STATEWIDE
Hazardous Materials
COMMODITY FLOW STUDY

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EXECUTIVE SUMMARY

This report was prepared by Nuka Research and Planning Group, LLC (Nuka Research) for the Alaska Department of Environmental Conservation (ADEC) and the Alaska Department of Military and Veterans Affairs (DMVA). The report provides an updated, comprehensive Hazardous Materials Commodity Flow Report for the State of Alaska. The purpose of the report, which updates a similar 2005 study, is to compile data on the transportation of extremely hazardous substances (EHS), hazardous substances (HS), and oil/petroleum products through local communities in Alaska, as well as provide critical information to first responders on the transportation routes and hazardous materials commodities shipped within their local jurisdiction.

The methodology for this study involved five major tasks: (1) comprehensive literature review; (2) data compilation; (3) data review and scoping; (4) analysis; and (5) final report. This report represents the final deliverable for the ADEC issued contract. The final report compiles data for the calendar years 2007, 2008, and 2009. EHS, HS and oil/petroleum product transportation and storage data is analyzed by transportation mode, hazardous material class, and Potentially Impacted Subarea.

While the EHS Commodities transported within the State of Alaska varied slightly in year-to-year volume for certain commodities, the ranking of the top six (6) commodities were very consistent. The top EHS Commodities by volume shipped were (1) Sodium Cyanide, (2) Chlorine, (3) Sulfuric Acid, (4) Anhydrous Ammonia, (5) Formaldehyde, and (6) Phosgene. The Subareas that experienced the greatest volumes of EHS shipments were (1) Cook Inlet, (2) Interior Alaska, (3) Kodiak Island, (4) Prince William Sound, (5) the Aleutians, (6) North Slope, and (7) Northwest Arctic. According to the data received and analyzed, the remaining Subareas (Southeast Alaska, Western Alaska, and Bristol Bay) saw little (less than 150 lbs) to no volume of EHS commodities shipped during the three-year time period evaluated.

The top three HS commodities transported within the State of Alaska were Hazard Classification (HC) 2 (Gas Materials), HC 3 (Flammable Liquid Materials), and ORM-D (Other Regulated Materials). These commodities dominated the total volumes by several orders of magnitude due primarily to natural gas, crude oil, and produced water production and transport volumes within the State, and particularly on the North Slope and within Cook Inlet. After these commodities, HC 9 (Miscellaneous Materials), HC 5 (Oxidizer & Organic Peroxide Materials), and HC 8 (Corrosive Materials) consistently dominated the volumes of hazardous materials shipped year-to-year. Following the trend noted above for the top three hazardous substances, the Subareas with the highest total volumes of hazardous materials shipped were (1) North Slope, (2) Cook Inlet, (3) Interior Alaska, and (4) Prince William Sound. These

Subareas dominated the total volumes shipped over the three-year period by several orders of magnitude making up 99.99% of the total volume.

The top petroleum commodities transported within the State of Alaska remained very consistent in terms of product by volume year-to-year. Crude oil shipments via the Trans-Alaska Pipeline and Cook Inlet Pipeline dominate the petroleum products shipped within the State. The Anchorage Fueling and Service Company (AFSC) Pipeline transports significant volumes of jet fuel from the Port of Anchorage to the Ted Stevens International Airport day-to-day as well. As a direct result, the primary Subareas potentially impacted by these commodities are the North Slope, Cook Inlet, Interior Alaska and Prince William Sound. In general, the petroleum products most prevalent in Southeast Alaska, Kodiak Island, Aleutians, Bristol Bay, Western Alaska, and Northwest Arctic were primarily gasoline, diesel and heating oil type commodities.

The hazardous materials commodity flow transportation modes considered in this report were air cargo, highway corridor, marine corridor, pipeline corridor, and rail corridor. Data was compiled from shippers representing each of the transportation methods. The 'completeness' of the data received varied significantly between sources, but it all provided a solid foundation for the completion of this study.

In general, for the less detailed shipment information received for this study (e.g. rail and air) the types and volumes of hazardous materials shipped remained fairly consistent year-to-year. For the transportation modes where more detailed information was available (e.g. highway, marine and pipeline), the volumes did vary for some commodities from year to year.

Air cargo transportation routes were analyzed by number of hazardous materials shipments from Ted Stevens International Airport in Anchorage to airports statewide, as reported by one air cargo carrier. The primary hazardous material commodities transported were HC 1 (Explosives), HC 3 (Flammable Liquid Materials), HC 8 (Corrosive Materials), and HC 9 (Miscellaneous Materials). In general, it is suspected that this combination of hazardous material commodities is fairly representative of what the other air cargo carriers would carry within the State. Based on the limited data received and analyzed, Bethel and Kotzebue consistently experienced the highest number of hazardous material shipments via air cargo from year to year. As there are over 30 air carriers that could transport hazardous materials within the State of Alaska, the preliminary conclusion could change significantly if additional air cargo data were made available.

The top 5 highway corridors in terms of volume of hazardous materials shipped are (1) Alaska Highway, (2) North Slope Haul Road, (3) Glenn Highway, (4) Richardson Highway, and (5) Sterling Highway. In general, the primary highway corridors that are utilized to transport hazardous materials are located in and around, and in between the cities of Anchorage,

Fairbanks, Valdez, and locations on the North Slope. Highway transportation is the dominant method for transportation of hazardous materials in terms of the total number of shipments in any given year.

In general, the primary marine corridors for hazardous materials transportation are in and around Cook Inlet and associated ports, Southeast Alaska's Inside Passage and associated ports, routes that transit the Aleutians Subarea in innocent passage while enroute to other domestic or international ports, and routes from Cook Inlet through the Aleutians and up to the North Slope. Marine transportation of hazardous materials is second to highway transportation in terms of the total number of shipments in any given year.

The top pipeline corridors identified for the movement of hazardous materials are primarily located in the Cook Inlet Subarea, on the North Slope, and between the North Slope and Valdez. Volumes of hazardous materials commodities and petroleum products shipped were significant and dominate the total volume of all hazardous materials commodities shipped within the State.

The top rail corridors identified for the movement of hazardous materials are located within the Cook Inlet Subarea. Like pipeline shipments, commodities are consistent from year to year and second to pipelines in dominating the total volumes of hazmat shipped within the State.

The Subareas with the highest total volumes of hazardous materials shipped were (1) North Slope, (2) Cook Inlet, (3) Interior Alaska, and (4) Prince William Sound. As stated earlier, these Subareas dominated the total volumes shipped over the three-year period by several orders of magnitude making up 99.99% of the total volume. In order of total volume shipped, the remaining six subareas are ranked as follows: (5) Western Alaska, (6) Northwest Arctic, (7) Southeast Alaska, (8) Aleutians, (9) Bristol Bay and (10) Kodiak Island.

In general, by volume, the commodities transported by pipeline dominate the total volume of hazardous materials shipped within the State by several orders of magnitude. Specifically, the primary commodities are natural gas, crude oil and produced water. For all other remaining modes of transportation, the volume of shipments by rail is significantly higher given the capacity of the various railcar options.

The North Slope experiences the highest volume of hazardous materials transported, and is nearly 44% higher than the next highest Subarea (Cook Inlet). The Cook Inlet Subarea, however, experiences the highest number of shipments of any other Subarea nearly doubling the number of shipments in Interior Alaska and more than tripling the number of shipments in the North Slope Subarea.

Of the over 28 trillion pounds of hazardous materials transported Statewide via all transportation modes, 98.96% were HC 2 (Gas Materials) commodities, specifically natural gas/methane. The remaining 1.04% (302 billion pounds) is primarily dominated by HC 3 (Flammable Liquid Materials), which accounts for 91% of the remaining volume and includes petroleum crude oil, aviation fuel, diesel and gasoline as the primary commodities.

This study should help raise the awareness of the State Emergency Response Commission (SERC) and the Local Emergency Planning Committees (LEPC) with regard to the types and volumes of hazardous materials being shipped through their respective areas of responsibility. More importantly, the information will be of significant value to first responders in preparing for and responding to oil and hazardous substance releases within their local jurisdiction. Additionally, it will augment the hazardous material information contained in the Subarea Contingency Plans and may serve as the foundation for future Statewide hazardous materials commodity flow studies.

1. INTRODUCTION

1.1 Purpose and Scope

This report presents data and analysis compiled during the 2010 Hazardous Materials Commodity Flow Study, which expands upon a 2005 study (Ecology and Environment, 2005). The purpose of the 2010 report is to provide an updated comprehensive study for use by the State of Alaska DEC, SERC, LEPCs, and local jurisdictions to plan for and respond to the potential risks associated with hazardous materials transportation through Alaska's communities.

This study evaluates the hazardous materials commodities transported via five transportation modes into and within the State of Alaska: air, highway, marine, pipeline, and railroad over a three-year period including the calendar years of 2007, 2008, and 2009.

The hazardous materials commodities included were Extremely Hazardous Substances (EHS)[1], Hazardous Substances (HS)[2], and major petroleum products such as crude oil, natural gas, gasoline, aviation fuel, and diesel fuel.

The primary purpose of a commodity flow study is to identify the types and amounts of commodities transported through a specified geographic area, such as a single community, a state, or large urban area, and the routes used for transporting these commodities. A hazardous materials commodity flow study identifies the hazardous substances (HS) or extremely hazardous substances (EHS) transported, either specifically or by hazard class, as well as the routes by which they are transported[3].

This report compiles and analyzes hazardous materials commodity flow data based on the State and federal hazardous materials transportation and storage regulations, and the hazardous material classification systems used by industry.

[1] The Emergency Planning & Community Right-to-Know Act (EPCRA) identifies several hundred hazardous substances for their extremely toxic properties. EPA establishes the list of extremely hazardous substances in 40 CFR Part 355, Appendices A and B.

[2] The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) defines a hazardous substance as substance designated as hazardous under section 102 or CERCLA, any hazardous substance designated under sections 311 (b)(2)(a) and 307(1) of the Clean Water Act (CWA), any hazardous waste having characteristics identified in section 3001 of the Resource Conservation & Recovery Act, any hazardous air pollutant listed in section 112 of the Clean Air Act (CAA), and any imminently hazardous chemical substance or mixture which the EPA Administrator has "taken action under" section 7 of the Toxic Substances Control Act.

[3] U.S. Department of Transportation, Research and Special Programs Administration, "Guidance for Conducting Hazardous materials Flow Surveys." January 1995.

1.2 Background

By statute, the Alaska Department of Environmental Conservation (ADEC) has primary State responsibility for ensuring appropriate containment and cleanup actions are taken for a hazardous substance incident (AS 46.08.130). These incidents are commonly referred to as hazardous materials (HAZMAT) incidents for the purposes of planning and response.

Understanding the types and quantities of hazardous materials moving through the State of Alaska's major transportation corridors – highway, railway, marine, air, and pipeline – helps the State to better prepare for and respond to hazardous materials releases.

ADEC completed a statewide hazards analysis in 2005 to identify the known hazardous substance (HS, including oil) and extremely hazardous substance (EHS) facilities and transportation routes in the State.[4] This analysis was used in hazardous materials spill prevention and response planning at the local, state and federal levels, including the Alaska Federal and State Preparedness Plan for Response to Oil and Hazardous Substance Discharges and Releases (Unified Plan) and the ten Subarea Contingency Plans (SCPs); State of Alaska Emergency Response Plan; Regional and local all-hazard mitigation and emergency response plans; and Community Right-to-Know programs. This 2010 report provides updated data compilation and analysis to support future hazardous materials planning.

1.3 Hazardous Materials Regulations.

1.3.1 Reporting Requirements

State and federal regulations require that companies prepare reports on the types and quantities of hazardous materials that they store and transport. Companies are also required to report any hazardous substance spills that occur in Alaska lands or waters to both state and federal agencies.

Under the Federal Emergency Planning and Community-Right-to-Know Act (EPCRA)[5], certain businesses are required to annually report information about hazardous substances used and stored at their facility. This report, known as the Tier Two Report, is submitted to the Local Emergency Planning Committees (LEPCs), the State Emergency Response Commission (SERC), and local fire departments. ADEC receives these reports on behalf of the SERC. The report identifies HS and EHS chemicals used or stored at the facility during the previous year. ADEC typically receives 800 to 1,000 Tier Two reports each year. This information is used by State and local planners to update the inventory of reporting facilities, develop emergency response plans for potential releases, and to identify ways of reducing the risks to their communities. ADEC, in conjunction with EPA, periodically prepares summary reports of the Tier Two

[4] "Statewide Hazardous Materials Commodity Flow Study," Ecology and Environment, 2005.
[5] 42 U.S.C. 116, Emergency Planning and Community Right-to-Know Act of 1986, SARA Title III

information and provides the data to first responders, LEPCs, and the SERC. These reports provide the information required for fixed facilities.

The National Response Center (NRC) is the sole national point of contact for reporting all oil, chemical, radiological, biological, and etiological discharges into the environment anywhere in the United States and its territories. The National Oil and Hazardous Substances Pollution Contingency Plan charges the NRC with receiving reports of discharges of oil and hazardous substances in accordance with the Federal Water Pollution Control Act (FWPCA) or Clean Water Act.[6]

ADEC also receives spill reports for oil and hazardous substance releases occurring throughout the State. These spill reports are useful in identifying types of releases that occur in the State, along with the primary source, cause, and quantity released. A separate spill summary report is prepared by the ADEC, normally on an annual basis.

1.3.3 Transportation Requirements

While hazardous materials spills from all transportation modes must be reported, State and Federal Tier Two reporting requirements do not apply to hazardous materials transportation. The U.S. Department of Transportation (DOT) in the Code of Federal Regulations has standards for marking, labeling, placarding, shipping papers, emergency response information, packaging, handling, and transporting of hazardous materials,[7] but there are no reporting requirements for HS and EHS transportation. The ability to summarize the EHS and HS chemicals, and major petroleum products transported throughout the State has been an on-going challenge.

There are various federal and state agencies that enforce hazardous materials regulations found in the CFR and state law. Additionally, there are other agency standards and international requirements that certain agencies enforce in addition to those found in the federal regulations. Table 1-1 lists the agencies, their respective enforcement responsibilities, and the associated regulatory cites.

[6] The National Response Center website, http://www.nrc.uscg.mil/nrchp.html
[7] 49 Code of Federal Regulations Part 100-185

Table 1-1. Federal & State Agency Responsibilities & Regulations

AGENCY	ENFORCEMENT RESPONSIBILITY	REGULATION
Federal Railroad Administration (FRA)	Regulations for rail transport.	49 CFR Part 174
Federal Highway Administration (FHA)	Regulations for highway transport.	49 CFR Part 177
Federal Aviation Administration (FAA)	Regulations for air transport International Air Transport Association (IATA) dangerous goods regulations.	49 CFR Part 175 IATA Dangerous Goods Regulations 51st Edition
U.S. DOT Pipeline & Hazardous Materials Safety Administration	Shipment of hazardous materials and the manufacturer, fabrication, marking, maintenance, reconditioning, repair or testing of multi-modal containers	49 CFR Parts 100-185
Federal Motor Carriers Safety Administration (FMCSA)	Regulations for highway transport Regulations for motor carrier safety	49 CFR Part 177 49 CFR Parts 350-399
United States Coast Guard	Regulations for vessel transport International Maritime Dangerous Goods Code (IMDG) requirements.	49 CFR Part 176 IMDG Code
Environmental Protection Agency (EPA)	Emergency Planning & Community Right-to-Know Act (EPCRA) 1986, SARA Title III	42 USC 116[8]
Alaska Department of Transportation & Public Facilities (AKDOTPF)	Transportation of hazardous materials, hazardous substances, or hazardous waste	17 AAC 25.200
Alaska Department of Environmental Conservation (ADEC) on behalf of SERC	Tier Two Reporting for the State of Alaska	AS 29.35.500

1.4 Hazardous Commodity Classification Methods.

Determining the hazardous materials classification for each commodity shipment evaluated in this study was necessary to provide a more complete picture of the specific types of hazardous materials being shipped within the State. This was completed using several common categorization schemes to group each commodity shipped. The classification methods used included the following systems:

United Nations / North America Hazard Identification Number (UN/NA Number). United Nations / North America Identification Number is a four digit number representing a particular chemical or group of chemicals. These numbers are assigned by the United Nations (UN Numbers), the U.S. Department of Transportation (NA Numbers), or Transport Canada (NA Numbers).[9]

[8] This law provides an infrastructure at the state and local levels to plan for chemical emergencies. Facilities that store, use, or release certain chemicals, may be subject to various reporting requirements.
[9] IMDG Code

United Nations Hazardous Materials Classification System. The United Nations (UN) Hazardous Materials (HAZMAT) Classification System uses a numeric designator to categorize hazardous materials according to their hazard potential. This study utilizes the Hazard Classification numbers and the associated definitions, listed in Table 1-2, as the primary identifier for compiling commodities over the various transportation routes. The numerical order of the classes and divisions is not indicative of the degree of danger each poses.[10]

Table 1-2. United Nations Hazardous Materials Classification System[11]

United Nations Hazardous Materials Classification System	
Classification	Definition
1	49 CFR Part 173.50 - Explosive Materials. An explosive means any substance or article, unless otherwise classified, which is (a) designed to function by explosion, or (b) which (by chemical reaction within itself, is able to function in a similar manner even it not designed to function by explosion.
1.1	**Division 1.1** consists of explosives, which have a mass explosion hazard. A mass explosion is one, which affects almost the entire load instantaneously.
1.2	**Division 1.2** consists of explosives, which have a projection hazard but not a mass explosion hazard.
1.3	**Division 1.3** consists of explosives, which have a fire hazard and either a minor blast hazard or a minor projection hazard, or both, but not a mass explosion hazard.
1.4	**Division 1.4** consists of explosives, which 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.
1.5	**Division 1.5** consists of very insensitive explosives. This division is comprised of substances that have a mass explosion hazard, but they are so insensitive that they offer very little probability of initiation or of transition from burning to detonation under normal transport conditions.
1.6	**Division 1.6** consists of extremely insensitive articles, which lack 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	**49 CFR Part 173.115 – Gas Materials**
2.1	**Division 2.1** means that any material that is a gas at 20C (68F) or less and 101.3 kPa (14.7 psi) of pressure, and that (a) is ignitable when in a mixture of 13% or less by volume with air, or (b) has a flammable range with air of at least 12%, regardless of the lower limit.
2.2	**Division 2.2** materials are nonflammable, nonpoisonous compressed gases including compressed gas, liquefied gas, pressurized cryogenic gas and compressed gas in solution. They include any material or mixture that (a) exerts in the packaging an absolute pressure of 280 kPa (41psia or greater at 20C (68F), and (b) does not meet the definition of Divisions 2.1 and 2.3.
2.3	**Division 2.3** materials are gases that are poisonous by inhalation and are (a) known to be so toxic to humans that they pose a health hazard during transportation, or (b) in the absence of adequate data on human toxicity, are presumed toxic to humans because when tested on laboratory animals they have an LC50 value of not more than 5000 ml/m3.

[10] IMDG Code
[11] 49 Code of Federal Regulations Part 173 Definitions

United Nations Hazardous Materials Classification System	
Classification	Definition
3	**49 CFR Part 173.120 – Flammable Liquid Materials**
	A flammable liquid is (a) any liquid having a flash point of not more than 60.5C (141F), or (b) any material in a liquid with a flash point at or above 37.8C (100F) that is intentionally heated and offered for transportation, or transported, at or above its flash point in a bulk packaging. A distilled spirit of 140 proof or lower is considered to have a flash point no lower than 23C (73F).
	A combustible liquid is any liquid that does not meet the definition of any other hazard class and has a flash point above 60.5c (141F) and below 93C (200F). The classification of a material as a combustible liquid is strictly for transportation within the United States and is not recognized internationally. However, 49CFR Part 173.120(b)(2) provides for Class 3 Flammable Materials with flash points at or above 38C (100F) and up to 60.5C (141F) which do not meet the definition of any other hazard class, to be reclassified as combustible liquids for transportation by highway and rail. For shipments involving any air, water, or international movement, these materials are Class 3 Flammable Materials.
4	**49 CFR Part 173.124 – Flammable Solid Materials**
4.1	**Division 4.1** Flammable Solid includes any of the following three types of flammable solid material: Wetted explosives, which, when dry, are explosives of Class 1, other than those of compatibility group A, which, when wetted, suppress the explosive properties, and materials specifically authorized by name in the HMT or by the Associate Administrator for Hazardous Materials Safety. Self-reactive materials that are liable to undergo, at normal or elevated temperatures, a strongly exothermal decomposition caused by excessively high transport temperatures or by contamination. Readily combustible solids that may (a) cause a fire through friction, or (b) show a burning rate faster than 2.2 mm (0.087 inch) per second under specified test procedures, or any metal powders that can be ignited and react over the whole length of a sample in ten minutes or less under specified test procedures.
4.2	**Division 4.2** Spontaneously Combustible material includes (a) liquid or solid pyrophoric material, which (even in small quantities and without an external ignition source), can ignite within five minutes after coming in contact with air under specified test procedures, or (b) self heating material which (when in contact with air and without an energy supply), is liable to self-heat and which exhibits spontaneous ignition, or under specified test procedures would be classed as a Division 4.2 material.
4.3	**Division 4.3** Dangerous When Wet material are ones which (a) by contact with water are liable to become spontaneously flammable, or (b) give off flammable or toxic gas at a rate greater than one liter per kilogram of material per hour under specified test procedures.
5	**49 CFR Part 173.127 & 128 – Oxidizer & Organic Peroxide Materials**
5.1	**Division 5.1** Oxidizer material is a material which may (generally by yielding oxygen), cause or enhance the combustion of other materials.
5.2	**Division 5.2** Organic Peroxide material is any organic compound containing oxygen (O) in the bivalent -O-O- structure which may be considered a derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals, with some exceptions.
6	**49 CFR Part 173.132 & 134 – Poison Materials**
6.1	**Division 6.1** those materials, other than gases, which (a) are known to be so toxic to humans as to afford a hazard to health during transportation, or (b) in the absence of adequate data on human toxicity, are presumed to be toxic to humans because they fall within specified oral, dermal, or inhalation toxicity ranges when tested on laboratory animals, or (c) are irritating materials (with properties similar to tear gas), which cause extreme irritation, especially in confined spaces.

United Nations Hazardous Materials Classification System	
Classification	Definition
6.2	**Division 6.2** materials are (a) infectious substances which are viable microorganisms (or their toxins) which cause or may cause disease in humans or animals., (b) those agents listed in 42CFR part 72.3 of the Department of Health and Human Services regulations, or (c) any other agents which cause or may cause severe disabling or fatal disease.
7	**49 CFR Part 173.403 – Radioactive Materials**
	A Radioactive Material is any material having a specific activity greater than 0.002 micro curie per gram (MCi/g).
8	**49 CFR Part 173.136 – Corrosive Materials**
	A Corrosive Material is a liquid or solid which causes visible destruction or irreversible alteration in human skin tissue at the site of contact, or a liquid which has a severe corrosion rate on steel or aluminum in accordance with specified criteria.
9	**49 CFR Part 173.140 – Miscellaneous Materials**
	A Miscellaneous Hazardous Material is one which presents a hazard during transportation but does not meet the definition of any other hazard class. This includes (a) any material, which has an anesthetic, noxious, or other similar property which could cause extreme annoyance or discomfort to any employee so as to prevent the performance of assigned duties, or (b) any material which meets the definition in 49CFR Part 171.8 for an elevated temperature.
ORM-D	**49 CFR Part 173.144 – Other Regulated Materials**
	An ORM-D Material is a material such as a consumer commodity, which (although otherwise subject to the regulations) presents a limited hazard during transportation because of its form, quantity, and packaging. It must be a material for which exceptions are provided in the HMT. In addition to the limited quantity exceptions from labeling, specification packaging and placarding, ORM-D materials are also excepted from the shipping paper requirements unless the material is a hazardous substance, hazardous waste, marine pollutant, or the material is offered or intended for transport by air.

Chemical Abstracts Service (CAS) Registry System. CAS registry numbers are unique numerical identifiers for chemical elements, compounds, polymers, biological sequences, mixtures and alloys. They are also referred to as CAS numbers, CAS RNs or CAS #s. A CAS Registry Number includes up to 10 digits. As there are approximately 12,000 new substances added each day, it is impossible to list them in this document. They are available on-line through the American Chemical Society.[12] An example of a CAS Registry Number is 74-82-8 that corresponds to 'methane' with UN ID Number 1971. In many cases, where the UN ID Number, hazardous material classification division, or hazardous material description was unknown or non-specific, the CAS Registry Number was used to make an association with the corresponding commodity.

Chemical Hazard Response Information System (CHRIS) Code. The Chemical Hazard Response Information System (CHRIS) is designed to provide information needed for decision-making by responsible Coast Guard personnel during emergencies that occur during the water transport of hazardous chemicals. The 3-letter code is designed to facilitate correct identification of chemicals in oral or written communication to assist

[12] American Chemical Society, http://www.cas.org/expertise/cascontent/index.html

first responders in further assessing necessary response needs should there be a release of a particular commodity within their area of responsibility.[13] The total number of CHRIS Codes exceeds 1,300 chemicals and mixtures and therefore the listing of three-letter codes is not provided in this report. However, a CD-ROM, known as CHRIS+, contains the CHRIS database and is available through the U.S. Coast Guard free of charge. This classification, when available, was captured in the dataset. In some cases, the CHRIS Code also helped determine the UN ID Number, hazardous classification division and/or CAS Registry Number.

[13] U.S. Coast Guard Chemical Hazard Response Information System Manual

2. METHODOLOGY

The methodology for this study involved five major tasks: (1) comprehensive literature review; (2) data solicitation and compilation; (3) dataset development; (4) analysis; and (5) reporting.

2.1 Literature Review

A literature review was conducted to examine the available data, published reports, plans, regulations, and guidance relating to hazardous materials transportation and storage statewide. Appendix D contains a complete list of all literature reviewed for this study.

2.2 Data Solicitation and Compilation

The first step in compiling the data required to conduct this study was to generate a list of agency and industry contacts that might be able to provide datasets or other information for use in completing this study. In total, 135 individuals and organizations were identified as potential information sources to support the completion of this Hazardous Materials Commodity Flow Study.

Contact and information requests took the form of phone calls, emails and Freedom of Information Act Requests (Appendix B). Of the 135 potential information sources identified, approximately 76% were successfully contacted; of those successfully contacted, approximately 67% were responsive, providing some data that was of use to the development of this study. Of those parties that responded to information requests, nine respondents provided the majority of the data for this report. Table 2-1 summarizes the key data sources, and Appendix C provides a complete list of the potential information sources contacted and their responsiveness.

Table 2-1. Summary of Key Data Sources

Information Source	Data Provided	Comments
Carlile Transportation Systems	Hazardous material shipments for 2005 through 2009 totaling over 88,000 lines of data (highway, marine and air).	Data included hazardous materials shipped via highway, marine and air modes.
Alaska West Express	Hazardous Material Traffic Analysis for 2009.	Useful report that contributed to the development of this study.
Alaska Railroad Corporation	Hazardous material shipments for 2007 through 2009. The dataset included information for movement of over 160,000 railcar hazardous material units.	To control the number of discreet line item entries, shipments were grouped and volumes shipped determined.
U.S. Coast Guard[14]	Facility and Vessel hazardous material	Much of the data was incomplete lacking

[14] It should be noted that the response from the United States Coast Guard (Headquarters response to the Freedom of Information Act Request dated March 22, 2010) was incomplete and did not address the information requested. As noted above, spill data extracted from the Marine Information Safety and Law Enforcement System (MISLE) database was provided in lieu of any hazardous materials facility specific or vessel transportation information. While somewhat useful, the response did not address what was requested.

Information Source	Data Provided	Comments
	release data for 2005 through 2009, over 1200 entries.	dates, or was below the 1 barrel threshold and therefore was not included in the dataset.
U.S. Coast Guard Marine Safety Unit Valdez	Facility information for six (6) facilities including geo-spatial data and commodities stored.	Data useful in helping validate completeness of Tier Two Report data.
U.S. Coast Guard Sector Anchorage	Facility information for 296 facilities including geo-spatial data and commodities stored.	Data useful in helping validate completeness of Tier Two Report data.
Totem Ocean Trailer Express	Marine shipping information (total volume shipped) for U.S. Coast Guard regulated commodities for 2007 through 2009 (chlorine only).	Data useful as it addressed what appeared to be a significant gap/difference in EHS commodities shipped from the 2005 report.
Air Cargo Carrier[15]	Total hazardous material shipments for 2007 through 2009, over 13,000 data entries.	This carrier is one of 22 carriers (cargo and passenger) that operate out of Anchorage.
Environmental Protection Agency	Tier Two Facility data for 2008 including over 4,000 entries covering commodities stored within the State.	Data useful in helping validate completeness of shipping information.

2.3 Dataset Development

The Hazardous Material Commodity Flow Study Dataset analyzed in this report began as more than 100,000 entries, had significant gaps in data completeness, and varied greatly in format and detail. In many cases, line entries were missing UN/NA Identification numbers, CAS Numbers, Hazard Classifications, and/or a definitive Hazardous Material Name. To the extent possible, these gaps were filled using the on-line CAMEO database[16] and Material Safety Data Sheets (MSDS).

One of the primary challenges with evaluating and compiling the dataset included the inability to effectively provide comprehensive data quality assurance/quality control (QA/QC). While QA/QC measures were implemented throughout the period of this study, questions of data integrity came up that were difficult, if not impossible, to validate. In one case, a several order of magnitude jump in the volume of a particular hazard class shipment was observed between 2007 and 2008, and then a near equivalent drop was observed between 2008 and 2009. Given the size of this jump and subsequent reduction, this entry was suspected to be a data entry error on the part of the information source. Unfortunately, lacking the cognizant company's ability to trace back through hundreds of thousands of shipping records, there was no confident method to adjust or validate the data entry. As such, these issues were noted as appropriate.

[15] Air Carrier preferred to not be identified for proprietary business concerns.
[16] http://cameochemicals.noaa.gov/search/simple

Once the dataset had been supplemented, it was scoped down to control data quality and allow for comparative analysis:

- Data from the years 2007, 2008, and 2009 were selected to ensure there was consistent coverage between the various data sources; all other years were excluded from the dataset. Entries without date information were also eliminated from the dataset.[17]
- The dataset was scoped to only include those items that met a minimum volume threshold value, which was set at 1 barrel (42 gallons, or 351 pounds) for all HS substances.[18] EHS chemicals were all retained in the dataset regardless of volume.
- Like entries of hazardous material commodities being transported via the same mode and between the same origin and destination cities within the same timeframe (e.g. same year) were combined and a single total volume shipped was determined[19] to limit the number of discreet line item entries. For example, three shipments of HC 3.0 (Flammable Liquid Materials) commodities with UN ID Number 1267 (Petroleum Crude Oil), transported via the highway from Anchorage to Fairbanks in 2008 would be combined into a single entry totaling the volumes of all three entries.
- Fixed facility information was removed from the dataset (although retained for inclusion in this report).

The conversion of the hazardous materials commodity flow data from an Excel spreadsheet into an ACCESS Database enabled simplified data entry, data query, report generation, and data maintenance. Future studies could build upon this database to enable analysis across larger year classes. Figure 2-1 shows an example of a data record from the ACCESS Database.[20] Appendix A contains a table with the complete data set.

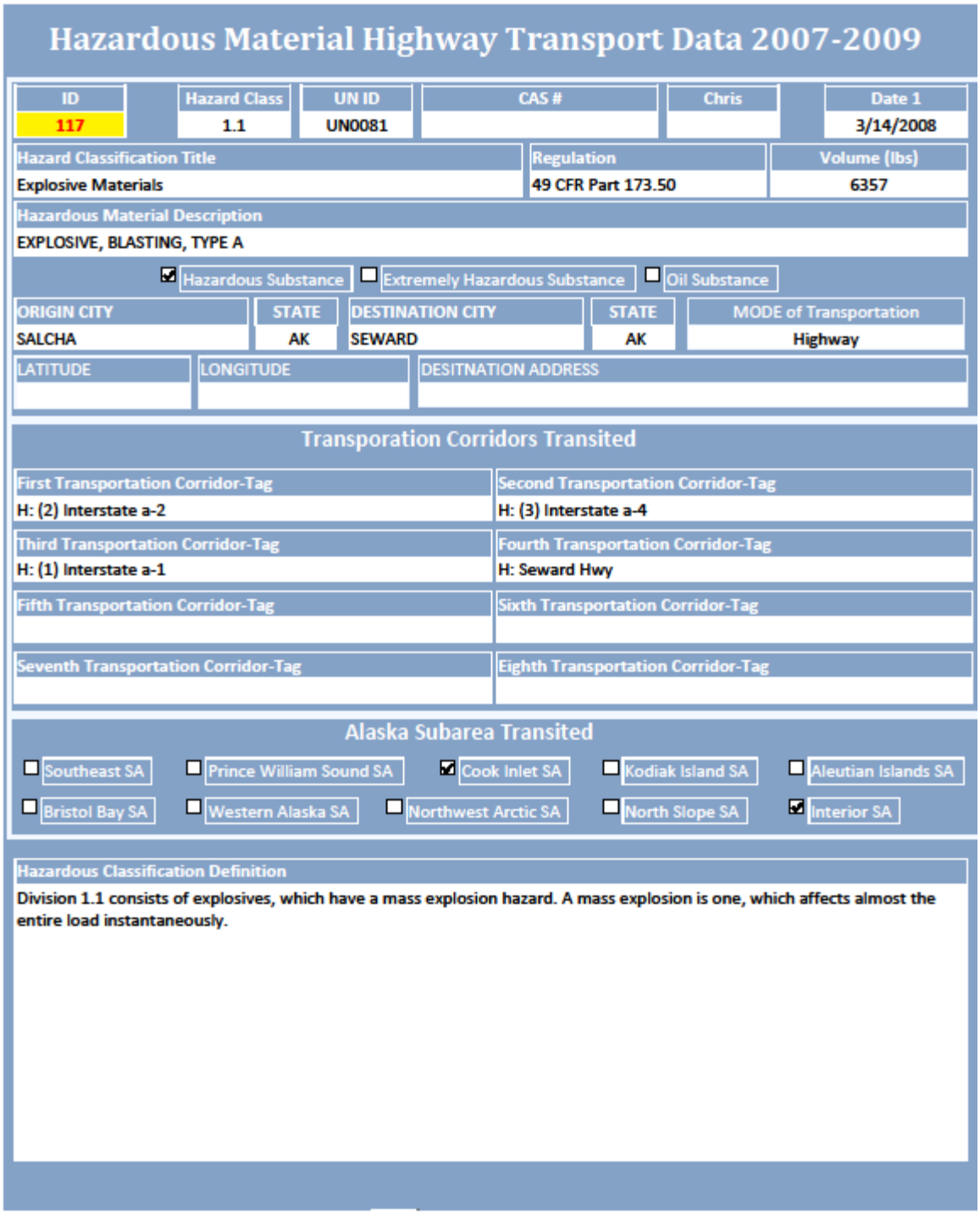
[17] These entries were primarily incomplete spill data received from the USCG MISLE database and were typically single distinct spills of minimal volumes.

[18] The weight of 1 gallon of water was used to calculate the weight threshold for the equivalent of 1 barrel of commodity shipped – 8.35 pounds/gallon of water. Any commodity, with the exception of EHS, under this volume threshold was removed from the dataset.

[19] This scoping step combined similar shipments. As a result, the final analysis focuses primarily on volume shipped versus total number of actual shipments.

[20] A full copy of the database was provided to ADEC as a deliverable for this project.

Figure 2-1. Example of data record from ACCESS Database



Hazardous Material Highway Transport Data 2007-2009

ID	Hazard Class	UN ID	CAS #	Chris	Date 1
117	1.1	UN0081			3/14/2008

Hazard Classification Title	Regulation	Volume (lbs)
Explosive Materials	49 CFR Part 173.50	6357

Hazardous Material Description: EXPLOSIVE, BLASTING, TYPE A

☑ Hazardous Substance ☐ Extremely Hazardous Substance ☐ Oil Substance

ORIGIN CITY	STATE	DESTINATION CITY	STATE	MODE of Transportation
SALCHA	AK	SEWARD	AK	Highway

LATITUDE	LONGITUDE	DESITNATION ADDRESS

Transporation Corridors Transited

First Transportation Corridor-Tag	Second Transportation Corridor-Tag
H: (2) Interstate a-2	H: (3) Interstate a-4
Third Transportation Corridor-Tag	**Fourth Transportation Corridor-Tag**
H: (1) Interstate a-1	H: Seward Hwy
Fifth Transportation Corridor-Tag	**Sixth Transportation Corridor-Tag**
Seventh Transportation Corridor-Tag	**Eighth Transportation Corridor-Tag**

Alaska Subarea Transited

☐ Southeast SA ☐ Prince William Sound SA ☑ Cook Inlet SA ☐ Kodiak Island SA ☐ Aleutian Islands SA

☐ Bristol Bay SA ☐ Western Alaska SA ☐ Northwest Arctic SA ☐ North Slope SA ☑ Interior SA

Hazardous Classification Definition

Division 1.1 consists of explosives, which have a mass explosion hazard. A mass explosion is one, which affects almost the entire load instantaneously.

2.3.1 Assumptions

For hazardous materials that were shipped by rail, there are multiple methods for shipment. As the data received from the Alaska Railroad provided the number of 'containers' or 'tank cars' shipped in a given year to a specified location, some assumptions had to be made to convert these total number of shipments to volumes. These assumptions were:

- That general break-bulk commodities (e.g. sodium cyanide, gas materials) were transported in 20-foot containers. A loaded 20 foot container weight of 48,000 pounds was used for these commodity shipments;
- That flammable liquids were shipped in General Service Tank Cars. A loaded volume of 23,000 gallons was used and verified by Alaska Railroad;
- That corrosive materials, as validated by the Alaska Railroad, were generally shipped in smaller cars, approximately 15,000-gallon tank cars. The volume was converted to pounds using a conversion of 15 lbs/gallon;
- That ammonium nitrate was shipped in covered hopper type cars. A loaded volume of 203,000 pounds was used and verified by Alaska Railroad; and
- That radioactive materials, as validated by the Alaska Railroad, were shipped in 65-foot gondolas weighing 250,000 pounds.
- That military shipment of ammunition entering Valdez from the lower 48 twice a year and being trucked to Anchorage and Fairbanks averaged between 47 and 302 20-foot containers per shipment and included Hazard Class 1.0 (Explosive Materials) commodities with hazard class divisions 1.1 (mass explosion hazard), 1.2 (projection hazard), 1.3 (fire and minor blast and/or projection hazards) and 1.4 (minor explosion hazard).[21] In order to develop an estimated volume, the following assumptions were made:
    - A single 20-foot container loaded weight was estimated at 48,000 pounds;
    - The average number of containers per shipment was set at 200. While slightly higher than the true average, this number was selected to be slightly conservative in the estimate.
    - Half of each shipment went to Anchorage, and half went to Fairbanks.
    - There were 100 containers each year (50/shipment) for each hazard class 1.1, 1.2, 1.3 and 1.4 explosives.
- For hazardous materials shipped via air, only the total number of shipments was provided for specific destinations. To enable further analysis, two key assumptions were applied to the air cargo data:
    - The volume of hazardous materials shipments ranged between 1 and 5000 pounds per shipment based on the cargo capacity of the aircraft utilized; and

[21] 6/2/10 Phone call with Mr. Bob Meno, Service Deployment & Distribution Command Military Munitions move coordinator.

- The number of shipments of the specific hazardous material commodities was distributed evenly across the total number of shipments to a given destination.

For air shipments, a simple algorithm was developed that distributed an average weight category equally across the total number of shipments to a given destination (e.g. it was assumed that there were the same number of shipments that averaged 500 pounds as those that averaged 4500 pounds). Within each weight category, the five (5) general commodities were spread over the weight category such that lower weight commodities dominated the lower two weight categories (500 and 1500 pounds) while the higher weight commodities dominated the upper three weight categories (2500, 3500 and 4500). The average weight category distribution is displayed below in Table 2-2. For the purposes of this example, the number of shipments to destination 'Q' is 100 (therefore 20 shipments per weight category), and there are 5 commodities that may be shipped to this location.[22]

Table 2-2. Air Cargo Average Weight Category Distribution

Q	Air Cargo Weight & Commodity Hazard Class Distribution Algorithm					
Ship-ments	Cargo A	Cargo B	Cargo C	Cargo D	Cargo E	Weight Cat.[23]
20	.3*20*500	.3*20*500	.3*20*500	.05*20*500	.05*20*500	500
20	.3*20*1500	.3*20*1500	.3*20*1500	.05*20*1500	.05*20*1500	1500
20	.05*20*2500	.05*20*2500	.05*20*2500	.425*20*2500	.425*20*2500	2500
20	.05*20*3500	.05*20*3500	.05*20*3500	.425*20*3500	.425*20*3500	3500
20	.05*20*4500	.05*20*4500	.05*20*4500	.425*20*4500	.425*20*4500	4500

2.4 Analysis

Once reduced through scoping, the dataset was analyzed to consider trends by transportation mode, hazardous materials class by volume, and Potential Impacted Subarea.

2.4.1 Transportation Mode

Five transportation modes were considered in this study: air, rail, highway, marine, and pipeline. The analysis of transportation modes captured multiple transportation routes.

Initially, 119 transportation routes were identified to describe the route a particular commodity transited during shipment from origin to destination. Unique identifiers represented a code

[22] The assumptions and hazard class category distributions that resulted in a volume of a particular hazardous materials commodity moving from point A to point B are for reporting consistency and to provide an indication of relative volumes of hazardous materials cargos.

[23] An average weight was selected for each weight category: 500 for 1-1000, 1500 for 1000 to 2000, etc. Using both a Uniform and Parabolic distribution of weights, the average centers in on the mid points for each respective range, http://www.statisticalengineering.com/index.html.

identifying the mode of transportation, and the route and/or origin/destination locations. Table 2-3 provides examples of the transportation mode identifiers.

Table 2-3. Summary of Transportation Mode Identifiers

Transportation Mode	Route Identifier	Meaning
Air	A: Anchorage-Galena	The commodity was shipped via aircraft from Anchorage to Galena.
Air	Backhaul Anchorage	The commodity was shipped via aircraft from various locations back to Anchorage.
Highway	H: (1) Interstate A-1	The commodity transited Interstate A-1 during shipment.
	H: Anchorage Local	The commodity was shipped within the greater Anchorage area, but specific destinations were undetermined.
Marine	M: Cook Inlet	The commodity transited Cook Inlet during shipment.
Pipeline	P: North Slope – Valdez	The commodity was shipped from the North Slope to Valdez via the Trans-Alaska pipeline.
Rail	R: Whittier-Portage	The commodity was shipped via the Whittier to Portage segment of the Alaska Rail Road.

The marine corridor identifiers were developed utilizing multiple sources including the Alaska Marine Highway routes and the Aleutian Islands Vessel Traffic Survey (Nuka Research and Planning Group, 2005), and geographic reference points. The marine corridor naming convention identified an actual marine route (M: Inside Passage), a waterway that was transited (M: Cook Inlet), a destination port (M: Seward), or a destination Subarea (M: North Slope).

For the purposes of this study, the maximum number of segments for any particular route was limited to eight (8) and primarily identified only the major transportation routes (city to city rather than point to point) as specific addresses were not available for the majority of commodities. In scenarios where the origination and destination cities were the same (e.g. Anchorage), and no additional route information was available, a 'local' identifier was assigned (e.g. H: Anchorage Local indicates that the commodity was transported between undetermined locations in the Anchorage area via highway/roadway; see Table 2-3).

