<u>ANNEX L:</u> <u>HAZARDOUS MATERIALS</u>

The following information was extracted from the <u>State and Regional Hazard Profiles</u>, Easton Environmental, May 1995.

This annex profiles the hazards associated with extremely hazardous substances in Alaska. It identifies the substances, where they are found, how they are transported, the risks they pose to the general public, and the current capability of industry and government to respond to large-scale accidents.

Extremely hazardous substances, for the most part, are those that pose an acute inhalable toxic threat to humans. A total of 20 different extremely hazardous substances are known to be present in amounts large enough to represent a potential toxic threat beyond the immediate working environment. The four substances present in greatest total amounts are hydrogen sulfide gas associated with crude oil production, anhydrous ammonia used primarily as a refrigerant, sulfuric acid and its solutions used for a variety of industrial purposes, and chlorine gas used for water and wastewater disinfection.

In some cases, vast amounts of extremely hazardous substances are present at a small number of facilities. Examining the prevalence of extremely hazardous substances in terms of the number of facilities at which they are stored or used results in a profile different than the profile based on total amounts. In this view, chlorine gas, which is found at 150 facilities, is the most prevalent, followed by anhydrous ammonia (102 facilities), sulfuric acid (29 facilities), and sulfur dioxide (7 facilities).

The distribution of extremely hazardous substances in Alaska falls into relatively distinct and predictable patterns. Hydrogen sulfide gas occurs only in association with crude oil production. Chlorine is found primarily at the municipal water and wastewater treatment facilities and seafood processing facilities of coastal southcentral and southeastern Alaska -- as well as larger municipal facilities on the highway system. Anhydrous ammonia is found typically in coastal communities with seafood processing facilities. Sulfuric acid occurs at major industrial facilities, and sulfur dioxide is found at larger industrial and more sophisticated wastewater treatment facilities. Many of the more exotic substances occur at a small number of industrial or transshipment facilities.

The vast amount of hydrogen sulfide gas on the North Slope ranks that region as having the largest amount of extremely hazardous substances. The Cook Inlet, Southeast and Northwest Arctic regions follow, each with a significant share of the total quantity. Amounts present in all other regions are small by comparison.

Major routes and modes of transportation of extremely hazardous substances into and around the state are relatively simple. Interstate transport of extremely hazardous substances consists nearly exclusively of transport of substances into the state from the southern contiguous states by water. The vast majority of extremely hazardous substance shipments transit the Gulf of Alaska and enter the state at the port of Whittier via Prince William Sound or the port of Anchorage (and Kenai) via Cook Inlet. Upon arrival in Alaska, extremely hazardous substances are transported via the Alaska Railroad rail system, the highway system, or local road systems to final destinations.

With a scattered and largely rural population, the potential for an accidental release of an extremely hazardous substance with catastrophic consequences -- say impacting over 1000 persons -- in Alaska is confined to a handful of population centers. On the other hand, release consequences evaluated in terms of the percentage of a community's population impacted and the degree of impact could still be great in many Alaskan communities.

Three compressed gases pose the greatest risk to communities in Alaska: chlorine, sulfur dioxide and anhydrous ammonia. Chlorine gas, by far, presents the greatest threat to community populations in Alaska. That it is commonly found at municipal facilities, often in more densely populated areas, is responsible for the high risk ranking. Sulfur dioxide, though not nearly as prevalent as anhydrous ammonia, presents the next greatest risk. Here again the high risk ranking is primarily due to the chemical's presence at more sophisticated municipal and industrial facilities in highly populated areas. Finally, risk associated with use and storage of anhydrous ammonia, though less than the other two compressed gases, is still substantial.

The risk the three compressed gases pose to the general public of the Cook Inlet region exceeds the combined risk for the rest of the state. The higher degree of risk is primarily a result of the presence of chlorine gas in populated areas. Interestingly, the region facing the next greatest degree of risk is Southeast though it contains less quantities of hazardous substances than some of the other regions. Risk in this region is due to the widespread use of chlorine gas for water treatment in smaller, but densely populated communities. The Southeast Region is followed by the Kodiak and Interior regions. Anhydrous ammonia use by seafood processors poses the main chemical risk in the Kodiak region. The use of chlorine for water treatment in the Fairbanks area presents the single greatest risk in the Interior region.

Response to a release of an extremely hazardous substance can be either defensive or offensive in nature. Defensive response measures include detecting a release, notifying the public and appropriate agencies, predicting plume movement, and protecting the public through evacuation or shelter-in-place tactics. Key to effective defensive response is a local emergency plan to guide the effort. Offensive response includes monitoring chemical concentrations and entering hazard zones to effect rescue, control, decontamination or other objectives. Key to effective offensive response is a well-trained and practiced HazMat team. Such teams, though, are expensive to equip and train, and maintaining a level of proficiency commensurate with the risk to responders is also costly.

A degree of defensive response capability, as evidenced by the existence of local emergency response plans, exists in the Fairbanks North Star Borough, the City of

Petersburg, the Ketchikan Gateway Borough, and the southern zone of the Kenai Peninsula Borough. Many of the Local Emergency Planning Committees are making progress towards defensive response capability by developing local emergency response plans.

Local HazMat response teams provide a degree of offensive response capability for the Municipality of Anchorage and the Fairbanks North Star Borough.

Areas with a high degree of risk and no offensive response capability include the Kodiak Island Borough, the City and Borough of Juneau, the City and Borough of Sitka, the Petersburg/Wrangell planning district and the Ketchikan Gateway Borough. Areas with substantial risk and no or limited offensive response capability include the Northern and Southern Southeast Planning Districts, the Prince William Sound Planning District, the Kenai Peninsula Borough Planning District, the Aleutians East and Aleutian and Pribilof Planning Districts, the Bristol Bay Planning District, and the Northwest Arctic Borough Planning District.

APPENDIX I - OVERVIEW OF CHEMICAL HAZARDS

This appendix discusses chemical hazards in general and in Alaska. It is intended to provide some background for readers that may not be familiar with the hazards posed by extremely hazardous substances.

1. **Release and Dispersion Mechanics:** Extremely hazardous substances in Alaska include compressed and refrigerated gases, liquids and solids. The ways in which each is released and disperses in the environment differ.

   Gases

   Compressed and refrigerated gases can be released directly into the environment and spread under the influence of meteorological conditions. The rate at which a compressed gas is released depends on such factors as the amount of the substance in the container, the temperature of the substance, and the size of the hole through which the gas escapes.

   Once released, compressed gases spread in a downwind direction under the influence of meteorological conditions and gravity. The spread of compressed gases is particularly sensitive to wind speed. The slower the wind speed, the further high concentrations of gases will reach.

   Liquids

   Liquids are normally assumed to be dispersed into the atmosphere through evaporation. The evaporative rate is largely a function of chemical properties, the temperature of the liquid, and the surface area of the pool. The rate of release of liquids to the atmosphere through evaporation at normal temperatures is usually much slower than that for compressed gasses. As a result, even highly toxic liquids are far less likely to cause off-site impacts than the compressed gasses -- provided the liquids are released and remain at ambient temperatures.

   It is important to note that heating toxic liquids as a result of fire or other chemical reactions can dramatically increase release rates and downwind impact distances. Highly reactive liquids, such as strong acids, react with many substances while generating heat which increases evaporative rates. Chemical reaction of liquids with substances in the environment upon release can also produce toxic gases as products of reaction.

   Under certain conditions, liquids can also be introduced into the environment as fine aerosols which behave much like gases.

Solids

Finely divided solids can be released by explosion or other physical means and may disperse much like gases. Like liquids, solids can also react with other substances to release toxic gases.

2. Causes of Releases

Causes of chemical accidents in Alaska are expected to mirror causes reflected in nationwide records. In a general sense, causes of most chemical accidents fall into three primary (but not entirely distinct) categories: human error, fire, and natural disasters.

Human Error

The single greatest cause of chemical releases reflected in nationwide records is -- directly or indirectly -- human error. Inadequate training, lapses in judgment, and inadequate number of personnel appear repeatedly in the records as the cause of chemical accidents. The statistic suggests that the frequency of accidental releases is directly proportional to the level of human judgment and opportunity for mistakes. There is every reason to expect that the prevalence of human error as a cause of chemical accidents will apply in Alaska.

Fire

Fire is also a common, and in some ways a problematic, cause of releases. In closed systems, such as pressure vessels or refrigeration systems, increases in temperatures cause increases in internal pressure. To reduce the risk of explosion, most closed systems are equipped with some form of pressure relief device that will vent all or some of the system contents in the event of over-pressurization. Extreme temperatures associated with fires can be expected to result in the release of gases via these pressure relief devices.

For liquids, heat produced by fires increases vapor pressures and the rate at which liquids are released into the air. Fires can also produce or accelerate chemical reactions whereby toxic substances are created and dispersed. It is important to note that most plume models do not simulate the effects of fire and other chemical reactions.

One characteristic of fire, on the other hand, tends to reduce the effects of fire-associated releases. Produced heat forms strong vertical air currents that disperse emissions vertically, as opposed to horizontally along the ground surface.

Natural Disaster

Other causes of accidental chemical releases include natural phenomena such as earthquakes, and floods. With its active seismic zones, earthquakes may be a more likely cause of chemical releases in Alaska. Natural disasters can result in situations that exceed those contemplated in normal emergency planning.

3. Accident Frequencies

The expected frequency of accidental chemical releases on a unit basis will be higher in Alaska than on a national basis. Factors that will tend to increase the likelihood of a release include extreme environmental conditions, improper training, and lack of regulatory oversight.

Fixed Facilities

The Handbook of Chemical Hazard Analysis Procedures (Federal Emergency Management Agency -- FEMA et al, 1990) presents an approach for estimating the likelihood of releases from facilities. In formulating the approach, FEMA suggests that the frequency of significant accidents is largely a function of the number of containers, and whether the containers are in use or in storage: Primarily due to the potential for fire damage, FEMA concludes that the frequency of accidents is ten times greater for containers in warehouses and other storage facilities than for containers at medium size industrial facilities such as water treatment plants. FEMA also concludes that accident frequency varies directly with the number of containers. The more containers, the higher the likelihood of an accident.

The handbook suggests a failure rate for water treatment plants and other medium size industrial users of 1×10^{-4} failures per storage tank or pressure vessel per year. For warehouses and other storage facilities, the handbook suggests a failure rate of 1×10^{-3} failures per storage tank or pressure vessel per year.

While valve and piping leaks are far more common than container failures, such operational leaks are often detected and are often of a magnitude that does not pose a threat beyond the facility and immediate working environment.

As a result of the limited number of containers present at individual facilities in Alaska, the expected frequency of container failure at any single facility should never exceed 1×10^{-2} per year.

Bulk Marine Transport

The Handbook of Chemical Hazard Analysis Procedures (FEMA et al, 1990) states that marine transportation has the lowest accident rate per ton-mile and the lowest number of accidents of the various modes of transportation. The large energies involved when accidents do occur, however, can result in large cargo losses. The handbook estimates spill frequency for bulk marine transport based on the likelihood of vessel accidents per mile traveled or per port call. Suggested accident frequencies vary from 1×10^{-3} per mile for collisions and groundings in harbors and bays to 5×10^{-6} per mile for groundings on lakes, rivers and intercoastal waterways. Of the accidents involving single-hulled vessels, 25 percent can be expected to result in releases, and of these, 30 percent can be expected to result in the loss of 100 percent of one tank or compartment. This suggests large scale releases may occur at a frequency of 7.5×10^{-5} to 3.75×10^{-7} per mile traveled.

Bulk Rail Transport

The Handbook of Chemical Hazard Analysis Procedures (FEMA et al, 1990) estimates spill frequency for bulk rail transport based on the likelihood of accidents per rail car-mile. The handbook suggests a frequency for mainline accidents of 6×10^{-7} per car-mile and a frequency for yard accidents of 3×10^{-6} per car mile. Of the accidents, the handbook suggests that 30 percent can be expected to result in complete loss of cargo. This yields a frequency for large scale releases from mainline accidents of 1.8×10^{-7} per car-mile and 9×10^{-7} per car-mile for releases from accidents in rail yards.

Bulk Truck Transport

The Handbook of Chemical Hazard Analysis Procedures (FEMA et al, 1990) estimates spill frequency for bulk truck transport based on the likelihood of truck accidents per mile traveled, and the percentage of those accidents that result in a release of some or all of the contents. The handbook suggests use of an average accident rate of 2×10^{-6} accidents per mile for trucks carrying bulk quantities of hazardous materials. The method suggests that accidents result in spills 20 percent of the time, and of those, 20 percent will result in release of the entire cargo. Taking all factors into account, the handbook suggests that accidents will result in release of the entire contents at a rate of 8×10^{-8} per mile traveled per year.

4. Release Consequences

While releases of chemical substances can certainly affect the environment, release consequences are most often evaluated in terms of human injury and loss of life. If this standard is used, it goes without saying that the most severe consequences are associated with releases in highly populated areas. With a scattered and largely rural population, the potential for catastrophic consequences -- say impacting over 1000 persons -- in Alaska is confined to a handful of population centers. On the other hand, release consequences evaluated in terms of the percentage of a community's population impacted and the degree of impact could still be great in many Alaskan communities.

4. Risk

Risk is normally considered a function of both the likelihood of a release, and the severity of the consequences. Risk is greatest where a release is most likely to occur and the consequences would be most severe -- least where releases are highly improbable, and even if one were to occur, impacts would be minor. In a general sense, chemical risk in Alaska is not nearly as high as many parts of the nation. Nevertheless, many Alaskan communities are faced with some degree of chemical risk.

APPENDIX II - A CHEMICAL PROFILE OF ALASKA

This appendix profiles extremely hazardous substances in Alaska -- the substances and their characteristics, the facilities that use or store them, their transportation, the risks they pose, and the capability to respond to large scale releases.

