions:

(i) For materials containing no more than 1.0 percent hydrogen peroxide, the available oxygen, as calculated using the equation in paragraph (a)(4)(ii) of this section, is not more than 1.0 percent, or

(ii) For materials containing more than 1.0 percent but not more than 7.0 percent hydrogen peroxide, the available oxygen, content (O_a) is not more than 0.5 percent, when determined using the equation:

$$O_a = 16 \times \sum_{i=1}^{k} \frac{n_i c_i}{m_i}$$

where, for a material containing k species of organic peroxides:

n_i = number of -O-O- groups per molecule of the *i* th species

c_i = concentration (mass percent) of the *i* th species

m_i = molecular mass of the *i* th species

(b) *Generic types.* Division 5.2 organic peroxides are assigned to a generic system which consists of seven types. An organic peroxide identified by technical name in the Organic Peroxides Table in §173.225 is assigned to a generic type in accordance with that table. Organic peroxides not identified in the Organic Peroxides table are assigned to generic types under the procedures of paragraph (c) of this section.

(1) *Type A.* Organic peroxide type A is an organic peroxide which can detonate or deflagrate rapidly as packaged for transport. Transportation of type A organic peroxides is forbidden.

(2) *Type B.* Organic peroxide type B is an organic peroxide which, as packaged for transport, neither detonates nor deflagrates rapidly, but can undergo a thermal explosion.

(3) *Type C.* Organic peroxide type C is an organic peroxide which, as packaged for transport, neither detonates nor deflagrates rapidly and cannot undergo a thermal explosion.

(4) *Type D.* Organic peroxide type D is an organic peroxide which—

(i) Detonates only partially, but does not deflagrate rapidly and is not affected by heat when confined;

(ii) Does not detonate, deflagrates slowly, and shows no violent effect if heated when confined; or

(iii) Does not detonate or deflagrate, and shows a medium effect when heated under confinement.

(5) *Type E.* Organic peroxide type E is an organic peroxide which neither detonates nor deflagrates and shows low, or no, effect when heated under confinement.

(6) *Type F.* Organic peroxide type F is an organic peroxide which will not detonate in a cavitated state, does not deflagrate, shows only a low, or no, effect if heated when confined, and has low, or no, explosive power.

(7) *Type G.* Organic peroxide type G is an organic peroxide which will not detonate in a cavitated state, will not deflagrate at all, shows no effect when heated under confinement, and shows no explosive power. A type G organic peroxide is not subject to the requirements of this subchapter for organic peroxides of Division 5.2 provided that it is thermally stable (self-accelerating decomposition temperature is 50 °C (122 °F) or higher for a 50 kg (110 pounds) package). An organic peroxide meeting all characteristics of type G except thermal stability and requiring temperature control is classed as a type F, temperature control organic peroxide.

(c) *Procedure for assigning an organic peroxide to a generic type.* An organic peroxide shall be assigned to a generic type based on—

(1) Its physical state (i.e., liquid or solid), in accordance with the definitions for liquid and solid in §171.8 of this subchapter;

(2) A determination as to its control temperature and emergency temperature, if any, under the provisions of §173.21(f); and

(3) Performance of the organic peroxide under the test procedures specified in the UN Manual of Tests and Criteria (IBR, see §171.7 of this subchapter), and the provisions of paragraph (d) of this section.

(d) *Approvals.* (1) An organic peroxide must be approved, in writing, by the Associate Administrator, before being offered for transportation or transported, including assignment of a generic type and shipping description, except for—

(i) An organic peroxide which is identified by technical name in the Organic Peroxides Table in §173.225(c);

(ii) A mixture of organic peroxides prepared according to §173.225(b); or

(iii) An organic peroxide which may be shipped as a sample under the provisions of §173.225(b).

(2) A person applying for an approval must submit all relevant data concerning physical state, temperature controls, and tests results or an approval issued for the organic peroxide by the competent authority of a foreign government.

(e) *Tests.* The generic type for an organic peroxide shall be determined using the testing protocol from Figure 20.1(a) (Classification and Flow Chart Scheme for Organic Peroxides) from the UN Manual of Tests and Criteria (IBR, see §171.7 of this subchapter).

§ 173.132 Class 6, Division 6.1—Definitions.

