1.0 INTRODUCTION:

1.1 What is a Hazard Mitigation Plan?

The Hockinson School District Hazard Mitigation Plan covers each of the major natural hazards that pose significant threats to the District.

The effects of potential future disaster events on the Hockinson School District may be minor - a few inches of water in a street - or may be major - with widespread damages, deaths and injuries, and economic losses reaching millions of dollars. The effects of major disasters on a district and on the communities served by a district can be devastating: the total damages, economic losses, casualties, disruption, hardships, and suffering are often far greater than the physical damages alone.

The mission statement of the Hockinson School District Hazard Mitigation Plan is to:

> Proactively facilitate and support district-wide policies, practices, and programs that make the Hockinson School District more disaster resistant and disaster resilient.

Making the Hockinson School District more disaster resistant and disaster resilient means taking proactive steps and actions to protect life safety, reduce property damage, minimize economic losses and disruption, and shorten the recovery period from future disasters.

This plan is an educational and planning document that is intended to raise awareness and understanding of the potential impacts of natural hazard disasters and to help the District deal with natural hazards in a pragmatic and cost-effective manner. It is important to recognize that the Hazard Mitigation Plan is not a regulatory document and does not change existing District policies or zoning, building codes, or other ordinances that apply to the District.

Completely eliminating the risk of future disasters in the Hockinson School District is neither technologically possible nor economically feasible. However, substantially reducing the negative consequences of future disasters is achievable with the implementation of a pragmatic Hazard Mitigation Plan.

Mitigation simply means actions that reduce the potential for negative consequences from future disasters. That is, mitigation actions reduce future damages, losses, and casualties.

The Hockinson School District mitigation plan has several key elements:

1. Each hazard that may significantly affect the Hockinson School District's facilities is reviewed to estimate the probability (frequency) and severity of likely hazard events.

2. The vulnerability of Hockinson School District to each hazard is evaluated to determine the likely severity of physical damages, casualties, and economic consequences.

3. A range of mitigation actions are evaluated to identify those with the greatest potential to reduce future damages and losses to the Hockinson School District and that are desirable from the community's political and economic perspectives.

1.2 Why is Mitigation Planning Important for the Hockinson School District?

Effective mitigation planning will help the Hockinson School District deal with natural hazards realistically and rationally. That is, to identify where the level of risk from one or more hazards may be unacceptably high and then to find cost effective ways to reduce such risk. Mitigation planning strikes a pragmatic middle ground between unwisely ignoring the potential for major hazard events on one hand and unnecessarily overreacting to the potential for disasters on the other hand.

Furthermore, the Federal Emergency Management Agency (FEMA) now requires each local government entity to adopt a multi-hazard mitigation plan to remain eligible for future pre- or post-disaster FEMA mitigation funding. Thus, an important objective in developing this plan is to maintain eligibility for FEMA funding and to enhance the Hockinson School District's ability to attract future FEMA mitigation funding.

Further information about FEMA mitigation grant programs is given in Appendix 1: FEMA Mitigation Grant Programs.

1.3 The Hockinson School District Hazard Mitigation Plan

This Hockinson School District Hazard Mitigation Plan is built upon a quantitative assessment of each of the major hazards that may significantly affect the Hockinson School District, including their frequency, severity, and the campuses most likely to be affected. This assessment draws heavily on statewide data collected for the development of the Washington State K–12 Facilities Hazard Mitigation Plan and on additional district-specific data.

These reviews of the hazards and the vulnerability of Hockinson School District to these hazards are the foundation of the District's mitigation plan. From these assessments, the greatest threats to the District's facilities are identified. These high risk situations then become priorities for future mitigation actions to reduce the negative consequences of future disasters affecting the Hockinson School District.

