

*W. D. [Signature]*  
4-16-96

AN ORDINANCE ADDING PART 5 (GEOLOGIC STUDY AND MITIGATION) TO ARTICLE 3 (GENERAL SITE DEVELOPMENT STANDARDS) OF CHAPTER 14.1 (ZONING) OF THE CODE OF THE CITY OF COLORADO SPRINGS, 1980, AS AMENDED, RELATING TO THE STUDY, IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

WHEREAS, Colorado Springs is located in a natural setting which includes various types of known geologic hazards, and

WHEREAS, geologic conditions may pose risk to land development projects, homes and residents, and

WHEREAS, the risk posed by geologic hazards may be reduced through the study and identification of said hazards, as well through the use of geologic hazard mitigation techniques.

NOW, THEREFORE BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF COLORADO SPRINGS:

Section 1. that Article 3 (General Site Development Standards) of Chapter 14.1 (Zoning) of the Code of the City of Colorado Springs, 1980, as amended, is hereby amended with the addition of the following Part 5 (Geologic Hazard Study and Mitigation):

ARTICLE 3: GENERAL SITE DEVELOPMENT STANDARDS

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PART 5: GEOLOGICAL HAZARD STUDY AND MITIGATION

SECTION 501 - PURPOSE

A. The purpose of this Part is to identify geologic conditions which may pose hazards to a land development project in order that appropriate mitigation or avoidance techniques may be implemented. The types of geologic hazards to be identified shall include, but not be limited to, the following:

1. Expansive soils and expansive rock
2. Unstable or potentially unstable slopes
3. Landslide Areas or potential landslide areas
4. Debris Fans
5. Rockfall
6. Subsidence
7. Shallow water tables
8. Springs
9. Flood prone areas
10. Collapsing Soils
11. Faults
12. Dipping Bedrock

## SECTION 502 - APPLICABILITY

A Geologic Hazard Study shall be required in conjunction with the City's review of the following type of land development proposals:

- A. New or updated Master Plans - Preliminary study.
- B. In conjunction with rezoning requests when determined to be necessary by the Manager of Development Services, City Engineer, Planning Commission or City Council - Preliminary study.
- C. Preliminary Plats - Final detailed study required.
- D. Final Plats - Final study required if no report was reviewed in conjunction with the Preliminary Plat or Development Plan. Not required for replats of previous subdivisions in which buildings exist on each of the proposed lots, and no new building sites are being created.
- E. Development Plans (including expired Development Plans which are being reconsidered) - Final study required if no report was previously reviewed in conjunction with the original Plat or Development Plan. Not required for Development Plans in which no buildings, nor additions to existing buildings, are proposed.

## SECTION 503 - EXEMPTIONS

- A. The Manager of Development Services, in consultation with the City Engineer, may waive the requirement for the submittal of a Geological Hazard Study for the following types of projects:
  1. Master Plans, Development Plans or Subdivision Plats for which Geologic Hazard Reports have been previously prepared and reviewed and which are still considered to be relevant.
  2. Development proposals which exhibit all of the following characteristics:
    - a. No portion of the project lies within the Hillside (HS) Overlay zone.
    - b. The project contains no slopes (existing or proposed) which are unstable or potentially unstable.
    - c. The project site has no history of underground mining or subsidence activity.
    - d. The project site exhibits no geologic hazards which pose risks to the proposed project, other than slight to moderately expansive soils or expansive bedrock which can be mitigated with standard foundation design/construction practices.
- B. In order to be exempted an applicant shall submit a letter from a professional geologist or geotechnical engineer, who is qualified in accordance with Section 504, which states that the project meets all of the above noted criteria.

## SECTION 504 - PREPARATION OF GEOLOGIC STUDIES

Geologic Hazard Studies, or exemption letters, shall be prepared by, or under the direction of, a professional geologist as defined by *CRS 34-1-201(3)*, or by a qualified geotechnical engineer as defined by Policy statement 15 - "*Engineering in Designated Natural Hazards Areas*" of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors.

## SECTION 505 - SCOPE OF STUDY

- A. In general the Geological Hazard Study shall be of sufficient detail and scope to:
  1. Identify the geologic hazards affecting the development site.
  2. Analyze the potential negative impacts the geologic hazards will have upon the proposed project.
  3. Suggest mitigation techniques which will minimize the risk posed to the development by any identified geologic hazards.

B. The conclusions and recommendations of the study shall be based upon:

1. Site specific subsurface investigations. (Not required for Master Plan level studies.)
2. Site reconnaissance to identify the geologic features of the site and surrounding property.
3. Review of previous geologic reports within close proximity to the subject site.
4. Review of past geologic mapping in the area.
5. Conclusions drawn from the experience of the reviewing geologist.

