4.4.5 Hazardous Material Release

4.4.5.1 Characteristics

Hazardous materials are any substances posing an unreasonable risk to safety and health, the environment, and the property of North Dakota citizens. The term "hazardous materials" envelops a vast array of products, from the relatively innocuous types, such as creosote, to highly toxic or poisonous types, such as polychlorinated biphenyl's (PCB's) and phosgene gas. The severity of potential hazards caused by these materials is varied, but the primary reason for the designation is their risk to public safety.

Categories of hazardous materials include:

- Explosives (Class 1)
- Gases (Class 2)
- Flammable and combustible liquids (Class 3)
- Flammable solids, spontaneously combustible materials, and water-reactive substances (Class 4)
- Oxidizing substances and organic peroxides (Class 5)
- Toxic/poisonous substances and infectious substances (Class 6)
- Radioactive materials (Class 7)
- Corrosive substances (Class 8)
- Miscellaneous hazardous materials (Class 9)

(US Department of Transportation, 2004)

Table 302.4 in the Code of Federal Regulations (CFR) Title 40, Part 302 lists hazardous substances and their reportable quantities.

Hazardous material incidents are categorized as uncontrolled releases occurring during transportation or at a stationary facility. Although the listed hazardous materials are classified essentially the same in both transportation and stationary incidents, the US Department of Transportation is responsible for determining hazardous materials associated with transportation and the US Environmental Protection Agency (EPA) determines which materials are considered hazardous in stationary releases.

The United States' economy is the largest in the world and to expand its competitive edge, durable and non-durable goods must not only satisfy a global consumer market, but must be produced more efficiently. Unfortunately, many materials used to power the economy are, by nature, hazardous to public safety. Billions of tons of hazardous materials are transported, stored, and used each year. Improper use and improper stationary storage create a definite threat. Millions of shipments of hazardous materials move throughout the US each year via the highway, rail, and air transportation systems. Collisions, other types of accidents, equipment malfunction, and improperly engineered containers are inherent risks that pose a threat of release.

The economy of North Dakota is based on agriculture, light manufacturing, coal mining, and petroleum and natural gas extraction. All of these businesses and industries rely on the production, use, storage, and transportation of hazardous materials. In North Dakota, explosives are used principally in mineral extraction, construction, and seismic work. Traffic accidents pose the greatest threat of incidents involving

explosives. Flammable liquids, solids, and gases are produced and transported intrastate and interstate via the highway, railroad, and pipeline systems, constituting a danger to public safety. One jurisdiction in west central North Dakota has one of the largest coal gasification plants in the world. This plant alone has forty-two hazardous materials that are used, stored, or produced. One product produced is anhydrous ammonia (fertilizer), a hazardous material used by most farmers in North Dakota. Nuclear fuels are not produced or used but may be transported in North Dakota. Radioactive isotopes are used in the medical profession and are classified as a hazardous material and a hazardous waste. According the Environmental Protection Agency's (EPA) Envirofacts database, North Dakota has 2,149 facilities regulated by the EPA. (US Environmental Protection Agency, 2007)

Hazardous materials releases often are viewed in a worst case scenario. Some have resulted in the loss of several lives and contamination of soils, rivers, lakes, streams, underground water supplies, and fish and wildlife habitat; however, the majority of incidents involve small spills and releases requiring little response or recovery action. The problem for decision-makers at all levels of government is to create a safe system for the use, storage, and transportation of hazardous materials while expanding the economic viability.

In the event of a hazardous material release, the National Weather Service has the ability to issue a variety of warnings or statements. For example, a Hazardous Materials Warning, a warning of the release of a non-radioactive hazardous material that may recommend evacuation or shelter in place, may be issued using information reported by state or local officials. Other warnings and statements for civil danger, civil emergency, evacuation immediate, local area emergency, radiological hazard, and shelter in place are also available to state and local emergency officials if needed. (National Weather Service, 2005)

Other significant hazardous material concerns are the hazardous by-products from the production of the drug methamphetamine. This drug is easily "cooked" up using readily available hazardous materials in clandestine labs. These labs may then be contaminated with a variety of toxic chemicals such as methanol, ether, benzene, methylene chloride, trichloroethane, toluene, muriatic acid, sodium hydroxide, anhydrous ammonia, and red phosphorus.