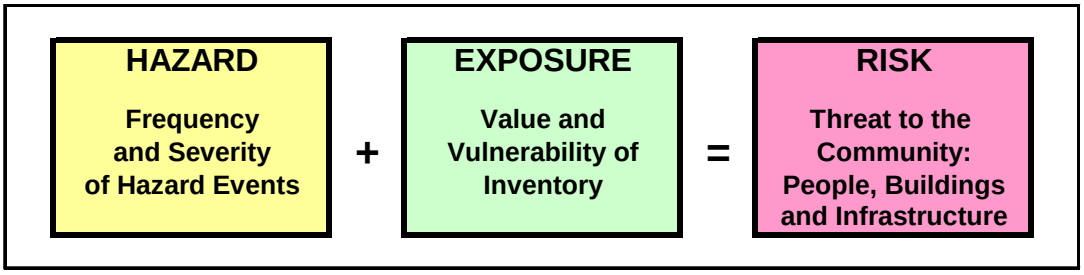
The Hockinson School District Hazard Mitigation Plan deals with hazards realistically and rationally and also strikes a balance between suggested physical mitigation actions to eliminate or reduce the negative consequences of future disasters and planning measures which better prepare the community to respond to, and recover from, disasters for which physical mitigation actions are not possible or not economically feasible.

1.4 Key Concepts and Definitions

The central concept of mitigation planning is that mitigation reduces risk. **Risk** is defined as the threat to people and the built environment posed by the hazards being considered. That is, risk is the potential for damages, losses, and casualties arising from the impact of hazards on the built environment. The essence of mitigation planning is to identify facilities in the Hockinson School District that are at high risk from one or more natural hazards and to evaluate ways to mitigate (reduce) the effects of future disasters on these high risk facilities.

The level of risk at a given location, building, or facility depends on the combination of **hazard** frequency and severity plus the **exposure,** as shown in Figure 1 below.

Figure 1.1
Hazard and Exposure Combine to Produce Risk



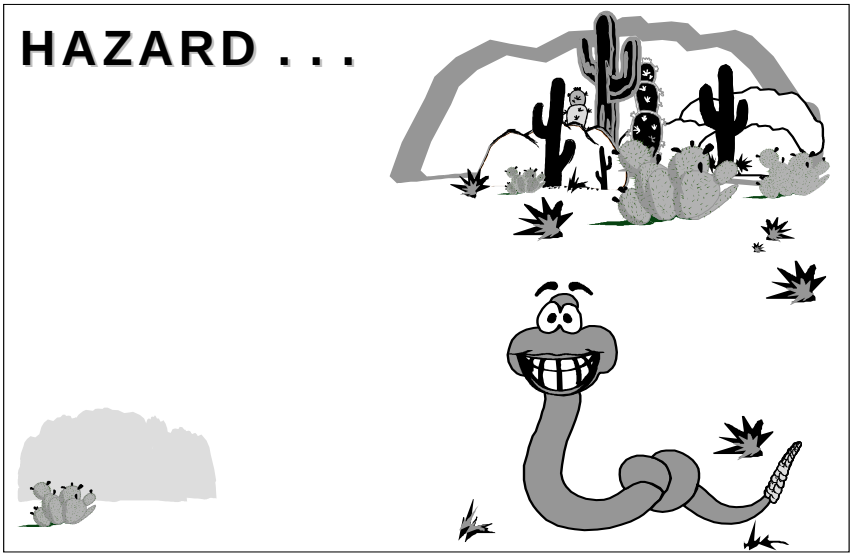
Risk is generally expressed in dollars (estimates of potential damages and other economic losses) and in terms of casualties (numbers of deaths and injuries).

There are four key concepts that govern hazard mitigation planning: hazard, exposure, risk, and mitigation. Each of these key concepts is addressed in turn.

HAZARD refers to natural events that may cause damages, losses or casualties, such as earthquakes, tsunamis, and floods. Hazards are characterized by their frequency and severity and by the geographic area affected. Each hazard is characterized differently, with appropriate parameters for the specific hazard. For example, earthquakes are characterized by the probable severity and duration of ground motions while tsunamis are characterized by the areas inundated and by the depth and velocity of the tsunami inundations.

A hazard event, by itself, may not result in any negative effects on a community. For example, a flood-prone five-acre parcel may typically experience several shallow floods per year, with several feet of water expected in a 50-year flood event. However, if the parcel is wetlands, with no structures or infrastructure, then there is no risk. That is, there is no threat to people or the built environment and the frequent flooding of this parcel does not have any negative effects on the community. Indeed, in this case, the very frequent flooding (the high hazard) may be beneficial environmentally by providing wildlife habitat, recreational opportunities, and so on.