2.4.2 Hazardous Materials Class

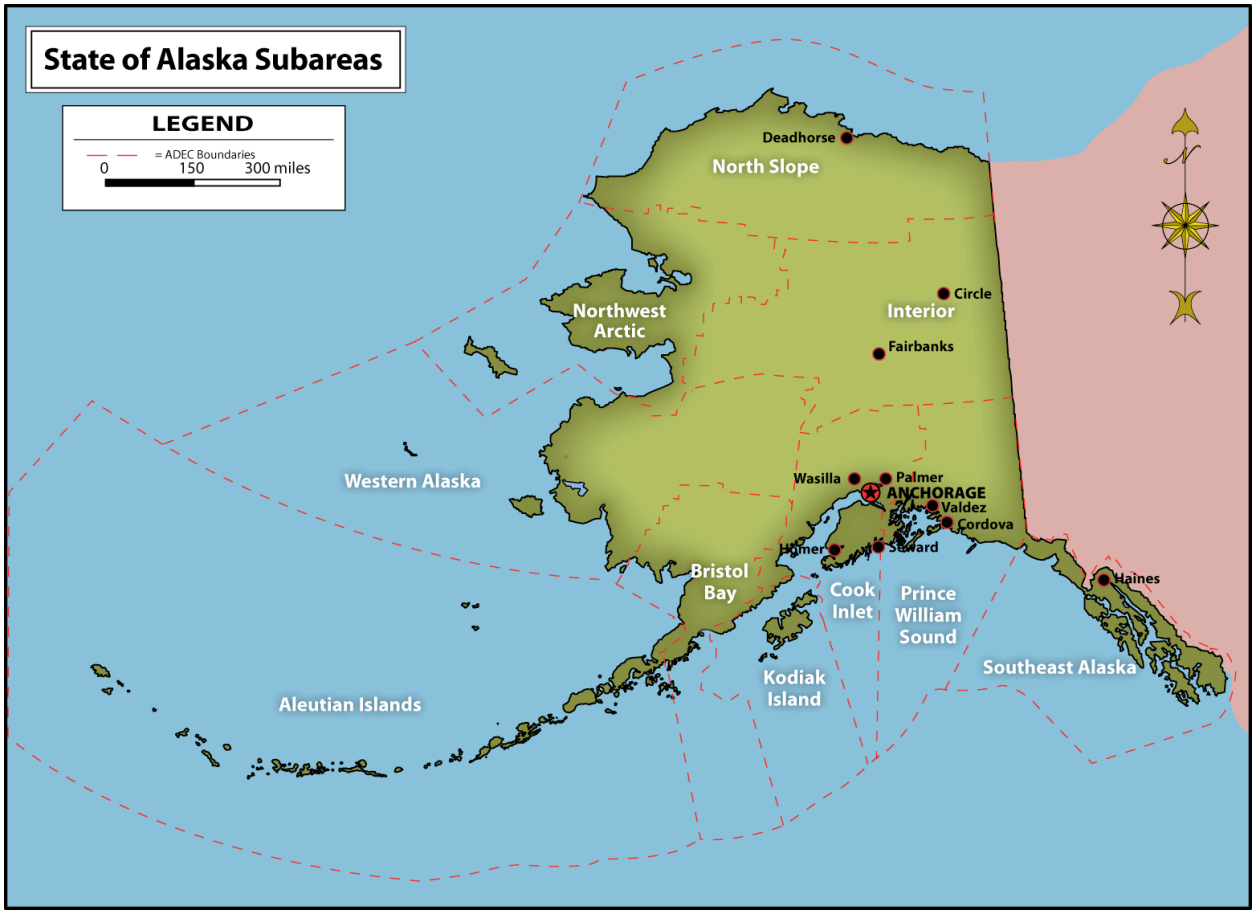
The transportation of hazardous materials statewide was analyzed by type of hazardous material (class) transported by year, volume, and number of shipments, to identify statewide trends. Commodities were grouped by hazard class and by year shipped and evaluated by total volume shipped statewide. Additionally, the total numbers of shipments were compared by hazard class for each year evaluated in this study.

2.4.3 Potentially Impacted Subarea

There are ten Subareas in Alaska for the purpose of oil and hazardous materials spill response planning: Southeast Alaska, Prince William Sound, Cook Inlet, Kodiak Island, Aleutians, Bristol Bay, Western Alaska, Northwest Arctic, North Slope and Interior Alaska (Figure 2-2). The initial determination of Potentially Impacted Subarea was made based on the origination and destination cities noting that this was not necessarily complete and that it would have to be further defined as the actual transportation routes were identified.

Once transportation routes were identified, Potentially Impacted Subareas were further defined to capture those Subareas transited between origin and destination. For air cargo transportation, only the origination and destination subareas were identified since the greatest potential likelihood of a hazardous material incident resides at the origin and destination locations.

Figure 2-2. Alaska Subareas



2.5 Reporting

Interim and final reporting on the data included three progress reports on data compilation and scoping and this final report.[24]

[24] Interim reports were submitted to ADEC on 4/15/10, 5/14/10, and 6/30/10.

3. ANALYSIS BY TRANSPORTATION MODE

There were 5 (five) transportation modes evaluated during this study: air, highway, marine, pipeline and railroad. A brief discussion of fixed facilities is also presented.

3.1 Air

Shipments of hazardous materials via aircraft represent three (3) percent of the total shipments in the data evaluated. This percentage may be underestimated because data on hazardous materials shipped by air was provided by only one of over 30 carriers operating in the State of Alaska. The data on air transport of hazardous materials documented the number of hazardous materials air shipments, but lacked specific detail regarding the volume and type of hazardous materials.[25] While it was stated that all classes of hazardous materials may be shipped via air, in general the primary commodities include batteries and battery fluid, corrosive cleaning supplies, vehicles (cars, trucks, ATVs, and snow mobiles), engines (of all varieties but limited to internal combustion, liquid powered), gasoline, and ammunition for hunting.[26]

The primary hazard classes transported by one Air Cargo Carrier included Class 1 Explosive Materials (ammunition), Class 3 Flammable Liquid Materials (gasoline), Class 8 Corrosive Materials (corrosive cleaning supplies and batteries with fluid), and Class 9 Miscellaneous Materials (engines and vehicles). These materials were transported to 13 primary destinations throughout the State and also included two other backhaul routes (Backhaul Anchorage and Backhaul Fairbanks) where commodities were shipped from the 13 primary destinations back to Anchorage and from other charter locations within Alaska back to Fairbanks.

Total shipments for the time period evaluated in this study were 12,415 (average of 4,140 per year). A sharp rise in the number of hazardous materials shipments between 2007 and 2008 (Figure 3-1) may be attributable to the increase in the Alaska Permanent Fund Dividend checks for that year, which resulted in a significant increase in snow mobiles, ATV's, outboard boat motors, and other equipment. being purchased and shipped to remote communities. Additionally, the sharp increase in shipments to Emmonak between 2007 and 2008 is likely a reporting bias resulting from the fact that another airline reduced their service into that destination, replaced by the one airline that provided the most data for this study. A relative breakdown of hazardous materials shipments by total volume across the State is shown below in Figure 3-1 for comparison purposes only.

[25] 7/9/10 Conversation with Mr. John Landis, FAA Regional Hazmat Contact: "Although the Federal Aviation Administration (FAA) requires airlines to track hazardous material shipments and to maintain those HAZMAT shipment records for the previous year, the regional FAA agency does not maintain any type of database that would yield the number, type and volume of hazardous materials shipments within the respective region over a given period of time."

[26] 7/20/10 conversation with Air Cargo / Hazardous Material Cargo Manager.

Figure 3-1. Statewide Relative Breakdown of Air Cargo Hazardous Material Shipments by Total Volume (lbs), 2007-2009

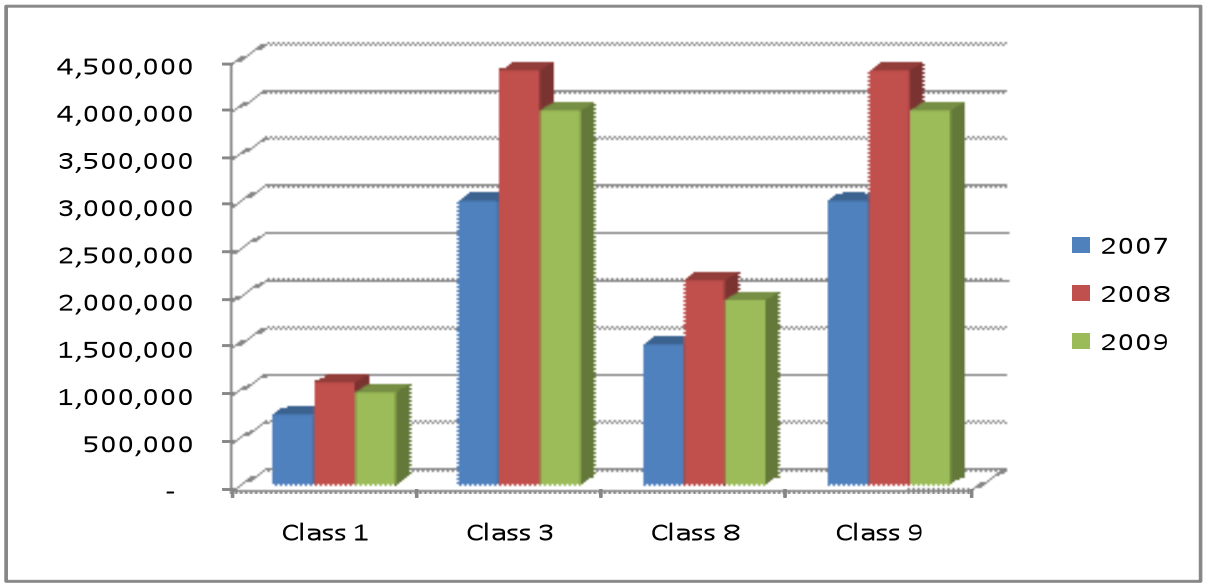


Table 3-1 lists the top five (5) air corridors according to the data received and evaluated.[27] Air routes from Anchorage to Bethel, Kotzebue, Nome, Emmonak, and Dillingham consistently experienced the highest number of hazardous materials shipments from 2007 to 2009. Figure 3-2 depicts weighted airline routes based on the number of hazardous materials shipments to a particular location.

Bethel and Kotzebue consistently experienced the highest number of hazardous materials shipments from 2007 to 2009, based on the one air carrier that provided data. It is likely there were additional hazardous material shipments throughout the State via air carriers not captured in this dataset, including specifically routes to Prince William Sound, and Southeast Alaska Subareas.

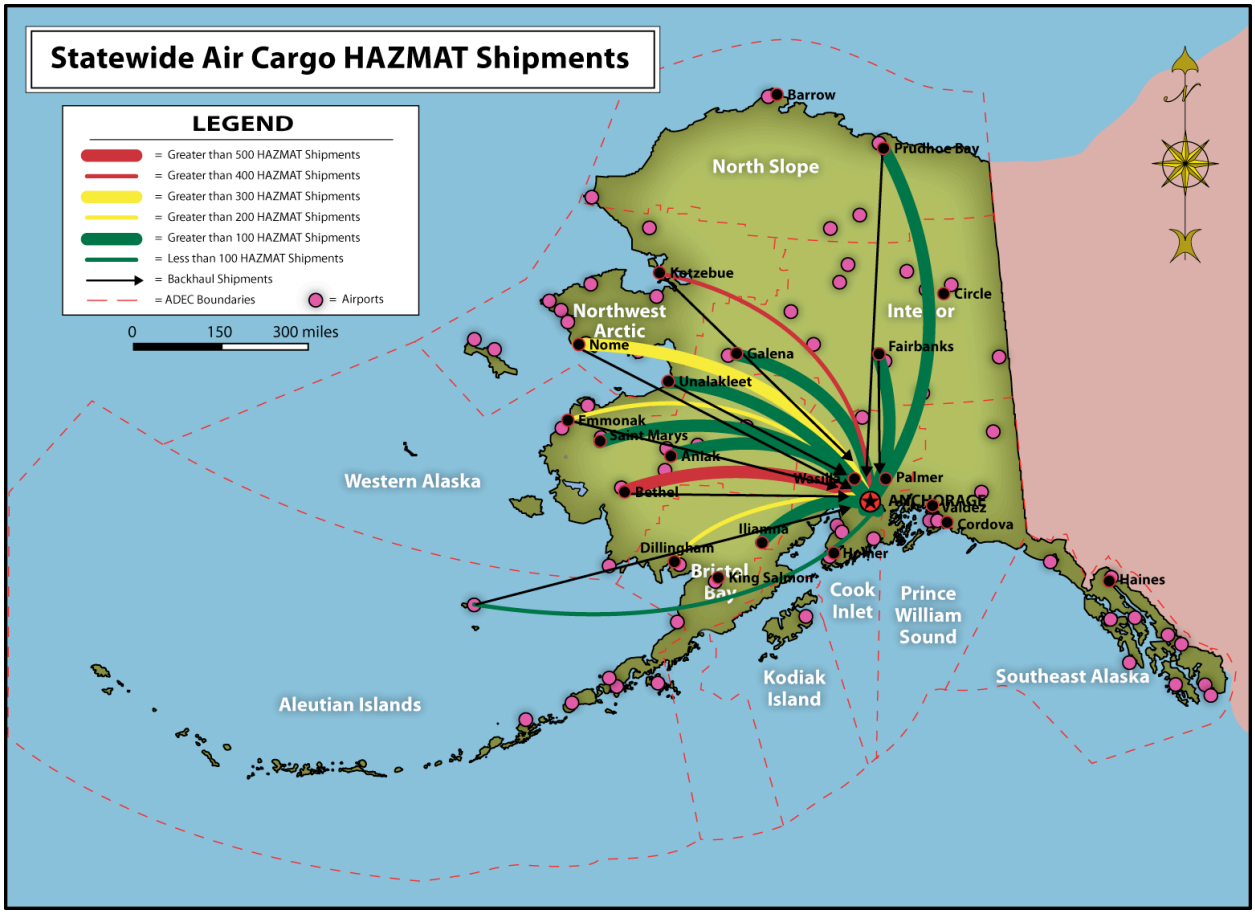
Based on the data received and evaluated, the primary EHS commodity transported via air was sulfuric acid that was carried in batteries.

[27] Note that no data was received regarding air shipments to or from Juneau or within the Southeast Alaska Subarea. The lack of data should not necessarily be interpreted as a lack of activity.

Table 3-1. Top 5 Air Corridors by Hazardous Material Classification

Top 5 Air Corridors (Based on a 3 year average)					
Hazard Class	**1**	**2**	**3**	**4**	**5**
1	Anchorage-Bethel	Backhaul Anchorage	Anchorage-Kotzebue	Anchorage-Nome	Anchorage-Emmonak
2	N/A	N/A	N/A	N/A	N/A
3	Anchorage-Bethel	Anchorage-Kotzebue	Anchorage-Nome	Anchorage-Emmonak	Anchorage-Dillingham
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	Anchorage-Bethel	Backhaul Anchorage	Anchorage-Kotzebue	Anchorage-Nome	Anchorage-Emmonak
9	Anchorage-Bethel	Backhaul Anchorage	Anchorage-Kotzebue	Anchorage-Nome	Anchorage-Emmonak
ORM-D	N/A	N/A	N/A	N/A	N/A

Figure 3-2. Statewide Air Cargo Hazardous Materials Shipments by Total Shipments



3.2 Highway

The transportation of hazardous materials via the highway represents 55% of the total number of shipments in the timeframe evaluated but only 0.0016% of the total volume statewide. The highway shipments reviewed cover the complete spectrum of hazard classes. Table 3-2 lists the volumes of hazardous material commodities shipped in total from 2007 to 2009. Hazard Class 3 (Flammable Liquid Materials) commodities represent the highest volume commodity shipped via the highway.

Table 3-2. Total Volumes of Hazardous Materials Shipped via Highway

Statewide Summary of Volumes (lbs) Transported via Highway		
Rank	**Commodity**	**Total Volume (lbs)**
1	HC 3 - Flammable Liquid Materials	342,943,656
2	HC 1 - Explosive Materials	263,426,333
3	HC 4 - Flammable Solid Materials	259,407,387
4	HC 2 - Gas Materials	104,748,177
5	HC 9 - Miscellaneous Materials	93,534,346
6	HC 8 - Corrosive Materials	83,419,216
7	HC 5 - Oxidizer & Organic Peroxide Materials	71,145,588
8	HC 7 - Radioactive Materials	4,851,008
9	HC 6 - Poison Materials	2,119,354

Twenty-one primary highways/roadways were found to be associated with the transportation of hazardous materials within the State of Alaska.[28] Table 3-3 lists the top five (5) highway corridors identified for movement of hazardous materials by the specific Hazard Class division, and Figure 3-3 depicts the weighted highway routes based on the volume of hazardous materials shipments to a particular location.

Table 3-4 lists the total three-year volume of hazardous materials shipped along seven (7) primary highways that are included in Table 3-3. The top five highway corridors by volume of hazardous materials shipped are: (1) Alaska Highway, (2) North Slope Haul Road, (3) Glenn Highway, (4) Richardson Highway, and (5) Sterling Highway. The EHS commodities transported via the highway are listed in Table 3-5 by volume. The major EHS commodity transported via highway is sulfuric acid.

The top highway corridors used to transport the EHS noted above are listed in Table 3-6. The primary routes include shipment from Anchorage north through Fairbanks en-route to the North Slope, and shipment from Anchorage south to Kenai, Homer, Seward and Nikiski.

[28] It is likely that hazardous materials are shipped over other secondary roads, but these were not identified because of the limitation in scope to eight layers (e.g. 8 changes in roadways/highways).

Figure 3-3. Statewide Highway Corridors by hazardous materials Volume

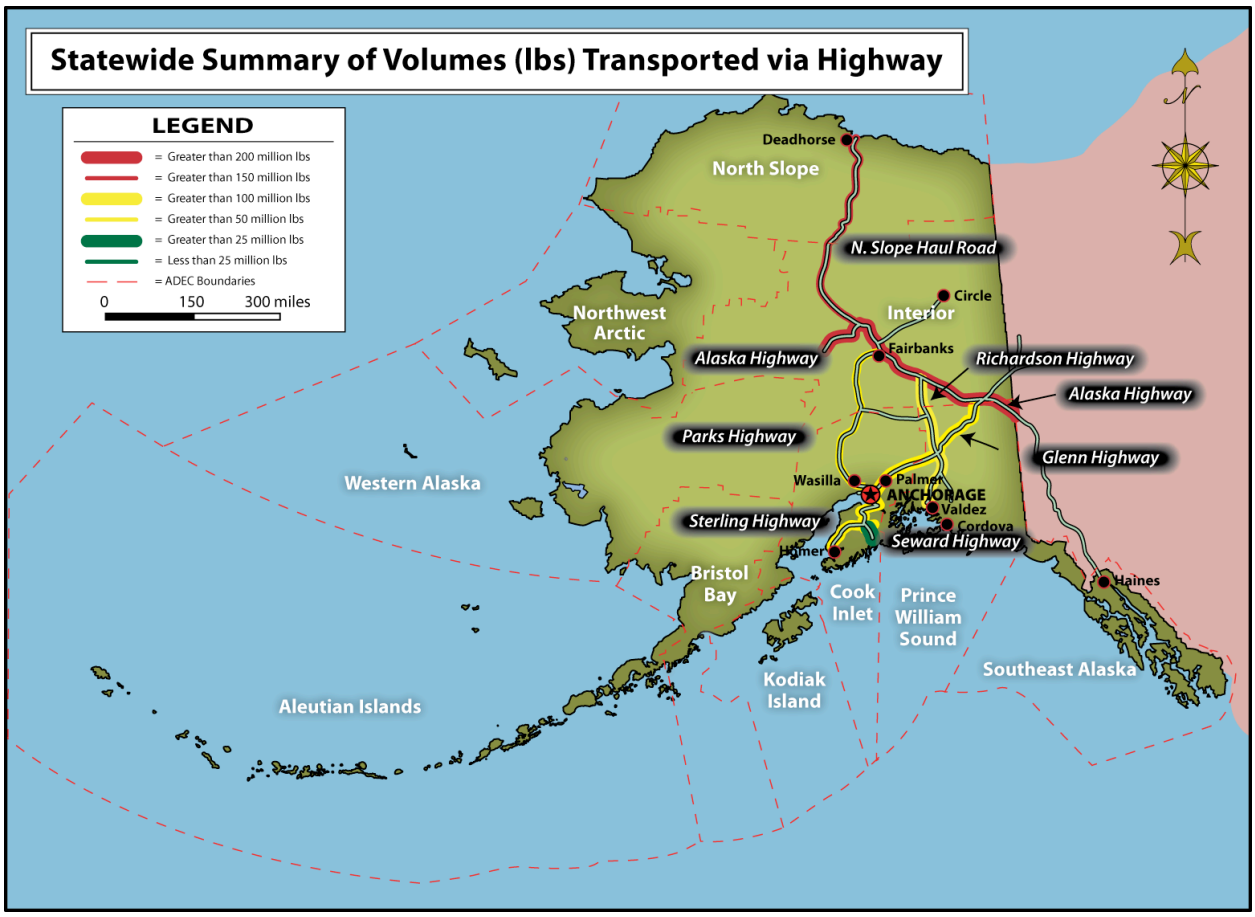


Table 3-3. Top 5 Highway Corridors by Specific Hazardous Material Classification

Top 5 Highway Corridors (Based on a 3 year average) by Hazard Class Division					
Divisions	**1**	**2**	**3**	**4**	**5**
1.1	Richardson Hwy	Glenn Hwy	Alaska Hwy	Parks Hwy	Klondike Hwy
1.2	Richardson Hwy	Glenn Hwy	Alaska Hwy	Parks Hwy	N/A
1.3	Richardson Hwy	Glenn Hwy	Parks Hwy	Alaska Hwy	N/A
1.4	Richardson Hwy	Glenn Hwy	Alaska Hwy	Parks Hwy	N. Slope Haul Rd
1.5	Alaska Hwy	Klondike Hwy	Klondike Hwy	Glenn Hwy	Parks Hwy
2	Seward Hwy	North Slope Lcl	Glenn Hwy	Sterling Hwy	Parks Hwy
2.1	Parks Hwy	Knik-Goose Bay	Port Access Rd	Alaska Hwy	Glenn Hwy
2.2	Glenn Hwy	Alaska Hwy	N. Slope Haul Rd	Parks Hwy	Seward Hwy
2.3	Alaska Hwy	Glenn Hwy	Richardson Hwy	Sterling Hwy	Parks Hwy
3	Alaska Hwy	N. Slope Haul Rd	Glenn Hwy	Parks Hwy	Richardson Hwy
4	Glenn Hwy	Parks Hwy	N/A	N/A	N/A
4.1	Sterling Hwy	Kalifornsky Bch	Bridge Access Rd	Greatland St	Seward Hwy
4.2	Sterling Hwy	Kalifornsky Bch	Bridge Access Rd	Seward Hwy	Greatland St
4.3	Sterling Hwy	Kalifornsky Bch	Greatland St	Bridge Access Rd	Glenn Hwy
5.1	Fairbanks Local	Alaska Hwy	Parks Hwy	Glenn Hwy	N. Slope Haul Rd
5.2	Alaska Hwy	Glenn Hwy	N. Slope Haul Rd	Parks Hwy	Seward Hwy
6.1	Glenn Hwy	Alaska Hwy	N. Slope Haul Rd	Parks Hwy	Seward Hwy
6.2	Glenn Hwy	Richardson Hwy	Parks Hwy	Alaska Hwy	N. Slope Haul Rd

Top 5 Highway Corridors (Based on a 3 year average) by Hazard Class Division					
Divisions	**1**	**2**	**3**	**4**	**5**
7	Glenn Hwy	Parks Hwy	N. Slope Haul Rd	Alaska Hwy	Seward Hwy
8	Glenn Hwy	Parks Hwy	Alaska Hwy	N. Slope Haul Rd	Seward Hwy
9	Seward Hwy	Sterling Hwy	Glenn Hwy	Parks Hwy	Alaska Hwy
ORM-D	N/A	N/A	N/A	• N/A	N/A

Table 3-4. 3-Year Volume of Hazardous Materials Shipped via the seven primary highway corridors

Statewide Summary of Volumes (lbs) Transported via Highway		
Rank	**Highway Corridor**	**Total Volume (lbs)**
1	Alaska Highway	251,248,348
2	North Slope Haul Road	163,573,116
3	Glenn Highway	142,438,260
4	Richardson Highway	129,011,155
5	Sterling Highway	113,019,744
6	Parks Highway	77,907,063
7	Seward Highway	49,305,224

Table 3-5. EHS Commodities Shipped via Highway 2007-2009

Hazard Class	EHS transported via Highway Corridor	Volume (lbs)
8	Sulfuric Acid	1,223,963
2.2	Ammonia, Anhydrous; or Anhydrous Ammonia	56,013
3	Formaldehyde Solution, Flammable	16,577
2.3	Nitric Oxide, Compressed	5,653
8	Nitric Acid	3,251
6.1	Arsenical Pesticides, Liquid, Toxic	2,560
2.3	Chlorine*	2,512
2.3	Sulfur Dioxide; or Sulphur Dioxide	1,600
2.3	Phosgene	457
6.1	Mercuric Chloride	3

**It is suspected that transport of Chlorine is one of the highest EHS commodities shipped via the highway but the dataset did not support this. There were large marine shipments coming into Anchorage, but there was no equivalent trucking information for Chlorine beyond Anchorage.*

Table 3-6. EHS Highway Corridors (Based on a 3 year average)

Top 5 EHS Highway Corridors (Based on a 3 year average) by Hazardous Material Description					
EHS	**1**	**2**	**3**	**4**	**5**
AA	Glenn Hwy	Parks Hwy	Alaska Hwy	N. Slope Haul Rd	Sterling Hwy
Bromine	N/A	N/A	N/A	N/A	N/A
Chlorine*	Seward Hwy	N/A	N/A	N/A	N/A
Chloroform	Glenn Hwy	Parks Hwy	N/A	N/A	N/A
Formaldehyde	Glenn Hwy	Alaska Hwy	Parks Hwy	N. Slope Haul Rd	Seward Hwy
Mercuric Chloride	Seward Hwy	Sterling Hwy	N/A	N/A	N/A
Nitric Acid	Sterling Hwy	Seward Hwy	Kalifornsky Bch	Bridge Access	Glenn Hwy
Nitric Oxide	Nikiski Local	Alaska Hwy	Glenn Hwy	Parks Hwy	N. Slope Haul Rd
Phosgene	Glenn Hwy	Seward Hwy	Sterling Hwy	Alaska Hwy	N/A
Sodium Cyanide	N/A	N/A	N/A	N/A	N/A
Sulfuric Acid	Glenn Hwy	Seward Hwy	Parks Hwy	Sterling Hwy	Alaska Hwy
Sulfur Dioxide	Nikiski Local	N/A	N/A	N/A	N/A

**Chlorine data corridors are suspect based on lack of corresponding highway shipments as noted above.*

3.3 Marine

For the data received, the transportation of hazardous materials via marine corridors represents 41% of the total number of shipments within the timeframe evaluated, but only 0.0006% of the total volume statewide. Marine shipments cover the entire hazard class spectrum. Table 3-7 lists the volumes of hazardous materials shipped in total over the three-year period evaluated in this study. Based on the data received and reviewed for this analysis, Hazard Class 1 commodities are the most prevalent commodity shipped. This is counter-intuitive and indicative of a gap in the dataset regarding marine shipment of Hazard Class 3 commodities, e.g. petroleum products shipped to/from Cook Inlet refineries, and from Valdez to various locations.

Table 3-7. Total 3-Year Volumes of Hazardous Materials Shipped via Marine Corridors

Statewide Summary of Volumes (lbs) Transported via Marine		
Rank	**Commodity**	**Total Volume (lbs)**
1	HC 1 - Explosive Materials	152,375,223
2	HC 2 - Gas Materials	37,824,316
3	HC 3 - Flammable Liquid Materials	22,509,122
4	HC 8 - Corrosive Materials	13,841,481
5	HC 9 - Miscellaneous Materials	5,071,176
6	HC 5 - Oxidizer & Organic Peroxide Materials	2,352,734
7	HC 4 - Flammable Solid Materials	1,223,684
8	HC 7 - Radioactive Materials	1,065,573
9	HC 6 - Poison Materials	105,061

The top five (5) marine transportation corridors by hazard class shipped are noted below in Table 3-8. The primary marine corridor involves transit through Cook Inlet to the various port locations within the Inlet.

Table 3-8. Top 5 Marine Corridors by Specific Hazardous Material Classification

Top 5 Marine Corridors (Based on a 3 year average)					
Hazard Class	**1**	**2**	**3**	**4**	**5**
1.1	Inside Passage	Homer-Kodiak	Cook Inlet	Haines-Juneau	Haines-Ketch
1.2	Cook Inlet	N/A	N/A	N/A	N/A
1.3	Cook Inlet	Cook Inlet-Kodiak	N/A	N/A	N/A
1.4	Cook Inlet	Homer-Kodiak	Inside Passage	Cook Inlet-Kodiak	Seward
1.5	Inside Passage	Cook Inlet	Haines-Juneau	Juneau-Ketch	Skagway-Haines
2	Cook Inlet	Kodiak	N/A	N/A	N/A
2.1	Cook Inlet	Seward	Cook Inlet-Kodiak	Kodiak	Homer-Kodiak
2.2	Cook Inlet	Homer-Kodiak	Cook Inlet-Kodiak	Kodiak	Aleutians
2.3	Cook Inlet	Homer-Kodiak	N/A	N/A	N/A
3	Cook Inlet	Inside Passage	Aleutian Islands	Northwest Arctic	Western AK

Top 5 Marine Corridors (Based on a 3 year average)					
Hazard Class	**1**	**2**	**3**	**4**	**5**
4	Cook Inlet	N/A	N/A	N/A	N/A
4.1	Cook Inlet	Seward	Homer-Kodiak	N/A	N/A
4.2	Cook Inlet	N/A	N/A	N/A	N/A
4.3	Cook Inlet	Whittier-Cordova	N/A	N/A	N/A
5.1	Cook Inlet	Inside Passage	Aleutians	Unimak Pass	North Slope
5.2	Cook Inlet	Inside Passage	Aleutians	Unimak Pass	North Slope
6.1	Cook Inlet	Homer-Kodiak	Seward	Aleutians	Unimak Pass
6.2	N/A	N/A	N/A	N/A	N/A
7	Aleutians	Inside Passage	North Slope	Unimak Pass	Cook Inlet
8	Cook Inlet	Homer-Kodiak	Seward	Inside Passage	Aleutians
9	Cook Inlet	Homer-Kodiak	Inside Passage	Kodiak	Kodiak-DH
ORM-D	N/A	N/A	N/A	N/A	N/A

Table 3-9 lists the total volume of hazardous materials exceeding one million pounds shipped via marine corridors from 2007 to 2009. By volume, Prince William Sound is the primary marine corridor. For this study, this result is primarily based on the size of military ammunition shipments that go through Valdez each year. The addition of tankship and barge shipments of petroleum products in/out of Prince William Sound and Cook Inlet would increase significantly the volumes moving through these subareas. The top five marine corridors by volume of hazardous materials shipped are: (1) Prince William Sound, (2) Cook Inlet, (3) Inside Passage, (4) Homer to Kodiak, and (5) Seward.

The EHS commodities transported via marine modes of transportation are listed in Table 3-10. Chlorine had the highest volume more than doubling the volume of Sulfuric Acid shipped. These shipments were shipped on the route from Tacoma, WA to Anchorage.

The primary marine transportation corridors for EHS are listed in Table 3-11. Again, Cook Inlet is the primary marine route that transports EHS commodities. Figure 3-5 depicts the weighted marine routes based on the volume of hazardous materials shipments to a particular location.

Table 3-9. 3-Year Volumes of Hazardous Materials Shipped via Marine Corridors

Statewide Summary of Volumes (lbs) Transported via Marine		
Rank	**Marine Corridor**	**Total Volume (lbs)**
1	Prince William Sound	144,220,300
2	Cook Inlet	49,289,686
3	Inside Passage / Southeast (Bellingham, Haine	3,803,035
4	Homer - Kodiak	3,319,711
5	Seward	1,956,017
6	Cook Inlet - Kodiak	1,513,025
7	Aleutian Islands & Alaska Peninsula (Akutan, C	1,414,655
8	Unimak Pass	1,411,428
9	Western Alaska	1,401,828
10	Northwest Arctic	1,401,732
11	North Slope	1,398,787

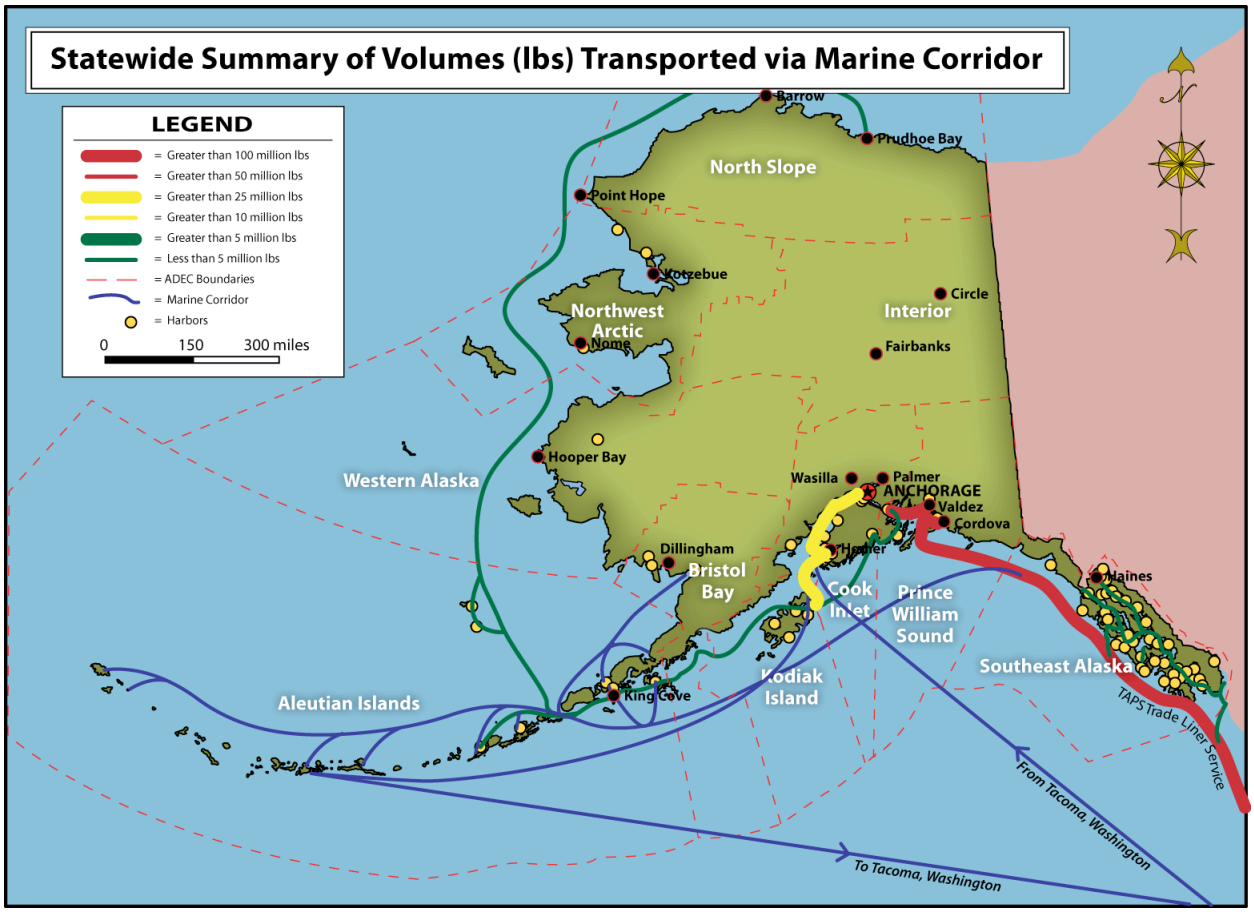
Table 3-10. EHS Commodities Shipped via Marine 2007-2009

Hazard Class	EHS transported via Marine Corridor	Volume (lbs)
2.3	Chlorine	3,651,900
8	Sulfuric Acid	1,493,703
3	Formaldehyde Solution, Flammable	23,520
2.3	Phosgene	17,700
8	Nitric Acid	869
8	Bromine or Bromine Solutions	277
2.2	Ammonia, Anhydrous; or Anhydrous Ammonia	204
2.3	Nitric Oxide, Compressed	165
6.1	Chloroform	55
6.1	Mercuric Chloride	9

Table 3-11. EHS Marine Corridors (Based on a 3 year average)

Top 5 EHS Marine Corridors (Based on a 3 year average)					
EHS	**1**	**2**	**3**	**4**	**5**
AA	Cook Inlet	N/A	N/A	N/A	N/A
Bromine	Cook Inlet	Inside Passage	Aleutians	Unimak Pass	North Slope
Chlorine	Cook Inlet	N/A	N/A	N/A	N/A
Chloroform	Cook Inlet	N/A	N/A	N/A	N/A
Formaldehyde	Cook Inlet	N/A	N/A	N/A	N/A
Mercuric Chloride	Aleutians	Unimak Pass	North Slope	Valdez-Whittier	Inside Passage
Nitric Acid	Cook Inlet	Inside Passage	Aleutians	Unimak Pass	North Slope
Nitric Oxide	Cook Inlet	N/A	N/A	N/A	N/A
Phosgene	Homer-Kodiak	N/A	N/A	N/A	N/A
Sodium Cyanide	N/A	N/A	N/A	N/A	N/A
Sulfuric Acid	Cook Inlet	Seward	Homer-Kodiak	Cook Inlet-Kodiak	Aleutians
Sulfur Dioxide	N/A	N/A	N/A	N/A	N/A

Figure 3-5. Volumes transported by Marine Corridor



3.4 Pipeline

The transportation of hazardous materials via pipeline represents 99% of the total volume of hazardous materials/petroleum shipments within the State. The dominance of the pipeline corridors is primarily due to the natural gas and petroleum commodities that are transported in the North Slope oil and gas pipelines, from the North Slope to Valdez via the Trans-Alaska Pipeline, and in the regional pipeline systems surrounding Cook Inlet, including the Anchorage Fueling and Service Company (AFSC). The scope of hazard classes transported via pipeline is limited to Hazard Class 3 and 2.1 commodities whereas the other transportation modes, particularly highway and marine cover the full spectrum of hazard classes. Table 3-12 lists the top five pipeline corridors by hazardous class shipped.

Table 3-12. Top 5 Pipeline Corridors by Hazard Class Shipped

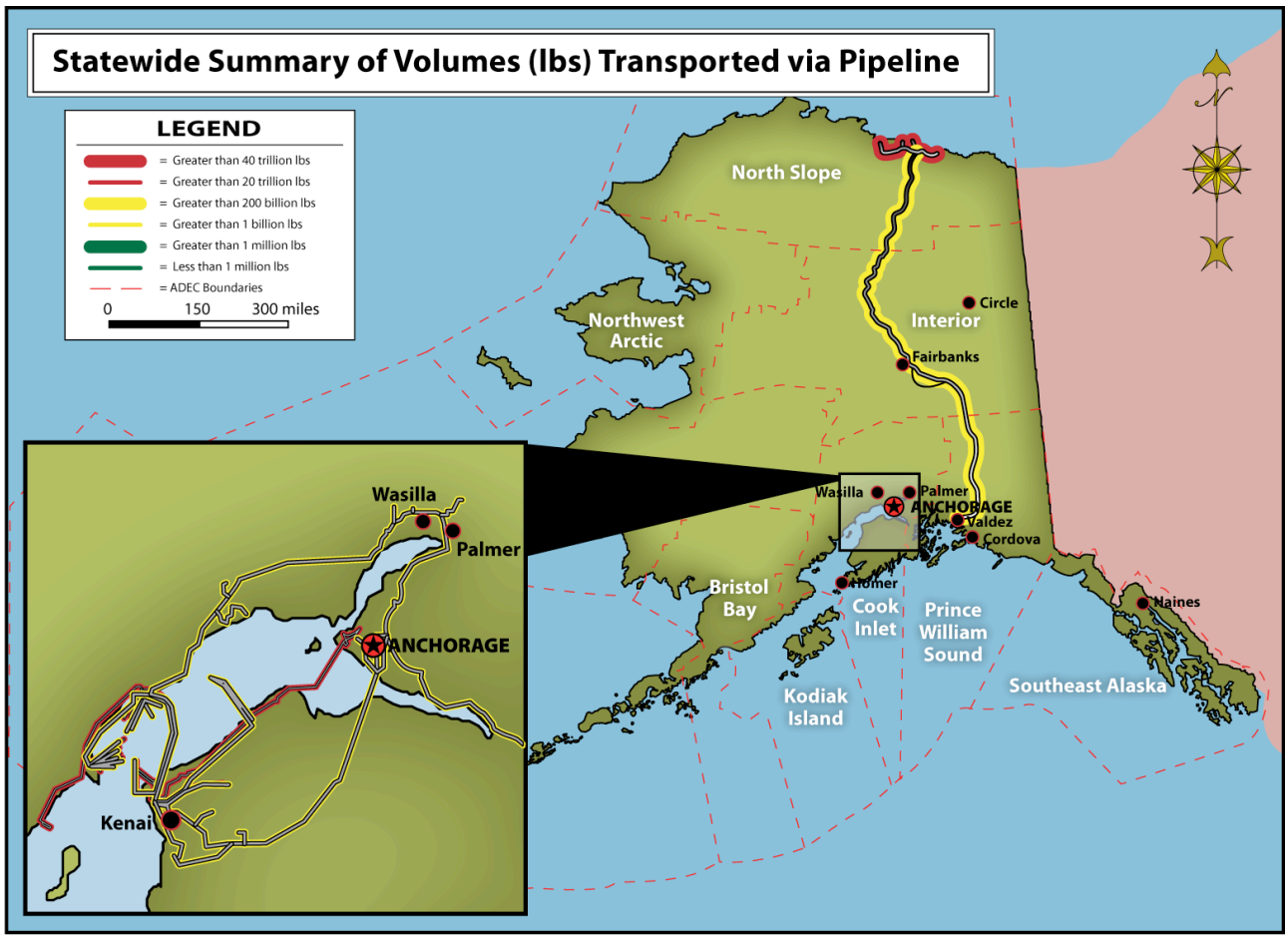
Top 5 Pipeline Corridors (Based on a 3 year average)				
Hazard Class	**1**	**2**	**3**	**4**
1	N/A	N/A	N/A	N/A
2.1	North Slope Process	Cook Inlet	N/A	N/A
3	North Slope-Valdez	Kenai-Anchorage	Cook Inlet	AFSC Crosstown
4	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A
ORM-D	North Slope	N/A	N/A	N/A

There are no EHS commodities transported via pipelines within the State of Alaska. Table 3-13 lists the total three-year volumes of commodities shipped via pipeline. The top five by volume are: (1) North Slope Process Pipeline, (2) Cook Inlet Pipeline, (3) Trans-Alaska Pipeline (North Slope-Valdez), (4) Kenai-Anchorage Pipeline, and (5) AFSC Pipeline. Figure 3-6 depicts the weighted pipeline routes based on the 3-year volume of hazardous materials shipments to a particular location.