Hazardous material releases occur for a variety of reasons but are often initiated by a transportation accident. Almost any hazard that destroys infrastructure can lead to a hazardous material release. For example, floods can wash out bridges or roadways and infiltrate storage facilities and ultimately cause a hazardous material release. Strong winds, poor visibilities, or slippery roadways from tornadoes, wildfires, or winter storms may also instigate such an accident. Hazardous material releases can also be intentional as is the case with a terrorist act or a domestic incident such as a methamphetamine lab. Hazardous material releases during any disaster will most certainly compound the complexity of the event.

4.4.5.2 History

The history of hazardous material releases in North Dakota range from small household leaks to large releases from train derailments. Table 4.4.5.2C lists the number of reports listed in the National Response Center database from 1997-2006 by county. Perhaps the most significant hazardous material release in North Dakota's history was the January 2002 anhydrous ammonia release near Minot. An excerpt from the associated National Transportation Safety Board report follows.

Figure 4.4.5.2A The January 18, 2002 derailment scene near Minot. Source: National Transportation Safety Board, 2004.

"At approximately 1:37 a.m. on January 18, 2002, eastbound Canadian Pacific Railway freight train 292-16, traveling about 41 mph, derailed 31 of its 112 cars about ½ mile west of the city limits of Minot, North Dakota. Five tank cars carrying anhydrous ammonia, a liquefied compressed gas, catastrophically ruptured, and a vapor plume covered the derailment site and surrounding area. The conductor and engineer were taken to the hospital for observation after they complained of breathing difficulties. About 11,600 people occupied the area affected by the vapor plume. One resident was fatally injured, and 60 to 65 residents of the neighborhood nearest the derailment site were rescued. As a result of the accident, 11 people sustained serious injuries, and 322 people, including the 2 train crewmembers, sustained minor injuries. Damages exceeded $2 million, and more than $8 million has been spent for environmental remediation." (National Transportation Safety Board, 2004)

Figure 4.4.5.2B Fire photo taken by Gilby Fire and Rescue.

Other significant hazardous material releases in North Dakota include the 1989 chemical fire near Grand Forks, the 1987 agricultural chemical warehouse fire in Minot that forced the evacuation of 10,000 people, and the 1985 uranium oxide spill near Bowdon.

