Emergency Response Assessment and Hazardous Materials Spill Control

Prepared for:

State of Alaska
Department of Transportation and Public Facilities

Prepared by:
HDR Alaska, Inc.
2525 C Street, Suite 305
Anchorage, Alaska 99503

July 2003

TABLE OF CONTENTS

LIST OF FIGURES

On or following page

LIST OF TABLES

APPENDICES

1.0 Introduction

The Alaska Department of Transportation and Public Facilities (ADOT&PF) is investigating alternatives for improving transportation along the Sterling Highway between Milepost (MP) 45 and MP 60 in a supplemental draft environmental impact statement (SDEIS). The Sterling Highway, which is part of the National Highway System, provides the only overland route for vehicles traveling between South Central Alaska and the western portion of the Kenai Peninsula. Between MP 45 and MP 60, the Sterling Highway follows the Kenai River Valley and passes through the community of Cooper Landing. Because of the vulnerability of the area and its resources to vehicular accidents and releases of hazardous materials, ADOT&PF investigated the risks associated with potential spills and the emergency response capabilities for the region in its examination of alternatives for the SDEIS. This report presents the results of that investigation.

1.1 Overview

The Sterling Highway provides surface transportation for local residential, recreational, commercial, and industrial traffic along an east-west corridor of the Kenai Peninsula. The residential and various commercial and industrial land uses on the Kenai Peninsula require the transport of gasoline, diesel, heating oil, propane, chlorine, and other hazardous materials on the Sterling Highway. "Hazardous materials," or HAZMAT, is the common term used to describe materials that pose a threat to safety, human health, and the environment if released. Releases of hazardous materials demand immediate attention because of this threat. Infrequently, weather, road conditions, and driver error can result in accidents that may cause a release of hazardous materials into the environment.

1.2 Accidental Spills and Emergency Response

This investigation identifies the types of hazardous materials being transported on the Sterling Highway, recent commercial trucking accidents between MP 45 and MP 60, and emergency response planning and capabilities for the region. This study also evaluates the potential risks associated with an accidental spill release along the proposed alternative alignments that ADOT&PF is investigating in its SDEIS for the Sterling Highway between MP 45 and 60. Any new transportation route through the study area would be constructed based on present day national design standards and thus have a lower susceptibility to accidents when compared to the existing road alignment.

2.0 Hazardous Materials Shipping

The possibility of a release of hazardous materials on the Sterling Highway is based on the amount of materials currently being shipped through the area and the previous occurrences of accidents involving such shipments. This section presents the information on hazardous materials shipments and truck accidents on the Sterling Highway between MP 45 and MP 60.

2.1 Hazardous Materials Transported on the Sterling Highway

Hazardous materials are transported through the project area on the Sterling Highway to numerous facilities on the Kenai Peninsula. Other than fuel transported to two gas stations in Cooper Landing,[1] the community of Cooper Landing has no fixed industrial facilities that store or otherwise use hazardous materials.

There are no state or federal laws requiring that the transportation of hazardous materials on federal or state highways be monitored (Moskowitz 2003; Bovee 2003). As a result, the type and amount of hazardous materials shipped along the Sterling Highway is only obtainable at the transporters' discretion. During the development of this report, several of the companies that transport hazardous materials through the study area or operate facilities that store hazardous materials on the Kenai Peninsula were contacted by telephone to discuss hazardous materials shipments through the study area; however, little information was made available because of its proprietary nature (see telephone records contained in Appendix A). Thus, actual volumes of the hazardous materials shipped through the project area were not obtained. Based on the limited amount of information available, this analysis assumes that hazardous materials shipments through the area do not exceed 100,000 gallons of material per shipment.

The State of Alaska does track the storage of extremely hazardous substances (EHSs[2]) at fixed facilities such as refineries and seafood processing plants. It is important to note that the EHS designation does not include petroleum products, such as gasoline and diesel fuel, which are also hazardous to human health and the environment if uncontrollably released. The EHS designation represents those hazardous materials that pose a greater risk to human health and the environment and have more stringent regulatory reporting requirements.

Table 1 lists facilities on the Kenai Peninsula that store EHSs. The large volumes of urea formaldehyde and ammonia stored in Nikiski and Kenai are produced at those locations and likely shipped out as marine cargo from local dock facilities. Although, it is unlikely that these materials are transported on the Sterling Highway in the quantities listed in Table 1, these materials are included in this analysis because there is a potential for this material to be shipped through the project area. Similarly, chlorine stored in Seward could be transported on the Sterling Highway, although such transport is unlikely.

[1] The two gas stations are The Sunrise Inn located at MP 45 and Hamilton's Place located at MP 48.5. Hamilton's Place is in the Alaska Department of Environmental Conservation's Contaminated Sites Program because of petroleum hydrocarbon contamination in the soil and groundwater (ADEC, 2003).

[2] Extremely hazardous substances (EHSs) are acutely toxic substances identified by the U.S. Environmental Protection Agency under the Emergency Planning and Community Right-to-Know Act. The list of EHSs is established by 40 CFR Part 355 and includes approximately 360 substances. Chlorine and ammonia are the most common EHSs. Petroleum products are not considered EHSs.

