



CITY OF KIRKLAND
Planning and Building Department
123 5th Avenue, Kirkland, WA 98033
425.587.3600- www.kirklandwa.gov

MEMORANDUM

To: Planning Commission

From: David Barnes, Senior Planner
Jeremy McMahan, Planning Manager - Development Services
Adam Weinstein, AICP, Deputy Planning Director

Date: April 5, 2018

Subject: **Kirkland Zoning Code (KZC) Chapter 85 Amendments (Critical Areas: Geologically Hazardous Area Regulations) and Related Minor Code Amendments to KZC Chapter 5 (Definitions)**
File No. CAM17-00681

I. RECOMMENDATION

- Receive a presentation on the revised code amendments
- Discuss the revised code amendments
- Planning Commission by motion should make a recommendation to the City Council on the code amendments.

II. BACKGROUND

The update to the City's Geologically Hazardous Area regulations follows a comprehensive process of mapping Kirkland's geology and educating the community about geologic hazards that are present. The code update process started with a public lecture on the geology of Kirkland, a joint study session with the Planning Commission and the Houghton Community Council, a briefing before the City Council, and release of updated geologically hazardous area maps. Staff is now bringing forward the proposed updates to KZC Chapter 85 and Chapter 5 in accordance with the requirements of the Growth Management Act (GMA) and best available science (BAS). Under the GMA, local governments are required to use BAS in their policies and regulations for geologically hazardous areas, wetlands, and other sensitive areas.

Following is a summary of the public meetings and outreach events held to educate the community about the geologic hazard mapping effort and receive input on the subsequent code amendment process (meeting materials are available on the City's website):

- [City Council briefing on November 21, 2017.](#) Presentation on Kirkland's geology, previewed updated landslide susceptibility and liquefaction potential maps, and discussed the code amendment process for KZC Chapter 85.

- Public lecture on Kirkland's geology on December 11, 2017. Prior to the public lecture, staff exhibited the updated maps for landslide susceptibility and liquefaction potential and answered questions from the public. Approximately 80 people attended the public lecture, which was filmed for viewing on the Planning and Building Department webpage for the Geologically Hazardous Area Code Amendments and can be viewed by clicking [here](#).
- Joint study session with the Planning Commission and Houghton Community Council on January 11, 2018. Reviewed the updated maps and presented upcoming amendments to KZC Chapter 85. Many of the proposed updates were changes required to reflect BAS and conform to the GMA. The Planning Commission and Houghton Community Council discussed whether KZC Chapter 85 should be revised to further restrict development activities in geologically hazardous areas, and if peer review of applicant-supplied geotechnical reports should be required in all cases. The Planning Commission and Houghton Community Council suggested modifying the code such that BAS and site specific reports could be used to eliminate or mitigate geological hazards in order to allow development to occur. In addition, the majority of the Planning Commission and Houghton Community Council suggested that peer review of geotechnical reports be required only under specific circumstances.
- Public open houses prior to meetings on December 11, 2017 and January 11, 2018. These meetings provided an opportunity for the public to ask questions about the updated maps and the code amendment process.
- Joint Hearing with the Houghton Community Council and the Planning Commission on March 26, 2018. Staff presented the draft code amendments at this joint hearing and also listened to public comments. Several residents spoke during the hearing. The Finn Hill Neighborhood Alliance suggested that the proposed code amendments did not go far enough to restrict development in areas susceptible to landslides and made two recommendations:
 1. Prohibit construction in high landslide hazard areas, or alternatively
 2. Prohibit construction in high landslide hazard areas unless the developer can demonstrate through a peer-reviewed geotechnical report that the proposed development would not result in significant on- or off-site impacts related to geological hazards.

Staff received direction from both the Houghton Community Council and the Planning Commission to return to a future meeting with revised code amendments to address the following concerns:

1. Establish criteria for situations in which peer review of geotechnical reports prepared for projects located on steep slopes in high landslide areas and seismic hazard areas would not be required.
2. Establish criteria to require peer review of geotechnical reports for all projects located on slopes of 40 percent or greater.

3. Revise a requirement proposed in KZC 85.50 to record an abstract/summary of a site's geotechnical report on the property's title.
4. Remove a public agency exemption for noxious weed removal and restoration plans.
5. Undertake minor edits and clarifications to code language, including capitalizing defined terms and actions that must occur under all circumstances.

III. CODE AMENDMENTS

BAS for geologically hazardous areas has not advanced significantly since the adoption of the current regulations in KZC Chapter 85. Therefore, the proposed update requires relatively modest amendments to meet GMA requirements. The vast majority of the amendments were designed to correct and improve the existing code language, and ensure improved public safety based on current knowledge of these hazards.

Staff has addressed the concerns expressed by the Houghton Community Council and the Planning Commission by making the following revisions to the code amendments reviewed on March 26:

1. Added a Peer Review section (KZC 85.22.1) that requires peer review of geotechnical reports for properties located on slopes of 40 percent or greater in high landslide areas. In addition, added language to KZC 85.22.2 to require peer review of geotechnical reports for properties not located on steep slopes, but in high landslide areas and seismic hazards areas, along with criteria for when peer review may be waived.
2. Revised language to only require a recorded notice on the property title that the property lies within a Geologically Hazardous Area (KZC 85.50).
3. Removed a public agency exemption for removal of noxious weeds and restoration plans.
4. Made numerous minor technical changes to the code text to clarify and define procedural and substantive matters.

Attachment 1 contains proposed revisions to KZC Chapter 85. New text is shown as underlined and deleted text is shown as ~~strikeout~~.

The proposed amendments to KZC Chapter 85 are summarized below and the revised code language is in Attachment 1:

Section 85.07 – Purpose Statement

- Section added to describe the intent of the chapter and the purpose of the regulations.