(a) For the purpose of this subchapter, *poisonous material* (Division 6.1) means a material, other than a gas, which is known to be so toxic to humans as to afford a hazard to health during transportation, or which, in the absence of adequate data on human toxicity:

(1) Is presumed to be toxic to humans because it falls within any one of the following categories when tested on laboratory animals (whenever possible, animal test data that has been reported in the chemical literature should be used):

(i) *Oral Toxicity.* A liquid with an LD_{50} for acute oral toxicity of not more than 500 mg/kg or a solid with an LD_{50} for acute oral toxicity of not more than 200 mg/kg.

(ii) *Dermal Toxicity.* A material with an LD_{50} for acute dermal toxicity of not more than 1000 mg/kg.

(iii) *Inhalation Toxicity.* (A) A dust or mist with an LC_{50} for acute toxicity on inhalation of not more than 10 mg/L; or

(B) A material with a saturated vapor concentration in air at 20°C (68°F) greater than or equal to one-fifth of the LC_{50} for acute toxicity on inhalation of vapors and with an LC_{50} for acute toxicity on inhalation of vapors of not more than 5000 mL/mm ^{3} ; or

(2) Is an irritating material, with properties similar to tear gas, which causes extreme irritation, especially in confined spaces.

(b) For the purposes of this subchapter—

(1) LD_{50} (median lethal dose) for acute oral toxicity is the statistically derived single dose of a substance that can be expected to cause death within 14 days in 50% of young adult albino rats when administered by the oral route. The LD_{50} value is expressed in terms of mass of test substance per mass of test animal (mg/kg).

(2) LD_{50} for acute dermal toxicity means that dose of the material which, administered by continuous contact for 24 hours with the shaved intact skin (avoiding abrading) of an albino rabbit, causes death within 14 days in half of the animals tested. The number of animals tested must be sufficient to give statistically valid results and be in conformity with good pharmacological practices. The result is expressed in mg/kg body mass.

(3) LC_{50} for acute toxicity on inhalation means that concentration of vapor, mist, or dust which, administered by continuous inhalation for one hour to both male and female young adult albino rats, causes death within 14 days in half of the animals tested. If the material is administered to the animals as a dust or mist, more than 90 percent of the particles available for inhalation in the test must have a diameter of 10 microns or less if it is reasonably foreseeable that such concentrations could be encountered by a human during transport. The result is expressed in mg/L of air for dusts and mists or in mL/m ^{3} of air (parts per million) for vapors. See §173.133(b) for LC_{50} determination for mixtures and for limit tests.

(i) When provisions of this subchapter require the use of the LC_{50} for acute toxicity on inhalation of dusts and mists based on a one-hour exposure and such data is not available, the LC_{50} for acute toxicity on inhalation based on a four-hour exposure may be multiplied by four and the product substituted for the one-hour LC_{50} for acute toxicity on inhalation.

(ii) When the provisions of this subchapter require the use of the LC_{50} for acute toxicity on inhalation of vapors based on a one-hour exposure and such data is not available, the LC_{50} for acute toxicity on inhalation based on a four-hour exposure may be multiplied by two and the product substituted for the one-hour LC_{50} for acute toxicity on inhalation.

(iii) A solid substance should be tested if at least 10 percent of its total mass is likely to be dust in a respirable range, e.g. the aerodynamic diameter of that particle-fraction is 10 microns or less. A liquid substance should be tested if a mist is likely to be generated in a leakage of the transport containment. In carrying out the test both for solid and liquid substances, more than 90% (by mass) of a specimen prepared for inhalation toxicity testing must be in the respirable range as defined in this paragraph (b)(3)(iii).

(c) For purposes of classifying and assigning packing groups to mixtures possessing oral or dermal toxicity hazards according to the criteria in §173.133(a)(1), it is necessary to determine the acute LD_{50} of the mixture. If a mixture contains more than one active constituent, one of the following methods may be used to determine the oral or dermal LD_{50} of the mixture:

(1) Obtain reliable acute oral and dermal toxicity data on the actual mixture to be transported;

(2) If reliable, accurate data is not available, classify the formulation according to the most hazardous constituent of the mixture as if that constituent were present in the same concentration as the total concentration of all active constituents; or

(3) If reliable, accurate data is not available, apply the formula:

$$\frac{C_A}{T_A} = \frac{C_B}{T_B} + \frac{C_Z}{T_Z} = \frac{100}{T_M}$$

where:

C = the % concentration of constituent A, B ... Z in the mixture;

T = the oral LD_{50} values of constituent A, B ... Z;

T_M = the oral LD_{50} value of the mixture.