Table 1. Extremely Hazardous Substances Stored at Kenai Peninsula Facilities

Community	Facility	EHS	Maximum Quantity (lbs)
Nikiski	M-I Drilling Fluids L.L.C.	Acrylamide	15,000
Homer	Homer Ice Plant	Ammonia	4,000
Kenai	Air Liquide America Corp.	Ammonia	2
Kenai	Pacific Star Seafoods	Ammonia	5,000
Kenai	Royal Pacific Fisheries	Ammonia	7,500
Kenai	Snug Harbor Seafoods Inc.	Ammonia	7,500
Kenai	Salamatof Seafood Processing Plant	Ammonia	12,000
Kenai	Wards Cove Packing Company	Ammonia	15,000
Kenai	Alaska Nitrogen Products LLC	Ammonia	250,000,000
Kenai Cannery	Wards Cove Packing Company	Ammonia	55,550
Nikiski	Cook Inlet Processors	Ammonia	9,000
Nikiski	Tesoro Alaska Company	Ammonia	10,313
Soldotna	Salmon Inlet Fisheries Kasilof Plant	Ammonia	3,400
Soldotna	Inlet Fisheries Kenai Plant	Ammonia	7,500
Kenai	Salamatof Seafood Processing Plant	Chlorine	300
Nikiski	Tesoro Alaska Company	Chlorine	2,000
Nikiski	Alaska Nitrogen Products LLC	Chlorine	12,000
Seward	Seward Well # 1	Chlorine	150
Seward	Seward Well # 4	Chlorine	150
Seward	Seward Well # 5	Chlorine	150
Seward	Seward Well # 6	Chlorine	150
Seward	Seward Well Spring Creek	Chlorine	150
Seward	Seward Lowell Canyon Storage	Chlorine	300
Nikiski	Alaska Nitrogen Products LLC	Cyclohexylamine	960
Nikiski	Kenai Pipeline Company	Hydrogen Sulfide	9,999
Nikiski	Tesoro Alaska Company	Hydrogen Sulfide	9,999
Nikiski	Tesoro Alaska Company	Sulfur Dioxide	9,999
Nikiski	Alaska Nitrogen Products LLC	Urea formaldehyde	800,000

Source: ADEC 1997

Most of the EHSs that could potentially be shipped on the Sterling Highway (Table 1) are toxic to aquatic organisms at elevated levels. However, the toxicity levels are not well documented. Appendix B provides the Chemical Safety Cards for EHSs potentially shipped through the project area.

Petroleum products are transported through the project area on the Sterling Highway on a regular basis to supply fueling stations on the western portion of the Kenai Peninsula. The volumes and frequency of petroleum product shipments through the project area have not been quantified. It can be assumed that the amount of petroleum products moving through the project area is considerably higher than the amount of EHS moving through the project area.

2.2 Accidents Involving Commercial Vehicles

According to Alaska Statute (AS 28.40.100), hazardous materials, if being shipped for the purposes of commerce, must be shipped by commercial vehicle. The ADOT&PF, Division of Measurement Standards and Commercial Vehicle Regulations tracks and collects data on accidents involving commercial vehicles. According to available data from ADOT&PF (see Appendix C), ten commercial vehicles were involved in eight separate accidents on the Sterling Highway in the area between MP 45 and MP 60 (Figure 1) during the time period from March 26, 1996 to December 28, 2000 (57 months). The database did not list the cargo carried at the time of the accidents. Table 2 lists the locations of the commercial vehicle accidents within the study area during the period for which data was obtained.

Table 2. Commercial Vehicle Accidents on Sterling Highway, Between MP 45 and MP 60

Sterling Highway Location		Date	Number of Vehicles in Accident
1.	Mile 48.3	7/22/96	1
2.	Mile 50	2/6/00	2
3.	Mile 50.3	4/20/96	1
4.	Mile 52.5	7/13/00	1
5.	Mile 52.5	9/19/00	2
6.	Mile 54.2	6/23/00	1
7.	Mile 56	9/29/99	1
8.	Mile 57	7/5/98	1

(Source: ADOT&PF 2002)

2.3 Recent Spill Event

On October 29, 2001, a tractor-trailer tanker carrying a total of 8,800 gallons of fuel products (1,800 gallons of diesel and 7,000 gallons of gasoline) rolled over at MP 52 on the Sterling Highway. It was estimated that 4,570 gallons of product spilled from the tanker into a small pond located adjacent to the highway. Personnel from the Alaska State Troopers, Cooper Landing Volunteer Fire Department, Alaska Department of Environmental Conservation (ADEC), Alaska Department of Natural Resources (ADNR), Alaska Department of Fish and Game (ADF&G), U.S. Environmental Protection Agency (EPA), and private contractors all responded to the incident. Cooper Landing Volunteer Fire Department Chief, Todd Wilson, stated that the fire department had responders at the site within approximately 7 minutes of the accident. Rapid response was critical in this situation as the tanks were severely damaged and large holes were spilling diesel fuel and gasoline. State troopers were on-site within 15 to 20 minutes and Central Emergency Services medical support arrived from Soldotna in 20 to 30 minutes. It took approximately 3 to 4 hours before agency responders and equipment arrived from Anchorage and Kenai, according to Chief Wilson. Appendix D contains situation reports published by the ADEC Division of Spill Prevention and Response that provide details on the cleanup response activities.

