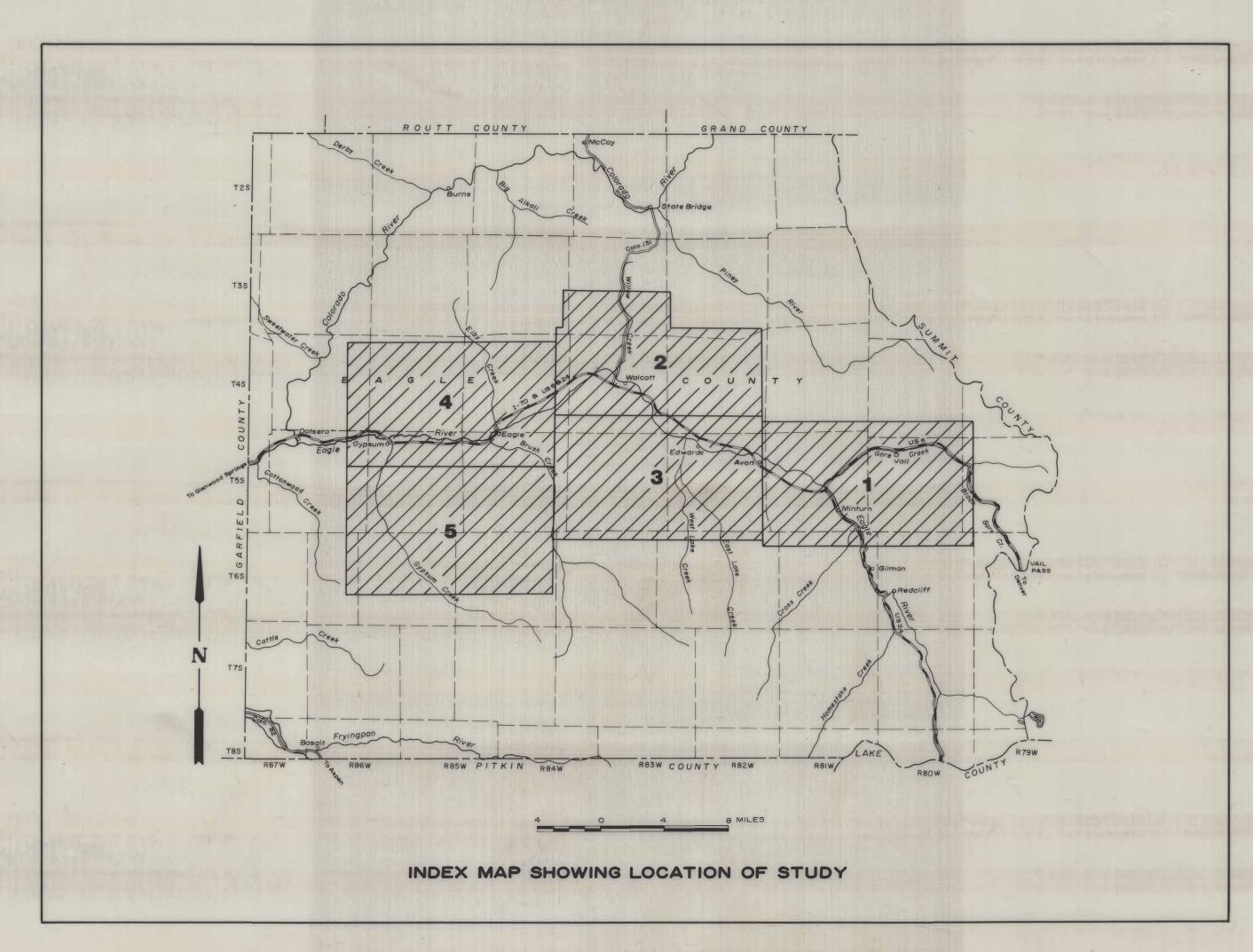
COLORADO GEOLOGICAL SURVEY
and
EAGLE COUNTY, COLORADO

PREPARED BY:

CHARLES S. ROBINSON & ASSOCIATES, INC.
GOLDEN, COLORADO

FOLIO OF GEOLOGIC LAND USE MAPS EAGLE COUNTY, COLORADO



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BEDROCK GEOLOGIC MAP

[Qal

Alluvium

Boulders, gravel, sand and silt accumulated by fluvial processes in large stream valleys.

C) PY

Moraine

Thick deposit of boulders, gravel, sand and silt deposited by glaciers.



Extrusive Volcanics

Basaltic lavas, Interbedded flow breccias, ash flows and tuffaceous sedimentary rocks overlying older sedimentary rocks.