Note to formula in paragraph (c)(3): This formula also may be used for dermal toxicities provided that this information is available on the same species for all constituents. The use of this formula does not take into account any potentiation or protective phenomena.

(d) The foregoing categories shall not apply if the Associate Administrator has determined that the physical characteristics of the material or its probable hazards to humans as shown by documented experience indicate that the material will not cause serious sickness or death.

§ 173.134 Class 6, Division 6.2—Definitions and exceptions.

(a) *Definitions and classification criteria.* For the purposes of this subchapter, the following definitions and classification criteria apply to Division 6.2 materials.

(1) *Division 6.2 (Infectious substance)* means a material known or reasonably expected to contain a pathogen. A pathogen is a microorganism (including bacteria, viruses, rickettsiae, parasites, fungi) or other agent, such as a proteinaceous infectious particle (prion), that can cause disease in humans or animals. An infectious substance must be assigned the identification number UN 2814, UN 2900, UN 3373, or UN 3291 as appropriate, and must be assigned to one of the following categories:

(i) *Category A:* An infectious substance in a form capable of causing permanent disability or life-threatening or fatal disease in otherwise healthy humans or animals when exposure to it occurs. An exposure occurs when an infectious substance is released outside of its protective packaging, resulting in physical contact with humans or animals. A Category A infectious substance must be assigned to identification number UN 2814 or UN 2900, as appropriate. Assignment to UN 2814 or UN 2900 must be based on the known medical history or symptoms of the source patient or animal, endemic local conditions, or professional judgment concerning the individual circumstances of the source human or animal.

(ii) *Category B:* An infectious substance that is not in a form generally capable of causing permanent disability or life-threatening or fatal disease in otherwise healthy humans or animals when exposure to it occurs. This includes Category B infectious substances transported for diagnostic or investigational purposes. A Category B infectious substance must be described as “Biological substance, Category B” and assigned identification number UN 3373. This does not include regulated medical waste, which must be assigned identification number UN 3291.

(2) *Biological product* means a virus, therapeutic serum, toxin, antitoxin, vaccine, blood, blood component or derivative, allergenic product, or analogous product, or arsphenamine or derivative of arsphenamine (or any other trivalent arsenic compound) applicable to the prevention, treatment, or cure of a disease or condition of human beings or animals. A *biological product* includes a material subject to regulation under 42 U.S.C. 262 or 21 U.S.C. 151–159. Unless otherwise excepted, a *biological product* known or reasonably expected to contain a pathogen that meets the definition of a Category A or B infectious substance must be assigned the identification number UN 2814, UN 2900, or UN 3373, as appropriate.

(3) *Culture* means an infectious substance containing a pathogen that is intentionally propagated. *Culture* does not include a human or animal patient specimen as defined in paragraph (a)(4) of this section.

(4) *Patient specimen* means human or animal material collected directly from humans or animals and transported for research, diagnosis, investigational activities, or disease treatment or prevention. *Patient specimen* includes excreta, secreta, blood and its components, tissue and tissue swabs, body parts, and specimens in transport media (*e.g.*, transwabs, culture media, and blood culture bottles).

(5) *Regulated medical waste or clinical waste or (bio) medical waste* means a waste or reusable material derived from the medical treatment of an animal or human, which includes diagnosis and immunization, or from biomedical research, which includes the production and testing of biological products. Regulated medical waste or clinical waste or (bio) medical waste containing a Category A infectious substance must be classed as an infectious substance, and assigned to UN2814 or UN2900, as appropriate.

(6) *Sharps* means any object contaminated with a pathogen or that may become contaminated with a pathogen through handling or during transportation and also capable of cutting or penetrating skin or a packaging material. *Sharps* includes needles, syringes, scalpels, broken glass, culture slides, culture dishes, broken capillary tubes, broken rigid plastic, and exposed ends of dental wires.

