

Chapter 17.59

GEOLOGIC HAZARDS

Sections:

- 17.59.010 Purposes
- 17.59.020 Definitions
- 17.59.030 General Provisions
- 17.59.040 Responsibility for Geologic and Geotechnical Studies and Reports
- 17.59.050 Minimum Standards of Safety
- 17.59.060 Scoping Meeting
- 17.59.070 Geologic and Geotechnical Reports
- 17.59.080 Optional Process for Single-Family Residences, Accessory Development, and Excavation/Grading Activities in Geologic-Hazard Study Areas.
- 17.59.090 Review of Geologic and Geotechnical Reports
- 17.59.100 Compliance with the Recommendations of the Geologic/Geotechnical Report and Conditions of the Development Authorization
- 17.59.110 Geologic-Hazard Ordinance Appeals
- 17.59.120 Fees
- 17.59.130 Warning and Disclaimer
- 17.59.140 Conflicting Regulations
- 17.59.150 Iron County Geologic-Hazard Disclosure and Hold-Harmless Agreement
- 17.59.160 References
- Exhibit A Typical Geologic-Hazard Review Process—Flowchart
- Exhibit B Iron County Landslide Map
- Appendix A Iron County Geologic-Hazard Disclosure and Hold-Harmless Agreement

17.59.010 Purposes. This chapter and the regulations and restrictions contained herein are adopted and enacted for the following purposes:

- A. To minimize the potential of geologic hazards adversely affecting public and private property, safety, and health.
- B. To identify and to educate all development professionals, landowners, and potential purchasers of the presence and risks of geologic hazards—including the hazards of surface-fault rupture, mass wasting (landslide, rock fall, and debris flow), liquefaction, and problem soil and rock; and to establish minimum standards and

methods for evaluating these hazards when development is proposed in these areas. This stated purpose does not absolve a developer or potential purchaser from the responsibility to conduct their own due diligence and research.

- C. To ensure that decisions relating to geologic hazards are based on unbiased professional, scientific and engineering information provided by those with the proper licensing and expertise in the matter;
- D. To encourage development, when possible, to occur in areas not identified as geologically hazardous; and, when that is not possible, to ensure that proper mitigation methods are followed to minimize the potential for loss of life and property from an adverse geological event. If adequate mitigation methods are not possible, it is the intent of these regulations to ensure that the contemplated development does not occur in the area of the hazard.

17.59.020 Definitions.

The following words and phrases, as used in this chapter, mean:

Acceptable and Reasonable Risk: A level of risk at which it is expected that there will be no loss of life or significant injury to occupants, no release of hazardous or toxic substances, and no more than minimal structural damage (i.e. physically and economically reasonable to repair) to infrastructure, critical facilities, or to structures designed for human occupancy, in the event that the anticipated geologic hazard were to occur.

Activity Class of a fault: The level of activity of a surface fault based on the time of most recent movement. Holocene activity class means movement of a fault that has broken the ground surface in approximately the past 10,000 years (11,500 cal yr B.P.); Late Quaternary activity class means movement of a fault that has broken the ground surface in approximately the past 130,000 years; and, Quaternary activity class means movement of a fault that has broken the ground surface in approximately the past 1.8 million years.

Alluvial Fan: A fan-shaped deposit formed by deposition from a stream as it exits the mountains, slows, and spreads onto the flatter plain.

Buildable Area: That portion of a site, lot, or parcel that otherwise is entitled to contain the proposed improvement (e.g. complies with zoning and building setbacks); and, will either not be impacted by a geologic hazard, or has all identified geologic hazards mitigated to an acceptable and reasonable risk. Any mitigation necessary to deem a geologically hazardous area as “buildable” must be based on an approved geologic-hazard report and engineered methods. Contrast to “Non-buildable area”.

Collapsible Soil: Soil that has considerable strength in its dry, natural state, but that settles significantly due to hydrocompaction when wetted—usually associated with young alluvial fans, debris flows, and loess deposits.

Critical Facilities: Buildings, infrastructure, and other structures that represent a substantial hazard to human life in the event of failure, or which are designated as “essential facilities”. Critical facilities include, but are not limited to Occupancy Category III or IV structures, as defined in the International Building Code (IBC, table 1604.5, p. 307; International Code Council, 2009).

Debris Flow: A fast-moving slurry of rock, soil, organic material, and water transported down a channel and onto an alluvial fan. The term as used in this ordinance includes the sedimentation flows and processes technically classified as debris flows (>60% sediment), hyperconcentrated flows (20-60% sediment), and stream flows (<20% sediment) which are associated with debris-flow and hyperconcentrated-flow hazards. Stream-flow hazards that are not associated with debris-flow or hyperconcentrated-flow hazards are not included in this definition, but are regulated through the flood damage prevention ordinance (Chapter 15.12 I.C.C.) and drainage regulations (e.g. Section 17.40.020 I.C.C.).

Development: For purposes of this chapter, development includes the installation and construction of roads, utility lines/conveyances, subdivision improvements, buildings, structures, and physical improvements accessory to any of these uses.

Earth Fissure: A linear crack in the ground that extends upward from the groundwater table and is a direct result of subsidence caused by groundwater depletion. The surface expression of earth fissures may range from less than a yard to several miles long and from less than an inch to tens of feet wide. Earth fissures change runoff/flood patterns, break buried pipes and utilities, cause infrastructure to collapse, provide a direct conduit to the groundwater table for contaminants, and may pose a life-safety hazard.

Engineering Geologist: A Utah-licensed geologist, who, through education, training, and experience practices in the field of engineering geology.

Engineering Geology: The application of the geologic sciences to engineering practice for the purpose of assuring that the geologic factors affecting the location, design, construction, operation and maintenance of engineering works are recognized and adequately provided for in the interest of the public health, safety and welfare.

Essential Facilities: A subset of “Critical Facilities”, essential facilities include the infrastructure and facilities intended to remain operational in the event of an adverse geologic event or natural disaster. They include, but are not limited to, those uses listed under Occupancy Category IV in Table 1604.5 of the International Building Code.

Expansive Soil and/or Rock: Soil or rock that swells when wetted and shrinks when dried—typically associated with high clay content soil and rock, particularly sodium-rich clay.

Fault: A fracture in the earth's crust forming a boundary between rock or soil masses that have moved relative to each other, due to tectonic forces. When the fracture extends to the earth's surface, it is known as a surface-fault rupture, or fault trace.

Fault Setback: An area on either side of a fault within which critical facilities and structures designed for human occupancy are not permitted.

Fault Scarp: A steep slope or cliff formed by movement along a fault.

Fault Trace, or Surface-Fault Rupture: The intersection of a fault plane with the ground surface, often present as a fault scarp, or detected as a lineament on aerial photographs.

Fault Zone: A corridor of variable width along one or more fault traces, within which deformation has occurred.

Geologic Evaluation: The review of a geologic-hazard study area to determine the hazard potential relative to the proposed development, and to verify the need for geologic studies and reports. Geologic Evaluations are performed by engineering geologists, or geotechnical engineers with input from engineering geologists.

Geologic Hazard: Includes surface-fault rupture, mass wasting (landslides, rock falls, debris flows), liquefaction, problem soil and rock and other geologic processes that present a significant risk to life or property. This chapter regulates those geologic hazards determined most likely to occur in Iron County, with the exception of ground shaking, and flooding not associated with alluvial fans. Ground shaking, although related to and considered in the evaluation of several of the other geologic hazards, is regulated primarily for its impacts to buildings and structures through the seismic requirements of the building code. Flooding is primarily addressed through the Iron County Flood Damage Prevention Ordinance.

Geologically Hazardous Area: An area that because of its susceptibility to a geologic hazard is not suitable for the siting of structures designed for human occupancy or critical facilities, consistent with public health or safety concerns, unless the hazard is mitigated to an acceptable and reasonable level.