Section 85.12 – Critical Area Maps

- Describes the purpose and use of the City's critical area maps and indicates that site specific findings from a geotechnical report take precedence over the City's critical area maps for the purposes of identifying appropriate mitigation measures related to geologic issues.

Section 85.15 - Required Information – Landslide Hazard Areas and Seismic Hazard Areas

- Requires exploration logs with geotechnical reports (so that reviewers can better understand underlying soil conditions).
- Requires a geotechnical engineer or engineering geologist to be licensed in Washington State, conforming to geologic professional standards.
- Requires a LiDar shaded relief map to be provided with a geotechnical report (the City now has a [LiDar derived "bare earth" map](#) available to the public that shows the city's land without vegetation and helps identify potential geologic hazards).
- Requires providing results of a slope stability analysis with a geotechnical report (this provides another tool for the reviewer or peer reviewer to establish how stable a specific slope is and provides a factor of safety).
- Requires a discussion of presence or absence of features indicative of historic landslide activity or increased risk of future landslide activity.
- Requires a geotechnical report to estimate the magnitude of seismically induced settlement if the site is within a Seismic Hazard Area.

Section 85.20 – Required Review

- Provides language to allow staff to make a decision to approve, deny or approve with conditions based on the materials provided by an applicant about geologic hazards.
- Clarifies the process for decisions about projects located within geologically hazardous areas and identifies the circumstances under which a decision could be modified by the City.

Section 85.22 - Peer Review

- Requires third party review for projects on slopes in high landslide areas equal to or greater than 40 percent.
- Requires third party review for projects in high landslide areas with slopes less than 40 percent, and seismic hazard areas, but provides criteria for waiving peer review.

Section 85.25 - Performance Standards

- Adds "geologic hazards" to 85.25.1 as a criterion requiring consideration of mitigation measures.
- Requires and defines factors of safety for a slope stability analysis, to ensure that a project can be undertaken with a minimized landslide risk.
- Requires a licensed geotechnical engineer to provide a statement in the report that the project plans have been reviewed and that they conform to recommendations.
- Revises 85.25.7.a and b add language to clarify the intent of the original wording related to when development activities may be restricted due to slope stability, drainage patterns, erosion and related hazards, and damage to persons or property.

Section 85.50 – Notice of Geologic Hazard

- Requires recording of a notice on the title of a property informing future property owners that the property is located in a geologically hazardous area.

Attachment 2 contains minor amendments to KZC Chapter 5 (Definitions). New text is shown as underlined and deleted text is shown as ~~strikeout~~. Most of the definitions added to KZC Chapter 5 were originally found within KZC Chapter 85, but have been moved to KZC Chapter 5 so that definitions of terminology used in the KZC can be found in one location, instead of dispersed among multiple chapters. The list below contains the existing and new definitions added to KZC Chapter 5:

- a. Erosion Hazard Areas
- b. Geologically Hazardous Areas
- c. Landslide Hazard Area
- d. Moderate Landslide Area
- e. High Landslide Area
- f. Seismic Hazard Areas
- g. Quantitative Slope Stability Analysis
- h. Factor of Safety

Attachment 3 provides a clean copy of the proposed code amendments to KZC Chapter 85 and Attachment 4 provides a clean copy of the proposed code amendments to KZC Chapter 5.

IV. NEXT STEPS

The next steps include bringing a Planning Commission recommendation on the code amendments to the City Council in May 2018.

Attachments:

1. Draft Chapter 85 KZC
2. Draft Chapter 5 KZC
3. Draft Chapter 85 KZC (clean copy)
4. Draft Chapter 5 KZC (clean copy)

cc: CAM17-00681

Chapter 85 – CRITICAL AREAS: GEOLOGICALLY HAZARDOUS AREAS

Sections:

85.05	User Guide
<u>85.07</u>	<u>Purpose Statement</u>
85.10	Applicability
85.12	Critical Area Maps
85.13	Definitions
85.14 <u>85.13</u>	Erosion Hazard Areas
85.15	Required Information — Landslide Hazard Areas and Seismic Hazard Areas
85.20	Required Review — Landslide Hazard Areas and Seismic Hazard Areas
<u>85.22</u>	<u>Peer Review</u>
85.25	Performance Standards — Landslide Hazard Areas and Seismic Hazard Areas
85.30	Appeals
85.35	Bonds
85.40	Dedication
85.45	Liability
85.50	Request for Determination <u>Notice of Geologic Hazard</u>

85.05 User Guide

1. This chapter establishes special regulations that apply to development on property containing Geologically Hazardous Areas. These regulations add to and, in some cases, supersede other regulations of this code. See Chapter 95 KZC for additional regulations that address trees and other vegetation within and outside of Geologically Hazardous Areas.
2. If you are interested in developing property that contains a geologically hazardous area, or if you wish to participate in the City's decision on a proposed development on any of these areas, you should read this chapter.
3. For properties within jurisdiction of the Shoreline Management Act, see Chapter 83 KZC.

(Ord. 4252 § 1, 2010; Ord. 4010 § 3, 2005)

85.07 Purpose Statement

These regulations were prepared to comply with the Growth Management Act and implement the goals and policies of the City's Comprehensive Plan. The purpose of these regulations is to protect human life, property, and the environment. This purpose will be achieved by thoroughly evaluating development activity in Geologically Hazardous Areas using best available science.