Table 4.4.5.2C National Response Center Hazardous Material Releases 1997-2006

County	Aircraft	Conti-nuous	Fixed	Mobile	Pipeline	Railroad	Railroad (Non-Release)	Storage Tank	Other	Total
North Dakota	*3*	*19*	*259*	*63*	*55*	*89*	*77*	*48*	*6*	*615*
Adams	0	0	0	0	0	0	1	0	0	1
Barnes	0	1	2	7	2	6	3	2	0	23
Benson	0	0	1	1	1	0	0	0	0	3
Billings	0	0	6	1	5	1	0	0	0	13
Bottineau	0	1	2	1	5	0	0	0	0	9
Bowman	0	0	1	0	0	0	1	2	0	4
Burke	0	0	3	0	1	2	1	1	0	8
Burleigh	0	0	8	1	3	3	2	1	0	18
Cass	1	7	7	7	4	5	17	4	1	53
Cavalier	1	0	0	0	0	0	0	2	0	3
Dickey	0	0	0	0	0	0	0	0	0	0
Divide	0	0	0	0	1	0	0	0	0	1
Dunn	0	0	1	0	1	0	0	1	0	3
Eddy	0	0	1	0	0	1	1	0	0	3
Emmons	0	0	0	0	0	0	0	1	0	1
Foster	0	0	0	1	0	1	5	1	0	8
Golden Valley	0	0	0	2	0	0	0	0	0	2
Grand Forks	0	1	22	4	4	4	8	6	1	50
Grant	0	0	0	0	0	0	1	0	0	1
Griggs	0	0	0	0	0	1	2	0	0	3
Hettinger	0	0	0	0	0	0	0	0	0	0
Kidder	1	0	1	0	1	0	3	0	0	6
LaMoure	0	0	0	2	0	0	0	0	1	3
Logan	0	0	1	0	0	0	0	0	0	1
McHenry	0	0	1	3	1	6	5	1	0	17
McIntosh	0	0	1	1	0	0	0	0	0	2
McKenzie	0	0	8	0	11	0	0	1	1	21
McLean	0	1	6	4	0	1	0	1	0	13
Mercer	0	2	65	3	0	3	1	4	0	78
Morton	0	1	66	1	0	2	0	2	0	72
Mountrail	0	0	2	0	3	3	3	1	2	14
Nelson	0	0	0	2	0	0	1	0	0	3
Oliver	0	1	9	1	2	1	0	0	0	14
Pembina	0	2	1	1	1	0	0	3	0	8
Pierce	0	0	0	0	0	1	0	1	0	2
Ramsey	0	0	3	2	0	0	0	1	0	2
Ransom	0	0	1	2	0	5	0	0	0	8
Renville	0	0	2	1	0	0	0	1	0	4
Richland	0	1	6	2	1	5	2	3	0	20
Rolette	0	0	2	0	0	0	0	0	0	2
Sargent	0	0	0	0	0	0	0	0	0	0
Sheridan	0	0	0	0	0	1	0	1	0	2
Sioux	0	0	0	0	0	0	0	1	0	1
Slope	0	0	0	0	0	0	0	0	0	0
Stark	0	0	3	3	1	2	1	0	0	10

Table 4.4.5.2C National Response Center Hazardous Material Releases 1997-2006 (continued)

County	Aircraft	Conti-nuous	Fixed	Mobile	Pipeline	Railroad	Railroad (Non-Release)	Storage Tank	Other	Total
Steele	0	0	1	1	0	0	0	0	0	2
Stutsman	0	0	8	0	0	6	2	1	0	17
Towner	0	0	0	0	0	0	1	0	0	1
Traill	0	1	0	0	0	0	1	0	0	2
Walsh	0	0	1	1	0	0	0	2	0	4
Ward	0	0	10	6	2	10	9	1	0	38
Wells	0	0	0	2	0	16	3	0	0	21
Williams	0	0	7	0	5	3	3	2	0	20

Source: National Response Center, 2007.

Table 4.4.5.2D North Dakota Hazardous Material Release Declared Disasters and Emergencies

Declaration	Location	Date	Magnitude	Casualties	Damages
None					

4.4.5.3 Probability and Magnitude

During the 10 year period of 1997-2006, 615 hazardous material releases in North Dakota were reported to the National Response Center, with the majority (259) from fixed sites. Based on this dataset, on average, 62 incidents can be expected annually in North Dakota. In reality, the actual probability may be higher as not all incidents get recorded in the national database. Major incidents requiring large scale evacuations and causing mass fatalities or injuries are possible as the historical record indicates.

Table 4.4.5.3A shows the evacuation radii for a few common hazardous materials. This list is generalized for planning purposes and is certainly not all-inclusive. Emergency responders should rely on other sources for more detailed information.

Table 4.4.5.3A Evacuation Radii for Hazardous Material Releases

Material	Potential Hazard	Initial Isolation	Evacuation
Diesel Fuel/Gasoline	Highly Flammable	150 feet	Up to ½ mile
Ammonium Nitrate Fertilizers	Oxidizer	330 feet	Up to ½ mile
Propane	Extremely Flammable	330 feet	Up to 1 mile
Anhydrous Ammonia	Toxic by Inhalation	200 feet	Up to 1.4 miles
Chlorine Gas	Toxic by Inhalation	900 feet	Up to 4.6 miles