(7) *Toxin* means a Division 6.1 material from a plant, animal, or bacterial source. A *toxin* containing an infectious substance or a *toxin* contained in an infectious substance must be classed as Division 6.2, described as an infectious substance, and assigned to UN 2814 or UN 2900, as appropriate.

(8) *Used health care product* means a medical, diagnostic, or research device or piece of equipment, or a personal care product used by consumers, medical professionals, or pharmaceutical providers that does not meet the definition of a diagnostic specimen, biological product, or regulated medical waste, is contaminated with potentially infectious body fluids or materials, and is not decontaminated or disinfected to remove or mitigate the infectious hazard prior to transportation.

(b) *Exceptions.* The following are not subject to the requirements of this subchapter as Division 6.2 materials:

(1) A material that does not contain an infectious substance or that is unlikely to cause disease in humans or animals.

(2) Non-infectious biological materials from humans, animals, or plants. Examples include non-infectious cells, tissue cultures, blood or plasma from individuals not suspected of having an infectious disease, DNA, RNA or other non-infectious genetic elements.

(3) A material containing micro-organisms that are non-pathogenic to humans or animals.

(4) A material containing pathogens that have been neutralized or inactivated such that they no longer pose a health risk.

(5) A material with a low probability of containing an infectious substance, or where the concentration of the infectious substance is at a level naturally occurring in the environment so it cannot cause disease when exposure to it occurs. Examples of these materials include: Foodstuffs; environmental samples, such as water or a sample of dust or mold; and substances that have been treated so that the pathogens have been neutralized or deactivated, such as a material treated by steam sterilization, chemical disinfection, or other appropriate method, so it no longer meets the definition of an infectious substance.

(6) A biological product, including an experimental or investigational product or component of a product, subject to Federal approval, permit, review, or licensing requirements, such as those required by the Food and Drug Administration of the U.S. Department of Health and Human Services or the U.S. Department of Agriculture.

(7) Blood collected for the purpose of blood transfusion or the preparation of blood products; blood products; plasma; plasma derivatives; blood components; tissues or organs intended for use in transplant operations; and human cell, tissues, and cellular and tissue-based products regulated under authority of the Public Health Service Act (42 U.S.C. 264–272) and/or the Food, Drug, and Cosmetic Act (21 U.S.C. 332 *et seq.*).

(8) Blood, blood plasma, and blood components collected for the purpose of blood transfusion or the preparation of blood products and sent for testing as part of the collection process, except where the person collecting the blood has reason to believe it contains an infectious substance, in which case the test sample must be shipped as a Category A or Category B infectious substance in accordance with §173.196 or §173.199, as appropriate.

(9) Dried blood spots or specimens for fecal occult blood detection placed on absorbent filter paper or other material.

(10) A Division 6.2 material, other than a Category A infectious substance, contained in a patient sample being transported for research, diagnosis, investigational activities, or disease treatment or prevention, or a biological product, when such materials are transported by a private or contract carrier in a motor vehicle used exclusively to transport such materials. Medical or clinical equipment and laboratory products may be transported aboard the same vehicle provided they are properly packaged and secured against exposure or contamination. If the human or animal sample or biological product meets the definition of regulated medical waste in paragraph (a)(5) of this section, it must be offered for transportation and transported in conformance with the appropriate requirements for regulated medical waste.

(11) A human or animal sample (including, but not limited to, secreta, excreta, blood and its components, tissue and tissue fluids, and body parts) being transported for routine testing not related to the diagnosis of an infectious disease, such as for drug/alcohol testing, cholesterol testing, blood glucose level testing, prostate specific antibody testing, testing to monitor kidney or liver function, or pregnancy testing, or for tests for diagnosis of non-infectious diseases, such as cancer biopsies, and for which there is a low probability the sample is infectious.

(12) Laundry and medical equipment and used health care products, as follows:

(i) Laundry or medical equipment conforming to the regulations of the Occupational Safety and Health Administration of the Department of Labor in 29 CFR 1910.1030. This exception includes medical equipment intended for use, cleaning, or refurbishment, such as reusable surgical equipment, or equipment used for testing where the components within which the equipment is contained essentially function as packaging. This exception does not apply to medical equipment being transported for disposal.