85.10 Applicability

1. General – This chapter applies to any property that contains any of the following:
 - a. An ~~e~~Erosion ~~h~~Hazard ~~a~~Area.
 - b. A ~~l~~Landslide ~~h~~Hazard ~~a~~Area.
 - c. A ~~s~~Seismic ~~h~~Hazard ~~a~~Area.
2. Conflict with Other Provisions of this Code – The provisions of this chapter supersede any conflicting provisions of this code. The other provisions of this code that do not conflict with the provisions of this chapter apply to property that contains a geologically hazardous area. If more than one (1) provision of this chapter applies to the subject property because of the presence on the subject property of more than one (1) type of Geologically Hazardous Area, then the regulations that provide the greatest protection from the hazardous area shall apply to the area governed by multiple regulations.

3. SEPA Compliance – Nothing in this chapter or the decisions made pursuant to this chapter in any way affect the authority of the City to review, approve, condition, and deny projects under SEPA.

85.12 Critical Area Maps

The City maintains general mapping of known critical areas. These maps and other available resources (such as topographic maps, soils maps, and aerial photos) are intended only as guides. They depict the approximate location and extent of known critical areas. Some critical areas depicted in these resources may no longer exist and critical areas not shown in these resources may occur. The provisions of this chapter and the findings of a critical areas geotechnical report and review of the report by the City take precedence over the City’s mapping in regard to identification and mitigation of potential geologic hazards. Site specific geologic hazard studies shall be conducted prior to approval of development, land surface modification, utility installation, or other activities to evaluate if a geologic hazard area actually exists, and to assess suitable options for hazard mitigation, if appropriate. As part of the City’s Comprehensive Plan, City Council from time to time amends the critical area maps. Included in the critical area maps is a map entitled “Geologically Hazardous Areas.” The maps are used as a guide only to determine the presence of seismic hazards, erosion hazards, and landslide hazards, and the determination regarding whether these hazards exist on or near the subject property will be based on the actual characteristics of these areas and the definitions of this code.

The City’s maps relating to this chapter are entitled “Landslide Susceptibility” and “Liquefaction Potential.”

(Ord. 4551 § 4, 2017)

85.13 Definitions

The following definitions apply throughout this code, unless, from the context, another meaning is clearly intended:

1. ~~Erosion Hazard Areas~~—Those areas containing soils which, according to the USDA Soil Conservation Service King County Soil Survey dated 1973, may experience severe to very severe erosion hazard. This group of soils includes, but is not limited to, the following when they occur on slopes of 15 percent or greater: Alderwood gravelly sand loam (AgD), Kitsap silt loam (KpD), Ragnar Indianola Association (RdE) and portions of the Everett gravelly sand loams (EvD) and Indianola Loamy fine sands (InD).
2. ~~Geologically Hazardous Areas~~—Landslide hazard areas, erosion hazard areas and seismic hazard areas.
3. ~~Landslide Hazard Areas~~—Both of the following:
 - a. ~~High Landslide Hazard Areas~~—Areas sloping 40 percent or greater, areas subject to previous landslide activities and areas sloping between 15 percent and 40 percent with zones of emergent groundwater or underlain by or embedded with impermeable silts or clays.
 - b. ~~Moderate Landslide Hazard Areas~~—Areas sloping between 15 percent and 40 percent and underlain by relatively permeable soils consisting largely of sand and gravel or highly competent glacial till.
4. ~~Seismic Hazard Areas~~—Those areas subject to severe risk of earthquake damage as a result of seismically induced settlement or soil liquefaction, which conditions occur in areas underlain by cohesionless soils of low density usually in association with a shallow groundwater table.

(Ord. 4551 § 4, 2017)

85.134 Erosion Hazard Areas

Regulations to control erosion are contained within KMC Title 15 and in other codes and ordinances of the City. Development activity within erosion hazard areas is regulated using these other provisions of this code and other City codes and ordinances and may be subject to increased scrutiny and conditioning because of the presence of an Erosion Hazard Area.

85.15 Required Information – ~~Landslide Hazard Areas and Seismic Hazard Areas~~

The City ~~may~~ shall require the applicant to submit some or all of the following information, consistent with the nature and extent of the proposed development activity, for any proposed development activity in a ~~landslide hazard~~

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~~area or seismic hazard area or on property which may contain one (1) of these areas based on the Geologically Hazardous Areas maps or preliminary field investigation by the Planning Official:~~

1. A topographic survey of the subject property, or the portion of the subject property specified by the Planning Official, with two-foot contour intervals ~~specified by the Planning Official~~. This mapping shall contain the following information:
 - a. ~~Delineation of areas containing slopes 15 percent or greater, and identification of slopes 40 percent or greater.~~
 - b. ~~The proximity of the subject property to~~ Wetlands, streams and lakes in the area.
 - c. The location of ~~structured~~ storm drainage ~~systems~~ facilities on the subject property.
 - d. Existing vegetation, including size and type of significant trees.
2. A geotechnical investigation, prepared by a ~~qualified~~ geotechnical engineer licensed in Washington State or engineering geologist licensed in Washington State, to determine if a landslide hazard area or seismic hazard area exists on the subject property.
3. A geotechnical report, prepared by a ~~qualified~~ geotechnical engineer licensed in Washington State or engineering geologist licensed in Washington State, showing and including the following information:
 - a. A description of how the proposed development will or will not affect slope stability, surface and subsurface drainage, erosion, and seismic hazards on the subject and adjacent properties.
 - b. Evidence, if any, of holocene or recent landsliding, sloughing, or soil creep.
 - c. The location of springs, seeps, or any other surface expression of groundwater, and the location of surface water or evidence of seasonal runoff or groundwater.
 - d. Identification of existing fill areas.
 - e. Soil description in accordance with the ~~Unified~~ Soil Classification Systems.
 - f. Depth to groundwater and estimates of potential seasonal fluctuations, if applicable to the project.
 - g. Subsurface exploration logs sufficient to assess geologic hazards at the site. Soil descriptions on the logs shall be in accordance with the Unified Soil Classification System. The logs shall also identify each of the geologic units encountered (e.g., fill, Vashon lodgement till, Vashon advance outwash).
 - h. If the subject property is located within 100 feet of a High Landslide Hazard area, then a current LiDAR-based shaded relief map of the project area and a discussion of the licensed geotechnical professional's interpretation of this mapping must be provided.
 - i. Results of a Quantitative Slope Stability Analysis for any project involving development within a horizontal distance "H" of a High Landslide Hazard Area where "H" is equal to the height of the slope within the High Landslide Hazard Areas or 50 feet, whichever is greater. The evaluation of slope stability under seismic conditions shall be based on a horizontal ground acceleration equal to ½ of the peak horizontal ground acceleration with a 2 percent in 50-year probability of exceedance as defined in the current version of the *International Building Code*.
 - j. A discussion of the presence or absence of site features potentially indicative of historic landslide activity or increased risk of future landslide activity. Such features include, but are not limited to, tree trunk deformation, emergent seepage, landslide scarps, tension cracks, reversed slope benches, hummocky topography, vegetation patterns, and area stormwater management practices.