Table 3-13. Statewide Summary of 3-Year Volumes of Hazardous Materials Shipped via Pipeline

Statewide Summary of Volumes (lbs) Transported via Pipeline		
Rank	**Pipeline**	**Total Volume (lbs)**
1	North Slope Process Pipeline	49,941,394,050,000
2	Cook Inlet Pipeline	28,682,426,991,000
3	North Slope - Valdez Pipeline (TAPS)	270,827,508,620
4	Kenai - Anchorage Pipeline	13,337,100,000
5	AFSC Crosstown Pipeline	10,655,149,086

Figure 3-6. Pipeline Corridors



3.5 Railroad

The transportation of hazardous materials via railroad represents 0.0931% of the total volume of hazardous materials shipped from 2007 to 2009. Railroad shipments represent 97% of the total volume of shipments when pipeline volumes are excluded. While this mode represents the highest volume of commodities transported when compared to air, highway and marine modes, the commodities shipped are fairly limited across the spectrum of hazard classes when compared to those transported by highway and/or marine modes.

The top five (5) railroad corridors by Hazard Class shipped are listed in Table 3-14. The Whittier-Portage and Portage-Anchorage segments are primary routes for the majority of hazardous materials commodities shipped.

Table 3-15 lists the total three-year volumes of commodities shipped via railroad. The top five rail corridors are: (1) Anchorage – Fairbanks, (2) Fairbanks – Eielson AFB, (3) Portage – Anchorage, (4) Whittier –Portage, and (5) Seward – Portage. Figure 3-7 depicts the weighted railroad routes based on the 3-year volume of hazardous materials shipments to a particular location.

Sodium Cyanide is the only EHS commodity transported via the railroad as listed in Table 3-16, and is moved via the railroad segments listed in Table 3-17.

Table 3-14. Top 5 Railroad Corridors by Hazard Class Shipped

Top 5 Railroad Corridors (Based on a 3 year average)					
HC	**1**	**2**	**3**	**4**	**5**
1	Anchorage-Fairbanks	Portage-Anchorage	Whittier-Portage	N/A	N/A
2	Portage-Anchorage	Whittier-Portage	Anchorage-Fairbanks	Seward-Portage	N/A
3	Anchorage-Fairbanks	Fairbanks-Eielson	Portage-Anchorage	Whittier-Portage	Seward-Portage
4	Whittier-Portage	Portage-Anchorage	N/A	N/A	N/A
5.1	Whittier-Portage	Portage-Anchorage	Anchorage-Fairbanks	N/A	N/A
6.1	Whittier-Portage	Portage-Anchorage	Anchorage-Fairbanks	N/A	N/A
7	Whittier-Portage	Portage-Anchorage	N/A	N/A	N/A
8	Whittier-Portage	Portage-Anchorage	Anchorage-Fairbanks	N/A	N/A
9	Anchorage-Fairbanks	Whittier-Portage	Portage-Anchorage	Fairbanks-Eielson	Seward-Portage

Table 3-15. Statewide Summary of 3-Year Volumes of Hazardous Materials Shipped via Railroad

Statewide Summary of Volumes (lbs) Transported via Railroad		
Rank	**Rail Segment**	**Total Volume (lbs)**
1	Anchorage - Fairbanks	13,078,641,750
2	Fairbanks - Eielson, AFB	12,539,329,250
3	Portage - Anchorage	679,827,500
4	Whittier - Portage	602,236,750
5	Seward - Portage	76,750,250

Table 3-16. EHS Commodities Shipped via Rail 2007-2009

Hazard Class	EHS transported via Railroad Corridor	Volume (lbs)
6.1	Sodium Cyanide	29,136,000

Figure 3-7. Railroad Corridors

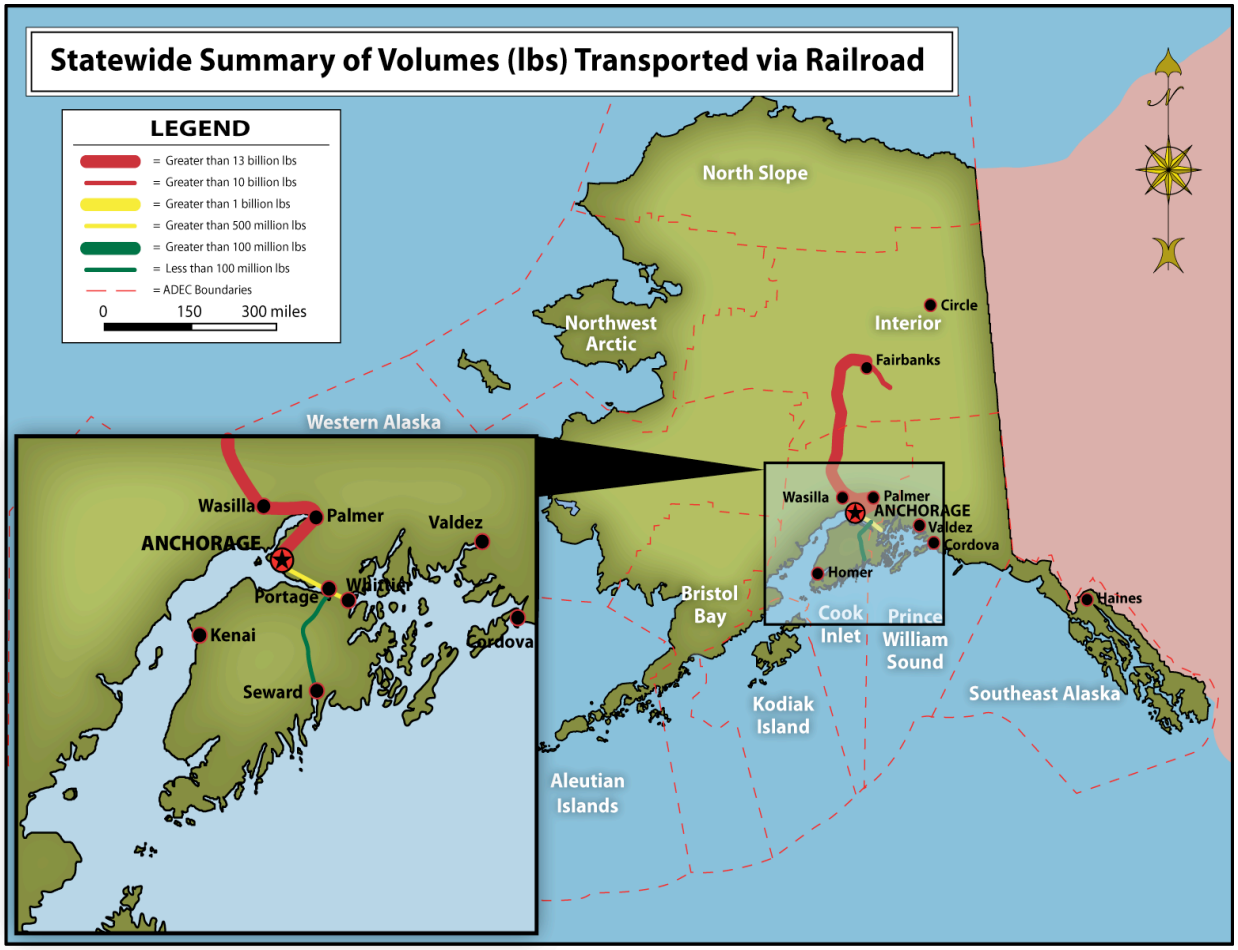


Table 3-17. EHS Rail Corridors (Based on a 3 year average)

Top 5 EHS Rail Corridors (Based on a 3 year average)					
EHS	**1**	**2**	**3**	**4**	**5**
Sodium Cyanide	Whittier-Portage	Portage-Anchorage	Anchorage-Fairbanks	N/A	N/A

3.6 Fixed Facilities

The State's existing knowledge of and familiarity with the Tier Two Report content alleviated the need to provide a detailed evaluation of this data for this study. However, since the primary focus of the study is on Extremely Hazardous Substances (EHS) and given the need for increased awareness of the presence of these commodities within the State[29], it was determined that this data should be summarized in this report. The total volumes of EHS stored at fixed facilities in the State are displayed in Table 3-18, and reveals that Anhydrous Ammonia, Sulfuric Acid, Urea, Sodium Cyanide, and Chlorine are the top 5 EHS commodities stored, by volume, within the State[30].

Table 3-18. Total Volumes of EHS Commodities Stored in Fixed Facilities in the State for 2008

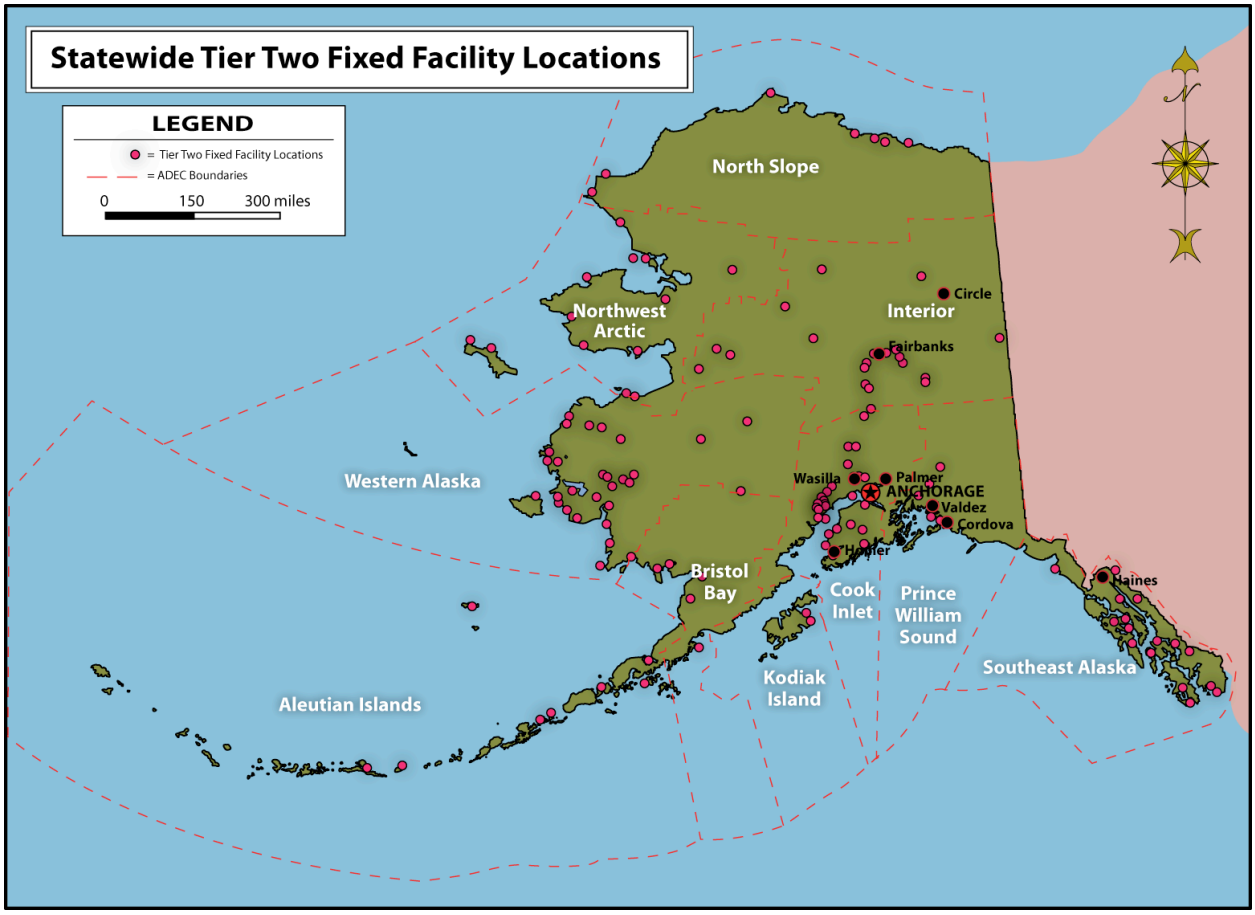
Hazard Class	EHS Facility	Volume (lbs)
2.2	Anhydrous Ammonia	17,058,534
8	Sulfuric Acid	1,998,043
3	Urea	414,000
6.1	Sodium Cyanide	276,002
2.3	Chlorine	179,550
3	Formaldehyde Solution, Flammable	41,936
8	Batteries, Wet, Filled with Acid	22,961
8	Nitric Acid	20,719
6.1	Arsenic Trioxide	9,367
8	Waste Oil w/Sulfuric Acid	6,740
8	Bromine	299
6.1	Chloroform	8
2.3	Nitric Oxide	5
6.1	Mercuric Chloride	5
6.1	Potassium Cyanide	2
4.1	Cobalt 57	1

Additionally, the locations of the fixed facilities within the State as reported/outlined in the 2008 Tier Two Report are shown below in Figure 3-8. While there are large concentrations of fixed facilities in the Western Alaska and Southeast Alaska Subareas, the majority of fixed facilities are located in/around Cook Inlet and along the corridor between Anchorage and Fairbanks.

The Tier Two reporting requirements apply to OSHA-regulated facilities. As such, mining facilities regulated under the Mining Safety and Health Administration (MSHA) are exempt from Tier Two reporting requirements.

[29] Extremely Hazardous Substances offer more of a public safety risk than general Hazardous Substances.
[30] This volume data was pulled directly from the 2008 Tier Two Report data.

Figure 3-8. Tier Two Fixed Facilities



4. ANALYSIS OF STATEWIDE FLOW BY HAZARDOUS MATERIAL CLASS

The transportation of hazardous materials statewide was analyzed by type of hazardous material (class) transported by year, volume, and number of shipments, to identify statewide trends.

4.1 Hazard Class by Year and Volume

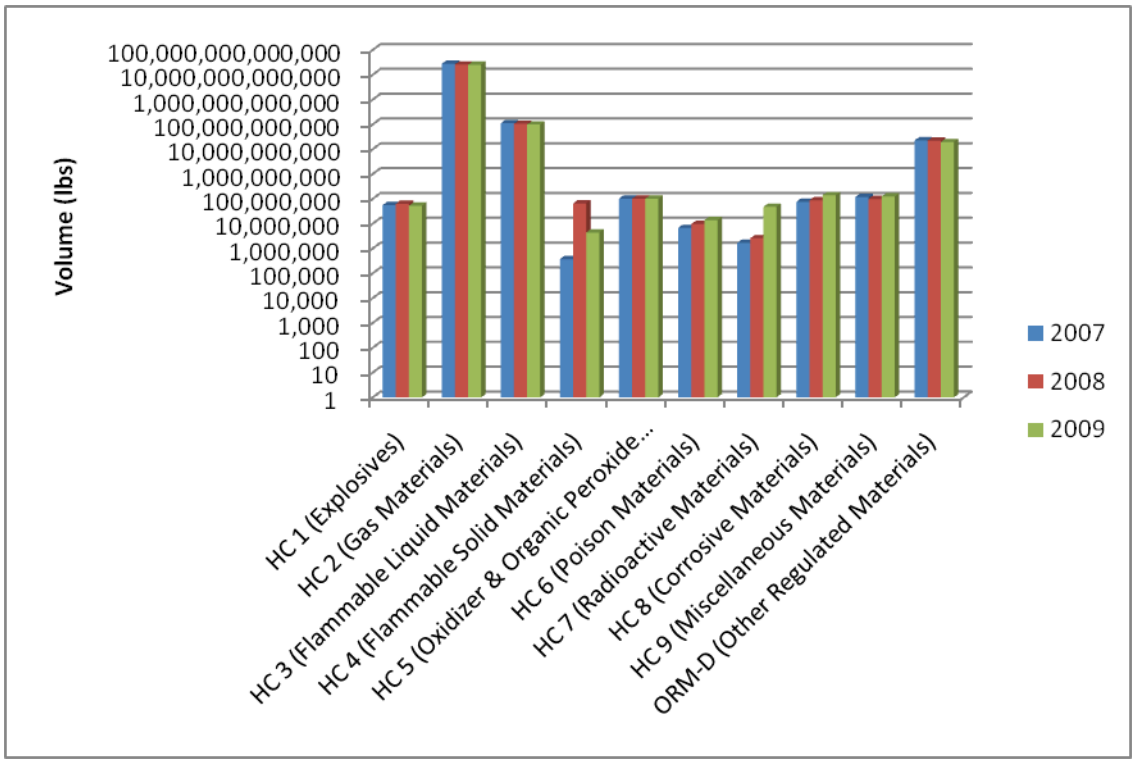
The total volume of hazardous materials transported within the State by Hazard Class is listed in Table 4-1. Hazard Classes 2 and 3 dominate the total volumes due to the volume of natural gas and petroleum products transferred via the statewide pipeline systems. Figure 4-1 depicts the volumes of Hazardous Materials shipped by year.

In general the volumes of hazardous materials shipped remain fairly consistent, with HC 4 and 7 seeing the greatest variability.

Table 4-1. Statewide Summary of Volumes Transported by Hazard Class

Statewide Summary of Volumes (lbs) Transported by Hazard Class			
Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	55,865,218	62,812,440	52,675,640
HC 2 (Gas Materials)	27,598,898,519,034	25,639,414,809,063	25,317,771,957,302
HC 3 (Flammable Liquid Materials)	115,170,048,970	108,309,900,536	101,560,892,838
HC 4 (Flammable Solid Materials)	369,047	64,651,483	4,362,709
HC 5 (Oxidizer & Organic Peroxide Materials)	101,975,691	100,775,388	101,214,347
HC 6 (Poison Materials)	6,703,004	9,607,936	13,868,029
HC 7 (Radioactive Materials)	1,668,866	2,579,306	47,591,160
HC 8 (Corrosive Materials)	75,247,814	87,030,260	139,162,517
HC 9 (Miscellaneous Materials)	117,988,049	98,364,533	124,242,409
ORM-D (Other Regulated Materials)	22,464,000,000	22,113,000,000	19,305,000,000

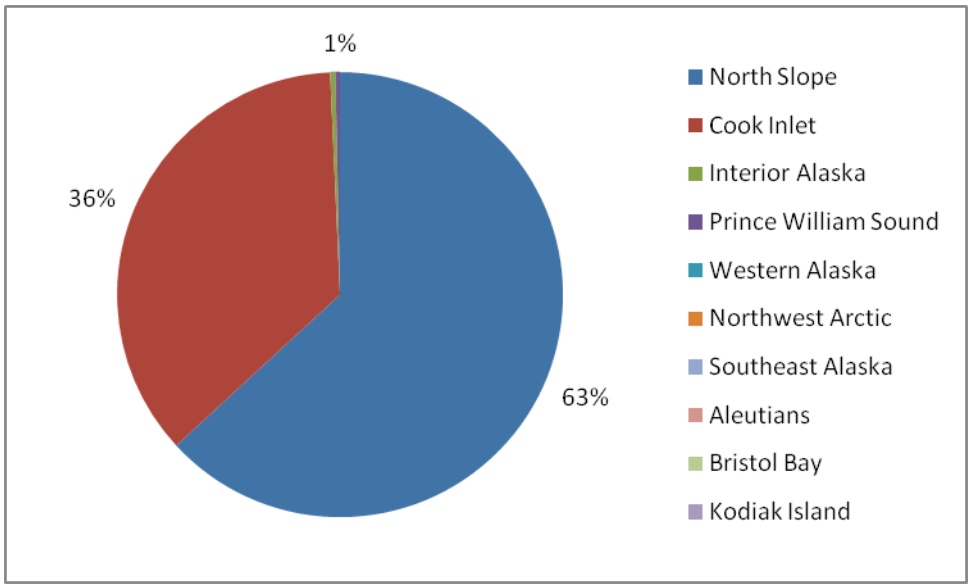
Figure 4-1. Volume of Hazardous Materials Shipped by Year



4.1 Hazard Class by Statewide Shipments per Year

Because HC 2.1 (Natural Gas), HC 3 (Petroleum Products), and ORM-D (Produced Water) make up 99% of the total volume shipped, a graphic breakdown of volumes of Hazard Class shipments statewide in a percentage of statewide volume demonstrates that the North Slope and Cook Inlet subareas dominate the volume of hazardous materials shipped within the State. Figure 4-2 depicts the Statewide breakdown by subarea by percentage of volume of hazardous materials shipped. The North Slope and Cook Inlet subareas account for 63% and 36% respectively of the total volume transported. The remaining subareas account for 1% of the total volume shipped within the State.

Figure 4-2. Statewide Breakdown by Subarea of Percentage of Volume of Hazardous Material Shipped.



Evaluation of the total number of shipments statewide of a given Hazard Class, for a given calendar year, provides a general idea of how the shipments are spread across the spectrum of commodities. For this comparison, pipeline shipments were pulled from the data as the shipment data captured for pipelines was based purely on production volume for a given year. For example, a single entry was made to capture the total crude oil volume shipped in the Trans-Alaska Pipeline during 2007. It should also be noted that the number of shipments evaluated for this general comparison is a subset of the much larger dataset that was used as the starting point for this project[31]. However, when comparing the percentage breakdowns of shipments by Hazard Class from this study with the breakdown found in the 2005 study, the results were similar. This lends some validity that the evaluation of the smaller subset, provided in this report, is representative of the larger dataset. Only very minor variations occur on a year-to-year basis in the breakdown of shipments statewide.

Figures 4-3 through 4-5 depict the breakdown of shipments for calendar years 2007, 2008 and 2009 respectively.

[31] The 7,500+ shipments analyzed in this study ultimately represent over 75,000 shipments statewide: Like commodities, shipped between the same locations during the same year were combined into a single data entry.

Figure 4-3. 2007 Statewide Breakdown of Hazardous Material Shipments by Hazard Class

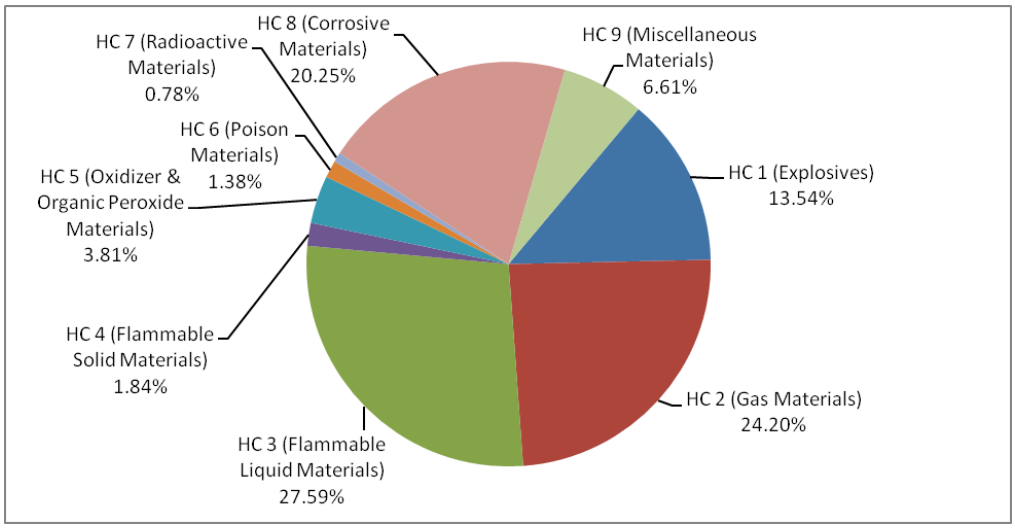


Figure 4-4. 2008 Statewide Breakdown of Hazardous Material Shipments by Hazard Class

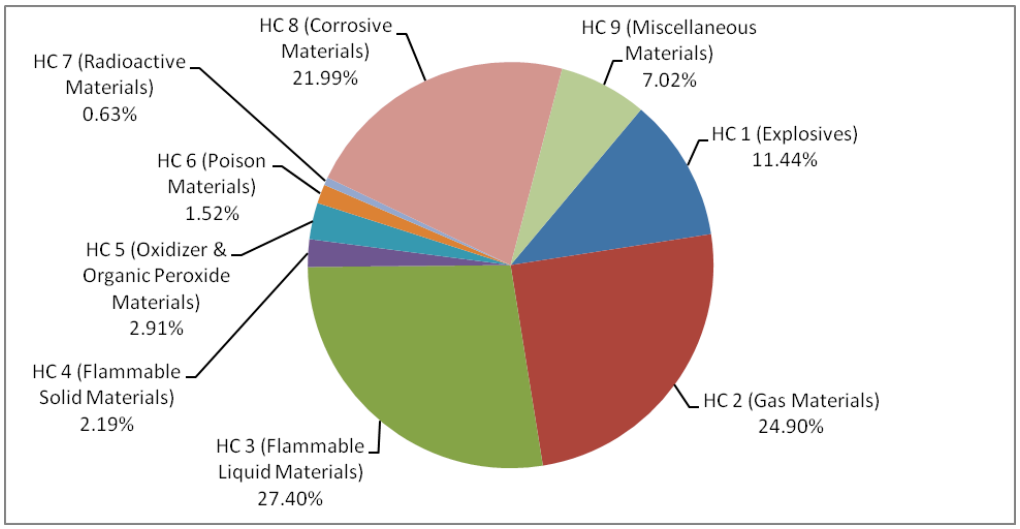
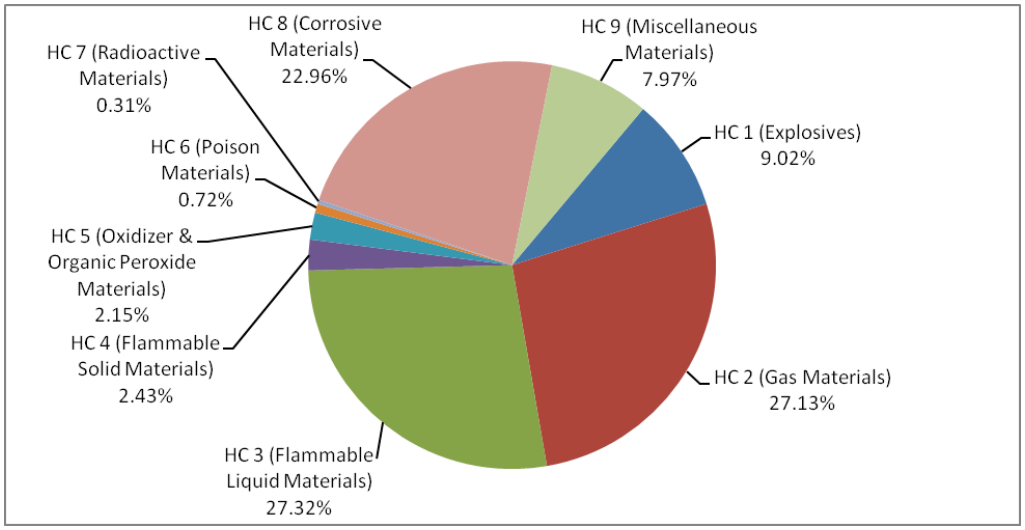


Figure 4-5. 2009 Statewide Breakdown of Hazardous Material Shipments by Hazard Class

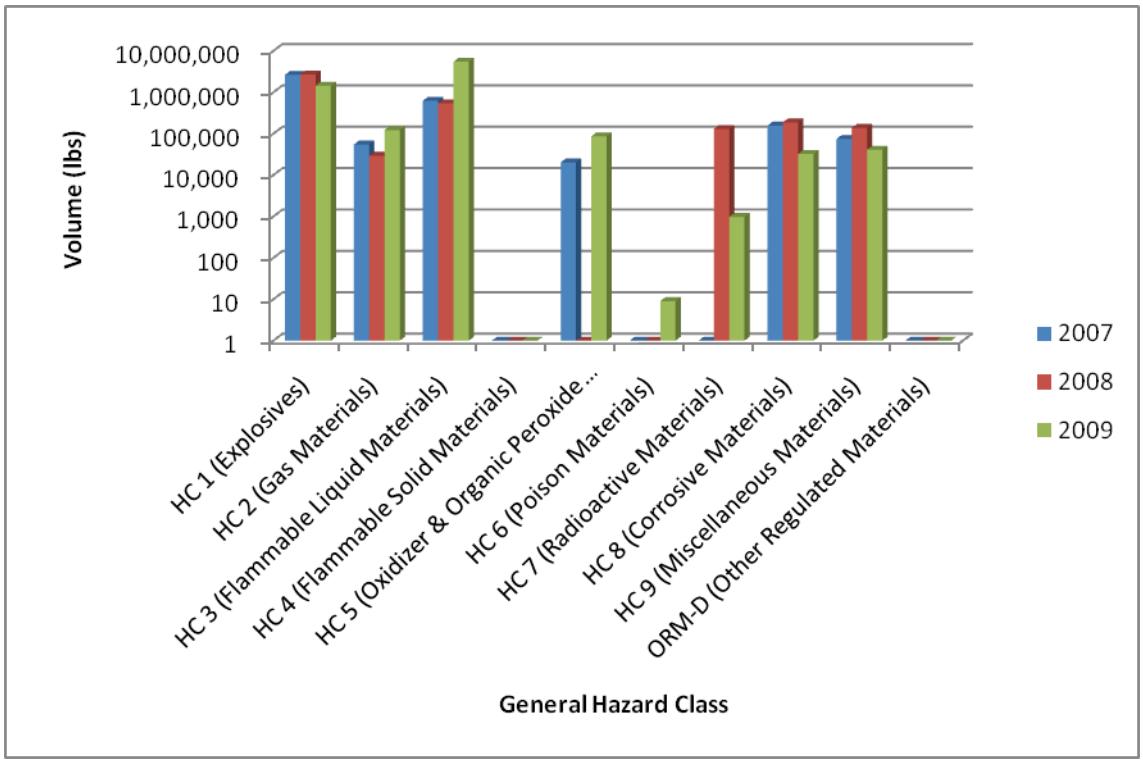


5. ANALYSIS BY SUBAREA

5.1 Southeast Alaska

Transportation of hazardous materials within the Southeast Alaska Subarea (SEAK) was primarily via marine transportation mode through inside passage route(s). Some shipments reportedly then continued on to other areas of Alaska via the marine and highway transportation modes. There were no shipments reported via air, pipeline, and/or rail in this subarea. For pipelines and rail, this is readily apparent since there are no pipelines in Southeast Alaska, and the railroad that runs from Skagway into Canada transports primarily tourists. However, the lack of air shipments is likely indicative of the data gap that exists for air cargo shipments and not an accurate reflection of reality. The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-1 below.

Figure 5-1. Volumes of Hazardous Materials Shipped into SEAK presented on a log scale



Figures 5-2, 5-3 and 5-4 depict the breakdown of hazardous materials shipments within the Southeast Alaska Subarea by a percentage of total volume shipped. It is interesting that the percentages by hazard class remained very consistent between 2007 and 2008 with HC 1 (Explosives) commodities dominating the volume. In 2009 that trend shifted due to a significant increase in HC 3 (Flammable Liquid Materials) commodities with a corresponding 50% drop in HC 1 shipments.

Figure 5-2. SEAK Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

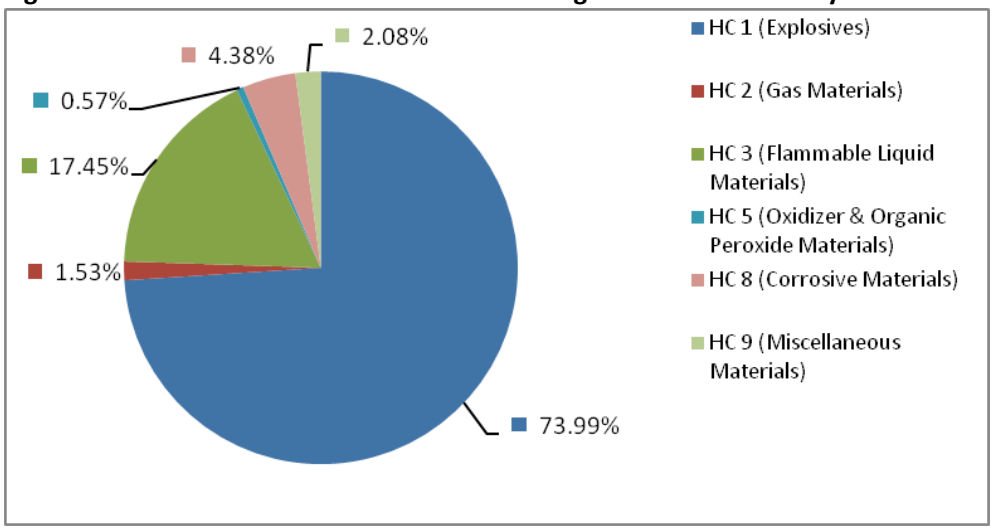


Figure 5-3. SEAK Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

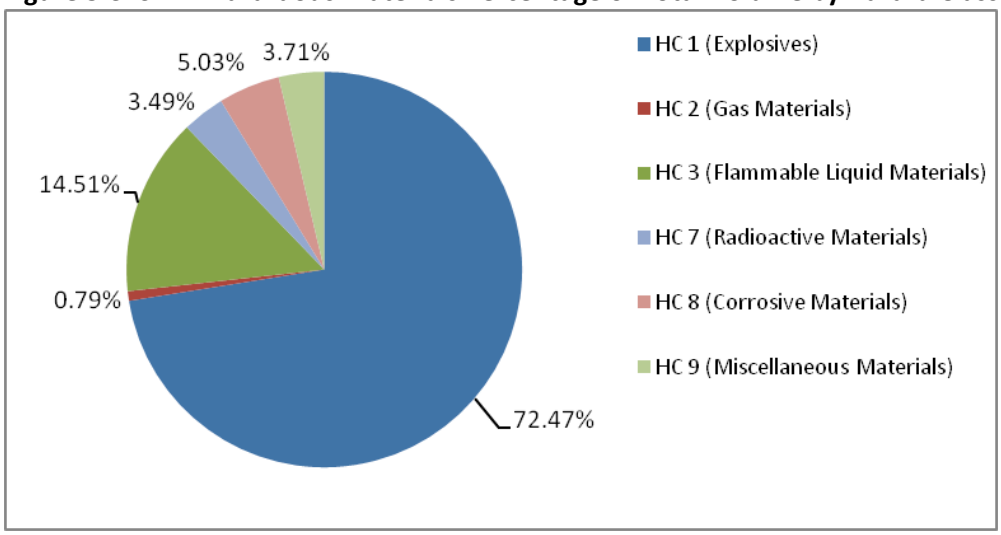


Figure 5-4. SEAK Hazardous Materials Percentage of Total Volume by Hazard Class for 2009

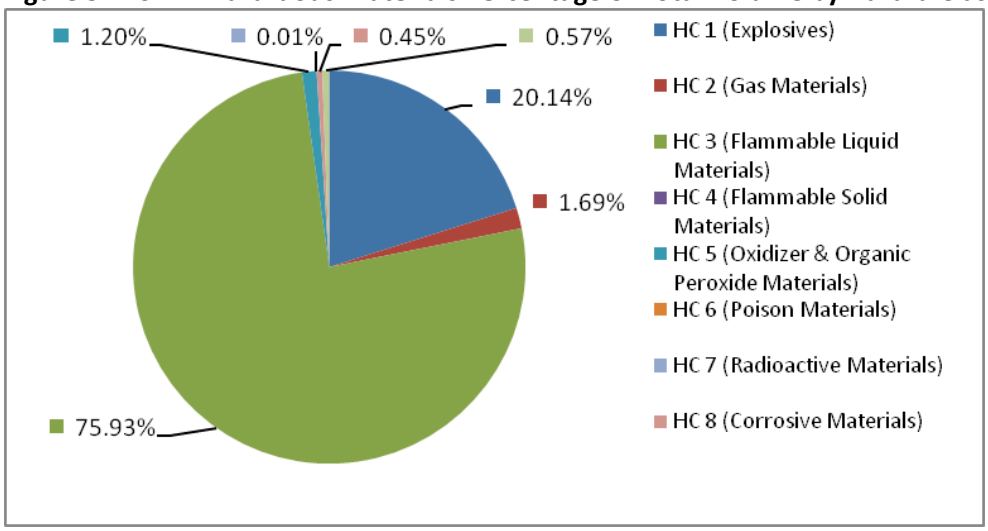


Table 5-1 below lists the actual volumes of commodities transported within the Southeast Alaska Subarea by calendar year.

Table 5-1. Volumes of Hazard Class Transported within SEAK Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	2,644,646	2,690,563	1,444,784
HC 2 (Gas Materials)	54,713	29,263	121,517
HC 3 (Flammable Liquid Materials)	623,868	538,750	5,446,316
HC 4 (Flammable Solid Materials)	-	-	-
HC 5 (Oxidizer & Organic Peroxide Materials)	20,207	-	86,388
HC 6 (Poison Materials)	-	-	9
HC 7 (Radioactive Materials)	-	129,487	975
HC 8 (Corrosive Materials)	156,593	186,928	32,186
HC 9 (Miscellaneous Materials)	74,389	137,762	40,911
ORM-D (Other Regulated Materials)	-	-	-

A more detailed evaluation of each hazard class category is provided below. A threshold volume for this analysis was established at 10,000 lbs and this provided an adequate level of detail for the types of commodities shipped.

HC 1 Explosives: The primary explosives that were transported through the Southeast Alaska Subarea were within HCs 1.1, 1.4 and 1.5 with the highest volume in HC 1.5 from year to year. The total volume of HC 1 commodities shipped did not display a great deal of change between 2007 and 2008, but decreased by nearly 50% in 2009. Table 5-2 lists the primary HC 1 commodities shipped within the SEAK Subarea.

Table 5-2. Primary Hazard Class 1 Commodities Shipped within the SEAK Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
1.1	Explosive, Blasting, Type E	0241
	Cord, Detonating	0065
	Boosters	0042
	Torpedoes	0330
1.4	Articles, Explosive, N.O.S.	0349
	Detonators, Electric	0255
	Detonator Assemblies, Non-Electric	0361
1.5	Explosive, Blasting, Type E or Agent Blasting, Type E	0332
	Explosive, Blasting, Type B or Agent Blasting, Type B	0331
	Ammonium Nitrate-Fuel Oil Mixture	0331

HC 2 Gas Materials: HCs 2.1 and 2.2 were the gas materials transported through the Southeast Alaska Subarea between 2007 and 2009. Table 5-3 lists the primary HC 2 commodities shipped within the SEAK Subarea.

Table 5-3. Primary Hazard Class 2 Commodities Shipped within the SEAK Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
2.1	None	
2.2	Aerosols	1950
	Nitrogen, Compressed	1066
	Fire Extinguishers	1044
	Liquefied Gas, N.O.S.	3163
	Carbon Dioxide	1013
	Dichlorodifluoromethane or Refrigerant Gas R12	1028
	Compressed Gas, N.O.S.	1956

Volumes shipped through the Subarea were low when compared with other Subareas. HC 2.2 saw an approximate 80% increase in volume between 2008 and 2009.

HC 3 Flammable Liquid Materials: HC 3.0 transported through the Southeast Alaska Subarea saw a 10-fold increase between 2008 and 2009. Table 5-4 lists the primary HC 3 commodities shipped within the SEAK Subarea.

Table 5-4. Primary Hazard Class 3 Commodities Shipped within the SEAK Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
3.0	Paint	1263
	Flammable Liquids, N.O.S.	1993
	Petroleum Distillates, N.O.S. or Petroleum Products, N.O.S.	1268
	Adhesives	1133
	Acetone	1090
	Alcohols, N.O.S.	1987
	Flammable Liquids, Corrosive, N.O.S.	2924
	Xylenes	1307
	Butanols	1120
	Fuel, Aviation, Turbine Engine	1863
	Ethyl Methyl Ketone	1193
	Diesel Fuel, Fuel Oil, Gas Oil or Heating Oil Light	1202
	Combustible Liquid, N.O.S.	1993
	Methanol	1230

The sharp increase in HC 3 commodities between 2008 and 2009 appears to be the result of an addition of significant shipments of "DIESEL FUEL, FUEL OIL, GAS OIL or HEATING OIL LIGHT" equaling nearly 4.7 million pounds.

HC 4 Flammable Solid Materials: There were no Flammable Solid Materials transported within this Subarea during this time period according to the data evaluated.

HC 5 Oxidizer and Organic Peroxide Materials: HC 5.1 and 5.2 were shipped in 2007 and HC 5.1 was shipped in 2009. While there was an approximate 75% increase in HC 5.1 between 2007 and 2009, there were no discernible trends noted. There were no HC 5.1 or 5.2 materials shipped in 2008 in this Subarea. Table 5-5 lists the primary HC 5 commodities shipped within the SEAK Subarea.

Table 5-5. Primary Hazard Class 5 Commodities Shipped within the SEAK Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
5.1	Oxidizing Liquid, N.O.S.	3139
	Hydrogen Peroxide Aqueous Solutions	2014

There were no HC 5.2 commodities shipped that exceeded 10,000 lbs in volume.

HC 6 Poisons: A very small amount of HC 6.1 (Mercuric Chloride) was reported being shipped in 2009 within the Southeast Alaska Subarea. The small volume was retained for reporting purposes because it is classified as an EHS. There were no HC 6.1 or 6.2 commodities shipped that exceeded 10,000 lbs in volume.

HC 7 Radioactive Materials: HC 7.0 was transported in 2008 and 2009 within the Southeast Alaska Subarea. A sharp decrease was noted in volume between 2008 and 2009. Table 5-6 lists the primary HC 7 commodities shipped within the SEAK Subarea.

Table 5-6. Primary Hazard Class 7 Commodities Shipped within the SEAK Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
7.0	Radioactive Material, Type A Packaging, Special Form	3332
	Radioactive Material, Type A Package	2915

In 2009, there were no HC 7.0 commodities shipped that exceeded 10,000 lbs.

HC 8 Corrosive Materials: Shipments of HC 8.0 in the Southeast Subarea varied from year to year with the volume increasing between 2007 and 2008 and then sharply decreasing between 2008 and 2009. Table 5-7 lists the primary HC 8 commodities shipped within the SEAK Subarea.