Geologic-Hazard Study Area: A potential geologically hazardous area, within which geologic-hazard investigations are required prior to development.

Geologist: A Utah-licensed geologist, who, through education, training, and experience practices in the field of geology. As used in this chapter, Geologist specifically refers to

an Engineering Geologist qualified to study the specific geologic hazard(s) identified. (See also “Engineering Geologist”).

Geotechnical Engineer: A professional, Utah-licensed engineer who, through education, training and experience, is competent in the field of geotechnical engineering.

Geotechnical Engineering: The investigation and engineering evaluation of earth materials including soil, rock, and man-made materials and their interaction with earth retention systems, foundations, and other civil engineering works. The practice involves the fields of soil mechanics, rock mechanics, and earth sciences and requires knowledge of engineering laws, formulas, construction techniques, and performance evaluation of engineering.

Governing Body: The Iron County legislative body, or a designee of the Iron County legislative body.

Hazard Mitigation: An action taken to avoid, minimize, or compensate for the risk to human life and public and private property from identified hazards.

Hydrocompaction: Where the ground subsides due to unconsolidated soils becoming saturated with water and losing their structural strength (soil bonds being dissolved by water), and the ground compacting under the weight above.

Land Use Authority: The person, board, commission, agency, or other body designated by the local legislative body to act upon a land use application.

Landslide: The downslope movement of a mass of soil, surficial deposits, or bedrock. It may include a continuum of geologic processes such as landslides, earth-flows, debris flows, debris avalanches, and rock falls.

Liquefaction: A process by which certain water-saturated soils (typically sand) lose bearing strength because of earthquake-related ground shaking and subsequent increase of groundwater pore pressure. Liquefaction may induce ground failure, including lateral spreads and flow-type landslides.

Iron County: The Iron County Engineer, Iron County Planner, Iron County Zoning Administrator, Iron County Building Official, Iron County Administrator, County Commission, Land Use Authority, or other Iron County employee or designee.

Non-Buildable Area, Due to Geologic Hazard: An area that contains a geologic hazard that presents an unreasonable and unacceptable risk, such that the siting of structures designed for human occupancy, critical facilities, and other specified development improvements are prohibited in that area through the authority of this ordinance. Contrast to “buildable area”.

Problem Soil and Rock: Geologic materials having characteristics that make them susceptible to volumetric changes, collapse, hydrocompaction, subsidence, or other engineering geologic problems.

Problem-Soil-and-Rock Study Areas: Areas identified as likely to contain problem soils or rock. Geotechnical study of the problem soil/rock and reporting by a licensed geotechnical engineer is required.

Reviewing Official: The Building Official if related to a building permit, and the Land Use Authority if related to a land use application.

Rock Fall: A rock, or mass of rocks, that has detached from a cliff or other steep slope and moves down a slope by falling, rolling, sliding, toppling, or bouncing.

Setback, Geologic Hazard: An area subject to risk from a geologic hazard, within which construction of critical facilities and structures designed for human occupancy are not permitted.

Slope Stability: The resistance of a natural or artificial slope or other inclined surface to failure from landslide; technically the ratio of resisting forces to the ratio of driving forces. Slope stability is expressed as a “factor of safety”. Slope stability is to be assessed under both static and dynamic (earthquake-induced) conditions.

Structure Designed for Human Occupancy: Any building or structure containing a habitable space, or classified as an “Assembly”, “Business”, “Educational”, “Factory and Industrial”, “Institutional”, “Mercantile”, or “Residential” occupancy classification under the adopted International Building Code.

Subsidence: The lowering or sinking of the ground due to physical changes in the underlying soil. Subsidence is a geologic hazard in Iron County primarily due to hydrocompaction and groundwater withdrawal in excess of recharge.

Surface Faulting: The propagation of an earthquake-generated fault rupture to the ground surface, which displaces the surface and forms a scarp.

Talus: Accumulated rock fragments lying at the base of a cliff or a steep rocky slope.

17.59.030 General Provisions

A. Geologic-Hazard Study Areas.

This chapter applies to the development of all lands in unincorporated Iron County that are known or suspected to contain one or more of the geologic hazards herein regulated. Such areas are known as geologic-hazard study areas. Where a proposed development activity is located within a geologic-hazard study area, an investigation and report of the hazard(s) is required.

The following methods shall be used to determine whether a proposed development is within a hazard study area. In the event there is a known or readily apparent geologic hazard in the area of a proposed development that is not shown on a geologic hazard map, the geologic hazard nevertheless exists and the area shall be considered a hazard study area as if it were mapped.

1. Surface-fault ruptures: The “Quaternary Fault and Fold Database and Map of Utah”, published by the Utah Geological Survey, is to be used as the primary source of fault information for Iron County. The fault locations, fault activity classes (geologic age), and other supplementary information contained therein shall be the standard upon which a surface-fault-rupture study must be based, unless more detailed and accurate scientific information becomes available.

Areas along Holocene activity class faults constitute surface-fault-rupture study areas for all critical facilities, subdivisions, and structures designed for human occupancy. Areas along Late Quaternary activity class faults constitute surface-fault-rupture study areas for all critical facilities and subdivisions of more than four lots. Faults of the Quaternary activity class constitute surface-fault-rupture study areas for critical facilities only. If the activity class of a Quaternary fault is not specified, it shall be considered to be of the Holocene activity class, unless scientific data demonstrates otherwise. Fault zones with multiple fault traces shall be considered to be the activity class of the most recent fault trace.

For well-defined surface faults, the fault hazard study area extends 500 feet on the downthrown side of the fault and 250 feet on the upthrown side of the fault, except when 250 feet does not extend to the top of the scarp, in which case the study area on the upthrown side shall extend to 500 feet. Where multiple faults exist within a fault zone, the geologic-hazard study area is to include all land between the faults, as well as the specified 500-foot and 250-foot adjacent areas. Distances are measured horizontally from the surface fault.

For a buried or approximately located fault (dotted or dashed line on fault map), the study area extends 1,000 feet to each side of the mapped location of the fault.

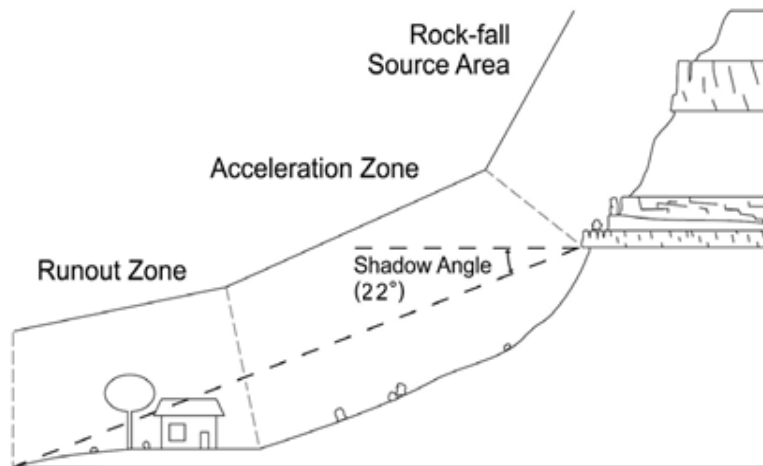
2. Landslide/Slope Instability: As stated, in *Guidelines for Evaluating Landslide Hazards in Utah, UGS Circular 92, 1996*, “Landslide hazards involve both natural and development-induced variables”. For this reason, landslide geologic hazard study areas include both areas that are hazardous in their natural state (i.e. landslides and landslide susceptible slopes) and areas that may become hazardous if development does not properly consider the geologic limitations of the site (e.g. steep slopes). Specifically, geologic study areas for landslide/slope instability hazards include:

- a. All lands identified as “deep landslides”; “shallow landslides”; “landslides undifferentiated from talus and/or colluvial deposits”; and, “landslides and/or landslides undifferentiated from talus, colluvial, rock fall, glacial, and soil-creep

deposits”, on the Iron County Landslide Map, prepared by the Utah Geologic Survey (Exhibit B of the adopting ordinance”), or any update thereto; and,

- b. All slopes that may be affected or created by the proposed development, which meet any of the following:
 - i. cut and/or fill slopes steeper than, or equal to, 2 horizontal to 1 vertical.
 - ii. natural slopes steeper than or equal to 4 horizontal to 1 vertical.
 - iii. natural and cut slopes with potentially adverse geologic conditions (e.g. bedding, foliation, or other structural features that are potentially adverse to the stability of the slope).
 - iv. natural and cut slopes that include a geologic hazard such as a landslide, irrespective of the slope height or slope gradient.
 - v. buttresses and stability fills.