Intrusive Rocks

Thin dikes composed of dark gray or greenish-gray, fine grained to aphanitic vesicular basalt.



Quartz Monzonite

Light to dark gray, fine to medium grained quartzo-feldspathic intrusive rock.



Plerre Shale

Dark gray or dark brownish-gray clay shale with interbedded thin limestones and siltstones in the lower part and two thick shaley and silty sandstone beds in the upper part.



Niobrara Formation

Dark to light gray calcareous and non-calcareous shale interbedded with thin beds of limestone and calcareous siltstones.



Benton Shale

Dark gray shale with interbedded, fine grained, brownish-gray, clayey sandstone and thin beds of white clay.



Dakota Sandstone

Fine to very coarse sandstones with thin interbedded shale and coal.



Morrison Formation

Interbedded lenticular sandstone, variegated and calcareous claystones and fine grained, fossilisterous fresh-water limestones.



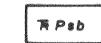
Entrada Sandstone

Light reddish-orange, fine grained aeolian cross-bedded sandstone.



Chinle Formation

Fine grained red sandstones and sandy shales with local lenses of limestone conglomerate.



State Bridge Formation

Reddish-orange clay free sandstones and fine grained sandstones with interbedded conglomerates and lime-stones.



Maroon Formation

Grayish-red to moderate reddisherange siltstone and silty sandstone; grayish-red, pale red and pale red-purple arkosic sandstones.



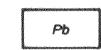
Eagle Valley Formation

White to medium gray gypsum and associated greenish-gray clay-stone, siltstones and sandstones.



Minturn Formation

Medium to very coarse-grained, gray to reddish-brown sandstone, conglom-eratic sandstone, thin beds of reddish-brown siltstone and sandy and silty shale and prominent pinkish-gray to gray limestone beds. In the Ruedi area it includes the Gothic Formation.



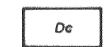
Belden Formation

interbedded dark gray to black fine grained fossiliferous lime-stones and gray to black fissile shales. Two massive, arkosic, conglomeratic sandstones occur near the middle of the formation.



Leadville Limestone

Dark gray massive to thin bedded lithographic limestones with a lower unit of grayish-brown medium grained calcareous sandstone.



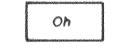
Chaffee Formation

Uniformly thin bedded gray dolomite with a lower member of white massive and crossbedded medium to coarse grained quartzitic sandstone with some thin gray shale units.



Manitou Dolomite

Dark gray to reddish=brown or purple thin bedded crystalline dolomite.

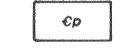


Harding Quartzite

White to yellowish gray-green interbedded conglomerates, sandstones and orthoquartzites.

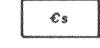


Harding and Manitou formations undivided



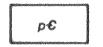
Peerless Formation

Brown sandy dolomite with streaks and laminae of greenish-gray or dark red dolomite interbedded with brown or gray shale and sandstone.



Sawatch Quartzite

Fine to medium grained brown dolomitic sandstones and white orthoguartzites.



Precambrian

Igneous, meta-sedimentary and metavolcanic rocks including granites, gneisses, lamprophyres, pegmatites and schists of the core of the Sawatch and Gore Ranges.



Contact

Contact between bedrock units.



(bar and bell on down thrown side)

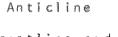


Thrust Fault (teeth on up thrown side)



Strike and dip of bed

Strike and dip of bedrock,
Photogeologic



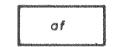
Showing crestline and direction of plunge.



Showing troughline and direction of plunge.

EXPLANATION

MAP OF SURFICIAL DEPOSITS



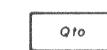
Artificial fill

Tailings pond deposit of fine sand, silt and clay.



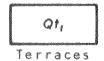
Alluvium

Stream sediments in the tributaries of the Eagle River.

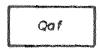


Active floodplain

Boulders, gravel, sand and silt reworked by the present stream.



Terrace levels along Eagle River and tributaries. Numerical subscript indicates relative age; number 1 is the youngest. May be unnumbered.



Alluvial Fan

Cone shaped deposit of fluvial sediments that are deposited where a tributary enters into a larger stream valley.



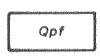
Older Alluvial Fans

Cone shaped deposits of fluvial sediments that were deposited where a tributary entered into a larger stream valley. Recent erosion is greater than deposition, resulting in dissection of fan surface by down-cutting of tributary stream.



Alluvial Aprons

Coalescing alluvial fans at the base of slopes.



Pediment Fan

Erosional surfaces with thin deposits of residual gravel.

GLACIAL DEPOSITS



Moraine

Boulders, gravel, sand and silt deposited at the margins of glaciers.