Table 5-7. Primary Hazard Class 8 Commodities Shipped within the SEAK Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
8.0	Corrosive Liquids, N.O.S.	1760
	Batteries, Wet, Non-Spillable	2800
	Batteries, Wet, Filled with Acid	2794
	Formic Acid	1779
	Paint or Paint Regulated Material	3066
	Corrosive Liquid, Acidic, Inorganic, N.O.S.	3264
	Corrosive Liquid, Basic, Inorganic, N.O.S.	3266
	Acetic Acid, Glacial or Acetic Acid Solution	2879

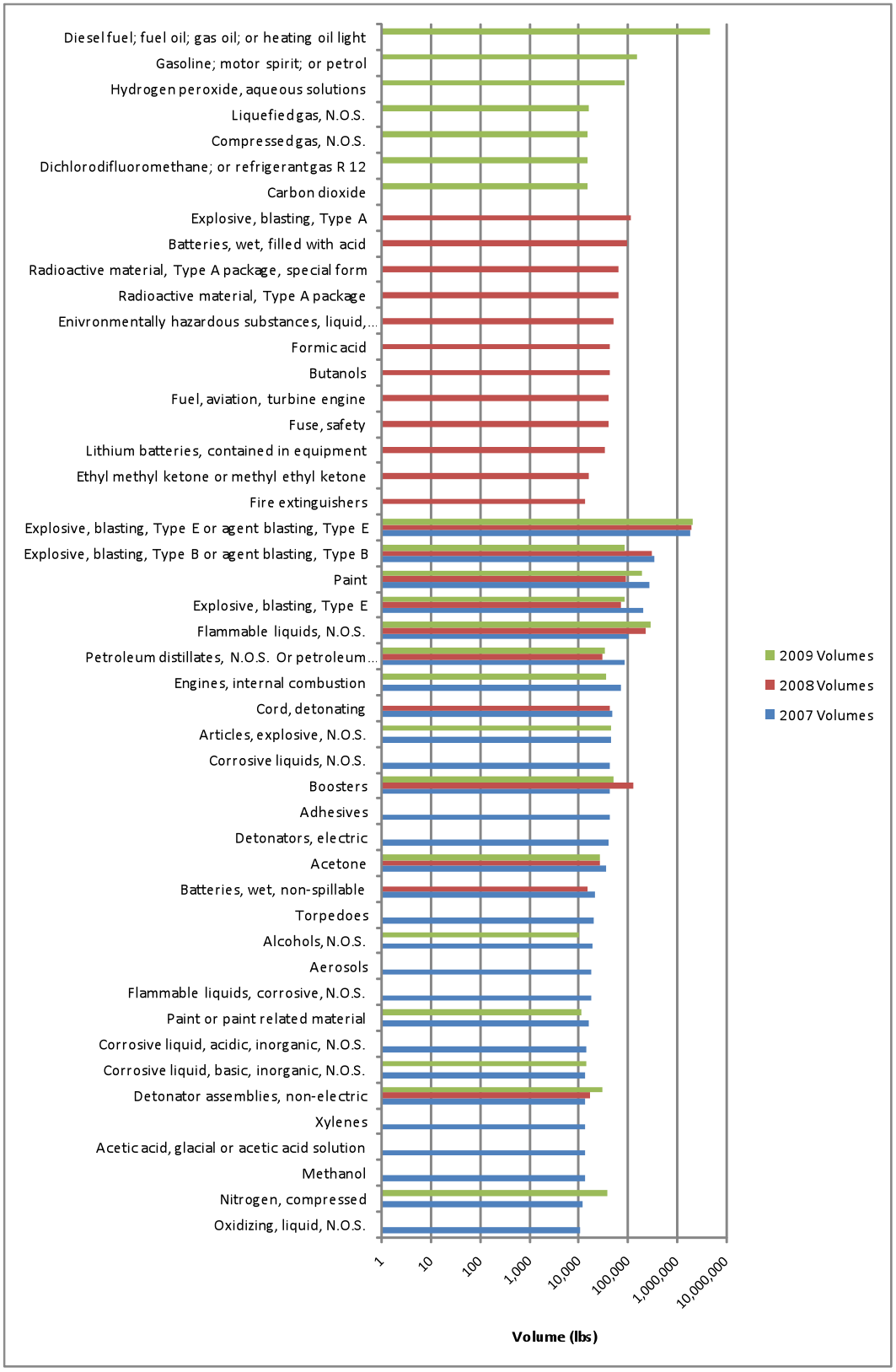
HC 9 Miscellaneous Materials: The volume of HC 9.0 commodities shipped within the Southeast Alaska Subarea saw a dramatic increase between 2007 and 2008 and then dropped below the 2007 levels in 2009. The sharp increase in 2008 could be attributable to the increase in the Alaska Permanent Fund Dividend checks during this timeframe. Table 5-8 lists the primary HC 9 commodities shipped within the SEAK Subarea.

Table 5-8. Primary Hazard Class 9 Commodities Shipped within the SEAK Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
9.0	Engines, Internal Combustion	3166
	Lithium Batteries, Contained in Equipment	3091
	Vehicle, Flammable Gas Powered	3166

Figures 5-5 depicts the volumes of hazardous materials shipped each year within SEAK by Hazardous Material Name for volumes exceeding 10,000 pounds.

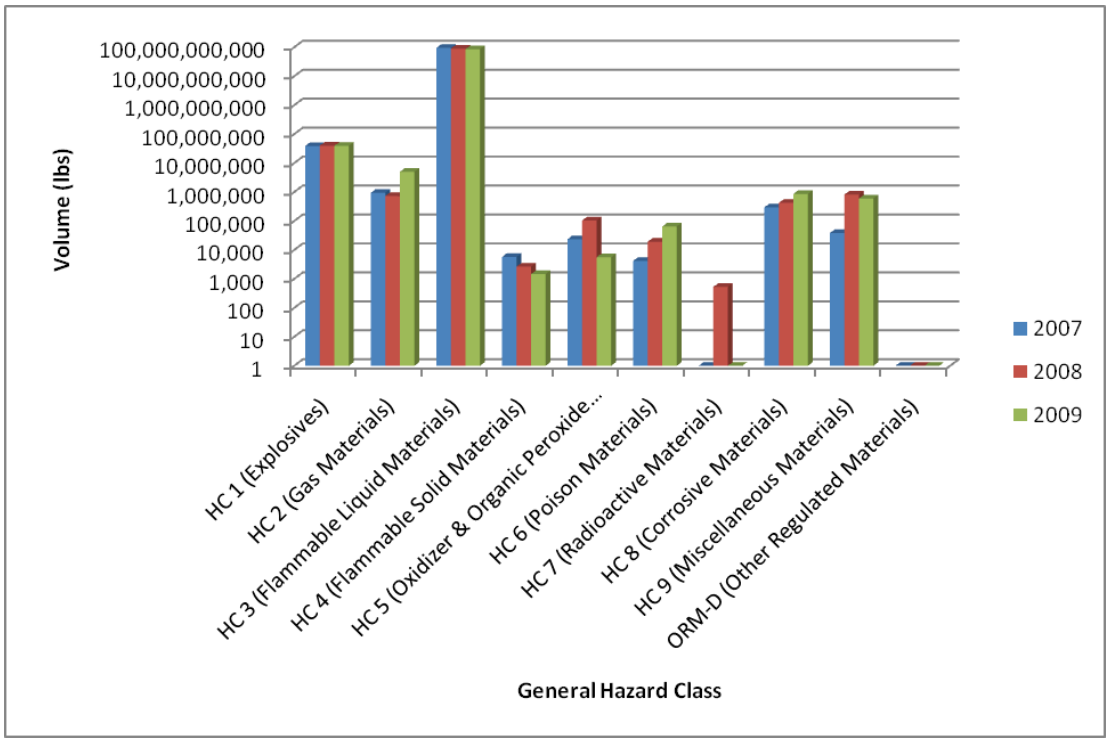
Figure 5-5. Hazardous Material Commodities by Hazardous Material Name (Greater than 10,000 lbs) for SEAK, for 2007 through 2009, presented on a log scale



5.2 Prince William Sound

Transportation of hazardous materials through the Prince William Sound Subarea (PWS) included three modes: highway, marine, and pipeline. The largest volume commodity was crude oil that is piped from the North Slope to Valdez and then loaded onto tankers and shipped to the lower 48 and other locations within Alaska. There were no shipments via air or rail reported in the data evaluated for this study. The lack of air shipments is suspect, and likely reflective of the limited air transport data captured for this study. The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-6 below.

Figure 5-6. Volumes of Hazardous Materials Shipped into PWS presented on a log scale



Because HC 3 (Flammable Liquid Materials), specifically petroleum products, makes up 99.9% of the total volume shipped, the breakdown of volumes of hazard class shipments as a percentage of subarea-wide volume does not provide any meaningful insight. If HC 3 (Flammable Liquid Materials) commodities are excluded, HC 1 (Explosives) dominates the remaining hazard classes. If HC 1 (Explosives) is also excluded as these are primarily military shipments of ammunition, the breakdown of hazardous material shipments does provide some meaningful insight. Figures 5-7, 5-8 and 5-9 depict the breakdown of hazardous material shipments within the Prince William Sound Subarea by a percentage of total remaining volume shipped. Of the remaining hazard classes, HC 2 (Gas Materials), HC 8 (Corrosive Materials), and HC 9 (Miscellaneous Materials) dominate the volumes of hazardous materials shipped from year to year.

Figure 5-7. PWS Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

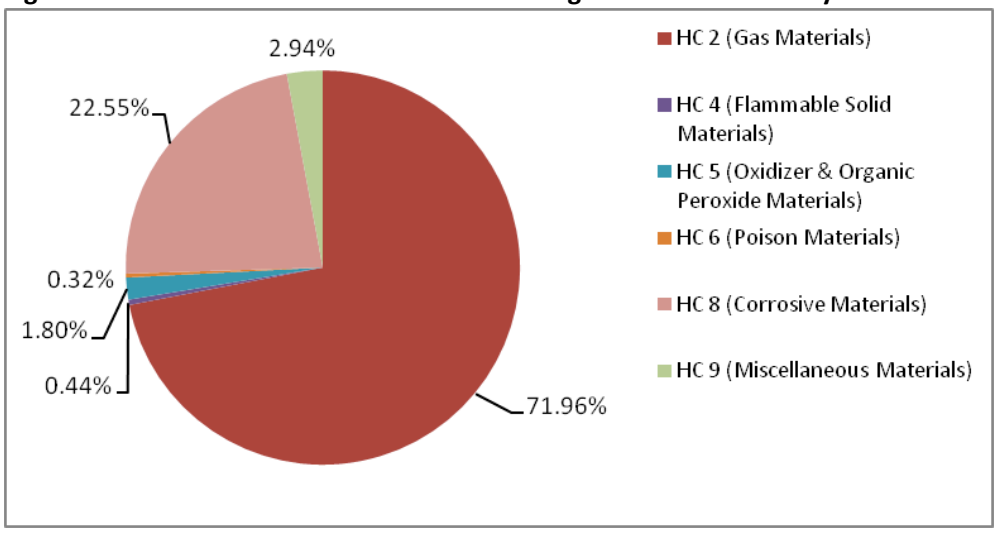


Figure 5-8. PWS Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

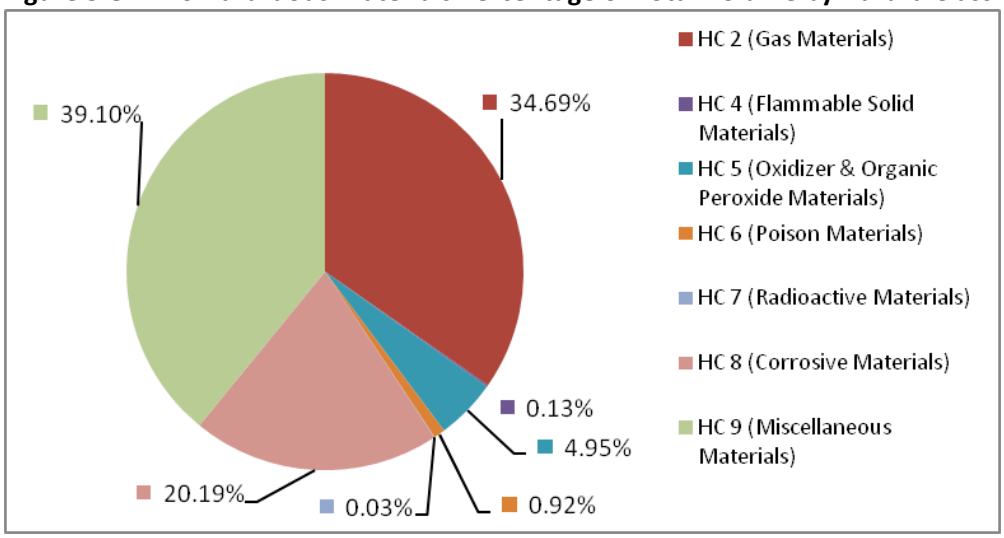
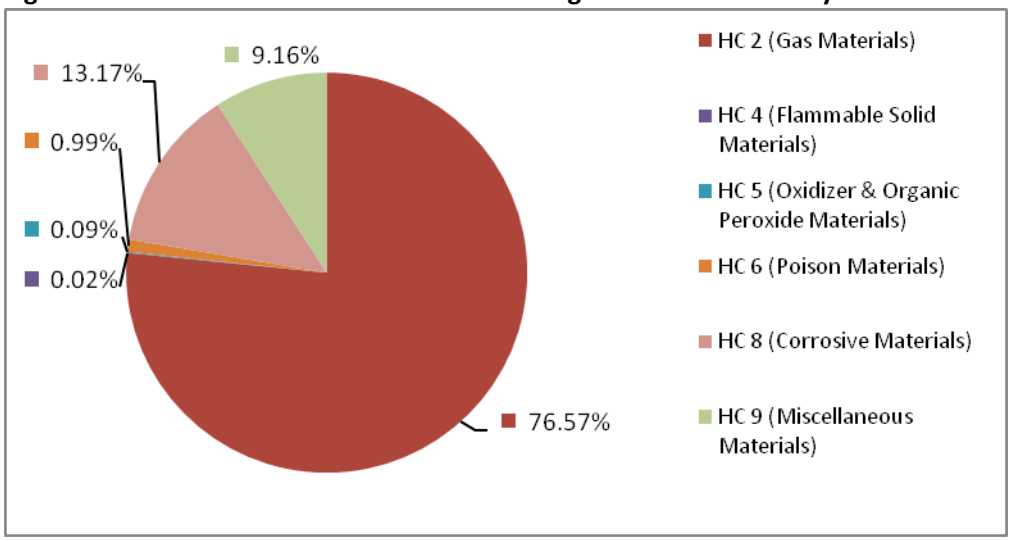


Figure 5-9. PWS Hazardous Materials Percentage of Total Volume by Hazard Class for 2009



In general, HC 3 commodities (Flammable Liquid Materials) dominated the volume of hazardous materials transported within the PWS Subarea by nearly three (3) orders of magnitude. This observation is logical and is aligned with the fact that the Trans-Alaska Pipeline passes through and terminates in this Subarea at the Port of Valdez. Table 5-9 below lists the total volumes (lbs) of hazardous materials by hazard class for each calendar year evaluated in this study.

Table 5-9. Volumes of Hazard Class Transported within PWS Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	38,804,513	39,785,078	39,158,003
HC 2 (Gas Materials)	938,075	724,767	5,002,646
HC 3 (Flammable Liquid Materials)	94,748,096,616	90,058,924,538	86,025,436,418
HC 4 (Flammable Solid Materials)	5,699	2,634	1,462
HC 5 (Oxidizer & Organic Peroxide Materials)	23,416	103,389	5,602
HC 6 (Poison Materials)	4,176	19,249	64,416
HC 7 (Radioactive Materials)	-	528	-
HC 8 (Corrosive Materials)	294,046	421,712	860,719
HC 9 (Miscellaneous Materials)	38,275	816,786	598,725
ORM-D (Other Regulated Materials)	-	-	-

A more detailed evaluation of each hazard class is provided below. For the Prince William Sound Subarea, the volume threshold for more detailed analysis was set at 50,000 lbs due to the higher numbers of hazmat commodities shipped in this region.

HC 1 Explosives: The primary explosives that were transported through the Prince William Sound Subarea were HC, 1.1, 1.2, 1.3, 1.4 and 1.5. These shipments are primarily made up of the twice-a-year ammunition shipments that arrive in Valdez from Indian Island, WA and are shipped north to Anchorage and/or Fairbanks, AK. The hazard classes for these military ammunition shipments include 1.1, 1.2, 1.3 and 1.4 commodities. However, the specific hazardous materials descriptions, Hazard Class Divisions and/or UN ID Numbers were not available for these shipments. For the most part, the commodity volumes remained fairly consistent from year to year[32]. HC 1.5 commodity shipments increased by approximately 60% between 2007 and 2008, and then decreased by approximately 60% between 2008 and 2009. Table 5-10 lists the primary HC 1 commodities shipped within the PWS Subarea.

[32] Largely based on the detail of the data made available from the military ammunition shipment manager.

Table 5-10. Primary Hazard Class 1 Commodities Shipped within the PWS Subarea

Hazard Class	Hazardous Material Description (Greater than 50,000 lbs Shipped)	UN ID Number
1.1	Explosive Materials (Military Shipments)	Unspecified
	Boosters	0042
1.2	Explosive Materials (Military Shipments)	Unspecified
1.3	Explosive Materials (Military Shipments)	Unspecified
1.4	Explosive Materials (Military Shipments)	Unspecified
	Detonator Assemblies, Non-Electric	0361
	Articles, Explosive, N.O.S.	0349
	Cartridges for Weapons, Blank	0014
	Signal Devices, Hand	0373
1.5	Explosive, Blasting, Type B	0331
	Explosive, Blasting, Type E or Agent Blasting, Type E	0332
	Ammonium Nitrate-Fuel Oil Mixture	0331

HC 2 Gas Materials: HCs 2.0, 2.1 and 2.2 were transported in the Prince William Sound Subarea in 2007 and 2009. In 2008, HC 2.3 was also shipped. The volumes between 2007 and 2008 rose slightly for HC 2.1 and decreased by approximately 30% for HC 2.2. Between 2008 and 2009, both HCs 2.1 and 2.2 increased by an order of magnitude. Table 5-11 lists the primary HC 2 commodities shipped within the PWS Subarea.

No HC 2.3 commodities were shipped in a volume that exceeded 50,000 lbs.

Table 5-11. Primary Hazard Class 2 Commodities Shipped within the PWS Subarea

Hazard Class	Hazardous Material Description (Greater than 50,000 lbs Shipped)	UN ID Number
2.0	Gas Materials	Unspecified
2.1	Petroleum Gases, Liquefied or Liquefied Petroleum Gas	1075
	Residue: Hydrogen, Compressed	1049
	Methane Compressed or Natural Gas Compressed	1971
	Compressed Gas, Flammable, N.O.S.	1954
	Acetylene, Dissolved	1001
2.2	Oxygen Compressed	1072
	Compressed Gas, N.O.S.	1956
	Air, Compressed	1002
	Argon, Compressed	1006
	Helium, Compressed	1046
	Fire Extinguishers	1044
	Articles, Pressurized, Pneumatic	3164
	Nitrogen, Compressed	1066
	Carbon Dioxide	1013

HC 3 Flammable Liquid Materials: HC 3.0 transported through the Prince William Sound Subarea represents the third highest volume in the State. The primary commodity is crude oil that is transported via the Trans-Alaska Pipeline from the North Slope to Valdez. As crude oil is the dominant commodity, it makes sense that the changes in volume from year to year follow the changes in crude oil production. Table 5-12 lists the primary HC 3 commodities shipped within the PWS Subarea.

Table 5-12. Primary Hazard Class 3 Commodities Shipped within the PWS Subarea

Hazard Class	Hazardous Material Description (Greater than 50,000 lbs Shipped)	UN ID Number
3.0	Petroleum Crude Oil	1267
	Paint	1263
	Methanol	1230
	Flammable Liquids, N.O.S.	1993
	Flammable Liquids	Unspecified
	Resin Solution	1866

HC 4 Flammable Solid Materials: Small volumes of HC 4.1 and 4.3 were transported in the Prince William Sound Subarea. No discernible trends were noted. With HCs 4.1 and 4.3, no shipments in excess of 50,000 lbs were noted.

HC 5 Oxidizer and Organic Peroxide Materials: HC 5.1 and 5.2 were shipped in this Subarea each year. According to the data received and reviewed, HC 5.1 was shipped in 2008 in volumes that exceeded the threshold volume of 50,000 lbs. Table 5-13 lists the primary HC 5 commodities shipped within the PWS Subarea.

Table 5-13. Primary Hazard Class 5 Commodities Shipped within the PWS Subarea

Hazard Class	Hazardous Material Description (Greater than 50,000 lbs Shipped)	UN ID Number
5.1	Ammonium Nitrate	1942

Volumes of HC 5.2 showed no dramatic increases or decreases over this time period and did not exceed the volume threshold of 50,000 lbs.

HC 6 Poisons: HC 6.1 and 6.2 were shipped within the Prince William Sound Subarea. Varying volumes were reported. Only calendar year 2009 noted shipments of HC 6.1 in excess of the volume threshold of 50,000 lbs. Table 5-14 lists the primary HC 6 commodities shipped within the PWS Subarea.

Table 5-14. Primary Hazard Class 6 Commodities Shipped within the PWS Subarea

Hazard Class	Hazardous Material Description (Greater than 50,000 lbs Shipped)	UN ID Number
6.1	Trichloroethylene	1710

Conversely, volumes of HC 6.2 shipments consistently decreased from year to year. HC 6.2 commodities were primarily regulated medical waste products and did not exceed a shipping volume of 50,000 lbs.

HC 7 Radioactive Materials: According to the data received and reviewed, there were no HC 7.0 commodities shipped within the Prince William Sound Subarea that exceeded the shipping volume threshold of 50,000 lbs.

HC 8 Corrosive Materials: HC 8.0 shipments within the Prince William Sound Subarea increased steadily from year to year. An approximate 70% increase was noted between 2007 and 2008 with the total volume shipped more than doubling between 2008 and 2009. Table 5-15 lists the primary HC 8 commodities shipped within the PWS Subarea.

Table 5-15. Primary Hazard Class 8 Commodities Shipped within the PWS Subarea

Hazard Class	Hazardous Material Description (Greater than 50,000 lbs Shipped)	UN ID Number
8.0	Batteries, Wet, Filled with Acid	2794
	Amines, Liquid, Corrosive, N.O.S. or Polyamines, Liquid, Corrosive, N.O.S.	2735
	Sulfuric Acid	2796
	Chemical Kit	1760
	Paint	3066
	Batteries, Wet, Filled with Alkali	2795

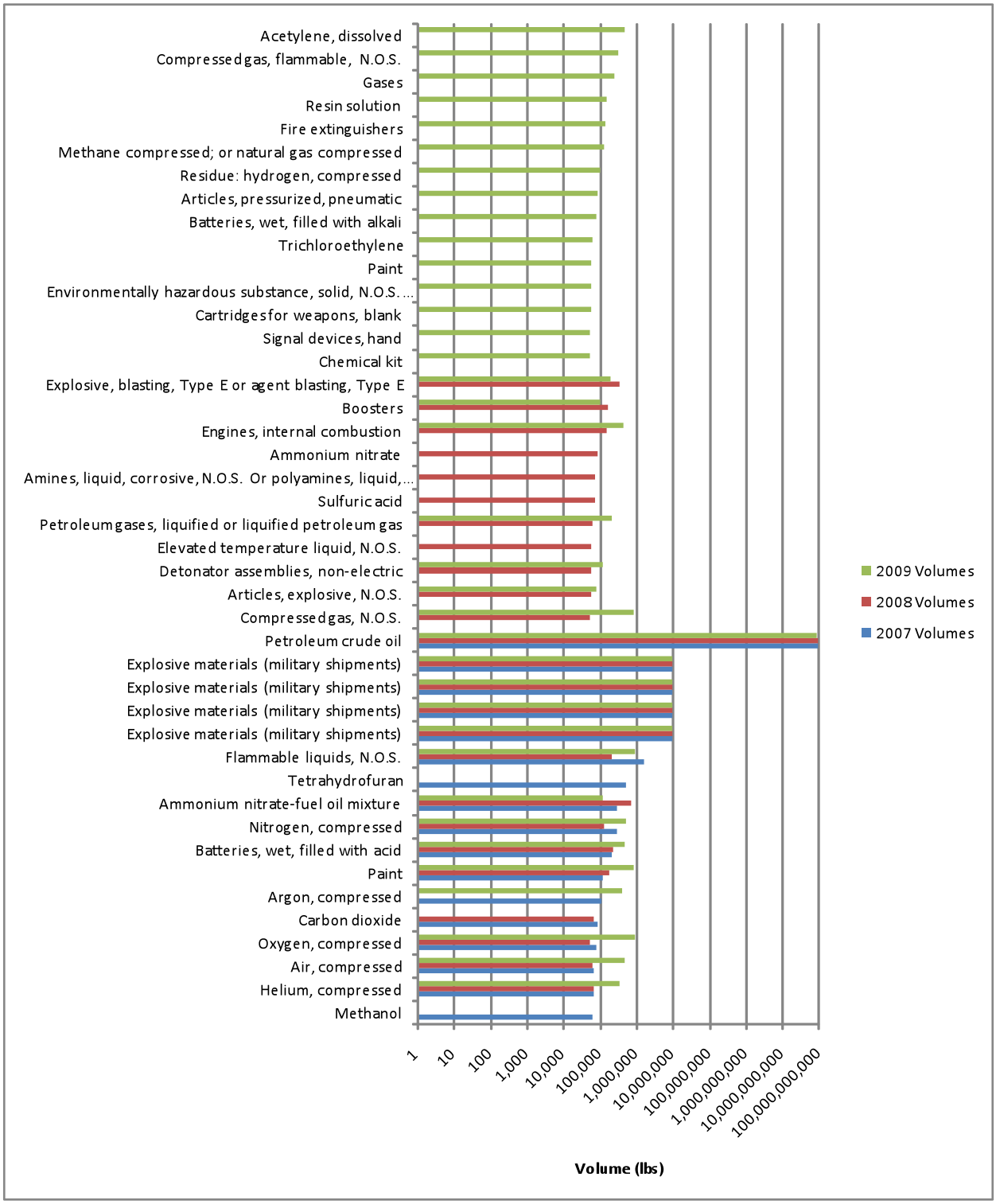
HC 9 Miscellaneous Materials: The volume of HC 9.0 commodities shipped within the Prince William Sound Subarea saw a dramatic increase between 2007 and 2008, an order of magnitude increase, and then dropped but remained much higher than 2007 levels in 2009. The sharp increase in 2008 could be attributable to the increase in the Alaska Permanent Fund Dividend checks during this timeframe. Table 5-16 lists the primary HC 9 commodities shipped within the PWS Subarea.

Table 5-16. Primary Hazard Class 9 Commodities Shipped within the PWS Subarea

Hazard Class	Hazardous Material Description (Greater than 50,000 lbs Shipped)	UN ID Number
9.0	Engines, Internal Combustion (Flammable Gas Powered)	3166
	Environmentally Hazardous Substance, Solid, N.O.S. (Lead)	3077
	Elevated Temperature Liquid N.O.S.	3257

Figure 5-10 depicts the volume of hazardous materials shipped each year within Prince William Sound by Hazardous Material Name for volumes exceeding 50,000 pounds.

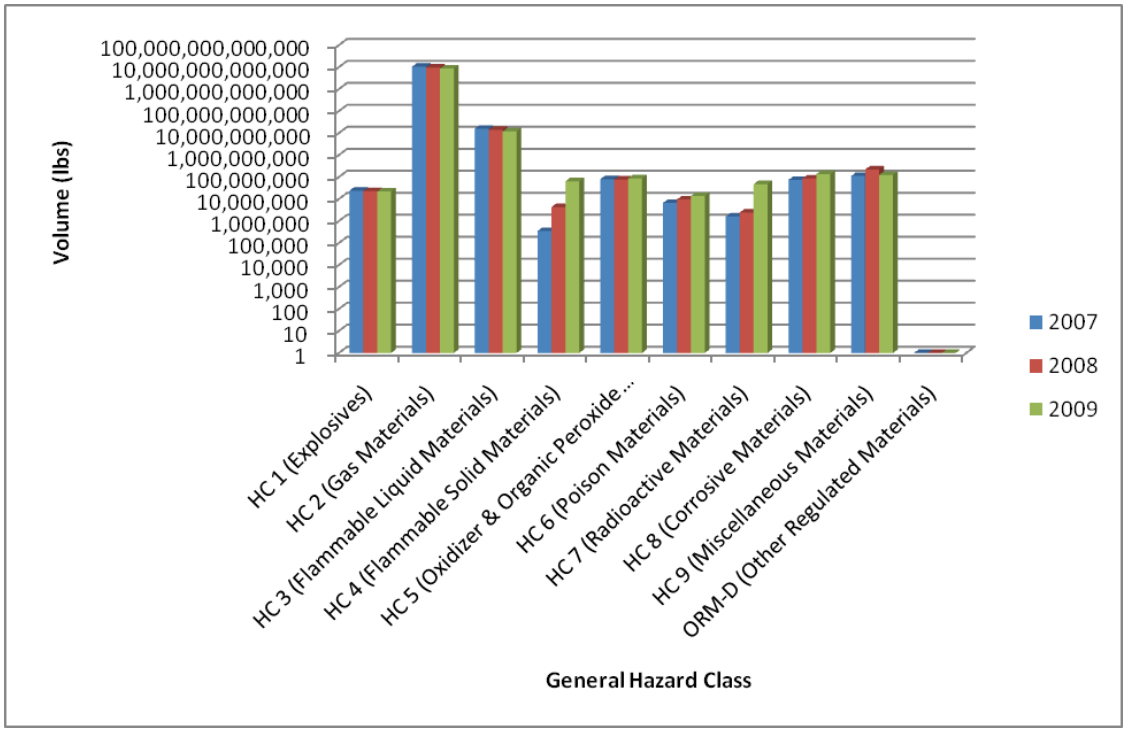
Figure 5-10. Hazardous Material Commodities by Hazardous Material Name (Greater than 50,000 lbs) for PWS, for 2007 through 2009, presented on a log scale.



5.3 Cook Inlet

The transportation of hazardous materials through the Cook Inlet Subarea (CI) includes all modes of transportation. Not surprisingly due to the transportation infrastructure availability and the strategic positioning of this region as an ultimate receiver or transshipment point within the State, this Subarea has the highest total number of shipments and covers the entire spectrum of hazardous materials commodities to be shipped. The volumes transported are largely dominated by those volumes reported for shipment by pipeline (HC 3.0: Petroleum products, and HC 2.1: Natural Gas). The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-11 below.

Figure 5-11. Volumes of Hazardous Materials Shipped into CI presented on a log scale



Because HC 2.0 (Gas Materials) and 3.0 (Flammable Liquid Materials), specifically natural gas and petroleum products, make up 99.8% of the total volume shipped, the breakdown of volumes of Hazard Class shipments (inclusive of all hazard classes) as a percentage of subarea-wide volume does not provide any meaningful insight. However, excluding those two hazard classes provides a general breakdown of the remaining hazard classes by percentage of the total remaining volume. Figures 5-12, 5-13 and 5-14 depict the breakdown of hazardous material shipments within the Cook Inlet Subarea by a percentage of total remaining volume shipped. HC 8 (Corrosive Materials), HC 9 (Miscellaneous Materials) and HC 5 (Oxidizer & Organic Peroxide Materials) consistently dominate the volume of hazardous materials shipped from year to year.

Figure 5-12. CI Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

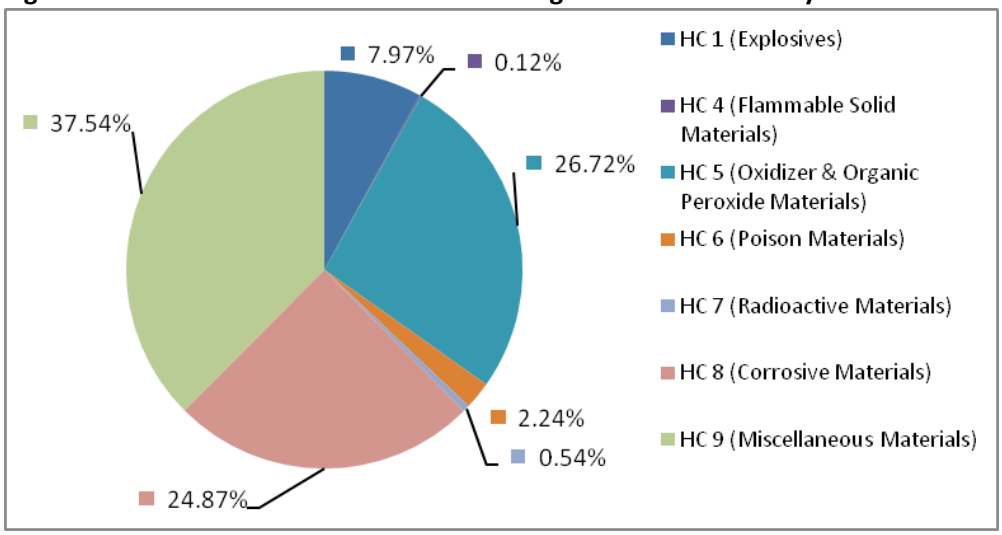


Figure 5-13. CI Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

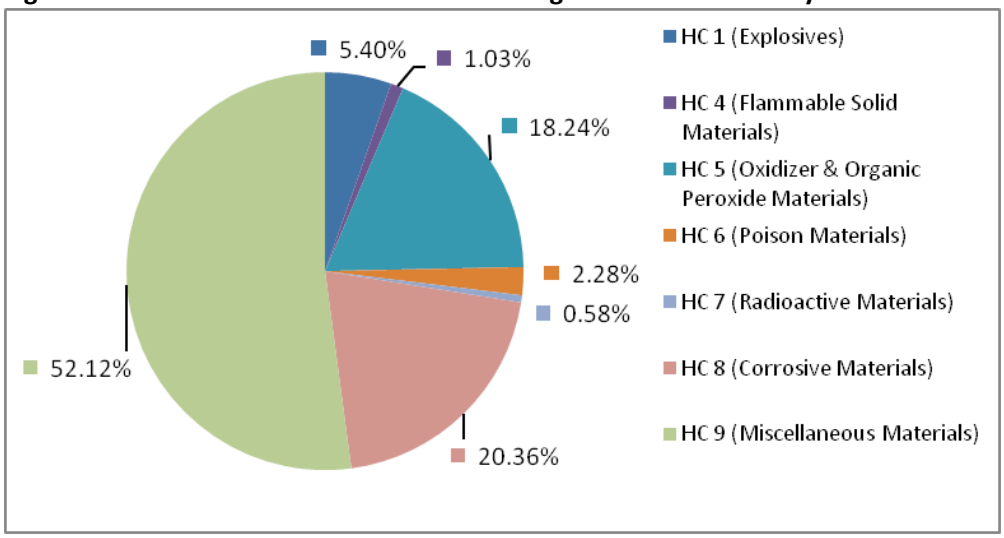
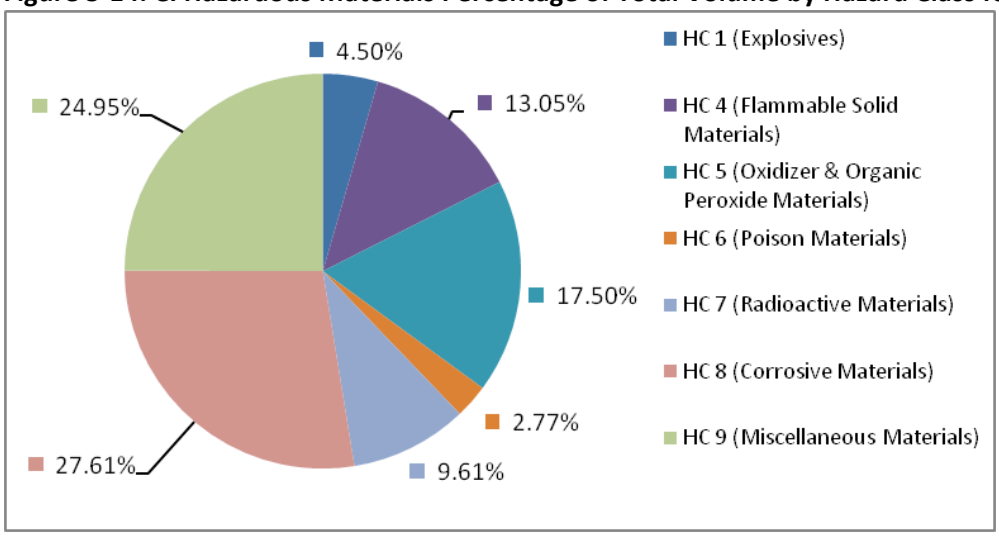


Figure 5-14. CI Hazardous Materials Percentage of Total Volume by Hazard Class for 2009



In general, HC 2 commodities (Gas Materials), specifically Natural Gas, dominated the volume of hazardous materials shipped in the Cook Inlet Subarea by over two (2) orders of magnitude.

This observation is consistent with the fact that Natural Gas is transported via the Cook Inlet Pipeline. The total volumes of hazardous materials shipped within the Cook Inlet subarea, by hazard class, for each calendar year evaluated for this study are listed in Table 5-17.

Table 5-17. Volumes of Hazard Class Transported within CI Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	23,777,943	22,750,090	22,278,874
HC 2 (Gas Materials)	10,492,451,607,239	9,533,783,569,273	8,652,326,419,057
HC 3 (Flammable Liquid Materials)	15,576,027,730	14,088,937,179	11,874,523,207
HC 4 (Flammable Solid Materials)	351,462	4,324,312	64,618,509
HC 5 (Oxidizer & Organic Peroxide Materials)	79,702,456	76,897,232	86,639,264
HC 6 (Poison Materials)	6,679,978	9,603,623	13,722,201
HC 7 (Radioactive Materials)	1,619,968	2,449,819	47,584,991
HC 8 (Corrosive Materials)	74,181,289	85,837,452	136,681,823
HC 9 (Miscellaneous Materials)	111,969,641	219,711,495	123,510,058
ORM-D (Other Regulated Materials)	-	-	-

A more detailed evaluation of each hazard class is provided below. For the Cook Inlet Subarea, the volume cutoff for more detailed analysis was set at 100,000 lbs due to the higher numbers of hazmat commodities shipped in this region.

HC 1 Explosives: The primary explosives that were transported through the Cook Inlet Subarea in 2007, 2008 and 2009 were 1.0 (unspecified hazard class), 1.1, 1.2, 1.3, 1.4 and 1.5. Shipment volumes were very consistent from year to year. Table 5-18 lists the primary HC 1 commodities shipped within the Cook Inlet Subarea.

Table 5-18. Primary Hazard Class 1 Commodities Shipped within the CI Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
1.1	Explosive Material (Military Shipments)	Unspecified
1.2	Explosive Material (Military Shipments)	Unspecified
1.3	Explosive Material (Military Shipments)	Unspecified
1.4	Explosive Material (Military Shipments)	Unspecified
1.5	Explosive, Blasting, Type B or Agent Blasting, Type B	0331

HC 2 Gas Materials: HCs 2.0, 2.1, 2.2 and 2.3 were shipped in the Cook Inlet Subarea. The most significant volume shipped within Cook Inlet was Natural Gas, HC 2.1, which was transported via the Cook Inlet Pipeline. The shipments of HC 2.0 were primarily the gas materials commodities transported via the Alaska Railroad from year to year that

did not have a specified hazard class, UN ID number or detailed hazardous materials description. Table 5-19 lists the primary HC 2 commodities shipped within the Cook Inlet Subarea.

Table 5-19. Primary Hazard Class 2 Commodities Shipped within the CI Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
2.1	Natural Gas (Methane)	1971
	Petroleum Gases, Liquefied or Liquefied Petroleum Gas	1075
	Methane, Refrigerated Liquid or Natural Gas, Refrigerated Liquid	1972
2.2	Oxygen, Compressed	1072
	Compressed Gas, N.O.S.	1956
	Fire Extinguishers	1044
2.3	Chlorine	1017

HC 2.2 were the only grouping of gas material commodities to display an increase in volume from year to year. The primary source of shipment into this subarea was via the marine mode as the commodity was shipped from Tacoma, WA.

HC 3 Flammable Liquid Materials: HC 3.0 commodities are transported in the Cook Inlet Subarea by all five (5) modes of transportation that were evaluated in this study. The volumes transported decreased consistently from year to year between 2007 and 2009. The decrease appears to follow the changes in throughput of the regional pipelines during this time period. Table 5-20 lists the primary HC 3 commodities shipped within the Cook Inlet Subarea.

Table 5-20. Primary Hazard Class 3 Commodities Shipped within the CI Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
3.0	Paint	1263
	Petroleum Crude Oil	1267
	Jet Fuel	1863
	Diesel, Flammable Liquids	1993
	Petroleum Distillates, N.O.S. or Petroleum Products, N.O.S.	1268
	Diesel Fuel; Fuel Oil; Gas Oil or Heating Oil Light	1202
	Flammable Liquids	Unspecified

HC 4 Flammable Solid Materials: HCs 4.0 (unspecified hazard class), 4.1, 4.2 and 4.3 were shipped within the Cook Inlet Subarea. Volumes and HC varied from year to year and no discernible trends were noted. It appears that there may have been an entry

error by the data provider for the volume of a single 2008 shipment of HC 4.1. The volume of HC 4.1 shipped in 2008 is two orders of magnitude higher than either 2007 or 2009. Table 5-21 lists the primary HC 4 commodities shipped within the Cook Inlet Subarea.

Table 5-21. Primary Hazard Class 4 Commodities Shipped within the CI Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
4.0	Flammable Solid Material	Unspecified
4.1	Sulfur	1350

There were no HC 4.2 or 4.3 commodities shipped that exceeded 100,000 lbs.

HC 5 Oxidizer and Organic Peroxide Materials: HC 5.1 and 5.2 were transported in this Subarea each year. HC 5.1 shipped within the Cook Inlet Subarea represented the largest volume of HC 5.1 transported within the State. The volume showed no discernible trend. HC 5.2 increased approximately 35% between 2007 and 2008, and then increased an order of magnitude between 2008 and 2009. Table 5-22 lists the primary HC 5 commodities shipped within the Cook Inlet Subarea.

Table 5-22. Primary Hazard Class 5 Commodities Shipped within the CI Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
5.1	Ammonium Nitrate	3375

There were no HC 5.2 commodities shipped that exceeded 100,000 lbs.

HC 6 Poisons: HC 6.1 and 6.2 were shipped within the Cook Inlet Subarea. The volume of HC 6.1 shipped was primarily dominated by the Alaska Railroad shipments of Sodium Cyanide and consistently increased from year to year. HC 6.2 commodities were primarily regulated medical waste products and consistently decreased from year to year. Table 5-23 lists the primary HC 6 commodities shipped within the Cook Inlet Subarea.

Table 5-23. Primary Hazard Class 6 Commodities Shipped within the CI Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
6.1	Sodium Cyanide	1689

There were no HC 6.2 commodities shipped that exceeded 100,000 lbs.

HC 7 Radioactive Materials: HC 7.0 was transported within the Cook Inlet Subarea from year to year. The volume increased each year seeing a substantial order of magnitude

increase between 2008 and 2009. Table 5-24 lists the primary HC 7 commodities shipped within the Cook Inlet Subarea.

Table 5-24. Primary Hazard Class 7 Commodities Shipped within the CI Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
7.0	Radioactive Materials	Unspecified

HC 8 Corrosive Materials: HC 8.0 commodities shipped within the Cook Inlet Subarea also increased from year to year. Volumes shipped increased by approximately 15% between 2007 and 2008, and by approximately 38% between 2008 and 2009. Table 5-25 lists the primary HC 8 commodities shipped within the Cook Inlet Subarea.