Chief Wilson believes the local capabilities were severely limited in stopping the fuel drainage from the tanker. He said they could not contain the leaking product from one particularly large hole because they lacked the proper personal protective equipment to get close enough to plug

the hole. They were limited to spreading absorbent pads and soft boom to minimize environmental impact. During this incident the Cooper Landing Volunteer Fire Department depleted their HAZMAT cleanup supplies.

3.0 Emergency Response Capabilities

State and federal laws prohibit the discharge of oil or hazardous substances; require prompt reporting when a spill does occur; and mandate containment, control, removal, and proper disposal of all waste materials. The ADEC is tasked with carrying out these laws. The ADEC's Division of Spill Prevention and Response is responsible for ensuring facilities prevent spills and take proper response actions when spills occur. The potential for hazardous materials spills on state highways is managed under ADEC's Prevention and Emergency Response Program, which institutes a statewide spill prevention program that ensures that spills are responded to and cleanup measures are implemented as soon as possible.

The project area is located within the Cook Inlet Subarea of ADEC's Prevention and Emergency Response Program. The Cook Inlet Subarea Plan, which was developed as a supplement to the *Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases*, is a guideline for establishing operations in the event of a major oil spill or hazardous material release. The plan, developed in conjunction with ADEC, U.S. Coastal Guard (USCG), and EPA, defines procedures, available equipment, and local contractors to call for assistance in responding to a hazardous material spill.

This section defines the major local and non-local resources that would be available if a hazardous spill were to occur on the Sterling Highway between MP 45 and MP 60.

3.1 Emergency Response Notification and Mobilization

In accordance with the Cook Inlet Subarea Plan, the first to react to a highway spill in the project area would be the Cooper Landing Volunteer Fire Department and the Alaska State Troopers. Upon identifying the spill, the fire department and State troopers would contact the ADEC Division of Spill Prevention and Response and the Kenai Peninsula Borough Office of Emergency Management, and each would send an on-site coordinator immediately to the scene of the spill. Other State and federal agencies would be notified, including EPA, ADNR, and ADF&G. The response effort would include assistance from surrounding larger communities, including Anchorage and Kenai or Soldotna.

If needed, spill response resources would be secured from locations outside the Cook Inlet Subarea. These could be expected to arrive initially by air, sea, or road and then transferred to a staging location (ADEC, 1997). A significant response effort would necessitate a large area for equipment delivery, HAZMAT personnel, damage inventory and repair, and temporary storage of the cleaned up material.

3.2 Local Resources / First Responders

The Cooper Landing Volunteer Fire Department has 20 volunteer responders. Five of the 20 listed volunteer firefighters have completed an 8-hour HAZMAT training course. As first responders, the Cooper Landing Volunteer Fire Department would attempt to contain a spill while waiting for outside resources and equipment from larger communities such as Anchorage and Kenai or Soldotna. Ambulance and emergency medical services (EMS) service to Cooper Landing is mobilized out of Kenai or Soldotna.

A review of the local emergency response capabilities shows that the Cooper Landing Volunteer Fire Department has a minimal amount of supplies to react to a hazardous materials spill. The ADEC has supplied a boom; oil sorbent pads; disposal bags; and Class A foam, which can be used for vapor suppression.[3]

The ADEC had planned to move a spill response vehicle to the area; however, the Cooper Landing Volunteer Fire Department does not have a place to store it, as their building is small and can only hold four of their seven existing fire trucks. The building has no running water, no working bathroom facilities, no decontamination room or shower, and no office.

3.3 Regional Resources

The use of regional resources depends primarily on the significance and location of the spill event. Spill response and hazardous materials cleanup requires an assessment of the type and quantity of released materials.

State resource agencies have no Level A or B response capabilities in the Cook Inlet region (see descriptions of response levels at right). However, there are city fire departments and private contractors that maintain Level A and Level B response capabilities in Anchorage and Kenai that could be mobilized for assistance (ADEC 1997). The Anchorage Fire Department and Unocal (in Nikiski) maintain Level A HAZMAT teams.

Levels of Personal Protection for HAZMAT Response

There are four levels of protection for HAZMAT spill responders, based on the type of release and amount of personal protection needed to safely respond to a spill. **Level A** provides the greatest level of respiratory, skin, and eye protection. This includes a fully encapsulating suit and self-contained breathing apparatus (SCBA). **Level B** also provides SCBA and chemical-resistant clothing, but provides a lower level of skin protection. **Level C** provides a respirator and chemical-resistant clothing. **Level D** provides coveralls without respiratory protection and is used for responses to the least harmful substances.

The ADEC currently maintains several term contracts for spill response in the Cook Inlet Subarea, but none are positioned for an immediate emergency response on the Sterling Highway, between MP 45 and MP 60. Appendix E contains a list of ADEC Registered and Approved Oil Spill Primary Response Action Contractors.

[3] According to the Cooper Landing Volunteer Fire Department Chief, Todd Wilson, the foam is at least 20 years old, making its usefulness questionable.

