

Chapter 24.16 SEISMIC HAZARD AREA

24.16.010 General purposes.

The purposes of this section are to:

- A. Protect public health and safety;
- B. Establish minimum requirements to address seismic hazards; and
- C. Identify seismic hazard areas in Thurston County.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

24.16.020 Applicability.

This chapter applies to all properties in Thurston County. Seismic activity can be unpredictable and may exceed the scope of this title and other requirements of the Thurston County Code. Such events may cause serious personal or bodily injury, including death, and damage to or loss of property. Too many uncertainties exist about the source, size, and mobility of future events or secondary hazards such as landslides or floods caused by earthquakes. This chapter is not a guarantee against damage or injury due to seismic activity.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

24.16.030 Development standards and review.

- A. Buildings shall be subject to the design requirements and review process in Title 14 TCC, Buildings and Construction.
- B. Subdivision of property in an area that has a liquefaction susceptibility rating of high or a Site Class of E or F may occur provided that a geological report is provided that identifies sufficient buildable area outside of the area that has a liquefaction susceptibility rating of high. The boundary of the area that has a liquefaction susceptibility rating of high shall be clearly shown on the map.
- C. New roads, bridges, and utilities shall only be allowed in an area that has a liquefaction susceptibility rating of high when there is no feasible alternative location. Geotechnical analysis and design shall be provided to ensure the roadway, bridge and utility structures and facilities will not be susceptible to damage from seismic-induced ground deformation. Proposals shall be designed consistent with other requirements in the Thurston County Code, including Title 13 TCC, Roads and Bridges, Title 14 TCC, Buildings and Construction, and other applicable regulations.
- D. Geotechnical professionals shall use the Liquefaction Susceptibility Map of Thurston County and the Site Class Map of Thurston County developed by the Washington Geologic Survey when assessing the risk of liquefaction potential.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

Chapter 24.17 VOLCANIC HAZARD AREA

24.17.010 General purposes.

The purposes of this section are to:

- A. Protect public health and safety given current information on volcanic hazards;
- B. Minimize damage to property due to volcanic events; and
- C. Identify approximate locations of volcanic hazard areas.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

24.17.020 Applicability.

This chapter applies to all properties in Thurston County meeting the definition for volcanic hazard area in Chapter 24.03 TCC. However, because volcanic activity can be unpredictable and may exceed the scope of this title, other areas of the county may be affected. Such low-probability, high-consequence events and other events documented by the United States Geological Survey, the State of Washington, or Thurston County may cause serious personal or bodily injury, including death, and damage to or loss of property. Too many uncertainties exist about the source, size and mobility of future events to locate hazard-free zones with absolute confidence. This chapter is not a guarantee against damage or injury due to volcanic activity.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

24.17.030 Development standards and review.

- A. No new critical facilities as defined in Chapter 24.03 TCC and listed in Table 24.15-2 TCC shall be constructed or located in Case 1 lahar volcanic hazard areas; and
- B. Existing critical facilities may be expanded so long as the existing evacuation plan is amended to demonstrate that any additional people can be evacuated in an amount of time less than the anticipated time that it takes a lahar to reach the facility. The time that it takes a lahar to reach a given point is calculated from the source of the event to the given point; and
- C. An evacuation plan shall be provided for all multi-family, subdivisions with more than four lots, lodging, and public assembly uses with posting of the plan in all occupied rooms; and
- D. For all new permitted uses and structures approved under this title, recordation on the title with the Thurston County Auditor that:
 - 1. Acknowledges that the development is within a Case 1 lahar volcanic hazard area for Mount Rainier, and is subject to debris flows and other hazards that potentially endangers property and life; and
 - 2. The owner and all future owners take complete responsibility for development and occupation of the residence or structure and hold Thurston County and its employees harmless for any damage suffered because of volcanic hazards; and
 - 3. Acknowledges that evacuation is the sole responsibility of the owner or occupant and that information on potential evacuation routes and holding areas is available from local emergency management agencies.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

24.17.040 Additional reasonable use exception criteria.

In addition to the decision criteria in Chapter 24.45 TCC for granting reasonable use exceptions, reasonable use exceptions for the critical facilities listed in Table 24.15-2 proposed to be located in volcanic hazard areas shall also comply with the following conditions:

- A. The applicant shall show through submittal of travel time data the amount of time that is anticipated for a Case 1 lahar to reach the proposed project and evacuation route.
- B. The applicant has demonstrated that through submittal of a volcanic hazard emergency evacuation plan that:
 - 1. The proposed project is located near a safety zone (area completely located outside the limits of a Case 1 lahar) that is within walking distance in an amount of time less than the anticipated time that it takes a lahar and/or flood waters from the release of water from the Tacoma Power Structures (dams) to reach a given point, whichever is less. The time that it takes a lahar and/or flood waters to reach a given point is calculated from the source of the event to the given point. The time of walking distance will be calculated based upon the amount of time necessary for people with physical or mental disabilities to get from the proposed project to the safety zone any lahars off of Mt. Rainier may be mitigated or enhanced by the Tacoma Power Structures (dams); and
 - 2. The evacuation route is at a slope and surface to be considered accessible to those with disabilities; and
 - 3. The evacuation route has been determined not to contain any other potential natural hazards, such as landslide or flood hazards, to cause a blockage or destruction of the evacuation route during an event (i.e. seismic event causes the evacuation route to become impassible because of a landslide or soil liquefaction, or a release of water from the Tacoma Power Structures upstream that are likely to flood evacuation routes); and
 - 4. The evacuation route is not located adjacent to any highways or arterial road networks that may cause a life safety threat to evacuating pedestrians; and
 - 5. The safety zone is an area with adequate ingress/egress following an event, and that individuals have the ability to exit without going out of a safety zone.
- C. Proposed critical facilities shall have an adequate contingency plan that identifies where occupants and emergency response equipment and vehicles will be relocated in the event that a lahar damages the facility to an uninhabitable condition.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

Chapter 24.18 MINE HAZARD AREA

24.18.010 General purposes.

The purposes of this chapter are to:

- A. Protect public health and safety given current information on mine hazards;
- B. Minimize damage to property due to mine hazards; and
- C. Identify approximate locations of mine hazard areas.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

24.18.020 Applicability—Permitted uses.

- A. Mine hazard areas in Thurston County are generally limited to abandoned coal mines in south central Thurston County.
- B. This chapter applies to areas in Thurston County that may be designated as a mine hazard area as defined in Chapter 24.03 TCC, which include those areas within 100 horizontal feet of a mine opening at the surface or which are underlain at a depth of three hundred feet or less by mine workings.
- C. Permitted uses in mine hazard areas shall be the same as the underlying zoning district except that critical facilities listed in Table 24.15-2 shall not be permitted.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

24.18.030 Maps.

Mine workings are identified in the Washington State Department of Natural Resources, Division of Geology and Earth Resources, Open File Report 94-7 "The Washington State Coal Mine Map Collection: A Catalog, Index, and User's Guide," Open File Report 84-6 "Inventory of Abandoned Coal Mines in the State of Washington," and specific maps and surveys of mine workings on file with the Department of Natural Resources. General areas of coal mines have been delineated on maps provided by the Washington State Department of Natural Resources. These maps relied on annual reports submitted by mining companies since about 1900. Mines abandoned prior to 1900, and some small and unregistered mines are not documented in filed reports. Maps note broad areas suspected of posing coal-mine hazards and may not show individual mines. Because the lack of a full historic record for coal mines leaves uncertainties on the location of all coal mine hazards, Thurston County cannot guarantee that all coal mine hazard areas are noted on maps. This chapter is not a guarantee against damage or injury due to coal mine hazards.

(Ord. No. 14773, § 3(Att. B), 7-24-2012)

24.18.040 Development standards and review.

- A. Development within 200 feet hazard area requires the applicant to first demonstrate that no hazards to health or safety exist at the proposed site.
- B. Development within 200 feet of mine hazard areas shall be accompanied by technical studies by qualified professionals that assess the potential risk from past or present mine operations, including entries, shafts and ventilation facilities; investigate potential future trough subsidence or sinkhole development due to collapse of abandoned coal mines; and identify specific measures to mitigate the risk in accordance with the criteria below:
 - 1. Mine entries and shafts shall be permanently sealed using controlled density backfill and/or grouting, or an approved, engineered seal and shall include permanent diversion of surface drainage away from the shaft or mine entry; and
 - 2. Existing sinkholes and shallow prospect excavations shall be backfilled to surface using suitable engineered backfill and shall include permanent diversion of surface drainage away from existing sinkholes and prospect excavations; and
 - 3. Potential sinkhole hazards shall be assessed by a qualified professional utilizing direct subsurface investigations that demonstrate coal mine workings either do not exist, or that the workings have fully collapsed so that there is no remaining potential for sinkhole development, or show that the hazards

-
- associated with any voids that are identified are fully mitigated by backfilling, grouting, or other approved means such that the potential for sinkhole development is eliminated; and
4. Any coal mine waste dump shall be demonstrated to be stable through analysis by a qualified professional. If the coal mine waste dump does not meet the stability criteria, it shall be regraded or otherwise mitigated to meet stability criteria. If springs or seeps discharge from the coal mine waste dump, materials shall be removed or be covered with a minimum of two feet of clean soil and be revegetated with native vegetation. Development shall not be permitted within one hundred feet of any coal mine waste dump that shows evidence of current or past combustion. Development may be permitted over coal mine waste material only if an investigation and analysis by a qualified professional identifies feasible construction criteria for foundation stability and performance; and
 5. Mine gas hazards shall be mitigated by backfilling all mine entries, shafts and sinkholes and providing appropriate venting; and
 6. Mine fire potential shall be assessed through analysis by a qualified professional. Development shall not be permitted within one hundred feet of mine workings where investigations indicate the possibility of combustion or the possible presence of existing combustion in the underlying seam or seams.
- C. As a result of geotechnical investigations, the director may require special studies to ensure proposed buildings, utilities, and roads are constructed to adequate engineering specifications to address subsidence effects, strains, tilts and other issues associated with mine hazards areas.
- (Ord. No. 14773, § 3(Att. B), 7-24-2012)