1. The Substances

a. Chemical Inventory

Alaska is fortunate in that a limited number of extremely hazardous substances are known to be present in the state, and of the limited number identified only a few are prevalent. A total of 20 different extremely hazardous substances are known to be present in amounts large enough to represent a potential toxic threat beyond the immediate working environment (amounts exceeding threshold planning quantities). Those 20 substances are listed below in order of the total amounts thought to be present in Alaska -- from greatest to least.

- hydrogen sulfide gas associated with crude oil
- anhydrous ammonia as a compressed gas and as a refrigerated liquid
- sulfuric acid as a liquid and in solution
- chlorine as a compressed gas
- sodium cyanide as a solid and in solution
- formaldehyde gas in solution
- urea-formaldehyde solution
- hydrofluoric acid as a liquid and in solution
- hydrogen peroxide as a solution
- nitric acid as a liquid and in solution
- sulfur dioxide as a compressed gas
- acrolein as a liquid
- anhydrous hydrazine
- sodium azide
- tetraethylead
- sodium arsenite
- hydroquinone
- phenol
- xylylene dichloride
- potassium cyanide

In addition to the substances listed above, substantial quantities of other chemicals may be transported through the state aboard large vessels bound for Asian ports. No records are kept that detail the specific chemicals transiting the state.

b. Chemical Properties

Under certain conditions, all of the extremely hazardous substances present in substantial quantities in Alaska pose an acute inhalable toxic threat. Properties of some of the more common chemicals are discussed in the following paragraphs.

Chlorine

Chlorine is a greenish-yellow gas with a characteristic odor. It is neither explosive nor flammable, but is a strong oxidizing agent and will support combustion. It is only slightly soluble in water. At about two and one-half times the density of air, it will spread as a dense gas flowing downhill under the influence of gravity. The chemical has a strong affinity for many substances and will usually produce heat on reacting. While dry chlorine is non-corrosive at ordinary temperatures, it becomes extremely corrosive in the presence of moisture.

Chlorine gas is primarily a respiratory toxicant. In sufficient concentrations, the gas affects mucous membranes, the respiratory system and the skin. In high concentrations it can permanently damage the lungs and can cause death by suffocation. Liquid chlorine will cause burns if it comes in contact with skin or eyes.

Significant amounts of chlorine are used in Alaska for water and wastewater treatment. It is nearly always found in use, in transport and in storage as a liquefied compressed gas in 100- 150- and 2,000-lb pressure vessels. All vessels are equipped with fusible metal pressure relief devices to relieve pressure and prevent rupture in the case of fire or other exposure to high temperatures.

Response to chlorine releases may require Level A personal protective equipment. Repair kits are available from the Chlorine Institute and chemical suppliers. Chlorine can be disposed of by passing it through an alkali (caustic soda or soda ash) solution.

Anhydrous Ammonia

Anhydrous ammonia is a colorless gas with a characteristic odor. The term "anhydrous" is used to distinguish the pure form of the compound from solutions of ammonia in water. Like chlorine, anhydrous ammonia is neither explosive nor flammable, but will support combustion. It readily dissolves in water to form an aqua ammonia solution. Anhydrous ammonia is considerably lighter than air and will rise in absolutely dry air. As a practical matter, however, anhydrous ammonia immediately reacts with any humidity in the air and will often behave as a heavier gas. The chemical reacts with and corrodes copper, zinc and many alloys.

Anhydrous ammonia affects the body in much the same way as chlorine gas. Like chlorine, anhydrous ammonia gas is primarily a respiratory toxicant. In sufficient concentrations, the gas affects the mucous membranes, the respiratory system and the skin. In high concentrations it can cause convulsive coughing, difficult and painful breathing, and death. Anhydrous ammonia will cause burns if it comes in contact with skin or eyes.

Significant amounts of anhydrous ammonia are used in Alaska as a refrigerant -- most often associated with cold storage of seafood. The chemical is also present in very large quantities at a single urea production facility on the Kenai peninsula. It is nearly always found in transport and in temporary storage as a liquified compressed gas in 100-, 150- and 2,000-lb pressure vessels. All pressure vessels are equipped with fusible metal pressure relief devices to relieve pressure and prevent rupture in the case of fire or other exposure to high temperatures.

While packaging for transport and temporary storage is nearly uniform, and similar to that for chlorine, ammonia is often found in much larger volumes in the piping and receivers of refrigeration systems. There are numerous refrigeration systems in Alaska where the amount of anhydrous ammonia present exceeds ten thousand pounds.

Response to anhydrous ammonia releases may require Level A personal protective equipment. Repair kits are available from chemical suppliers.

Sulfuric Acid Solution

Sulfuric acid is a colorless, oily liquid. It is highly reactive and readily soluble in water with release of heat. Both the liquid and solutions will cause burns if allowed to come in contact with skin or eyes. Fumes are highly toxic, and heat as a result of fire or other chemical reaction can significantly increase emissions. Reaction of the acid with a variety of substances can also produce other toxic gases.

While sulfuric acid is a versatile and common industrial chemical, in Alaska sulfuric acid solution is most often found in use as a battery electrolyte, as part of the water treatment process for industrial boilers, as part of the cleaning process for fish meal plants, and in ore milling processes. Sulfuric acid solution is found across the state, but nearly always in association with larger industrial facilities.

Sulfur Dioxide

Sulfur dioxide is a colorless gas with a sulfur odor. Vapors are heavier than air and will spread as a heavy gas under the influence of gravity. It is soluble in water and with dissolution forms sulfurous acid, a corrosive liquid. Sulfur dioxide can irritate eyes and mucous membranes, and cause adverse health effects upon inhalation. Short term exposure to even small concentrations can cause death or permanent injury due to respiratory depression.

Sulfur dioxide is used in Alaska primarily for pulp production and wastewater treatment.

It is found at large industrial facilities and more sophisticated wastewater treatment plants.

Formaldehyde Solution

While formaldehyde at normal temperatures is a gas, it is found in bulk in Alaska only as an industrial solution. Toxic formaldehyde gas readily vaporizes from solution. The gas is more dense than air and will disperse as a heavy gas. Addition of heat will increase the rate at which formaldehyde gas is released from solution.

The gas is highly toxic and can cause adverse health effects at small concentrations.

While formaldehyde solution has a number of uses, it is used in bulk in Alaska primarily as a biocide, and occurs at fish hatcheries and in the oil production areas of Prudhoe Bay. It is most frequently found as a 37 percent solution in water.

APPENDIX III - EXTREMELY HAZARDOUS SUBSTANCES AT FACILITIES

This appendix examines extremely hazardous substances in use or storage at facilities in Alaska. Appendix IV addresses transportation of extremely hazardous substances into and around the state.

1. Chemical Quantities

Figure 1 shows the relative amounts of extremely hazardous substances in use or storage at facilities in Alaska. Of the extremely hazardous substances present, hydrogen sulfide gas clearly is reported to be present in the greatest quantities. Based on oil industry reports, there may be over 500 million pounds of hydrogen sulfide gas present in the pipelines and facilities of the North Slope. Anhydrous ammonia is present in the next greatest quantity (approximately 180 million pounds), followed by sulfuric acid and its solutions (approximately 5 million pounds) and chlorine gas (approximately 3 million pounds).

In some respects, however, the distribution of extremely hazardous substances by weight is distorted by the effect of a handful of facilities that are responsible for a disproportionate share of the total chemical quantity. The vast amount of hydrogen sulfide, for example, is a result of its presence in a single, isolated location. One urea production facility is responsible for over 99 percent of the total weight of anhydrous ammonia in the state. The pulp mills in Sitka and Ketchikan, and two transshipment facilities are similarly responsible for large amounts of certain chemicals. *Figure 2* shows the distribution of extremely hazardous substances exclusive of the vast amounts of hydrogen sulfide on the north slope and ammonia at the urea production facility in Kenai.

Examining the numbers of facilities known to store or use substantial amounts of extremely hazardous substances results in a significantly different (and perhaps better) picture of statewide chemical distribution. *Figure 3* shows the distribution of extremely hazardous substances in Alaska by numbers of facilities that use or store them. From this perspective, three substances clearly stand out as most prevalent: chlorine, anhydrous ammonia and sulfuric acid.

Figure 1 - Chemical Distribution by Substance (State of Alaska)

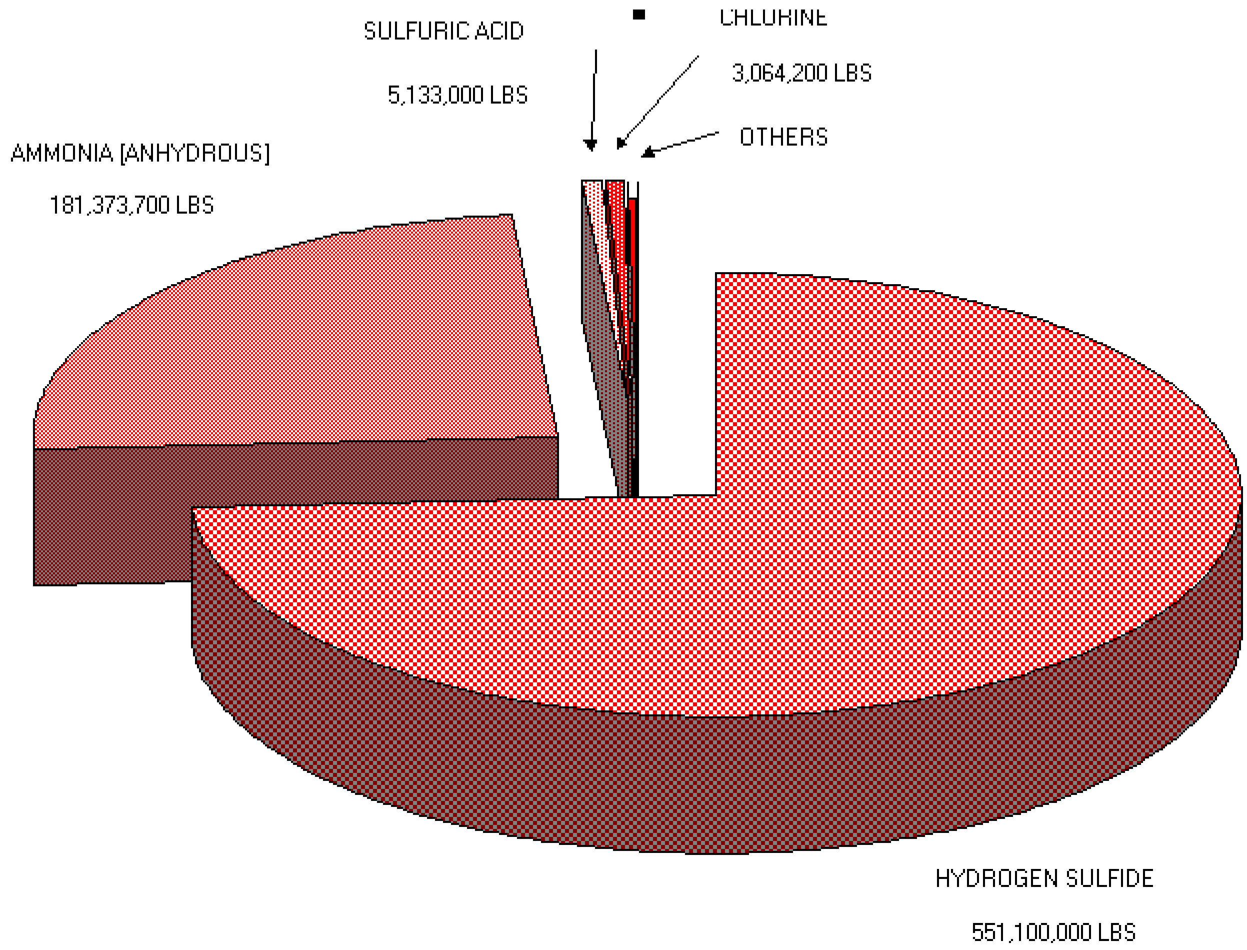


Figure 2 - Chemical Distribution by Substance (State of Alaska)