(ii) Used health care products not conforming to the requirements in 29 CFR 1910.1030 and being returned to the manufacturer or the manufacturer's designee are excepted from the requirements of this subchapter when offered for transportation or transported in accordance with this paragraph (b)(12). For purposes of this paragraph, a health care product is used when it has been removed from its original packaging. Used health care products contaminated with or suspected of contamination with a Category A infectious substance may not be transported under the provisions of this paragraph.

(A) Each used health care product must be drained of free liquid to the extent practicable and placed in a watertight primary container designed and constructed to assure that it remains intact under conditions normally incident to transportation. For a used health care product capable of cutting or penetrating skin or packaging material, the primary container must be capable of retaining the product without puncture of the packaging under normal conditions of transport. Each primary container must be marked with a BIOHAZARD marking conforming to 29 CFR 1910.1030(g)(1)(i).

(B) Each primary container must be placed inside a watertight secondary container designed and constructed to assure that it remains intact under conditions normally incident to transportation. The secondary container must be marked with a BIOHAZARD marking conforming to 29 CFR 1910.1030(g)(1)(i).

(C) The secondary container must be placed inside an outer packaging with sufficient cushioning material to prevent movement between the secondary container and the outer packaging. An itemized list of the contents of the primary container and information concerning possible contamination with a Division 6.2 material, including its possible location on the product, must be placed between the secondary container and the outside packaging.

(D) Each person who offers or transports a used health care product under the provisions of this paragraph must know about the requirements of this paragraph.

(13) Any waste or recyclable material, other than regulated medical waste, including—

(i) Garbage and trash derived from hotels, motels, and households, including but not limited to single and multiple residences;

(ii) Sanitary waste or sewage;

(iii) Sewage sludge or compost;

(iv) Animal waste generated in animal husbandry or food production; or

(v) Medical waste generated from households and transported in accordance with applicable state, local, or tribal requirements.

(14) Corpses, remains, and anatomical parts intended for interment, cremation, or medical research at a college, hospital, or laboratory.

(15) Forensic material transported on behalf of a U.S. Government, state, local or Indian tribal government agency, except that—

(i) Forensic material known or suspected to contain a Category B infectious substance must be shipped in a packaging conforming to the provisions of §173.24.

(ii) Forensic material known or suspected to contain a Category A infectious substance or an infectious substance listed as a select agent in 42 CFR Part 73 must be transported in packaging capable of meeting the test standards in §178.609 of this subchapter. The secondary packaging must be marked with a BIOHAZARD symbol conforming to specifications in 29 CFR 1910.1030(g)(1)(i). An itemized list of contents must be enclosed between the secondary packaging and the outer packaging.

(16) Agricultural products and food as defined in the Federal Food, Drug, and Cosmetics Act (21 U.S.C. 332 *et seq.*).

(c) *Exceptions for regulated medical waste.* The following provisions apply to the transportation of regulated medical waste:

(1) A regulated medical waste transported by a private or contract carrier is excepted from—

(i) The requirement for an “INFECTIOUS SUBSTANCE” label if the outer packaging is marked with a “BIOHAZARD” marking in accordance with 29 CFR 1910.1030; and

(ii) The specific packaging requirements of §173.197, if packaged in a rigid non-bulk packaging conforming to the general packaging requirements of §§173.24 and 173.24a and packaging requirements specified in 29 CFR 1910.1030, provided the material does not include a waste concentrated stock culture of an infectious substance. Sharps containers must be securely closed to prevent leaks or punctures.

(2) A waste stock or culture of a Category B infectious substance may be offered for transportation and transported as a regulated medical waste when it is packaged in a rigid non-bulk packaging conforming to the general packaging requirements of §§173.24 and 173.24a and packaging requirements specified in 29 CFR 1910.1030 and transported by a private or contract carrier in a vehicle used exclusively to transport regulated medical waste. Medical or clinical equipment and laboratory products may be transported aboard the same vehicle provided they are properly packaged and secured against exposure or contamination. Sharps containers must be securely closed to prevent leaks or punctures.

(d) If an item listed in paragraph (b) or (c) of this section meets the definition of another hazard class or if it is a hazardous substance, hazardous waste, or marine pollutant, it must be offered for transportation and transported in accordance with applicable requirements of this subchapter.

§ 173.136 Class 8—Definitions.