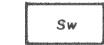
Glacial undifferentiated

Thin deposit of boulders, gravel, sand and silt deposited as a lag on older units.



Lake Deposits

Fine grained sands, silts and clay of fluvial origin deposited behind barriers in the drainage.



Swamp Deposits

Organic and clay accumulation occurs where groundwater table intersects the surface.



Colluvial Wedge

Areas of fine grained slope wash deposits.



Colluvium

Material derived by the weathering of bedrock in place. Letter symbols

from which material is derived.

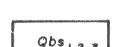
in parenthesis indicate formation



Talus

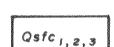
Accumulations of coarse debris at base of a cliff as a result of weathering of the cliff. Includes rock glaciers above 11,000 feet. Letter symbols in parenthesis indicate formation from which material is derived.





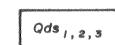
Landslides of Bedrock

Failure of bedrock slopes. Letter symbol in parenthesis indicates bedrock formation that failed. Numerical subscript indicates relative age; I being the youngest.



Slope Failure Comples

Large areas including a variety of types of slope failures as debris slides, mudflows, debris flows, landslides, etc. Letter symbol in parenthesis indicates unit that failed. Numerical subscript indicates relative age; I being the youngest.



Debris slides

Fine colluvium to boulder deposits including morainal deposits that have failed and moved down slope. Letter symbol in parenthesis indicates unit that failed. Numerical subscript indicates relative age; I being the youngest.



Accelerated Creep

An area of colluvial slope that is moving relatively rapidly downslope. Letter symbols in parenthesis indicate formation from which material is derived.

deposited behind

The portion of a major stream valley where erosion and deposition presently occurs and is generally subject to flooding on an approximate 25-year cycle.

Physiographic floodplain



Landslides

Mass movements where there is a distinct surface of rupture or zone of weakness. Subtypes identified and described below.



Slope failure complex

Large areas of failure of surficial and bedrock units. May consist of a combination of slope failure types. Symbol enclosed in parenthesis indicates unit involved. Subscript number indicates relative age; number lis youngest.



Debris slides

Landslide type consisting primarily of surficial material. Symbol enclosed in parenthesis indicates unit involved. Subscript number indicates relative age; number 1 is youngest.



Bedrock slides

of bedrock. Symbol enclosed in

Slope failure deposits consisting primarily of large detached blocks

parenthesis indicates unit involved.



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Fractures

me me me me me

Shear Zones



Landslide Scarp

Sinkholes in Limestone



Subsidence Areas

or evaporite rocks

Areas enclosed show several features related to subsidence

a C

POTENTIAL GEOLOGIC HAZARDS MAP

GEOLOGIC HAZARDS DEFINED OR INFERRED IN COLORADO GEOLOGICAL SURVEY SPECIAL PUBLICATION No. 6.

Accelerated Soil Creep

Areas of colluvial slope that is moving downslope at a relatively rapid rate.



Rockfall Hazard

Areas of either active or potential falling, rolling or sliding of large bedrock blocks. Symbol in parenthesis indicates unit involved.



Talus

Areas of potential rockfall and small localized debris flows. Symbol enclosed in parenthesis indicates unit involved.



Debris Fan

sw Swamps

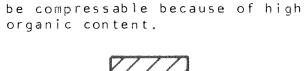
Areas where poor drainage or high

ground water cause permanent or

seasonal saturation. Soils may

debris flows and hydrocompaction.

Areas of possible recurrent flooding,



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Corrosive soils

Soils which may contain minerals in variable amounts that produce serious detrimental effects on concrete, metal or other substances that are in contact with the soil.



Subsidence

Areas that may be susceptible to



subsidence due to solution.

Areas that may be susceptible to subsidence due to hydrocompaction in low density soils.

Subsidence



Soil and rock which contains clay and which expands to a significant degree upon wetting and shrinks upon drying.

Possible resource covered by other

Surficial material

Volcanic scoria

Potassium mineral leases

(State of Colorado)

Building stone

MINERAL FUELS

Oil and gas

Dry hole

Dry hole, show of oil and gas

URANIUM

Mineral showing

Radioactive anomaly

Uranium bearing sedimentary

unit. To Chinle formation.

Line delimits area of probable

deposits.

location of possible disseminated or massive base metal sulfide

SNOW AVALANCHE HAZARD CLASSIFICATION

Areas where numerous or individual slide paths are readily identifiable,

Areas highly susceptible to snow avalanches, but no paths readily identifiable.

Areas considered as potential runout or airblast zone associated with l

Area that may be susceptible to snow sliding or snow avalanches under extreme weather conditions.



