3.11 Risk Assessment: Hazardous Materials

Description

Hazardous materials are substances that are considered severely harmful to human health and the environment. Many hazardous materials are commonly used substances which are harmless in their normal uses, but are quite dangerous if released.

If released or misused, hazardous substances can cause death, serious injury, long-lasting health effects, and damage to structures and other properties, as well as the environment. Many products containing hazardous substances are used and stored in homes and these products are shipped daily on highways, railroads, waterways, and pipelines.

What is a hazardous material?

There are many definitions and descriptive names being used for the term hazardous material, each of which depends on the nature of the problem being addressed. Unfortunately, there is no one list of definition that covers everything. The United States agencies involved, as well as state and local governments, have different purposes for regulating hazardous materials that, under certain circumstances, pose a risk to the public or the environment.

Preparation for Hazardous Materials Handling in Ada County

Source: www.accem.org/hazmatprep.html

Department of Transportation (DOT) Definition

It is any substance or material in any form or quantity which poses an unreasonable risk to safety, health, and property when transported in commerce. The United States Department of Transportation (DOT) uses the term **hazardous materials**, which covers nine hazard classes, some of which have sub-categories called classifications. When a substance meets the DOT definition of a hazardous material, it must be transported in accordance with safety regulations providing for appropriate packaging, communication of hazards, and proper shipping controls. DOT includes in its regulations hazardous substances and hazardous wastes, both of which are regulated by the Environmental Protection Agency (EPA), if their inherent properties would not otherwise be covered.

Environmental Protection Agency (EPA) Definition

(a) A **hazardous substance** is any material which when discharged into or upon the navigable water of the United States or adjoining shorelines may be harmful to the public health or welfare of the United States, including, but not limited to fish, shellfish, wildlife, and public or private property, shorelines and beaches. EPA uses the term **hazardous substance** for chemicals which, if released into the environment above a

certain amount, must be reported and, depending on the threat to the environment, federal involvement in handling the incident can be authorized. A list of the hazardous substances is published in 40 CFR § 302, Table 302.4.
(b) A **hazardous waste** is any material that may pose an unreasonable risk to health, safety or property when transported in commerce for the purposes of treatment, storage or disposal as waste. EPA uses the term **hazardous wastes** for chemicals that are regulated under the Resource, Conservation and Recovery Act (40 CFR § 261.33). Hazardous wastes in transportation are regulated by DOT (49 CFR § 171-177).
(c) **Extremely Hazardous Substances**. EPA uses the term extremely hazardous substance for the chemicals which must be reported to the appropriate authorities if released above the threshold reporting quantity. Each substance has a threshold reporting quantity. The list of extremely hazardous substances is identified in Title III of Superfund Amendments and Reauthorization Act (SARA) of 1986 (40 CFR § 355). Extremely hazardous substances, while also generally toxic materials, represent acute health hazards that, when released, are immediately dangerous to the lives of humans and animals and cause serious damage to the environment. When facilities have these materials in quantities at or above the threshold planning quantity (TPQ), they must submit "Tier II" information to appropriate State and/or local agencies to facilitate emergency planning.
(d) **Toxic Chemicals.** EPA uses the term toxic chemical for chemicals whose total emissions or releases must be reported annually by owners and operators of certain facilities that manufacture, process, or otherwise use a listed toxic chemical. The list of toxic chemicals is identified in Title III of SARA.

Occupational Safety and Health Administration (OSHA) Definition

(a) **Hazardous Chemical.** The United States Occupational Safety and Health Administration (OSHA) uses the term **hazardous chemical** to denote any chemical that would be a risk to employees if exposed in the work place. Hazardous chemicals cover a broader group of chemicals than the other chemical lists.
(b) **Hazardous Substances.** OSHA uses the term **hazardous substance** in 29 CFR § 1910.120, which resulted from Title I of SARA and covers emergency response. OSHA uses the term differently than EPA. Hazardous substances, as used by OSHA, cover every chemical regulated by both DOT and EPA.

When a substance meets the DOT definition of a hazardous material, it must be transported in accordance with safety regulations providing for appropriate packaging, communication of hazards, and proper shipping controls.

In addition to EPA and DOT regulations, the National Fire Protection Association (NFPA) develops codes and standards for the safe storage and use of hazardous materials. These codes and standards are generally adopted locally and include the use of the NFPA 704 standard for communication of chemical hazards in terms of health, fire, instability (previously called "reactivity"), and other special hazards

(such as water reactivity and oxidizer characteristics). Diamond-shaped NFPA 704 signs ranking the health, fire and instability hazards on a numerical scale from zero (least) to four (greatest) along with any special hazards, are usually required to be posted on chemical storage buildings, tanks, and other facilities. Similar NFPA 704 labels may also be required for individual containers stored and/or used inside facilities.

While it is defined somewhat differently by various organizations, the term "hazardous material" may be generally understood to encompass substances that have the capability to harm humans and other living organisms, property, and/or the environment. No universally accepted, objective definition of the term "hazardous material release incident" has been developed either. A useful working definition, however, might be framed as: any actual or threatened uncontrolled release of a hazardous material, its hazardous reaction products, or the energy released by its reactions that poses a significant risk to human life and health, property and/or the environment.

Location, Extent, and Magnitude

Because hazardous materials are so widely used, stored and transported, a hazardous material release incident could take place almost anywhere. Moreover, many hazardous materials are used, stored and transported in very large quantities, so the impacts of a release incident may be widespread and powerful. Hazardous material incidents usually occur on major highways and railways. There is no magnitude rating for hazardous material incidents at present.