Table 5-25. Primary Hazard Class 8 Commodities Shipped within the CI Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
8.0	Corrosive Cleaning Supplies	1760
	Batteries, Wet, Filled with Acid	2794
	Paint	3066
	Corrosive Liquid, Basic, Inorganic, N.O.S.	3266
	Corrosive Materials	Unspecified

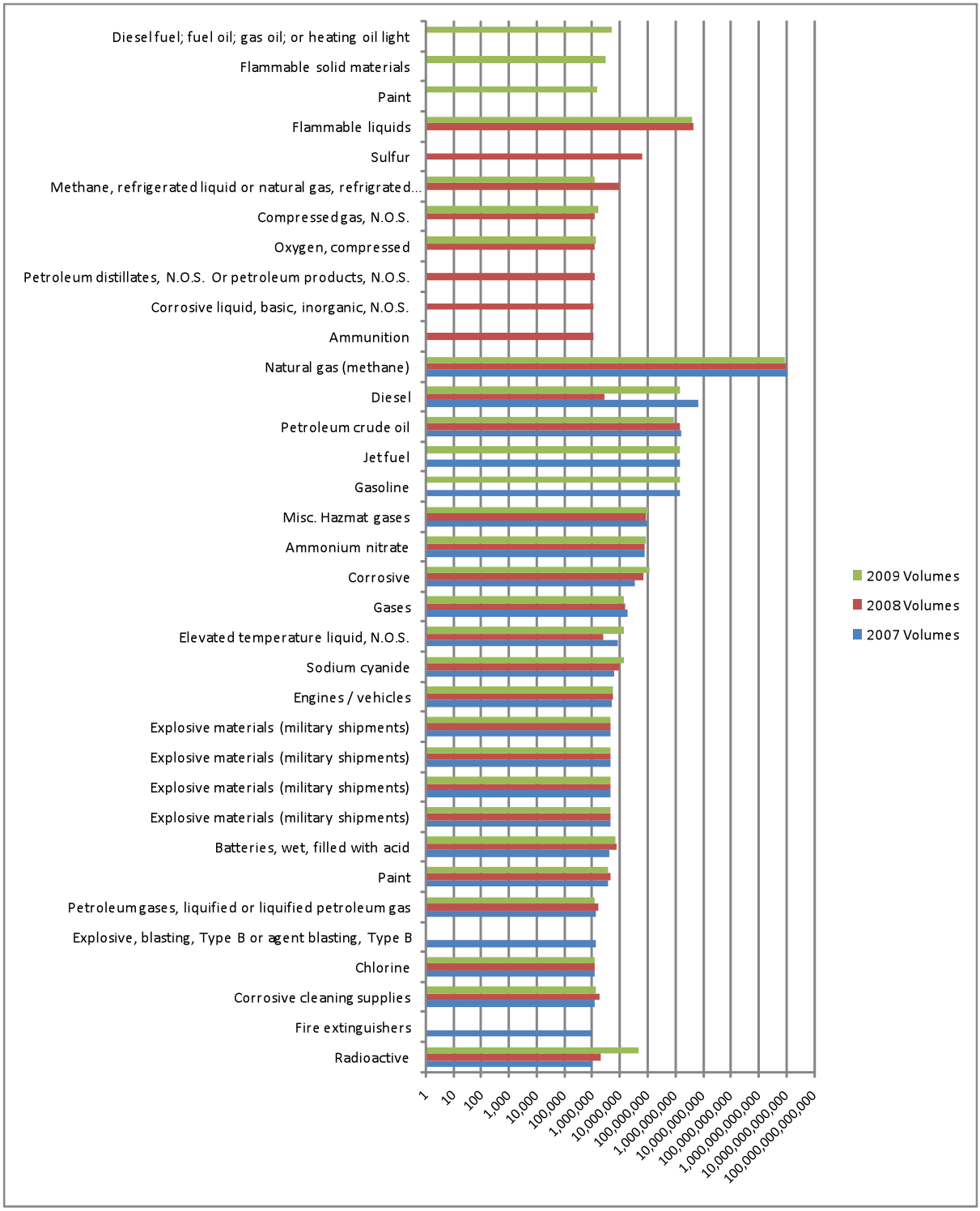
HC 9 Miscellaneous Materials: The volume of HC 9.0 commodities shipped within the Cook Inlet Subarea saw a dramatic increase between 2007 and 2008, nearly doubling, and then dropped but remained higher than 2007 levels in 2009. The sharp increase in 2008 could be attributable to the increase in the Alaska Permanent Fund Dividend checks during this timeframe. Table 5-26 lists the primary HC 9 commodities shipped within the Cook Inlet Subarea.

Table 5-26. Primary Hazard Class 9 Commodities Shipped within the CI Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
9.0	Engines / Vehicles	3166
	Elevated Temperature Liquid, N.O.S.	3257
	Hazardous Waste	Unspecified
	Miscellaneous Hazardous Material Gases	Unspecified

Figure 5-15 depicts the volume of hazardous materials shipped each year within Cook Inlet by Hazardous Material Name for volumes exceeding 100,000 pounds.

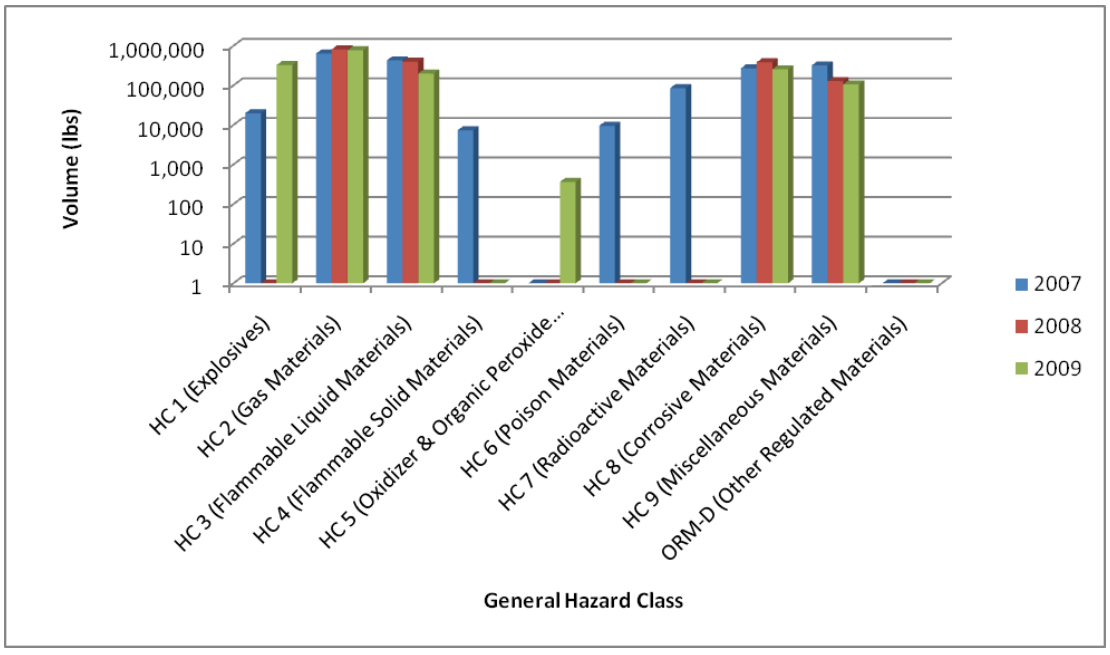
Figure 5-15. 2007 hazardous materials Commodity by Hazardous Material Name (Greater than 100,000 lbs) for CI



5.4 Kodiak

The transportation of hazardous materials into the Kodiak Subarea (KI) includes two modes of transportation: air and marine. Marine shipment is primary with air shipments making up an undetermined portion of the total volume. While there were no air shipments reported in the data received for this study, it is known that there are shipments via aircraft, and this is reflective of the limited scope of the air shipment data received and evaluated. For example, the Kodiak Launch Complex (KLC) located 44 road miles south of the city of Kodiak at Narrow Cape receives rocket motors and other payloads that are delivered via aircraft (e.g. Air Mobility Command aircraft) to the regional airport and then trucked to the KLC[33]. However, this air transportation information was not captured in this dataset. An undetermined portion of the hazardous material commodities entering via marine transportation and destined for the KLC were captured in this dataset and are reflected in the information that follows. Once a commodity is delivered to Kodiak Island, it would then be trucked to the destination location. In the case of the KLC, hazardous material deliveries would leave the regional airport and be driven to Narrow Cape via multiple roadway segments. The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-16 below.

Figure 5-16. Volumes of Hazardous Materials Shipped into KI presented on a log scale



In general and as shown in Figures 5-17, 5-18, and 5-19 below, HC 2 commodities (Gas Materials), HC 3 commodities (Flammable Liquid Materials), and HC 8 commodities (Corrosive Materials) consistently dominated the volume of hazardous materials commodities shipped within the Kodiak Subarea.

[33] Alaska Aerospace Corporation, http://www.akaerospace.com

Figure 5-17. KI Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

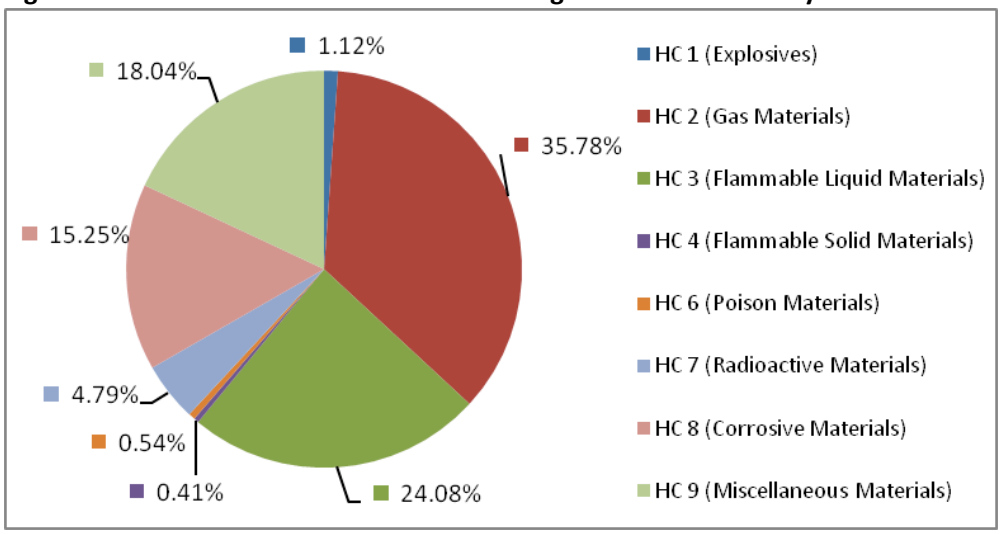


Figure 5-18. KI Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

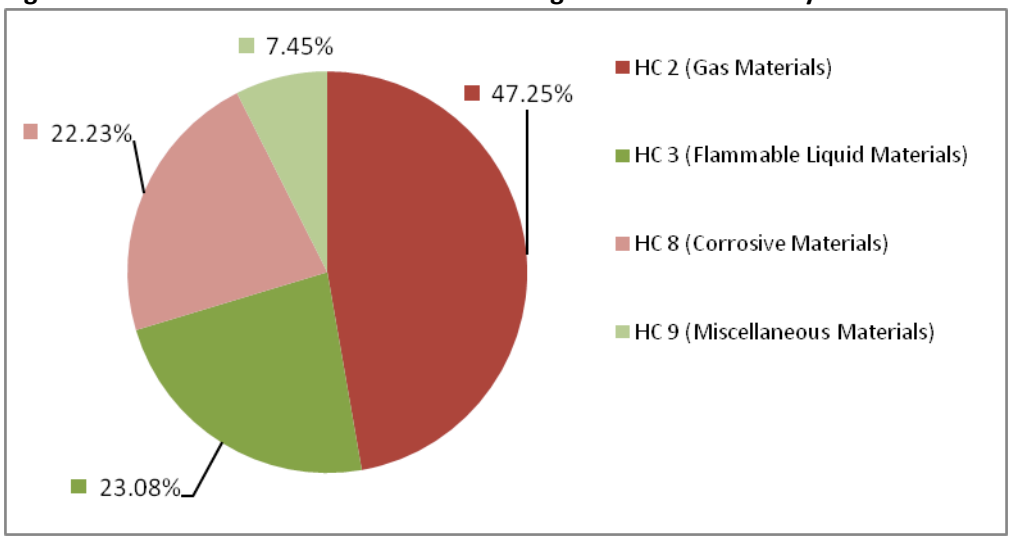


Figure 5-19. KI Hazardous Materials Percentage of Total Volume by Hazard Class for 2009

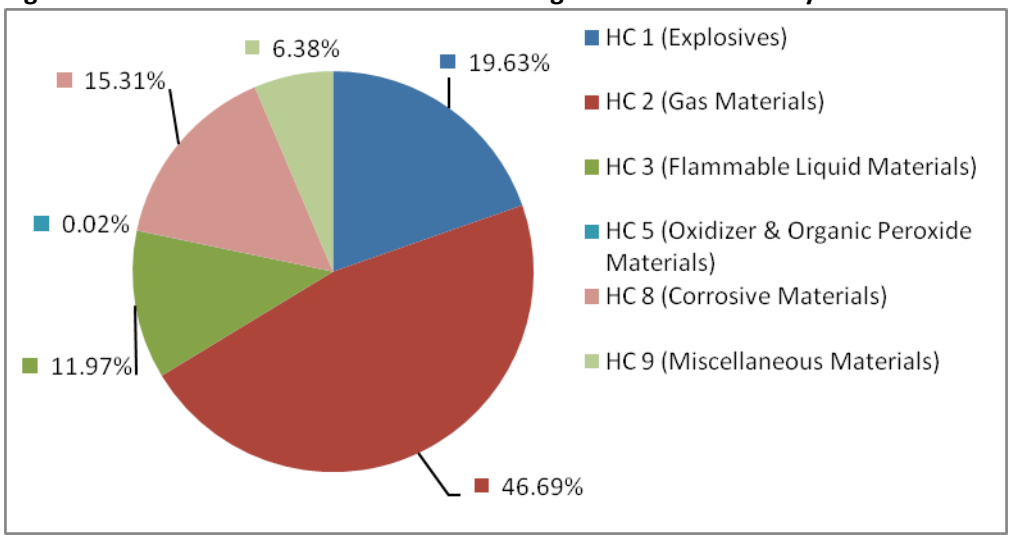


Table 5-27 below lists the total volume of hazardous materials shipped within the Kodiak Subarea by hazard class for each calendar year evaluated for this study.

Table 5-27. Volumes of Hazard Class Transported within KI Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	19,894	-	327,783
HC 2 (Gas Materials)	638,145	818,249	779,633
HC 3 (Flammable Liquid Materials)	429,498	399,648	199,896
HC 4 (Flammable Solid Materials)	7,358	-	-
HC 5 (Oxidizer & Organic Peroxide Materials)	-	-	366
HC 6 (Poison Materials)	9,583	-	-
HC 7 (Radioactive Materials)	85,512	-	-
HC 8 (Corrosive Materials)	271,984	384,939	255,671
HC 9 (Miscellaneous Materials)	321,791	128,958	106,570
ORM-D (Other Regulated Materials)	-	-	-

A more detailed evaluation of each hazard class is provided below. For Kodiak Subarea, the volume shipped threshold was established at 10,000 lbs.

HC 1 Explosives: The only explosives that were transported through the Kodiak Subarea in 2007 were HC 1.4. In 2008 there were no shipments of explosives noted, and in 2009 the explosives shipped through Kodiak Island expanded to HC 1.1, 1.3 and 1.4. Table 5-28 lists the primary HC 1 commodities shipped within the Kodiak Subarea.

Table 5-28. Primary Hazard Class 1 Commodities Shipped within the KI Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
1.1	Explosive, Blasting, Type E	0241
	Explosive, Blasting, Type A	0081
	Cord Detonating	0065
	Boosters	0042
1.4	Articles, Explosive, N.O.S.	0349

There were no HC 1.2, 1.3 or 1.5 commodities shipped in this subarea that exceeded the volume shipped of 10,000 lbs.

HC 2 Gas Materials: HCs 2.1, 2.2 and 2.3 were transported in the Kodiak Subarea between 2007, 2008 and 2009. HC 2.2 represented the largest volume shipped by an order of magnitude. Table 5-29 lists the primary HC 2 commodities shipped within the Kodiak Subarea.

Table 5-29. Primary Hazard Class 2 Commodities Shipped within the KI Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
2.1	Acetylene, Dissolved	1001
2.2	Chlorodifluoromethane or Refrigerant Gas R22	1018
	1,1,1,2-Tetrafluoroethane or Refrigerant Gas R134A	3159
	Carbon Dioxide, Refrigerated Liquid	2187
	Compressed Gas, N.O.S.	1956
	Fire Extinguishers	1044
	Argon, Compressed	1006
	Nitrous Oxide	1070
	Carbon Dioxide	1013
	Helium, Compressed	1046
	Nitrogen, Compressed	1066
	Oxygen, Compressed	1072

There were no HC 2.3 commodities that were shipped that exceeded 10,000 lbs.

HC 3 Flammable Liquid Materials: The volume of HC 3.0 shipped in the Kodiak Subarea decreased between 2007 and 2008 by approximately 10% and another 25% between 2008 and 2009. Table 5-30 lists the primary HC 3 commodities shipped within the Kodiak Subarea.

Table 5-30. Primary Hazard Class 3 Commodities Shipped within the KI Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
3.0	Isopropanol or Isopropyl Alcohol	1219
	Paint	1263
	Methanol	1230
	Flammable Liquids, N.O.S.	1993
	Adhesives	1133
	Kerosene	1223
	Petroleum Distillates, N.O.S. or Petroleum Products N.O.S.	1268

HC 4 Flammable Solid Materials: Small volumes of HC 4.1 were transported through the Kodiak Subarea in 2007. There were no other shipments noted for 2008 or 2009 based on the data evaluated for this study.

HC 5 Oxidizer and Organic Peroxide Materials: A very small volume of HC 5.1 was transported within the Kodiak Subarea during 2009 and it did not exceed 10,000 lbs shipped.

HC 6 Poisons: A relatively small volume of HC 6.1 was shipped in the Kodiak Subarea in 2007, and it did not exceed 10,000 lbs shipped. No shipments were reported in 2008 or 2009 according to the data received and evaluated for this study.

HC 7 Radioactive Materials: HC 7.0 was transported within the Kodiak Subarea in 2007. No shipments were reported in 2008 or 2009 according to the data received and evaluated for this study. Table 5-31 lists the primary HC 7 commodities shipped within the Kodiak Subarea.

Table 5-31. Primary Hazard Class 7 Commodities Shipped within the KI Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
7.0	Radioactive Material, Excepted Package-Articles Manufactured From Natural or Depleted Uranium or Natural Thorium	2910
	Radioactive Material, Type A Package, Special Form	3332

HC 8 Corrosive Materials: The volume of HC 8.0 commodities shipped within the Kodiak Subarea remained relatively consistent from year to year with no discernible trend noted. Table 5-32 lists the primary HC 8 commodities shipped within the Kodiak Subarea.

Table 5-32. Primary Hazard Class 8 Commodities Shipped within the KI Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
8.0	Phosphoric Acid	1805
	Sulfuric Acid	2796
	Corrosive Liquids, N.O.S.	1760
	Corrosive Liquids, Basic, Inorganic, N.O.S.	3266
	Sodium Hydroxide Solution	1824
	Batteries, Wet, Filled with Acid	2794
	Batteries, Wet, Non-Spillable	2800
	Batteries, Wet, Filled with Alkali	2795

HC 9 Miscellaneous Materials: The volume of HC 8.0 commodities shipped within the Kodiak Island decreased from year to year. Dropping by over 50% between 2007 and 2008 and then by another 20% between 2008 and 2009, this was the only subarea to

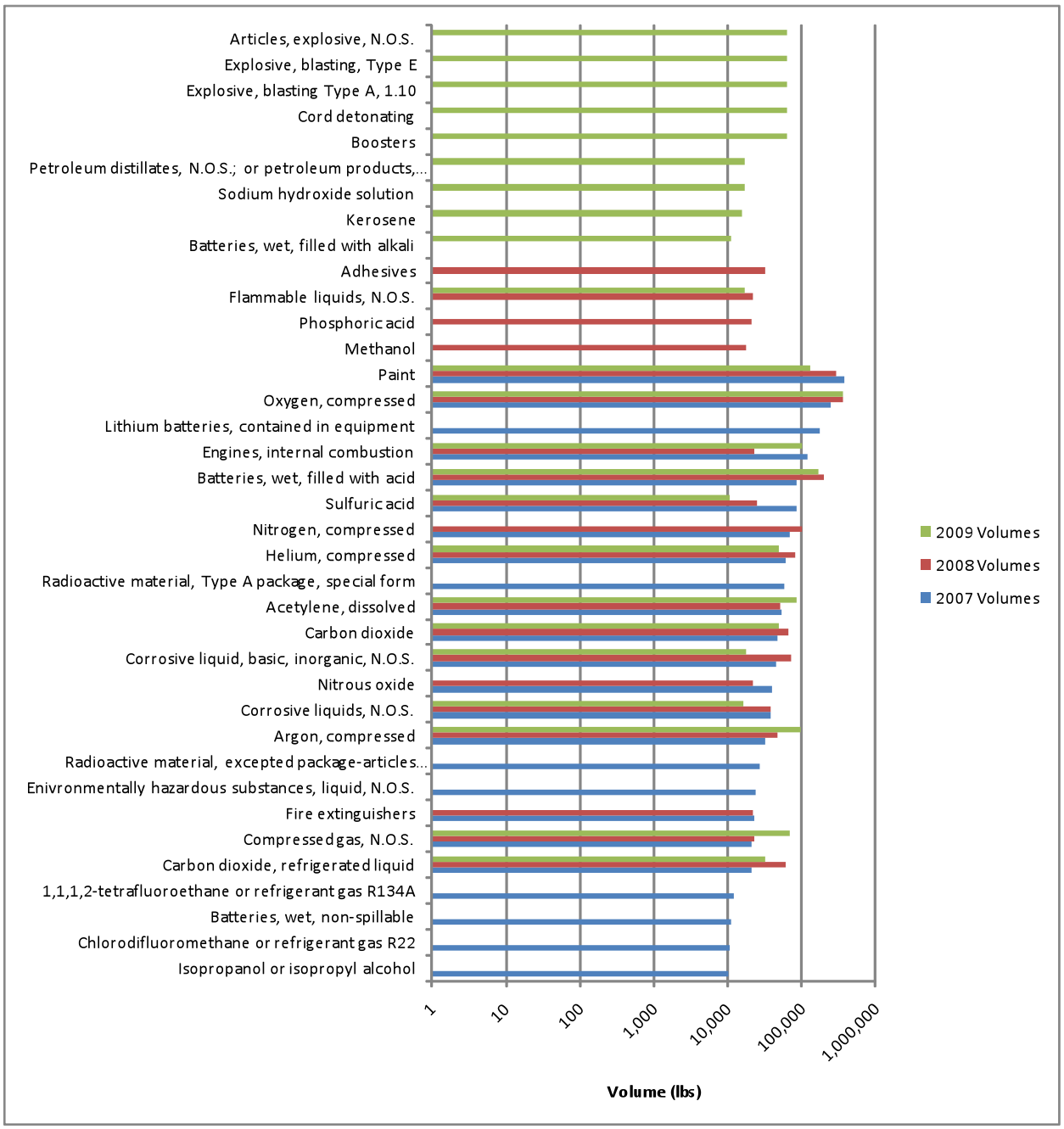
experience this type of volume decrease. Table 5-33 lists the primary HC 9 commodities shipped within the Kodiak Subarea.

Table 5-33. Primary Hazard Class 9 Commodities Shipped within the KI Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
9.0	Engines, Internal Combustion (Flammable Gas Powered)	3166
	Environmentally Hazardous Substances, Liquid, N.O.S.	3082
	Lithium Batteries, Contained in Equipment	3091

Figure 5-20 depicts the volume of hazardous materials shipped each year within the Kodiak Subarea by Hazardous Material Name for volumes exceeding 10,000 pounds.

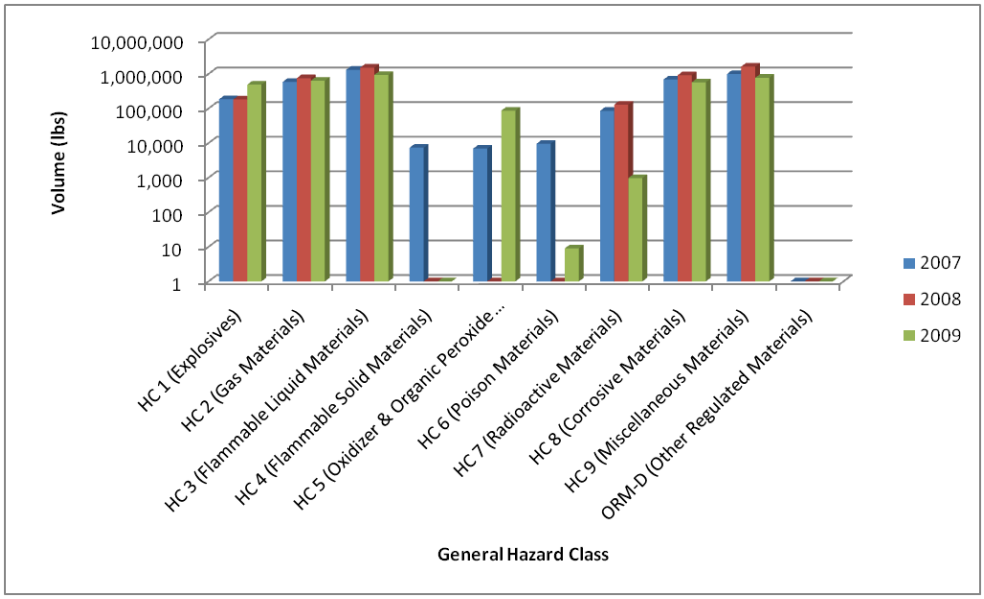
Figure 5-20. Hazardous Material Commodities by Hazardous Material Name (Greater than 10,000 lbs) for KI, for 2007 through 2009, presented on a log scale.



5.5 Aleutians

The transportation of hazardous materials through the Aleutian Subarea (AI) includes two modes of transportation: air and marine. Many of the commodities listed as transiting this subarea are destined for other subarea locations. For example, hazardous materials shipments that are delivered via barge/vessel to any of the subareas north of the Aleutians Subarea (e.g. Western Alaska, Northwest Arctic, and North Slope) will be noted as transiting within the Aleutians Subarea. Additionally, while not captured in this dataset, the Aleutian Subarea sees significant volume of commodities destined for other foreign and domestic ports. According to a September 3, 2010 Aleutian Islands Risk Assessment[34], the Aleutian Islands are the ideal route of passage for international trade. Commodities identified in this report that transit the Aleutian Islands enroute to other foreign and domestic ports include primarily HC 3 (Flammable Liquid Materials) and HC 2 (Gas Materials). These specific commodities are not captured in this dataset. The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-21 below.

Figure 5-21. Volumes of Hazardous Materials Shipped into the Aleutians presented on a log scale



In general, HC 3 commodities (Flammable Liquid Materials), HC 8 commodities (Corrosive Materials), HC 9 (Miscellaneous Materials), and HC 2 (Gas Materials) consistently dominated the volume of hazardous materials commodities shipped within the Aleutians Subarea. Figures 5-22, 5-23, and 5-24 depict the comparison of commodities shipped as a percentage of the total Aleutians Subarea volume.

[34] Aleutian Islands Risk Assessment Phase A – Preliminary Risk Assessment Task 1: Semi-quantitative Traffic Study Report, Det Norske Veritas and ERM – West, INC., September 2010.

Figure 5-22. AI Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

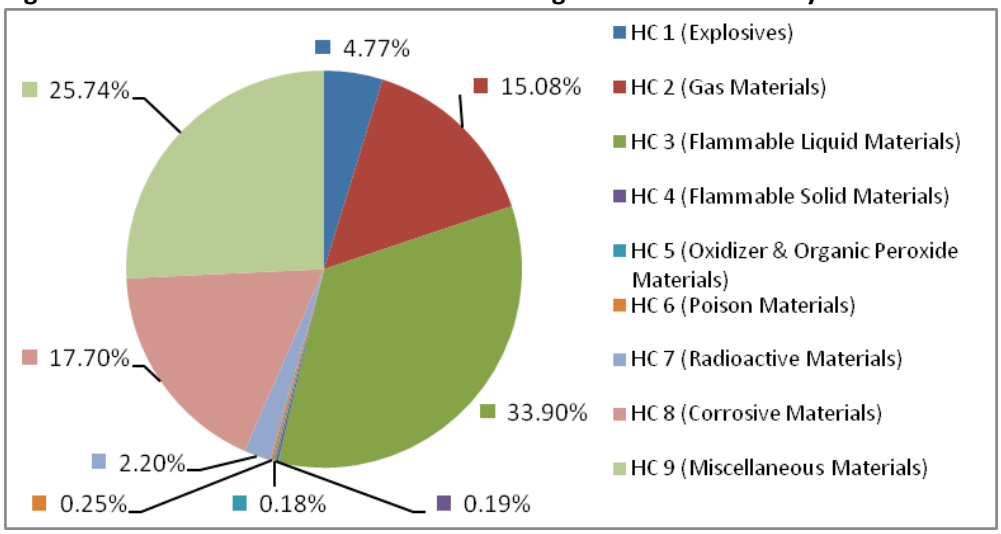


Figure 5-23. AI Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

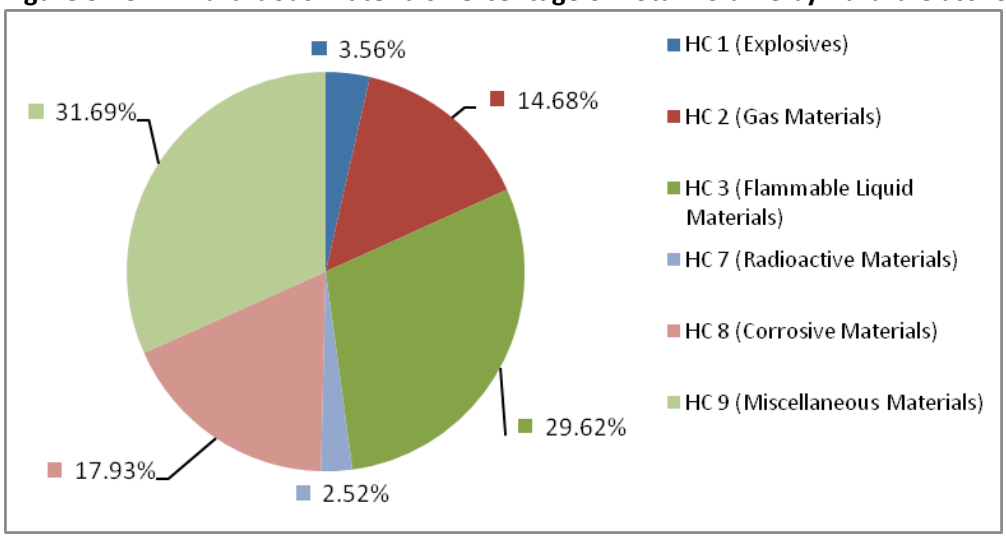


Figure 5-24. AI Hazardous Material percentage of total volume by Hazard Class for 2009

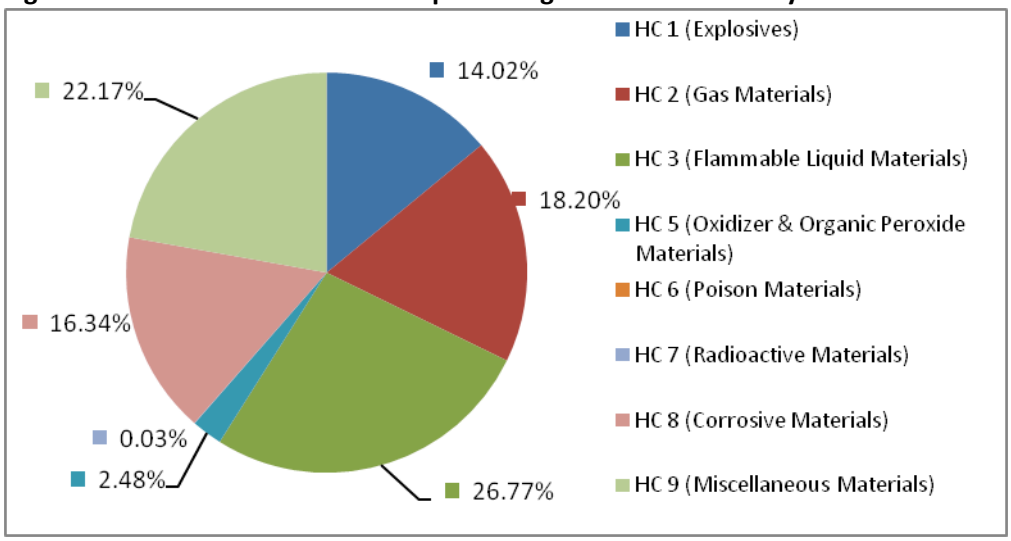


Table 5-34 lists the volumes of hazardous materials shipped within the Aleutians Subarea by hazard class for each calendar year evaluated for this study.

Table 5-34. Volumes of Hazard Class Transported within Al Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	185,044	182,475	491,133
HC 2 (Gas Materials)	585,380	752,882	637,228
HC 3 (Flammable Liquid Materials)	1,316,011	1,519,413	937,361
HC 4 (Flammable Solid Materials)	7,358	-	-
HC 5 (Oxidizer & Organic Peroxide Materials)	6,884	-	86,754
HC 6 (Poison Materials)	9,583	-	9
HC 7 (Radioactive Materials)	85,512	129,487	975
HC 8 (Corrosive Materials)	687,092	919,493	572,083
HC 9 (Miscellaneous Materials)	999,266	1,625,431	776,443
ORM-D (Other Regulated Materials)	-	-	-

A more detailed evaluation of each hazard class is provided below. For the Aleutians Subarea, the volume shipped threshold was established at 10,000 lbs.

HC 1 Explosives: The primary explosives that were transported through the Aleutians Subarea were HC 1.0 and 1.4 in 2007, HC 1.0 in 2008, and HCs 1.0, 1.1, 1.3 and 1.4 in 2009. Table 5-35 lists the primary HC 1 commodities shipped within the Aleutians Subarea.

Table 5-35. Primary Hazard Class 1 Commodities Shipped within the Aleutians Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
1.0	Ammunition	0006
1.1	Boosters	0042
	Cord Detonating	0065
	Explosive, Blasting, Type A	0081
	Explosive, Blasting, Type E	0241
1.3	Rocket Motors	0186
1.4	Articles, Explosive, N.O.S.	0349

There were no HC 1.2 or 1.5 commodities shipped in a volume that exceeded the 10,000 lb threshold.

HC 2 Gas Materials: HCs 2.0 (unspecified hazard class), 2.1 and 2.2 were transported in the Kodiak Subarea. Volumes transported remained relatively consistent from year to year. Table 5-36 lists the primary HC 2 commodities shipped within the Aleutians Subarea.

Table 5-36. Primary Hazard Class 2 Commodities Shipped within the Aleutians Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
2.1	Acetylene, Dissolved	1001
2.2	Argon, Compressed	1006
	Carbon Dioxide	1013
	Dichlorodifluoromethane or Refrigerant Gas R12	1028
	Chlorodifluoromethane or Refrigerant Gas R22	1018
	Helium, Compressed	1046
	Nitrogen, Compressed	1066
	Oxygen, Compressed	1072
	Compressed Gas, N.O.S.	1956
	Carbon Dioxide Refrigerated Liquid	2187
	Liquefied Gas, N.O.S.	3163
	1,1,1,2-Tetrafluoroethane or Refrigerant Gas R134A	3159
	Fire Extinguishers	1044

HC 3 Flammable Liquid Materials: HC 3.0 materials were shipped to the Aleutians Subarea via aircraft and marine methods. No discernible trend was displayed from the data received and compiled. However, it has been stated in the Vessel Traffic in the Aleutians Subarea Report of 2005[35] that as much as 800 million gallons (approximately 5,800,000,000 lbs) per year of persistent and non-persistent oil cargo moves through the Aleutians Subarea in innocent passage in about 30 to 40 tank ship voyages. Table 5-37 lists the primary HC 3 commodities shipped within the Aleutians Subarea.

Table 5-37. Primary Hazard Class 3 Commodities Shipped within the Aleutians Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
3.0	Gasoline	1203
	Isopropanol or Isopropyl Alcohol	1219
	Paint	1263
	Butanols	1120
	Adhesives	1133
	Methanol	1230
	Kerosene	1223

[35] Vessel Traffic in the Aleutians Subarea, Report to Alaska Department of Environmental Conservation, Nuka Research and Planning Group, LLC and Cape International, Inc., April 29, 2005

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
	Flammable Liquids, N.O.S.	1993
	Flammable Liquids, Corrosive, N.O.S.	2924
	Fuel, Aviation, Turbine Engine	1863
	Petroleum Distillates, N.O.S. or Petroleum Products, N.O.S.	1268

HC 4 Flammable Solid Materials: Small volumes of HC 4.1 were transported through the Aleutians Subarea in 2007 that did not exceed 10,000 lbs. There were no other shipments noted for 2008 or 2009 based on the data evaluated for this study.

HC 5 Oxidizer and Organic Peroxide Materials: HC 5.1 and 5.2 were shipped within the Aleutians Subarea in 2007 and 2009. The volume of HC 5.1 increased by an order of magnitude between 2007 and 2009 while HC 5.2 shipments stopped. Table 5-38 lists the primary HC 5 commodities shipped within the Aleutians Subarea.

Table 5-38. Primary Hazard Class 5 Commodities Shipped within the Aleutians Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
5.1	Hydrogen Peroxide, Aqueous Solutions	2014

There were no shipments of HC 5.2 commodities that exceeded 10,000 lbs.

HC 6 Poisons: A relatively small volume of HC 6.1 was shipped in the Aleutians Subarea in 2007 and no shipments were reported in 2008 according to the data received and evaluated for this study. A very small volume of Mercuric Chloride was shipped in 2009. The small volume was retained for reporting purposes because it is classified as an EHS. These volumes did not exceed 10,000 lbs.

HC 7 Radioactive Materials: HC 7.0 was transported within the Aleutians Subarea in 2007, 2008 and 2009. Volumes shipped increased between 2007 and 2008, and then decreased sharply in 2009. Table 5-39 lists the primary HC 7 commodities shipped within the Aleutians Subarea.

Table 5-39. Primary Hazard Class 7 Commodities Shipped within the Aleutians Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
7.0	Radioactive Material, Type A Package	2915
	Radioactive Material, Excepted Package-Articles Manufactured From Natural or Depleted Uranium or Natural Thorium	2910
	Radioactive Material, Type A Package, Special Form	3332

HC 8 Corrosive Materials: The volume of HC 8.0 commodities shipped within the Aleutians Subarea increased by approximately 30% between 2007 and 2008 and then decreased by approximately 40% between 2008 and 2009. Table 5-40 lists the primary HC 8 commodities shipped within the Aleutians Subarea.

Table 5-40. Primary Hazard Class 8 Commodities Shipped within the Aleutians Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
8.0	Corrosive Cleaning Supplies	1760
	Batteries, Wet, Filled with Acid	2794
	Sulfuric Acid	2796
	Batteries, Wet, Non-Spillable	2800
	Corrosive, Liquid, Basic, Inorganic, N.O.S.	3266
	Formic Acid	1779
	Phosphoric Acid	1805
	Sodium Hydroxide Solution	1824
	Batteries, Wet, Filled with Alkali	2795

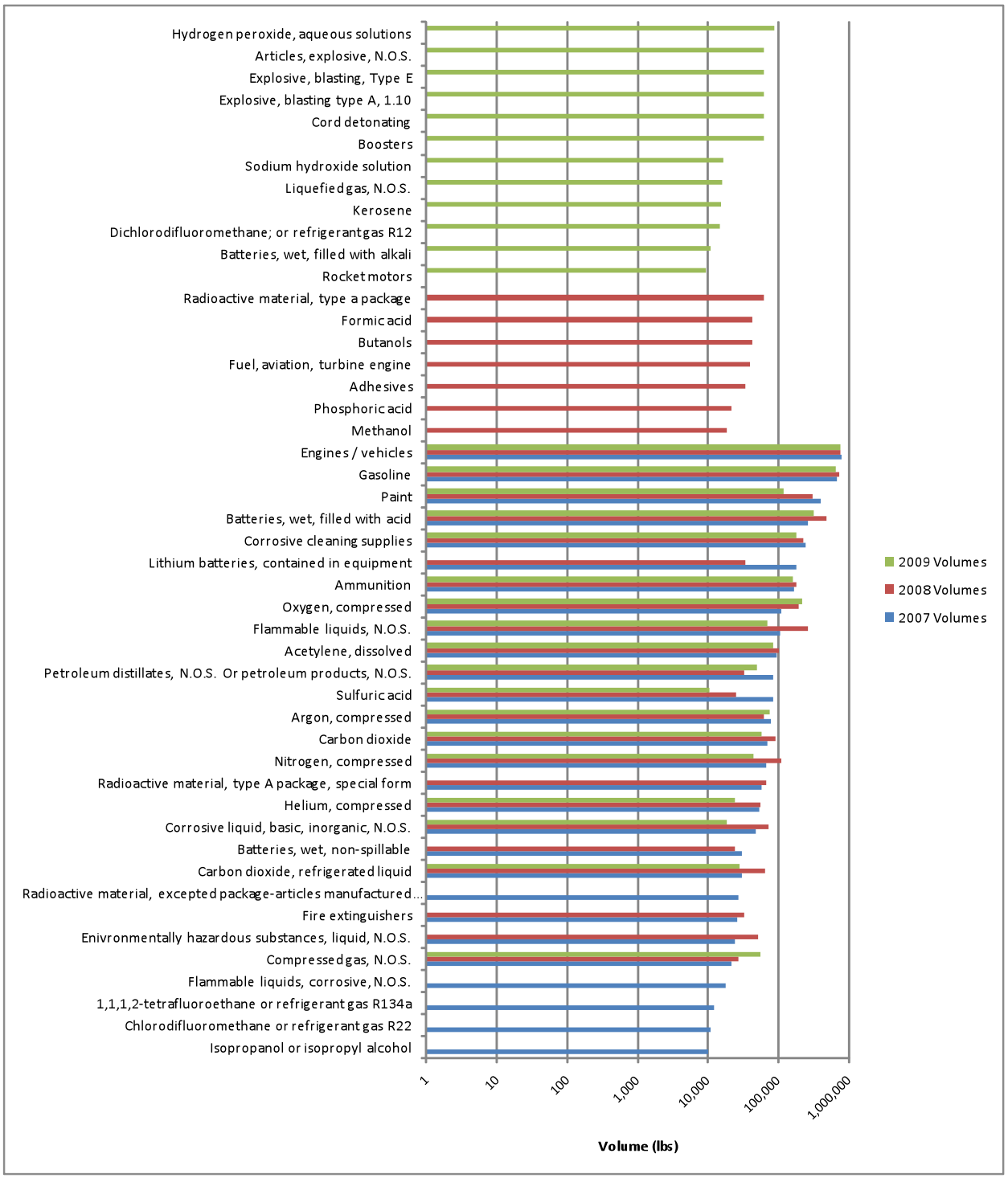
HC 9 Miscellaneous Materials: The volume of HC 9.0 commodities shipped within the Aleutians Subarea saw a dramatic increase between 2007 and 2008 and then dropped below the 2007 levels in 2009. The sharp increase in 2008 could be attributable to the increase in the Alaska Permanent Fund Dividend checks during this timeframe. Table 5-41 lists the primary HC 9 commodities shipped within the Aleutians Subarea.

Table 5-41. Primary Hazard Class 9 Commodities Shipped within the Aleutians Subarea

Hazard Class	Hazardous Material Description (Greater than 10,000 lbs Shipped)	UN ID Number
9.0	Engines / Vehicles	3166
	Environmentally Hazardous Substances, Liquid, N.O.S.	3082
	Lithium Batteries, Contained in Equipment	3091

Figure 5-25 depicts the volume of hazardous materials shipped each year within the Aleutians Subarea by Hazardous Material Name for volumes exceeding 10,000 pounds.