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- k. Estimate of the magnitude of seismically induced settlement that could occur during a seismic event for any project involving development within a Seismic Hazard Area. Estimation of the magnitude of seismically induced settlement shall be based on a peak horizontal ground acceleration based on a seismic event with a 2 percent in 50-year probability of exceedance as defined in the current version of the *International Building Code*. This requirement may be waived if it can be demonstrated that construction methods will completely mitigate the risk of seismically induced settlement.
 - l. A summary or abstract of the geotechnical report for the property where the development activity is proposed. The abstract shall at a minimum include the type of hazard, extent of the hazard, hazard analysis and geologic conditions.
4. Geotechnical recommendations, prepared by a qualified geotechnical engineer licensed in Washington State or engineering geologist licensed in Washington State, for special engineering or other mitigation techniques appropriate to the hazard area along with an analysis of how these techniques will affect the subject and adjacent properties, including discussions and recommendations on the following:
- a. The present stability of the subject property, the stability of the subject property during construction, the stability of the subject property after all development activities are completed and a discussion of the relative risks and slide potential relating to adjacent properties during each stage of development.
 - b. Location of buildings, roadways, and other improvements.
 - c. Grading and earthwork, including compaction and fill material requirements, use of site solids as fill or backfill, imported fill or backfill requirements, height and inclination of both cut and fill slopes and erosion control and wet weather construction considerations and/or limitations.
 - d. Foundation and retaining wall design criteria, including bearing layer(s), allowable capacities, minimum width, minimum depth, estimated settlements (total and differential), lateral loads, and other pertinent recommendations.
 - e. Surface and subsurface drainage requirements and drainage material requirements.
 - f. Assessment of seismic ground motion amplification and liquefaction potential.
 - g. Other measures recommended to reduce the risk of slope instability.
 - h. Any additional information believed to be relevant by the geotechnical engineer preparing the recommendations or requested by the Planning Official.

(Ord. 4551 § 4, 2017)

85.20 Required Review — ~~Landslide Hazard Areas and Seismic Hazard Areas~~

1. General – Except as specified in subsection (2) of this section, the City Planning Official will ~~administratively~~ review and decide upon any proposed development activity within a Geologically Hazardous Area.
2. Other Approval Required – If the proposed development on the subject property requires approval through Process I, IIA, or IIB, described in Chapters 145, 150, and 152 KZC, respectively, the proposed development activity within the ~~landslide hazard area or seismic hazard area~~ Geologically Hazardous Area will be reviewed and decided upon as part of that other process.
3. The decision on a proposed project shall be to approve, deny or approve with conditions.
4. The City may modify any decision, prior to completion of the project, made under this section when it has been determined that physical circumstances have markedly and demonstrably changed on the subject property or the surrounding areas as a result of natural processes or human activity. This authority does not include requiring removal of structures or additions to structures that have been legally constructed under this decision.

85.22 Peer Review

1. For projects located on a slope of 40 percent or steeper over a height of at least 10 feet and including those areas within a horizontal distance “H” equal to the height of the slope, whichever is greater; the City shall require applicant funding of a licensed geotechnical engineer or licensed engineering geologist, selected and retained by the City subject to a third party contract, to review the geotechnical report and recommendations.
2. For projects located in a High Landslide Hazard Area, other than #1 above, or a Seismic Hazard Area, the City shall normally require applicant funding of a licensed in Washington State geotechnical engineer or licensed in Washington State engineering geologist, selected and retained by the City subject to third party contract, to review the geotechnical report and recommendations. The Planning Official may waive the third party review requirement in some cases. Guidance criteria to be considered by the Planning Official when evaluating if third party review will be waived, includes, but may not necessarily be limited to, any of the following:
 - a. City staff have the technical expertise to provide knowledgeable review of the submitted geotechnical materials;
 - b. The consequences of failure present a low level of risk (e.g., type of structure proposed, slope height, surrounding topography or structures);
 - c. There is not any presence of known, recent landslide activity that presents a potential heightened landslide hazard risk; and
 - d. Stormwater infiltration or stormwater facilities that could potentially impact slope stability are not proposed.
3. For projects subject to peer review, the recommendations of the peer review shall be addressed in a revised geotechnical report (or supplement to the originally-prepared report).