Common HazMat Incidents

Non-structural Incidents

A. Gas Leaks

1. Natural gasoline breaks
2. Liquefied Petroleum Gases (LPG)
3. Chlorine (swimming pool)
4. Ammonia (refrigeration)

B. Landfills, dumpsters, and other waste disposal sites

1. Fires involving unwanted materials at the above locations.

C. Electrical fires

1. Power poles (Poly Chlorinated Biphenyls [PCB's])
2. Transformer fires

D. Transportation

1. Highway

a. Car fires
b. Accidents
c. Trucks and their contents

2. Rail

a. Engines and their various fuels
b. Tank cars and box cars carrying large quantities

3. Air

a. Cargo and passenger airlines

4. Water

a. Barges and their contents

5. Pipeline

a. Pipelines and their various contents – local, interstate, intrastate

Fixed Facility Incidents

A. Medical/Research Facilities

B. Industrial manufacturing and processing

C. Agricultural/Lawn and Garden facilities

D. Single Family Residences

E. Apartment buildings, condominiums, and hotels

Chemicals by Business Type

IOEM developed a listing of hazardous materials and chemical types commonly found at a myriad of businesses across different sectors. This list is displayed below in Figure 3.11.A.

Figure 3.11.A. Hazardous Materials Present by Business Type

Type of Business	Types of Chemicals Used
Airport and marine fuel depots	Gasolines and fuel oils
Breweries and distilleries	Alcohols
Chemical Manufacturers	Acids/Bases, cyanide wastes, heavy metals/inorganics, ignitable wastes, reactives, solvents
Cleaning Agents and cosmetics	Acids/bases, heavy metals/inorganics, ignitable wastes, pesticides, solvents
Compressed gas suppliers	medical and industrial gases
Constructions firms and sites	Acids/bases, explosives, compressed gases, fuels, ignitable wastes, solvents, radioactive materials
Dry Cleaners and laundaries	cleaning solvents, perchloroethylene, dry cleaning filtration residues, solvents
Educational and Vocational Shops	Acids/bases, ignitable wastes, pesticides, reactives, solvents
Electronic circuit makers	Acids/bases
Embalming supply houses and funeral services	formaldehyde, solvents
Equipment repair	Acids/bases, ignitable wastes, solvents
Farm/garden supply shops, lawn fertilizer companies, pesticide end users and application services	pesticides, fertilizers, herbicides, heavy metal/inorganics, solvents
Fireworks manufacturers	explosives, pyrotechnics
Food stores or warehouses	ammonia (in refrigeration systems), combustible dusts
Foundries	resins, other chemicals
Formulators	Acids/Bases, cyanide wastes, heavy metals/inorganics, ignitable wastes, reactives, pesticides, solvents
Fuel oil companies	fuel oils
Furniture/wood manufacturing and refinishing	solvents, ignitable wastes
Gasoline stations	Various fuels
Gun and ammo shops	ammunition, explosives
Hazardous waste disposal facilities	virtually anything
Hospitals	compressed gases, medicines, radioactive materials, etiologic agents
Laboratories, research, chemical and biological	Acids/Bases, cyanide wastes, heavy metals/inorganics, ignitable wastes, reactives, solvents, various chemical and etiologic agents
Leather tanners	various chemicals
LP-gas or propane suppliers	liquifiedflammable gases
Metal manufacturing	Acids/Bases, cyanide wastes, heavy metals/inorganics, ignitable wastes, reactives, solvents, spent plating wastes
Motor freight terminals and railroad transportation	Acids/bases, heavy metals/inorganics, ignitable wastes, lead-acid batteries, solvents, fuels
Paint, varnish, and lacquer makers and wholesalers	resins, solvents, chemical pigments and additives
Pest control companies	pesticides, poisons
Plastic and rubber makers	solvents, additives, bulk chemicals
Plating shops	acids/bases, cyanides
Printing and allied industries	acids/bases, heavy metals/inorganics, ink sludges, spent plating wastes, solvents
Pulp and paper mills	bleaches, caustics, acids, sulfur compounds, and others
School and university chemical laboratories	various chemicals
Swimming pools, and supply houses	liquified chlorine, oxidizers, acids/bases, algaecides
Steel mills	acids, degreasers
Textile and fiber manufacturers	solvents, dyes, resins, various other bulk chemicals
Vehicle maintenance	acids/bases, heavy metals/inorganics, ignitable wastes, lead-acid batteries, solvents, compressed gases, paints
Water treatment facilities	liquified chlorine, acids
Welding shops and supply shops	compressed gases
Wood Preserving	preserving agents

Source: IOEM, 2018

Fixed-Site Hazardous Materials

Serious hazardous materials incidents – those causing hospitalizations, deaths, and large-scale economic loss and environmental damage – are generally the result of a series of improbable events involving large quantities of material and are, thus, relatively rare and difficult to predict.

Superfund sites in Idaho. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), was passed by Congress in 1980. The USEPA was authorized to create a list of polluted locations requiring a long-term response to clean up hazardous-material contamination. These locations are designated as Superfund sites, and are placed on USEPA's National Priorities List (NPL). The NPL guides the USEPA in "determining which sites warrant further investigation" for environmental remediation. The industrial sites were areas of mining, heavy metal processing and manufacturing, during a period when processes were inefficient and wastes were dumped, contaminating water and land, with polluting materials also released into the air. In many cases the companies responsible for contamination are no longer in business, and the federal government has had to contribute to clean-up to protect citizens' health. The Idaho Office of Emergency Management carries out the requirements of the Federal Emergency Planning and Community Right to Know Act (EPCRA), as well as the Idaho Hazardous Substance Emergency Response Act. According to the USEPA, there are 12 Superfund sites located in Idaho and can be located via the following website: https://www.epa.gov/aboutepa/epa-idaho.

