

PIERCE COUNTY

HAZARD IDENTIFICATION & RISK ASSESSMENT

INTRODUCTION

The Pierce County Hazard Identification and Risk Assessment (HIRA) is the latest rendition of a process and document that has gone on for over twenty-five years. The HIRA is an assessment of natural, technological and human-caused hazards that threaten those who live, visit, work or play in Pierce County. This is the foundation for other Emergency Management planning documents in fulfillment of both their mission statement and the statutory requirements of the Washington Administrative Code (WAC).

Pierce County Emergency Management’s Mission Statement:

The mission of the **Department of Emergency Management** is to create resilient communities and enhance public safety by empowering the whole community in Pierce County to prevent, mitigate, prepare for, respond to and recover from all types of hazards, emergencies and disasters.

Washington Administrative Code requirement for hazard analysis:

WAC 118-30-060 Emergency plan. (1) Each political subdivision shall maintain a current plan of operations which shall be based on a hazard analysis...

Pierce County has a long history of emergencies and disasters. This includes those with a natural, human-caused, or technological origin. They range from train derailments to hazardous chemical spills to earthquakes and from civil disorder to windstorms. Some of the hazards, like a major lahar from Mount Rainier, have not occurred for hundreds of years, yet the result could be a catastrophic loss of life, destruction of infrastructure, disruption of the County's governance and long-term economic devastation.

Since 1962, Pierce County has been included in twenty-five presidential disaster declarations. While storms and floods make up the bulk of these, there are others including: earthquakes, the volcanic eruption of Mt. St. Helens, and the 2008 snowstorm. In addition to these, smaller emergencies can and have caused major disruption.

Understanding these threats, their history, impacts, and frequency for which they occur, is the core requirement for being able to mitigate these future consequences, preventing them when possible; preparing for their eventuality; responding to them when necessary; and, recovering from the damage they cause. Without this understanding it is impossible to plan for them effectively and comprehensively. Therefore, this HIRA serves as the foundation document for the development of plans, public education programs, first responder training, exercises, and operational readiness.

In order to fulfill the spirit of the mission statement and the Washington Administrative Code, this document has information from a variety of public documents, academic research, subject matter experts, personal commentary, the internet, and the previous edition of the Pierce County HIRA.

Hazard Chapters

The decision on which hazards should be included in the HIRA came from the compilation of several different factors. First and foremost was a continuation of previous editions of Hazard Inventory and Vulnerability Analysis (HIVAs) that were developed over the years. Early work on the original Pierce County Mitigation Plan included a series of meetings with subject matter experts on the impacts of various hazards on the County. This material was incorporated into both the mitigation plan and the previous edition of the HIRA completed in 2014. The Washington State HIVA, 2018 edition, was referenced to make sure there were no other state-wide hazards that might threaten the County. Finally, in recent years there has been a drastic increase in real world incidents relating to cyber-attacks and active threat tactics. With threat assessments from the Department of Homeland Security and the Washington State Fusion Center it was considered necessary to add cyber threat and active threat to the list of hazards in the HIRA.

This HIRA addresses those hazards thought to have a reasonable potential for impacting the community in the foreseeable future and takes into consideration the needs of the population at risk. The Pierce County Hazard Mitigation Plan (Section 4) complements the HIRA by providing a detailed risk assessment for each identified hazard for each jurisdiction. Additional analysis of individual hazards can be found through many of the sources listed in the chapter endnotes and resource directory.

The HIRA chapters have three main sections: the hazard definition, the profile section (discusses location, extent, occurrences, and reoccurrence rates), and the impacts section (includes health and safety impacts of people, continuity of operations, the environment, the economic and financial condition, and public confidence in the jurisdictions governance).

Since the last update a few new concepts have come to fruition with recent events. These new concepts are to be considered when reading each of the chapters. These concepts are the addition of recovery and human impacts.

Recovery and Human Impacts

In previous editions of the HIRA the impacts section, addressing health and safety, limited the scope to response and was not inclusive of recovery. Therefore, mental and behavioral health impacts and social elements of recovery from disasters need to be added into the impacts section of the HIRA. Given the timeframe of the current update, the integration of these concepts throughout all the hazards is not be possible. General statements have been given below and are to be considered for each hazard.

Emergency response and recovery workers may be at risk of exposure to multiple health hazards associated with the occurrence of an event. These hazards can include physical, chemical, ergonomic, biologic, radiologic, psychological, and behavioral health hazards.¹

This section includes potential psychological health impacts as they relate to persons in the affected area at the time of the incident and personnel responding to the incident.