3. Rock Fall: Rock-fall geologic hazard study areas are not mapped in Iron County at this time, but include locations at the base of rock and talus slopes that are susceptible to rock fall—evidence of past rock falls being the primary indicator. A 22-degree shadow angle, extending from the base of the rock fall source area, as depicted in the following diagram, shall be used to define the extent of a rock fall geologic study area. (Note: shadow angle is dependent on the type of rock involved, and the actual rock-fall hazard may be more or less than that captured by the 22-degree shadow angle. However, 22 degrees is relatively conservative, and is deemed sufficient to capture most rock-fall hazard situations.)



A rock-fall hazard area consists of three components: (1) a rock source, in general defined by bedrock geologic units that exhibit relatively consistent patterns of rock-fall susceptibility throughout the study area, (2) an acceleration zone, where rock-fall debris detached from the source gain momentum as it travels downslope—this zone often includes a talus slope, which becomes less apparent with decreasing relative hazard and is typically absent where the hazard is low, and finally (3) a runout zone (rock-fall shadow zone), which includes gentler slopes where boulders have rolled or bounced

beyond the base of the acceleration zone. (Source of diagram and above paragraph: *Geologic Hazards and Adverse Construction Conditions, St. George—Hurricane Metropolitan Area, Washington County, Utah*, by Lund, Knudsen, Vice, and Shaw, 2008. UGS Special Study 127).

4. Debris flows: Alluvial fans are the evidence of past debris flows. Until more detailed information or maps are available and adopted, debris-flow geologic hazard study areas include areas that have a landform setting description of “Alluvial fans”, “Fans”, or “Fan remnants” on the Natural Resource Conservation Service (NRCS) soil survey; and that are either,
- a) Within two miles of the mouth of a canyon that contains a stream with a 100-year floodplain identified on the adopted flood hazard map; or
 - b) Within one mile of the mouth of the canyon that contains a stream without a 100-year floodplain identified on the adopted flood hazard map.

The soil survey is available online at:

<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

and the FEMA flood hazard map is available at the County or online at:

<http://gis1.msc.fema.gov/Website/newstore/viewer.htm>.

Examples of drainages in Iron County with active alluvial fans include Spring Creek, Shurtz Canyon Creek, Braffits Creek, Summit Creek, Red Creek, Little Creek, and Quichapa Creek.

5. Liquefaction: Liquefaction study areas include areas with unconsolidated Quaternary geologic units of stream and terrace alluvium, alluvial deposits, eolian deposits, or colluvial deposits, which contain groundwater within fifty (50) feet of the surface. Generally these are the areas at the lower elevations of the Cedar, Parowan, and Beryl valleys. A generalized map of areas in the Cedar Valley consisting of unconsolidated soils with suspected groundwater within fifty feet is adopted with this ordinance. These mapped areas are liquefaction geologic study areas. As maps of the groundwater levels in the Parowan and Beryl Valleys become available, those areas shown as containing groundwater within fifty (50) feet of the surface shall also be liquefaction study areas. The Cedar Valley map is available at the County Building Department.

Liquefaction study areas require the preparation of a geologic-hazard report for the development of critical facilities, utility lines/conveyances, commercial and industrial structures, attached housing, and subdivisions. An individual geologic-hazard report is not required for the construction of single-family detached housing, provided the construction incorporates recommendations of the geotechnical engineer to mitigate the liquefaction hazard. The geotechnical engineer will already be reviewing the site for problem soil and rock, and can include recommendations to address the liquefaction hazard in the problem-soil report.

6. **Problem Soil and Rock:** Although problem soil and rock is more of an adverse construction/property damage condition than a life-safety hazard, it is included in this chapter due to the nature of the investigation, reporting, and design requirements associated therewith. The most common problem soils in Iron County are those susceptible to hydrocompaction. Hydrocompaction potential exists in all areas of Iron County that contain unconsolidated soils (i.e. the valleys and alluvial fans). There are also areas of the County with expansive soils—particularly clays with high sodium content. Other problem soil and rock, such as gypsiferous soil and rock, shallow bedrock, caliche, wind-blown sand, and soils susceptible to piping and erosion are less common, yet also exist in some parts of the County. Due to the highly variable composition and extent of problem soils in Iron County, all lands within the County shall be considered problem soil and rock study areas.

7. (Reserved for Ground Fissures. Ground Fissures has been discovered in the Beryl Valley in the area of Beryl Junction, in the Cedar Valley in locations north and west of Quichapa Lake as well as northern Enoch, and in the Parowan Valley near the southwest end of the Little Salt Lake playa. Other fissures are likely to be discovered as the hazard is further investigated. The Utah Geological Survey is commencing an investigation, and expects to have recommendations on the matter in early 2011.)

B. Geologic/Geotechnical Report Required with Permit Application.

Where a proposed development activity is located within a geologic-hazard study area and the activity requires a land use or building permit from Iron County, an engineering geologic report (geologic report) or geotechnical report shall be submitted with the permit application, as specified in this chapter. A permit application for development in a geologic-hazard study area shall not be considered complete for review without the required geologic-hazard report.

When grading or excavation activities are proposed in a Landslide/Slope Instability, Debris-flow, Surface-Fault-Rupture, or Rock-Fall geologic-hazard study area that has not been the subject of a geologic report pursuant to this chapter, and the activity is not otherwise subject to geologic-hazard review through a land use or building permit, the property owner shall obtain a Geologic Hazard Development Authorization-Optional Process, by following the procedures outlined in section 17.59.080 of this chapter, prior to commencing the grading or excavation activities.

If a geologic report was recently completed for an area that includes the subject property, and the report adequately addresses the applicable geologic hazard(s) and contemplated development activity, an additional report is not required. In such case, the previous report shall be reviewed for its adequacy and applicable recommendations by an engineering geologist. A summary of the adequacy and applicable recommendations of the report shall be submitted by the engineering geologist with the permit application.

C. Buildable Areas and Safe Access.

Every lot, parcel, or tract that is to be developed must have a buildable area, as defined herein, that is of sufficient area and dimensions for the intended use(s). Any area determined to be non-buildable due to the presence of a geologic hazard shall be identified in sufficient detail by the geologic professional (geologist or geotechnical engineer, depending on type of hazard) so as to provide regulatory guidance to the County, landowner, and developer. The boundary between a buildable and non-buildable area shall be identified by the geologic professional on a scalable map and in the field (e.g. ground staked). If the proposed action is a subdivision, the boundary and non-buildable area(s) shall be identified on the plat map.

In addition, every lot, parcel or tract that is to be created in a geologically hazardous area must have a buildable area that is accessible from the nearest existing public road via a route that complies with all adopted construction and dimensional standards (e.g. county construction standards and Wildland-Urban Interface Code) and is geologically safe (no more than an acceptable and reasonable risk, as defined in this chapter), as determined by the reviewing official.

Any mitigation necessary to provide a buildable area or acceptable and reasonable access must be completed at such time and in such manner as specified in the accepted professional report; provided, all mitigation must be completed prior to acceptance of the development (e.g. final plat sign-off, certificate of occupancy).

The County may require notice of the geologic hazards, completed geological/geotechnical reports, and any accompanying restrictions, to be placed on plat maps or other recorded documents.