Figure 3.11.B. Superfund Sites in Idaho

City	County	Zip Code	Site Name
Rathdrum	Kootenai	83858	Arrcom (Drexler Enterprises)
Lemhi County	Lemhi	83469	Blackbird Mine
Smelterville	Shoshone	83837	Bunker Hill Mining & Metallurgical Complex
Pocatello	Bannock	83201	Eastern Michaud Flats Contamination
Idaho Falls	Bonneville	83401	Idaho National Engineering Laboratory (Usdoe)
Soda Springs	Caribou	83276	Kerr-Mcgee Chemical Corp. (Soda Springs Plant)
Soda Springs	Caribou	83276	Monsanto Chemical Co. (Soda Springs Plant)
Mountain Home	Elmore	83648	Mountain Home Air Force Base
Pocatello	Bannock	83201	Pacific Hide & Fur Recycling Co.
St. Maries	Benewah	83861	St. Maries Creosote
Stibnite	Valley	83677	Stibnite/Yellow Pine Mining Area
Pocatello	Bannock	83201	Union Pacific Railroad Co.

Source: USEPA, 2018

The Superfund sites in Idaho are legacy sites that have ongoing remediation in place and are well documented and monitored through the Department of Environmental Quality (DEQ), and all are in the cleanup phase. In relation to currently operating facilities with large quantities of hazmat on site, or railroad yards and trains carrying hazmat posing threats, the Superfund sites are less of a threat for the state.

Tier II reporting reveals the location and identity of large quantities of hazardous materials in storage and use. Table 3.11.C. shows the number of Tier II sites (n=1166) in Idaho by county in 2017. Table 3.11.D. shows the number of Toxic Release Inventory (TRI) sites (n=106) in Idaho by county.

Table 3.11.C. Tier II Facilities in Idaho, by County (as of March 1, 2017)

County	T2 Facilities	County	T2 Facilities
Ada	213	Gem	8
Adams	4	Gooding	26
Bannock	47	Idaho	24
Bear Lake	9	Jefferson	13
Benewah	6	Jerome	38
Bingham	26	Kootenai	71
Blaine	19	Latah	24
Boise	6	Lemhi	14
Bonner	20	Lewis	10
Bonneville	68	Lincoln	6
Boundary	7	Madison	15
Butte	9	Minidoka	27
Camas	1	Nez Perce	47
Canyon	109	Oneida	6
Caribou	20	Owyhee	13
Cassia	33	Payette	20
Clark	2	Power	21
Clearwater	9	Shoshone	9
Custer	8	Teton	6
Elmore	31	Twin Falls	73
Franklin	10	Valley	13
Fremont	15	Washington	10
			County (n=44)
			Facilities (n=1166)

Source: IOEM, 2018

Table 3.11.D. TRI Reporting Facilities in Idaho, by County (2016 data, October 2017)

County	TRI Facilities	County	TRI Facilities
Ada	10	Idaho	1
Adams	1	Jerome	5
Bannock	1	Kootenai	9
Benewah	3	Latah	1
Bingham	4	Lemhi	1
Blaine	1	Lewis	1
Bonner	2	Lincoln	2
Bonneville	5	Madison	1
Boundary	1	Minidoka	2
Butte	1	Nez Perce	11
Canyon	16	Owyhee	3
Caribou	2	Payette	2
Cassia	3	Power	2
Custer	1	Shoshone	5
Elmore	2	Twin Falls	4
Gooding	3		***County (n=31)***
			TRI Facilities (n=106)