85.25 Performance Standards – Landslide Hazard Areas and Seismic Hazard Areas

(See also Chapter 95 KZC)

As part of any approval of development in a Landslide Hazard Area or Seismic Hazard Area, the City ~~may~~ shall require the following to protect property and persons:

1. Implementation of the geotechnical recommendations to mitigate identified impacts and geologic hazards including the retention of trees, shrubs, and groundcover, and if applicable the immediate implementation of a revegetation plan, along with a written acknowledgment on the face of the plans signed by the architect, engineer, and/or designer that he/she has reviewed the geotechnical recommendations and incorporated these recommendations into the plans.
2. Funding of a qualified geotechnical engineer or engineering geologist, selected and retained by the City subject to a 3 party contract, to review the geotechnical report and recommendations. Written acknowledgement from the licensed in Washington State geotechnical engineer or licensed in Washington State engineering geologist who prepared the report required by KZC 85.15 that they have reviewed the project plans and that they conform to their recommendations.
3. That a qualified geotechnical professional, working under the supervision of a licensed in Washington State geotechnical engineer or licensed in Washington State engineering geologist, be present on-site during land surface modification and foundation installation activities, and submittal by a licensed in Washington State geotechnical engineer or licensed in Washington State engineering geologist of a final report prior to occupancy, certifying substantial compliance with the geotechnical recommendations and geotechnical-related permit requirements.
4. ~~The retention of any and all trees, shrubs, and groundcover, and implementation of a revegetation plan including immediate planting of additional vegetation.~~
5. Specifically engineered foundation and retaining wall designs.

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65. The review of all access and circulation plans by the Department of Public Works.
76. Limitation or restriction of any development activity that may:
- a. Significantly impact slope stability ~~or drainage patterns~~ on the subject property or adjacent properties;
 - b. Significantly alter drainage patterns in a manner that would adversely impact the subject property or adjacent properties;
 - bc. Cause serious erosion hazards, sedimentation problems or landslide hazards on the subject property or adjacent properties; or
 - ed. Cause property damage or injury to persons on or off the subject property.
7. If a Quantitative Slope Stability Analysis is required with the geotechnical report, as specified in KZC 85.15.3(i), the proposed development shall provide a factor of safety of at least 1.5 for static conditions and at least 1.1 for seismic conditions.
8. Dedication of one (1) or more natural greenbelt protective easements or tracts.

(Ord. 4010 § 3, 2005)

85.30 Appeals

All classifications, decisions, and determinations made under this chapter are appealable using, except as stated below, the applicable appeal provisions of Chapter 145 KZC:

1. The appeal may be filed by the applicant or any other aggrieved person within 15 days of the date of the City's written classification, determination, or decision.
2. If a proposed development activity on the subject property required approval through Process IIA or IIB, described in Chapters 150 and 152 KZC, respectively, any appeal of a classification, determination, or decision under this chapter will be heard as part of that other process.

85.35 Bonds

The City may require a bond under Chapter 175 KZC and/or a perpetual landscape maintenance agreement to ensure compliance with any aspect of this chapter or any decision or determination made under this chapter.

85.40 Dedication

The City may require that the applicant dedicate development rights, air space, or an open space easement to the City to ~~ensure the protection of any~~ avoid needless impacts associated with a Landslide Hazard Area or Seismic Hazard Area on the subject property.

85.45 Liability

Prior to issuance of any development permit, the applicant shall enter into an agreement with the City, which runs with the property, in a form acceptable to the City Attorney, indemnifying the City for any damage resulting from development activity on the subject property which is related to the physical condition of the property. The applicant shall record this agreement with the King County Recorder's Office.

(Ord. 4491 § 11, 2015)

85.50 Request for Determination

1. ~~General~~ ~~The determination of whether a geologically hazardous area exists on the subject property and the boundaries of that geologically hazardous area will normally be made when the applicant applies for a development permit for the subject property. However, a property owner may, pursuant to the provisions of this section, request a determination from the City regarding whether a geologically hazardous area exists on the subject property and the boundaries of the geologically hazardous area.~~

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- ~~2. — Application Information — The applicant shall submit a letter of request along with a vicinity map and site plan indicating the location of the potential geologically hazardous area and other information, as appropriate.~~
- ~~3. — Review — A request for determination of whether a geologically hazardous area exists on the subject property, the location of the geologically hazardous area, and the type of geologically hazardous area will be made using the definitions, procedures, and criteria of this chapter, as appropriate.~~
- ~~4. — Decision — Determinations regarding geologically hazardous areas pursuant to this section will be made by the Planning Official.~~
- ~~5. — Appeals — Appeals from decisions made under this section will be reviewed and decided upon pursuant to KZC 85.30.~~
- ~~6. — Effect — Any decision made under this section will be used by the City in any development activity proposed on the subject property for which an application is received within two (2) years of the final decision of the City under this section; provided, that the City may modify any decision made under this section any time physical circumstances have markedly and demonstrably changed on the subject property or the surrounding areas as a result of natural processes or human activity.~~

85.50 Notice of Geologic Hazard

Prior to final inspection of any development permit, the applicant shall record (unless legally prohibited from doing so), a statement on the title of the property that informs future owners that the property is located in a Geologically Hazardous Area.

Definitions – KZC Chapter 5

5.20.178.5 Critical Area Maps - Maps contained in the Kirkland Comprehensive Plan maintained by the Department of Planning and Building; specifically Geologically Hazardous Areas Map for Chapter 85 KZC, and Wetlands, Streams and Lakes Map for Chapter 90 KZC. (Ord. 4551 § 4, 2017)

Erosion Hazard Areas – Those areas containing soils which, according to the United States Department of Agriculture (USDA) Natural Resource Conservation Services (NRCS) Web Soil Survey, may experience severe to very severe erosion hazard. Due to potential for mapping errors and other discrepancies in the NRCS data, Erosion Hazard Area designation should be based on actual site conditions as verified in the field by the geotechnical professional.