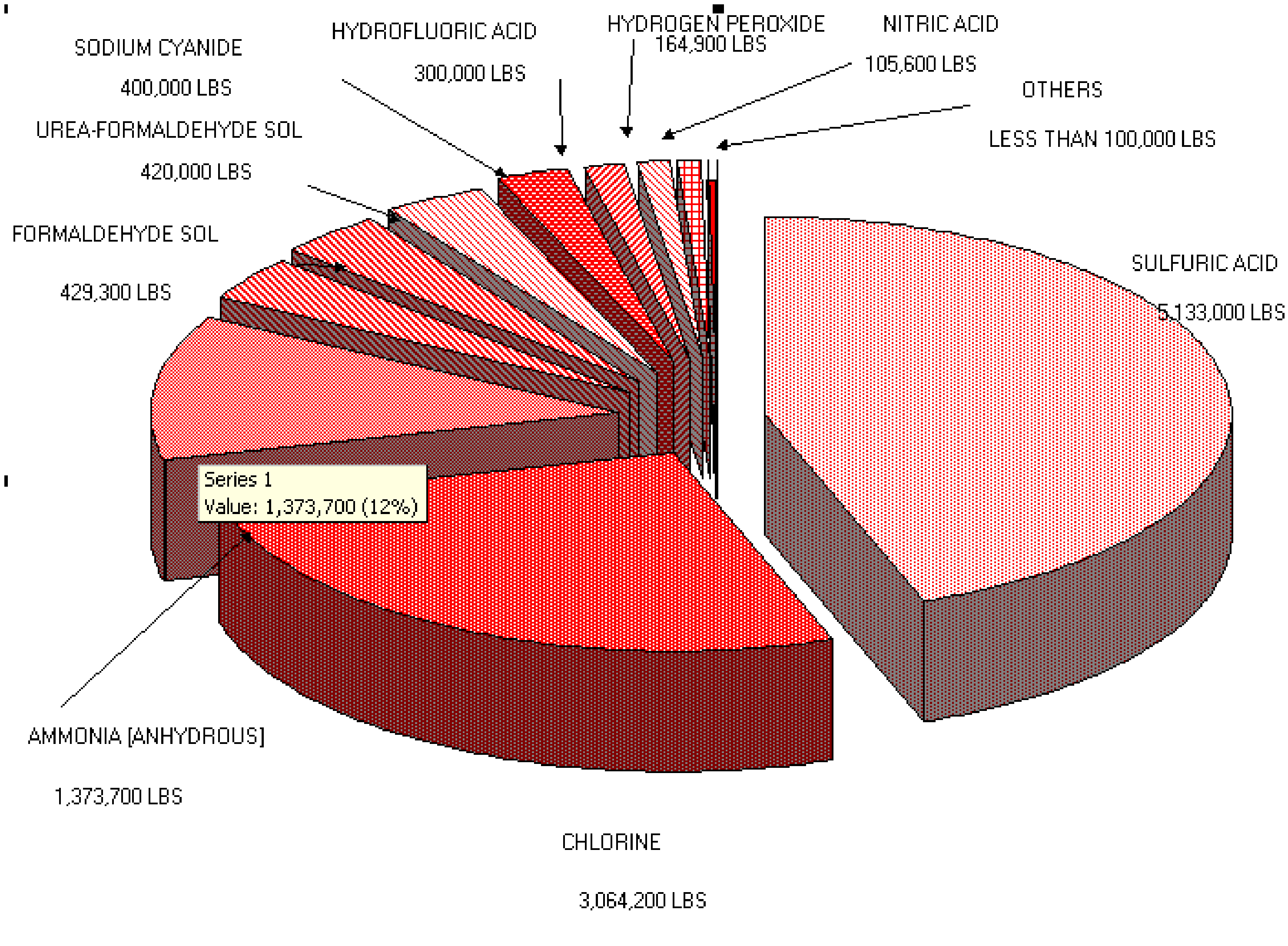
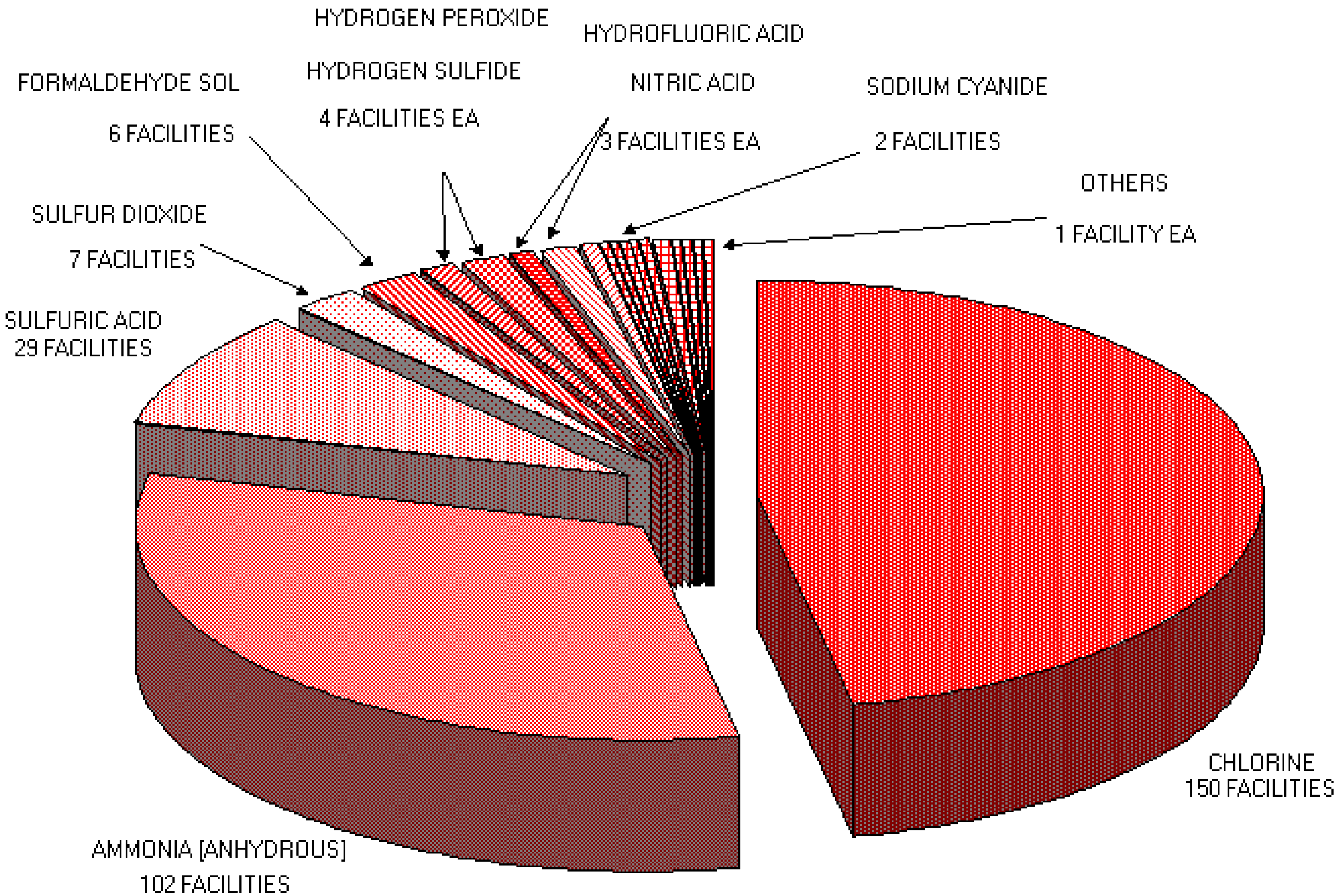


Figure 3 - Chemical Distribution by Facility (State of Alaska)



2. Geographic Distribution

Each Subarea Plan (Volume II of this Unified Plan) describes in detail the geographic distribution of extremely hazardous substances in that specific sub-area/region. In a more general sense, however, it is interesting to note that the distribution of extremely hazardous substances in Alaska falls into relatively distinct and predictable patterns. The patterns are a result of two primary influences: the uses of a substance, and how it is transported.

For example, the distribution of anhydrous ammonia -- used primarily as a refrigerant -- is simple: It mirrors the distribution of seafood processing centers with their large cold storage facilities. Similarly, sulfuric acid -- with a number of industrial uses -- occurs in the major industrial centers of the state.

The distribution of chlorine is more complex. Its primary use as a water and wastewater disinfectant does little to restrict its distribution -- water and wastewater treatment for both municipal and industrial purposes is required across the State. The distribution of chlorine in Alaska, instead, is affected primarily by transportation factors. Chlorine is found nearly exclusively in larger communities and military facilities where the pressurized cylinders can be transported over major road or rail systems, and in coastal locations from Bristol Bay south where the cylinders can be delivered year-round by water. Conversely, chlorine is not found in communities accessible only by air, or (with the exception of Kotzebue) in the northern coastal communities.

Figure 4 portrays the distribution of extremely hazardous substances by weight and planning region. The vast amount of hydrogen sulfide gas on the North Slope ranks that region as having the majority of extremely hazardous substances. The Cook Inlet, Southeast and Northwest Arctic subareas follow with significant shares of the total quantity. Amounts present in all other regions are small by comparison. *Figure 5* shows the distribution of extremely hazardous substances between planning regions exclusive of the vast amounts of hydrogen sulfide on the north slope and ammonia at the urea production facility in Kenai.

As discussed previously, a few facilities with massive amounts of substances tend to distort the distribution. Examining chemical distribution by numbers

Figure 4 - Chemical Distribution by Planning Region (State of Alaska)

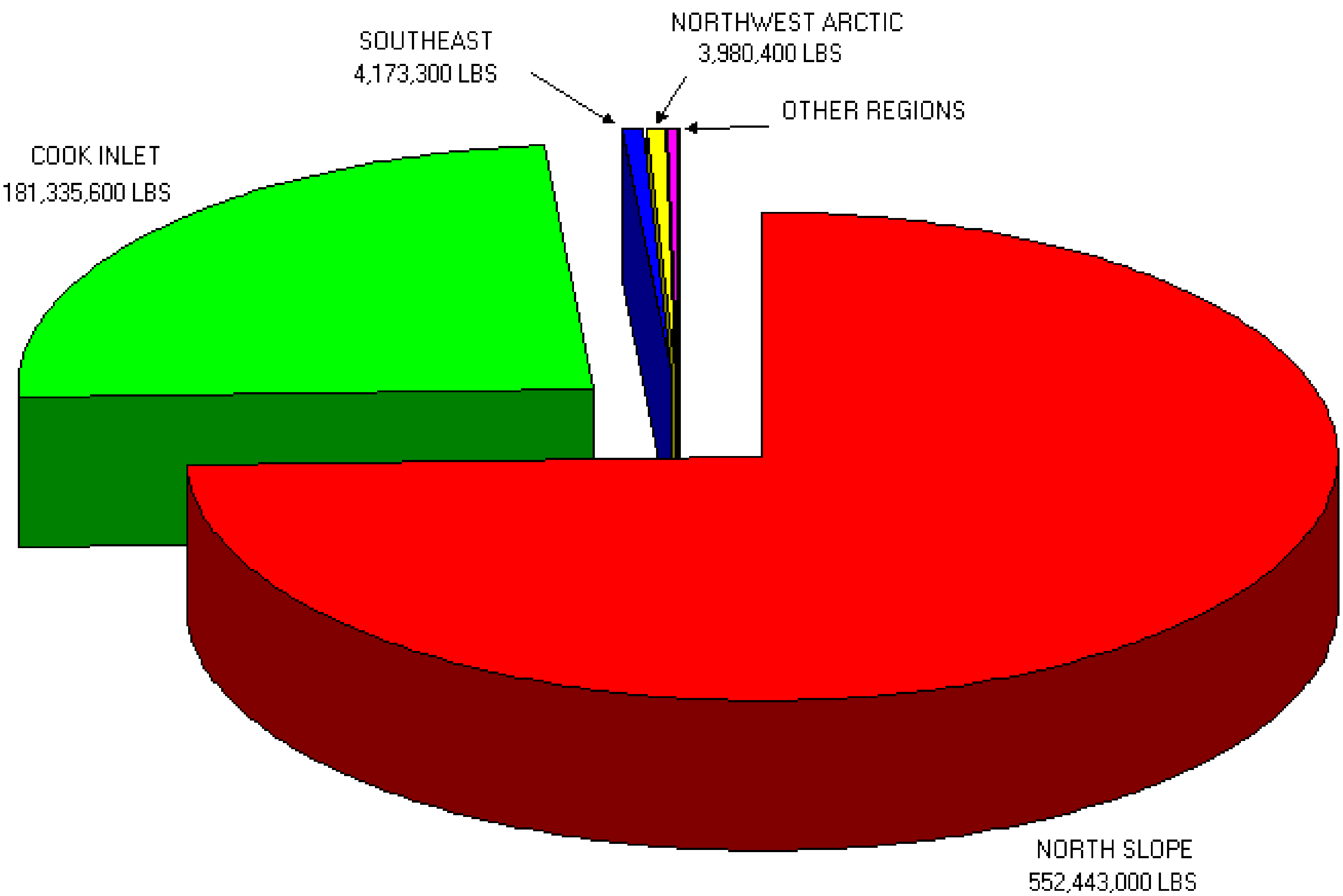
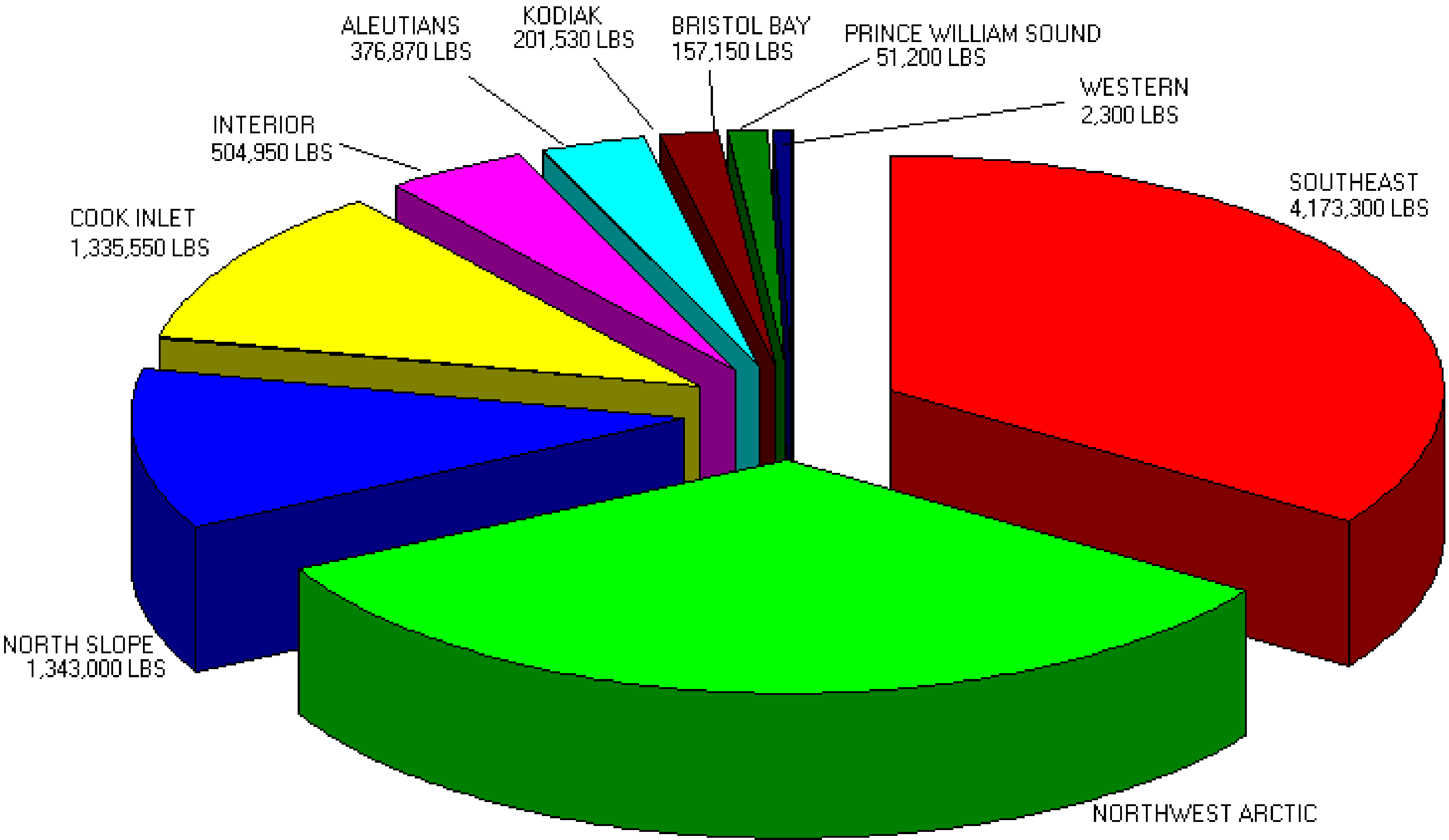


Figure 5 - Chemical Distribution by Planning Region (State of Alaska)



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of facilities that use or store extremely hazardous substances paints a different picture (*Figure 6*). In this view, extremely hazardous substances are most prevalent in the Cook Inlet region. The Southeast region also has a significant share of facilities. The number of facilities in the Aleutians, Kodiak, Interior, Prince William Sound, North Slope and Bristol Bay regions falls in a mid-range. The Northwest Arctic and Western regions have the fewest facilities.