## **SECTION 506 - GEOLOGIC HAZARD REPORT GUIDELINES**

The following guidelines generally reflect the type of information to be included in a geologic hazard report. These guidelines are not intended to be a rigid framework of requirements, nor a specific format for all reports. Specific information listed may be deleted or may require emphasis because of unique or particular geologic conditions or due to the type of project proposed. These guidelines should be considered as a general list of geotechnical information commonly evaluated and provided in a geologic hazard investigation.

### **A. GENERAL PROJECT INFORMATION**

1. Size and location of the project.
2. Existing and proposed zoning and land use.
3. A statement regarding the types of land uses the report assumes will be built within the project.
4. Identification of the person who prepared the study and his/her qualifications for conducting the study per Section 504.

### **B. STUDY OVERVIEW**

1. State the objective(s) and level of investigation for the study.
2. Cite previous publicly available geologic reports which were reviewed or referenced in the course of preparing the geologic hazard study and indicate the author(s), firm, and dates of each report.
3. List all the methods of investigation as well as professional firm(s) and individuals who participated.
4. If the level of investigation varies within the subject area, describe in the text and show on the maps areas of concentration or exclusion.
5. Describe the general physiographic setting of the project and its relationship to local topographic features.
6. Describe the general geologic setting of the project and indicate any lithologic, tectonic, geomorphic, or soils problems specific to the area.
7. Describe the general surface and ground water conditions.

### **C. SITE EVALUATION TECHNIQUES**

1. State the extent and method of surface and subsurface geologic studies.
2. Geologic Mapping.
  - a. Prepare geologic map(s) on the project topographic map to show important details corresponding to the size, extent and degree of the investigation.
  - b. Show the abundance and distribution of earth materials and structural elements exposed or inferred in the subject area. Observed and inferred features or relationships should be so designated on the geologic map.
  - c. Depict significant three dimensional relationships on appropriately positioned cross sections.
  - d. Portray all geologic information at the same scale as the project plans. Use "tie-points" between the geologic map, topographic map, and project plans.
  - e. Indicate the geologic base map use, date, and significant additions and modifications to previous work.

3. Aerial Photographs and Remote-Sensing Imagery
  - a. Describe type(s) of photographs or images including instrumentation, processing techniques, and final product.
  - b. Indicate data and scale of photographs or imagery used in the investigation.
  - c. Indicate usefulness and general relationships observed on the images.
4. Geophysical Investigations
  - a. State type and objectives of the geophysical investigation(s) (if any), quality of the data, and limitations of the geophysical techniques.
  - b. Describe the information used to correlate the geophysical data and geologic conditions.
  - c. Display the geophysical data on the topographic/geologic maps and cross sections.
5. drill-Hole Data
  - a. State the specific investigative methods, tests conducted, drilling, and date of investigation.
  - b. Show the location of all borings on the topographic or geologic map.
  - c. Show boring logs, geophysical logs, or profiles obtained in the investigation.
6. Test Pits and Trenches
  - a. Describe the location and dimensions of all pits and trenches and date of investigation.
  - b. Indicate the location of all excavations on the topographic/geologic map and profiles.
  - c. Provide a large scale descriptive log with sufficient detail.
  - d. Show sample locations if supplemental laboratory tests were conducted.
7. Field and Laboratory Tests
  - a. Describe the type of any tests conducted in the field or laboratory.
  - b. Describe the sample method and test procedures.
  - c. Show the test results on data work sheets or on summary tables.
8. Monitoring Programs
  - a. Describe the type, objectives, and location of all monitoring programs in the subject area.
  - b. State the monitoring period, the firm(s) or individuals responsible for the care and disposal of the installations.

#### D. GEOLOGIC DESCRIPTIONS

1. BEDROCK UNITS: Sedimentary, igneous, and metamorphic rock types.
  - a. Rock type and bedding attitude or foliation.
  - b. Age of and correlation with recognized formations.
  - c. Dimensional characteristics such as thickness and extent.
  - d. Distribution and extent of the weathered zone.
  - e. Physical characteristics.
  - f. Response of bedrock materials to natural processes.
2. SURFICIAL DEPOSITS: fluvial, colluvial, glacial, eolian, mass wasting, and man-made deposits.
  - a. Distribution, occurrence, and age.
  - b. Identification of material types and sources.
  - c. Dimensional characteristics such as thickness and extent.
  - d. Surface expression and relationships with present topography.
  - e. Physical and chemical characteristics.
  - f. Distribution and extent of altered zones.
3. GEOMORPHIC FEATURES: landslides, earthflows, debris flows, mudflows, rockfalls, debris avalanches, fault scarps, soil creep, erosion scarps, avalanches paths, and subsidence phenomenon.
  - a. Location and distribution.
  - b. Dimensional characteristics.
  - c. Age of feature and history of activity.
  - d. Recurrence interval for geomorphic process.
  - e. Physical characteristics including depth, flow velocities, and impact pressures.