(a) For the purpose of this subchapter, “corrosive material” (Class 8) means a liquid or solid that causes full thickness destruction of human skin at the site of contact within a specified period of time. A liquid, or a solid which may become liquid during transportation, that has a severe corrosion rate on steel or aluminum based on the criteria in §173.137(c)(2) is also a corrosive material..

(b) If human experience or other data indicate that the hazard of a material is greater or less than indicated by the results of the tests specified in paragraph (a) of this section, PHMSA may revise its classification or make the determination that the material is not subject to the requirements of this subchapter.

(c) Skin corrosion test data produced no later than September 30, 1995, using the procedures of part 173, appendix A, in effect on September 30, 1995 (see 49 CFR part 173, appendix A, revised as of October 1, 1994) for appropriate exposure times may be used for classification and assignment of packing group for Class 8 materials corrosive to skin.

§ 173.140 Class 9—Definitions.

For the purposes of this subchapter, *miscellaneous hazardous material* (Class 9) means a material which presents a hazard during transportation but which does not meet the definition of any other hazard class. This class includes:

(a) Any material which has an anesthetic, noxious or other similar property which could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties; or

(b) Any material that meets the definition in §171.8 of this subchapter for an elevated temperature material, a hazardous substance, a hazardous waste, or a marine pollutant.

APPENDIX E: NOTICE OF PROPOSED RULEMAKING LIST- HAZARDOUS MATERIALS RISK-BASED ADJUSTMENT OF TRANSPORTATION SECURITY PLAN REQUIREMENTS; FINAL RULE (PHMSA, 2010).

NPRM LIST

Class	Current threshold	Proposed threshold	Change
1.1	Any quantity	Any quantity	None.
1.2	Any quantity	Any quantity	None.
1.3	Any quantity	Any quantity	None.
1.4	A quantity requiring placarding	Any quantity of UN 0104, 0237, 0255, 0267, 0289, 0361, 0365, 0366, 0440, 0441, 0455, 0456, 0500.	Security plan required only for detonators and shaped charges.
1.5	A quantity requiring placarding	Any quantity	Security plan required for all shipments.
1.6	A quantity requiring placarding	Not subject	Security plan not required for any Division 1.6 shipments.
2.1	A quantity requiring placarding	>3,000 L in a single packaging	Security plan not required for 3,000 L (793 gallons) or less.
2.2	A quantity requiring placarding	Not subject except for oxygen and gases with a subsidiary 5.1 hazard (<3,000 L (793 gallons) in a single packaging).	Security plan not required for most non-flammable, non-poisonous compressed gas shipments.
2.3	Any quantity	Any quantity	None.
3	A quantity requiring placarding	>3,000 L (793 gallons) in a single packaging and any quantity of Class 3 desensitized explosives.	Security plan not required for 3,000 L (793 gallons) or less except for desensitized explosives.
4.1	A quantity requiring placarding	Any quantity desensitized explosives	Security plan not required except for desensitized explosives.
4.2	A quantity requiring placarding	PG I and II only in quantities >3,000 kg in a single packaging.	Security plan not required for PG III materials.
4.3	Any quantity	Any quantity	None.
5.1	A quantity requiring placarding	PG I and II liquids, perchlorates, ammonium nitrate (including fertilizers) in quantities >3,000 L (793 gallons) in a single packaging.	Security plan not required for PG III liquids or unlisted solids.
5.2	Any quantity of Organic peroxide, Type B, liquid or solid, temperature controlled.	Any quantity of Organic peroxide, Type B, liquid or solid, temperature controlled.	None.
6.1	A quantity requiring placarding; any quantity of PIH material.	Any quantity of PG I; >3,000 L (793 gallons) for PG II and III.	Security plan not required for 3,000 L (793 gallons) or less of PG II and III.
6.2	Select agents	Select agents	None.
7	Shipments requiring Yellow III label; highway route controlled quantity.	For radionuclides covered by the IAEA Code of Conduct, Category 1 and Category 2 sources per package; for all other radionuclides, 3000 A2 per package.	Security plan only required for Class 7 materials that pose transportation security risk.
8	A quantity requiring placarding	PG I only in quantities >3,000 L (793 gallons) in a single packaging.	Security plan not required for PG II and III materials.
9	Capacity >3,500 gallons for liquid/gas; volumetric capacity >468 cubic feet for solids.	Not subject	Security plan not required for Class 9 materials.