D. Minimum Requirements.

The standards set forth in this chapter are minimum requirements. The more complex the hazard, or combination of hazards, the more potentially complex the evaluation and recommendations of the hazard report. More complex projects may require more detailed and in-depth evaluations than the minimum standards outlined herein to accomplish the stated purposes of this ordinance. The requirements of this chapter shall not supersede other, more stringent requirements that may be required by other codes or regulatory agencies.

E. Exemptions

The following actions are exempt from the provisions of this chapter:

- a. The maintenance, repair, and replacement of existing public utility lines, public utility structures, and communication facilities, with similar but not necessarily identical facilities, either in the same location or a less geologically hazardous location;
- b. Any renovation or remodel of an existing residential building or structure that does not enlarge its footprint or change its occupancy classification under the building code.

c. Any building or structure of 600 square feet or less that is: not designed for human occupancy, not classified as a critical facility, and which will not increase the geologic-hazard risk to other properties if an adverse geological event were to occur. This determination shall be made by the reviewing official with jurisdiction over the development action. The reviewing official may require a statement from a qualified professional indicating that the proposal meets the conditions of this exemption. Examples may include some, but not all, residential accessory buildings, utility structures, agricultural storage structures, signs, etc.

F. Map Corrections

When a geologic-hazard study area is indicated by a map referenced by this chapter, and it is agreed upon by the applicant's geological consultant and the County that based on geologic information the hazard feature does not exist, further geologic review is not required and the map shall be corrected to remove the subject property from the geologic-hazard study area. Such map corrections shall be noted in a file and accompanied by the geologic information made to justify the change.

17.59.040 Responsibility for Geologic and Geotechnical Studies and Reports

A. Geologic-hazard studies often involve both geology and geotechnical engineering. Geologic studies shall be performed under the direct supervision of a Utah-licensed geologist who by training and experience is qualified to study the specific geologic hazard(s) identified. Geotechnical engineering studies shall be performed under the direct supervision of a Utah licensed professional geotechnical engineer. Specifically, this shall mean that the applicable professionals to study each of the geologic hazards shall be as follows:

1. **Landslide/Slope Instability hazard studies:** In the case of Landslide/Slope Instability hazards, an engineering geologist shall provide appropriate input to the geotechnical engineer with respect to the potential impact of the geology, stratigraphy, and hydrologic conditions on the stability of the slope. The shear strength and other geotechnical earth material properties shall be evaluated by the geotechnical engineer. Qualified engineering geologists and geotechnical engineers may assess and quantitatively evaluate slope stability. However, the geotechnical engineer shall perform all design stability calculations. Ground motion parameters for use in seismic stability analysis may be provided by either the engineering geologist or geotechnical engineer.
2. **Debris-flow hazard studies:** Geologic evaluations of debris-flow hazards must be performed by a qualified engineering geologist. A qualified geotechnical engineer must sign and seal all studies that include engineering design of mitigation measures.
3. **Surface-Fault-Rupture hazard studies:** Surface-fault-rupture hazard studies are to be performed by a qualified engineering geologist.

4. Rock-Fall hazard studies: Geologic evaluations of rock-fall hazards must be performed by a qualified engineering geologist. A qualified geotechnical engineer must sign and seal all studies that include engineering design of mitigation measures.

5. Liquefaction hazard studies: The investigation of liquefaction hazard is an interdisciplinary practice. The site investigation report must be prepared by a qualified geotechnical engineer, competent in the field of seismic hazard evaluation and mitigation.

Because of the differing expertise and abilities of engineering geologists and geotechnical engineers, the scope of the site investigation report for a project may require that both types of professionals prepare and review the report, each practicing in the area of their expertise. Involvement of both a qualified engineering geologist and geotechnical engineer is intended to provide greater assurance that the hazard is properly identified, assessed, and mitigated.

Liquefaction-hazard analyses are the responsibility of the geotechnical engineer, although the engineering geologist should be involved in the application of screening criteria (verifying conditions are suitable for liquefaction) and the general geologic site evaluation to map the likely extent of liquefiable deposits and shallow groundwater. Engineering properties of earth material shall be evaluated by the geotechnical engineer. The performance of a quantitative liquefaction-hazard analysis resulting in a numerical factor of safety and quantitative assessment of settlement and liquefaction-induced permanent ground displacement shall be performed by geotechnical engineers. The geotechnical engineers shall develop all mitigation and design recommendations. Ground motion parameters for use in quantitative liquefaction-hazard analyses may be provided by either the engineering geologist or geotechnical engineer.

6. Problem Soil and Rock hazard studies: Problem-soil-and-rock hazard studies are to be performed by a qualified, Utah-licensed geotechnical engineer or engineering geologist. Typically, they are performed by geotechnical engineers.

B. Type of Geologic-Hazard Report Required. Studies required to be performed by a geologist shall include preparation of an engineering geologic report (geologic report), as specified in 17.59.070. In the case of a geologic hazard requiring review by a geotechnical engineer only (i.e. problem-soil-and-rock studies and some liquefaction studies), an engineering geologic report is not required—a complete geotechnical report on the hazard is sufficient.

C. Minimum Qualifications of the Geologist.

The evaluation of geologic hazards is a specialized discipline within the practice of geology requiring technical expertise and knowledge of techniques not commonly used in other geologic investigations. Therefore, geologic-hazard investigations involving geologic studies shall be conducted, signed, and sealed by a professional geologist

licensed in the State of Utah, who practices in the field of engineering geology and is qualified to study the specific geologic hazard(s) identified. Proof of qualifications shall be provided to Iron County upon request. Inadequate credentials and applicable experience of the preparer shall be grounds for the County to reject any geologic study, report, statement, recommendation, inspection, or other work product.

It is recommended that the engineering geologist have at least the following qualifications:

1. An undergraduate or graduate degree in geology, engineering geology, geological engineering, or closely related field, from an accredited college or university; and,
2. Five years of experience in a responsible position in the field of engineering geology in Utah, or in a state with similar geologic hazards and regulatory environment.

D. Minimum Qualifications of the Geotechnical Engineer.

The evaluation and mitigation of geologic hazards will often require contributions from a qualified geotechnical engineer, particularly in the design of mitigation measures. Geotechnical engineering is a specialized discipline within the practice of civil engineering requiring technical expertise and knowledge of techniques not commonly used in civil engineering. Therefore, problem-soil-and-rock hazard investigations, liquefaction hazard investigations, and other geologic-hazard investigations requiring contributions from a qualified geotechnical engineer shall be signed and sealed by a qualified geotechnical engineer, licensed as a professional engineer in the State of Utah, and with relevant education, training, and experience. Proof of qualifications shall be provided to Iron County upon request.

It is recommended that the geotechnical engineer have at least the following qualifications. The more complex the geologic situation, the more important the level of relevant experience:

1. A graduate degree in civil engineering, with an emphasis in geotechnical engineering; or a B.S. degree in civil engineering with 12 semester hours of post B.S. credit in geotechnical engineering, or course content closely related to evaluation of geologic hazards, from an accredited college or university; and,
2. Five full years of experience in a responsible position in the field of geotechnical engineering in Utah, or in a state with similar geologic hazards and regulatory environment, and experience demonstrating the engineer's knowledge and application of appropriate techniques in participating in geologic hazards studies.

17.59.050 Minimum Standards of Safety

Minimum standards of safety are hereby established for the following geologic hazards.

A. Landslide/Slope Instability Hazard:

Both of the following minimum factors of safety shall be demonstrated in Landslide/Slope Instability Hazard study areas. The minimum slope-stability factors of safety are:

1. For static slope-stability analysis, a factor of safety of 1.5; provided, for existing landslides where measured residual-strength parameters and advanced computer modeling are used a factor of safety of 1.3 may be accepted.