Figure 1.2
Hazard Alone Does Not Produce Risk



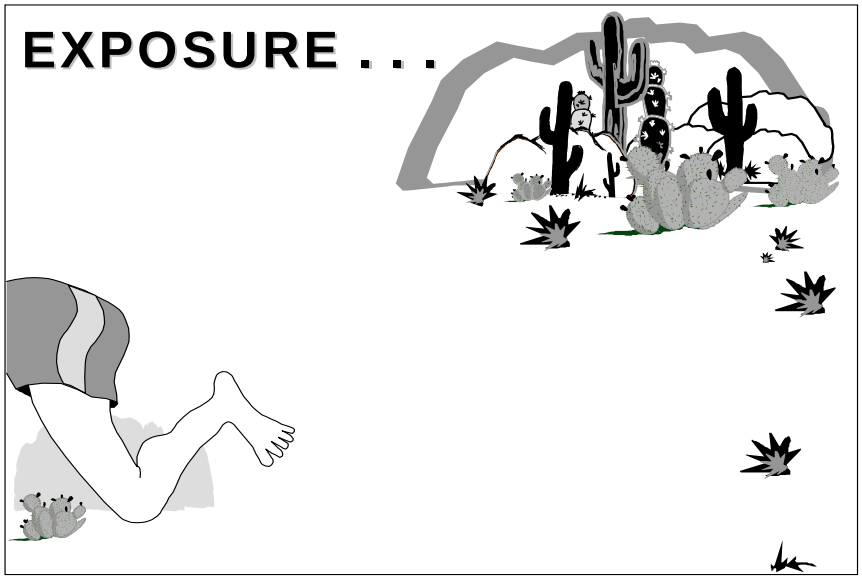
The important point is that hazards do not necessarily produce risk to people and property unless there is vulnerable inventory exposed to the hazard. Risk to people, buildings, or infrastructure results only when hazards are combined with an exposure to the hazard.

EXPOSURE is the quantity, value, and vulnerability of the built environment (inventory of people, buildings, and infrastructure) in a particular location subject to one or more hazards. Inventory is described by the number, size, type, use, and occupancy of buildings and by the infrastructure present. Infrastructure includes roads and other transportation systems, utilities (potable water, wastewater, natural gas, and electric power), telecommunications systems, and so on.

For the Hockinson School District, the built-environment inventory of concern is largely limited to the District's facilities. For planning purposes, schools are often considered critical facilities because they may be used as emergency shelters for the community after disasters and because communities often place a very high priority on providing life safety for children in schools.

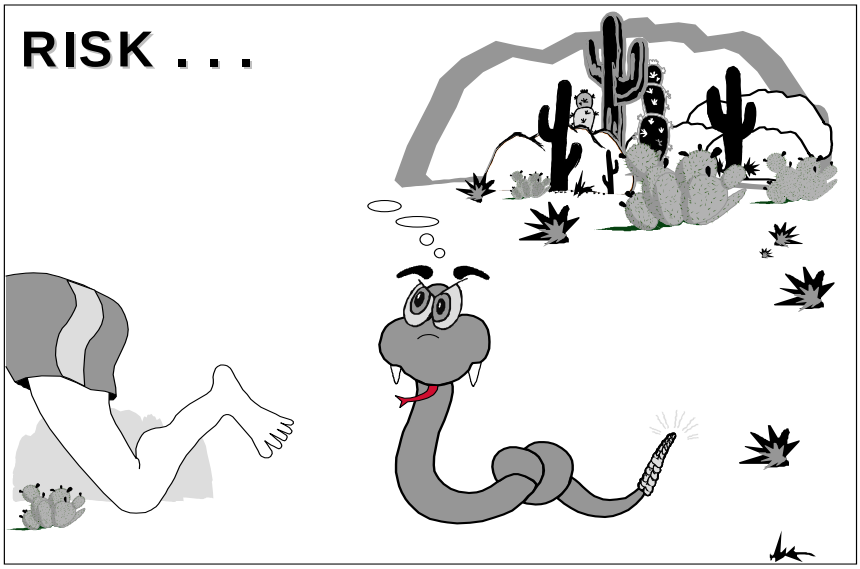
For hazard mitigation planning, inventory must be characterized not only by the quantity and value of buildings or infrastructure present, but also by its vulnerability to each hazard under evaluation. For example, a given facility may or may not be particularly vulnerable to flood damages or earthquake damages, depending on the details of its design and construction. Depending on the hazard, different engineering measures of the vulnerability of buildings and infrastructure are used.