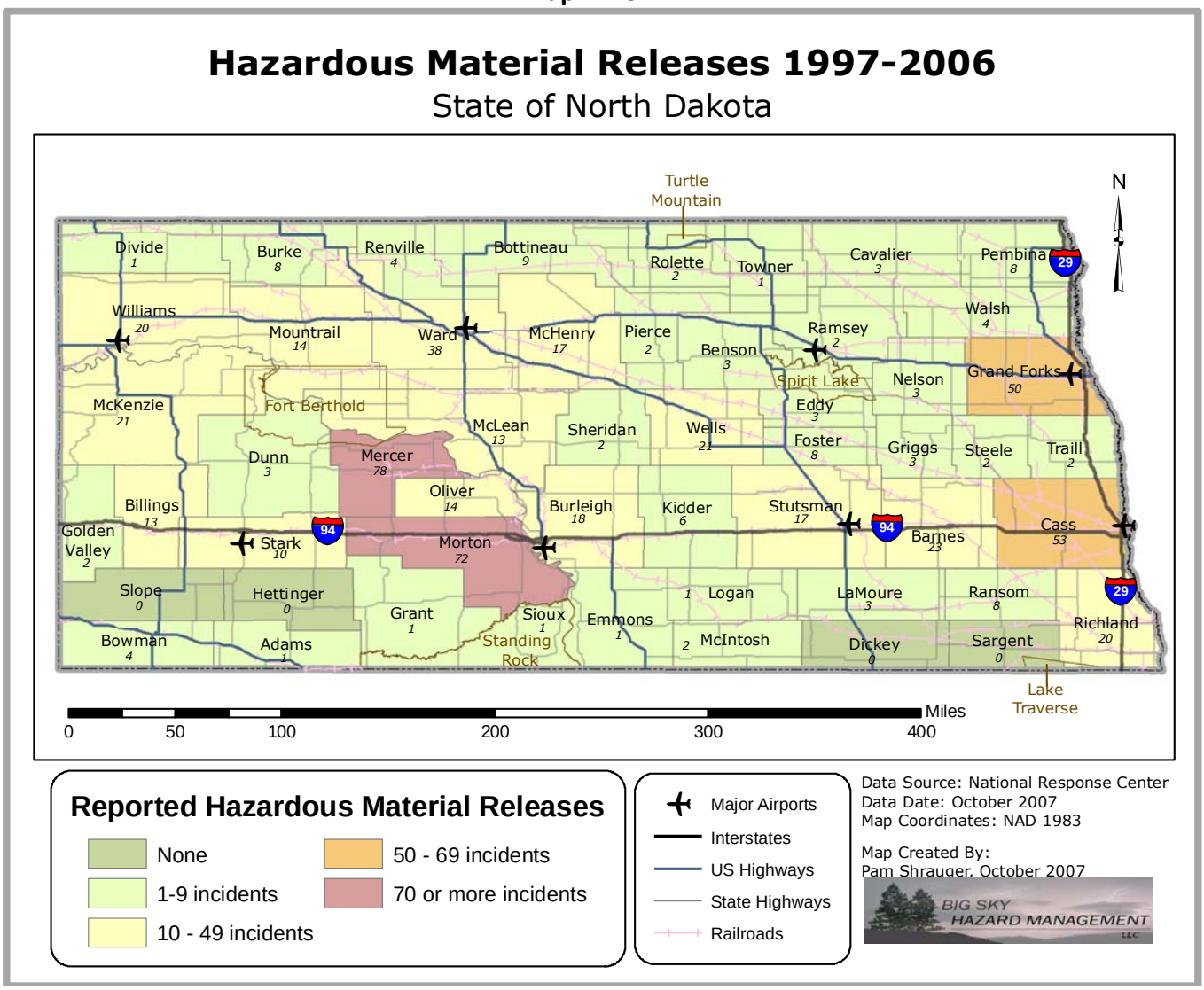
Sources: US Department of Transportation, 2004.

4.4.5.4 Mapping

Hazardous material incidents can happen anywhere, but the most likely locations are at fixed facilities producing, housing, or using hazardous materials or along the interstate, railroad, and pipeline

infrastructure. Map 4.4.5.4A shows the historical occurrences by county and also the transportation infrastructure in the state.