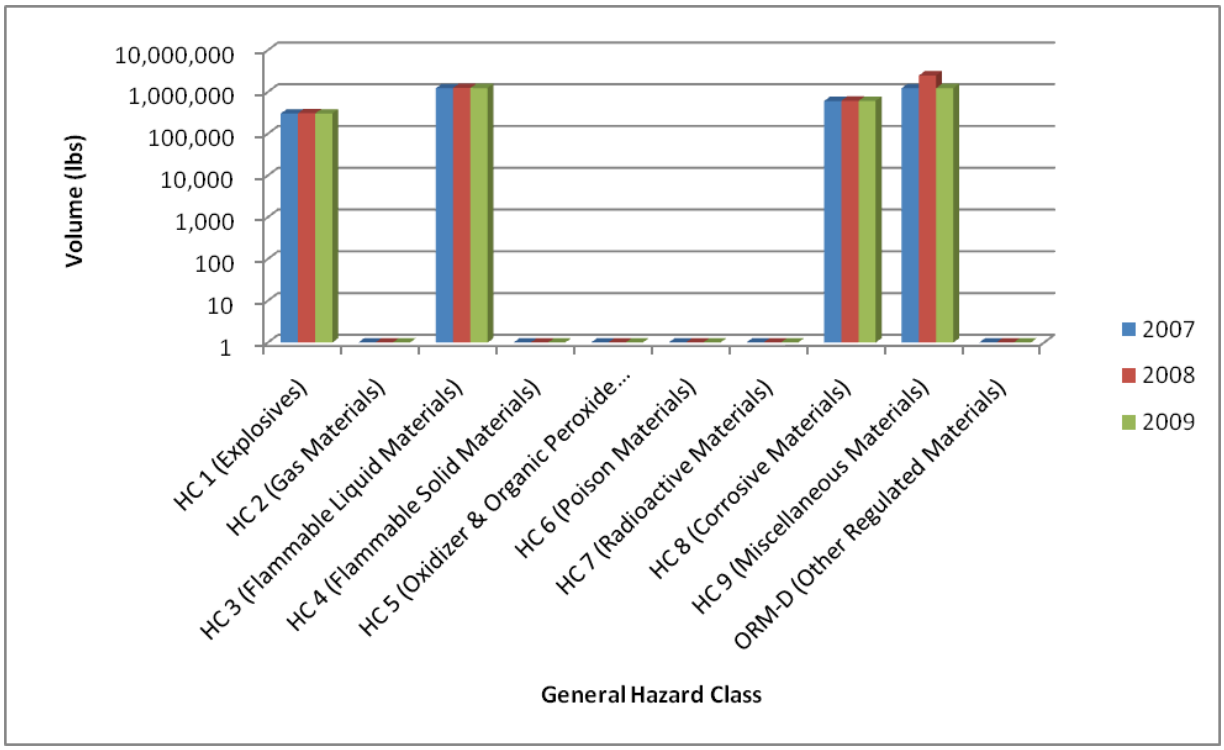
Figure 5-25. Hazardous Material Commodities by Hazardous Material Name (Greater than 10,000 lbs) for the Aleutians Subarea, for 2007 through 2009, presented on a log scale.



5.6 Bristol Bay

The transportation of hazardous materials through the Bristol Bay Subarea (BB) includes two modes of transportation: air and marine. The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-26 below.

Figure 5-26. Volumes of Hazardous Materials Shipped into Bristol Bay presented on a log scale



In general, HC 3 commodities (Flammable Liquid Materials), HC 9 (Miscellaneous Materials), and HC 8 commodities (Corrosive Materials) consistently dominated the volume of hazardous materials commodities shipped within the Bristol Bay Subarea. Figures 5-27, 5-28, and 5-29 below depict the volume of hazardous materials by hazard class as a percentage of the total volume shipped within the subarea for each calendar year.

Figure 5-27. BB Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

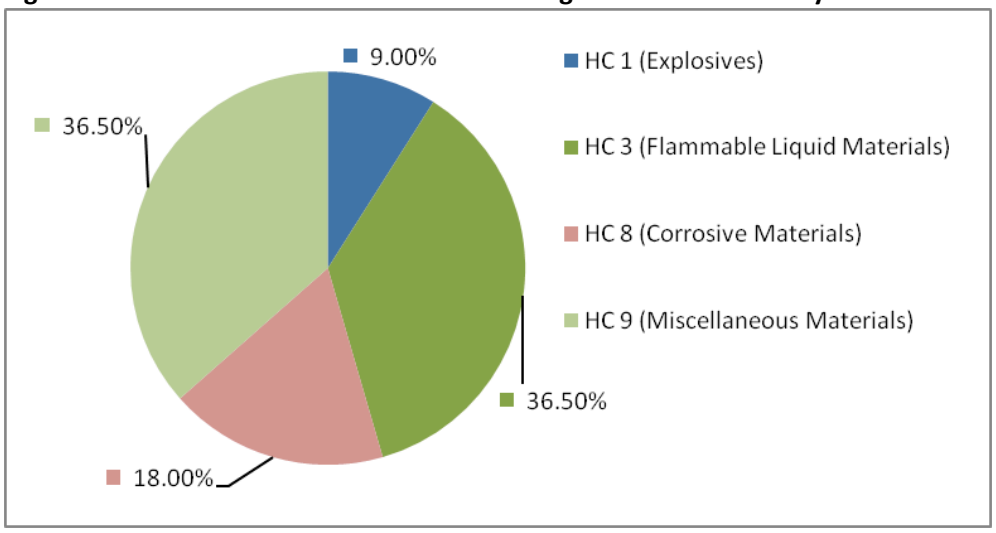


Figure 5-28. BB Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

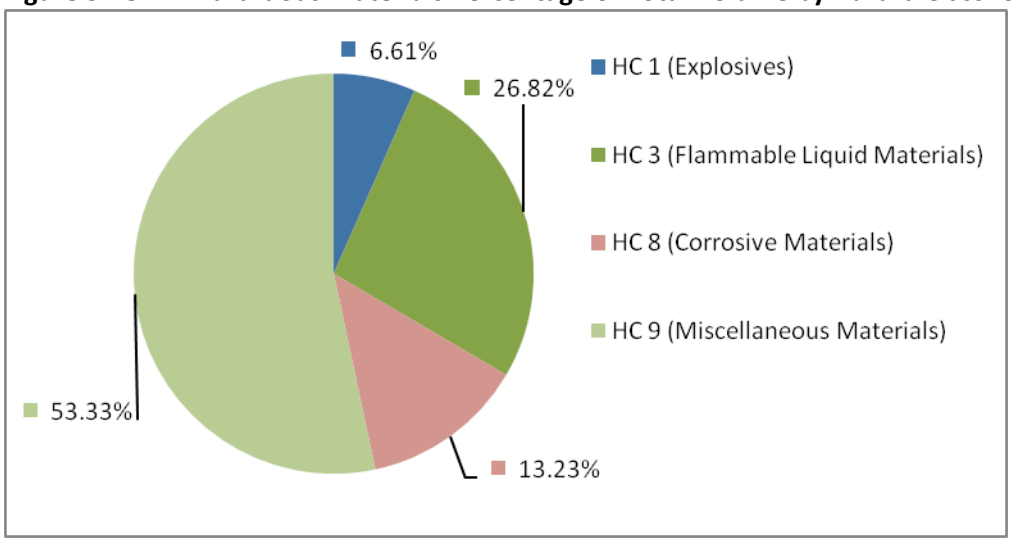


Figure 5-29. BB Hazardous Materials Percentage of Total Volume by Hazard Class for 2009

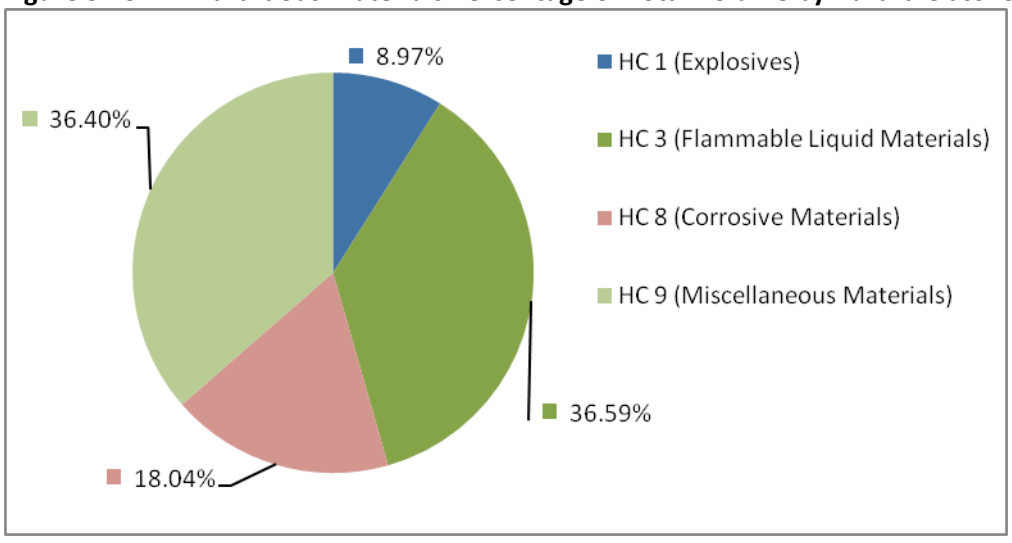


Table 5-42 lists the volumes of hazardous materials shipped within the Bristol Bay subarea by hazard class for each calendar year evaluated for this study.

Table 5-42. Volumes of Hazard Class Transported within BB Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	303,750	308,925	305,325
HC 2 (Gas Materials)	-	-	-
HC 3 (Flammable Liquid Materials)	1,231,875	1,252,864	1,244,663
HC 4 (Flammable Solid Materials)	-	-	-
HC 5 (Oxidizer & Organic Peroxide Materials)	-	-	-
HC 6 (Poison Materials)	-	-	-
HC 7 (Radioactive Materials)	-	-	-
HC 8 (Corrosive Materials)	607,500	617,850	613,850
HC 9 (Miscellaneous Materials)	1,231,875	2,491,127	1,238,263
ORM-D (Other Regulated Materials)	-	-	-

A more detailed evaluation of each hazard class is provided below. A shipment volume threshold was not established for the Bristol Bay subarea due to the limited number and volumes of shipments reported.

HC 1 Explosives: The primary explosives that were transported through the Bristol Bay Subarea were HC 1.0 (unspecified hazard class) and the volumes of the shipments were very consistent from year to year. The primary mode of transportation for these commodities was via air – therefore the volumes shipped, as noted in the previous section, are artificial and based on an algorithm generated from some discussions with the air carrier. However, it is apparent that based on the consistency of the volumes transported, the number of hazardous materials shipments in the Bristol Bay Subarea via aircraft remained fairly consistent. Table 5-43 lists the primary HC 1 commodities shipped within the Bristol Bay Subarea.

Table 5-43. Primary Hazard Class 1 Commodities Shipped within the BB Subarea

Hazard Class	Hazardous Material Description	UN ID Number
1.0	Ammunition	0006

HC 2 Gas Materials: There were no gas materials shipped within the Bristol Bay Subarea according to the data evaluated for this study.

HC 3 Flammable Liquid Materials: The shipments of HC 3.0 within the Bristol Bay Subarea were primarily shipped via aircraft. Fuel barges also make deliveries to the Bristol Bay subarea, but this information was not captured in this dataset. The volumes shipped via aircraft, as noted in the previous section, are somewhat artificial and based on an algorithm generated from discussions with the air carrier. However, the volume

changes reflect the changes in the number of hazardous materials shipments into the Bristol Bay Subarea. Table 5-44 lists the primary HC 3 commodities shipped within the Bristol Bay Subarea.

Table 5-44. Primary Hazard Class 3 Commodities Shipped within the BB Subarea

Hazard Class	Hazardous Material Description	UN ID Number
3.0	Gasoline	1203
	Flammable Liquid, Toxic, N.O.S.	1992
	Flammable Liquid, N.O.S.	1993

HC 4 Flammable Solid Materials: There were no Flammable Solid Materials transported within this Subarea during this time period according to the data evaluated.

HC 5 Oxidizer and Organic Peroxide Materials: No Oxidizer or Organic Peroxide Materials were shipped in this Subarea according to the data evaluated for this study.

HC 6 Poisons: No Poisons were reported for this Subarea.

HC 7 Radioactive Materials: No Radioactive Materials were reported for this Subarea.

HC 8 Corrosive Materials: The volumes of HC 8.0 shipments within the Bristol Bay Subarea remained nearly equivalent from year to year. No discernible trend noted. Table 5-45 lists the primary HC 8 commodities shipped within the Bristol Bay Subarea.

Table 5-45. Primary Hazard Class 8 Commodities Shipped within the BB Subarea

Hazard Class	Hazardous Material Description	UN ID Number
8.0	Amines, Liquid, Corrosive, N.O.S. or Polyamines, Liquid, Corrosive, N.O.S.	2735
	Corrosive Cleaning Supplies	1760
	Batteries, Wet, Filled with Acid	2794

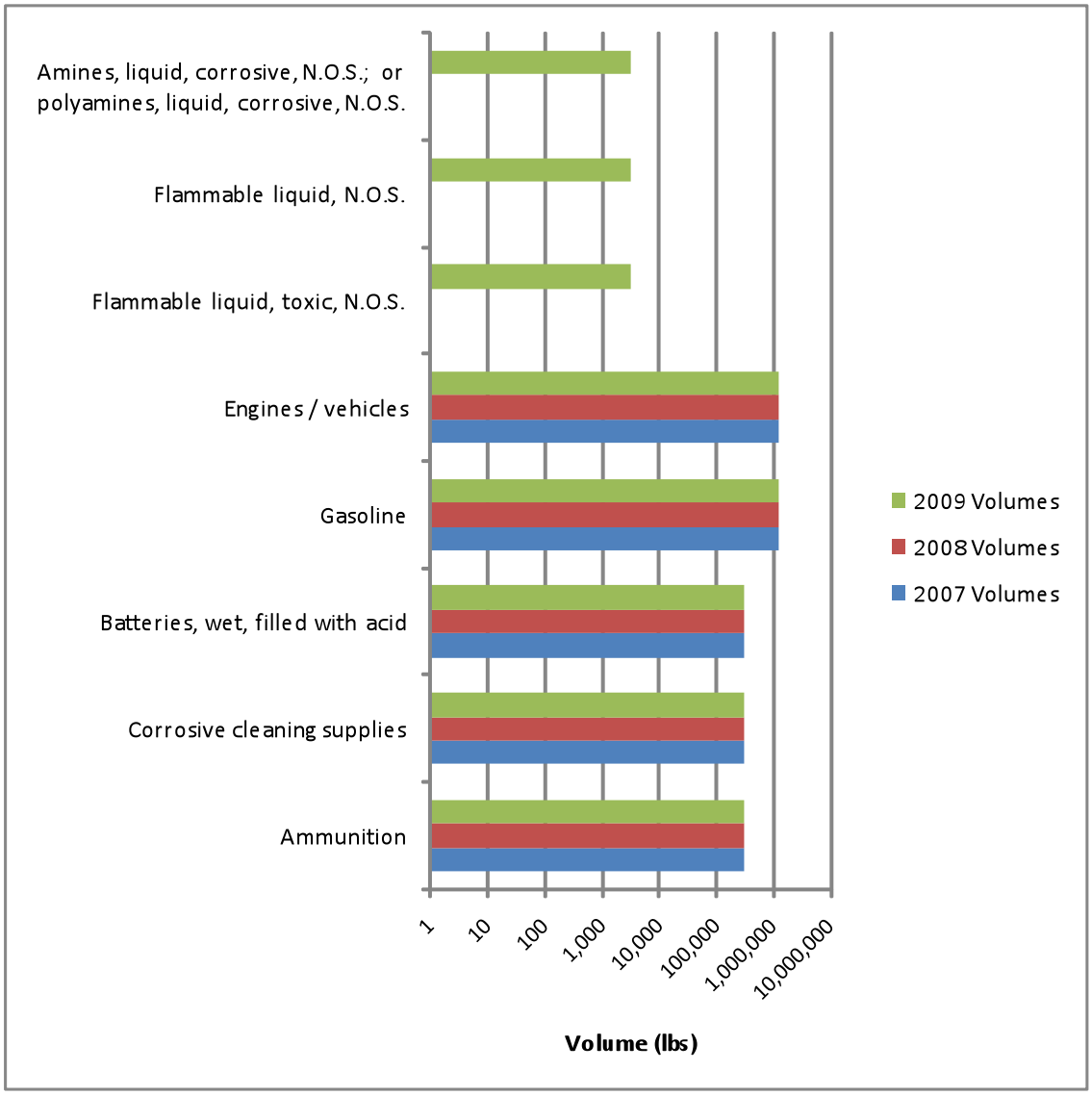
HC 9 Miscellaneous Materials: The volume of HC 9.0 commodities shipped within the Bristol Bay Subarea saw an increase between 2007 and 2008 and then dropped but remained higher than 2007 levels in 2009. The increase in 2008 could be attributable to the increase in the Alaska Permanent Fund Dividend checks during this timeframe. Table 5-46 lists the primary HC 9 commodities shipped within the Bristol Bay Subarea.

Table 5-46. Primary Hazard Class 9 Commodities Shipped within the BB Subarea

Hazard Class	Hazardous Material Description	UN ID Number
9.0	Engines / Vehicles	3166

Figure 5-30 depicts the volume of hazardous materials shipped each year within the Bristol Bay Subarea by Hazardous Material Name for volumes exceeding 10,000 pounds.

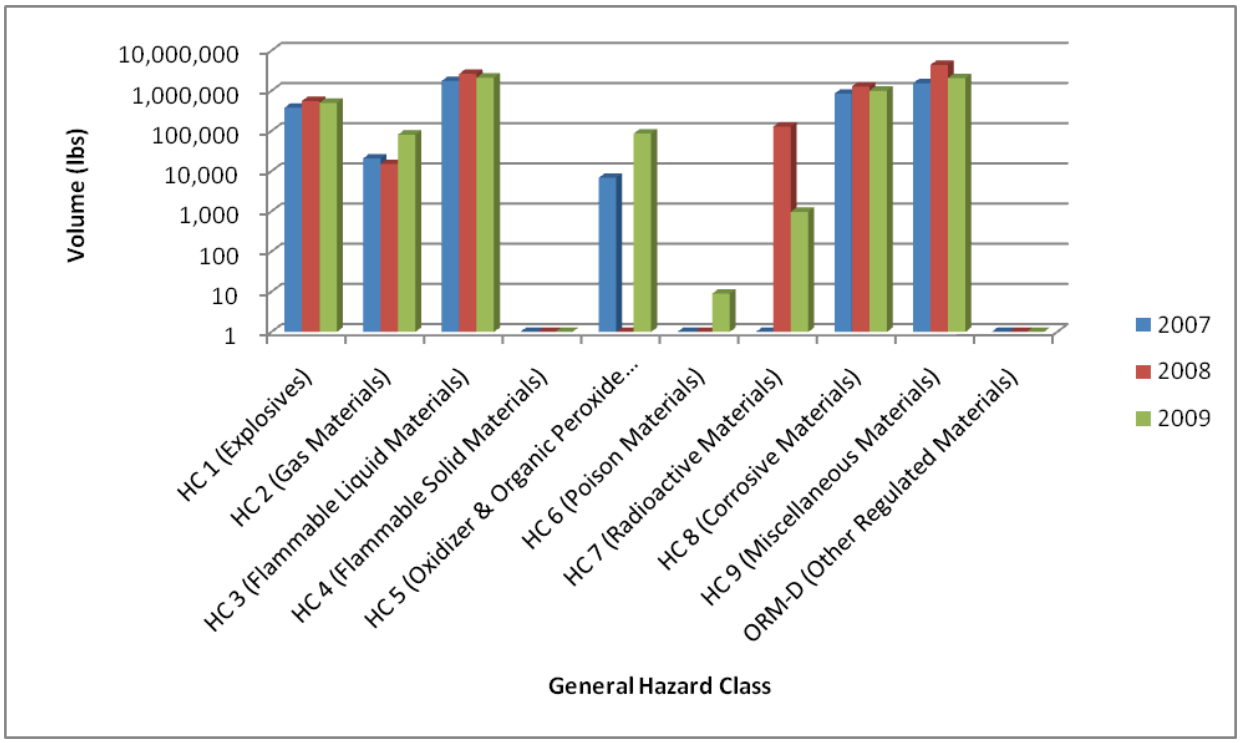
Figure 5-30. Hazardous Material Commodities by Hazardous Material Name (Greater than 10,000 lbs) for the Bristol Bay Subarea, for 2007 through 2009, presented on a log scale.



5.7 Western Alaska

The transportation of hazardous materials through the Western Alaska Subarea (WAK) includes two modes of transportation: air and marine. Many of the commodities listed as transiting this subarea are destined for other subarea locations. For example, hazardous materials shipments that are delivered via barge/vessel to any of the subareas north of the Western Alaska Subarea (e.g. Northwest Arctic, and North Slope), or that are transiting from subareas north to southern locations will be noted as transiting within the Western Alaska Subarea. The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-31.

Figure 5-31. Volumes of Hazardous Materials Shipped into WAK presented on a log scale



In general, HC 3 commodities (Flammable Liquid Materials), HC 9 commodities (Miscellaneous Materials), and HC 8 commodities (Corrosive Materials) consistently dominated the volume of hazardous materials commodities shipped within the Western Alaska Subarea. Figures 5-32, 5-33, and 5-34 depict the breakdown by hazard class based on percentage of volumes shipped within the Western Alaska Subarea.

Figure 5-32. WAK Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

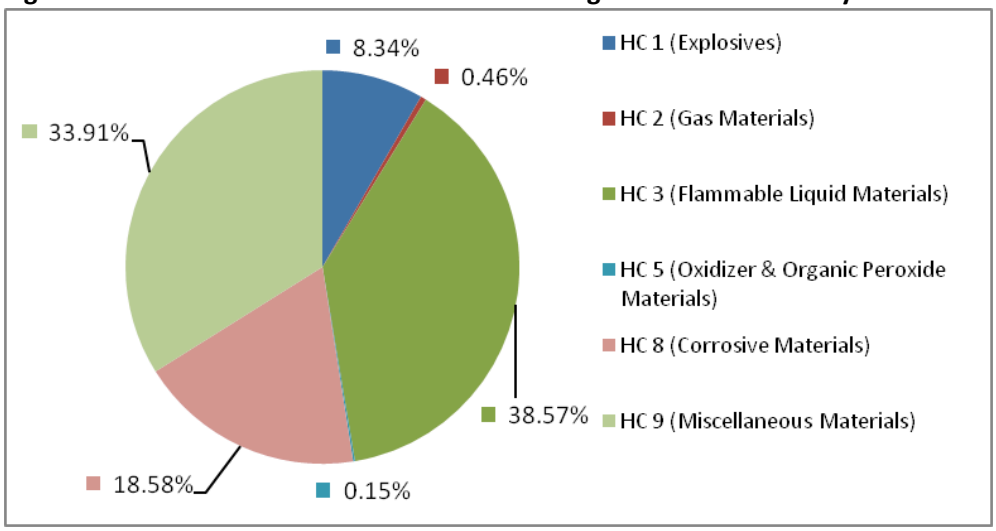


Figure 5-33. WAK Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

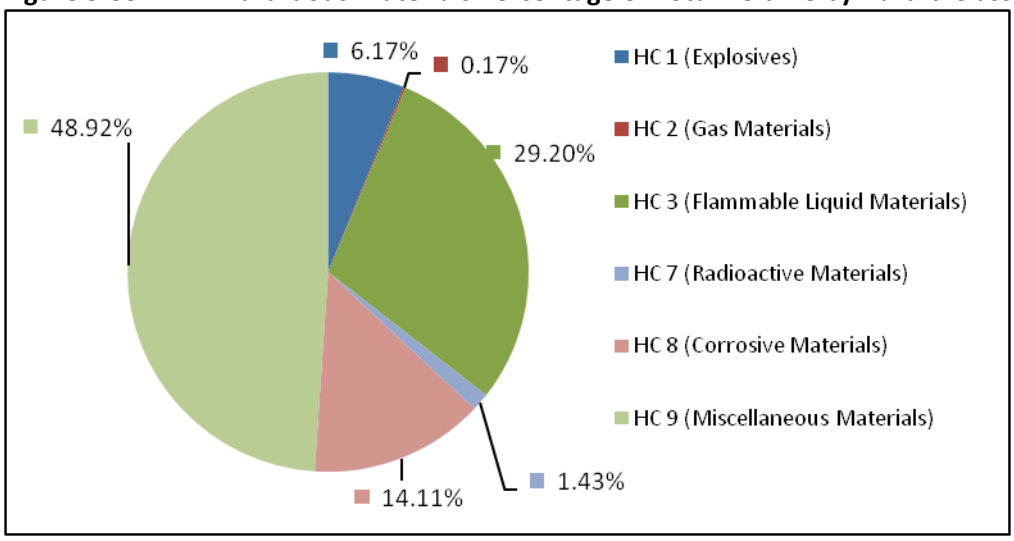


Figure 5-34. WAK Hazardous Materials Percentage of Total Volume by Hazard Class for 2009

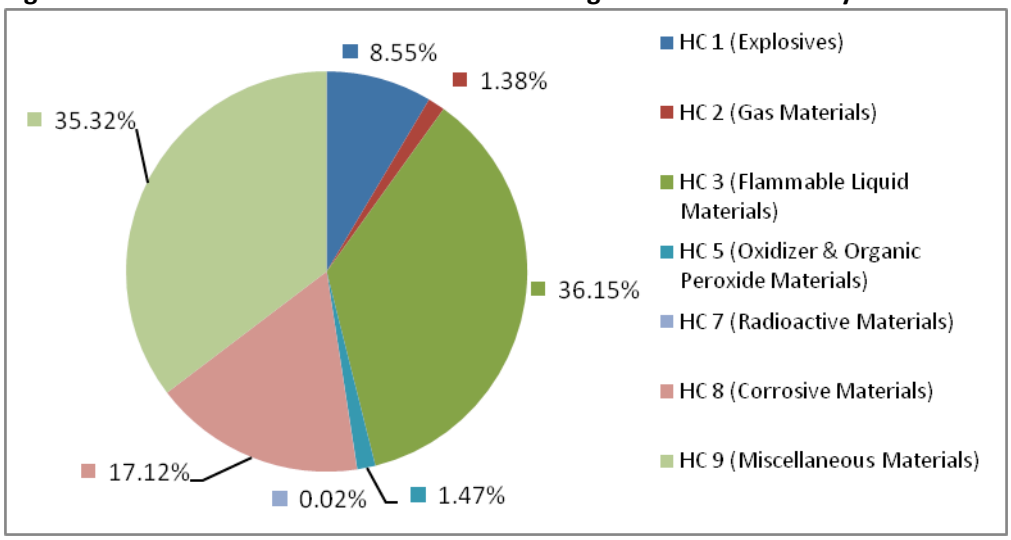


Table 5-47 lists the volumes of hazardous materials shipped within the Western Alaska Subarea by hazard class for each calendar year evaluated for this study.

Table 5-47. Volumes of Hazard Class Transported within WAK Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	380,475	559,350	503,325
HC 2 (Gas Materials)	20,802	15,067	81,268
HC 3 (Flammable Liquid Materials)	1,759,777	2,648,203	2,127,080
HC 4 (Flammable Solid Materials)	-	-	-
HC 5 (Oxidizer & Organic Peroxide Materials)	6,884	-	86,388
HC 6 (Poison Materials)	-	-	9
HC 7 (Radioactive Materials)	-	129,487	975
HC 8 (Corrosive Materials)	847,958	1,279,803	1,007,130
HC 9 (Miscellaneous Materials)	1,547,084	4,435,771	2,078,190
ORM-D (Other Regulated Materials)	-	-	-

A more detailed evaluation of each hazard class is provided below. A shipment volume threshold was not established for the Western Alaska Subarea due to the limited number and volumes of hazardous materials shipped.

HC 1 Explosives: The primary explosives that were transported through the Western Alaska Subarea were HC 1.0. The volume increased by about 30% between 2007 and 2008 and remained fairly consistent into 2009. The primary mode of transportation for these commodities in this Subarea was via air – therefore the volumes shipped, as noted in the previous section, are somewhat artificial and based on an algorithm generated from discussions with the air carrier. However, the volume changes reflect the increase in the number of hazardous materials shipments into the Western Alaska Subarea. Table 5-48 lists the primary HC 1 commodities shipped within the Western Alaska Subarea.

Table 5-48. Primary Hazard Class 1 Commodities Shipped within the WAK Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
1.0	Ammunition	0006

- Within HC 1.0 (unspecified hazard class division), the primary commodity shipped (greater than 1,000 lbs) was “AMMUNITION” with UN ID Number 0006.

HC 2 Gas Materials: HC 2.2 represented the commodities shipped in the Western Alaska Subarea. The volume of shipments showed a slight decrease between 2007 and 2008, and an approximate 80% increase between 2008 and 2009. Table 5-49 lists the primary HC 2 commodities shipped within the Western Alaska Subarea.

Table 5-49. Primary Hazard Class 2 Commodities Shipped within the WAK Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
2.2	Fire Extinguishers	1044
	Liquefied Gas, N.O.S.	3163
	Sulfur Hexafluoride	1080
	Carbon Dioxide	1013
	Dichlorofluoromethane or Refrigerant Gas R12	1028
	Compressed Gas, N.O.S.	1956
	Nitrogen, Compressed	1066

HC 3 Flammable Liquid Materials: The shipments of HC 3.0 within the Western Alaska Subarea were shipped via aircraft and marine corridors and displayed a broader variety in 2008. The volumes shipped by air, as noted in the previous section, are somewhat artificial and based on an algorithm generated from discussions with the air carrier. However, the volume changes reflect the changes in the number of hazardous materials shipments into the Northwest Arctic Subarea. Table 5-50 lists the primary HC 3 commodities shipped within the Western Alaska Subarea.

Table 5-50. Primary Hazard Class 3 Commodities Shipped within the WAK Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
3.0	Petroleum Distillates, N.O.S. or Petroleum Products N.O.S.	1268
	Combustible Liquid, N.O.S.	1993
	Gasoline	1203
	Resin Solution	1866
	Alcohols, N.O.S.	1987
	Paint	1263
	Flammable Liquids, Corrosive, N.O.S.	2924
	Flammable Liquids, N.O.S.	1993
	Undecane	2330
	Adhesives	1133
	Fuel, Aviation, Turbine Engine	1863
	Butanols	1120

HC 4 Flammable Solid Materials: There were no Flammable Solid Materials transported within this Subarea during this time period according to the data evaluated.

HC 5 Oxidizer and Organic Peroxide Materials: HC 5.1 and 5.2 were shipped within the Western Alaska Subarea in 2007 and 2009. The volume of HC 5.1 increased by an order of magnitude between 2007 and 2009 while HC 5.2 shipments stopped during this time period. Table 5-51 lists the primary HC 5 commodities shipped within the Western Alaska Subarea.

Table 5-51. Primary Hazard Class 5 Commodities Shipped within the WAK Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
5.1	Oxidizing, Solid, N.O.S.	1479
	Hydrogen Peroxide, Aqueous Solutions	2014
5.2	Organic Peroxide Type D, Solid	3106

HC 6 Poisons: A very small amount of HC 6.1 (Mercuric Chloride) was reported being shipped in 2009 within the Western Alaska Subarea. The small volume was retained for reporting purposes because it is classified as an EHS. There were no HC 6.0 commodities that were shipped that exceeded 1,000 lbs.

HC 7 Radioactive Materials: HC 7.0 was shipped within the Western Alaska Subarea in 2008 and 2009 as determined by the data evaluated for this study. The volume of shipments reported decreased dramatically between 2008 and 2009. Table 5-52 lists the primary HC 7 commodities shipped within the Western Alaska Subarea.

Table 5-52. Primary Hazard Class 7 Commodities Shipped within the WAK Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
7.0	Radioactive Material, Type A Package	2915
	Radioactive Material, Type A Package, Special Form	3332

HC 8 Corrosive Materials: The volumes of HC 8.0 transported within the Western Alaska Subarea increased by approximately 30% between 2007 and 2008, and decreased by approximately 20% between 2008 and 2009. Table 5-53 lists the primary HC 8 commodities shipped within the Western Alaska Subarea.

Table 5-53. Primary Hazard Class 8 Commodities Shipped within the WAK Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
8.0	Corrosive Liquid, Basic, Inorganic, N.O.S.	3266
	Tetraethylenepentamine	2320

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
	Hypochlorite Solutions	1791
	Batteries, Wet, Non-Spillable	2800
	Batteries, Wet, Filled with Acid	2794
	Corrosive Cleaning Supplies	1760
	Formic Acid	1779

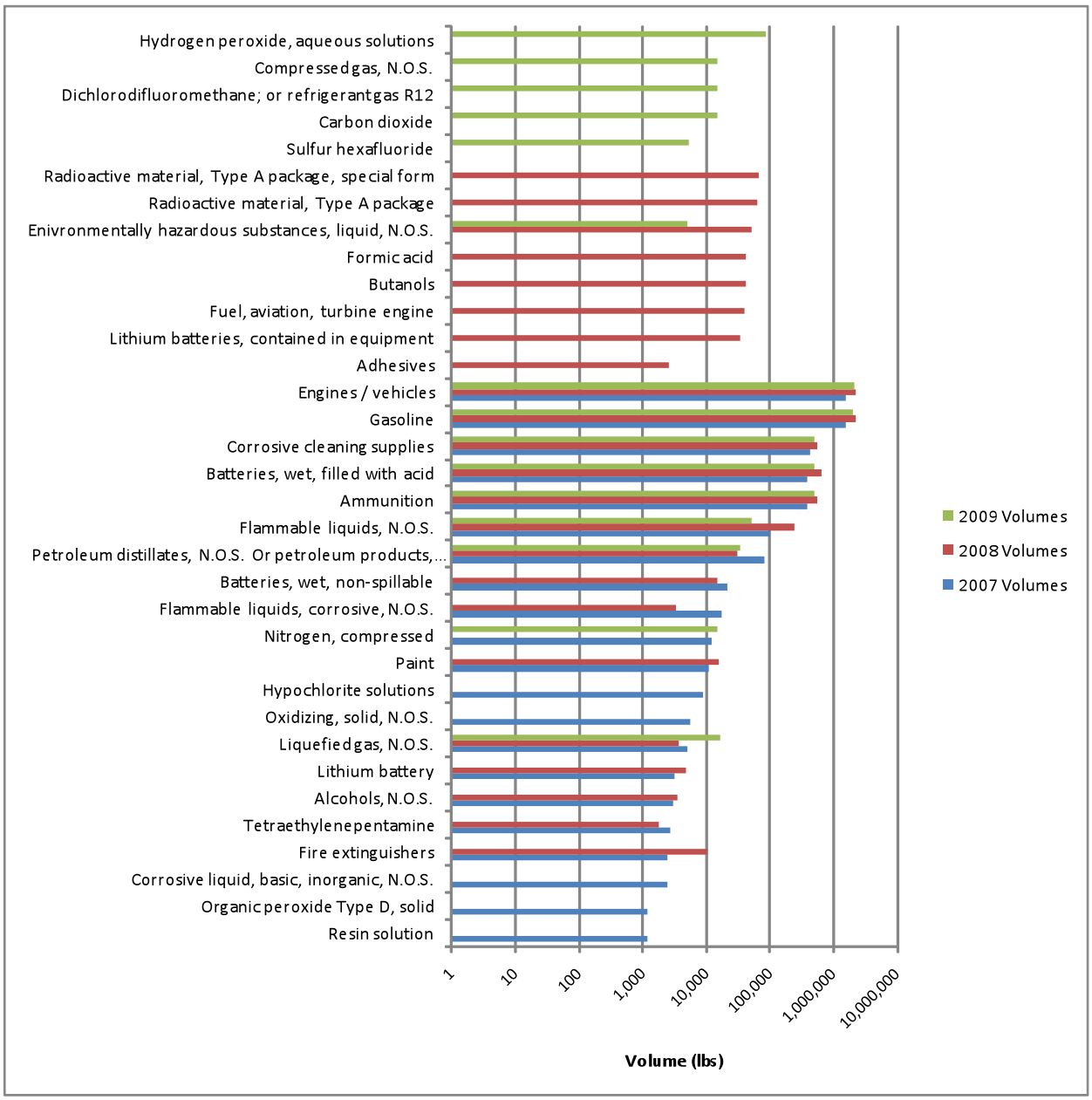
HC 9 Miscellaneous Materials: The volume of HC 9.0 commodities shipped within the Western Alaska Subarea saw a dramatic increase between 2007 and 2008 and then dropped but remained higher than 2007 levels in 2009. The sharp increase in 2008 could be attributable to the increase in the Alaska Permanent Fund Dividend checks during this timeframe. Table 5-54 lists the primary HC 9 commodities shipped within the Western Alaska Subarea.

Table 5-54. Primary Hazard Class 9 Commodities Shipped within the WAK Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
9.0	Lithium Batteries	3090
	Lithium Batteries, Contained in Equipment	3091
	Environmentally Hazardous Substance, Liquid, N.O.S.	3082
	Engines / Vehicles	3166

Figure 5-35 depicts the volume of hazardous materials shipped each year within the Western Alaska Subarea by Hazardous Material Name for volumes exceeding 1,000 pounds.

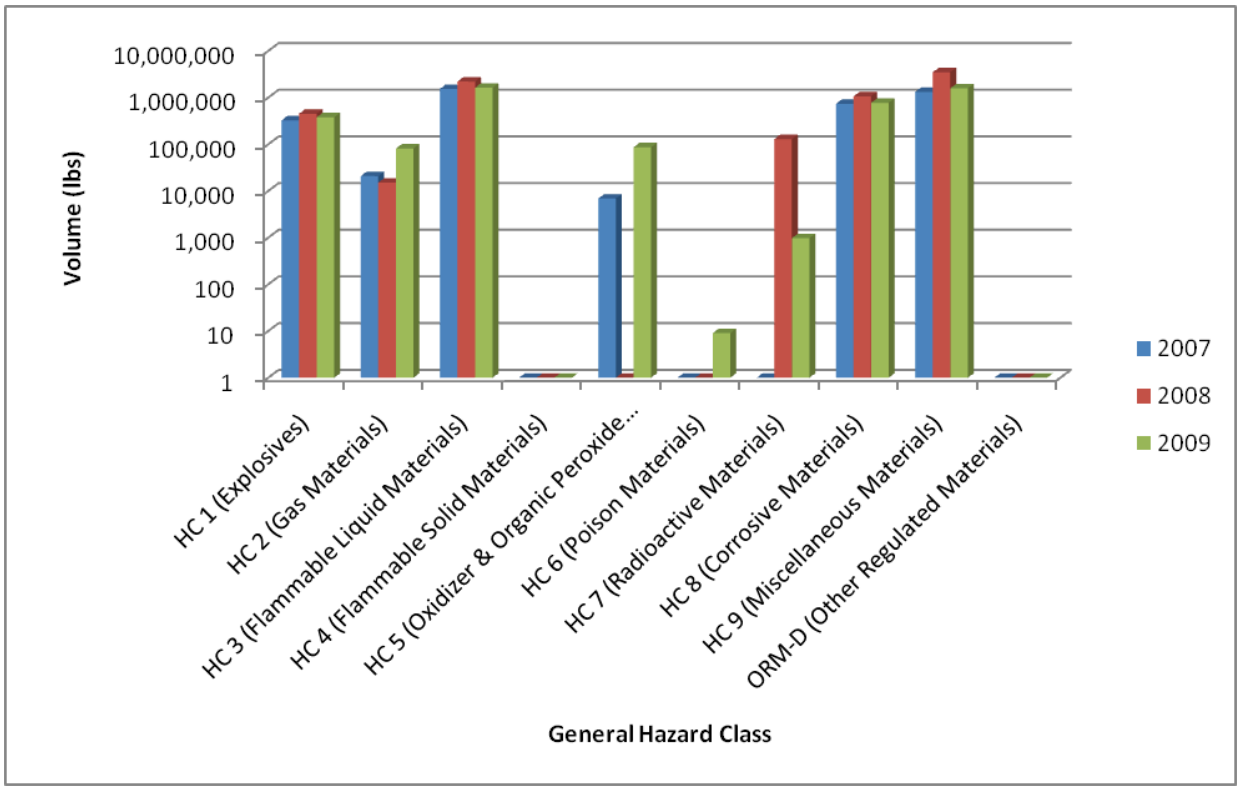
Figure 5-35. Hazardous Material Commodities by Hazardous Material Name (Greater than 1,000 lbs) for the Western Alaska Subarea, for 2007 through 2009, presented on a log scale.



5.8 Northwest Arctic

The transportation of hazardous materials through the Northwest Arctic Subarea (NWA) includes two modes of transportation: air and marine. Many of the commodities listed as transiting this subarea are destined for other subarea locations. For example, hazardous materials shipments that are delivered via barge/vessel to the North Slope, or that are transiting from the North Slope to southern locations will be noted as transiting within the Northwest Arctic Subarea. The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-36 below.

Figure 5-36, Volumes of Hazardous Materials Shipped into the NWA presented on a log scale



In general, HC 3 commodities (Flammable Liquid Materials), HC 9 commodities (Miscellaneous Materials), and HC 8 commodities (Corrosive Materials) consistently dominated the volume of hazardous materials commodities shipped within the Northwest Arctic Subarea. Figures 5-37, 5-38, and 5-39 depict the volume of hazardous materials shipped as a percentage of the total volume for each calendar year evaluated for this study.

Figure 5-37. NWA Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

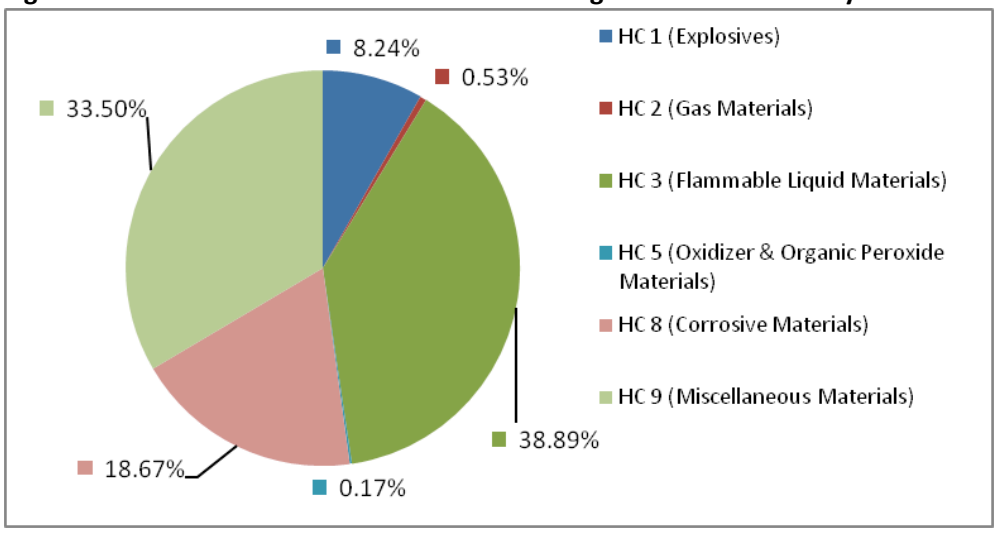


Figure 5-38. NWA Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

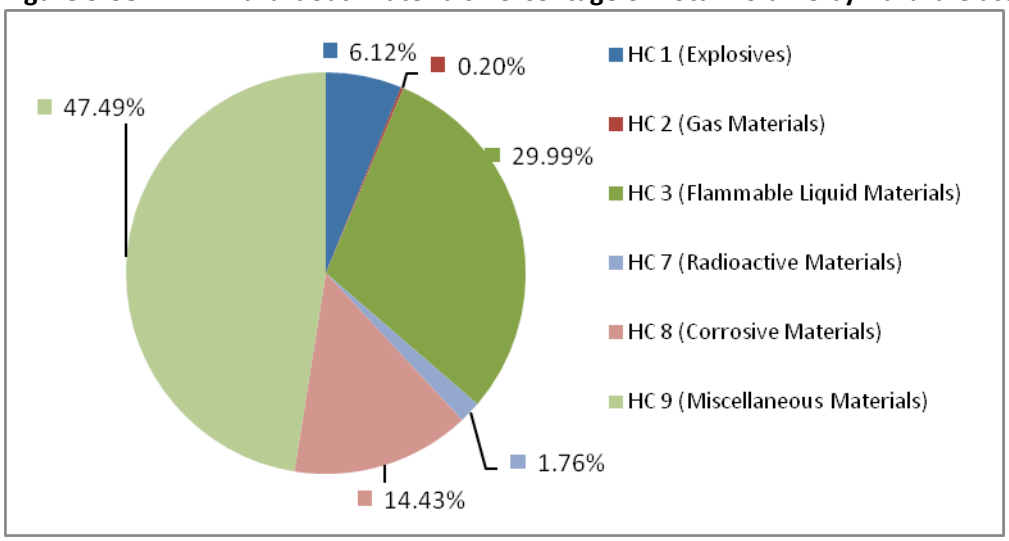


Figure 5-39. NWA Hazardous Materials Percentage of Total Volume by Hazard Class for 2009

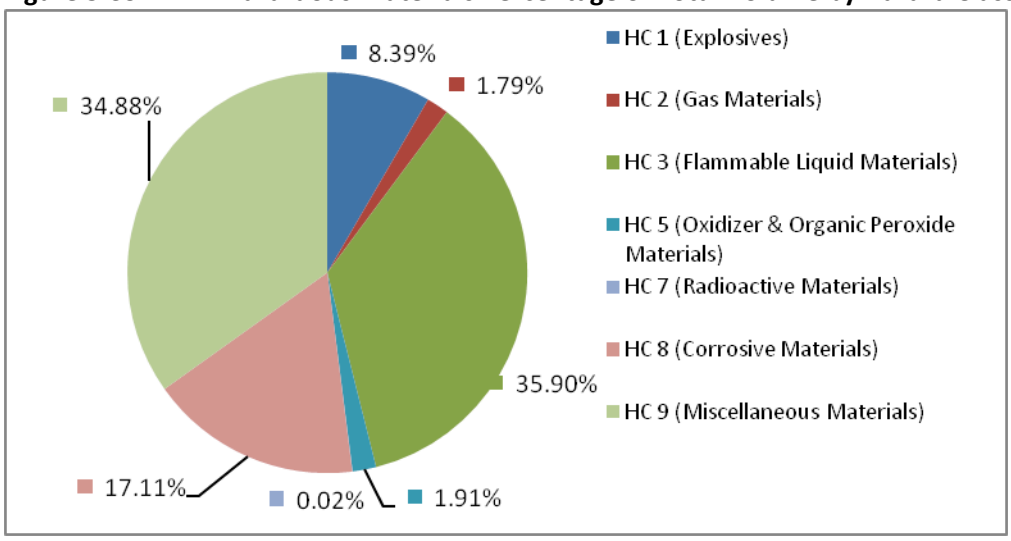


Table 5-55 lists the volume of hazardous materials shipped within the Northwest Arctic Subarea by hazard class for each calendar year evaluated for this study.