3. Transportation of Extremely Hazardous Substances

a. Transportation Modes

Extremely hazardous substances are transported in Alaska by water, rail, road and pipeline. Despite some conflicting information, we were unable to verify transportation of extremely hazardous substances in amounts exceeding threshold planning quantities by air.

Characterizing the transportation of extremely hazardous substances into and around the state is difficult. While manifests -- or shipping papers -- accompany bulk shipments of hazardous substances, the manifests are filed away at the end of the journey. At this time, no entity enters shipping information into a database or compiles the information into a record. Adding to the difficulty, substances in transit are identified by U.S. Department of Transportation classifications and not by chemical name. Finally, corporate arrangements in some cases tend to blur what is being transported. Towing companies, for example, are not necessarily aware of the specific contents of their tows.

b. Major Transportation Modes and Corridors

Despite the difficulties, major routes and modes of transportation of extremely hazardous substances into and around the state fortunately are relatively simple (*Figure 7*). Interstate transport of extremely hazardous substances consists nearly exclusively of transport of substances into the state from the southern contiguous states by water. The only exception is transport of ammonia from the urea production facility in Kenai to points outside the state. The vast majority of extremely hazardous substance shipments transit the Gulf of Alaska and enter the state at the port of Whittier

Figure 6 - Distribution of Facilities by Planning Region (State of Alaska)

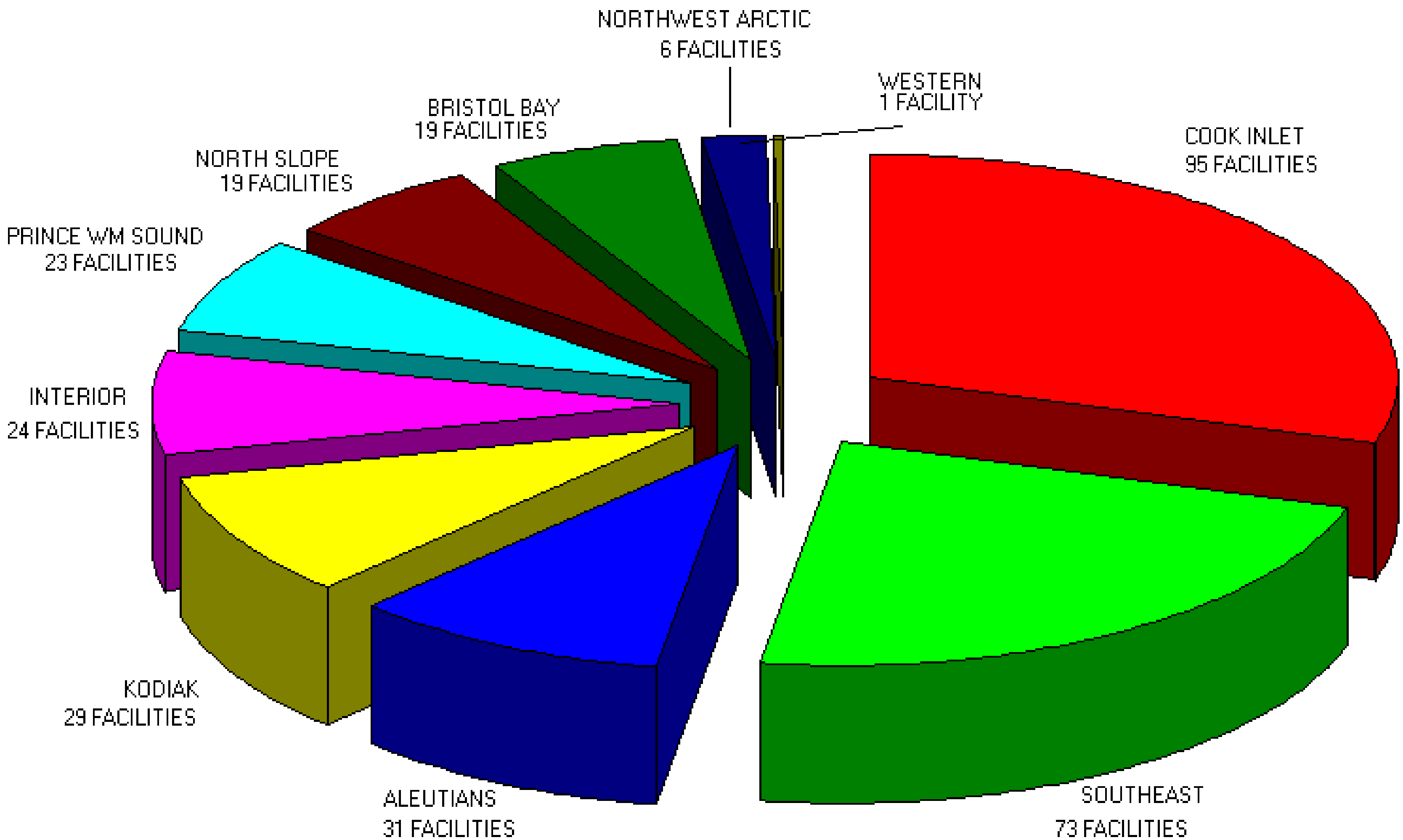

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Figure 7 - Major Transportation Corridors

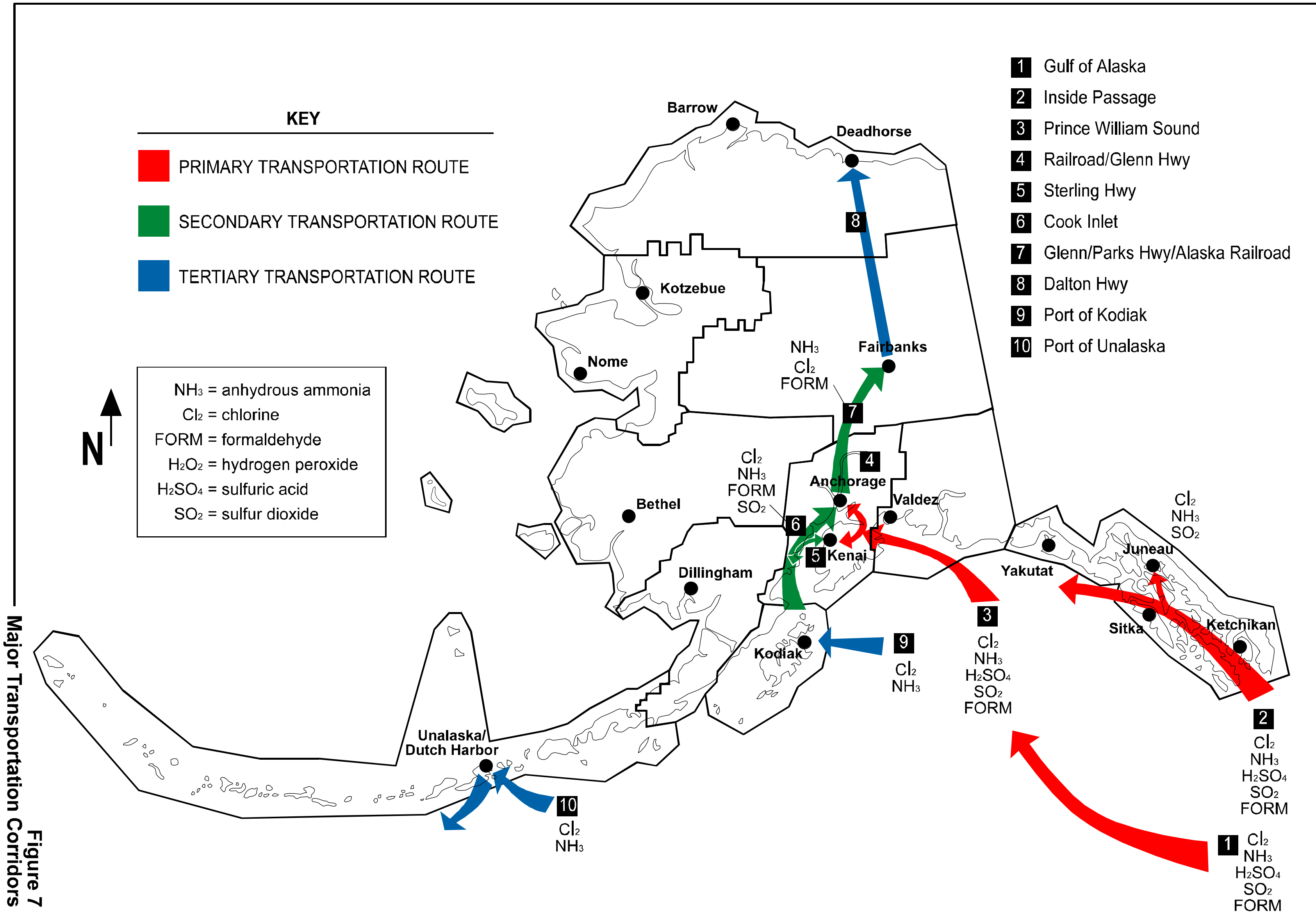

Figure 7 Major Transportation Corridors

via Prince William Sound or the port of Anchorage (and Kenai) via Cook Inlet. An exception to this primary flow is that vessels bound for the southcentral Alaska ports will use the inside passage of southeast Alaska to avoid foul weather in the Gulf. Vessels also use the inside passage to deliver substances to ports within the southeast region.

Shipments arriving at the port of Whittier are transferred to the Alaska Railroad and routed north or south. Shipments routed south on the rail system are transferred to trucks at the Crown Point industrial siding for distribution to facilities on the Kenai Peninsula. Shipments routed north on the rail system are transported to the Anchorage area where they are transferred to trucks for delivery to local facilities, or continue north on the rail system to Fairbanks.

Shipments arriving at the port of Anchorage are transferred to trucks for transport to local facilities or for transport over the highway system to Kenai Peninsula facilities to the south or Fairbanks and Prudhoe Bay facilities to the north.

Shipments of extremely hazardous substances are also received at the ports of Kodiak, Unalaska, and Cordova as well as the scattered seafood processing facilities in coastal communities from Southeast Alaska to Bristol Bay. In addition to commercial freight carriers, extremely hazardous substances are also delivered to seafood processing facilities aboard fishing industry vessels. Unalaska also receives vessels in route to west Pacific ports whose cargo may include extremely hazardous substances.

Finally, there are infrequent shipments of extremely hazardous substances along the western coast of Alaska to Kotzebue and the Red Dog mine marine terminal.

APPENDIX IV - CHEMICAL RISK

Figures 8 thru 11 depict the distribution of risk associated with accidental release of extremely hazardous compressed gases by planning region, planning district and community. One would expect risks to be greatest where compressed toxic gases are stored or used in heavily populated areas. In fact, the chemical risk in the Cook Inlet region, and particularly the Municipality of Anchorage and Kenai Local Emergency Planning Districts, eclipses the combined risk for the rest of the state. Interestingly, the region with the next greatest risk is Southeast. Risk in this region is due to the widespread use of chlorine gas for water treatment and the use of sulfur dioxide for wastewater treatment. In terms of chemical risk, the Southeast Region is followed by Kodiak and the Interior. Chemical risk in Kodiak is largely a result of the use of chlorine gas for water treatment, and the relatively large number of seafood processors using chlorine and anhydrous ammonia. The risk in the Interior region is nearly exclusively confined to the Fairbanks North Star Borough, and is likely underestimated since identification of chemical substances in the area is not as complete as for other areas.

Another way to examine the distribution of chemical risk is to look at the risk associated with each of the compressed toxic gases (*Figure 12*). From this perspective, chlorine gas, by far, presents the greatest chemical threat to community populations in Alaska. That it is commonly found at municipal facilities, often in more densely populated areas, is responsible for the high risk ranking. Sulfur dioxide, though not nearly as prevalent as anhydrous ammonia, presents the next greatest risk. Here again, the high risk ranking is primarily due to the chemical's presence at municipal facilities in highly populated areas. Finally, risk associated with use and storage of anhydrous ammonia, though less than the other two compressed gases, is still substantial.

As a rule-of-thumb for depicting chemical risks in Alaska: Three compressed gases pose the greatest risk: Chlorine, sulfur dioxide and anhydrous ammonia. Risk associated with release of sulfur dioxide is approximately twice that associated with anhydrous ammonia; and risk associated with release of chlorine is approximately twice that associated with sulfur dioxide.