Figure 1.3
Exposure (Quantity, Value and Vulnerability of Inventory)



RISK is the threat to people and the built environment - the potential for damages, losses, and casualties arising from hazards. Risk results only from the combination of Hazard and Exposure as discussed above and as illustrated schematically in Figure 1.4 on the following page.

Figure 1.4
Risk Results from the Combination of Hazard and Exposure



Risk is the potential for future damages, losses, or casualties. A disaster event happens when a hazard event is combined with vulnerable inventory (that is when a hazard event strikes vulnerable inventory exposed to the hazard). The highest risk in a community occurs in high hazard areas (frequent and/or severe hazard events) with large inventories of vulnerable buildings or infrastructure.

However, high risk can also occur with only moderately high hazard if there is a large inventory of highly vulnerable inventory exposed to the hazard. Conversely, a high hazard area can have relatively low risk if the inventory is resistant to damages (such as strengthened to minimize earthquake damages).

MITIGATION means actions to reduce the risk due to hazards. Mitigation actions reduce the potential for damages, losses, and casualties in future disaster events. Repair of buildings or infrastructure damaged in a disaster is not mitigation. Hazard mitigation projects may be initiated proactively - before a disaster, or after a disaster has already occurred. In either case, the objective of mitigation is always to reduce future damages, losses, or casualties.

A few common types of mitigation projects are shown in Table 1.1 on the following page.

Table 1.1
Examples of Mitigation Projects

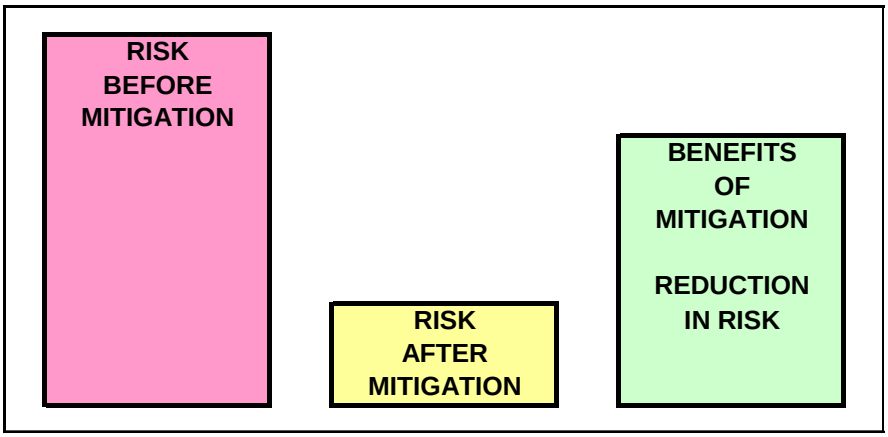
Hazard	Common Mitigation Projects
Earthquake	Structural retrofits for buildings
	Nonstructural retrofits for building elements and contents
	Replace existing building with new, current-code building
Tsunami	Enhance evacuation planning, including practice drills
	Build structure for vertical evacuation
Volcanic Hazards	Enhance evacuation planning, including practice drills
Floods	Flood barriers and other floodproofing measures
	Elevate at risk buildings
	Abandon campus at high risk (possible FEMA buyout) and build new campus outside of floodplain
Wildland/Urban Interface Fires	Enhance defensible space around buildings
	Fuel reduction measures near campus
	Improve fire resistance of existing buildings with non-flammable roofs and exterior finishes and other fire-safe measures
Landslides	Stabilize slopes with improved drainage and/or retaining walls.
Multi-Hazard	Replace vulnerable facility with new current-code facility, outside of high hazard zones when possible
	Obtain insurance to cover some damage/losses
	Enhance emergency planning, including drills
	Expand education/outreach to improve community understanding of natural hazards

The mitigation project list above is not comprehensive; mitigation projects can encompass many other actions to reduce future damages, losses, and casualties.

1.5 The Mitigation Process

The key element for all hazard mitigation projects is that they reduce risk. The benefits of a mitigation project are the reductions in risk (i.e., the avoided damages, losses, and casualties attributable to the mitigation project). Benefits are the difference in expected damages, losses, and casualties before mitigation (as-is conditions) and after mitigation. These important concepts are illustrated on the following page.