4. **STRUCTURAL FEATURES:** joints, faults, shear zones, folds, schistosity, and foliation.
  - a. Occurrence, distribution, and proximity to site.
  - b. Dimensional and displacement characteristics of faults.
  - c. Orientation and changes in orientation.
  - d. Physical characteristics such as brecciation, slickensides, gouge zones, sand boils, sag ponds, springs alignment, e. disrupted drainages, or ground-water barriers.
  - f. Nature of offset(s) and timing of movement(s).
  - g. Absolute or relative age of latest movement.
5. **SURFACE DRAINAGE:** streams, creeks, draws and springs.
  - a. Distribution.
  - b. Relation to topography (drainage patterns).
  - c. Relation to areas of vegetation, including wetlands.
  - d. Relation to geologic features.
  - e. Source, permanence, and variation in amount of surface water.
  - f. Evidence of earlier occurrence of water at localities now dry.
  - g. Estimated peak flows and physiographic flood plain of drainages.
  - h. Probable maximum or 100-year flood limits, including flash and debris floods.
  - i. Outfall.
6. **GROUND WATER:** confined and unconfined.
  - a. Distribution and occurrence.
  - b. Hydraulic gradients.
  - c. Recharge areas for aquifers.
  - d. Relation to topography.
  - e. Relation to geologic features.
  - f. Seasonal variations.

#### E. GEOLOGIC INTERPRETATION

1. **GEOLOGIC HAZARDS** (landslides, avalanches, rockfall, mudflows, debris flows, radioactivity)
  - a. Geomorphic and structural features/processes present in the area.
  - b. Man-induced features/processes.
  - c. Age and activity of the features/processes.
  - d. Natural conditions affecting the features/processes.
  - e. Susceptibility to man-induced changes.
  - f. Potential impact of hazard(s) and risk to project.
  - g. Amenability of adverse conditions for adequate mitigation.
  - h. Long-term lateral and vertical stability of earth materials.
  - i. Impact of project on materials stability.
2. **GEOLOGIC CONSTRAINTS** (expansive soil or rock, potentially unstable slopes, high groundwater levels, soil creep, hydrocompaction, shallow bedrock, erosion).
  - a. Soil, surface and ground water, and geomorphic conditions.
  - b. Man-induced conditions.
  - c. Activity of conditions.
  - d. Effect of natural or man-induced changes.
  - e. Potential impact of conditions and risk to project.
  - f. Amenability of adverse conditions for adequate mitigation.
  - g. Impact of project on long-term project stability.

## F. THE BEARING OF GEOLOGIC FACTORS UPON THE INTENDED LAND USE

This topic normally constitutes the principal contribution of the report. It involves both the effects of geologic features upon the proposed grading, construction, and land use; and the effects of these proposed modifications upon future geological processes in the area. The following checklist includes the topics that ordinarily should be considered as part of the findings, conclusions, and recommendations of the geologic reports:

1. General compatibility of natural features with proposed land use:
  - a. Topography
  - b. Lateral stability of earth materials.
  - c. Problems of flood inundation, erosion, and deposition.
  - d. Problems caused by features or conditions in adjacent properties.
  - e. Problems potentially caused to adjacent properties.
  - f. Other general problems.
2. Proposed Cuts:
  - a. Prediction of what materials and structural features will be encountered.
  - b. Prediction of stability based on geologic factors.
  - c. Problems of excavation (e.g. unusually hard or massive rock, excessive flow of groundwater).
  - d. Recommendations for reorientation or repositioning of cuts, reduction of cut slopes, development of compound cut slopes, special stripping above daylight lines, buttressing, protection against erosion, handling of seepage water, setbacks for structures above cuts, etc.
3. Proposed masses of fill:
  - a. General evaluation of planning with respect to canyon-filling and sidehill masses of fill.
  - b. Comment on suitability of existing natural materials for fill.
  - c. Recommendations for positioning of fill masses, provision for underdrainage, buttressing, special protection against erosion.
4. Recommendations for subsurface testing and exploration:
  - a. Cuts and test holes needed for additional geologic information.
5. Special recommendations:
  - a. Areas to be left as natural ground.
  - b. Removal or buttressing of existing slide masses.
  - c. Flood protection.
  - d. Problem of groundwater circulation.
  - e. Position of structures, with respect to active faults.
  - f. Problems associated with radon gas and soil radioactivity.
  - g. Problems caused by natural flammable gas, e.g. methane.