Figure 8 - Risk Distribution by Planning Region (State of Alaska)

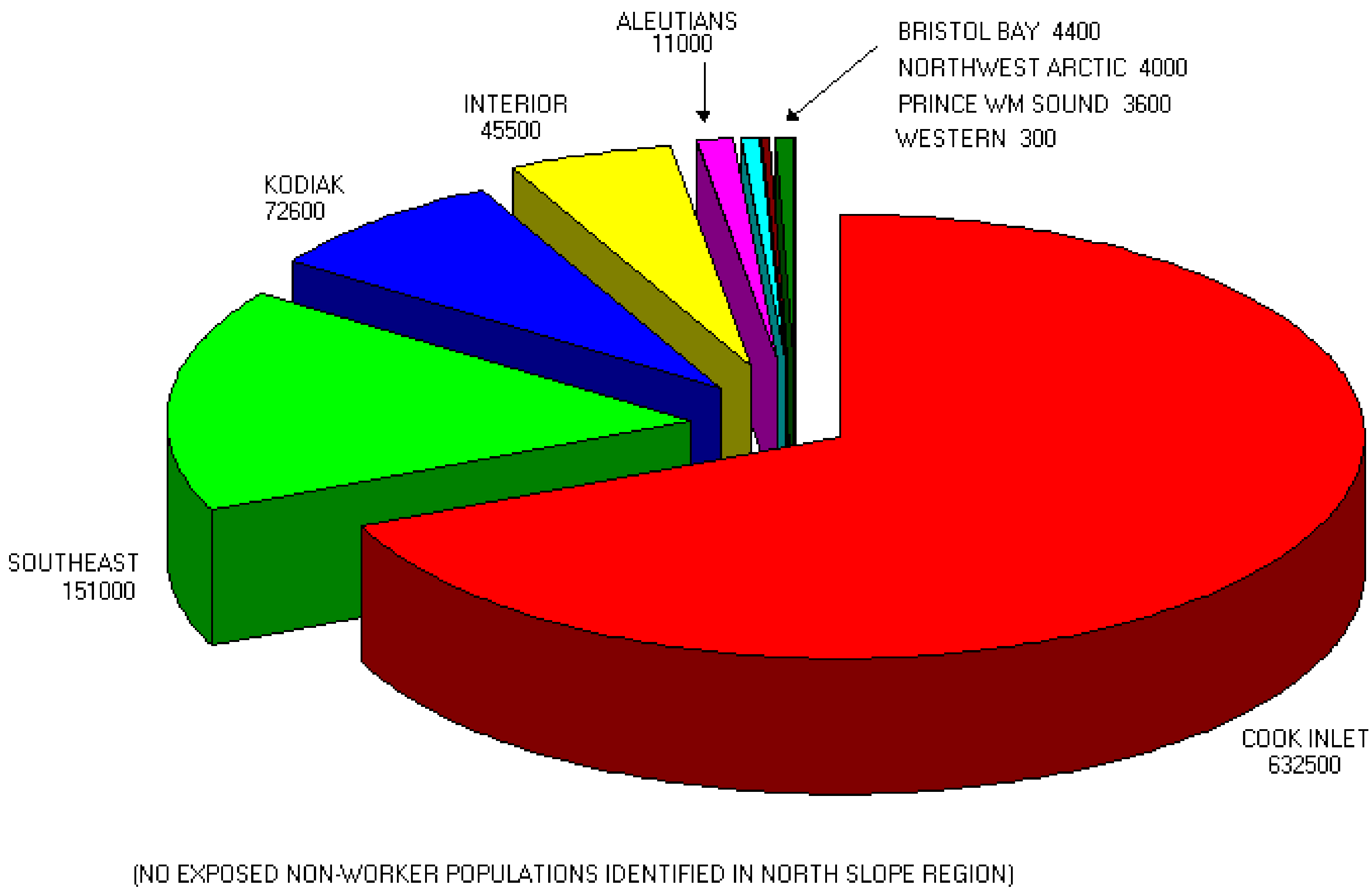

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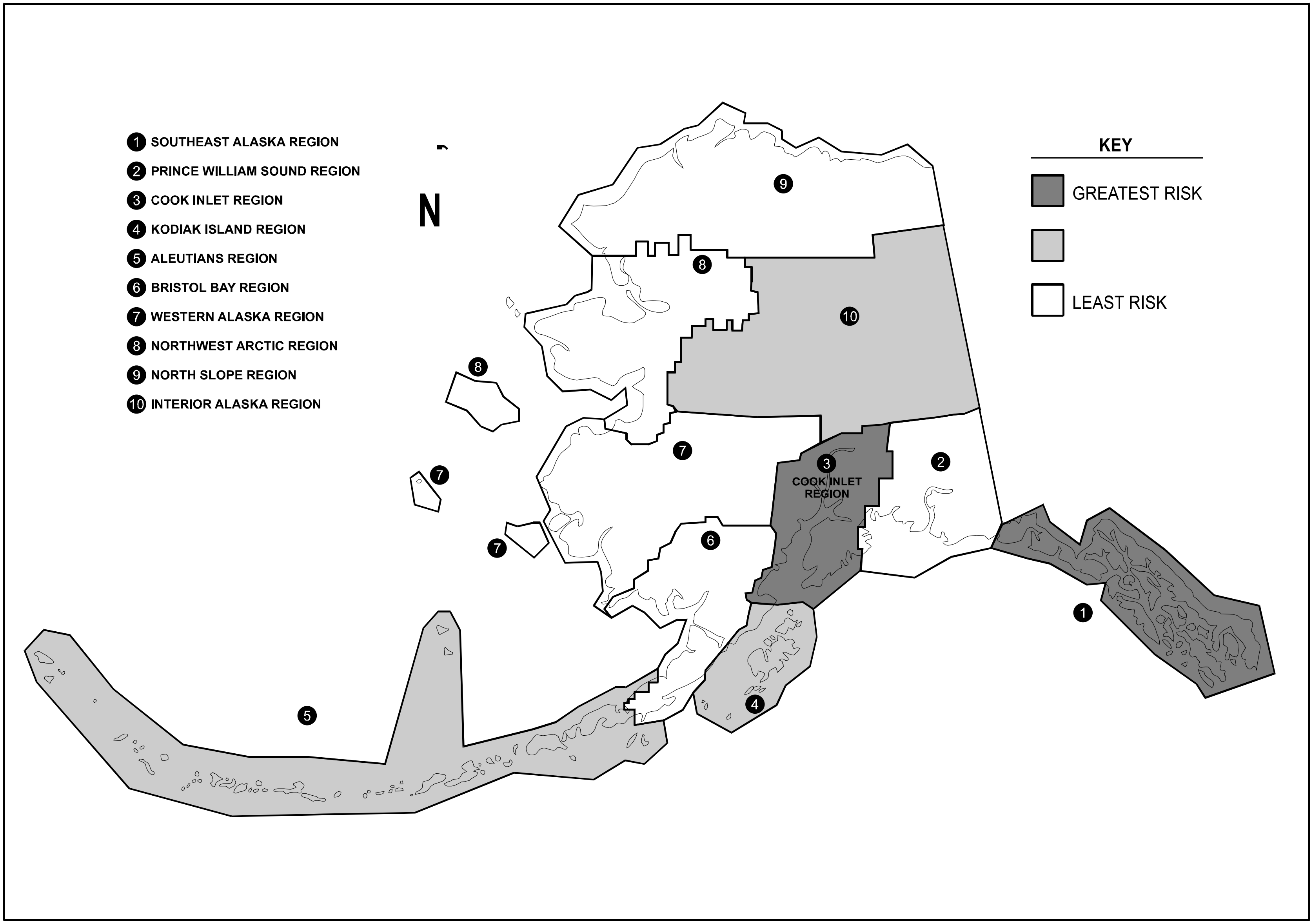
Figure 9 - Risk Distribution by Planning Region



(Change 1, May 1996)

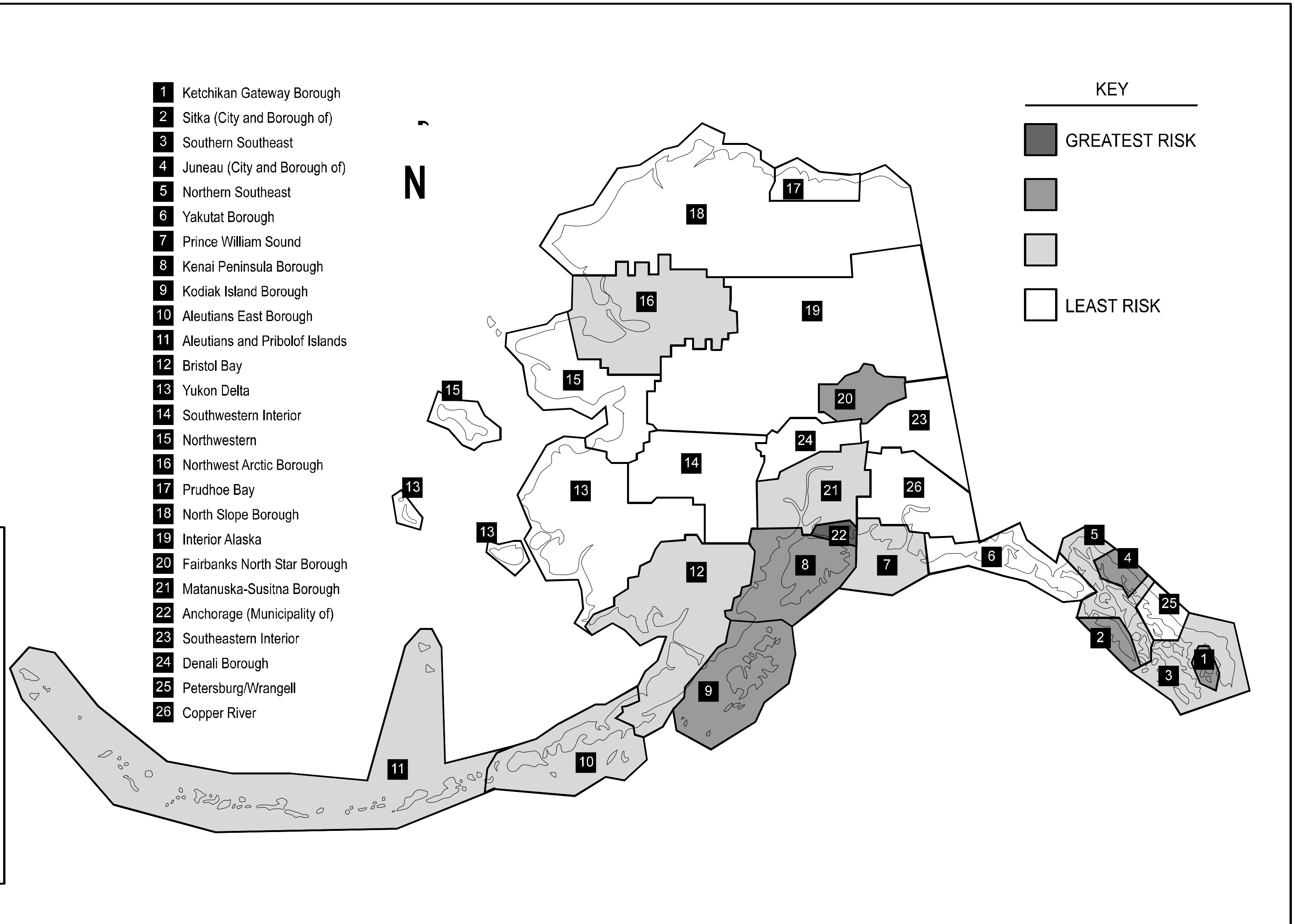


Figure 10
Risk Distribution by Planning District

(Change 1, May 1996)