Factor of Safety- The ratio of forces that resist sliding to the forces that drive sliding.

Geologically Hazardous Areas – Landslide hazard areas, erosion hazard areas and seismic hazard areas.

High Landslide Hazard Areas

1. Areas that have shown movement during the Holocene epoch (from 10,000 years ago to the present) or that are underlain or covered by mass wastage debris of that epoch, or

2. Areas with both of the following characteristics:

A. Slopes steeper than 15 percent that intersect geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment, and

B. Springs

or

3. Areas potentially unstable because of rapid stream incision, stream bank erosion, or undercutting by wave action, or

4. Any area with a slope of 40 percent or steeper over a height of at least 10 feet.

5. For areas meeting the criteria of 1 through 4 above, the High Landslide Hazard Area also includes the area within a horizontal distance “H” equal to either the height of the slope or 50 feet, whichever is greater.

Landslide Hazard Area – Areas at risk of mass movement due to a combination of geologic, topographic, and hydrologic factors. Includes High and Moderate Landslide Hazard Areas.

Moderate Landslide Hazard Area – Areas with slopes between 15 percent and 40 percent which do not meet the definition of High Landslide Hazard Area.

Seismic Hazard Areas – Those areas subject to severe risk of earthquake damage as a result of seismically induced ground shaking, slope failure, settlement or soil liquefaction, which typically occurs in areas underlain by cohesionless soils of low density, usually in association with a shallow groundwater table.

Quantitative Slope Stability Analysis – A study performed to assess the safe design of human-made or natural slopes and the equilibrium conditions.

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85.40	Dedication
85.45	Liability
85.50	Notice of Geologic Hazard

85.05 User Guide

1. This chapter establishes special regulations that apply to development on property containing Geologically Hazardous Areas. These regulations add to and, in some cases, supersede other regulations of this code. See Chapter 95 KZC for additional regulations that address trees and other vegetation within and outside of Geologically Hazardous Areas.
2. If you are interested in developing property that contains a geologically hazardous area, or if you wish to participate in the City's decision on a proposed development on any of these areas, you should read this chapter.
3. For properties within jurisdiction of the Shoreline Management Act, see Chapter 83 KZC.

(Ord. 4252 § 1, 2010; Ord. 4010 § 3, 2005)

85.07 Purpose Statement

These regulations were prepared to comply with the Growth Management Act and implement the goals and policies of the City's Comprehensive Plan. The purpose of these regulations is to protect human life, property, and the environment. This purpose will be achieved by thoroughly evaluating development activity in Geologically Hazardous Areas using best available science.

85.10 Applicability

1. General – This chapter applies to any property that contains any of the following:
 - a. An Erosion Hazard Area.
 - b. A Landslide Hazard Area.
 - c. A Seismic Hazard Area.
2. Conflict with Other Provisions of this Code – The provisions of this chapter supersede any conflicting provisions of this code. The other provisions of this code that do not conflict with the provisions of this chapter apply to property that contains a geologically hazardous area. If more than one (1) provision of this chapter applies to the subject property because of the presence on the subject property of more than one (1) type of Geologically Hazardous Area, then the regulations that provide the greatest protection from the hazardous area shall apply to the area governed by multiple regulations.
3. SEPA Compliance – Nothing in this chapter or the decisions made pursuant to this chapter in any way affect the authority of the City to review, approve, condition, and deny projects under SEPA.

85.12 Critical Area Maps

The City maintains general mapping of known **critical areas**. These maps and other available resources (such as topographic maps, soils maps, and aerial photos) are intended only as guides. They depict the approximate location and extent of known **critical areas**. Some **critical areas** depicted in these resources may no longer exist and **critical areas** not shown in these resources may occur. The provisions of this chapter and the findings of a geotechnical report and review of the report by the City take precedence over the City’s mapping in regard to identification and mitigation of potential geologic hazards. Site specific geologic hazard studies shall be conducted prior to approval of development, land surface modification, utility installation, or other activities to evaluate if a geologic hazard area actually exists, and to assess suitable options for hazard mitigation, if appropriate.

The City’s maps relating to this chapter are entitled “Landslide Susceptibility” and “Liquefaction Potential.”

(Ord. 4551 § 4, 2017)

(Ord. 4551 § 4, 2017)

85.14 Erosion Hazard Areas

Regulations to control erosion are contained within KMC Title 15 and in other codes and ordinances of the City. Development activity within erosion hazard areas is regulated using these other provisions of this code and other City codes and ordinances and may be subject to increased scrutiny and conditioning because of the presence of an Erosion Hazard Area.

85.15 Required Information

The City shall require the applicant to submit some or all of the following information, consistent with the nature and extent of the proposed development activity, for any proposed development activity in Geologically Hazardous Areas

1. A topographic survey of the subject property, or the portion of the subject property specified by the Planning Official, with two-foot contour intervals. This mapping shall contain the following information:
 - a. Delineation of areas containing slopes 15 percent or greater, and identification of slopes 40 percent or greater.
 - b. Wetlands, streams and lakes in the area.
 - c. The location of storm drainage facilities on the subject property.
 - d. Existing vegetation, including size and type of significant trees.
2. A geotechnical investigation, prepared by a geotechnical engineer licensed in Washington State or engineering geologist licensed in Washington State, to determine if a landslide hazard area or seismic hazard area exists on the subject property.
3. A geotechnical report, prepared by a geotechnical engineer licensed in Washington State or engineering geologist licensed in Washington State, showing and including the following information:
 - a. A description of how the proposed development will or will not affect slope stability, surface and subsurface drainage, erosion, and seismic hazards on the subject and adjacent properties.
 - b. Evidence, if any, of holocene or recent landsliding, sloughing, or soil creep.
 - c. The location of springs, seeps, or any other surface expression of groundwater, and the location of surface water or evidence of seasonal runoff or groundwater.
 - d. Identification of existing fill areas.
 - e. Soil description in accordance with the Unified Soil Classification Systems.