2. For seismic slope-stability analysis, a factor of safety greater than 1.0.

The above factors of safety shall be based on an appropriate calculation method, such as those recommended in the following publication, or equivalent:

Blake, T.F., Hollingsworth, R.A., and Stewart, J.P., editors, 2002, *Recommended procedures for implementation of DMG Special Publication 117, Guidelines for analyzing and mitigating landslide hazards in California*: Los Angeles, California, Southern California Earthquake Center, 110 p., 1 appendix.

The above publication is currently available on the "External Publication" page of the Utah Geological Survey website (http://geology.utah.gov/ghp/consultants/outside_pubs.htm).

B. Surface-Fault-Rupture Hazard:

Minimum building setbacks from identified normal faults shall be based on the greater of the setbacks obtained from either the Salt Lake County fault setback calculation method, or the minimum distances from Table 1, as presented in UGS publication MP 03-6, *Guidelines for Evaluating Surface-Fault Rupture Hazards In Utah* (see page 4 for Table 1, and pages 8-9 for the Salt Lake County setback calculation method). Setbacks from other types of faults shall be based on the recommendation of the licensed professional geologist.

C. Debris-Flow Hazard:

No development of structures designed for human occupancy or critical facilities shall be located in the proximal or medial areas of an active alluvial fan unless the debris-flow hazard has been mitigated for the entire active area(s) of the alluvial fan. The construction of a debris basin(s) sized to accommodate the calculated debris flow is the most common mitigation method. Development may occur in the distal area of the alluvial fan when the development is protected by engineered mitigation methods to address the potential floodwaters.

D. Liquefaction Hazard:

No development of essential facilities shall occur in any area determined to have a moderate, high, or very high risk of liquefaction, except when no other site in a lower risk area is suitable. The rating of the hazard shall be made by a qualified geotechnical engineer competent in the field of seismic-hazard evaluation and mitigation, and be based on a geologic study of the site. If construction of an essential facility will occur in

a moderate, high, or very high risk liquefaction area, the geologic-hazard report shall be prepared by a geologist and geotechnical engineer.

It is recommended, but not required, that the following construction methods be utilized for single-family detached houses in liquefaction hazard areas thought to have a high or very high level of liquefaction risk. (Based on Building Code Policy of Newport Beach, CA)

- Tie all pad footings with grade beams
- Have the bottom of all footings be at least 24" below grade.
- On continuous footings, install a minimum of two #5 steel bars at the top and bottom.
- Make floor slabs on grade a minimum of 5" thick, and reinforced with #4 steel bars at 12" on center, midway into the depth of the slab.
- Dowel the footing to the slab with #4 steel bars at 24" on center.
- If the soil material is sand, mix the top five feet of soil with cement (2 sacks per cubic yard) and recompact in place; or, replace soil to a depth of five feet with imported material approved by a soils engineer.
- Provide a 12" thick structural mat foundation.
- Post-tension the slab and foundation.
- Do not utilize caissons or pile foundations.

E. Rock-fall Hazard:

No development of structures intended for human occupancy or critical facilities shall be located in a rock-fall hazard area unless the hazard is mitigated to an acceptable and reasonable risk level.

F. Problem-Soil-and-Rock Hazard:

No development of structures intended for human occupancy or critical facilities shall be located in a problem-soil-and-rock hazard area unless the hazard is mitigated to an acceptable and reasonable risk level.

17.59.060 Scoping Meeting

Depending on the complexity of a geologic hazard(s), the investigation and review process may range from relatively straightforward to extremely complex. The more complex geologic hazard areas, such as large landslides, may involve several steps of review, including a geologic evaluation, preliminary geotechnical-engineering evaluations, detailed geotechnical-engineering evaluations, and peer review. Geologic hazards requiring review by a geologist are typically more complex than those reviewed by geotechnical engineers, and therefore shall be subject to the following requirements for scoping.

If a geologist plans to do less than a complete study of the geologic hazard area that may impact the development, they must provide justification and attend a scoping meeting as described below. If a full study is planned, the scoping meeting is optional. Informal discussions/updates outside the context of the scoping meeting are also encouraged.

Iron County will be represented in the scoping meeting by the County Engineer, Building Official, Zoning Administrator, and County Planner, which together form a committee to recommend to the applicant and reviewing official whether the proposed scope of work of the geological review is adequate to identify and characterize the risk of the hazard to the proposed development, and constitutes a professional standard of care. The decision of this committee as to the adequacy of the proposed scope of work is non-binding. Provided, when the building permit application, subdivision application, zoning request, or other land use action is before the reviewing official with the accompanying results of the study, the reviewing official will consider the geologic report presented, and whether the extent of the report followed the committee's recommendation. If the reviewing official finds the extent of the geologic report inadequate, it is grounds for denial of the building permit, land use application, or other development authorization.

The scoping meeting is to be held after the geologist has performed a preliminary geologic evaluation. The purpose of the scoping meeting is for the applicant and their geologist to meet with Iron County representatives to evaluate the geologist's geologic evaluation and intended investigative approach. At this meeting, the applicant shall present a work plan that includes locations of anticipated geologic hazards and locations of proposed exploratory excavations, such as trenches, borings, and CPT soundings, which meet the minimum acceptable standards of practice, and specifications of this chapter. The investigation approach shall allow for flexibility due to unexpected site conditions. Field findings may require modifications to the work plan.

Iron County may acquire a qualified consultant to assist in the scoping determination, and charge the applicant for the cost of the consultant's services to the County.

17.59.070 Geologic and Geotechnical Reports

Except as provided in 17.59.080, any applicant requesting approval for development within a geologic-hazard study area shall submit to Iron County five paper copies and one electronic copy of a site-specific geologic report or site-specific geotechnical report, as appropriate, which relates specifically to the type of geologic hazard(s) and problem soils present on the site. The report shall meet the submittal requirements of this chapter and will be reviewed accordingly.

Geologic reports shall follow the guidelines presented in *Guidelines for Preparing Engineering Geologic Reports in Utah* (Utah Section of the Association of Engineering Geologists [AEG], 1986). As noted in the publication, all elements of the guidelines should be considered during the preparation and review of the geologic reports. The degree of detail and scale of site geologic mapping should appropriately reflect the geologic complexity of the site.

A. Geologic reports shall be site-specific and identify all known or suspected potential geologic hazards that may affect the subject property, whether previously identified or not.

B. All geologic reports shall include the professional's qualifications, and the professional's original signature and seal. Geologic-hazard reports co-prepared by a geotechnical engineer and geologist must include both professionals' qualifications, original signatures, and seals;

C. Geologic reports shall include the following items:

1. A geologic vicinity map, at an appropriate scale (typically 1:24,000) and with references, showing the general surface geology (landslides, alluvial fans, etc), bedrock geology where exposed, bedding attitudes, faults, other geologic structural features, and location of any geologic hazards;

2. A detailed site geologic map and geologic cross section(s), at a scale equal to or more detailed than 1 inch = 100 feet, to illustrate local geologic structure. The site geologic map shall include locations of trenches, test pits, borings, etc, and site-specific geologic mapping performed as part of the geologic-hazard investigation, including boundaries and features related to any geologic hazards, topography, and drainage. The site geologic map must show the location and boundaries of the property, geologic hazards, any recommended setback distances from the hazards, and recommended locations for structures. Buildable and non-buildable areas shall be clearly identified;

3. Trench and test pit logs, when applicable, prepared in the field and presented in the geologic report at a scale equal to or more detailed than 1 inch = 5 feet;

4. Boring logs, when applicable, prepared with standard geologic and engineering nomenclature;

5. An evaluation of aerial photographs, oblique aerial photographs, and DEMs derived from detailed topography and/or LIDAR for the potential presence of geologic hazards;

6. Listing of aerial photographs used, technical references with citations, and other supporting information, as applicable;

7. Information regarding historical groundwater highs and lows must be indicated in the report. Any vegetation or surface features that indicate perennially wet conditions or surface creep shall be identified on the site geologic map and discussed in the report;