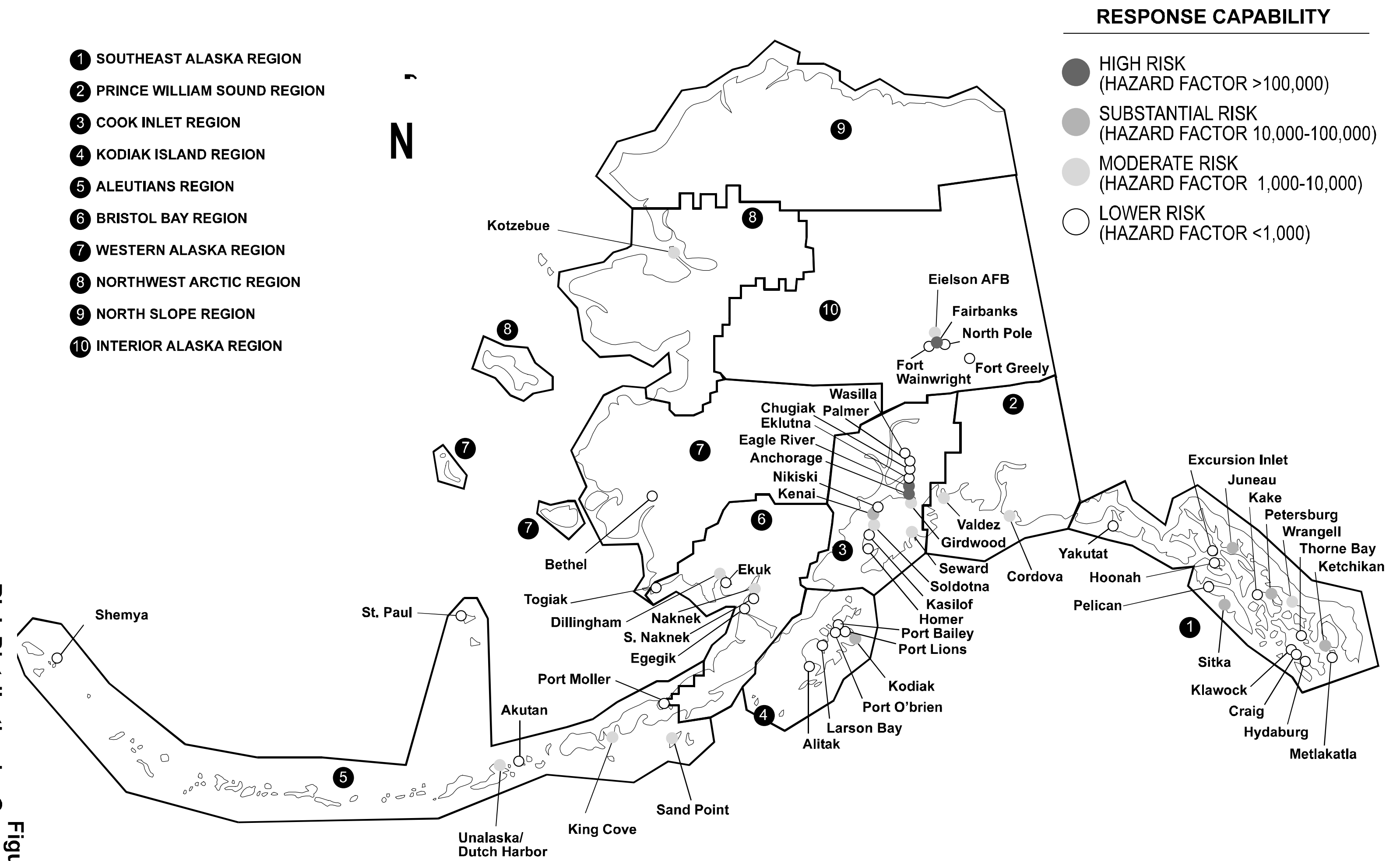
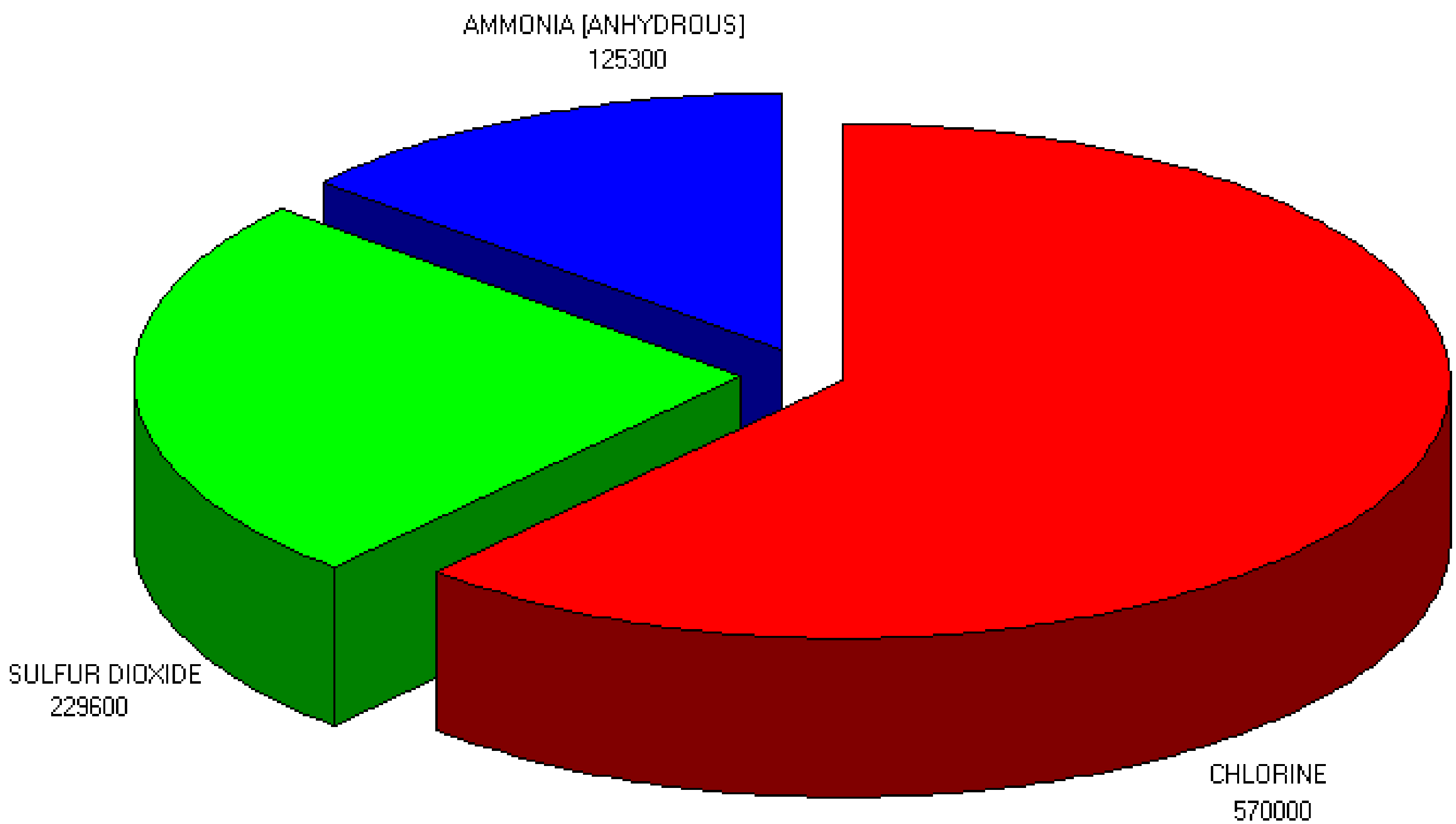


Figure 11
Risk Distribution by Community

(Change 1, May 1996)

Figure 12 - Risk Distribution by Substance



(Change 1, May 1996)

APPENDIX V - RESPONSE CAPABILITY

1. General: The Statewide Hazards Analysis noted serious deficiencies in the State's ability to respond to a hazardous materials incident. The limited offensive response capability is inadequate, and areas exist with significant risks and no response capability.

Many of the Local Emergency Planning Committees are making progress towards defensive response capability by developing local response plans. Focusing on offensive HazMat response capability: Areas with a high degree of risk and no offensive response capability include the Kodiak Island Borough, the City and Borough of Juneau, the City and Borough of Sitka, the Petersburg/Wrangell planning district and the Ketchikan Gateway Borough. Areas with substantial risk and no or limited offensive response capability include the Northern Southeast and Southern Southeast Planning Districts, the Prince William Sound Planning District, the Kenai Peninsula Borough Planning District (although some offensive response is available through the Municipality of Anchorage), the Aleutians East and Aleutian and Pribilof Planning Districts, the Bristol Bay Planning District, and the Northwest Arctic Borough Planning District. *Figure 13* examines the distribution of offensive HazMat response capability in relation to risk.

In an effort to fully inventory Level A/B HazMat response capabilities statewide, the Alaska Department of Environmental Conservation issued a professional services contract to Easton Environmental in May 1995, with final reports rendered in December 1995. The scope of work included two tasks: a detailed inventory of in-State Federal, State, Local, and private Level A/B resources; and recommending options for the development of an effective, in-State Level A/B response capability.

A total of 97 state, federal, local, and industry organizations were contacted, of which 34 organizations indicated they had level A/B response resources. Eighteen organizations responded with completed questionnaires. An additional five organizations were thought to have level A/B response resources. While the survey undoubtedly does not comprise a comprehensive inventory of A/B resources, the included facilities are thought to represent the major repositories of those resources. For example, not included (with the exception of UniSea's resources at Dutch Harbor and St. Paul) are the A/B resources at the numerous seafood processing facilities around the state. In talking with the processors, most indicated that resources are limited to those required to meet OSHA requirements and are very chemical- and facility-specific. There are undoubtedly small stores of OSHA-required equipment at other facilities such as municipal water treatment facilities as well.

2. Current Level A/B Response Capability:

a. Federal:

The Pacific Strike Team (located at Novato, California) maintains a Level A entry capability and may be requested by the Federal On-Scene Coordinator to respond to incidents in Alaska. The Strike Team maintains an alert standby posture and can be deployed to Alaska locations within 24 hours (weather permitting).

The U.S. Environmental Protection Agency capabilities include the use of EPA Technical Assistance Teams located in the lower 48 states. Additionally, the Coast Guard and EPA may call upon the Department of Defense's Alaskan Command (as a member of the Alaska Regional Response Team) to provide hazmat response resources (teams and equipment) from the U.S. Army at Fort Richardson or the U.S. Air Force at Elmendorf Air Force Base.

b. State:

The Alaska Department of Environmental Conservation (ADEC) is mandated by statute to respond promptly to a discharge of oil or a hazardous substance (AS 46.08.130). The ADEC may contract with a person, business or municipality in order to meet response requirements, or may establish and maintain a containment and cleanup capability (i.e., personnel, equipment and supplies).

Presently, the State of Alaska has no Level A or B hazmat response capability, although there is some possibility that ADEC response term contractors could be mobilized out of Anchorage in time to assist in certain hazmat responses. The ADEC has some monitoring equipment in Anchorage and Fairbanks and there is some capacity for the agency to assist local or nearby response efforts by monitoring airborne contaminant levels.

As an alternative measure, the ADEC is negotiating response agreements with local communities to enhance oil and hazardous substance response capabilities through the use of existing local resources. The ADEC will, in turn, reimburse the responding local community for expenses incurred during the response. Under the provisions of the local response agreement, the local community reserves the right to refuse an SOSC's request to respond based on local conditions and overall readiness capability.

The ADEC has formally entered into local response agreements with the Fairbanks North Star Borough (FNSB) and the Municipality of Anchorage (MOA) whereby the local Hazmat team may elect to respond on the State's behalf to an incident when requested by the State On-Scene Coordinator. These agreements address hazmat responses beyond the normal jurisdictional boundaries of the FNSB and MOA.

c. Level A/B Response Resource Summary:

Figure 14 summarizes some of the key characteristics of the 22 organizations with substantial A/B resources. It is important to note that not all of the organizations are actually organized into response teams. Some, for example, have substantial equipment and offer technical services, but are not primary responders. Others limit their response to defensive-type operations despite having entry-type training and gear. Of the 22 organizations, there are eight that comprise level A/B response teams, and another five level-B-only teams. Known level A and B entry teams are shown in Figures 15, 16, 17, and 18.

It is also interesting to examine the distribution of level A and B response capability in relation to the locations where extremely hazardous substances are found -- which can be roughly equated to the locations where a level A or B response might be required.

Resources may include trained personnel, equipment, or both. Personnel and equipment already organized as hazmat teams, of course, are the most formidable resources. The inventory, however, seeks also to identify significant stores of A/B response equipment in the absence of trained personnel, and vice versa. Such information may prove valuable when looking at ways to expand A/B response capabilities.

Aside from the task of developing options for a state-wide A/B response capability, the inventory is beneficial in many respects. In the unlikely event of a large -- or even catastrophic -- release of some sort, knowing what additional resources are located in the area could be important. Organizations with A/B response resources should also take the opportunity to compare their strategies and resources with those of other organizations.

d. Personnel:

Sources of hazmat response personnel fell into relatively distinct categories depending on the type of organization. Municipal organizations draw their hazmat personnel primarily from local fire departments. In most cases, hazmat response is simply one function of the local fire department(s) -- along with firefighting, other forms of disaster management and emergency medical services. Fire department hazmat personnel include both paid and volunteer members.

Primary hazmat team members for the single state response organization, the University of Alaska Fairbanks (UAF) Department of Risk Management and Safety, are drawn from both the staff of the UAF Department of Risk Management and Safety, as well as officers of the UAF Fire Department. UAF Fire Department firefighters are available to support primary team members as required.

Federal organizations with hazmat response capability draw members from defense installation fire departments. The military fire departments often include both military and civilian personnel.

Industry organizations with hazmat response capability draw personnel from two areas: facility workers and industry fire departments. The single exception is Philip Environmental which draws emergency response personnel from their pool of hazmat site and tank workers.

e. Equipment:

(1) Personal Protection Equipment (PPE)

The reported number of self-contained breathing apparatus (SCBAs) varied with the size of response organization from 3 to 140. MSA, Scott, Survivair and Interspiro products with 30- or 60-minute bottles are standard. Newer equipment tends towards the lighter, composite 60-minute models. Where reported, spare bottles are available at a ratio of between one spare for each unit to one spare for each two units.

The Life-Guard Responder is by far the most common level A suit. B suits are largely Tyvek/SARANEX or Chemrel products.

(2) Source Control Kits

Chlorine kits are common where a chlorine release is of concern. In most cases, response organizations reported that they have at least one kit for the predominant chlorine container size(s) in the area (or at the facility). Most organizations also have generic pipe and drum plug and patch tools and materials.

(3) Gas Detection and Monitoring

Essentially all organizations have electronic gas detection and monitoring equipment capable of at least measuring LEL, O_2, H_2S and CO concentrations. The variety in the types of equipment reported reflects the large number of manufacturers offering portable gas measuring equipment. All Municipality of Anchorage agencies are standardizing on ISC gas detection equipment.

f. Transport Capability: In most cases, hazmat response equipment is pre- staged in either a trailer or utility vehicle. For the most part, the gear is air transportable, though none of the organizations currently use aircraft as a primary means of mobilizing personnel and equipment. Based on the restrictions imposed by commercial airlines on certain response equipment (e.g., air cylinders), the Coast Guard and State are currently exploring other means for rapidly air deploying a Level A Hazmat team to a major release.

g. Response Areas and Frequencies

(1) Response Area: In nearly all cases formal response areas were limited to jurisdictional boundaries: local responders indicated that they will respond within city or borough limits, military organizations will respond within installation boundaries, industry personnel will respond inside the facility perimeter. The Fairbanks and Anchorage Hazmat Teams, through the local response agreements negotiated with ADEC, may elect to respond beyond jurisdictional boundaries (at the SOSC's request and with the concurrence of local officials).