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- f. Depth to groundwater and estimates of potential seasonal fluctuations, if applicable to the project.
 - g. Subsurface exploration logs sufficient to assess geologic hazards at the site. Soil descriptions on the logs shall be in accordance with the Unified Soil Classification System. The logs shall also identify each of the geologic units encountered (e.g., fill, Vashon lodgement till, Vashon advance outwash).
 - h. If the subject property is located within 100 feet of a High Landslide Hazard area, then a current LiDAR-based shaded relief map of the project area and a discussion of the licensed geotechnical professional's interpretation of this mapping must be provided.
 - i. Results of a Quantitative Slope Stability Analysis for any project involving development within a horizontal distance "H" of a High Landslide Hazard Area where "H" is equal to the height of the slope within the High Landslide Hazard Areas or 50 feet, whichever is greater. The evaluation of slope stability under seismic conditions shall be based on a horizontal ground acceleration equal to ½ of the peak horizontal ground acceleration with a 2 percent in 50-year probability of exceedance as defined in the current version of the *International Building Code*.
 - j. A discussion of the presence or absence of site features potentially indicative of historic landslide activity or increased risk of future landslide activity. Such features include, but are not limited to, tree trunk deformation, emergent seepage, landslide scarps, tension cracks, reversed slope benches, hummocky topography, vegetation patterns, and area stormwater management practices.
 - k. Estimate of the magnitude of seismically induced settlement that could occur during a seismic event for any project involving development within a Seismic Hazard Area. Estimation of the magnitude of seismically induced settlement shall be based on a peak horizontal ground acceleration based on a seismic event with a 2 percent in 50-year probability of exceedance as defined in the current version of the *International Building Code*. This requirement may be waived if it can be demonstrated that construction methods will completely mitigate the risk of seismically induced settlement.
 - l. A summary or abstract of the geotechnical report for the property where the development activity is proposed. The abstract shall at a minimum include the type of hazard, extent of the hazard, hazard analysis and geologic conditions.
4. Geotechnical recommendations, prepared by a geotechnical engineer licensed in Washington State or engineering geologist licensed in Washington State, for special engineering or other mitigation techniques appropriate to the hazard area along with an analysis of how these techniques will affect the subject and adjacent properties, including discussions and recommendations on the following:
- a. The present stability of the subject property, the stability of the subject property during construction, the stability of the subject property after all development activities are completed and a discussion of the relative risks and slide potential relating to adjacent properties during each stage of development.
 - b. Location of buildings, roadways, and other improvements.
 - c. Grading and earthwork, including compaction and fill material requirements, use of site solids as fill or backfill, imported fill or backfill requirements, height and inclination of both cut and fill slopes and erosion control and wet weather construction considerations and/or limitations.
 - d. Foundation and retaining wall design criteria, including bearing layer(s), allowable capacities, minimum width, minimum depth, estimated settlements (total and differential), lateral loads, and other pertinent recommendations.
 - e. Surface and subsurface drainage requirements and drainage material requirements.
 - f. Assessment of seismic ground motion amplification and liquefaction potential.

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- g. Other measures recommended to reduce the risk of slope instability.
- h. Any additional information believed to be relevant by the geotechnical engineer preparing the recommendations or requested by the Planning Official.

(Ord. 4551 § 4, 2017)

85.20 Required Review

1. General – Except as specified in subsection (2) of this section, the Planning Official will review and decide upon any proposed development activity within a Geologically Hazardous Area.
2. Other Approval Required – If the proposed development on the subject property requires approval through Process I, IIA, or IIB, described in Chapters 145, 150, and 152 KZC, respectively, the proposed development activity within the a Geologically Hazardous Area will be reviewed and decided upon as part of that other process.
3. The decision on a proposed project shall be to approve, deny or approve with conditions.
4. The City may modify any decision, prior to completion of the project, made under this section when it has been determined that physical circumstances have markedly and demonstrably changed on the subject property or the surrounding areas as a result of natural processes or human activity. This authority does not include requiring removal of structures or additions to structures that have been legally constructed under this decision.

85.22 Peer Review

1. For projects located on a slope of 40 percent or steeper over a height of at least 10 feet and including those areas within a horizontal distance “H” equal to the height of the slope, whichever is greater; the City shall require applicant funding of a licensed geotechnical engineer or licensed engineering geologist, selected and retained by the City subject to a third party contract, to review the geotechnical report and recommendations.
2. For projects located in a High Landslide Hazard Area, other than #1 above, or a Seismic Hazard Area, the City shall normally require applicant funding of a licensed in Washington State geotechnical engineer or licensed in Washington State engineering geologist, selected and retained by the City subject to third party contract, to review the geotechnical report and recommendations. The Planning Official may waive the third party review requirement in some cases. Guidance criteria to be considered by the Planning Official when evaluating if third party review will be waived, includes, but may not necessarily be limited to, any of the following:
 - a. City staff have the technical expertise to provide knowledgeable review of the submitted geotechnical materials;
 - b. The consequences of failure present a low level of risk (e.g., type of structure proposed, slope height, surrounding topography or structures);
 - c. There is not any presence of known, recent landslide activity that presents a potential heightened landslide hazard risk; and
 - d. Stormwater infiltration or stormwater facilities that could potentially impact slope stability are not proposed.
3. For projects subject to peer review, the recommendations of the peer review shall be addressed in a revised geotechnical report (or supplement to the originally-prepared report).