Source: IOEM, 2018

In-Transit Hazardous Materials

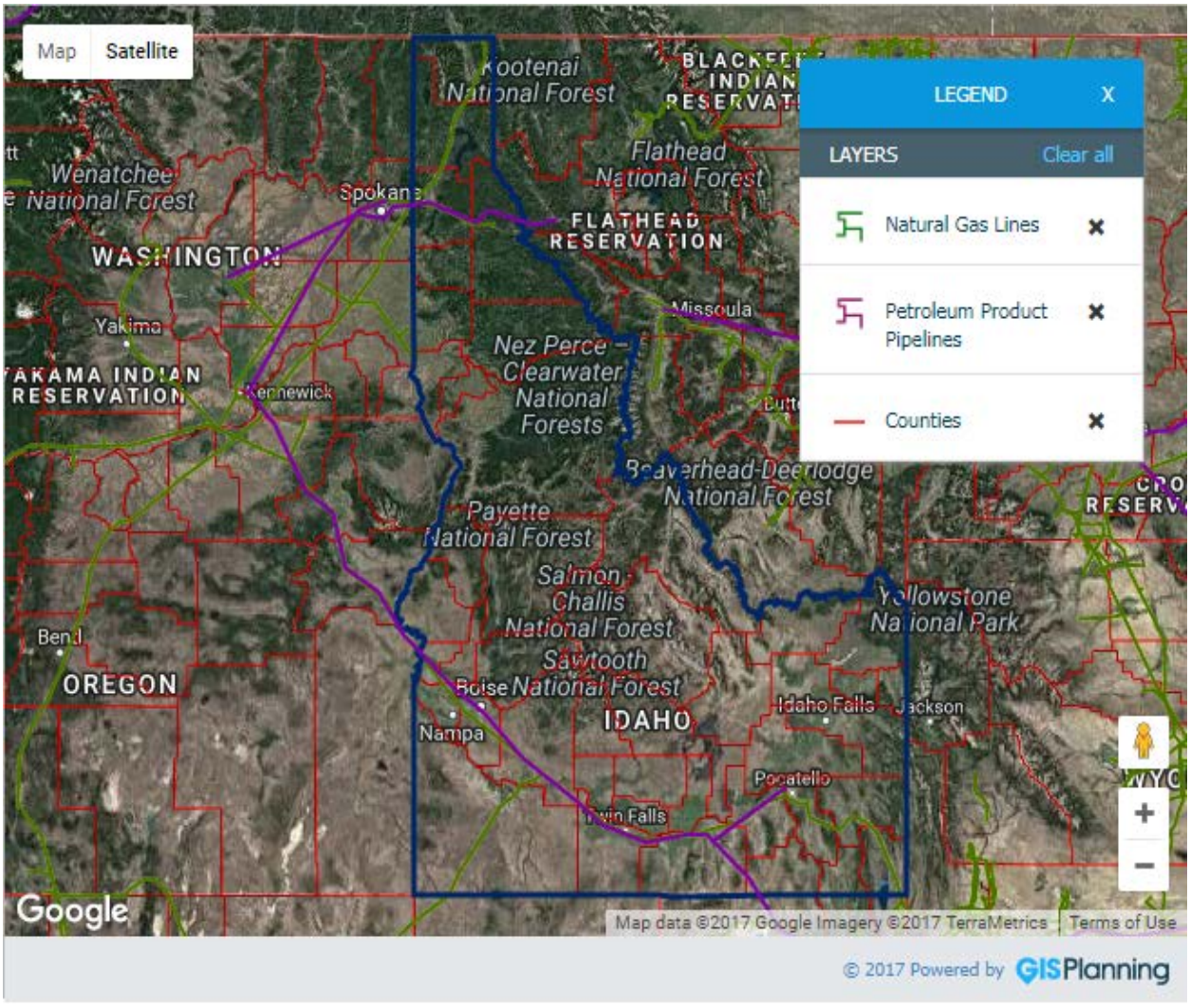
Incidents involving hazardous substances in transit can occur anywhere in the State, along highways and railroads. Idaho has a widespread highway network of over 60,000 miles, which includes interstate highways such as Interstates 84, 86, 15, and 90. Additionally, there are 1,887 miles of rail lines in the State. Figure 3.11.E below illustrates these major transportation routes in Idaho.

Ground water and surface water can be contaminated from a hazardous materials release incident, from a single point source or on an area-wide basis, depending on the severity of the event. According to the Idaho Surface Water Assessment Plan published by DEQ, major contaminants of concern on an area-wide or "nonpoint source" basis include nitrates and pesticides. Nitrates are currently one of the most prevalent nonpoint source pollutants in Idaho. Sources that potentially contribute nitrates to ground water and surface water include high densities of septic systems, agricultural activities such as fertilizer application and confined animal feeding operations, and disposal of food processing wastes.
Major point source contaminants of concern include volatile organic compounds and petroleum compounds. Point source contamination can come from industrial facilities, waste disposal sites, and large accidental spills. Additionally, point sources can be associated with small businesses, abandoned single family water supply wells, and other residential activities commonly located in every community. (IDEQ, 1999).

Figure 3.11.E. Major Transportation Routes in Idaho

Hazardous substances can also be transported via pipeline across Idaho. The State receives petroleum products by two pipelines, one running west along the Snake River Valley from refineries in Utah and another crossing the northern part of the State from refineries in Montana. Some petroleum products from Puget Sound refineries are also sent by pipeline to Portland, Oregon, and then by barge up the Columbia and Snake Rivers to Lewiston, Idaho. Those that use natural gas in the State receive their supply by interstate pipeline, mainly from Canada. One pipeline system enters Idaho at its northern border with Canada, crosses the panhandle, and continues to Washington, Oregon, and California. The other system runs from the San Juan Basin in southwestern Colorado across Idaho's Snake River Plain to the Pacific Northwest and Canada. That system is bi-directional, so it can supply natural gas to Idaho either from Canada or from Wyoming and Colorado. This map does not include distribution lines in communities nor propane distributors.

Figure 3.11.F. Petroleum and Natural Gas Pipelines in Idaho



Extent

The extent of a hazardous substance release will depend on whether it is from a fixed or mobile source, the size of impact, the toxicity and properties of the substance, duration of the release, and the environmental conditions (for example, wind and precipitation, terrain, etc.).

Severity

Hazardous substance releases can contaminate air, water, and soils, possibly resulting in death and/or injuries. Dispersion can take place rapidly when the hazardous substance is transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

With a hazardous substance release, whether accidental or intentional, several potentially exacerbating or mitigating circumstances will affect its severity or impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place measures protects people and property from the harmful effects of a hazardous substance release. Exacerbating conditions, characteristics that can enhance or magnify the effects of a hazardous substance release, include:

Source: https://cfa2012-c.s3.amazonaws.com/Incidents_Vehicle_Rescue_Hazmat/20130625_Hazmat_Keysborough/88915ae6a3c5cc06455afd30eb763b6c_dsa43319.jpg

> *Weather conditions, which affect how the hazard occurs and develops, or*
> *Micro-meteorological effects of buildings and terrain, which alters dispersion of hazardous substances, or in non-compliance with applicable codes (such as building or fire codes), and maintenance failures (such as fire protection and containment features), which can substantially increase the damage to the facility itself and to surrounding buildings.*

As discussed earlier, the severity of the incident is dependent not only on the circumstances described above, but also with the type of substance released and the distance and related response time for emergency response teams. The areas with the closest proximity to the releases are generally at greatest risk; however, depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (e.g. centuries to millennia).