While response areas are fairly clear-cut, several local organizations indicated that they would provide support upon request of another district with or without a mutual aid agreement under severe circumstances. Industry organizations were most emphatic about extra-jurisdictional response indicating that liability concerns would prohibit a response to other than a facility release. In most cases, however, industry allows its staff to serves as volunteers to local fire departments where duties may include hazmat response. In some cases, private organizations are willing to loan equipment and serve as technical resources to other response personnel.

(2) Response Frequency: There was a wide range in the number of actual hazmat responses conducted by the A or B response organizations in 1994. At one end, the Municipality of Anchorage Fire Department hazmat team responded to approximately 500 incidents ranging from carbon monoxide calls to chlorine and ammonia releases. The UAF hazmat team averages approximately 50 responses each year. Most of their responses are smaller laboratory-sized spills, though they expect one or two major responses per year. The number of responses tended to decrease from there, and many involved fuel spills only.

h. Administrative and Response Support

(1) Databases and Plume Prediction

The vast majority of response organizations use CAMEO/ALOHA. Several had the programs loaded on a portable computer. MSDSs are usually on file in hard copy form. Only the UAF Risk Management team indicated that they use the TOMES data base. The Anchorage Fire Department has ordered a weatherpak for on-site meteorological monitoring capability.

i. Availability:

Regarding the availability of personnel and equipment on extra-jurisdictional releases, the response from the industry organizations is clear: due primarily to liability concerns, industry personnel resources are not able to respond to extra-jurisdictional spills. For those industry organizations that draw hazmat team members from their everyday work force, the effect on operations is also an obvious and important concern. In some cases, industry organizations would (and do) make their equipment available to others, and allow their personnel to serve as technical resources. In most -- if not all -- cases, industry hazmat personnel are free to provide hazmat response as volunteer members of the local fire department.

In the case of government organizations, liability also tends to restrict availability, as does team size, logistics and budget. In some cases, requests for resources on extra-jurisdictional releases are considered on a case-by-case basis. Two organizations indicated that they would consider expansion of their response area under formal response agreements. The Fairbanks North Star Borough and the Municipality of Anchorage have negotiated such an agreement with ADEC.

3. General Response Objectives

As with the risk assessment, the statewide response capability assessment focuses on large scale releases of toxic gases. While the need for and type of response will depend on the particular substance released, the amount released, the release duration and a number of other factors, a simplified standard was developed to evaluate response capability. The standard consists of two objectives, and response capability is defined as the degree to which each of the two objectives can be met:

Defensive Response Objective. Detect the release and initiate immediate defensive measures including agency and public notification, plume movement prediction, and evacuation and shelter-in-place of the public.

Offensive Response Objective. Provide offensive measures including testing and monitoring chemical concentrations, setting hazard zones, entering hazardous atmospheres, and controlling the release.

A number of other objectives, of course, may have to be met during an actual response, such as providing medical care, firefighting capability, and decontamination. While all response elements are potentially important, examining the planning and resources needed to meet the above key objectives helps to focus the analysis.

While the first objective would apply for all toxic gas releases in populated areas, the second objective will not always be required or feasible. Offensive response may not be feasible, for example, for short duration releases. It is assumed, however, that there should be some offensive response capability wherever there are substantial risks.

4. General Response Capability Indicators

In specifying plans and resources required to meet the key offensive and defensive objectives, it is again necessary to simplify and focus on a few key items that can be used as indicators of response capability. The mere presence of certain plans or resources does not, of course, mean that a successful response will always occur. On the other hand, a successful response -- one that meets response objectives -- is highly unlikely in the absence of these key plans and resources.

The indicator of defensive response capability selected for the analysis is the existence of local emergency response plans that identify the hazards and at-risk facilities and populations, and contain specific procedures for notification, plume tracking, evacuation and shelter-in-place.

The in-state offensive response capability was discussed earlier and is based on the existence of a Level A/B HazMat team available to respond within four hours of notification.

Figure 19 depicts the distribution of offensive and defensive response capability across the state.

Local emergency response plans for the Fairbanks North Star Borough, the City of Petersburg, the Ketchikan Gateway Borough, Municipality of Anchorage, and the southern zone of the Kenai Peninsula Borough have been submitted to the State Emergency Response Commission for review. There are no other areas of the state with local emergency response plans that provide specific procedures for release detection, agency and public notification, plume movement prediction, and evacuation and shelter-in-place -- although many of the local emergency planning committees are making progress towards meeting this objective.

The distribution of offensive response capability was previously described. The Municipality of Anchorage, the area with the highest risk, is also the area where offensive response capability is greatest. Both the Municipality of Anchorage and the Fairbanks North Star Borough have functioning HazMat response teams to serve the local community. The Municipality of Anchorage Fire Department HazMat response team also may respond to incidents in the Kenai and the Matanuska-Susitna boroughs upon request to and approval by the MOA Fire Chief, subject to conditions specified in the governing agreement, thereby providing some coverage in those areas. As stated previously, both the FNSB and MOA Hazmat Teams may elect to respond beyond jurisdictional boundaries when requested by the ADEC SOSC.

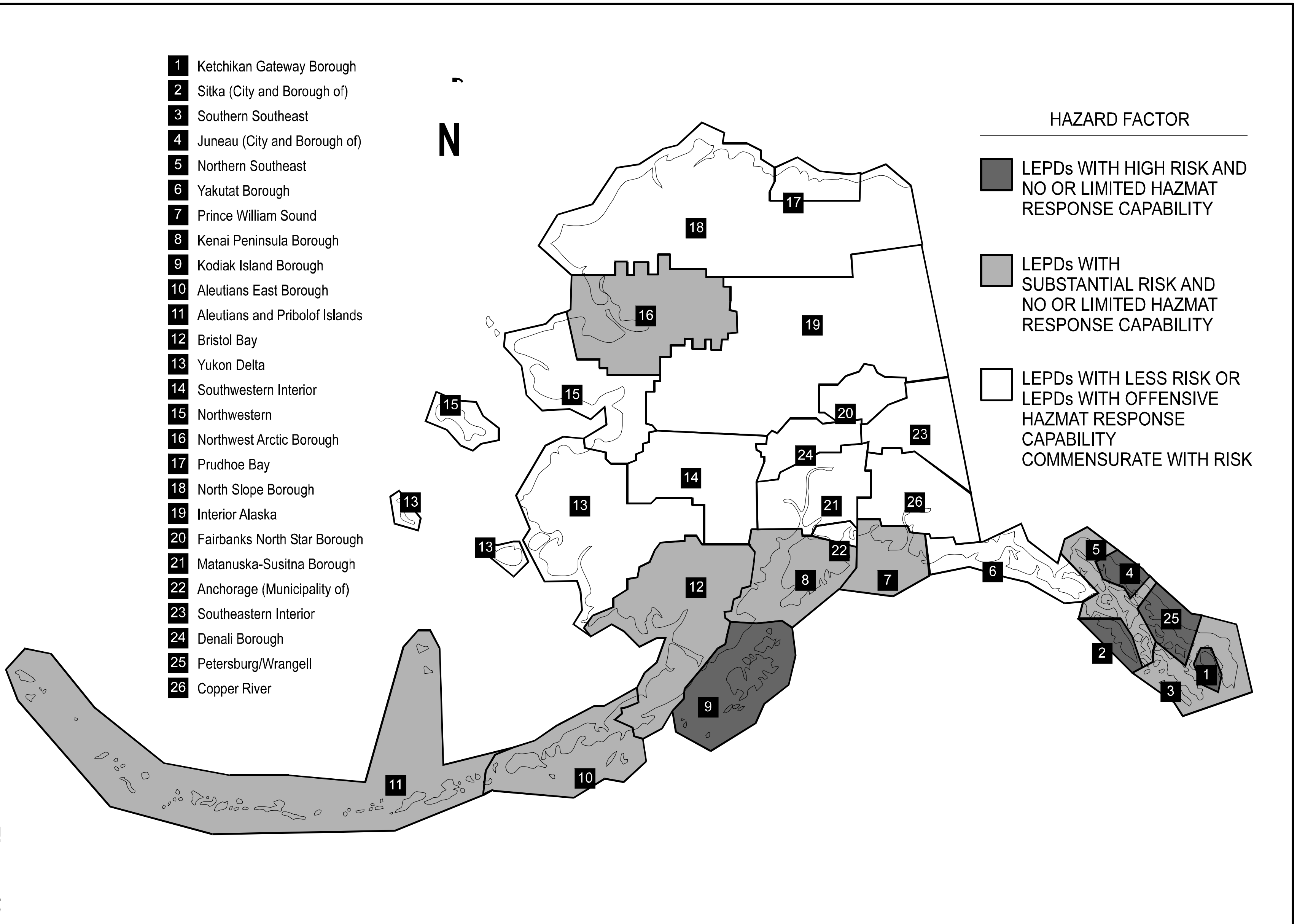


Figure 13
Offensive Hazmat Response Capability vs. Risk

(Change 1, May 1996)

Figure 14
Response Resource Summary

ORGANIZATION	RESPONSE AREA	TYPE	RESPONSE MODES: A ENTRY	RESPONSE MODES: B ENTRY	RESPONSE MODES: NON-ENTRY	PERSONNEL: SOURCE	PERSONNEL: TOTAL NO.	PERSONNEL: 24HR CALL	PPE: SCBA	PPE: A SUITS	PPE: B SUITS
ALASKA WEST	FAIRBANKS TO: ANCH, PRUDHOE, AND PUMP STATION 12	INDUSTRY	NO	YES	YES	IND	10	10	3	0	10
ALYESKA/SERVS	PRINCE WILLIAM SOUND	INDUSTRY	NO	NO	YES	IND COM	50			0	500
ANCHORAGE FIRE DEPARTMENT	MUNICIPALITY OF ANCHORAGE	MUNICIPAL	YES	YES	YES	MUN FD	45	12	140	24	24
ARCO NORTH SLOPE		INDUSTRY									
BP NORTH SLOPE		INDUSTRY									
CLEAR AIR STATION	CLEAR AIR STATION + 15 MILE RADIUS MUTUAL AID	MILITARY	NO	NO	YES	MIL FD	25	7	25	30	40
EIELSON AIR FORCE BASE		MILITARY				MIL				10	0
ELMENDORF AIR FORCE BASE		MILITARY				MIL				22	57
FAIRBANKS NORTH STAR BOROUGH	FAIRBANKS NORTH STAR BOROUGH	MUNICIPAL	YES	YES	YES	MUN FD	24-30	3-10	9	3	27
KETCHIKAN FIRE DEPARTMENT	KETCHIKAN GATEWAY BOROUGH	MUNICIPAL	NO	YES	YES	MUN FD	30	5	30	0	31

(Change 1, May 1996)

Figure 14
Response Resource Summary

ORGANIZATION	RESPONSE AREA	TYPE	RESPONSE MODES: A ENTRY	RESPONSE MODES: B ENTRY	RESPONSE MODES: NON-ENTRY	PERSONNEL: SOURCE	PERSONNEL: TOTAL NO.	PERSONNEL: 24 HR CALL	PPE: SCBA	PPE: A SUITS	PPE: B SUITS
KETCHIKAN PULP COMPANY	FACILITY	INDUSTRY	NO	YES	YES	IND	7	7	41	2	30
KODIAK (CITY OF) FIRE DEPARTMENT	CITY OF KODIAK	MUNICIPAL	NO	YES	YES	MUN FD	32	32	4	6-8	6
PHILIP ENVIRONMENTAL	STATE-WIDE	INDUSTRY	YES	YES	YES	IND	25	5	7	4	580
RED DOG MINE		INDUSTRY				IND					
SEWARD (CITY OF) FIRE DEPARTMENT	CITY OF SEWARD	MUNICIPAL	NO	NO	YES	MUN FD	31	1	27	3	0
TESORO ALASKA	FACILITY	INDUSTRY	YES	YES	YES	IND	12	7	35	2	MANY
UAA MINING & PETROLEUM TRAINING SERVICE	STATE-WIDE ASSISTANCE	STATE	NO	NO	NO	UAA	30	10	58	0	MANY
UAF RISK MANAGEMENT	UAF AND CAMPUS PROPERTIES THROUGHOUT STATE	STATE	NO	YES	YES	UAF	52	15-17	43	0	70
UNALASKA FIRE DEPARTMENT	CITY OF UNALASKA	MUNICIPAL	NO	YES	YES	MUN FD	12	12	22	0	12
UNISEA DUTCH HARBOR/ST PAUL	FACILITIES	INDUSTRY	YES	YES	YES	IND	25	15	18	4	0

(Change 1, May 1996)

Figure 14
Response Resource Summary

ORGANIZATION	RESPONSE AREA	TYPE	RESPONSE MODES: A ENTRY	RESPONSE MODES: B ENTRY	RESPONSE MODES: NON-ENTRY	PERSONNEL: SOURCE	PERSONNEL: TOTAL NO.	PERSONNEL: 24HR CALL	PPE: SCBA	PPE: A SUITS	PPE: B SUITS
UNOCAL AGRICULTURAL PRODUCTS	FACILITY	INDUSTRY	YES	YES	YES	IND	150	25-30	50	13	40
VALDEZ (CITY OF) FIRE DEPARTMENT	CITY OF VALDEZ TO TAPS PS 12 AND NEARBY PRINCE WM SOUND	MUNICIPAL	NO	YES	YES	MUN FD	3	1	50	0	16