In the Kenai Peninsula Borough, the cities of Kenai, Soldotna, Seward, Homer, and Seldovia have their own fire departments and EMS. These cities have agreements to provide mutual aid throughout the Borough for fire and EMS. However, there are no such agreements for hazardous materials response.

The Central Peninsula General Hospital, located in Soldotna, is the largest hospital in the Kenai Peninsula Borough. The hospital has some personal protective equipment and decontamination equipment; however, like the hospitals in Anchorage, they rely on the fire department or other first responders to decontaminate personnel on-site. South Peninsula Hospital, located in Homer, has no capabilities to treat victims of HAZMAT exposure. Seward General Hospital has some capabilities to handle a small number of HAZMAT victims, but is unable to accommodate a large number of personnel from a serious incident.

Tesoro, Unocal, and Conoco Phillips Petroleum operate major industrial facilities in the Kenai and Soldotna areas. These facilities are well equipped to respond to hazardous material incidents, but none are located within the project area.

For significant spills, a command center may be required to coordinate response efforts. Cook Inlet Spill Prevention Response, Inc. (CISPRI), a non-profit organization formed to provide oil spill prevention and response capabilities to its member companies in Cook Inlet, owns a command center facility in Nikiski that could act as a central command location. Spills extending over a large area may require the establishment of auxiliary locations.

Anchorage has substantial warehousing and support facilities to aid in a spill response effort. Elmendorf Air Force Base and Fort Richardson have significant potential as staging locations and could be made available with the proper coordination (ADEC, 1997). The procedures to establish the command center require the General Services Administration (GSA) and the Seventeenth USCG District to locate and contract for the command center in the case of a federally funded response. Parties responsible for causing the spill, will be required to provide a command center, should it be needed.

3.4 Constraints to Emergency Response and Cleanup

The distance over which some emergency response teams would have to travel to reach a hazardous materials spill along the Sterling Highway between MP 45 and MP 60 can increase the risk of release to resources within the spill migration pathways. In addition, the ability of regional responders to respond to and clean up an accidental spill can be impaired by weather conditions and the accessibility of the spill. Temperatures along this section of the Sterling Highway are often near freezing, which frequently causes “black ice” on the roadway surface, which creates hazardous driving conditions. Snow on the roads can slow travel to the spill site, as well as hinder spill control activities. Steep slopes can make access to the spill difficult and impair the ability to set up spill control equipment.

4.0 Preliminary Risk Evaluation

The potential environmental effects of an accidental release of hazardous materials are an important consideration in the evaluation of alternatives for the Sterling Highway between MP 45 and MP 60. Although any new highway development would include design elements to reduce accident risk and enhance emergency response by helping to effectively isolate and/or slow spill migration (see Appendix F), the potential for accidental spills still exists. This section characterizes the sensitivity of the area's resources relative to the alternative alignment locations.

4.1 Spill Migration Pathways

There are three primary environmental pathways for spill migration:

- Surface migration (surface water, soil)
- Subsurface migration (groundwater)
- Atmospheric migration (air)

Spills into surface pathways pose the greatest potential to quickly impact sensitive areas such as the Kenai and Russian Rivers or surface and shallow drinking water sources in the area. The surface migration of materials can be easy to predict based on surface gradient and aspect and existing surface water flow patterns.

Subsurface and atmospheric pathways are highly unpredictable and extremely difficult to identify with any significant degree of certainty. For the evaluation of subsurface migration, this analysis assumed that sensitive resources would be residential properties downgradient of the alternative alignments because private residences likely have drinking water wells associated with them (i.e., there is no public water supply in the Cooper Landing area). The atmospheric migration pathway is not included in this analysis because the potential impact area relative to the alignments cannot be predicted.

4.2 Environmentally Sensitive Areas

All of the proposed preliminary highway alignments are located within the Kenai River watershed, and because of the biological and economical significance of the Kenai River, its entire watershed is recognized as an acutely sensitive area. It is reasonable to presume that the risk of a spill entering the Kenai River diminishes the farther away from the Kenai River the spill occurs. A greater distance from the Kenai River allows more time for spill responders to contain the spilled material and prevent it from reaching the Kenai River.

Tributaries to the Kenai River, riparian areas, wetlands, and other features of the area such as residential areas are also of special concern when planning for and considering impacts related to the release of hazardous materials.

Figure 1 identifies each alternative alignment being considered in the SDEIS for the Sterling Highway between MP 45 and MP 60 and the elements contributing to the environmental sensitivity of the area with respect to spill hazards. A 500-foot riparian buffer zone is depicted

on either side of surface water pathways located within the project area. The 500-foot buffer zone represents the potential extent of ecologically sensitive riparian and aquatic habitats, where a spill of hazardous materials could have an amplified environmental effect. Ecologically sensitive areas of concern with respect to spill hazards are broken down into three categories:

1. **Tier I** water bodies and associated riparian zones. Tier I areas consist of Kenai Lake, Kenai River, Cooper Creek, Russian River, and Juneau Creek. These water bodies and the associated riparian zones are most sensitive to a hazardous spill because a spill in these areas can quickly impact larger areas as a result of migration in the surface water pathway, thereby potentially affecting many and diverse habitats.