The greatest psychological impacts for first responders after a natural disaster are Acute Stress Disorder (ASD) and PTSD. A study on firefighters found that post disaster personal events that were disaster-related, such as the loss of a loved one, can affect the development of symptoms in these individuals. Indicating that disasters do not occur in a vacuum and a disaster may trigger directly or indirectly other social and interpersonal events that can affect response and recovery.²

PTSD (Posttraumatic Stress Disorder) and PTS (Posttraumatic Stress) are psychological impacts that affect first responders, adults, and children impacted by disaster. The development of PTSD and PTS symptoms is associated with the proximity to death, the severity of trauma, and the perceived threat of harm to self.³

Traumatic responses/possible symptoms include:

- disturbances in sleep or concentration,
- distress,
- worry,
- alterations in work functions,
- difficulties with interpersonal relationships,
- increase in substance use,
- somatization,
- depression.

A 2015 study on the psychological resilience after Hurricane Sandy, found a higher association of depression and posttraumatic stress in individuals who had experienced or witnessed any lifetime traumatic event prior to Hurricane Sandy. Furthermore, individuals with certain demographic characteristics (e.g., socioeconomic, race or ethnic minority status, older age, etc.) were identified as having more disaster related stressors (which is strongly associated with posttraumatic stress⁴) and are more likely to experience stressors during recovery.

After a disaster there are four common pathways for psychological problems to form: resilient, chronic, recover, and delayed. Those who are resilient do not have symptoms initially or later. Individuals in the chronic group have multiple assessments overtime and meet the criteria for clinical psychological problems. Those in the recovery group initially show symptoms, but overtime recover; whereas, those in the delayed group do not show any initially symptoms but develop clinical symptoms later.⁵

Impacts to Children

A study in the *Journal of Affected Disorders* found children with comorbid symptoms of PTSD and depression had poorer recovery, more severe symptoms, and reported greater exposure and recovery stressors. Research indicates that having any comorbid symptoms (the presence of more than one disorder) can increase the severity of psychological distress, hindering the child's recovery. A couple of the largest risk factors for a child developing PTSD after a disaster is the perceived threat to life⁶ and undergoing emotional distress such as being separated from their family for an extended duration.

Children affected by a major disaster can have long-term impacts on communities. Major disasters can disrupt a child's education and the opportunities available to them in adolescence and young adulthood, which in turn affects their life trajectory.⁷ Children are more likely to suffer serious emotional effects, as they may lack the ability to communicate their symptoms and understand their feelings.

Maintenance

The Pierce County Department of Emergency Management (PCDEM) reviews and updates the HIRA every five years. To ensure a coordinated and collaborative approach to evaluation and revision, PCDEM facilitates a workshop of subject matter experts from a variety of fields during each five-year review period to determine the ongoing validity of identified hazards and their assessed risk levels, as well as to identify any new hazards that may have arisen since the last update. The workshop to inform this 2020 HIRA was held in May 2019; therefore, the next workshop will be scheduled for 2024 to inform the 2025 HIRA. Additional reviews of the HIRA are also encouraged following disaster events to determine if the hazard chapter should be updated or modified based on new information resulting from the event.

Endnotes

¹ Emergency Preparedness and Response Resources Directory, Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health (NIOSH), accessed August 13, 2019 at <https://www.cdc.gov/niosh/topics/emres/natural.html>

² Benedek, Fullerton, & Ursano; 2007.

³ Benedek, David M.; Fullerton, Carol; & Ursano, Robert J. (2007). First responders: Mental health consequences of natural and human-made disasters for public health and public safety workers. *Annual Review of Public Health*. <https://doi.org/10.1146/annurey.publhealth.28.021406.144037>. A digital copy of the original material is with PCDEM.

⁴ Lowe S.R., Sampson L., Gruebner O., & Galea S. (2015) Psychological resilience after hurricane sandy: The influence of individual- and community-level factors on mental health after a large-scale natural disaster. *PLoS ONE* 10(5): e0125761. <https://doi.org/10.1371/journal.pone.0125761>

⁵ Wadsworth, M., Santiago, C., & Einhorn, L. (2009). Coping with displacement from Hurricane Katrina: predictors of one-year post-traumatic stress and depression symptom trajectories. *Anxiety, Stress & Coping*, 22(4), 413–432. Retrieved from <http://search.ebscohost.com.ezaccess.libraries.psu.edu/login.aspx?direct=true&db=s3h&AN=41326893&site=ehost-live&scope=site>. A digital copy of the original material is with PCDEM.

⁶ Lai, B. S., La Greca, A. M., Auslander, B. A., & Short, M. B. (2013). Children's symptoms of posttraumatic stress and depression after a natural disaster: Comorbidity and risk factors. *Journal of Affective Disorders*, 146(1), 71-78. <https://doi.org/10.1016/j.jad.2012.08.041>

⁷ Peek, Lori, Wolkin, Amy, Thomas, Tracy N., & Paulsen, Russ (2019). Introduction: Children count in disasters. *Research Counts, Special Collection on Children and Disasters*. 3 (SC1). Retrieved from <https://hazards.colorado.edu/news/research-counts/special-collection/introduction-children-count-in-disasters>