5. Hazard Analysis Process

This section identifies and profiles the hazards that could affect the state of Alaska.

5.1. Overview

A hazard analysis includes identifying, screening, and profiling each hazard. Hazard identification includes recognizing the natural events that threaten an area. Natural hazards result from unexpected or uncontrollable natural events of sufficient magnitude. Even though a particular hazard may not have occurred in recent history, all natural hazards that may potentially affect Alaska were considered. Those hazards that are unlikely to occur or for which the State has determined as having a very low risk were eliminated from consideration.

The planning team decided to relocate Dam Failure and Public Health Hazards out of the Natural Hazard category into SHMP Annex 12. These hazards will no longer be addressed during future SHMP updates.

Additionally, the legacy SHMP's economic, hazardous materials, and terrorism-related hazards are beyond the scope of this plan. These hazards are controlled by regulatory agencies and will no longer be addressed during this or future SHMP updates.

5.2. Hazard Profiles

Hazard profiling requires research to determine the hazard type or characteristics, history, magnitude, frequency, location, extent, and likelihood. The State identifies hazards through historical and community anecdotal information, and by reviewing pertinent plans and scientific studies. Hazard mapping determines geographic extent and proximity to populated areas. A natural phenomenon, such as a volcanic eruption, is only considered a hazard when people and property are potentially affected. "Risk," is the likelihood of harm resulting from a hazard. All natural hazards posing a risk to the state are considered, and those found to have minimal risk are eliminated from consideration.

5.3. Hazard Identification and Risk Assessment

DMA 2000 Requirements
STANDARD STATE. Hazard Identification
S3. Does the risk assessment include an overview of the type and location of all natural hazards that can affect the state? [44 CFR §201.4(c)(2)(i)]
S4. Does the risk assessment provide an overview of the probabilities of future hazard events? [44 CFR §201.4(c)(2)(i)]
Source: FEMA, March 2015.

Hazard identification and risk assessment is the first step of the hazard analysis. The DHS&EM administration organized a project kick-off meeting with AECOM on November 20, 2017. Meeting participants discussed Request for Proposal (RFP) project deliverable requirements, project proposal documents, and DHS&EM management, project staffing, and primary project contacts. Travel expectations, reporting procedures, and invoicing requirements were also discussed.

AECOM reviewed the legacy 2013 SHMP to determine Alaska's identified statewide hazards. Next, AECOM evaluated and screened the comprehensive list of additional hazards based on a range of factors, including prior knowledge or perception of a hazard's threat along with the relative risk presented by each hazard, the ability to mitigate the hazard, and the known or expected information availability as listed in Table 5-1.

The planning team determined that there are eight natural hazards that potentially threaten Alaska: cryosphere, earthquake, flood, ground failure, tsunami, volcano, weather, and wildland fire; some of which are influenced by increasing changing climate conditions such as late ice formation, early thaw conditions, or inconsistent rain (described in Table 5-1).

Table 5-1 Hazard Identification and Screening

Hazard Type	Should It Be Profiled?	Explanation
Natural Hazards		
Cryosphere	Yes	There are many locations in Alaska where both surface and subsurface water is frozen year round. This includes sea ice, lake ice, river ice, snow cover, glaciers, ice caps, ice sheets, and frozen ground (such as permafrost).
Earthquake (EQ)	Yes	Alaska experiences over 100 earthquakes every day. Many located in remote unpopulated locations; some spanning very low to severe potential population impacts.
Flood (FL) (Riverine, Coastal, Lake, other related flood types. Includes resultant erosive scour damages)	Yes	Snowmelt run-off and rainfall flooding occur during spring thaw and the fall rainy season. Several minor flood events cause damage. Severe damages occur from major floods. Alaska experiences storm surge, coastal ice run-up, and coastal wind scour along the shoreline and riverine high water flow scour along the area's rivers, streams, and creek embankments as well as damages from coastal or riverine ice flows, wind, surface runoff, and boat traffic wakes.
Ground Failure (GF) (Landslide/Debris Flow, Subsidence)	Yes	Ground failure occurs throughout Alaska from earthquakes, landslides, thawing permafrost, and ground subsidence. However, subsidence and permafrost degradation are the primary hazards causing houses to shift due to ground sinking and upheaval, and high ground water thawing the permafrost.
Tsunami (TS) (includes Seiche)	Yes	This hazard has historically impacted Alaska's coastal community and infrastructure.
Volcano (VO) (Volcanic Ashfall)	Yes	Volcano-generated ash periodically impacts Alaska communities. Volcanic ash creates severe air, marine, and road transportation, disrupts utility operations, water quality, etc. Tephra can impact those communities closest to volcanoes.
Weather (WX) (Severe Cold, Drought, Rain, Snow, Wind, etc.)	Yes	Severe weather impacts the entire state with climate change/global warming and changing El Niño/La Niña Southern Oscillation (ENSO) patterns generating increasingly severe weather events. Winter storms, heavy or freezing rain, thunderstorms and subsequent secondary hazards such as riverine or coastal storm surge floods, landslides, snow, wind, etc. discussions are included within this section.
Wildland Fire (WF) (Tundra and Conflagration Fire)	Yes	Alaska communities with surrounding forest and/or tundra areas become very dry in summer months with weather (such as drought and lightning) and human-caused incidents igniting dry vegetation in the adjacent area (burning trash outside their landfill's burn box, camp fires, etc.). Fire proximity could also create urban/ wildland fire interface challenges.

Table 5-1 Hazard Identification and Screening

Hazard Type	Should It Be Profiled?	Explanation
Other Hazards (Located in Appendix 12)		
Dam Failure (DF)	No	Legacy dam failure hazard profile information is now located in Appendix 12.2.1 but will no longer be updated in SHMPs.
Public Health	No	Legacy public health hazard profile is now located in Appendix 12.2.2 but will no longer be updated in future SHMPs.