Warning Time

The warning time for an incident occurring at an on-site or fixed facility will vary. Incidents may be sudden without any warning such as an explosion, or may be slowly developing such as a leaking container. Facilities that store extremely hazardous substances are required to notify local officials when an incident occurs. Local emergency responders and emergency management officials would determine the need to evacuate the public or to advise to shelter in place.

Similarly to on-site hazardous substances incidents, the amount of warning time for incidents associated with hazardous substances in transit varies based on the nature and scope of the incident. If an explosion did not occur immediately following an accident, there may be time for warning of adjacent neighborhoods and enough time to facilitate appropriate protective actions.

Relationships to Other Hazards

Secondary Impacts

The secondary impacts associated with on-site hazardous substances releases include those impacting the health of the community and environment. The secondary impacts have the potential to occur regardless of the mode or the source of release. In addition to the secondary impacts noted for the fixed-site hazard, other impacts include damage to the infrastructure such as road beds or bridges may occur, Public Water, and Wastewater Systems.

Every year, natural disasters, such as wildfires, floods, earthquakes, hurricanes, tornadoes, and winter storms, challenge American communities. For example, in 2017, the United States experienced, in a one-month period, three separate destructive hurricanes that impacted a large area of the United States (U.S.) and its territories – Hurricane Harvey (August 2017), Hurricane Irma (September 2017), and Hurricane Maria (September 2017). These hurricanes represent only a few of the natural disasters that occurred that year, which also included the northern California firestorm (October 2017) and tornadoes across the South (January 2017) and Midwest (March 2017). In addition to addressing the loss of power, homes, and lives from natural disasters, communities are tasked with the difficult job of managing the large amounts of natural disaster debris that may be generated by these disasters. Natural disaster debris refers to the material and waste streams resulting from a natural disaster. Disaster debris often includes building materials, sediments, vegetative debris, **hazardous materials**, and personal property. Large quantities of debris can make recovery efforts difficult by, for example, hindering emergency personnel, damaging or blocking access to necessary infrastructure, and posing threats to human health and the environment. Generally, natural disaster debris can include:

- ACM (e.g., asbestos pipe wrap, siding, and ceiling and floor tiles);
- Ammunition and explosives;
- Animal carcasses;
- Asphalt;
- Building contents (e.g., furniture, personal property);

- Commingled debris (i.e., a mixture of many debris types, such as C&D debris, vegetative debris, HHW, and building contents);
- C&D debris (e.g., mixed metals, masonry materials, concrete, lumber, asphalt shingles);
- Cylinders and tanks;
- Electronics waste (e-waste) (e.g., televisions, computers, cell phones);
- Food waste (e.g., rotten food from grocery stores, restaurants, and residences);
- Hazardous waste (e.g., batteries, pesticides, solvents, paint thinners, mercury containing devices);
- HHW (e.g., household cleaners, freezer and refrigerator coolant);
- Marine or waterway debris;
- Medical waste;
- Metals;
- Mixed waste (i.e., waste containing both radioactive and hazardous waste components);
- Municipal solid waste (MSW);
- PCB-containing waste (e.g., transformers, capacitors, other electrical equipment);
- Pharmaceuticals;
- Radiological-contaminated waste (e.g., hospital equipment);
- Soils, sediments, and sandbags;
- Tires;
- Treated wood (e.g., utility poles, fencing, decks);
- Used oil and oil-contaminated waste;
- Vegetative debris (or green waste) (e.g., uprooted trees, branches, stumps, leaves);
- Vehicles and vessels; and
- White goods (i.e., household appliances, such as stoves, refrigerators, washers/dryers, air conditioner units).

Many of the waste indicated above are hazardous materials and must be properly handled and disposed of properly in designated locations.

Past Occurrence

The Pipeline and Hazardous Materials Safety Administration (PHMSA) tracks hazardous material releases through its nationwide database. Regulations in 49 CFR § 171.15 and 171.16 govern situations where hazardous materials are released and the resulting required notifications and reporting. Unless they are properly reported, it is difficult to identify and track past hazardous materials releases. Between January 1, 2012 and October 1, 2017, there have been 1,248 hazmat release incidents in Idaho, none of which were fatal. During that same period, 190 hazardous material incidents in Idaho were reported to PHMSA. These incidents resulted in one injury that required hospitalization and 200 non-hospital injuries. Damages were estimated at over $2.7 million. 3.11.G summarizes these events in Idaho from 2012 through 2017.

Figure 3.11.G. Idaho Hazardous Material Releases as Reported to IOEM

Year	Incidents
2012	226
2013	239
2014	208
2015	213
2016	174
2017	188
	n=1248

FEMA Disaster Declarations

Between 1954 and 2017, FEMA has not included Idaho in any hazardous material-related disasters (DR) or emergencies (EM) declarations. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. However, not all counties were included in the disaster declarations as determined by FEMA (FEMA 2017).

Future Occurrence

The events that can produce a hazardous materials release vary greatly, and the fact that all releases have a human component makes prediction difficult.

Probability

While only 190 hazardous material incidents in Idaho were reported to PHMSA over the last five years, statistical analysis of incidents reported to IOEM during the same timeframe indicates that there have been an average of 208 release incidents a year. The probability of future occurrence can be developed from the state reporting, and there is a 100-percent chance of a hazardous material incident occurring in any given year in the State.