Figure 1.5
Mitigation Projects Reduce Risk



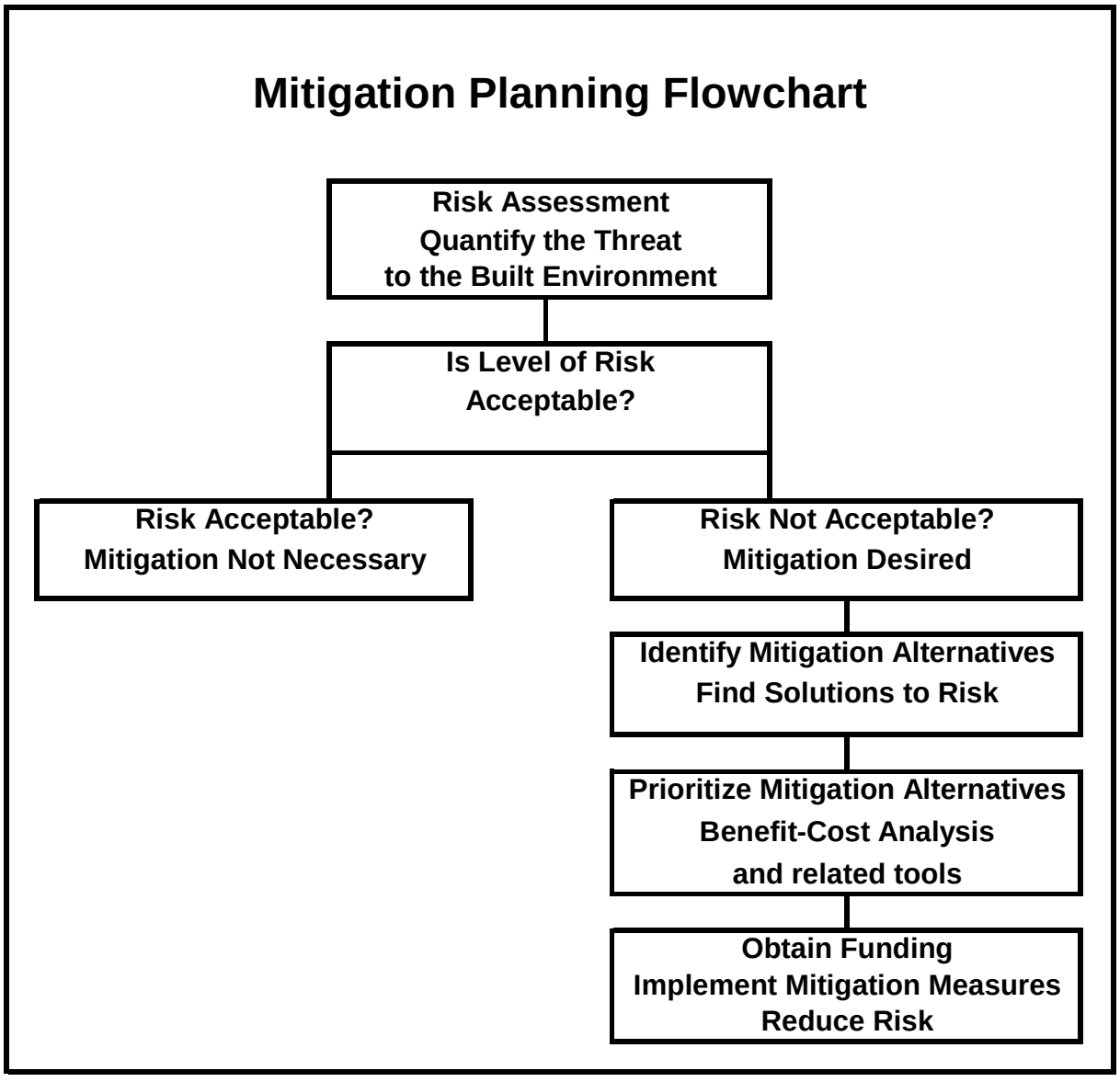
Quantifying the benefits of a proposed mitigation project is an essential step in hazard mitigation planning and implementation. Only by quantifying benefits is it possible to compare the benefits and costs of mitigation to determine whether or not a particular project is worth doing (i.e., whether it is economically feasible). Real world mitigation planning almost always involves choosing between a range of possible alternatives, often with varying costs, and varying effectiveness in reducing risk.

Quantitative risk assessment is centrally important to hazard mitigation planning. When the level of risk is high, the expected levels of damages and losses are likely to be unacceptable to the community and mitigation actions have a high priority: the greater the risk, the greater the urgency of undertaking mitigation.