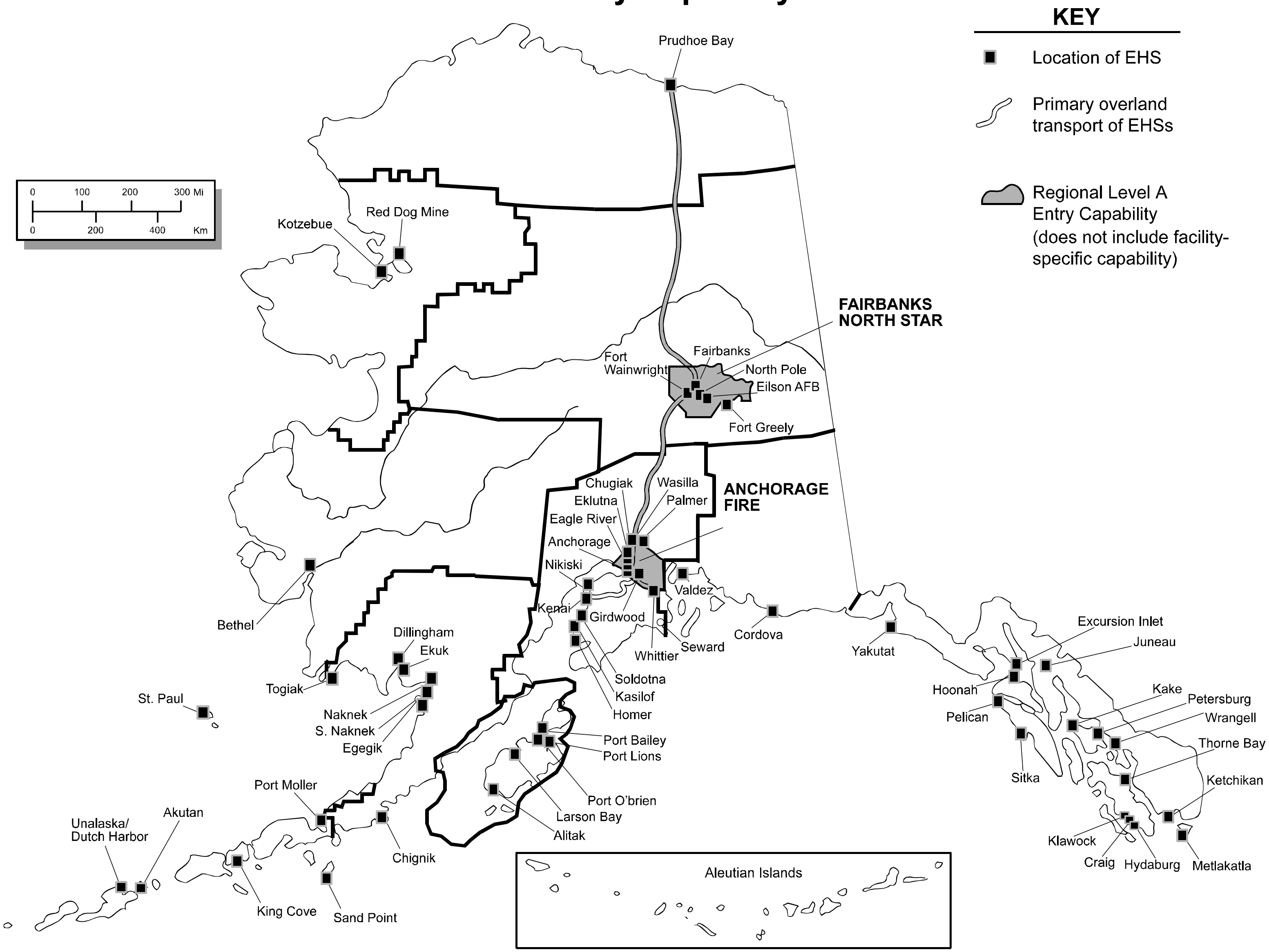
(Change 1, May 1996)

Figure 15
Known Level A Entry Teams

ORGANIZATION	RESPONSE AREA	TYPE	TOTAL PERSONNEL
ALASKA WEST EXPRESS	FAIRBANKS TO ANCH, PRUDHOE AND PUMP STATION 12	INDUSTRY	10
ANCHORAGE FIRE DEPARTMENT	MUNICIPALITY OF ANCHORAGE	MUNICIPAL	45
FAIRBANKS NORTH STAR BOROUGH	FAIRBANKS NORTH STAR BOROUGH	MUNICIPAL	24-30
PHILIP ENVIRONMENTAL INC	STATEWIDE WITH CONTRACT	INDUSTRY	25
TESORO ALASKA	FACILITY	INDUSTRY	12
UNOCAL DUTCH HARBOR/ST PAUL	FACILITIES	INDUSTRY	25
UNOCAL AGRICULTURAL PRODUCTS	FACILITY	INDUSTRY	150

(Change 1, May 1996)

Figure 16
Level A Entry Capability



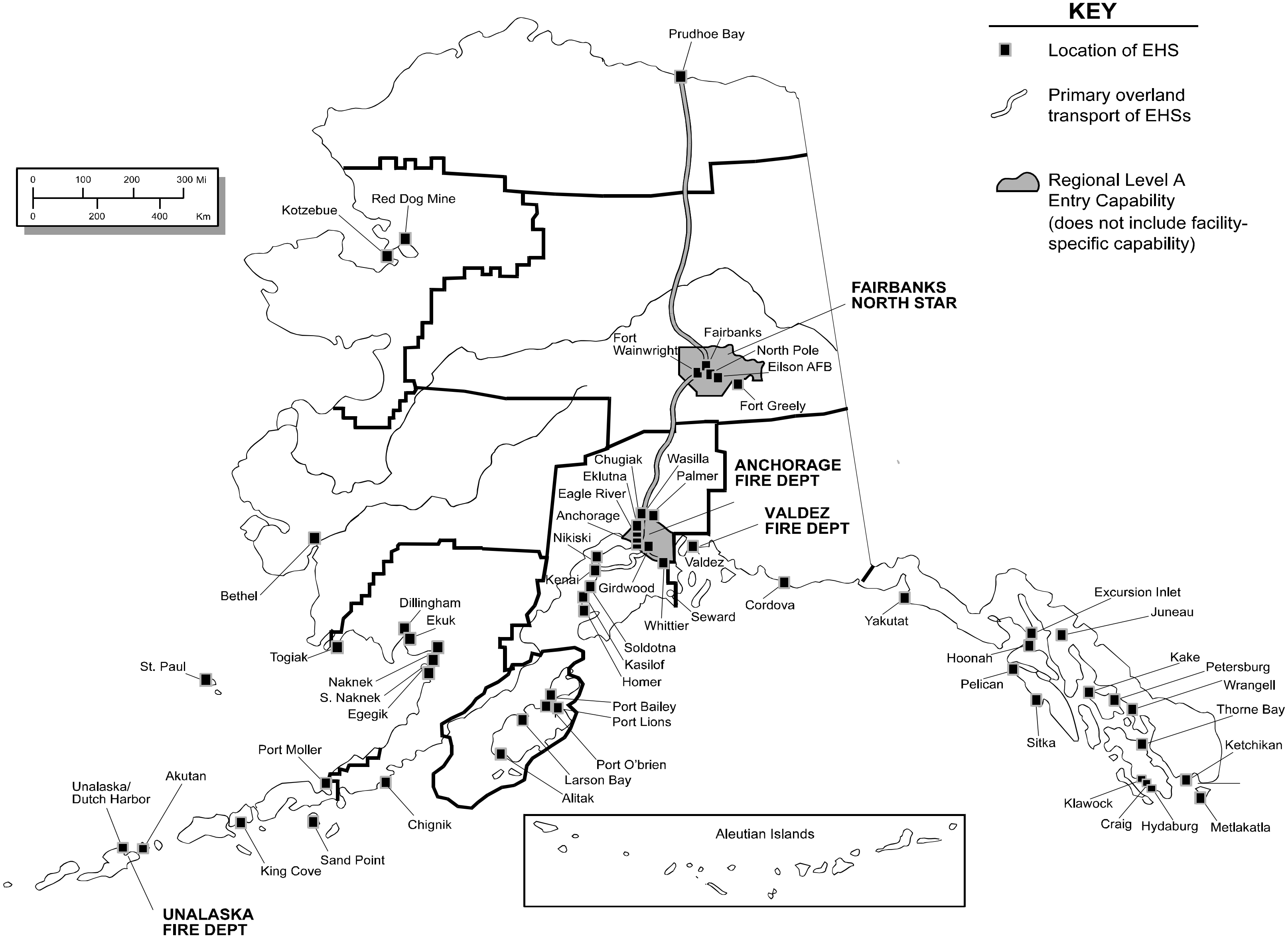
(Change 1, May 1996)

Figure 17
Known Level B Entry Teams

ORGANIZATION	RESPONSE AREA	TYPE	TOTAL PERSONNEL
ALASKA WEST EXPRESS	FAIRBANKS TO ANCH, PRUDHOE AND PUMP STATION 12	INDUSTRY	10
ANCHORAGE FIRE DEPARTMENT	MUNICIPALITY OF ANCHORAGE	MUNICIPAL	45
FAIRBANKS NORTH STAR BOROUGH	FAIRBANKS NORTH STAR BOROUGH	MUNICIPAL	24-30
KETCHIKAN FIRE DEPARTMENT	KETCHIKAN GATEWAY BOROUGH	MUNICIPAL	30
KETCHIKAN PULP COMPANY	FACILITY	INDUSTRY	7
KODIAK (CITY OF) FIRE DEPARTMENT	CITY OF KODIAK	MUNICIPAL	32
PHILIP ENVIRONMENTAL	STATEWIDE WITH CONTRACT	INDUSTRY	25
TESORO ALASKA	FACILITY	INDUSTRY	12
UAF RISK MANAGEMENT	UAF AND CAMPUS PROPERTIES THROUGHOUT STATE	STATE	52
UNALASKA FIRE DEPARTMENT	CITY OF UNALASKA	MUNICIPAL	12
UNISEA DUTCH HARBOR/ST PAUL	FACILITY	INDUSTRY	25
UNOCAL AGRICULTURAL PRODUCTS	FACILITY	INDUSTRY	150
VALDEZ (CITY OF) FIRE DEPARTMENT	CITY OF VALDEZ TO TAPS PS 12 AND NEARBY PRINCE WM SOUND	MUNICIPAL	9

Figure 18

Level B Entry Capability



(Change 1, May 1996)

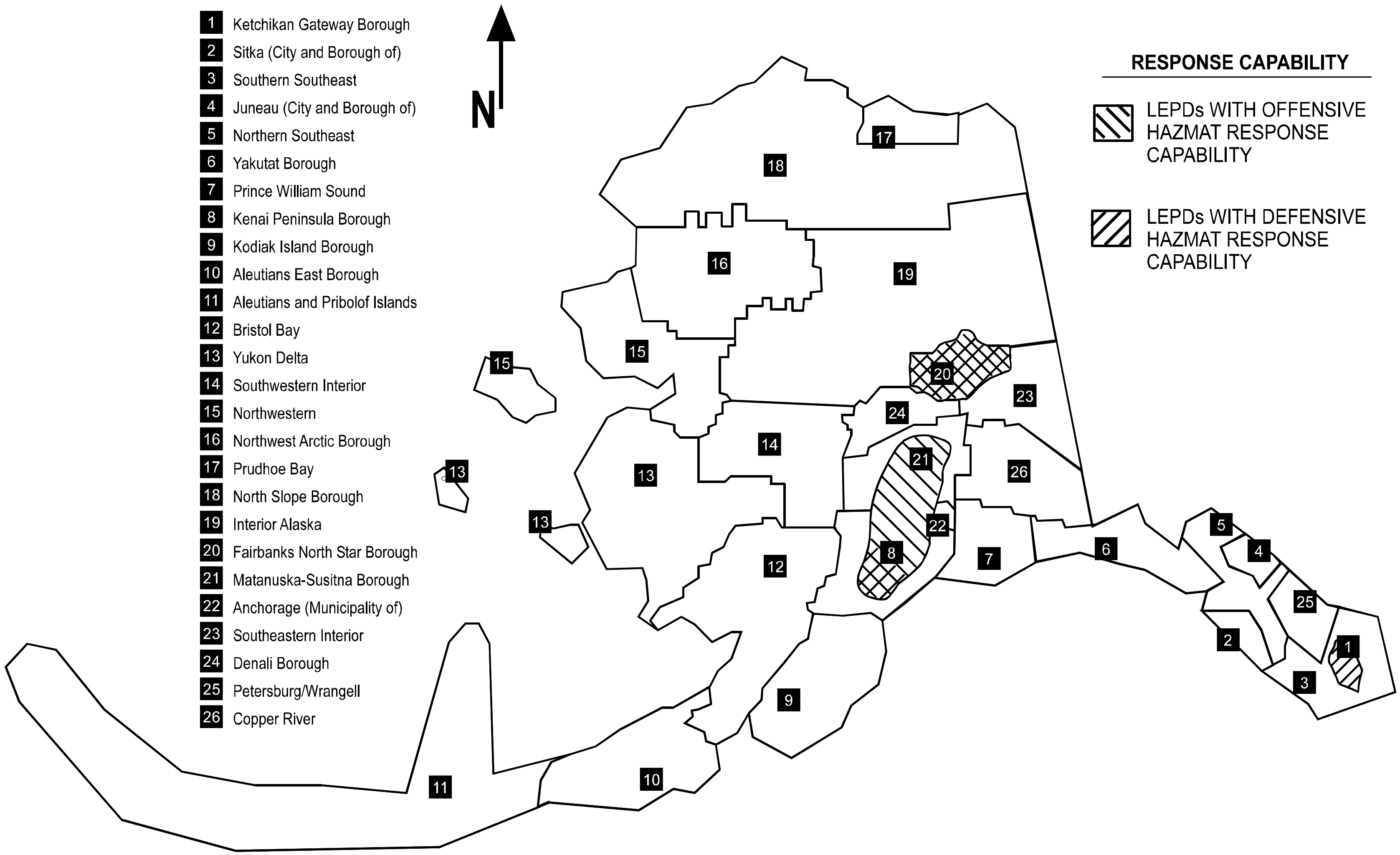


Figure 19
Response Capability Distribution

(Change 1, May 1996)

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