2. **Tier II** water bodies and associated riparian zones. Tier II water bodies are tributaries to Tier I surface waters. Tier II water bodies were identified using the existing U.S. Forest Service GIS database and aerial photo interpretation by HDR staff. Although migration in the surface water pathways of Tier II streams can affect large areas and impact depends on proximity important habitats, the migration rate in Tier II streams is potentially slower than for Tier I streams.

3. **Palustrine Wetlands** are bogs that are hydraulically connected to a Tier I or Tier II surface water body.

Another consideration in determining spill risk to the surface migration pathway is steep side slopes (6%-10%) directly adjacent to surface water bodies or residential areas. These are areas where a spill could quickly migrate overland into environmentally sensitive areas.

Figure 1 also shows each preliminary alternative based on its location relative to private properties, which most likely have drinking water wells or shallow drinking water sources, as there is no public drinking water infrastructure in Cooper Landing.

Table 3 and Figure 2 characterize each alternative with respect to the environmentally sensitive areas identified above, providing the percentage of the alignment length that crosses or is directly adjacent to these areas. Using the information depicted in Figures 1 and 2 and Table 3, each alternative can be characterized by its potential for impacts on environmentally sensitive areas due to a hazardous spill.

Table 3. Environmentally Sensitive Areas in Spill Migration Pathway

Name of Alternative	Total Length of Alignment (miles)	Down-gradient Residences	Down-gradient Side-Slope 6 - 10%	Tier I Stream and/or Riparian Buffer	Tier II Stream and/or Riparian Buffer	Palustrine Wetlands
Kenai River Wall	13.7	37.2%	6.7%	71.8%	1.5%	1.3%
Kenai River	13.7	40%	6.7%	72.1%	2.9%	2.0%
Cooper Creek	14.0	44.9%	7.6%	61.3%	1.5%	2.1%
Russian River	13.9	48.7%	30.7%	39.3%	0.4%	3.6%

Name of Alternative	Total Length of Alignment (miles)	Down-gradient Residences	Down-gradient Side-Slope 6 - 10%	Tier I Stream and/or Riparian Buffer	Tier II Stream and/or Riparian Buffer	Palustrine Wetlands
G North	13.9	40.6%	24.5%	46.7%	9.2%	9.3%
G South	13.8	40.6%	24%	46.9%	10.7%	6.8%
Juneau Creek F Forest	13.7	36.6%	32.6%	27.9%	25%	12.1%
Juneau Creek F Wilderness	14.6	34.4%	24.1%	28.8%	22.5%	12.1%
Juneau Creek Forest	14.6	35%	26.6%	26.5%	21.3%	12.9%
Juneau Creek Wilderness	14.5	35.2%	20.3%	24.8%	20.4%	12.9%

Kenai River Alternatives have the highest exposure to the Kenai River and lowest exposure to steep side slopes, Tier II streams, and wetlands. Because of the number of bridges crossing the Kenai River and the proximity to the Kenai River, these alternatives appear to pose the highest level of risk in terms of a spill being able to quickly enter the Kenai River.

The Cooper Creek Alternative has low exposure to steep side slopes, Tier II tributaries, and wetlands, but has a high exposure to down gradient residences and Tier I streams. After crossing Cooper Creek this alternative essentially follows the present day road alignment along the Kenai River, which poses a relatively high level of risk to the Kenai River.

The Russian River Alternative has the lowest exposure to Tier II tributaries, but crosses three Tier I streams (Cooper Creek, the Russian River, and the Kenai River) and has a high exposure to steep slopes and down gradient residences. This alternative has low exposure to wetlands.

G North and G South Alternatives have similar exposures to all categories. Nearly half of the total lengths of these alignments are within 500 feet of Tier I streams. Additionally, these alternatives have moderate exposure to wetlands.

Juneau Creek Alternatives have similar exposures to all categories when compared to each other and a moderate exposure to the steep side slopes, but overall have the lowest exposure to Tier I streams. Additionally, these alternatives are located the farthest away from the Kenai River, which would allow more response time to protect the Kenai River in the event of a spill. These alternatives do, however, have high exposure to wetlands.