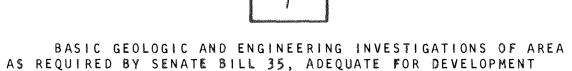
Area susceptible to snow avalanches with photo interpreted avalanche path outlined,

Classification takes into account

- 1. Slope, 5-40°
- 2. Wind direction, W-N
- Elevation, >8000'
- 4. Slope aspect, lee slopes
- Ability to identify paths
- 6. vegetation density

EXPLANATION

ENVIORNMENTAL AND ENGINEERING GEOLOGIC MAP FOR LAND USE CLASSIFICATION OF AREAS INDICATING MINIMUM ENGINEERING AND ENGINEERING GEOLOGIC INVESTIGATIONS REQUIRED FOR DEVELOPMENT PLANNING



A. High stable gravel covered terraces above the physiographic floodplain. Emphasis on, but not limited to, groundwater, surface and subsurface drainage, composition and characteristics of underlying bedrock that may be penetrated and possible resource evaluation.

PLANNING AND GENERALLY FOR CONSTRUCTION SITE SELECTION.

- B. Stable colluvium or bedrock on flat to gentle slopes. Emphasis on, but not limited to, surface and subsurface drainage and slope stability.
- C. Stable glacial material on flat to gentle slopes. Emphasis on, but not limited to, surface and subsurface drainage, slope stability, and possible resource evaluation.



GENERAL GEOLOGIC AND ENGINEERING INVESTIGATIONS OF AREA REQUIRED FOR DEVELOPMENT PLANNING FOR EACH CONSTRUC-TION SITE.

- A. Stable colluvium or bedrock on gentle slopes that may have a thin gravel cap. Emphasis on, but not limited to, surface and subsurface drainage, composition and characteristics of near surface bedrock and slope stability.
- B. Stable glacial deposits on gentle to moderate slopes. Emphasis on, but not limited to. surface and subsurface drainage, slope stability and possible resource evaluation.
- C. Swamps, bogs or lakes where surface water collects permanently or seasonally. Emphasis on, but not limited to, compaction, high ground water table and surface drainage,
- D. Stable colluvial slopes with gravel cap in areas of past subsidence. Emphasis on, but not limited to, subsidence potential, corrosive and expansive soils.



DETAILED GEDLOGIC AND ENGINEERING INVESTIGATIONS OF ENTIRE AREA IS REQUIRED FOR DEVELOPMENT PLANNING AND FOR SELECTION OF CONSTRUCTION SITES.

- A. Stable colluvium and bedrock on gentle to moderate slopes. Emphasis on, but not limited to, surface and subsurface drainage, slope stability and possible resource evaluation.
- B. Thick colluvium on gentle to moderate slopes. Emphasis on, but not limited to, expansive and corrosive soils, surface and subsurface drainage and hydrocompaction.
- C. Fine grained tailings deposit on flat to moderate slopes. Emphasis on, but not limited to, slope stability, corrosive material, surface and subsurface drainage.

- D. Debris fans. Gentle thick colluvial slopes consisting of fine to coarse rounded material. Emphasis on, but not limited to, surface and subsurface drainage, frequency and control of mudflows and debris flows, hydrocompaction and possible resource evaluation.
- E. Potential rockfall hazard. Emphasis on, but not limited to, slope stability, surface and subsurface drainage.
- F. Thin colluvium on potentially unstable gentle to moderate slopes. Emphasis on, but not limited to, surface and subsurface drainage, slope stability and corrosive and expansive soils.



DETAILED GEOLOGIC AND ENGINEERING INVESTIGATIONS REQUIRED FOR ENTIRE AREA FOR DEVELOPMENT PLANNING AND SOME CONSTRUCTION SITES MAY REQUIRE SPECIALIZED GEOLOGIC AND ENGINEERING INVESTIGATIONS FOR DESIGN PURPOSES.

A. Thin glacial deposits overlying potentially unstable moderate to steep colluvial and bedrock slopes. Emphasis on, but not limited to, slope stability, surface and subsurface

drainage.

- B. Stable colluvium and bedrock on moderate to steep slopes. Emphasis on, but not limited to, slope stability, rockfall hazard, expansive and corrosive soils and surface and subsurface
- C. Potential rockfall areas associated with talus slopes. Medium to coarse blocky material deposited by rockfall at the base of cliffs. Emphasis on, but not limited to, rockfall hazard, slope stability, surface and subsurface
- D. Areas of swamps or begs on potentially unstable gentle to moderate slopes. Emphasis on, but not limited to, surface and subsurface drainage and slope stability.
- E. Area of active debris flows. Emphasis on but not limited to, flooding, control of water entrained debris.