8. Conclusions and recommendations, clearly supported by adequate data included in the report, that summarize the characteristics of the geologic hazards, and that address the potential effects of the geologic conditions and geologic hazards on the

proposed development and occupants thereof, particularly in terms of risk and potential damage;

9. Any specific recommendations for additional or more detailed studies;

10. An evaluation of whether or not mitigation measures are required, including an evaluation of multiple mitigation options, and a recommendation of which method(s) should be used. When identifying proper hazard-mitigation methods, the following shall be considered, with avoidance of the hazard as first priority. A combination of hazard-mitigation methods may be necessary:

- a. Avoid the hazard (e.g. locate the development improvement outside of the geologically hazardous area, do not take any action that would create or increase the magnitude of a geologic hazard);
- b. Minimize the hazard potential to an acceptable level by limiting the degree or magnitude of a development action;
- c. Eliminate, or reduce the hazard to an acceptable level—utilize accepted engineering methods to remove, rehabilitate, repair, or restore the affected hazard area to a safe condition;
- d. Adapt to the hazard by designing/engineering structures or improvements to survive a hazard event;
- e. Avert the hazard by using structural devices to capture or direct a hazard occurrence to a designated location where it will do no harm (e.g. dams and levees).

11. Design or performance criteria for engineered mitigation measures, with all supporting calculations, analyses, modeling or other methods, and assumptions.

12. Final design plans and specifications for engineered mitigation signed and stamped by a qualified geotechnical, civil and/or structural engineer, as appropriate. (Note: If the geologic report is submitted with a land use application that is reviewed prior to the construction or building plans [e.g. preliminary plat or conditional use permit], the engineering level design and calculations of the improvement do not need to be submitted until after a land use approval is obtained and construction approval is requested. However, the methods must still be identified.);

13. A statement regarding the suitability of the site for the proposed development from a geologic-hazard perspective.

D. Hazard-specific report guidelines are available for surface fault rupture, landslide/slope stability, and debris flow hazards. The guidelines were developed by the Utah Geological Survey and are to be used as a supplement to the general report guidelines listed above. They are available on the UGS website (http://geology.utah.gov/ghp/consultants/rpt_guidelines.htm).

1. Surface-Fault-Rupture reports shall contain the items listed in the “Report Guidelines” section of the following publication:

Christenson, G.E., Batatian, L.D., and Nelson, C.V., 2003, Guidelines for evaluating surface-fault-rupture hazards in Utah: Utah Geological Survey Miscellaneous Publication 03-6, 14 p.

2. Landslide/Slope Instability reports shall contain the items listed in the "Report Guidelines" section of the following publication:

Hylland, M.D., 1996, Guidelines for evaluating landslide hazards in Utah: Utah Geological Survey Circular 92, 16 p.

3. Debris Flows reports shall contain the items listed in the "Report Guidelines" section of the following publication:

Giraud, R.E., 2005, Guidelines for the geologic evaluation of debris-flow hazards on alluvial fans in Utah: Utah Geological Survey Miscellaneous Publication 05-6, 16 p.

E. Problem soil and rock guidelines have not yet been developed by the Utah Geological Survey. Problem soil and rock geologic studies must address the structural characteristics of the soil, and identify specific mitigation to address the site limitations (e.g. over-excavation and compaction to address hydrocompaction). Standard professional care shall be exercised when investigating and reporting on problem-soil-and-rock study areas.

17.59.080 Optional Process for Single-Family Residences, Accessory Development, and Excavation/Grading Activities in Geologic-Hazard Study Areas.

When all of the requirements of this section will be met, as determined by the Iron County Zoning Administrator, a complete geologic report, as outlined in section 17.59.070, need not be submitted; the scoping meeting specified in 17.59.060 is not required; and, the minimum standards of safety specified in 17.59.050 do not need to be demonstrated. The statements, conclusions, recommendations, and other requirements outlined in this section will be sufficient for the purposes of this ordinance, provided they are based on an adequate study of the geologic hazard(s).

The Zoning Administrator is authorized to develop and utilize an application form for the process outlined in this section. The plans and documentation demonstrating compliance with this section shall be submitted for review to the Iron County Zoning Administrator with a non-refundable \$100.00 review fee. Development authorization granted pursuant to this section constitutes a "Geologic-Hazard Development Authorization--Optional Process". Iron County shall keep a record of all such authorizations granted.

A. The property must be a legal lot of record. The zoning administrator may request the applicant to provide the necessary deed(s) in order for him/her to make this determination.

B. The proposal must be for a single-family residence, development accessory to the single-family residence (e.g. driveway, swimming pool, retaining wall, well house), or excavation/grading activities not associated with any other land use or building permit review.

C. Provide a signed and sealed statement from a qualified Utah-licensed geologist (see 17.59.040(C)), identifying the presence or absence of any geologic hazards that may affect the property and describing the most suitable (geologically safest) location(s) on the lot for the proposed structure, which location(s) shall be where the improvement must be located. This determination shall be made after a geologic evaluation of the site and surrounding area has been conducted by the engineering geologist. Any mitigation of a geologic hazard that is recommended by the geologist must be implemented.

D. Provide a signed and sealed statement from a qualified Utah-licensed geotechnical engineer (see 17.59.040(D)), verifying that the slope stability of the proposed location of the structure will equal or exceed a 1.1 dynamic and 1.5 static factor of safety. The statement shall clearly identify any conditions or required mitigation methods necessary to provide such slope stability.

E. Provide a signed and sealed statement from a Utah licensed structural engineer, stating that he or she has reviewed the geologic and geotechnical statements and that he or she has designed the structure or improvement in accordance with the recommendations in those statements to account for any identified geologic or geotechnical hazards in accordance with applicable International Building/Residential Code standards.

F. Provide written verification from the preparer(s) of the written statements requested above of their liability insurance for professional errors and omissions in the amount of \$1,000,000.00, or 125% of the market value of the improvement, whichever is greater. The insurance policy must be in effect on the date of issuance of the building permit or development authorization.

G. Provide a geotechnical report for problem soil and rock, as outlined in this chapter, and comply with the recommended mitigation methods of the report (e.g. over-excavation, compaction, compaction testing, and drainage control), and with applicable building code soil bearing and foundation requirements.

H. Any areas restricted from development due to the recommendation of the engineering geologist or geotechnical engineer shall be clearly identified and staked in the field, and shall not be disturbed during construction.

I. Provide a completed and recorded "hold-harmless agreement", on a County approved form, which completely indemnifies and holds harmless Iron County and its representatives from any damage to the property or improvements, or injury or death to

its occupants, due to any geologic-hazard events or resulting activities. The agreement must be reviewed and authorized by the Iron County attorney, signed by all parties with an ownership interest in the property, apply to all heirs and assignees in interest, and be notarized. The agreement must be recorded with the Iron County Recorder.

J. Provide a completed and recorded geologic-hazard disclosure, on a County approved form, which discloses the presence and nature of the geologic hazard, and any development limitations on the property associated therewith. The agreement must be recorded with the Iron County Recorder. It may be combined with the “hold-harmless agreement” into a single document.

K. Comply with all other applicable land use, building, and fire codes, including those pertaining to slope restrictions.

L. After issuance of the building or improvement permit and prior to footing placement, an excavation inspection report shall be submitted by the Utah-licensed geologist or geotechnical engineer to the Building Official, which verifies that the proposed building or improvement is located in accordance with their recommendation. In addition, the Building Official may require, at any time prior to issuance of a certificate of occupancy, written verification from the Utah licensed geotechnical or structural engineer that the structure conforms to the recommendations of the reports and designs.

17.59.090 Review of Geologic and Geotechnical Reports

The following provisions apply to the review of geologic and geotechnical reports required by this chapter. They do not apply to the review of statements submitted pursuant to the requirements of 17.59.080(C thru E).