Figure 2. Environmental Sensitivity of Project

Figure 2a. Downgradient Residences

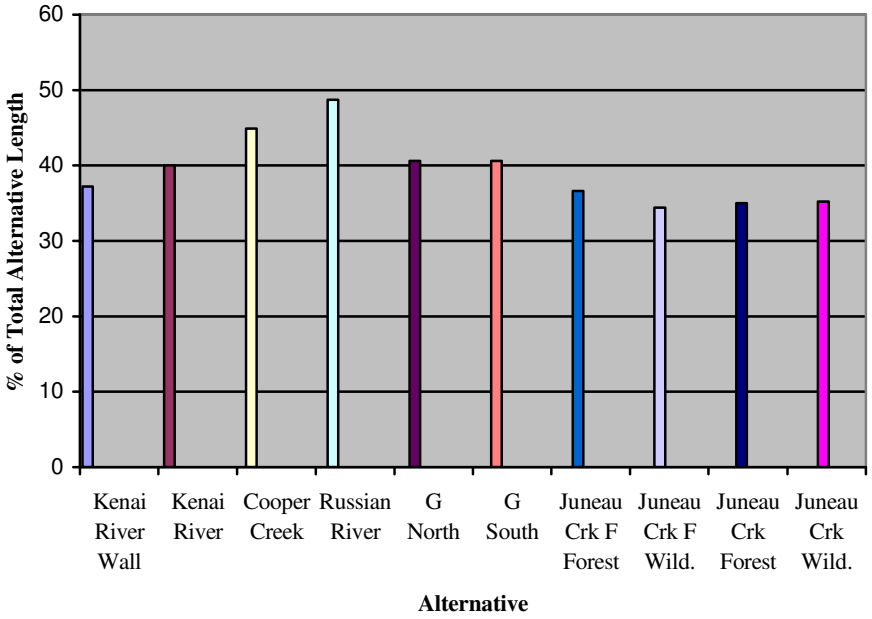


Figure 2b. Downgradient Side-Slope 6-10%

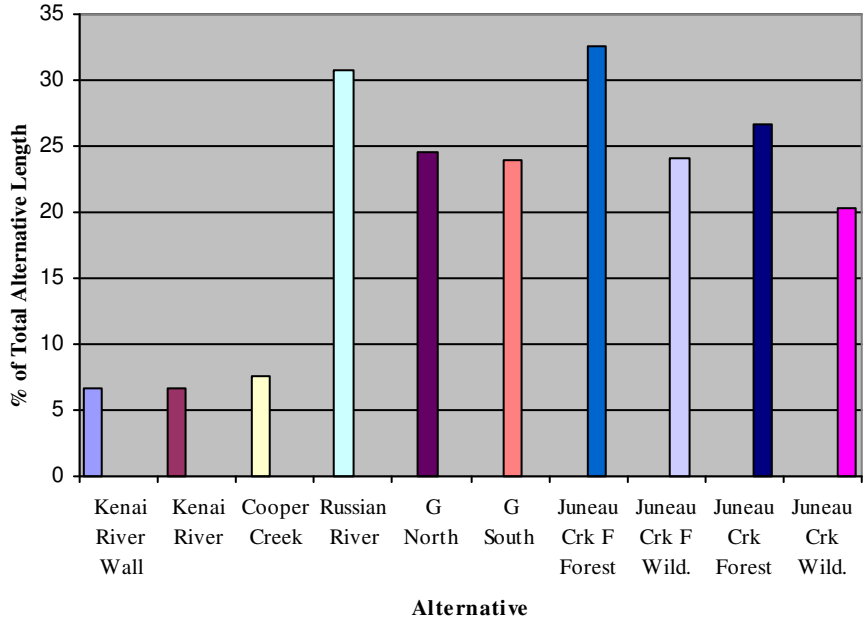


Figure 2c. Tier I Streams and/or Riparian Buffer

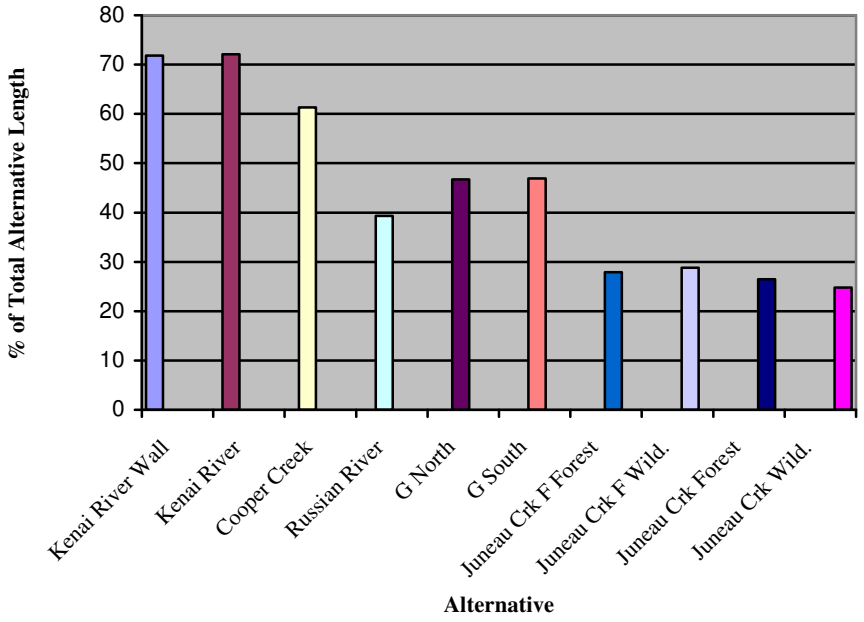


Figure 2d. Tier II Streams and/or Riparian Buffer

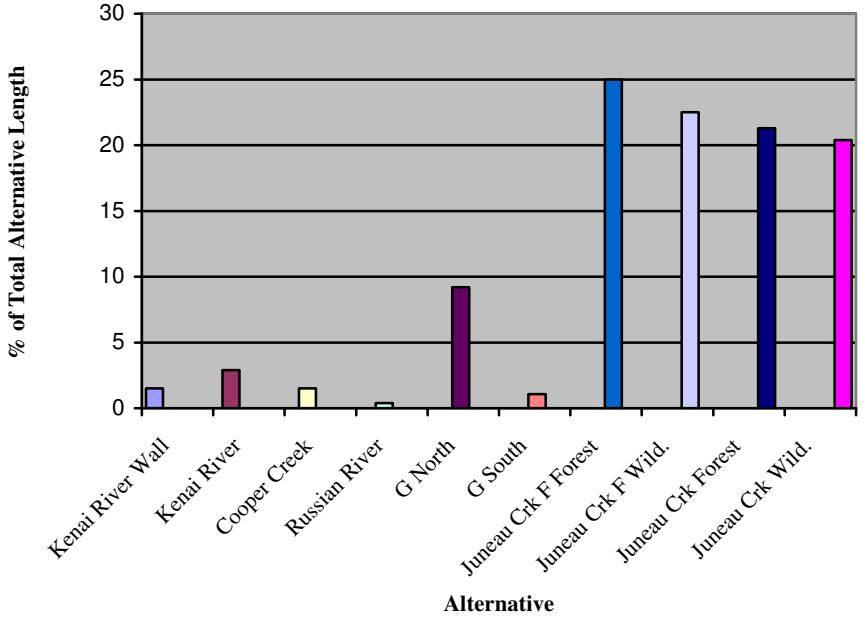
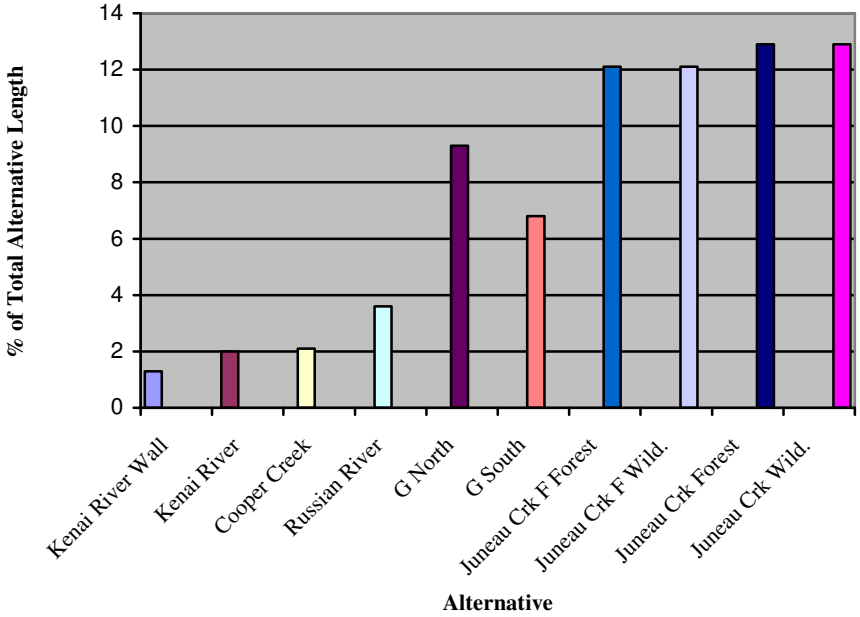


Figure 2e. Palustrine Wetlands



4.3 Environmental Risk

There are numerous factors affecting the amount of risk associated with a chemical release to the environment, including: location, weather, stream flow, soil permeability, time of year, toxicity and amount of spilled compound, and species present at the time of the release. While the release of any chemical compound to the environment would likely adversely affect natural resources that come in contact with the compound, the extent of the impact to a resource is largely dependent upon the toxicity characteristics of the compound and the sensitivity of the resource to the compound.

Material safety data sheets (MSDSs) contain ecological information characterizing the toxicity of certain chemicals for various species. Three of the eight chemical compounds that are potentially transported on the Sterling Highway (i.e., cyclohexylamine, hydrogen sulfide gas, and urea formaldehyde) do not have available ecological information. MSDSs for acrylamide, ammonia, chlorine, and sulfur dioxide gas indicate that these substances, if released to a river or other body of water, would be detrimental to aquatic life such as fish and aquatic invertebrates. The concentrations at which these substances are lethal to aquatic organisms, are provided in Table 4.