DETAILED GEOLOGIC AND ENGINEERING INVESTIGATIONS OF ENTIRE AREA REQUIRED FOR DEVELOPMENT PLANNING AND SPECIALIZED INVESTIGATIONS REQUIRED FOR SPECIFIC CONSTRUCTION SITES.

- A. Rockfall hazard areas and talus on moderate to steep bedrock and colluvial slopes. Emphasis on, but not limited to, slope stability, surface and subsurface drainage and expansive and
- B. Debris slides, bedrock slides and slope failure complexes composed of poorly sorted thin to thick, fine to coarse colluvial and bedrock on gentle to steep slopes. Emphasis on, but not limited to, slope stability, surface and sub-
- surface drainage, corrosive and expansive soils. C. Stable or potentially unstable colluvium or bedrock on moderate to steep slopes. Emphasis on, but not limited to, slope stability, surface and subsurface drainage, debris flows in higher mountain areas.

- D. Potentially unstable colluvium or gypsiferous bedrock on gentle to steep slopes. Emphasis on, but not limited to, hydrocompaction, subsidence due to solution, surface and subsurface drainage, corrosive and expansive soils, and slope stability.
- E. Areas of accelerated creep composed of colluvial or bedrock on moderate unstable or metastable slopes. Emphasis on, but not limited to, slope stability, surface and subsurface drainage, corrosive and expansive soils.



EXTENSIVE DETAILED GEOLOGIC AND ENGINEERING INV-ESTIGATIONS NECESSARY FOR DEVELOPMENT PLANNING. MOST OF THE AREA WITHIN THIS CLASSIFICATION MAY NOT BE SUITABLE FOR PERMANENT STRUCTURES.

- A. Debris slides and slope failure complexes made up of unsorted thick colluvial material on moderate to steep unstable or metastable slopes. Emphasis on, but not limited to, slope stability, surface and subsurface drainage, corrosive and expansive soils.
- B. Areas of accelerated creep compesed of colluvial or bedrock on steep unstable or metastable slopes. Emphasis on, but not limited to, slope stability, surface and subsurface drainage, corrosive and expansive soils.
- C. Areas near physiographic floodplain that may be susceptible to flooding during severe weather conditions. Emphasis on, but not limited to, flooding potential, frequency and control.
- D. Rockfall hazard in gypsiferous material. Steep, unstable or potentially unstable bedrock slopes. Emphasis on, but not limited to, slope stability, surface and subsurface drainage and corrosive and expansive soils.



EXTENSIVE DETAILED GEOLOGIC AND ENGINEERING FIELD INVESTIGATIONS REQUIRED FOR DEVELOPMENT PLANNING. UTILITY CORRIDORS, TEMPORARY STRUCTURES AND SOME PERM-ANENT STRUCTURES MAY UTILIZE PARTS OF THESE AREAS AFTER EXTENSIVE INVESTIGATIONS AND DESIGN FOR THE SPECIAL-IZED PROBLEMS INVOLVED.

A. Physiographic floodplain where erosion and deposition is presently active and is generally subject to recurrent flooding on an approximate 25-year cycle. Emphasis on, but not limited to, frequency, depth and control of water and water entrained debris.

Line delimiting areas susceptible to snow sliding or snow avalanches. See Snow Avalanche Hazard Map for details. Development within this area requires a thorough evaluation of snow avalanche hazard before development begins.

\$100,000 to \$1,000,000

Over \$100,000,000

METALLIC MINERALS

Production

\$10,000 to \$100,000

Less than \$10,000

Reported occurrence, no record of production

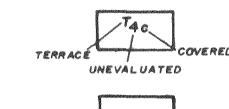
NON-METALLIC MINERALS

Perlite and pumice

GEOLOGIC RESOURCES MAP

Sand and gravel (known deposits)

Sand, Gravel and Quarry Aggregate





Stream Terrace Deposit

Alluvial Fan Upland Deposit

Coarse Aggregate

(at least 30% retained on #4 screen, visual estimation)

Glacial Deposit

Gravel: relatively clean and sound

Gravel: significant fines, decomposed rock, calcium carbonate.

Line delimits area of probable location of pessible vein type mineral deposits.

Fine Aggregate

3 Sand

Unevaluated Resource

Primary Mineralization

Au Gold Ag Silver

Cu Copper

Lead

Zn Zinc

Vanadium

SNOW AVALANCHE HAZARD, ENVIRONMENTAL AND ENGINEERING GEOLOGIC AND GEOLOGIC RESOURCE MAPS, EAGLE COUNTY, COLORADO