## G. CONCLUSIONS

1. State whether the intended use of the land is compatible with any identified or potential geologic hazards or constraints; and if mitigation measures are necessary.
2. Discuss the critical planning and construction aspects including irrigated landscaping, the stability of earth materials, grading plans, the need for selective location of project facilities, static and dynamic parameters for the design of structures.
3. Clearly state the geologic basis for all conclusions.

## H. RECOMMENDATIONS

1. Discuss the development of mitigation procedures or design changes necessary to minimize or abate any hazardous condition. Each hazardous condition requires a recommendation.
2. The recommendation should focus upon the long-term stability and safety of the proposed project.

**SECTION 507 - REVIEW OF GEOLOGIC HAZARD STUDIES**

- A. Geologic Hazard Studies will be reviewed concurrently by the City's Planning and City Engineering staffs in conjunction with the City's normal review of the land development proposal. The City's review shall determine whether the findings, conclusions and recommendations of the Geological Hazard Study have been incorporated into the design of the Development Plan, Subdivision Plat, Drainage Plan, Grading Plan and Street construction documents. If the review by the City determines that the study submitted is incomplete or fails to comply with the guidelines set forth in this Part 5, the study may be rejected and a new or supplemental study may be required. In cases where significant geologic hazards are identified, appropriate mitigation measures shall be required in conjunction with the approval of the project. Said mitigation measures shall include, but not be limited to:
  - 1. Changes to the proposed land use configuration
  - 2. Modification of land use types
  - 3. Modification of lot boundaries or building envelopes
  - 4. Special foundation designs
  - 5. Geotechnical engineering solutions
  - 6. Limitations on irrigated landscape designs
  - 7. Special drainage designs
  
- B. City staff, Planning Commission or City Council may, at their discretion, have geologic hazard studies independently reviewed by the Colorado Geological Survey (CGS) or by an independent professional geologist or qualified geotechnical consultant. This separate review shall be completed within a twenty-one (21) working day time frame, shall supplement the city's review and will be considered by the City in making a final determination on the land development proposal. The cost of having independent review and analysis of geologic hazard reports shall be borne by the City.

**SECTION 508 - DISCLOSURE STATEMENT**

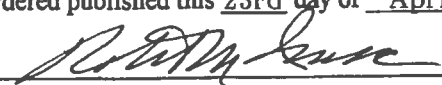
The following disclosure statement shall be placed upon each Subdivision Plat and Development Plan which is subject to a Geologic Hazard Study:

*"This property is subject to the findings summary and conclusions of a Geologic Hazard Report prepared by \_\_\_\_\_ dated \_\_\_\_\_. A copy of said report has been placed within file: \_\_\_\_\_ of the City of Colorado Springs - Development Services Division. Contact Development Services Division, 30 South Nevada Avenue, Suite 301, Colorado Springs, CO, if you would like to review said report."*

Section 2. This ordinance shall be in full force an effect from and after its passage and publication as provided by the Charter.


Section 3. Council deems it appropriate that this ordinance be published by title and summary prepared by the City Clerk and that this ordinance shall be available for inspection and acquisition in the Office of the City Clerk.

Introduced, read, passed on first reading and ordered published this 23rd day of April, 1996.

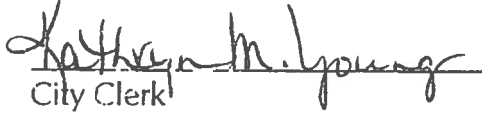
  
\_\_\_\_\_  
Mayor

ATTEST:   
City Clerk

Finally passed, adopted and approved this 14th day of May, 1996.

  
\_\_\_\_\_  
Mayor

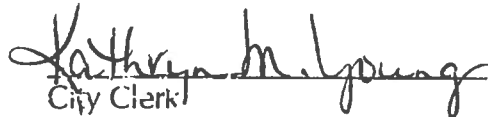
ATTEST:

  
\_\_\_\_\_  
City Clerk

I HEREBY CERTIFY, that the foregoing ordinance entitled "AN ORDINANCE  
ADDING PART 5 (GEOLOGIC STUDY AND MITIGATION) TO ARTICLE 3 (GENERAL SITE  
DEVELOPMENT STANDARDS) OF CHAPTER 14.1 (ZONING) OF THE CODE OF THE CITY  
OF COLORADO SPRINGS, 1980, AS AMENDED, RELATING TO THE STUDY,  
IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS"

was introduced and read at a regular meeting of the City Council of the City of Colorado Springs, held on April 23, 1996; that said ordinance was passed at a regular meeting of the City Council of said City, held on the 14th day of May, 1996, and that the same was published by summary, in accordance with Section 3-80 of Article III of the Charter, in the Daily Transcript, a newspaper published and in general circulation in said City, at least ten days before its passage.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of the City, this 14th day of May, 1996.

  
\_\_\_\_\_  
City Clerk