Table 5-55. Volumes of Hazard Class Transported within NWA Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	325,575	451,350	379,800
HC 2 (Gas Materials)	20,802	15,067	81,268
HC 3 (Flammable Liquid Materials)	1,537,126	2,210,203	1,626,117
HC 4 (Flammable Solid Materials)	-	-	-
HC 5 (Oxidizer & Organic Peroxide Materials)	6,884	-	86,388
HC 6 (Poison Materials)	-	-	9
HC 7 (Radioactive Materials)	-	129,487	975
HC 8 (Corrosive Materials)	738,158	1,063,707	774,724
HC 9 (Miscellaneous Materials)	1,324,433	3,499,373	1,579,792
ORM-D (Other Regulated Materials)	-	-	-

A more detailed evaluation of each hazard class is provided below. A shipment volume threshold was not established for the Northwest Arctic Subarea due to the limited number and volume of shipments evaluated.

HC 1 Explosives: Similar to the Western Alaska Subarea, the primary explosives that were transported through the Northwest Arctic Subarea were HC 1.0. There was an approximate 30% jump in volume between 2007 and 2008, and then an approximate 25% drop between 2008 and 2009. The primary modes of transportation for these commodities in this Subarea were via air and marine. The volumes shipped via air, as noted in the previous section, are somewhat artificial and based on an algorithm generated from discussions with the air carrier. However, the volume changes for the most part were reflective of the changes in the number of hazardous materials shipments into the Northwest Arctic Subarea. Table 5-56 lists the primary HC 1 commodities shipped within the Northwest Arctic Subarea.

Table 5-56. Primary Hazard Class 1 Commodities Shipped within the NWA Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
1.0	Ammunition	0006

HC 2 Gas Materials: HC 2.2 represented the commodities shipped in the Northwest Arctic Subarea. The volume of shipments showed a slight decrease between 2007 and 2008, and an approximate 80% increase between 2008 and 2009. Table 5-57 lists the primary HC 2 commodities shipped within the Northwest Arctic Subarea.

Table 5-57. Primary Hazard Class 2 Commodities Shipped within the NWA Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
2.2	Sulfur Hexafluoride	1080
	Carbon Dioxide	1013
	Dichlorodifluoromethane or Refrigerant Gas R12	1028
	Nitrogen, Compressed	1066
	Compressed Gas, N.O.S.	1956
	Liquefied Gas, N.O.S.	3163
	Fire Extinguishers	1044

HC 3 Flammable Liquid Materials: The shipments of HC 3.0 within the Northwest Arctic Subarea were primarily shipped via aircraft. The volumes shipped, as noted in the previous section, are somewhat artificial and based on an algorithm generated from discussions with the air carrier. However, the volume changes reflect the changes in the number of hazardous materials shipments into the Northwest Arctic Subarea. Table 5-58 lists the primary HC 3 commodities shipped within the Northwest Arctic Subarea.

Table 5-58. Primary Hazard Class 3 Commodities Shipped within the NWA Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
3.0	Resin Solution	1866
	Alcohols, N.O.S.	1987
	Paint	1263
	Flammable Liquids, Corrosive, N.O.S.	2924
	Petroleum Distillates, N.O.S. or Petroleum Products, N.O.S.	1268
	Flammable Liquids, N.O.S.	1993
	Gasoline	1203
	Undecane	2330
	Combustible Liquids, N.O.S.	1993
	Butanols	1120

HC 4 Flammable Solid Materials: There were no Flammable Solid Materials transported within this Subarea during this time period according to the data evaluated.

HC 5 Oxidizer and Organic Peroxide Materials: HC 5.1 and 5.2 were shipped within the Northwest Arctic Subarea in 2007 and 2009. The volume of HC 5.1 increased by an order of magnitude between 2007 and 2009 while HC 5.2 shipments stopped during this

time period. Table 5-59 lists the primary HC 5 commodities shipped within the Northwest Arctic Subarea.

Table 5-59. Primary Hazard Class 5 Commodities Shipped within the NWA Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
5.1	Hydrogen Peroxide, Aqueous Solutions	2014
	Oxidizing Solid, N.O.S.	1479
5.2	Organic Peroxide, Type D, Solid	3106

HC 6 Poisons: A very small amount of HC 6.1 (Mercuric Chloride) was reported being shipped in 2009 within the Northwest Arctic Subarea. The small volume was retained for reporting purposes because it is classified as an EHS.

HC 7 Radioactive Materials: HC 7.0 was shipped within the Northwest Arctic Subarea in 2008 and 2009 as determined by the data evaluated for this study. The volume of shipments reported decreased dramatically between 2008 and 2009. Table 5-60 lists the primary HC 7 commodities shipped within the Northwest Arctic Subarea.

Table 5-60. Primary Hazard Class 7 Commodities Shipped within the NWA Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
7.0	Radioactive Material, Type A Package	2915
	Radioactive Material, Type A Package, Special Form	3332

HC 8 Corrosive Materials: The volume of HC 8.0 transported within the Northwest Arctic Subarea increased by approximately 30% between 2007 and 2008, and decreased by approximately 30% between 2008 and 2009. Table 5-61 lists the primary HC 8 commodities shipped within the Northwest Arctic Subarea.

Table 5-61. Primary Hazard Class 8 Commodities Shipped within the NWA Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
8.0	Corrosive Liquid, Basic, Inorganic, N.O.S.	3266
	Tetraethylenepentamine	2320
	Hypochlorite Solutions	1791
	Batteries, Wet, Non-Spillable	2800
	Batteries, Wet, Filled with Acid	2794
	Corrosive Cleaning Supplies	1760
	Sulfuric Acid	2796
	Formic Acid	1779

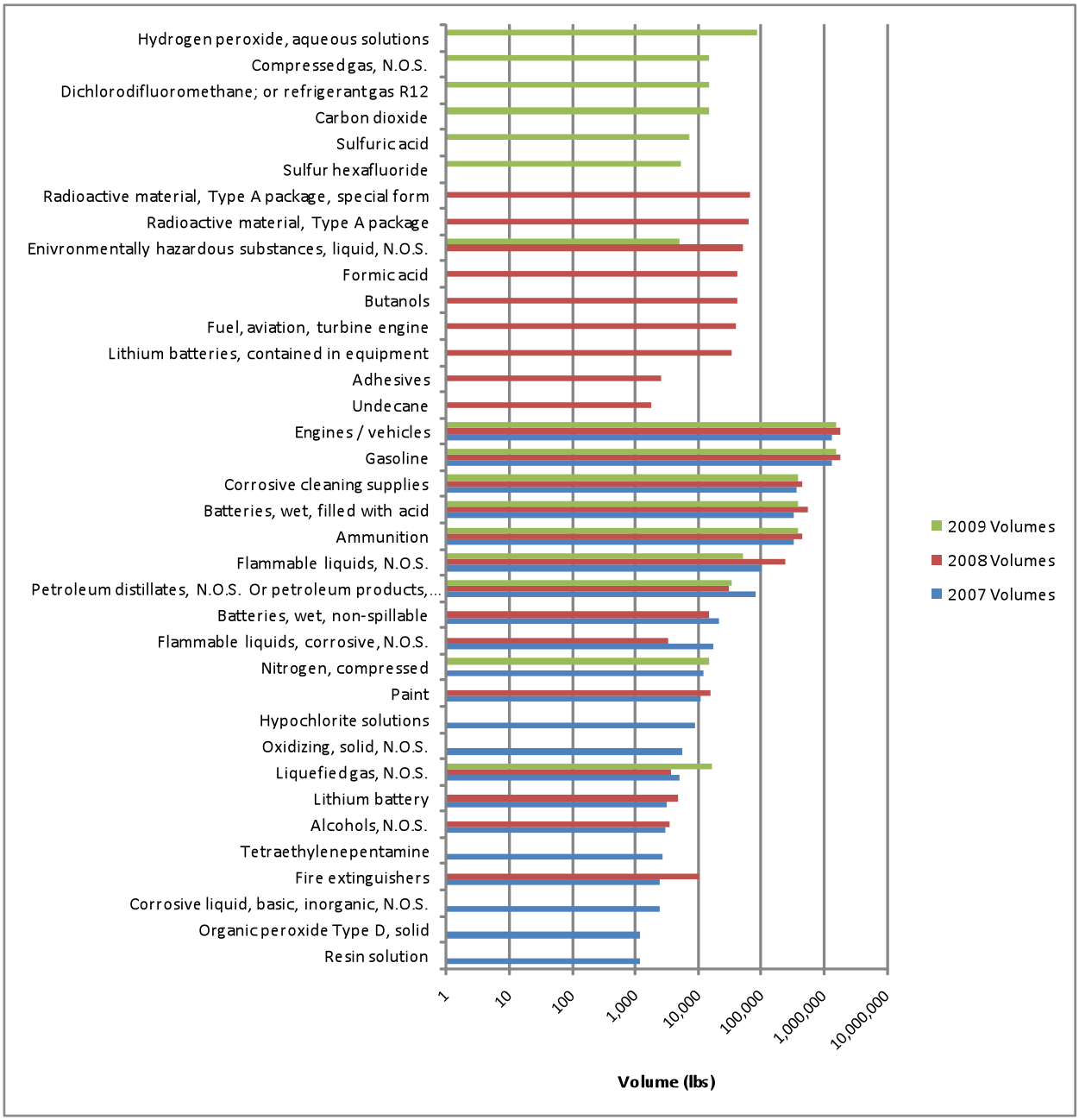
HC 9 Miscellaneous Materials: The volume of HC 9.0 commodities shipped within the Northwest Arctic Subarea saw a dramatic increase between 2007 and 2008 and then dropped but remained higher than 2007 levels in 2009. The sharp increase in 2008 could be attributable to the increase in the Alaska Permanent Fund Dividend checks during this timeframe. Table 5-62 lists the primary HC 9 commodities shipped within the Northwest Arctic Subarea.

Table 5-62. Primary Hazard Class 9 Commodities Shipped within the NWA Subarea

Hazard Class	Hazardous Material Description (Greater than 1,000 lbs Shipped)	UN ID Number
9.0	Environmentally Hazardous Substance, Liquid, N.O.S.	3082
	Engines / Vehicles	3166
	Lithium Batteries	3090
	Lithium Batteries, Contained in Equipment	3091

Figure 5-40 depicts the volume of hazardous materials shipped each year within the Northwest Arctic Subarea by Hazardous Material Name.

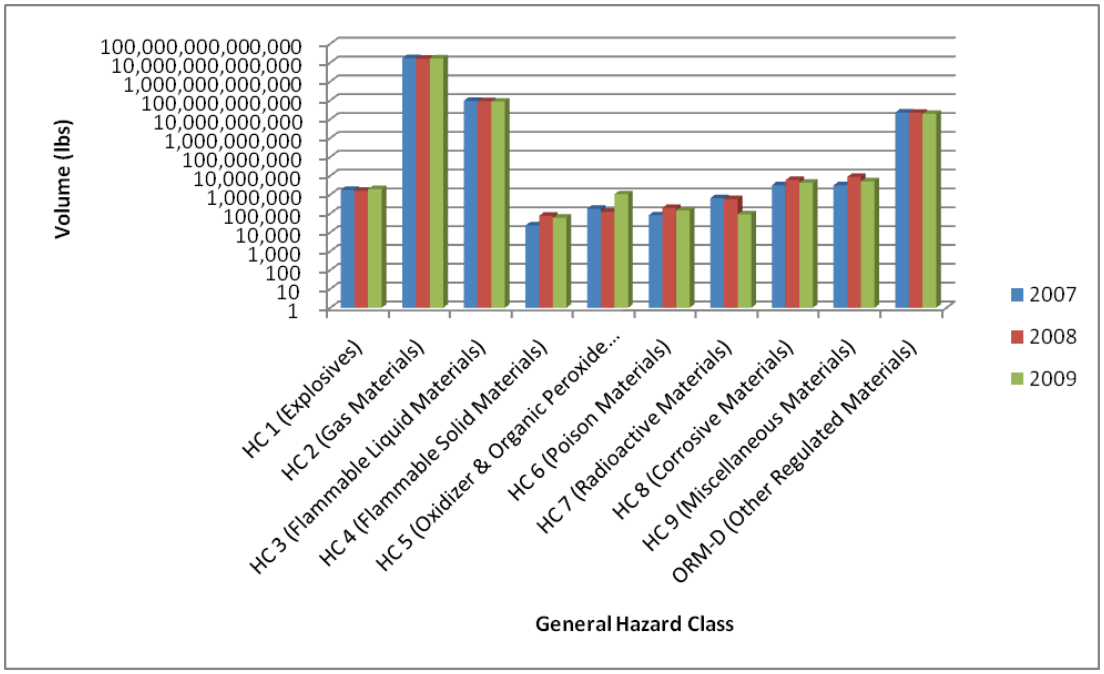
Figure 5-40. Hazardous Material Commodities by Hazardous Material Name (Greater than 1,000 lbs) for the Northwest Arctic Subarea, for 2007 through 2009, presented on a log scale.



5.9 North Slope

The transportation of hazardous materials through the North Slope Subarea (NS) includes four (4) modes of transportation: air, highway, marine and pipeline. While the commodities shipped spans the spectrum of hazard classes, the largest volume commodities shipped/transported are HC 2.1 (Natural Gas), and HC 3.0 (Petroleum Crude Oil). The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-41 below.

Figure 5-41. Volumes of Hazardous Materials Shipped into the NS presented on a log scale



In general, HC 2 commodities (Gas Materials), specifically natural gas, HC 3 commodities (Flammable Liquid Materials), specifically crude oil, and ORM-D (Other Regulated Materials), specifically produced water, dominate the volume of hazardous materials shipped within the NS Subarea. This observation is aligned with the facts that there is substantial natural gas and produced water produced as a direct result of the drilling operations on the North Slope, and that the Trans-Alaska Pipeline originates on the North Slope. As these three hazard classes make up 99.3% of the total volume shipped, the breakdown of volumes of hazard class shipments within this subarea (inclusive of all hazard classes) in a percentage of subarea-wide volume does not provide any meaningful insight. However, excluding those three hazard classes provides a general breakdown of the other hazard classes by percentage of the total remaining volume. Figures 5-42, 5-43 and 5-44 depict the breakdown of hazardous material shipments within the NS Subarea by a percentage of total remaining volume shipped. HC 8 (Corrosive Materials), HC 9 (Miscellaneous Materials) and HC 1 (Explosives) consistently dominate the volume of hazardous materials shipped from year to year.

Figure 5-42. NS Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

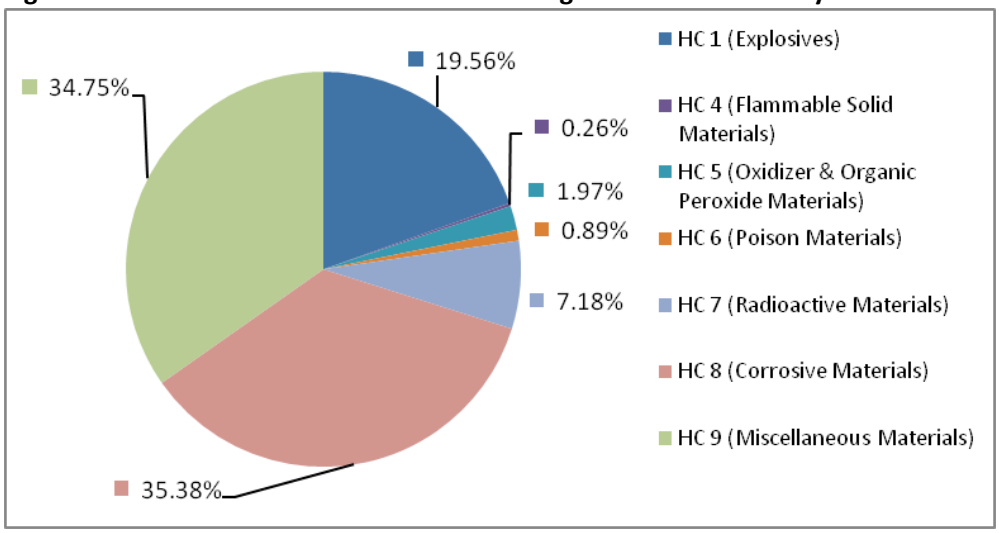


Figure 5-43. NS Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

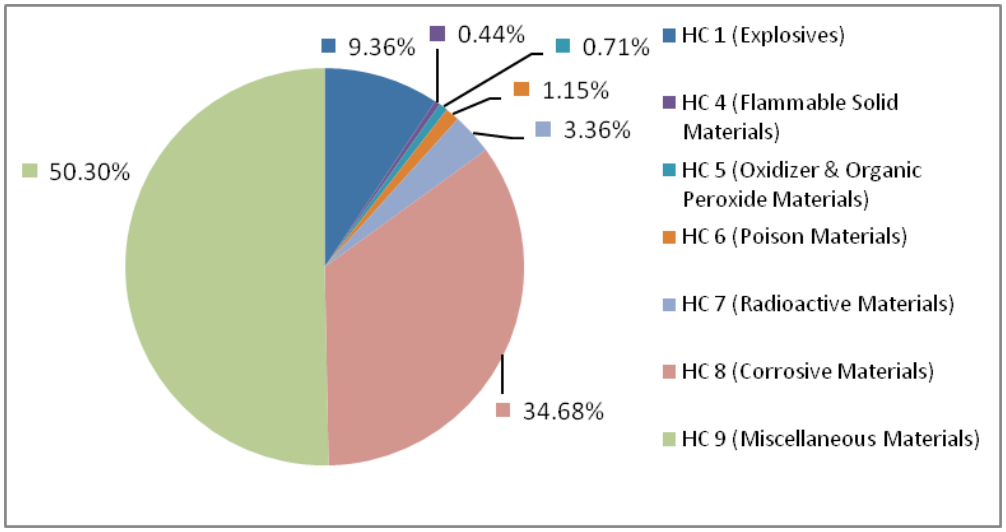


Figure 5-44. NS Hazardous Materials Percentage of Total Volume by Hazard Class for 2009

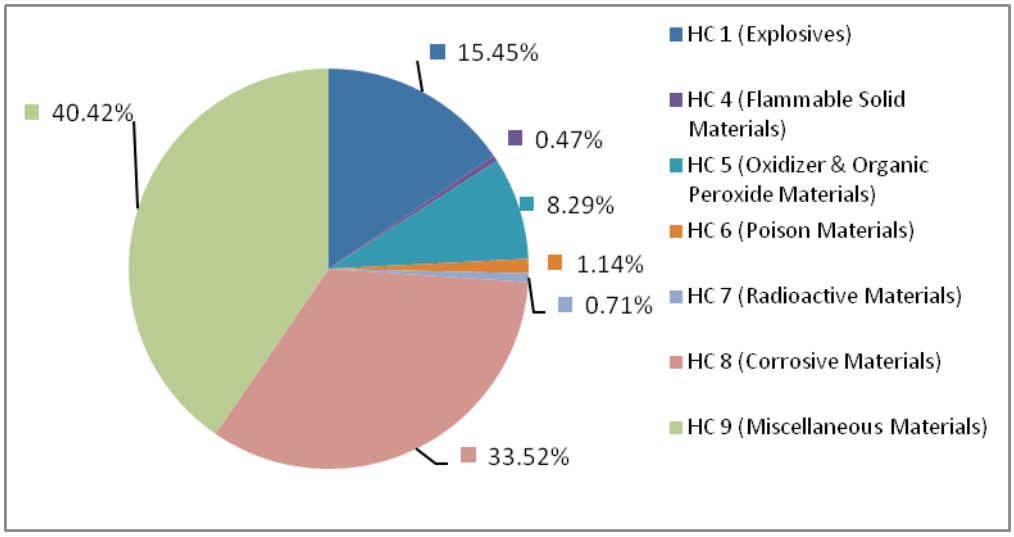


Table 5-63 lists the volume of hazardous materials shipped within the NS Subarea by hazard class for each calendar year evaluated for this study.

Table 5-63. Volumes of Hazard Class Transported within NS Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	1,759,291	1,602,057	1,950,164
HC 2 (Gas Materials)	17,106,447,039,097	16,105,633,218,281	16,665,444,532,526
HC 3 (Flammable Liquid Materials)	94,766,767,413	90,086,966,893	86,100,701,273
HC 4 (Flammable Solid Materials)	23,014	75,459	59,190
HC 5 (Oxidizer & Organic Peroxide Materials)	177,328	121,495	1,046,318
HC 6 (Poison Materials)	79,978	196,886	144,335
HC 7 (Radioactive Materials)	646,090	575,102	90,087
HC 8 (Corrosive Materials)	3,181,873	5,937,317	4,230,449
HC 9 (Miscellaneous Materials)	3,124,836	8,611,967	5,101,611
ORM-D (Other Regulated Materials)	22,464,000,000	22,113,000,000	19,305,000,000

A more detailed evaluation of each hazard class is provided below. A shipment volume threshold of 100,000 lbs was established for the North Slope Subarea due to the number and volume of hazardous materials commodity shipments.

HC 1 Explosives: The primary explosives that were transported through the North Slope Subarea were HC 1.0, 1.1, 1.4 and 1.5. HC 1.5 represented the highest volume transported from year to year, and increased by 15% in 2008 and another 25% in 2009. HCs 1.0 and 1.1 remained fairly consistent, while HC 1.4 decreased by 32% between 2007 and 2008 and another 48% between 2008 and 2009. Table 5-64 lists the primary HC 1 commodities shipped within the North Slope Subarea. There were no shipments of HC 1.2 or 1.3 that exceeded 100,000 lbs.

Table 5-64. Primary Hazard Class 1 Commodities Shipped within the NS Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
1.0	Ammunition	0006
1.1	Boosters	0042
1.4	Detonator Assemblies, Non-Electric	0361
	Articles, Explosives, N.O.S.	0349
1.5	Explosive, Blasting, Type B or Agent Blasting, Type B	0331
	Ammonium Nitrate-Fuel Oil Mixture	0331
	Explosive, Blasting, Type E	0332

HC 2 Gas Materials: HC 2.1, 2.2 and 2.3 were transported in the North Slope Subarea. The largest volume was represented by HC 2.1, Natural Gas, which was transported via

the pipeline infrastructure on the North Slope. Table 5-65 lists the primary HC 2 commodities shipped within the North Slope Subarea.

Table 5-65. Primary Hazard Class 2 Commodities Shipped within the NS Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
2.1	Natural Gas	1971
	Propane Cylinders	1978
	Compressed Gas, Flammable, N.O.S.	1954
	Acetylene, Dissolved	1001
	Petroleum Gases, Liquefied or Liquefied Petroleum Gas	1075
	Lighters or Lighter Refills	1057
2.2	Compressed Gas, N.O.S.	1956
	Fire Extinguishers	1044
	Carbon Dioxide	1013
	Oxygen, Compressed	1072
	Nitrogen, Compressed	1066
	Argon, Compressed	1006
	Air, Compressed	1002
	Bromotrifluoromethane	1009

HC 3 Flammable Liquid Materials: The North Slope Subarea has the second highest volume of HC 3.0 transported within the State. The primary commodity is crude oil that is shipped via the Trans-Alaska Pipeline, and associated piping on the North Slope, from the North Slope to Valdez. Table 5-66 lists the primary HC 3 commodities shipped within the North Slope Subarea.

Table 5-66. Primary Hazard Class 3 Commodities Shipped within the NS Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
3.0	Crude Oil	1267
	Flammable Liquids, Toxic, N.O.S.	1992
	Paint	1263
	Petroleum Distillates, N.O.S. or Petroleum Products, N.O.S.	1268
	Tetrahydrofuran	2056
	Gasoline	1203
	Combustible Liquid, N.O.S.	1993
	Flammable Liquids, Corrosive, N.O.S.	2924

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
	Alcohols, N.O.S.	1987
	Toluene	1294
	Methanol	1230
	Diesel Fuel; Fuel Oil; Gas Oil; or Heating Oil Light	1202
	Adhesives	1133

HC 4 Flammable Solid Materials: HC varied between 4.1, 4.2 and 4.3 from year to year for this grouping of commodities. Volumes also varied and displayed no visible trend other than potentially industrial demands. There were no HC 4.0 commodities shipped in a volume that exceeded 100,000 lbs.

HC 5 Oxidizer and Organic Peroxide Materials: HC 5.1 and 5.2 were transported within the North Slope Subarea. 2009 displayed the highest volume of both commodity groups (significantly higher than 2007 and 2008. Volumes between 2007 and 2008 decreased or increased, but no apparent trend was noted. Table 5-67 lists the primary HC 5 commodities shipped within the North Slope Subarea.

Table 5-67. Primary Hazard Class 5 Commodities Shipped within the NS Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
5.1	Calcium Hypochlorite, Hydrated or Calcium Hypochlorite, Hydrated Mixtures	2880
	Oxidizing Solid, N.O.S.	1479
5.2	Organic Peroxide Type F, Liquid	3109

HC 6 Poisons: HC 6.1 and 6.2 were transported within the North Slope Subarea. HC 6.1 increased significantly (more than doubling) between 2007 and 2008 and then decreased by approximately 25% between 2008 and 2009. HC 6.2 commodities were primarily regulated medical waste products and did not exceed a volume shipped of 100,000 lbs. Table 5-68 lists the primary HC 6 commodity shipped within the North Slope Subarea.

Table 5-68. Primary Hazard Class 6 Commodities Shipped within the NS Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
6.1	Toxic Liquid, Organic, N.O.S.	2810

HC 7 Radioactive Materials: HC 7.0 shipped within the North Slope Subarea decreased from year to year. While only a 10% decrease between 2007 and 2008, the volume of

shipments decreased by 85% between 2008 and 2009. Table 5-69 lists the primary HC 7 commodity shipped within the North Slope Subarea.

Table 5-69. Primary Hazard Class 7 Commodities Shipped within the NS Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
7.0	Radioactive Material, Surface Contaminated Object or Radioactive Material	2913

HC 8 Corrosive Materials: The volume of HC 8.0 shipped within the North Slope Subarea increased by almost 50% between 2007 and 2008, and then decreased by approximately 30% between 2008 and 2009. Table 5-70 lists the primary HC 8 commodities shipped within the North Slope Subarea.

Table 5-70. Primary Hazard Class 8 Commodities Shipped within the NS Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
8.0	Hypochlorite Solutions	1791
	Corrosive Liquid, Basic, Inorganic, N.O.S.	3266
	Corrosive Cleaning Supplies	1760
	Bisulfites, Aqueous Solutions, N.O.S.	2693
	Batteries, Wet, Filled with Acid	2794
	Corrosive Liquid, Acidic, Inorganic, N.O.S.	3264
	Batteries, Wet, Non-Spillable	2800
	Amines, Liquid, Corrosive, N.O.S. or Polyamines, Liquid, Corrosive, N.O.S.	2735

HC 9 Miscellaneous Materials: The volume of HC 9.0 commodities shipped within the North Slope Subarea saw a dramatic increase between 2007 and 2008 and then dropped but remained higher than 2007 levels in 2009. The sharp increase in 2008 could be attributable to the increase in the Alaska Permanent Fund Dividend checks during this timeframe. Table 5-71 lists the primary HC 9 commodities shipped within the North Slope Subarea.

Table 5-71. Primary Hazard Class 9 Commodities Shipped within the NS Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
9.0	Lithium Batteries	3090
	Environmentally Hazardous Substances, Solid, N.O.S.	3077
	Asbestos	2212
	Hazardous Waste, Liquid, N.O.S.	3082
	Lithium Batteries, Contained in Equipment	3091
	Engines / Vehicles	3166

ORM-D Materials: Produced water, transported via the North Slope Pipeline piping infrastructure is the only ORM-D commodity identified as being transported within the state. Table 5-72 lists the primary ORM-D commodity shipped within the North Slope Subarea.[36]

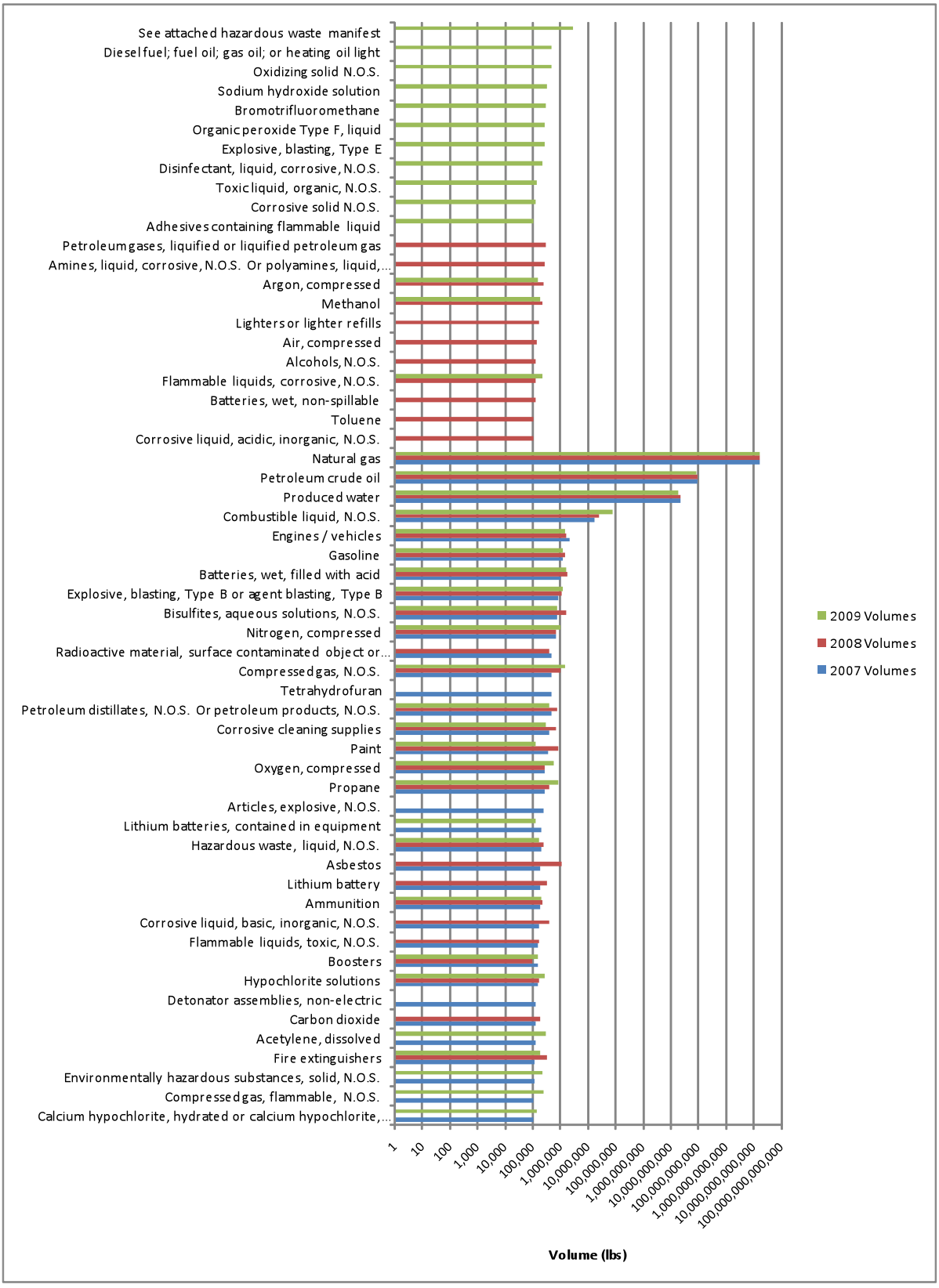
Table 5-72. Primary Hazard Class ORM-D Commodities Shipped within the NS Subarea

Hazard Class	Hazardous Material Description (Greater than 100,000 lbs Shipped)	UN ID Number
ORM-D	Produced Water	None

Figure 5-45 depicts the volume of hazardous materials shipped each year within the North Slope Subarea by Hazardous Material Name for volumes exceeding 100,000 pounds.

[36] Water production totals for 2007, 2008 and 2009 were extracted from the Alaska Risk Assessment Total Produced Water Production 1995-2009 statistics.

Figure 5-45. Hazardous Material Commodities by Hazardous Material Name (Greater than 100,000 lbs) for the North Slope Subarea, for 2007 through 2009, presented on a log scale.



5.10 Interior Alaska

The transportation of hazardous materials through the Interior Alaska Subarea (INT) includes all modes of transportation: air, highway, marine, pipeline and rail. The pipeline and rail modes dominate the volumes shipped as noted previously for the Prince William Sound and Cook Inlet Subareas. Similar to the Cook Inlet Subarea, the transportation infrastructure and central location as a receiver or transshipment point results in large volumes reported across the spectrum of hazard class commodities. The breakdown of hazardous materials volumes from year to year by Hazard Class is depicted in Figure 5-46 below.

Figure 5-46. Volumes of Hazardous Materials Shipped into INT presented on a log scale

In general, HC 3 commodities (Flammable Liquid Materials), specifically Crude Oil dominates the volume of hazardous materials shipped within the INT Subarea by nearly three (3) orders of magnitude. This observation is aligned with the fact that the Trans-Alaska Pipeline passes through this Subarea on its way from the North Slope to Valdez. As this hazard class makes up 99.8% of the total volume shipped, the breakdown of volumes of hazard class shipments within this subarea (inclusive of all hazard classes) in a percentage of subarea-wide volume does not provide any meaningful insight. However, excluding this hazard class provides a general breakdown of the other hazard classes by percentage of the total remaining volume. Figures 5-47, 5-48 and 5-49 depict the breakdown of hazardous material shipments within the INT Subarea by a percentage of total remaining volume shipped. HC 9 (Miscellaneous Materials), HC 5 (Oxidizer & Organic Peroxide Materials) and HC 1 (Explosives) consistently dominate the volume of hazardous materials shipped from year to year.

Figure 5-47. INT Hazardous Materials Percentage of Total Volume by Hazard Class for 2007

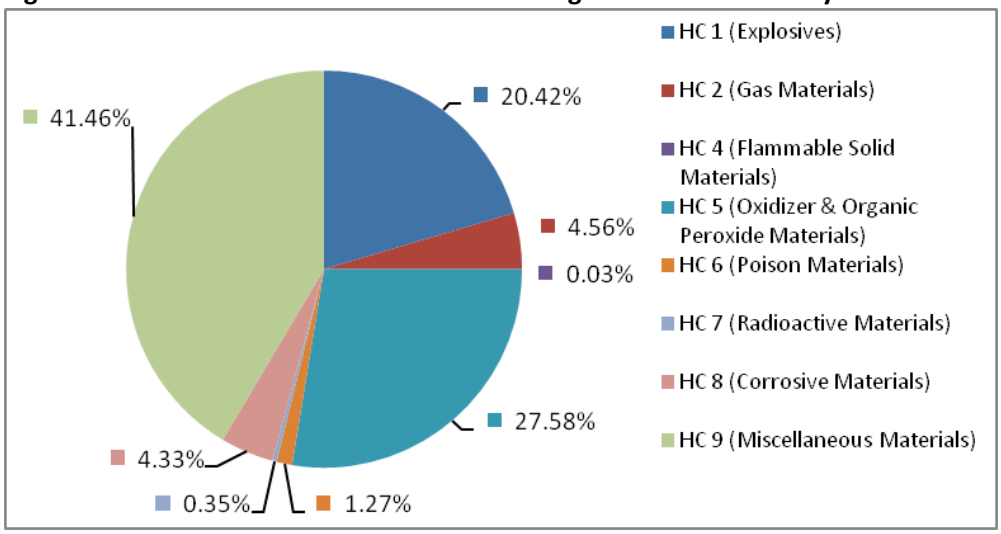


Figure 5-48. INT Hazardous Materials Percentage of Total Volume by Hazard Class for 2008

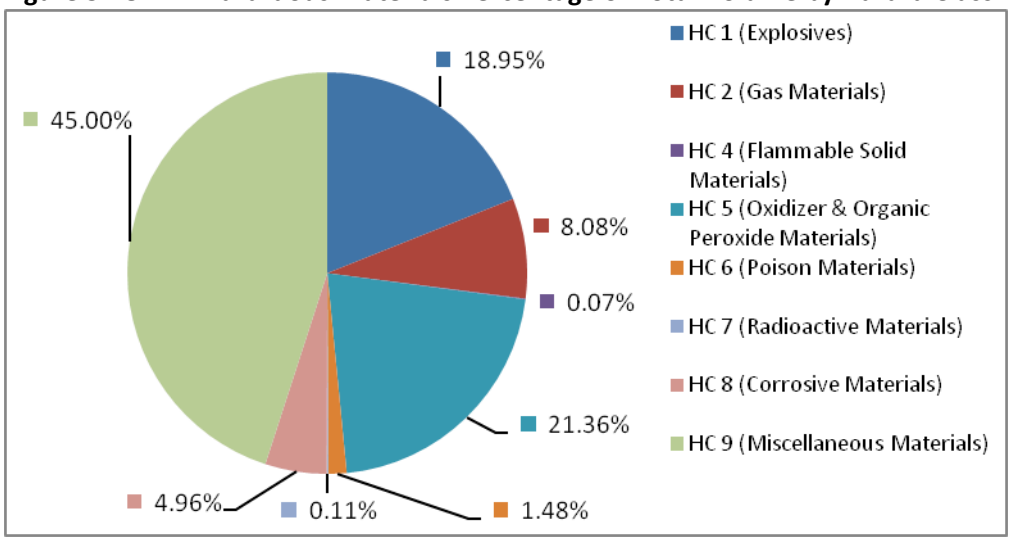


Figure 5-49. INT Hazardous Materials Percentage of Total Volume by Hazard Class for 2009

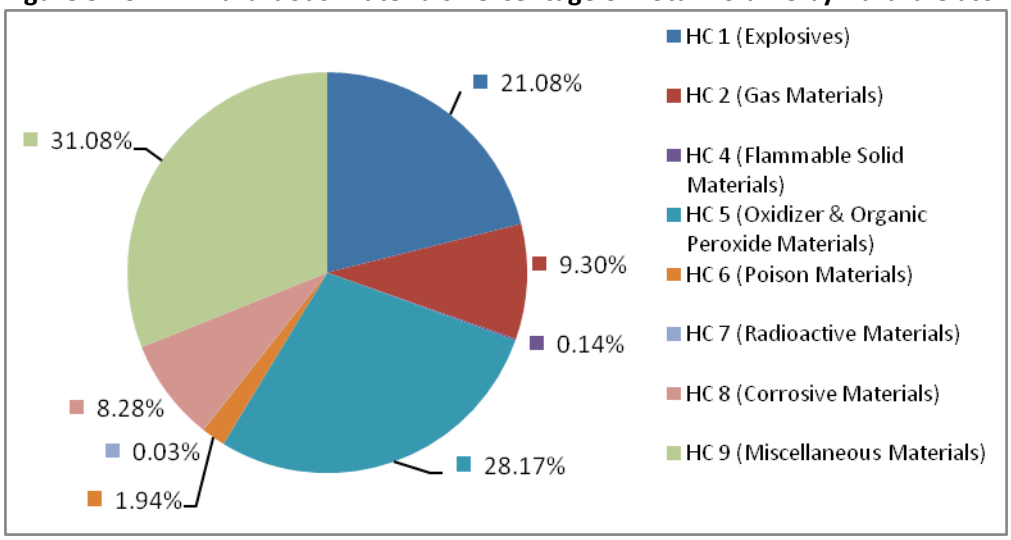


Table 5-73 lists the volume of hazardous materials shipped within the Interior Alaska Subarea by hazard class for each calendar year evaluated for this study.

Table 5-73. Volumes of Hazard Class Transported within INT Subarea by Calendar Year

Hazard Class	2007 (Total Volume in lbs)	2008 (Total Volume in lbs)	2009 (Total Volume in lbs)
HC 1 (Explosives)	35,250,447	42,337,916	31,490,549
HC 2 (Gas Materials)	7,871,310	18,040,563	13,888,474
HC 3 (Flammable Liquid Materials)	104,499,279,833	98,453,107,755	93,374,633,231
HC 4 (Flammable Solid Materials)	59,869	147,672	207,369
HC 5 (Oxidizer & Organic Peroxide Materials)	47,626,734	47,718,173	42,083,109
HC 6 (Poison Materials)	2,193,319	3,300,200	2,895,225
HC 7 (Radioactive Materials)	598,743	247,119	39,171
HC 8 (Corrosive Materials)	7,479,104	11,079,032	12,365,945
HC 9 (Miscellaneous Materials)	71,588,225	100,514,011	46,438,170
ORM-D (Other Regulated Materials)	-	-	-

A more detailed evaluation for each hazard class is provided below. The commodity shipment threshold was established at 500,000 lbs due to the variety and high volumes/shipment of hazmat commodities shipped in this region.

HC 1 Explosives: The explosives transported in the Interior Alaska Subarea covered HCs 1.0, 1.1, 1.2, 1.3, 1.4 and 1.5. Volumes of each HC remained relatively consistent from year to year with the biggest change seen for HC 1.5 where it nearly doubled in volume between 2007 and 2008, and then decreased by half between 2008 and 2009. Table 5-74 lists the primary HC 1 commodities shipped within the Interior Alaska Subarea.