A. Iron County shall critically review any proposed development that requires preparation and review of a geologic or geotechnical report to determine the possible risks to the safety of persons, property and Iron County infrastructure from geologic hazards. The typical geologic hazard review process is illustrated through the flowchart found in Exhibit A, “Typical Geologic-Hazard Review Process”.

B. Iron County shall critically review each geologic and geotechnical report and if necessary, require additional investigation and clarification. Iron County may request other experts to review the report and provide recommendations as to the adequacy of the report and proposed mitigation, the costs for which shall be incurred entirely by the applicant.

C. Iron County will complete each review in a reasonable time frame. Contingent on the geologic complexity of the project, reviews of geologic reports should be completed in 45 days. Review of geotechnical reports will typically take much less time.

D. All direct costs associated with the review of a geologic report shall be paid by the applicant, as set forth in section 17.59.120. Review of a geologic report is often an iterative process, and may require more than one review or field visit, depending on the quality of submittals, complexity of the proposal, etc.

E. Iron County shall retain a copy of each geologic/geotechnical report in the project file.

F. In reviewing the geologic/geotechnical report, Iron County shall determine whether the report complies with all of the following standards:

1. The report has been prepared by qualified professionals, as defined herein;

2. The report adequately defines the geologic hazard(s) and associated level of geologic risk to public or private property, safety, health, or welfare, whether off-site or on-site;

3. The proposal demonstrates that the identified geologic hazards can be mitigated to a level where the risk to human life and damage to property are reduced to an acceptable and reasonable level in a manner which will not violate applicable federal, state, or local statutes, ordinances or regulations; or, the report recommends non-buildable areas where such cannot be demonstrated; and,

4. The geologist/geotechnical engineer has included with the geologic/geotechnical report a mitigation plan, as necessary, to reduce the risk from any geologic hazard regulated by this chapter to an acceptable and reasonable level. If ongoing maintenance or precautionary measures are necessary, the mitigation plan shall identify the proposed method for ensuring that such maintenance or precautionary measures are conducted. All acceptable mitigation methods must be reasonable and practical to implement and shall not require frequent, ongoing maintenance by the property owners.

G. Iron County may set other submittal or mitigation requirements as necessary to ensure that the purposes of this chapter are met. These requirements may include, but are not limited to:

1. Requiring peer review, more detailed studies, or engineering to understand or quantify the hazard, or to determine whether the mitigation measures recommended in the report are adequate;

2. Imposing specific mitigation requirements; requiring buildable and non-buildable areas to be delineated; limiting slope grading; requiring revegetation of disturbed areas;

3. Prior to authorizing any development, ensuring that the developer has reviewed and is committed to following the recommendations of the geologic/geotechnical report. If there are grading and construction plans for the development (e.g. subdivision proposals), the plans shall be signed and sealed by the licensed professional engineer and the geologist/geotechnical engineer that prepared the geologic/geotechnical report(s) to verify that their recommendations have been appropriately incorporated.

4. Dictating the installation of monitoring equipment and seasonal monitoring of surface and subsurface geologic conditions and groundwater levels;

5. Specifying work windows or time schedules for completion of the mitigation and phasing of development.

6. Requiring grading plans, which shall include the following minimum elements:

- a. Maps of existing and proposed contours;
- b. The existing and proposed slopes for each graded area;
- c. The existing and proposed drainage patterns;
- d. The location and depth of all proposed cuts and fills;
- e. A description of the methods to be employed to achieve stabilization and compaction;
- f. The location and capacities of proposed drainage structures and erosion control measures, based on maximum runoff for a 100-year storm;
- g. The location of existing buildings or structures on or within 100 feet of the site, which could be affected by the proposed grading and construction;
- h. A plan for the monitoring and documentation of testing, field inspections, and reporting to Iron County; and,
- i. 24-hour contact information.

7. Requiring the submittal of as-built grading plans, which shall be prepared, signed and sealed by the licensed professional engineer and the geologist/ geotechnical engineer that prepared the geologic/geotechnical report(s) to verify that their recommendations have been appropriately incorporated and that building locations are approved, prior to the issuance of a building permit.

If any of the above seven items are to be required, it shall be so specified no later than during the review of the report. Efforts shall be made to identify necessary requirements as early in the review process as possible.

H. If the geologic or geotechnical report fails to meet the minimum standards of this Chapter, or if the reviewing official determines additional information is needed pursuant to this subsection, the applicant will be given a reasonable time period to expand or correct the report. The time period, beginning when the request for additional information is relayed to the applicant, shall be no less than 90 days, nor more than 180

days, as determined by the reviewing official. Failure to provide the additional information within the time period specified shall result in expiration of the application.

17.59.100 Compliance with the Recommendations of the Geologic/Geotechnical Report and Conditions of the Development Authorization

Unless specified otherwise by the reviewing official, all recommendations of the geologic/geotechnical report and the conditions of the development authorization, including those specified during the review process of 17.59.090, are to be fully implemented during construction of the proposed development.

To ensure compliance, the following actions shall occur, unless specified otherwise by the reviewing official:

A. The geologist and/or geotechnical engineer that prepared the geologic/geotechnical report(s) must be on site, at the cost of the applicant, during the applicable phases of construction—particularly during grading/excavation phases, deep foundation installation, and the construction of any retaining structures.

B. No final inspection shall be approved, no public improvement shall be accepted, no certificate of occupancy shall be issued, and no performance bond shall be released until the geologist/geotechnical engineer who signed the geologic/geotechnical report(s) certifies, in writing, that the completed improvements and structures conform to the descriptions and requirements contained in said report, and that all the required inspections were made and approved by the geologist and/or geotechnical engineer that signed said report(s).

17.59.110 Geologic-Hazard Ordinance Appeals

An applicant may appeal a decision made under the provisions of this chapter only after the reviewing official has issued a final decision on the application. The appeal shall set forth the specific grounds or issues upon which the appeal is based. The appeal shall be submitted in writing to Iron County in accordance with the appeal provisions of this title and Utah State Code.

An applicant who appeals the interpretation or administration of this geologic-hazard ordinance in a land-use decision may utilize the provisions of 17-27a-703 UCA, relating to a panel of experts to serve as the appeal authority for purposes of determining the technical geologic aspects of the appeal. The decision on the associated land use appeal shall still be made by the otherwise specified appeal authority, based on the decision of the panel of geologic experts. A joint hearing before the panel of geologic experts and the appeal authority is authorized and recommended.

17.59.120 Fees

A. Scoping Meeting Fee. The fee to attend a scoping meeting with the County is \$75.00, plus any cost for the County to acquire the services of a qualified consultant to assist in the scoping determination.

B. Application Fees.

1. The application fee for review of a required geologic study shall be the amount of costs actually incurred by the County, including the costs for any consultant(s) retained by the County to review or assist in the review of the study. A deposit shall be paid by the applicant prior to the review of a required geologic report, in the amount of \$250.00 when the geologic report appears relatively straight-forward to the County, and \$900.00 when the County believes that the geologic report and subsequent review will be complex or lengthy. Costs will be billed or refunded based on actual time and expenses incurred. Any amount due in excess of the initial deposit shall be paid by the applicant prior to receiving the requested development authorization.

2. The application fee for review of a required geotechnical study that is not associated with a building permit, is \$75.00.

C. Appeal Fee. The appeal fee is established as the actual costs incurred by the County, provided if there are costs for a geologic panel pursuant to §17.27a.703(2) UCA, the County will contribute 50% of the cost of the panel. The appellant is responsible for 100% of all other associated costs.