Environmental Impacts

Hazardous materials incidents can have obvious, direct environmental impact as well as long-term, insidious environmental damage. If spilled, hazardous substances can contaminate wells, kill wildlife, and impact the ecosystem. Hazardous substance incidents also can cause acute and chronic health issues and have an impact on long-term public health. Water pollution is an immediate concern for direct human consumption, recreation, crop irrigation, and fish and wildlife consumption. Depending on the material, pollutants can bio accumulate to differing degrees, affecting animals high on the food chain long after a spill. Hazardous material incidents would not likely affect geology, but could significantly impact soils and farmlands, requiring expensive remediation. Unless a spill is directly adjacent, hazardous materials incidents are unlikely to affect archeological sites.

Climate Change Impacts

Hazardous materials are everywhere in our communities and throughout the State; therefore, there are serious implications for impacts from climate change. As described in the earlier section regarding relationships to other hazards, hazardous materials are an important factor and often a cascading affect

in every natural and many man-made disasters. Therefore hazmat is subject to the same climate change considerations as each and every other hazard.

Development Trend Impacts

An understanding of population and development trends can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. The State considered the following factors to examine previous and potential conditions that may affect hazard vulnerability: potential or projected development; projected changes in population; and other identified conditions as relevant and appropriate. The U.S. EPA's Integrated Climate and Land-Use Scenarios (ICLUS) project generated projected population and land use projections for the United States through 2100. The project examined multiple scenarios taking into account various population growth and economic development parameters that have been used as the baseline for the Intergovernmental Panel on Climate Change's (IPCC) Special Report on emissions Scenarios (SRES). Population change took into account assumptions regarding fertility, mortality, and immigration, which was then used to drive the land use projections. Map 2.F. in Chapter 2 (State Profile) displays the projected population growth by 2026.

Not all land-use regulations restrict building around industrial facilities or along transportation routes. As the population increases, development will also continue to increase in these areas, thereby exposing a greater number of individuals to the risk of a hazardous materials release. Increased development will lead to increased vulnerability and potential losses.

Vulnerability Assessment

The risk of hazardous materials incidents in Idaho can be expected to remain at historical levels with small, incremental increases in proportion to statewide increases in population and economic activity. Transportation incident risk might also be expected to be influenced to some extent by population and economic activity increases in surrounding States. Idaho's highways network spans over 60,000 miles, and there are 1,887 miles of rail lines in the State. Major highways and railways are frequently used to transport hazardous materials. Hazardous spills or releases along these major transportation routes can cause delays or shut down service until the release incident is cleaned up. Hazardous materials could also affect water treatment facilities.

Serious hazardous materials incidents – those causing hospitalizations, deaths, and large-scale economic loss and environmental damage – are generally the result of a series of improbable events involving large quantities of material and are, thus, relatively rare and difficult to predict. Typically, a hazardous material release incident will not lead to physical damages to a structure; however, in the instance of a gas leak along a pipeline or within a hazardous storage facility for example, an explosion could occur and impact the structure. Generally though, potential losses may include inaccessibility, loss of service, contamination and/or potential structural and content losses if an explosion occurs.

Tier II reporting reveals the location and identity of large quantities of hazardous materials in storage and use. 1,166 Idaho facilities submitted Tier II reports in 2017. A table of this information broken down by county can be found in Table 3.11.C, located on page 3.11-7.

In addition, the Idaho National Laboratory (INL) site in southeastern Idaho routinely stores, uses, and ships high and low level radioactive materials. Hazard mitigation for the INL is addressed in separate INL and county plans. The presence of large shipments of hazardous materials is essentially a constant on rail lines and highways.

The Toxics Release Inventory (TRI) Program's goal is to provide communities with information about toxic chemical releases and waste management activities, and to support informed decisions making at all levels by industry, government, non-governmental organizations, and the public. Table 3.11.D. shows the numbers of those types of facilities, per county, in 2016.

Critical Infrastructure and State Facility Impacts

Major highways and railways are frequently used to transport hazardous materials. Hazardous materials release incidents could affect water treatment facilities.

Hazard Mitigation Vulnerability Assessments

All counties in Idaho have at least one Tier II facility that stores hazardous substances, according to IOEM. Additionally, thirty-three (31) counties have at least one Toxic Release Inventory reporting facility, according to the U.S. EPA. Depending on the type and quantity of chemicals released and the weather conditions, an incident can affect larger areas that cross jurisdictional boundaries. When hazardous substances are released in the air, water or on land they may contaminate the environment and pose greater danger to human health. The general population may be exposed to a hazardous substances release through inhalation, ingestion or dermal exposure. Exposure may be either acute or chronic, depending upon the nature of the substance and extent of release and contamination.

The majority of the Idaho population is at risk to the effects of hazardous substances incidents. Populations located along major transportation routes (such as I-84, I-86, I-15, and I-90) are more vulnerable because of the quantities of chemicals transported on these major thoroughfares. The closure of waterways, railroads, airports and highways as a result of a hazardous substance incident has the potential to impact the ability to deliver goods and services efficiently. Potential impacts may be local, regional, or statewide depending on the magnitude of the event and level of service disruptions. Most county hazardous materials response capabilities will more than likely be overwhelmed in the event of a major release incident, and could potentially require the assistance of State and even Federal agencies.

Loss Estimation

No specific, statewide loss estimation exists for the hazard of hazardous materials. Historical losses tend to be related to property damages more than to loss of life and injury. For the past five years, the 190 hazardous material incidents in Idaho that were reported to PHMSA resulted in one injury that required hospitalization and 200 non-hospital injuries. Damages were estimated at over $2.7 million, which is an

average of $14,210 per incident. If this same statistical analysis is applied to the actual number of incidents reported to the State of Idaho, loss estimations are calculated at an average of $17.7 million per year.