Map 4.4.5.4A



4.4.5.5 Vulnerabilities of State-Owned Buildings and Property

Since hazardous material releases can occur virtually anywhere, all state-owned buildings and property are at risk. Fortunately, unless an explosion is present with the release, structures are typically not damaged in a hazardous materials release. Therefore, the risk to state-owned buildings and property is low, however, those facilities in close proximity to a fixed facility containing hazardous materials, an interstate, a pipeline, or a railroad are at an enhanced risk. North Dakota State Fire and Tornado Fund data indicates $11,609 in state-owned building insurance claims for explosions since 1989; all claims were in Stutsman County. (North Dakota State Fire and Tornado Fund, 2007)

4.4.5.6 Vulnerabilities of Critical Facilities and Infrastructure

Similar to state-owned buildings and property, critical facilities and infrastructure are at risk from hazardous material releases. Those in close proximity to hazardous fixed facilities and transportation or utility infrastructure are at greatest risk. Much of the vulnerability depends on specifically where a release occurs in proximity to the critical facilities and infrastructure. Should a hazardous material release affect one of the critical facilities, the level of emergency services available could be reduced. A release near a special needs facility may present unique evacuation challenges. Table 4.4.5.6A shows the explosion losses recorded by the North Dakota State Fire and Tornado Fund.

Table 4.4.5.6A Explosion Claims Paid on Critical Facilities Insured by the State since 1989

County	Local Government	University System	School Districts
North Dakota	*$128,228*	*$137,886*	*$28,260*
Benson			$279
Dickey	$2,472		
Grand Forks		$137,886	
Kidder			$831
Ramsey			$26,113
Stark			$292
Steele	$1,747		
Walsh	$60,618		$745
Ward	$10,575		
Williams	$52,816		

Source: North Dakota State Fire and Tornado Fund, 2007.

Most hazardous material releases do not usually have an effect on infrastructure, particularly underground infrastructure. Some critical infrastructure uses hazardous materials to operate such as chlorine for water treatment and PCBs for electric transformers. Similarly, contamination of the water supply may be treated like a hazardous material release. Propane and fuel oil, necessary fuels for heating, can also be hazardous if released during their delivery due to their explosive potential. Transportation may be limited if a key roadway or railway is blocked by an incident.

Table 4.4.5.6B shows the critical facilities and infrastructure summary for the counties with a high or very high hazardous material release rating. See Section 4.3.2 for more details.

Table 4.4.5.6B Critical Facilities and Infrastructure in High and Very High Hazardous Material Release Hazard Counties

County	Local	State	Hospitals	National Guard	Comms	Energy	Trans.	Univ.	Schools	Special Needs
Burleigh	VH	H	H	VH	VH	M	VH	H	VH	H
Cass	VH	L	H	H	VH	L	VH	VH	VH	L
Grand Forks	VH	L	H	H	VH	L	VH	VH	H	L
Mercer*	M	L	L	L	M	VH	M	L	M	L
Morton	H	L	L	M	VH	VH	H	M	M	H
Richland*	M	L	L	M	VH	M	H	H	M	L
Stark	H	L	H	L	VH	H	VH	H	M	L
Stutsman	H	L	L	M	VH	M	VH	M	M	H
Ward*	H	L	H	H	VH	L	H	H	H	L
Williams	H	L	L	L	VH	H	H	H	M	L

VH=Very High; H=High; M=Moderate; L=Low
* includes at least part of the reservation

4.4.5.7 Vulnerabilities to Jurisdictions

The population impacts are often greater than the structural impacts during a hazardous material release. Depending on the material, the health impacts to humans can be long and short term. A hazardous material release could have a greater impact on those areas with higher population concentrations such as cities, special needs facilities, and businesses rather than more rural areas. In a hazardous material release, those in the immediate isolation area would have little to no warning, whereas, the population further away in the dispersion path may have some time to evacuate, depending on the weather conditions, material released, and public notification.

Hazardous material releases usually do not have a significant impact on the economy. Exceptions could be an event that restricts access to an area for weeks or months. During the clean-up period, tourism and commerce may be affected as travelers avoid the damaged area. The most serious impacts of a hazardous material release would likely be to the environment and other ecological values. Clean-up efforts may mitigate the effects, but some losses may occur. Sensitive habitats could be damaged or air and water quality reduced. Social values may also be temporarily disrupted until the affected areas are cleared. Unless a building or historic site is significantly damaged directly by the incident, historic values would remain unaffected.