85.25 Performance Standards

(See also Chapter 95 KZC)

As part of any approval of development in a Landslide Hazard Area or Seismic Hazard Area, the City shall require the following to protect property and persons:

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1. Implementation of the geotechnical recommendations to mitigate identified impacts and geologic hazards including the retention of trees, shrubs, and groundcover, and if applicable the immediate implementation of a revegetation plan.
2. Written acknowledgement from the licensed in Washington State geotechnical engineer or licensed in Washington State engineering geologist who prepared the report required by KZC 85.15 that they have reviewed the project plans and that they conform to their recommendations.
3. That a qualified geotechnical professional, working under the supervision of a licensed in Washington State geotechnical engineer or licensed in Washington State engineering geologist, be present on-site during land surface modification and foundation installation activities, and submittal by a licensed in Washington State geotechnical engineer or licensed in Washington State engineering geologist of a final report prior to occupancy, certifying substantial compliance with the geotechnical recommendations and geotechnical-related permit requirements.
4. Specifically engineered foundation and retaining wall designs.
5. The review of all access and circulation plans by the Department of Public Works.
6. Limitation or restriction of any development activity that may:
 - a. Significantly impact slope stability on the subject property or adjacent properties;
 - b. Significantly alter drainage patterns in a manner that would adversely impact the subject property or adjacent properties;
 - c. Cause serious erosion hazards, sedimentation problems or landslide hazards on the subject property or adjacent properties; or
 - d. Cause property damage or injury to persons on or off the subject property.
7. If a Quantitative Slope Stability Analysis is required with the geotechnical report, as specified in KZC 85.15.3(i), the proposed development shall provide a factor of safety of at least 1.5 for static conditions and at least 1.1 for seismic conditions.
8. Dedication of one (1) or more natural greenbelt protective easements or tracts.

(Ord. 4010 § 3, 2005)

85.30 Appeals

All classifications, decisions, and determinations made under this chapter are appealable using, except as stated below, the applicable appeal provisions of Chapter 145 KZC:

1. The appeal may be filed by the applicant or any other aggrieved person within 15 days of the date of the City's written classification, determination, or decision.
2. If a proposed development activity on the subject property required approval through Process IIA or IIB, described in Chapters 150 and 152 KZC, respectively, any appeal of a classification, determination, or decision under this chapter will be heard as part of that other process.

85.35 Bonds

The City may require a bond under Chapter 175 KZC and/or a perpetual landscape maintenance agreement to ensure compliance with any aspect of this chapter or any decision or determination made under this chapter.

85.40 Dedication

The City may require that the applicant dedicate development rights, air space, or an open space easement to the City to avoid needless impacts associated with a Landslide Hazard Area or Seismic Hazard Area on the subject property.

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85.45 Liability

Prior to issuance of any development permit, the applicant shall enter into an agreement with the City, which runs with the property, in a form acceptable to the City Attorney, indemnifying the City for any damage resulting from development activity on the subject property which is related to the physical condition of the property. The applicant shall record this agreement with the King County Recorder's Office.

(Ord. 4491 § 11, 2015)

85.50 Notice of Geologic Hazard

Prior to final inspection of any development permit, the applicant shall record (unless legally prohibited from doing so), a statement on the title of the property that informs future owners that the property is located in a Geologically Hazardous Area.

Definitions – KZC Chapter 5

5.20.178.5 Critical Area Maps - Maps maintained by the Department of Planning and Building; specifically Geologically Hazardous Areas Map for Chapter 85 KZC, and Wetlands, Streams and Lakes Map for Chapter 90 KZC. (Ord. 4551 § 4, 2017)

Erosion Hazard Areas – Those areas containing soils which, according to the United States Department of Agriculture (USDA) Natural Resource Conservation Services (NRCS) *Web Soil Survey*, may experience severe to very severe erosion hazard. Due to potential for mapping errors and other discrepancies in the NRCS data, Erosion Hazard Area designation should be based on actual site conditions as verified in the field by the geotechnical professional.

Factor of Safety- The ratio of forces that resist sliding to the forces that drive sliding.

Geologically Hazardous Areas – Landslide hazard areas, erosion hazard areas and seismic hazard areas.

High Landslide Hazard Areas -

1. Areas that have shown movement during the Holocene epoch (from 10,000 years ago to the present) or that are underlain or covered by mass wastage debris of that epoch, or
2. Areas with both of the following characteristics:
 - A. Slopes steeper than 15 percent that intersect geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment, and
 - B. Springs
 or
3. Areas potentially unstable because of rapid stream incision, stream bank erosion, or undercutting by wave action, or
4. Any area with a slope of 40 percent or steeper over a height of at least 10 feet.
5. For areas meeting the criteria of 1 through 4 above, the High Landslide Hazard Area also includes the area within a horizontal distance “H” equal to either the height of the slope or 50 feet, whichever is greater.

Landslide Hazard Area – Areas at risk of mass movement due to a combination of geologic, topographic, and hydrologic factors. Includes High and Moderate Landslide Hazard Areas.

Moderate Landslide Hazard Area – Areas with slopes between 15 percent and 40 percent which do not meet the definition of High Landslide Hazard Area.

Seismic Hazard Areas – Those areas subject to severe risk of earthquake damage as a result of seismically induced ground shaking, slope failure, settlement or soil liquefaction, which typically occurs in areas underlain by cohesionless soils of low density, usually in association with a shallow groundwater table.

Quantitative Slope Stability Analysis – A study performed to assess the safe design of human-made or natural slopes and the equilibrium conditions.