Table 5-74. Primary Hazard Class 1 Commodities Shipped within the INT Subarea

Hazard Class	Hazardous Material Description (Greater than 500,000 lbs Shipped)	UN ID Number
1.1	Explosive Materials (Military Shipments)	Unspecified
	Explosive, Blasting, Type E	0241
	Explosive, Blasting, Type A	0081
	Boosters	0042
	Cord Detonating	0065
1.2	Explosive Materials (Military Shipments)	Unspecified
1.3	Explosive Materials (Military Shipments)	Unspecified
1.4	Explosive Materials (Military Shipments)	Unspecified
	Detonator Assemblies, Non-Electric	0361
	Detonators, Non-Electric	0267
1.5	Explosive, Blasting, Type E or Agent Blasting, Type E	0332
	Explosive, Blasting, Type B or Agent Blasting, Type B	0331
	Ammonium Nitrate-Fuel Oil Mixture	0331

HC 2 Gas Materials: HCs 2.0, 2.1, 2.2 and 2.3 were transported in the Interior Alaska Subarea. The HC 2.0 commodities represent materials that were transported via Alaska Railroad on the Anchorage-Fairbanks rail segment. HC 2.1 saw an approximate 80% increase in volume shipped between 2007 and 2008, and then an approximate 67% decrease between 2008 and 2009. HC 2.2 increased consistently from year to year. HC 2.3 increased approximately 75% in 2008 and then decreased approximately 80% in 2009. Table 5-75 lists the primary HC 2 commodities shipped within the Interior Alaska Subarea.

Table 5-75. Primary Hazard Class 2 Commodities Shipped within the INT Subarea

Hazard Class	Hazardous Material Description (Greater than 500,000 lbs Shipped)	UN ID Number
2.0	Gases	Unspecified
2.1	Methane, Refrigerated Liquid or Natural Gas, Refrigerated Liquid	1972
	Propane Cylinders	1978
	Acetylene, Dissolved	1001
2.2	Nitrogen, Compressed	1066
	Oxygen, Compressed	1072

HC 3 Flammable Liquid Materials: The Interior Alaska Subarea displays the greatest volume of HC 3.0 transported within the State. The primary source of this commodity is crude oil that is transported via the Trans-Alaska Pipeline from the North Slope to Valdez. Table 5-76 lists the primary HC 3 commodities shipped within the Interior Alaska Subarea.

Table 5-76. Primary Hazard Class 3 Commodities Shipped within the INT Subarea

Hazard Class	Hazardous Material Description (Greater than 500,000 lbs Shipped)	UN ID Number
3.0	Petroleum Crude Oil	1267
	Flammable Liquids, N.O.S.	1993
	Paint	1263
	Gasoline	1203
	Adhesives	1133
	Combustible Liquid, N.O.S.	1993
	Petroleum Distillates, N.O.S. or Petroleum Products, N.O.S.	1268
	Flammable Liquids	Unspecified

HC 4 Flammable Solid Materials: HC varied between 4.1, 4.2 and 4.3 from year to year for this grouping of commodities. Volumes also varied and displayed no visible trend

other than potentially industrial demands. There were no HC 4.0 commodities shipped in a volume that exceeded 500,000 lbs.

HC 5 Oxidizer and Organic Peroxide Materials: HC 5.1 and 5.2 were transported within the Interior Alaska Subarea each year. The volume of HC 5.1 shipped within the Interior Alaska represented the second highest volume of HC 5.1 transported statewide. HC 5.1 decreased and increased slightly from year to year. Similar to Cook Inlet, HC 5.2 increased by approximately 35% between 2007 and 2008 and then by another 90% between 2008 and 2009. Table 5-77 lists the primary HC 5 commodities shipped within the Interior Alaska Subarea.

Table 5-77. Primary Hazard Class 5 Commodities Shipped within the INT Subarea

Hazard Class	Hazardous Material Description (Greater than 500,000 lbs Shipped)	UN ID Number
5.1	Ammonium Nitrate	3375
	Ammonium Nitrate	1942
	Sodium Nitrate	1498

Within HC 5.2, there were no commodities shipped in a volume that exceeded 500,000 lbs.

HC 6 Poisons: HC 6.1 and 6.2 were transported in the Interior Alaska Subarea. Sodium Cyanide, HC 6.1, was the largest volume commodity transported via the Alaska Railroad each year and any changes in volume follow the increases or decreases noted in the Alaska Railroad data. HC 6.2 commodities were primarily regulated medical waste products. Table 5-78 lists the primary HC 6 commodities shipped within the Interior Alaska Subarea.

Table 5-78. Primary Hazard Class 6 Commodities Shipped within the INT Subarea

Hazard Class	Hazardous Material Description (Greater than 500,000 lbs Shipped)	UN ID Number
6.1	Sodium Cyanide	1689

HC 7 Radioactive Materials: HC 7.0 shipped within the Interior Alaska Subarea decreased significantly from year to year dropping by half in 2008 and then by another 85% in 2009. There were no HC 7.0 commodities shipped in volumes that exceeded 500,000 lbs.

HC 8 Corrosive Materials: The volume of HC 8.0 shipped within the Interior Alaska Subarea consistently increased from year to year. Between 2007 and 2008 the volume increased by approximately 35%, and between 2008 and 2009 the volume increased by approximately 10%. Table 5-79 lists the primary HC 8 commodities shipped within the Interior Alaska Subarea.

Table 5-79. Primary Hazard Class 8 Commodities Shipped within the INT Subarea

Hazard Class	Hazardous Material Description (Greater than 500,000 lbs Shipped)	UN ID Number
8.0	Corrosives	Unspecified
	Batteries, Wet, Filled with Acid	2794
	Bisulfites, Aqueous Solutions, N.O.S.	2693
	Amines, Liquid, Corrosive, N.O.S. or Polyamines, Liquid, Corrosive, N.O.S.	2735
	Corrosive Cleaning Supplies	1760

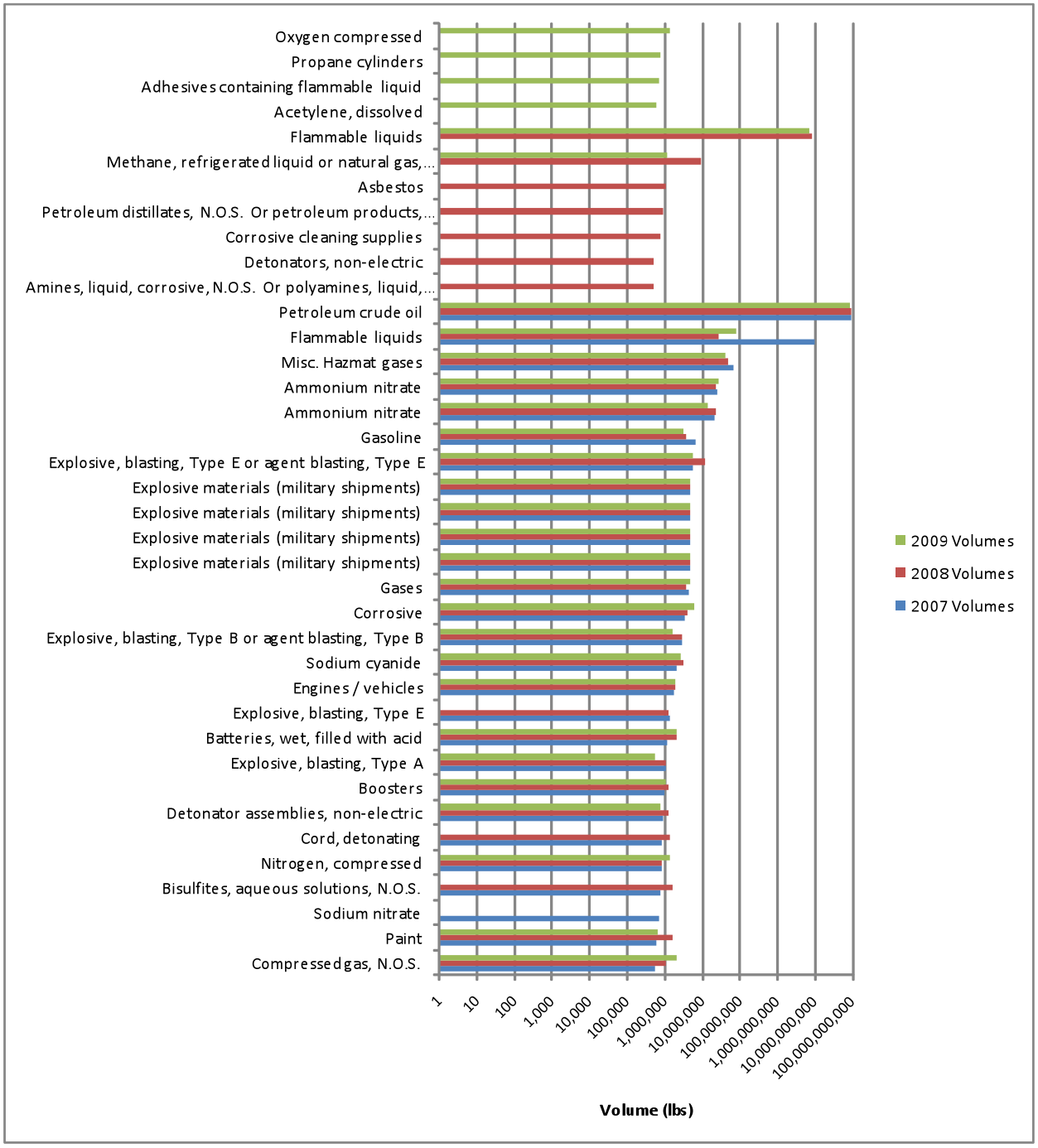
HC 9 Miscellaneous Materials: The volume of HC 9.0 commodities shipped within the Interior Alaska Subarea saw a dramatic increase between 2007 and 2008 and then dropped below 2007 levels in 2009. The sharp increase in 2008 could be attributable to the increase in the Alaska Permanent Fund Dividend checks during this timeframe. Table 5-80 lists the primary HC 9commodities shipped within the Interior Alaska Subarea.

Table 5-80. Primary Hazard Class 9 Commodities Shipped within the INT Subarea

Hazard Class	Hazardous Material Description (Greater than 500,000 lbs Shipped)	UN ID Number
9.0	Miscellaneous Hazardous Material Gases	Unspecified
	Engines / Vehicles	3166
	Asbestos	2212

Figure 5-50 depicts the volume of hazardous materials shipped each year within the Interior Alaska Subarea by Hazardous Material Name for volumes exceeding 500,000 pounds.

Figure 5-50. Hazardous Material Commodities by Hazardous Material Name (Greater than 500,000 lbs) for the Interior Alaska Subarea, for 2007 through 2009, presented on a log scale.



6. CONCLUSIONS

1. The conclusions drawn from this study must be tempered by the fact that there were data limitations/gaps particularly for air transportation of hazardous materials.

2. Of the over 28 trillion pounds of hazardous materials shipped within the State of Alaska during this three year period, 99.86% was attributable to the natural gas production and transport within the State.

3. Of the remaining 302 billion pounds of hazardous materials shipped within the State of Alaska during this three-year period, 91% was attributable to HC 3 (Flammable Liquid Materials), specifically petroleum crude oil production and transport.

4. While the EHS Commodities transported within the State of Alaska varied slightly in from year to year volume for certain commodities, the ranking of the top six (6) commodities was very consistent. The top EHS Commodities by volume shipped were (1) Sodium Cyanide, (2) Chlorine, (3) Sulfuric Acid, (4) Anhydrous Ammonia, (5) Formaldehyde, and (6) Phosgene. The Subareas that experienced the greatest volumes of EHS shipments were (1) Cook Inlet, (2) Interior Alaska, (3) Kodiak Island, (4) Prince William Sound, (5) the Aleutians, (6) North Slope, and (7) Northwest Arctic. According to the data received and analyzed, the remaining Subareas (Southeast Alaska, Western Alaska, and Bristol Bay) saw little (less than 150 lbs) to no volume of EHS commodities shipped during the three-year time period evaluated.

5. The top three HS commodities transported within the State of Alaska were HC 2 (Gas Materials), HC 3 (Flammable Liquid Materials), and ORM-D (Other Regulated Materials). These commodities dominated the total volumes by several orders of magnitude due primarily to natural gas, crude oil, and produced water production and transport volumes within the State. After these commodities, HC 9 (Miscellaneous Materials), HC 5 (Oxidizer & Organic Peroxide Materials), and HC 8 (Corrosive Materials) consistently dominated the volumes of hazardous materials shipped from year to year. Following the trend noted above for the top three hazardous substances, the Subareas with the highest total volumes of hazardous materials shipped were (1) North Slope, (2) Cook Inlet, (3) Interior Alaska, and (4) Prince William Sound. These Subareas dominated the total volumes shipped over the three-year period by several orders of magnitude making up 99.99% of the total volume.

6. The top petroleum commodities transported within the State of Alaska remained very consistent in terms of product by volume from year to year. Crude oil shipments via the Trans-Alaska Pipeline and Cook Inlet Pipeline dominate the petroleum products shipped

within the state. The AFSC Pipeline provides significant volumes of jet fuel to the Ted Stevens International Airport day-to-day as well. As a direct result, the primary Subareas potentially impacted by these commodities are the North Slope, Cook Inlet, Interior Alaska and Prince William Sound. In general, the petroleum products most prevalent in Southeast Alaska, Kodiak Island, Aleutians, Bristol Bay, Western Alaska, and Northwest Arctic were primarily gasoline, diesel and heating oil type commodities.

7. By volume, commodities transported by pipeline dominate the total volume of hazardous materials shipped within the State specifically in the Hazard Class 2.0 and 3.0 categories (HC 2.1: Natural Gas, UN ID Number 1971, HC 3.0: Petroleum Crude Oil, UN ID Number 1267), and HC ORM-D (Other Regulated Materials): Produced Water, no UN ID Number).

8. The North Slope Subarea consistently maintains the highest volume of hazardous materials commodity shipments than any other Subarea in the State accounting for 63% of the total volume. The primary drivers for this conclusion are the presence of the North Slope Natural Gas, Produced Water, and Trans-Alaska pipeline systems. The annual production volumes from these pipelines are almost 50% higher than the Cook Inlet subarea. For Cook Inlet, the regional pipelines and the Alaska Railroad contribute greatly to the total volume for Cook Inlet that constitutes 36% of the total State volume. Both the North Slope and Cook Inlet Subareas are two orders of magnitude higher than the next highest volume subareas. Table 6-1 displays the total volume for each subarea.

Table 6-1. Subarea ranking based on total hazardous materials volume (3-Year total)[37]

Subarea	Total 3-Year HS Volume	Percent of Total Volume Shipped
North Slope	50,212,399,960,330	63.1589585%
Cook Inlet	28,721,315,976,165	36.1267019%
Interior Alaska	296,872,481,267	0.3734169%
Prince William Sound	270,960,131,488	0.3408234%
Western Alaska	19,515,026	0.0000245%
Northwest Arctic	15,851,238	0.0000199%
Southeast Alaska	14,460,255	0.0000182%
Aleutians	12,513,297	0.0000157%
Bristol Bay	11,447,867	0.0000144%
Kodiak Island	5,185,478	0.0000065%

[37] The volume/shipment for the North Slope, Cook Inlet, Interior and Prince William Sound are extremely high due to the shipment of HC 2.1 and 3.0 commodities via pipeline and/or railcar.

9. In general, the Cook Inlet Subarea experiences the highest number of hazardous materials shipments within the State, via all transportation modes, almost doubling the total for the Interior.

Table 6-2. Subarea ranking based on total number of hazardous materials Shipments (3-Year total)

Subarea	Total 3-Year HS Volume	Total 3-Year Shipments	Percent of Total Volume Shipped
Cook Inlet	28,721,315,976,165	5,479	36.1267019%
Interior Alaska	296,872,481,267	2,874	0.3734169%
North Slope	50,212,399,960,330	1,367	63.1589585%
Prince William Sound	270,960,131,488	719	0.3408234%
Aleutians	12,513,297	382	0.0000157%
Southeast Alaska	14,460,255	357	0.0000182%
Kodiak Island	5,185,478	245	0.0000065%
Western Alaska	19,515,026	207	0.0000245%
Northwest Arctic	15,851,238	192	0.0000199%
Bristol Bay	11,447,867	78	0.0000144%

10. The Subareas with the highest total volume of hazardous materials shipped were (1) North Slope, (2) Cook Inlet, (3) Interior Alaska, and (4) Prince William Sound. These Subareas dominated the total volumes shipped over the three-year period by several orders of magnitude making up 99.99% of the total volume. In order of total volume shipped, the remaining six subareas are ranked as follows: (5) Western Alaska, (6) Northwest Arctic, (7) Southeast Alaska, (8) Aleutians, (9) Bristol Bay and (10) Kodiak Island. Table 6-2 displays the ranking of subareas by total shipments. Table 6-2 lists the ranking of Subareas by total volume shipped.

11. In general, by volume, the commodities transported by pipeline dominate the total volume of hazardous materials shipped within the State by several orders of magnitude. Specifically, the primary commodities are natural gas, crude oil and produced water. Additionally, the volume of shipments by rail is significantly higher than all other remaining modes of transportation given the capacity of the various railcar options. The North Slope recognizes the highest volume of hazardous materials transported and is nearly 44% higher than the next highest Subarea (Cook Inlet). The Cook Inlet Subarea however, experiences the highest number of shipments of any other Subarea nearly doubling the number of shipments in Interior Alaska and more than tripling the number of shipments in the North Slope Subarea.

12. When only air, highway and marine transportation modes are evaluated, the Interior Alaska Subarea is the subarea with the highest volume of hazardous materials transported. Table 6-3 displays the subarea ranking when only evaluating air, highway and marine modes of transportation.

Table 6-3. Subarea ranking based on total hazardous materials Volume Shipped for Air, Highway and Marine (3-Year total)

Subarea	Total 3-Year HS Volume	Percent of Total Volume Shipped
Interior	380,563,478	34.6%
Cook Inlet	335,762,449	30.5%
North Slope	173,300,099	15.7%
Prince William Sound	132,024,143	12.0%
Western Alaska	19,515,026	1.8%
Northwest Arctic	15,851,238	1.4%
Southeast Alaska	14,460,255	1.3%
Aleutians	12,513,297	1.1%
Bristol Bay	11,447,867	1.0%
Kodiak Island	5,185,478	0.5%

13. The Pipeline mode of transportation accounts for 99% of the total volume of hazardous materials transported due to the volumes of Natural Gas, Crude Oil and other petroleum/HC 3.0 commodities (e.g. Jet Fuel, Diesel) carried within the North Slope pipelines, Trans-Alaska Pipeline, Cook Inlet Pipeline, AFSC Cross-town Pipeline, and the Kenai-Anchorage Pipeline.

14. Second to pipelines and after extracting the pipeline volumes, the railroad constitutes 97.7% of the volume of hazardous materials commodities shipped when compared to the other three transportation modes (air, highway and marine). The top rail corridors identified for the movement of hazardous materials are located within the Cook Inlet Subarea. Like pipeline shipments, commodities are consistent from year to year within the State.

15. The highway mode of transportation accounts for the majority of the total number of shipments within the State. Overall, by volume, the highway mode of transportation accounts for 0.0016% of the total volume shipped within the state. After extracting the pipeline data, the volume of hazardous materials commodities shipped makes up only 1.6% of the total volume, and after extracting the rail data the volume of hazardous materials shipped by highway constitutes 69% of the volume between highway, marine and air. The highway transportation mode moves hazardous materials that span the spectrum of commodities.

16. The top 5 highway corridors in terms of volumes of hazardous materials shipped are (1) Alaska Highway, (2) North Slope Haul Road, (3) Glenn Highway, (4) Richardson Highway, and

(5) Sterling Highway. In general, the primary highway corridors that are utilized to transport hazardous materials are located in and around, and in between the cities of Anchorage, Fairbanks, Valdez, and locations on the North Slope. Highway transportation is the dominant method for transportation of hazardous materials in terms of the total number of shipments in any given year.

17. It is suspected that transport of Chlorine is one of the highest EHS commodities shipped via the highway but the dataset did not support this. There were large marine shipments coming into Anchorage, but there was no equivalent trucking information for Chlorine beyond Anchorage.

18. Overall by volume the marine mode of transportation accounts for 0.0006% of the total volume shipped within the State. After extracting the pipeline data, the marine mode of transportation accounts for .6% of the total volume, and after also extracting the rail data the volume of hazardous materials shipped by marine constitutes 26% of the total volume between highway, marine and air. In general, the primary marine corridors for hazardous materials transportation are in and around Cook Inlet and associated ports, the Southeast Alaska Inside Passage and associated ports, and routes from Cook Inlet through the Aleutians and up to the North Slope. Marine Transportation of hazardous materials is second to highway in terms of the total number of shipments in any given year.

19. Air cargo transportation routes were analyzed by number of hazardous materials shipments from Ted Stevens International Airport in Anchorage to airports statewide, as reported by one air cargo carrier. The primary hazardous material commodities transported were HC 1 (Explosives), HC 3 (Flammable Liquid Materials), HC 8 (Corrosive Materials), and HC 9 (Miscellaneous Materials). In general, it is suspected that this combination of hazardous material commodities is fairly representative of what the other air cargo carriers would carry within the State. Based on the limited data received and analyzed, Bethel and Kotzebue consistently experienced the highest number of hazardous material shipments from year to year. As there are over 30 air carriers that could transport hazardous materials within the State of Alaska, this preliminary conclusion could change significantly if additional air cargo data were made available.

20. The 2008 Fixed Facility storage volumes represent 0.2% of the total volume shipped in 2008, via all transportation modes. After extracting the pipeline volume data, the Fixed Facility storage volume is five times larger than the total volume shipped in 2008. In several cases, the storage volume may go unchanged over extended periods of time, especially where substances are recycled and remain in the facility system. Examples include anhydrous

ammonia (used in refrigeration systems) and sulfuric acid (used for power generation and batteries).

21. The large majority of Tier Two Fixed Facilities are located in/around Cook Inlet and along the corridor between Anchorage and Fairbanks.

22. One of the primary limitations of this study was the reliance on disparate sources of data that varied tremendously from source to source in terms of detail, accuracy and coverage for the full spectrum of shippers. As a result, a significant amount of time was dedicated to data evaluation, refinement, interpretation and compilation to ensure systematic analyses could be conducted. While this result was not ideal and directly impacted the ultimate depth and detail of the analysis, very useful results were obtained.

23. The ability to QA/QC data received from multiple sources was sometimes problematic in that there was no foundation upon which to validate data entries. While in some cases errors were easy to identify, e.g. a misspelling, there was no way to determine if a specific volume entry was accurate or not. Consequently, there are some volume entries that are suspect. Assumptions can be made to correct those apparent input errors, but the assumptions were not able to be validated.

24. The Alaska Railroad Corporation prepares annual summaries of materials transported by rail. This list is based primarily on the broad hazardous materials categories (e.g. HC 1, 2, 3, 4, etc.), and not by specific HC divisions (e.g. 1.1, 2.1, 4.2, etc.). Discussions with the Alaska Railroad yielded key insight into some of the specific chemicals or substances shipped within each category.

25. A Hazardous Material Traffic Analysis for 2009 was received from Alaska West Express (AWE) that summarized percentages of 3,200 hazardous material shipments transported within the State during 2009. Although the nature in which the data was presented prevented it from being effectively integrated into the dataset that was evaluated, there were critical pieces of this report that were utilized to help facilitate development of this study.

26. As the conclusions drawn from a study of this nature are only as good as the data that is evaluated, it is critical that the dataset be as accurate and complete as possible to enable a more detailed capture of data (e.g. all by hazard class division and specific hazardous material description), and an assessment that yields greater granularity.

7. Recommendations for Future Hazmat Commodity Studies.

1. That additional data from all / more of the Air Cargo Carriers operating in the State be obtained to further delineate the transportation of hazardous materials via aircraft.

2. That on-site visits to air cargo carriers be conducted to facilitate capturing the hazardous materials air cargo data.

3. That for future studies a broader spectrum of shippers in the highway, marine and air transportation modes be accessed to further validate the conclusions/findings of this and follow-on reports.

4. That for future statewide studies, a longer time-line be identified and set aside (12 to 18 months) to conduct the Hazardous Material Commodity Flow Study.

5. That future Hazardous Materials Commodity Flow Studies should utilize field personnel at strategic shipping locations to identify and document shipments of hazardous materials via the various modes of transportation. This field-based approach, vice relying on shippers to provide the data would yield a more consistent and more accurate dataset across all modes of transportation to be utilized for an analysis of this nature.

6. That future studies consider focusing on a smaller regional or more localized on-site study to provide greater accuracy and granularity on the transportation corridors used to transport hazardous materials. The deeper level of detail will further enhance the information gleaned and used in the respective Subarea plans to increase awareness of first responders, and to develop community response preparedness.

7. That the methodology outlined in the PHMSA Guide to Conducting Hazardous Materials Commodity Flow Studies, although somewhat dated, be used as a guide for any subsequent studies.

8. That a database, similar to the Microsoft ACCESS Database generated for this report, be utilized to capture and maintain hazardous materials commodity flow data. A database of this structure enables simplified data entry, data analysis, report generation, and data maintenance.

8. Appendices

Appendix A **Data Set used for Statewide Hazardous Material Commodity Flow Study**

Appendix B **Agency Hazardous Material Commodity Flow Study Information Requests**

Appendix C **List of Data Collection Contacts**

Appendix D **Bibliography**

Appendix E **Transportation Route Identifiers**

Appendix F **Acronyms and Abbreviations**

Appendix A: Data Set used for Statewide Hazardous Material Commodity Flow Study

Data was not reproduced due to length but is available through ADEC upon request.

Appendix B: Agency Hazardous Material Commodity Flow Study Information Requests

The following pages contain data request forms used to compile information for the Hazardous Materials Commodity Flow Database.

Appendix C: List of Data Collection Contacts

Agency	Role	POC	Contact	Information Provided for Study?
Federal				
USCG HQ CG-611	FOIA Coordinator	Mr. Don Taylor	Yes	No response to FOIA email of June 2010
		Dawn Patterson	Yes	Spill information for 2005 to 2009
USCG HQ CG-5223	CG-5223 Chief	CDR Mike Roldan	Yes	POC - Mr. James Bull
USCG HQ	Cargo and Facilities Division	Mr. James Bull	Yes	No return call - FOIA submitted June 2010
USCG MSU Valdez	Commanding Officer	CDR Darryl Verafaille	Yes	CG MSU Valdez Marine Terminal Info
		MST1 Angela Roman	Yes	CG MSU Valdez Marine Terminal Info
USCG D17	D17 Dpi	LCDR Gary Koehler	Yes	Facilitated FOIA Request
USCG D17	D17 Dpi Division	LT Rob Fields	Yes	Facilitated FOIA Request
		LCDR Greg Versaw	Yes	Facilitated FOIA Request
USCG Sector Juneau	Commanding Officer	Capt Melissa Burt	Yes	Nothing to date
USCG Sector Anchorage	Commanding Officer	Capt Jason Fosdick	Yes	CG Sector Anchorage Marine Terminal Info
DHS & Emergency Mngmt		Mr. Brian Fisher	Yes	Nothing to date
CBP Anchorage		Called back - w/Contact	Yes	POC - Ms. Kimberly Fernandez
	Chief, Cargo Division	Ms. Kimberly Fernandez	Yes	Nothing to date
FAA	Deputy Regional Administrator	Mr. Greg Holt	No	N/A
DOT FHA Nat'l Hwy Institute	Hwy Perf. Monitoring System	Mr. Rich Barnaby	Yes	No pertinent information available.
	HPMS SME	Mr. Harshad Desai	Yes	Directed to State DOT for information
US Bureau of the Census	Truck Inventory & Use Survey	Mr. Julius Smith	Yes	No pertinent information available.
DOT RSPA	Hazmat Incident Reporting System	Ms. Sereta McCoy	Yes	No pertinent information available.
Office of Motor Carriers	Safety Net Database		Yes	No pertinent information available.
Chemical Manufacturers Assoc.			Yes	No pertinent information available.
FAA Regional Hazmat Contact	Northwest Mountain	Sky Landis	Yes	FAA Hazmat reporting requirements.
US EPA Alaska	Tier II Reports	Ms. Michele Sherwood	Yes	Tier Two Data for 2008
EPA	EPA Lacey Washington	Ms. Idell Hansen	Yes	Breakout of Tier Two data from CAMEO
US DOT Pipeline & Hazardous Materials Safety Administration	HMIC	Victoria	Yes	Pointed to www.RITA.dot.gov as a potential datasource
Research & Innovation Technology Administration Transportation Safety Institute	POC	Pete	Yes	Nothing to date
TSA	Rail Surface Inspector	Mr. Jim Caldwell	Yes	Assisted with FAA POCs
State				
Alaska DOT & PF	Highways & Public Facilities	Mr. Frank Richards	Yes	POC - Mr. Mike Coffey
		Mike Coffey	Yes	Nothing to date
	Prgm Coordinator for Safety & Health & Emerg. Mngmt	Mickey Hendrickson	Yes	No pertinent information available.
	Aviation & Airports	Statewide Aviation	Yes	Nothing to date
	Marine Operations	Mr. James Beedle	Yes	POC - Captain Dave Jancauskas
Alaska Marine Highway		Capt Dave Jancauskas	Yes	POC - Mr. Edzel Clayton
	Safety Officer	Edzel Clayton	Yes	Nothing to date
Alaska DEC	Spill Prevention & Response Division	Mr. Larry Iwamoto	Yes	Project Guidance
Alaska DEC	Pipeline Integrity Section	Mr. Sam Saengsudham	Yes	Nothing to date
		Mr. Roger Burleigh	Yes	Infor on Kenai-Anchorage pipeline
Alaska DNR Oil & Gas Division	Deputy Director	Mr. Kurt Gibson	Yes	Nothing to date
US DOT FAA Alaska Region		Admin	Yes	POC - Ms. Kelly Cuthbertson
Alaska FAA Security & Hazmat Office		Ms. Kelly Cuthbertson	Yes	Nothing to date
		Mr. Chris McCullough	No	N/A
Highway				
Lynden		None	Yes	Nothing to date
AK West		Mr. Jim Maltby	Yes	AWE 2009 Hazardous Material Traffic Study
AK Marine Trucking		None	No	N/A
Division of Commercial Vehhicle Enforcement		Ms. Laura Edwards	No	N/A

Agency	Role	POC	Contact	Information Provided for Study?
Carlile Transportation		Ms. Lisa Marquiss	Yes	Carlile shipping info for 2005-2009
Carlile Transportation		Mr. Russ Baker	Yes	Not necessary given Ms. Marquiss's support
		Ms. Lydia Reeves	No	N/A
AK Trucking Association		Mr. Aves Thompson	Yes	Nothing to date
Emerald Services			No	N/A
Alaska Pollution Control	Management	Mr. Adam Luchsinger	No	N/A
Alaska Pacific Environmental Services	President	Mr. Kirk Duncan	Yes	Info on primary transports - garbage
Entech Alaska, LLC	Manager	Mr. Tom Boling	Yes	Info on primary transports - medical waste
B&P Waste Services, INC	Management; President	Ms. Polly Kadel	Yes	Nothing to date
Red Diamond Center	Principal	Mr. Erick Watkins	Yes	Nothing to date
Talkeetna Refuse	Owner	Mr. William Stearns	Yes	Nothing to date
Hopkins Brothers Construction Co.	Owner	Mr. Jim Hopkins	Yes	General hazardous materials shipment info
Alaska Pacific Env. Services, LLC	Manager	Mr. Jeff Riley	Yes	Info on who handles hazardous materials
Cys Management Services, Inc.	Manager	Mr. Chris Hawe	No	N/A
Colville Fuel Services			Yes	Nothing to date
Peak Oilfield Services			Yes	Nothing to date
Weaver Bros., Inc.			Yes	Nothing to date
Big State Logistics			No	N/A
Military (DOD)		Mr. Bob Meno	Yes	General info on military shipments
CH2MHill			No	N/A
Air Carriers				
United Parcel Service			Yes	Nothing to date
Federal Express	FEDEX Freight HQ		Yes	Nothing to date
Surface Expedite		Corporate	Yes	Nothing to date
	Senior Claims Prevention Analyst	Mr. Kyle Godfrey	Yes	Nothing to date
	Senior Environmental Specialist	Mr. Bill Gebhart	Yes	Nothing to date
Temp-Assure			No	N/A
Lynden			Yes	Nothing to date
Lynden Air Cargo	Director of Cargo Operations	Mr. Jerry Stout	Yes	One carrier provided information on hazardous materials hipoments. This represents one of over 30 air cargo carriers.
Lynden Air Freight	Corporate HQ		Yes	
ACE Air Cargo	Dispatch	Unknown	Yes	
Everts Air Cargo	Hazmat Coordinator	Vince Sterogowski	Yes	
	Hazmat Cargo Manager	John Libal	Yes	
Hageland Aviation Services	Hazmat Coordinator	Jake Smith	Yes	
		Mr. Don Singsaas	Yes	
North Air Cargo		Mr. Mark Smith	Yes	
PenAir	Air cargo	Mr. Joe Reed	Yes	
Marine				
TOTEM Ocean Trailer Express	Anchorage Office & Terminal	Mr. Chad Basket	Yes	POC - Mr. Rand Lymangrover
	Tacoma facility	Mr. Rand Lymangrover	Yes	Info on TOTE hazardous materials shipments
Yutana Barge		Mr. Endil Moore	Yes	Nothing to date
Crowley Alaska		Mr. Bill Taylor	Yes	Nothing to date
Crowley Prudhoe Bay		Caroline	Yes	POC - Mr. Greg Pavellas; route information
Crowley Anchorage	Operations Manager	Mr. Greg Pavellas	Yes	Nothing to date
Crowley Seattle	Director of Contract Services	Mr. Jim Vanderveen	Yes	Nothing to date
Naknek Barge			No	N/A
Northland Services			No	N/A
AK Marine Lines	Barge Service		No	N/A
Lynden Transport	Ship Service		Yes	Nothing to date
Bering Marine	Contract Marine Services		No	N/A
Port of Anchorage		Mr. Stuart Greydanus	No	N/A
Railroads				
Alaska RR		Mr. Jim Seeberger	Yes	AK RR hazardous materials hipment data
Pipelines				
Alyeska Pipeline Service	Senior VP Operations Division	Mr. Mike Joynor	Yes	Nothing to date

Agency	Role	POC	Contact	Information Provided for Study?
Koch Pipeline	Corpus Christi, TX		Yes	Nothing to date
AFSC Crosstown Pipeline	Safety/Envt Manager	Ms. Amber Deem	Yes	AFSC Pipeline throughput for 2007 to 2009
Other				
Anchorage Hazardous Waste Collection Center			Yes	Nothing to date
Fairbanks North Star Borough Solid Waste Division		Mr. Ken Jackson	Yes	Nothing to date
		Mr. Bob Jordan	Yes	Nothing to date
		Mr. David Bradley	Yes	Nothing to date
UAA Logistics Professor		Prof Phillip Price	Yes	Nothing to date
AIS Data		Dave Eley	No	N/A
E&E	Staff	Ms. Liza Sanden	Yes	Extracted Tier Two data from CAMEO
E&E	Staff	Ms. Vivian Melde	Yes	Extracted Tier Two data from CAMEO
LEPCs				
Aleutian Pribilof	LEPC Coordinator & Chair	Chief Jamie Sunderland	Yes	Nothing to date
Anchorage	LEPC Support Staff	Ms. Nikki Stokoe	Yes	Nothing to date
Juneau	Staff	Mr. Daniel Garcia	Yes	Nothing to date
Cooper River	Chair	Mr. Pete Dalton	Yes	Nothing to date
Delta Greely	Chair	Mr. Mike Paschall	Yes	Nothing to date
Denali Borough	Chair	Mr. Steve Love	Yes	Nothing to date
Fairbanks	Chair	Mr. James Maltby	Yes	AWE 2009 Hazardous Material Traffic Study
	POC	Ms. Lisa Howard	Yes	Nothing to date
Ketchikan	POC	Mr. Mark Jaqua	Yes	Nothing to date
Kenai Peninsula	POC	Ms. Bonnie Hanson	Yes	Nothing to date
Kodiak Island	POC	Mr. Duane Dvorak	Yes	Nothing to date
Matanuska-Sustina	Chair	Ms. Sarah Sanderlin	Yes	Nothing to date
	Alternate POC	Mr. Jonathan Owen	Yes	Nothing to date
	Mat-Su Borough Emerg. Services	Casey Laughlin	Yes	Confirmation of Tier Two data availability
Nome	Chair	Mr. Tom Vaden	Yes	Nothing to date
Northern S.E.	POC	Ms. Sara Kinjo-Hischer	Yes	Willingness to assist if needed
North Slope	Chair	Mr. Federick Brower	Yes	Nothing to date
Northwest Arctic	Chair	Ms. Wendie Schaeffer	Yes	Nothing to date
Petersburg/Wrangell	Chair	Ms. Sandra K. Dixson	Yes	Nothing to date
Wrangell	POC	Mr. Doug McCloskey	Yes	Nothing to date
Sitka	POC	Mr. Dave Miller	Yes	Nothing to date
Southern S.E.	Chair	Mr. Brian Templin	Yes	Nothing to date

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Appendix E: Transportation Route Identifiers

Transportation Corridor	Transportation Corridor
A: Anchorage - Unalakleet	H: Homer Local
A: Anchorage - Aniak	H: JEWEL LAKE ROAD
A: Anchorage - Barrow	H: Kalifornsky Beach Road
A: Anchorage - Bethel	H: Kasilof Road
A: Anchorage - Dillingham	H: Kenai Local
A: Anchorage - Emmonak	H: KENAI SPUR ROAD
A: Anchorage - Fairbanks	H: KLONDIKE Hwy
A: Anchorage - Galena	H: Knik-Goose Bay Road
A: Anchorage - Iliamna	H: Kodiak Local
A: Anchorage - King Salmon	H: MINNESOTA DRIVE
A: Anchorage - Kodiak	H: MITKOF HIGHWAY
A: Anchorage - Kotzebue	H: N. Slope Haul Road
A: Anchorage - McGrath	H: Nikiski Local
A: Anchorage - Nome	H: NORTH KENAI ROAD
A: Anchorage - North Slope	H: NS Local
A: Anchorage - Red Dog Mine	H: OLD DENALI HIGHWAY
A: Anchorage - St. George	H: OLD GLENN HIGHWAY
A: Anchorage - St. Mary's	H: OLD NENANA HIGHWAY
A: Anchorage - St. Paul	H: O'MALLEY ROAD
A: Backhaul Anchorage	H: PARKS HIGHWAY
A: Backhaul Fairbanks	H: Port Access Road
A: Barrow - Deadhorse	H: Portage Glacier Hwy
A: Dillingham - King Salmon	H: Pt MacKenzie Road
F: Storage	H: RICHARDSON HIGHWAY
H: (1) Glenn Hwy-Tok Cutoff	H: Salcha Local
H: (1) Interstate a-1	H: SEWARD ANCHORAGE HIGHWAY
H: (11) N. Slope Haul Road	H: SEWARD HIGHWAY
H: (2) Interstate a-2	H: Seward Local
H: (3) Interstate a-4	H: SITKA HIGHWAY
H: (4) Richardson Hwy	H: Spine Road
H: Alaska Hwy	H: State Hwy 5
H: Anchorage Local	H: State Hwy 9
H: Beach Access Road	H: STEESE HIGHWAY
H: BIG LAKE ROAD	H: STERLING HIGHWAY
H: BIRCHWOOD LOOP ROAD	H: STERLING HIGHWAY 300
H: Bridge Access Road	H: TAYLOR HIGHWAY
H: CHENA HOT SPRINGS ROAD	H: Top of the World Hwy
H: COPPER RIVER HIGHWAY	H: ZIMOVIA HIGHWAY
H: DAVIS HIGHWAY	M: Aleutian Islands & Alaska Peninsula (Akutan, Chignik, Cold Bay, False Pass, King Cove, Sand Point, Unalaska/Dutch Harbor)
H: DAYVILLE ROAD	M: Bristol Bay
H: DENALI HIGHWAY	M: Cook Inlet
H: DIMOND BOULEVARD	M: Cook Inlet - Kodiak
H: EDGERTON HIGHWAY	M: Haines - Juneau Ferry
H: ELLIOTT HIGHWAY	M: Homer - Kodiak
H: Fairbanks Local	M: Inside Passage / Southeast (Bellingham, Haines, Juneau, Ketchikan, Petersburg, Prince Rupert, Sitka, Skagway, Wrangell)
H: GEORGE PARKS HIGHWAY	M: Juneau - Ketchikan Ferry
H: GLACIER HIGHWAY	M: Kodiak
H: GLENN HIGHWAY	M: Kodiak - Dutch Harbor
H: Greatland Street	M: Kodiak Local
H: HAINES HIGHWAY	M: North Slope
H: Healy Spur Road	M: Northwest Arctic

Transportation Corridor
M: Prince William Sound
M: Seward
M: Skagway - Haines Ferry
M: Southeast Alaska (Chengega Bay, Cordova, Homer, Kodiak, Port Lions, Seldovia, Seward, Tatitlek, Valdez, Whittier)
M: Southeast Feeder (Angoon, Hollis, Hoonah, Kake, Metlakatla, Pelican, Tenakee Springs)
M: Unimak Pass
M: Valdez - Whittier Ferry
M: Western Alaska
M: Whittier - Cordova
P: AFSC Crosstown Pipeline
P: Cook Inlet
P: Kenai - Anchorage
P: North Slope - Valdez
P: North Slope Process
P: Pump Station 1 - Valdez
R: Anchorage - Fairbanks
R: Fairbanks - Eielson, AFB
R: Portage - Anchorage
R: Seward - Portage
R: Whittier - Portage

Appendix F: Acronyms and Abbreviations

ADEC	Alaska Department of Environmental Conservation
ADMVA	Alaska Department of Military and Veterans Affairs
AFB	Air Force Base
AFSC	Anchorage Fueling and Service Company
AKDOTPF	Alaska Department of Transportation and Public Facilities
AS	Alaska Statute
AWE	Alaska West Express
BB	Bristol Bay
CAA	Clean Air Act
CAMEO	Computer Aided Management of Emergency Operations
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
CHRIS	Chemical Hazard Response Information System
CI	Cook Inlet
COFC	Container on Flat Cars
CWA	Clean Water Act
DHS	U.S. Department of Homeland Security
DOT	U.S. Department of Transportation
EHS	Extremely Hazardous Substance
EPA	Environmental Protection Agency
EPCRA	Emergency Planning & Community Right-to-Know Act
ER	Emergency Response
FAA	Federal Aviation Administration
FHA	Federal Highway Administration
FMCSA	Federal Motor Carriers Safety Administration
FRA	Federal Railroad Administration
HAZMAT	Hazardous Materials
HC	Hazard Classification
HMT	Hazardous Materials Transportation
HS	Hazardous Substance
IATA	International Air Transport Association
ID	Identification
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
INT	Interior Alaska
KI	Kodiak Island
LC50	Lethal Concentration 50
LEPC	Local Emergency Planning Committees
MCi/g	Microcurie per gram
MISLE	Marine Information for Safety and Law Enforcement

MSDS	Material Safety Data Sheet
MSHA	Mining Safety and Health Administration
NA	North America
NS	North Slope
NTP	Notice to Proceed
NWA	Northwest Arctic
ORM-D	Other Regulated Materials
PHMSA	U.S. Department of Transportation Pipeline & Hazardous Materials Safety Administration
PWS	Prince William Sound
SARA	Superfund Amendments and Reauthorization Act
SCP	Subarea Contingency Plan
SDDC	Service Deployment and Distribution Command
SEAK	Southeast Alaska
SERC	State Emergency Response Commission
TOFC	Trailer on Flat Cars
TOTE	Totem Ocean Trailer Express
UN	United Nations
USCG	United States Coast Guard
WAK	Western Alaska