Conversely, when risk is moderate both the urgency and the benefits of undertaking mitigation are reduced. It is neither technologically possible nor economically feasible to eliminate risk completely. Therefore, when levels of risk are low and/or the cost of mitigation is high relative to the level of risk, the risk may be deemed acceptable (or at least tolerable). Therefore, proposed mitigation projects that address low levels of risk or where the cost of the mitigation project is large relative to the level of risk are generally poor candidates for implementation.

The overall mitigation planning process is outlined in Figure 1.6 on the following page, which shows the major steps in hazard mitigation planning and implementation for the Hockinson School District.

Figure 1.6
The Mitigation Planning Process



The first steps are quantitative evaluation of the hazards (frequency and severity) affecting the Hockinson School District and of the inventory (people and facilities) exposed to these hazards. Together, these hazard and exposure data determine the level of risk for specific locations, buildings, or facilities in the Hockinson School District.

The next key step is to determine whether or not the level of risk posed by each of the hazards affecting the Hockinson School District is acceptable or tolerable. If the level of risk is deemed acceptable or at least tolerable, then mitigation actions are not necessary or at least not a high priority. There is no absolute universal definition of the level of risk that is tolerable or not tolerable. Each district has to make its own determination.

If the level of risk is deemed not acceptable or tolerable, then mitigation actions are desired. In this case, the mitigation planning process moves on to more detailed evaluation of specific mitigation alternatives, prioritization, funding, and implementation of mitigation actions. As with the determination of whether or not the level of risk posed by each hazard is acceptable or not, decisions about which mitigation projects should be undertaken can only be made by the Hockinson School District.

1.6 The Role of Benefit-Cost Analysis in Mitigation Planning

Communities, such as the Hockinson School District, that are considering whether or not to undertake mitigation projects must answer questions that don't always have obvious answers, such as:

What is the nature of the hazard problem?

How frequent and how severe are hazard events?

Do we want to undertake mitigation actions?

What mitigation actions are feasible, appropriate, and affordable?

How do we prioritize between competing mitigation projects?

Are our mitigation projects likely to be eligible for FEMA funding?

Benefit-cost analysis (BCA) is a powerful tool that can help communities provide solid, defensible answers to these difficult socio-political-economic-engineering questions. Benefit-cost analysis is required for all FEMA-funded mitigation projects, under both pre-disaster and post-disaster mitigation programs. However, regardless whether or not FEMA funding is involved, benefit-cost analysis provides a sound basis for evaluating and prioritizing possible mitigation projects for any natural hazard.

Further details about benefit-cost analysis are given in the Appendix 2: Principles of Benefit-Cost Analysis.

1.7 Hazard Synopsis

The following figure illustrates the relative level of hazard for the six major hazards at each of the District's campuses. These hazard levels are based on statewide GIS data and additional district-specific data entered into OSPI's ICOS PDM database.

Figure 1.7
Hockinson School District: Major Hazards Matrix

STATE OF WASHINGTON
SUPERINTENDENT OF PUBLIC INSTRUCTION
DISTRICT PDM HAZARD SUMMARY

	Earthquake	Tsunami	Volcanic	Flood	WUI	Landslide
Hockinson						
Hockinson Heights Elementary School (East)	Moderate to High	None**	None**	Low	None**	None**
Hockinson Heights Elementary School (West)	Moderate to High	None**	None**	Low	None**	None**
Hockinson High School	High	None**	None**	Low	None**	None**
Hockinson Middle School	Moderate to High	None**	None**	Low	None**	None**

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All four of the district's campuses have a moderate to high or high levels of earthquake hazard. All four of the campuses also have low levels of flood hazard.

The Hockinson District is not subject to volcanic hazards, except possibly for minor volcanic ash falls, because none of the campuses are in, or near, any of the mapped volcanic hazard zones for any of the active volcanoes in Washington State.

The Hockinson District is not subject to tsunamis because the district is located many miles from the coast and at elevations far above any possible tsunami events.

The classification of risk as "none" for some hazards means the level of risk is zero or close to zero. For some hazards, there may be a remote possibility of some impacts for hazard events that are much greater than anticipated.

Further details re: the hazards that pose significant risk to the District's facilities and people are presented in the following chapters:

Chapter 6: Earthquakes,
Chapter 7: Floods