Table 4. Environmental Risk Concentrations of Chemical Compounds

Chemical Compound	Toxicity Level (LD50[1]) for Aquatic Life[2]	Oral Reference Dose[3,4]
Acrylamide	220 mg/L (96 hour flow)	2E-4mg/kg/day
Ammonia	0.097 mg/L (24 hour flow)	1E-1 mg/cubic meter (RfC[4])
Chlorine	0.08 mg/L (168 hour flow)	1E-1 mg/kg/day
Cyclohexylamine	Not available	2E-1 mg/kg/day
Hydrogen Sulfide Gas	Not available	3E-3 mg/kg/day
Sulfur Dioxide Gas	5 hour flow is lethal	Not available
Urea Formaldehyde	Not available	2E-1 mg/kg/day
Diesel	210 mg/L (96 hour flow)	5 mg/cubic meter (RfC[4])

1. Lethal dose to 50 percent of sample.
2. Information from MSDSs; concentrations in milligram/liter (mg/L).
3. The oral Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of milligram/kilogram/day (mg/kg/day). In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.
4. Information from IRIS.
5. The inhalation Reference Concentration (RfC) is analogous to the oral RfD and is likewise based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. The inhalation RfC considers toxic effects for both the respiratory system (portal-of-entry) and for effects peripheral to the respiratory system (extrarespiratory effects). It is expressed in units of mg/cubic meter. In general, the RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