The planning team chose hazards that occur most frequently, cause the most damage, and have the highest response and recovery costs. Examinations include several factors:

- Hazard characteristics (or hazard type)
  - Typical event characteristics
  - Potential climate change impacts are primarily discussed in the Weather hazard profile but are also identified where deemed appropriate within selected hazard profiles
- History (geologic as well as previous occurrences)
- Location
- Extent (breadth, magnitude, and severity)
- Impact (Section 5 provides general impacts associated with each hazard. Section 6 provides detailed impacts to Alaska's residents and critical facilities)
- Recurrence probability statement

Table 5-2 provides an alphabetical sub-classification index to various Alaska Division of Geological & Geophysical Survey (DGGS) defined scientific hazard classifications. These classifications have been integrated with pertinent major hazard profile classes as listed in Table 5-1. Table 5-2 facilitates easy access to specific subsets within specified SHMP locations.

Table 5-2 DGGS Hazard Index

Hazard	SHMP Location *(Section/Page)*	Hazard	SHMP Location *(Section/Page)*
Acidification	6-91, 95, 99	Lateral Spread	6-34, 66, 68
Alluvial Fan Flooding	6-43	Lava Flow	6-93
Aufeis Flooding or Icing	6-6, 6-48	Liquefaction	6-34
Ballistics	6-94	Local Tsunami	6-77
Block Slide	6-66, 67, 72	Loose Snow Avalanche	6-14
Climate Change	6-1, 19, 104, 111	Naled	6-48
Coastal Erosion	6-20, 49, 60	Overbank Flooding	6-43
Coastal Flooding	6-45, 62	Periglacial	6-5
Cornice Collapse	6-14	Permafrost	6-5, 19, 23
Cryosphere Hazards	6-3, 24	Pyroclastic Density Current	6-93
Debris Avalanche	6-66, 67, 88, 93	Rainfall-Runoff Flooding	6-43, 56
Debris Flow	66, 67, 72	Regional Tsunami	6-77
Directed Blast	6-88, 94	Retrogressive Thaw Slide	6-68
Distant Tsunami	6-77	Retrogressive Thaw Slump	6-68
Drifting Ice	6-13	Riverine Erosion	6-52, 60
Earthflow	6-66, 67	Riverine Flooding	6-43
Earthquake	6-27	Rockfall	6-19, 66, 67, 93
Earthquake-induced or tectonic Tsunami	6-75	Rotational Landslide	6-66, 67
Earthquake-related Ground Failure	6-36, 6-72	Sea Ice	6-13
Erosion	6-2, 41, 72	Sea Level Rise	6-46
Flash Flooding	6-44	Seiche	6-34, 77, 81
Flooding	6-41	Slab Avalanche	6-15
Fluctuating Lake Levels	6-47	Slump	6-68
Frost Cracking	6-6	Slush Avalanche	6-15
Frost Heaving	6-6	Slush Ice	6-14
Frost Jacking	6-7	Snow Avalanche	6-14, 23, 25
Frozen Debris Lobes	6-69	Snowmelt Flooding	6-43, 56
Gelifluction	6-68	Soil Creep	6-66, 68
Glacial Calving	6-3	Solifluction	6-68
Glacial Lake Outburst Flooding	6-5, 21, 47	Storm Surge	6-45
Glacier Surge	6-5	Strong Ground Motion	6-33
Glaciers	6-3	Subsidence	6-33, 68
Ground Failure	6-21, 31, 65, 70	Surface Rupture	6-33
Ground Ice	6-5, 6, 8, 11	Thermokarst	6-7, 68
Grounded Floeberg	6-13, 14	Topple	6-66, 67
Groundwater Flooding	6-48	Translational Landslide	6-66, 67
Ice Collapse	6-3	Tsunami	6-34, 75
Ice Fall Avalanches	6-4	Uplift	6-33
Ice Jam Flooding	6-44	Usteq	6-8
Ice Overflow Flooding	6-48	Volcanic Ash Cloud	6-88
Ice Push	6-13	Volcanic Ash Fall	6-89
Iceberg	6-13	Volcanic Debris Avalanche	6-93
Icing or Aufeis	6-6, 48	Volcanic Gases	6-91
Ivu	6-2, 13, 25, 59-59	Volcanic Landslide	6-93
Lahar	6-67, 92, 93	Volcanic Rockfall	6-93
Landfast Ice Break-out	6-14	Volcanic Tsunami	6-94
Landslide	6-65, 93	Volcanoes	6-85
Landslide-generated Tsunami	6-31, 79, 82	Wind erosion	6-52

Each profiled hazard is assigned an impact (i.e. magnitude or severity) rating based on its individual characteristics. Recurrence probability is defined within each hazard profile (Section 6).

Section 8.6 explains the SHMP's vulnerability assessment methodology along with detailed hazard risk analyses and associated vulnerability assessments.

This analysis was completed using geographic information system (GIS) mapping tools to analyze, manage, and present spatial relational data.

- Tables 8-14 through 8-21 have "Severity" and "Description" columns, which designate infrastructure category's locational or situational likelihood.
- Tables 8-22 and 8-23 provide historical event data from DHS&EM's 2018 Disaster Cost Index (Appendix 13.18).

Section 8.7 Exposure Analysis – Narrative Summaries

This section provides individual hazard narrative descriptions based on Tables 8-14 through Table 8-21 that are broken out by their respective "severity" and "description" column data.

Note: *Alaska's profiled hazards are presented throughout Sections 6. The presentation order does not signify their importance or risk level.*

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