From a general perspective, hazardous material releases damage and destroy public, commercial, and private property and natural resources. The resulting costs are for the restoration, maintenance, remediation, response, and post de facto litigation. Property damage routinely occurs on transportation facilities such as highways and railroads. Road closures are not uncommon. The economic costs of these disruptions can be significant, especially in areas with limited access options. Direct costs can be defined as the cost of materials, carrier damage, property damage, response cost, and remediation/cleanup cost for a specific release. All other costs from hazardous material releases are indirect and include (1) loss of industrial productivity as a result of damage to land, facilities, or interruption of services, (2) loss of access to recreation lands and facilities, (3) cost of lost human productivity due to injury and death, (4) damages to ecosystems, and (5) the cost of litigation as a consequence of the release. Some of these indirect costs are difficult to measure and tend to be ignored. As a result, most estimates of loss are far too conservative.

Consequence Analysis Evaluation

On June 8, 2017, a Consequence Analysis Evaluation was conducted aligning with hazards profiled in the State Hazard Mitigation Plan. The assessment was conducted by a diverse planning team comprised of subject matter experts from across the State. This effort mirrored a similar exercise that occurred during both the 2010 and 2013 State Hazard Mitigation Plan updates.

The exercise is intended to provide another way to assess the State's vulnerability to its hazards and was conducted as a group exercise. Participants were asked to individually rank the following systems on a scale from 0 (no consequences) to 5 (most severe consequences), separately evaluating both the short-term (0-6 month) and long-term (6+ months) consequences of the scenario.

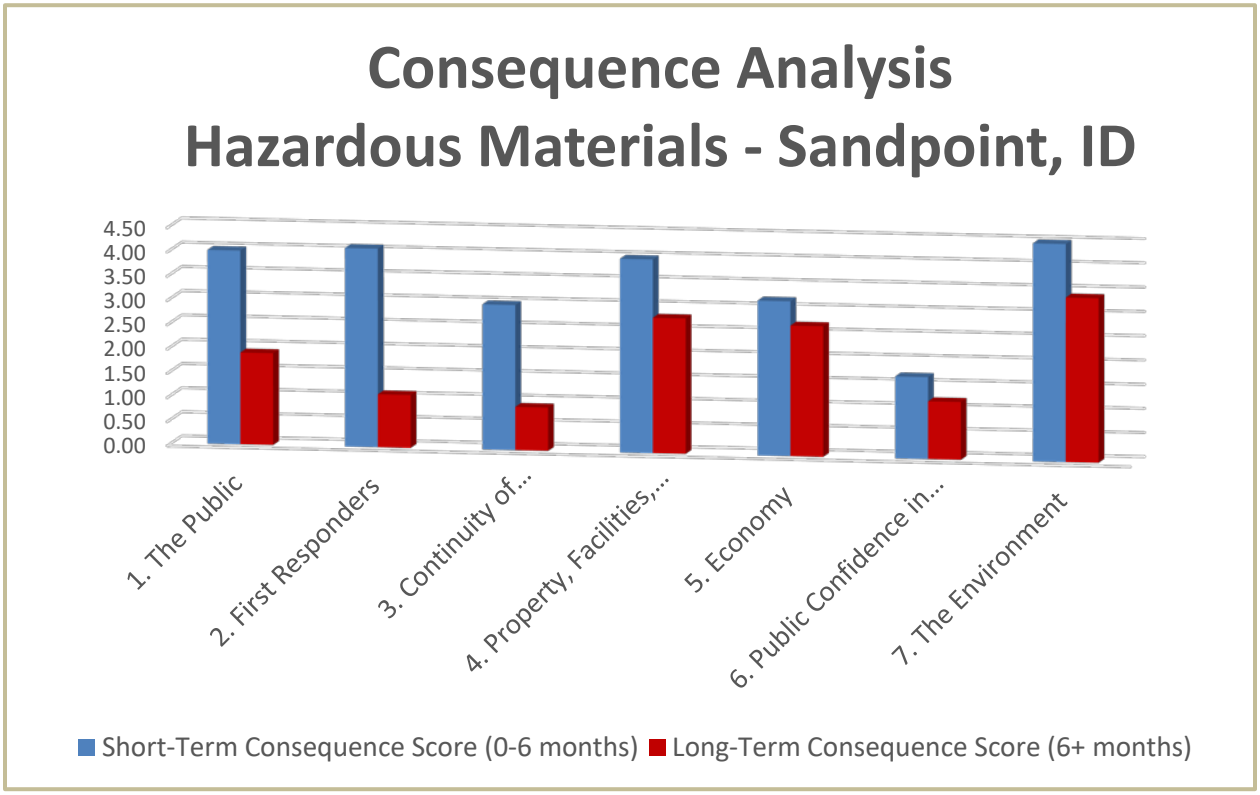
Systems Evaluated:

- The public
- First responders
- Continuity of operations
- Property, facilities, and infrastructure
- Economic conditions
- Public confidence in government

Scenario

August: At 7:00 a.m. on a beautiful August day, a westbound BNSF train derails on the Sandpoint Long Railroad Bridge. Five tank cars carrying crude oil derail. One of tank cars is reported to be discharging crude oil into Lake Pend Oreille that drains to the Pend Oreille River. Fires have been reported.