The U.S. Environmental Protection Agency (EPA) maintains the Integrated Risk Information System database (IRIS), which provides chronic human health hazard assessments for carcinogenic and non-carcinogenic substances. Six of the eight chemical compounds that are potentially transported on the Sterling Highway are listed in the IRIS database: acrylamide, ammonia, chlorine, cyclohexylamine, hydrogen sulfide gas, and urea formaldehyde. Table 4 provides the threshold doses for daily exposure to these substances (i.e., the amount of exposure within which no appreciable deleterious health effects would be expected).

The information in Table 4 can be used to characterize relative toxicities of the hazardous materials being transported on the Sterling Highway and the relative ecological risk associated with a release of these materials to the environment.

5.0 References

Alaska Department of Environmental Conservation, Division of Spill Prevention and Response. Site Summary Update: Hamilton's Place, Cooper Landing, Alaska. January 2003.

Alaska Department of Environmental Conservation, Division of Spill Prevention and Response. Situation Report: Mile 52 Sterling Highway Truck Rollover. Spill No. 01239930201. October 2001.

Alaska Department of Environmental Conservation, U.S. Coast Guard, U.S. EPA. Cook Inlet Subarea Contingency Plan. Supplement to Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases. July 1997.

Alaska Department of Environmental Conservation, Little, Arthur D. Final Report: Task 1, Analysis of Hazards, Alaska Cook Inlet Region - Kenai Peninsula Borough. April 1993.

Bovee, Frank. 2003. Personal Communication with Frank Bovee, U.S. EPA and Paul McLarnon, HDR Alaska, Inc.

HDR Alaska, Inc. Sterling Highway MP 45-60 Affected Environment Technical Memorandum. Prepared for the Alaska Department of Transportation and Public Facilities. September 2001.

International Program on Chemical Safety, Chemical Safety Cards, 2000. http://www.inchem.org

Moskowitz, Richard. 2003 Personal Communication with Richard Moskowitz, American Trucking Association and Paul McLarnon, HDR Alaska, Inc.

National Transportation Safety Board. Safety Report: Analysis of Intrastate Trucking Operations. Publication #PB2002-917001. March 2002.

Small Business and Technology Development Center. North Carolina Oil Spill Response Plan, On-going. http://www.sbtdc.org/mts/oilspills.htm

United States Department of the Interior, Fish and Wildlife Service. Robert G. Piper et.al. Fish Hatchery Management. 1983.

Appendix A
Telephone Conversation Records

Appendix B
Chemical Safety Cards

Appendix C
ADOT&PF Commercial Vehicle Accident Data

Appendix D
ADEC Situation Reports

Appendix E
Registered and Approved Spill Response Contractors

Appendix F
Highway Design Considerations and Recommendations

HIGHWAY DESIGN CONSIDERATIONS AND RECOMMENDATIONS

A critical aspect of spill control is the design of catchment systems downgradient of the highway and on bridges that could act to catch or impede runoff during a spill event. This becomes more important when the road is located in environmentally sensitive areas were surface waters such as creeks and rivers are present, which could further carry pollutants and severely elevate the affected area. Storm water devices could be used to help prevent spills from migrating to creeks and rivers. Examples include grassy swales, flat-graded ditches, and catchment basins etc. that are incorporated into the highway design.

An additional mitigating factor would be to identify obvious surface migration pathways and incorporate road designs that may slow the migration of a spill. This could be aided with a highway designed to capture pollutant runoff with storm water design modifications, large cornering radii, and limited exposure to surface waters. For all alternatives under consideration in the SDEIS for the Sterling Highway Between MP 45 and MP 60, it is impossible to eliminate bridge crossings due to the proximity of the many creeks on either side of the Kenai River.

Other design considerations that are more focused on traffic safety would, in general, lessen the probability of a traffic accident or impede spill migration. The following is a list of considerations for collision avoidance and improving response capabilities to minimize spill related impacts should a hazardous transportation spill occur on the Sterling Highway between MP 45 and MP 60:

- Collision avoidance measures
  a. Separate lanes by a wide median with natural vegetation
  b. Tree thinning on highway segments to reduce glare and wildlife attraction, improve visibility, melt snow and ice and possibly reduce wildlife-vehicle collisions
  c. Acceleration and deceleration lanes
  e. Identify wildlife crossings.

- Intelligent Transportation Systems
  a. Automated signs
  b. Radio advisory system

- Emergency Response Measures
  a. Wide shoulders for response vehicles
  b. Road side emergency telephones
  c. Emergency vehicle turnaround areas

- Improve local emergency response capabilities (Cooper Landing Fire Department) with better and more supplies of protective equipment, enabling them to immobilize and contain a spill while waiting for outside resources.

- Improve hazardous response training for the local voluntary fire department. This could be addressed with the implementation of a HAZMAT training course certified by OSHA. Information on grants and training opportunities can be obtained by contacting the Alaska Department of Environmental Conservation – Statewide Public Services Division.