24.18.050 Standards for mine hazard studies.

In addition to the geologic hazard assessment requirements in Chapter 24.35 TCC for special reports, the following are also required in mine hazard areas:

- A. A mine hazard assessment shall contain all available documented information about mine workings and the results of a surface reconnaissance that shall identify any public safety mine hazards, mine waste dumps, or evidence of mine subsidence or sinkholes and shall include:
 1. Historical mining data, including available copies of original mine records identifying shaft excavations and tailings locations; and
 2. A map showing property boundaries, mine hazard boundaries, and any potential hazards identified within one hundred feet of the property.
- B. Shallow hazards such as entry portals, shaft collars, ventilation shafts, prospects, and mine waste dumps may be investigated by test pits or trenching, provided the method enables an investigation to an adequate depth for the hazard being investigated.
- C. Site-Specific Evaluation of Potential Trough Subsidence.
 1. Review of available records of original mine workings that could potentially influence the site by trough subsidence shall include:
 - a. Locations, depths and thicknesses of such seams and workings; and
 - b. Mine workings that could potentially influence the site shall be determined by projecting the down-dip limit angle from the lowest limit of the documented workings to the ground surface. Mine workings are considered to potentially influence the property if the property lies within the line at which the limit angle intersects the ground surface.

-
2. Subsurface conditions may be evaluated by drilling. Drilling is the most acceptable method for providing information for reducing the remaining mine height value used in subsidence calculations to less than the height of the original workings. For these evaluations:
 - a. Drillholes shall be logged continuously from one hundred feet above to twenty feet below mine working, including lithology at five-foot intervals, drill fluid circulation, penetration rate, and free fall of the drill string; and
 - b. Greater confidence will be placed in core drilling using industry standard technique; and
 - c. As a guidelines, a minimum of one drillhole penetrating each seam that could potentially cause trough subsidence at the site should be drilled for each two-hundred-foot length of the adit; and
 - d. Surface geophysics, or other indirect means, may be used to assist in projecting information between and beyond drillholes, but shall not be accepted as the sole method for evaluating the condition of underground mine workings and calculating remaining mine height.
 3. Calculation of trough subsidence magnitudes, tilt and strains shall be in accordance with the empirical function method of the British National Coal Board, as presented in their Subsidence Engineers Handbook, adjusted to reflect the effects of inclined seams and downdip limit angles encountered, and shall be based on a conservative evaluation of site conditions developed from the review of available records, site investigation, and subsurface exploration. Calculations shall consider the following:
 - a. Calculations shall calculate the subsidence factor, and the downdip limit angle with direct field evidence or a review of detailed mine records; and
 - b. Remaining mine height shall be presumed to be equal to the seam thickness for the subsidence calculations unless evidence from drilling justifies modification; and
 - c. The calculation of potential tilts and strains shall consider effects of individual panel widths and barrier pillar widths. If direct subsurface investigation indicates that the mine workings are fully collapsed, an estimate of potential surface settlements due to consolidation of rubble and loose material shall be made for the cumulative effect of all seams that could induce trough subsidence at the site.
 4. Site plans shall be prepared showing the proposed development and calculated magnitudes of potential subsidence, strains, and tilts at the property boundaries and at the location of any proposed structures. This also includes the following:
 - a. A map showing contours of potential subsidence magnitudes, strains, and tilts throughout the property shall be submitted for use in design of roads and utilities; and
 - b. Appropriate recommendations shall be provided for structural and civil design requirements.
- D. Site-Specific Evaluation for Potential Sinkhole Hazards.
1. Review of available records shall be as in subsection (A)(1) of this section.
 2. Subsurface conditions for workings located within two hundred feet of the ground surface shall be investigated by drilling. For this investigation:
 - a. Drillhole sites shall be selected at representative locations and at representative working depths. A minimum of five drillholes shall be drilled along the alignment of any linear structure, such as proposed roads or utility lines designed to cross a mine hazard area. Drillholes shall be located along linear mine shaft features, no more than 100 feet apart, within the proposed development site.
 - b. Core drilling is preferred, but is not compulsory. Rotary drilling is an acceptable method, provided it is used in combination with downhole geophysical logging, including caliper logs. Drilling shall

penetrate immediately above and through the predicted mine workings locations to facilitate interpretation of the conditions of the mine workings.

- c. Drillholes shall be logged continuously throughout their length, including lithology at five-foot intervals for rotary drillholes, drill fluid circulation, penetration rate, and free fall of the drill string.
- E. The director may waive or reduce engineering study and design requirements for alterations in mine hazard areas for additions or alterations to legally existing structures meeting the requirements in place at the time of construction that do not increase occupancy or significantly affect the risk of structural damage or injury.

(Ord. No. 14773, § 3(Att. B), 7-24-2012; Ord. No. 14961, § 2(Att. B), 12-17-2013)