Results



Looking at the short-term consequences of this hazardous materials release incident, exercise participants felt that the most severe consequences would be felt by the environment and first responders. From a long-term standpoint, the three systems suffering the most severe consequences (in decreasing order) include the environment, the built environment, and the economy. The environment is expected to be most impacted from this release incident for both short and long-term consequences.

Some observations of the group to note included:

- Consequences would have a high short-term impact across all sectors.
- Short and long-term regional economic impacts could be felt as this is a primary railroad route for the Nation.
- All negative consequences would be reduced if the release incident would occur during the winter months, as opposed to prime tourism and wildfire season.
- Response to this event would be greatly improved as compared to five years ago, due to planning and investments directed towards the railroad due to growth in the oil sector.

Mitigation Rationale

Because hazardous materials are so widely used, stored and transported, a hazardous material release incident could take place almost anywhere. Further, many hazardous materials are used, stored and transported in very large quantities, so the impacts of a release incident may be widespread and powerful. For example, a 1947 Texas City, Texas, explosion of a ship carrying ammonium nitrate killed at least 581 people, injured or disabled more than 8,000, and caused property damage estimated in the hundreds of millions of dollars. Regulations and safety practices make such large-scale events unlikely, but smaller incidents may have severe impacts such as the following.

- Human deaths, injuries, and permanent disabilities
- Livestock/animal deaths
- Destruction of vegetation and crops
- Property damage and destruction
- Pollution of groundwater, drinking water supplies, and the environment
- Contamination of foodstuffs, property, land and structures
- Temporary or long-term closure of transportation routes and/or facilities
- Loss of business and industrial productivity
- Utility outages
- Clean-up and restoration costs
- Losses and inconvenience due to evacuation
- Loss of valuable chemical product

General Mitigation Approaches

Hazard Management

Hazardous materials are best managed through suitable containment. When hazardous materials are properly contained, they are unlikely to cause harm. The design of containers for transportation and storage is based on chemical and physical characteristics, the degree of hazard offered by the product, and (to some extent) on economic considerations. Most regulations and codes require containers to resist the most severe stresses that may reasonably be expected during normal handling, storage, and use.

Education and Outreach

Education is very important when it comes to hazardous material mitigation. Workers must receive proper training in the use, safety, and regulations regarding hazardous materials. Workers and emergency response personnel must be trained in the appropriate techniques and safety measures for dealing with spills and incidents. The general public should be made aware of the hazards of household chemical products and methods for properly disposing of these products. In addition, numerous regulations and codes have been created to address containment, hazard communication, and controls.

Transportation and Regulatory

Hazard communication is also an important regulatory measure. Where required by USDOT regulations, hazard communication information is provided in the form of container markings and labels, vehicle placarding, and shipping paper entries. Facilities are required to identify chemical hazards in buildings, tanks, and other storage facilities using the NFPA 704 system.

USDOT regulations impose certain controls on the types of chemicals that may be shipped together, how they must be loaded and secured on vehicles, levels of allowable radiation exposure and radiological contamination and, for certain high-level radioactive shipments, highway routing. Codes and zoning requirements may also address allowable locations for chemical storage and use.

Waste Management and Remediation

DEQ's Waste Management and Remediation Division is responsible for monitoring and controlling the generation, treatment, storage, and disposal of wastes in Idaho. The waste management group focuses on ensuring that wastes generated in or entering Idaho are managed and disposed in a manner protective of human health and the environment. On the remediation side, program resources, in conjunction with the Idaho Office of Emergency Management and the state of Idaho Regional Response Hazmat Teams, are directed to responding to releases of hazardous substances to surface waters, ground water, or soils.

Source Water Protection in Idaho

Source water protection is a voluntary effort a community can implement to help prevent contamination of the source water that supplies its public water system. The effort may involve creating a source water (or drinking water) protection plan and implementing regulatory and/or non-regulatory management practices. Preventing contaminants from entering a public water system supply greatly benefits the community by minimizing the problems that can occur from contaminants in the water supply, such as increased health risks to the public, expanded drinking water monitoring requirements, additional water treatment requirements, and expensive environmental cleanup activities.

- **Operator Certification and Training Associated with Source Water Assessment.** Idaho has an excellent state-funded drinking water operator training program and a well-established operator certification program; exams are given twice per year. Community and non-transient, community public water systems will be required to have certified operators. The importance of, and methods for assessing and protecting drinking water are taught in program workshops. More than 50 days of training is offered yearly at various locations around the state on a range of drinking water topics. Over the years, the Idaho training and certification programs have worked together to assure good correlation between training materials and related exams. The Idaho Water and Wastewater Certification Board (Board) shares “Need-to-Know” documents with trainers for preparation of workshop materials. The Board receives “Need-to-Know” documents from the Associated Boards of Certification (ABC) a national standardizing

organization which provides guidance and exams to the Idaho Board. One "Need-to-Know" area that ABC recommends to be taught is assessment and protection of sources. The ABC exams for all levels of drinking water certification evaluate knowledge in these areas. Emphasis on assessment can be increased and additional units of training initiated in coming years. The training and certification year runs from October to September on any given year. Both programs will continue into the future and will change as needed to meet changing conditions. Operators can be taught to play an important role in assessing and projecting the states drinking water resources and the Idaho training and certification activities can be adjusted to assure this.

- **Source Water Assessment and State Revolving Fund Loans.** The IDEQ recognizes the importance of source water protection when setting priorities for the award of Drinking Water State Revolving Loan funds. Using a priority rating form developed several years ago, the IDEQ rates all projects that go on a list primarily on the basis of public health, compliance and affordability. Additional points are awarded to projects that have completed a source water assessment and are maintaining a protection area around their source.

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