Appendix D.
Sample Safety Information for Landslides/
Debris Flows—
Suitable for Posting and (or) Distributing

Adapt as needed to suit local conditions and (or) circumstances

What Can You Do If You Live Near Steep Hills?

Prior to Intense Storms:

- Become familiar with the land around you. Learn whether debris flows have occurred in your area by contacting local
 officials, emergency management officials, State geological surveys or departments of natural resources, and university
 departments of geology. Slopes where debris flows have occurred in the past are likely to experience them in the future.
- Support your local government in efforts to develop and enforce land-use and building ordinances that regulate construction in areas susceptible to landslides and debris flows. Buildings should be located away from steep slopes, streams and rivers, intermittent-stream channels, and the mouths of mountain channels.
- Watch the patterns of stormwater drainage on slopes near your home and note especially the places where runoff water converges, increasing flow over soil-covered slopes. Watch the hillsides around your home for any signs of land movement, such as small landslides or debris flows or progressively tilting trees.
- Contact your local authorities to learn about the emergency-response and evacuation plans for your area and develop your own emergency plans for your family and business.

During Intense Storms:

- Stay alert and stay awake! Many debris-flow fatalities occur when people are sleeping. Listen to a radio for warnings of intense
 rainfall. Be aware that intense short bursts of rain may be particularly dangerous, especially after longer periods of heavy
 rainfall and damp weather.
- If you are in an area susceptible to landslides and debris flows, consider leaving if it is safe to do so. Remember that travel during an intense storm is hazardous.
- Listen for any unusual sounds that might indicate moving debris, such as trees cracking or boulders knocking together. A trickle of flowing or falling mud or debris may precede larger flows. If you are near a stream or channel, be alert for any sudden increase or decrease in water flow and for a change from clear to muddy water. Such changes may indicate debris-flow activity upstream, so be prepared to move quickly. Don't delay! Save yourself, not your belongings.
- Be especially alert when driving. Embankments along roadsides are particularly susceptible to landslides. Watch the road for collapsed pavement, mud, fallen rocks, and other indications of possible debris flows.

What to do if you suspect imminent landslide danger:

- Evacuate, if possible.
- Contact your local fire, police, or public works department.
- Inform affected neighbors.

After landslides occur:

- It is best to stay away from the slide area, as there may be danger of additional slides; however, this is not always possible
 or desirable.
- Check for injured and trapped persons near the slide area. Give first aid if trained, and call for help.
- Remember to help your neighbors who may require special assistance—infants, elderly people, and people with disabilities.
- Listen to a battery-operated radio or television for the latest emergency information.
- Remember that flooding may occur after a mudflow or a landslide.
- · Check for damaged utility lines. Report any damage to the utility company.
- Check the building foundation, chimney, and surrounding land for damage.
- Replant damaged ground as soon as possible because erosion caused by loss of ground cover can lead to flash flooding.
- Seek the advice of geotechnical expert for evaluating landslide hazards or designing corrective techniques to reduce landslide risk.

Index

glossary 57, 60, 63

sandbags 115-118, 120 sea cliff retreat 61 acoustic imagery 47 hydraulic 60, 61, 88, 95, 106 seepage 61 alluvial fan 60 hydraulic seeding 95 shear 6, 10, 16, 22, 24, 26, 61, 80 hydrology 60 slurry 16, 61, 95 soil mechanics 61 backcasting 129 stress 24, 60-62 backfill 78, 83, 86, 90 InSAR 58, 70, 72 sturzstroms 62 bedding surface/plane 60 Instrumentation 47, 74 subsidence 14, 60, 62 bedrock 20, 22, 29, 46, 47, 60, 62, 70, interstitial water 61 surficial geology 26, 46, 62, 70 86, 124 swelling soils 44, 60, 62 benches 53, 104 borehole 47, 60 lahar 18–20, 33, 61 landslide dam 32, 36, 53, 60, 123, 124, tensile stress 62 126 timber cribs 96 check dams 60, 82, 83, 111, 124 landslide hazard map 61, 69 topple 5, 8, 9 colluvium 60 landslide inventory maps 61, 68 triggering mechanism 18 landslide maps 52, 67 landslide risk map 61 debris avalanche 20, 21, 37 landslide susceptibility map 61, 68 weathering 6, 8, 24, 62, 64, 107, 109 debris basin 60 lateral spread 15 wildfire 28, 109 debris flow 5, 12, 16–18, 20, 26, 30, 50, LiDAR 57, 73 60, 61, 83, 103, 109, 112, 113 liquefaction 14, 18, 32, 61 Z delta-front landsliding 60 lithology 60, 61 zonation 58, 62 differential 6, 8, 60, 62, 63, 73, 129 loess 61 digital elevation model (DEM) 60, 70 M drains 78, 86, 88, 93 drawdown 22, 60, 64 mapping 46, 49, 61, 66, 69, 73 drilling 47, 66, 88, 105 mitigation 1, 6, 8, 20, 22, 24, 26, 34, 36, 52-54, 56-58, 61, 62, 75, 96, 109, 113, 122, 126 earthflow 5, 22-25, 39 monitoring 10, 18, 46, 47, 52, 58, 74 electronic distance meter (EDM) 60 mudflow 61, 128 emergency 1, 35, 49, 50, 113, 122, 124, mudslide 61, 113 128 epicenter 60 excavation 6, 8, 22, 35, 52, 76, 77, 79, perched ground water 61 88,94 pore water, 61 expansive soils 60 reconnaissance geology/mapping 61 factor of safety 60, 91 relief 61 field reconnaissance 46 remote sensing 73 fracture 60 retaining walls 6, 10, 12, 24, 25, 44, 52, 53, 90, 99, 112 risk 5, 26, 48, 58, 61, 70, 76, 128 geodesic/geodetic measurements 60 rockfall 5, 7, 49, 50, 53, 79, 99, 100, Geographic Information System (GIS) 102, 104, 107, 129 60 rock mechanics 61, 76 geologic hazard 60 rotational landslides 76 geologic map 60, 68 geomorphology 46, 60 geophysical studies 60 safety 1, 36, 48–50, 60, 91, 127

sag pond 61

Publishing support provided by: Denver Publishing Service Center

Manuscript approved for publication May 5, 2008 Edited by Mary Kidd Designed and prepared by Margo VanAlstine with assistance from Carol Quesenberry

For more information concerning this publication, contact: Team Chief Scientist, USGS Geologic Hazards Box 25046, Mail Stop 966 Denver, CO 80225 (303)273-8579

Or visit the Geologic Hazards Team Web site at: http://geohazards.cr.usgs.gov/