17.59.130 Warning and Disclaimer

The following warnings and disclaimers are provided. The Geologic-Hazard Study Areas designated herein represent only those potentially hazardous areas known to Iron County and should not be construed to include all possible potential hazards areas. The Geologic-Hazard Ordinance and the Geologic-Hazard Study Areas may be amended as new information becomes available. The provisions of this chapter do not in any way assure or imply that areas outside the Geologic-Hazard Study Areas are free from the possible adverse effects of geologic hazards. This chapter shall not create any liability on the part of Iron County, any Iron County officer, Iron County reviewer, or Iron County employee thereof for any damages from geologic hazards that result from reliance on this chapter or any administrative requirement or decision lawfully made hereunder.

17.59.140 Conflicting Regulations

In cases of conflict between the provisions of this chapter and the zoning ordinance, building code, subdivision ordinance, or any other ordinance of Iron County, the most restrictive provision shall apply.

17.59.150 Iron County Geologic-Hazard Disclosure and Hold-Harmless Agreement

Property owners receiving any permit or approval for development within a landslide/slope instability, debris-flow, surface-fault-rupture, rock-fall, liquefaction, or problem soil hazard area shall sign and record on the property a Geologic-Hazard Disclosure Statement and Hold-Harmless Agreement, if one does not already exist on the title to the property. The document shall be a County-approved form, which discloses: that the property is located in a geologically hazardous area, the nature of the geologic hazard(s), the availability and location of the geologic/geotechnical report for the property, the requirement to comply with the recommendations of the report and applicable County regulations, and the “hold harmless” language. The hold-harmless agreement shall completely indemnify and hold harmless Iron County and its representatives from any damage to the property or improvements, or injury or death to its occupants, due to any geologic-hazard events or resulting activities.

The document must be signed by all parties with an ownership interest in the property, apply to all heirs and assignees in interest, be notarized, and be recorded with the Iron County Recorder. A copy shall be submitted with the building permit application.

Subdivision plats shall delineate where these geologic hazards, related setbacks, and non-buildable areas are located in the subdivision, along with a note referring to the accompanying Geologic-Hazard Disclosure and Hold-Harmless Agreement.

17.59.160 References

This ordinance represents a compilation of material from a variety of sources. A review of these sources will provide the reader with additional knowledge and understanding of the geologic hazards and review procedures summarized herein. These sources include:

Association of Engineering Geologists, Utah Section, 1986, Guidelines for preparing engineering geologic reports in Utah: Utah Geological and Mineral Survey Miscellaneous Publication M, 2 p.




Black, Bill D., 2003, Quaternary fault and fold database and map of Utah: Utah Geological Survey Map 193DM, scale 1:500,000.

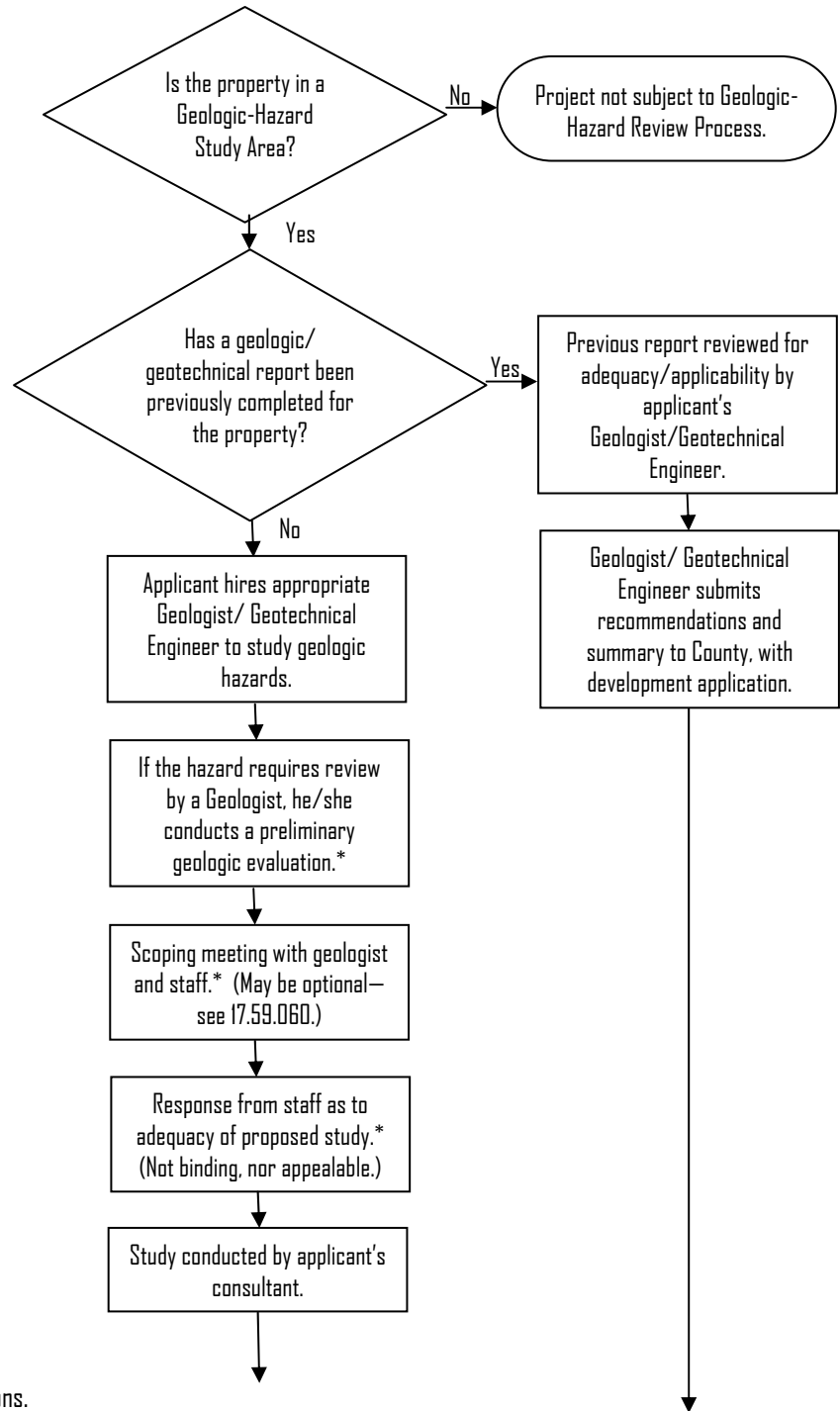
Blake, T.F., Hollingsworth, R.A., and Stewart, J.P., editors, 2002, Recommended procedures for implementation of DMG Special Publication 117, Guidelines for analyzing and mitigating landslide hazards in California: Los Angeles, California, Southern California Earthquake Center, 110 p., 1 appendix.

- Christenson, G.E., Batatian, L.D., and Nelson, C.V., 2003, Guidelines for evaluating surface-fault-rupture hazards in Utah: Utah Geological Survey Miscellaneous Publication 03-6, 14 p.
- International Code Council, 2009, International building code: Country Club Hills, Illinois, 868 p.
—2009, International residential code: Country Club Hills, Illinois, 675 p.
- Lund, W.R., Knudsen, T.R., Vice, G.S., and Shaw, L.M., 2008, Geologic hazards and adverse construction conditions, St. George—Hurricane metropolitan area, Washington County, Utah: Utah Geological Survey Special Study 127, 105 p.
- Giraud, R.E., 2005, Guidelines for the geologic evaluation of debris-flow hazards on alluvial fans in Utah: Utah Geological Survey Miscellaneous Publication 05-6, 16 p.
- Hylland, M.D., 1996, Guidelines for evaluating landslide hazards in Utah: Utah Geological Survey Circular 92, 16 p.
- Morgan County, March 2010, Morgan County geologic hazards ordinance (incl. Appendices), Draft Version.
- Utah Geological Survey, Geologic Hazards Program, Feb. 2010, Utah State Office of Education—Geologic-hazard report guidelines and review checklist for new Utah public school buildings: Utah State Office of Education.

TYPICAL GEOLOGIC-HAZARD REVIEW PROCESS

Legend:

-  Question/Decision
-  Process
-  Terminator/End



* Not applicable to geotechnical investigations.