Table 4.4.5.7A shows the overall hazardous material release hazard by county. The county hazard ratings were determined based on the historical occurrence (see Map 4.4.5.4A), the county population (see Map 4.3.3C), and the transportation infrastructure (see Table 4.3.2U).

Table 4.4.5.7A Hazardous Material Release Risk to Jurisdictions

County	Hazardous Material Release Hazard	Hazard Rating in Local/Tribal Plan	Additional Information from Local/Tribal Plan
Adams	Low	C	
Barnes	Moderate	B	$20M in potential losses
Benson	Low	NP	
Billings	Moderate	C	
Bottineau	Moderate	B	
Bowman	Low	B	
Burke	Low	D	
Burleigh	High	B	
Cass	Very High	C	
Cavalier	Low	B	
Dickey	Low	C	
Divide	Low	NP	
Dunn	Low	C	
Eddy	Low	C	
Emmons	Low	C	
*Fort Berthold^*	*Low*	*NP*	
Foster	Low	C	
Golden Valley	Moderate	C	
Grand Forks	Very High	B	
Grant	Low	D	
Griggs	Low	C	
Hettinger	Low	C	
Kidder	Moderate	B	
*Lake Traverse^*	*Low*	*NP*	
LaMoure	Low	C	
Logan	Low	D	
McHenry	Moderate	B	
McIntosh	Low	B	
McKenzie	Low	NP	
McLean	Moderate	A	
Mercer	High	B	
Morton	Very High	B	
Mountrail	Moderate	C	
Nelson	Low	B	
Oliver	Moderate	B	
Pembina	Moderate	B	
Pierce	Low	C	
Ramsey	Moderate	B	

Table 4.4.5.7A Hazardous Material Release Risk to Jurisdictions (continued)

County	Hazardous Material Release Hazard	Hazard Rating in Local/Tribal Plan	Additional Information from Local/Tribal Plan
Ransom	Low	B	
Renville	Low	C	
Richland	High	B	
Rolette	Moderate	NP	
Sargent	Low	NP	
Sheridan	Low	NP	
Sioux	Low	NP	
Slope	Low	NP	
Spirit Lake	*Low*	*NP*	
*Standing Rock^*	*Low*	*NP*	
Stark	High	NP	
Steele	Low	NP	
Stutsman	High	C	
Towner	Low	B	
Traill	Moderate	B	
*Turtle Mountain^*	*Low*	*NP*	
Walsh	Moderate	C	
Ward	High	NP	
Wells	Moderate	C	
Williams	High	B	

NP = no local plan
^ includes only North Dakota parts of the reservation

4.4.5.8 Vulnerabilities to Future Development

North Dakota, particularly the western part of the state, is rich in natural resources and the continued development of industries related to the natural resources is a distinct possibility. New development may increase the number of people and facilities exposed to hazardous material releases. These industries are regulated for air and water emissions, but unless local ordinances prohibit or regulate such development, the potential for hazardous material releases could increase through future development. Burleigh, Cass, Grand Forks, Morton, and Stark Counties each have a high or very high hazardous material release hazard and are currently experiencing or expecting population growth.

4.4.5.9 Data Limitations and Other Key Documents

Understanding when, where, and what substances are mostly likely to be released in a hazardous materials incident is the greatest limitation in analyzing this hazard. Hazardous substances pass through North Dakota daily without incident. With so many possibilities and sources for hazardous materials releases in the state, fully describing how a release may occur and what areas would be affected is not possible. A

study of the number and types of hazardous materials using the highways and railroads in the state would improve this profile. The various hazardous materials response teams in North Dakota, the state fire marshal, and the local fire departments could provide more details on specific types of materials and probable scenarios.

Other key documents related to the Hazardous Material Release hazard include:

- North Dakota Emergency Operations Plan, Hazardous Materials Annex