



FEMA

RECOVERY POLICY

RP9524.2

I. TITLE: Landslides and Slope Stability Related to Public Facilities

II. DATE: OCT 8 2010

III. PURPOSE:

This policy determines the eligibility of emergency work to protect eligible facilities threatened by landslides or slope failures that are the direct result of Presidentially-declared emergency or disaster; as well as the eligibility of permanent repairs to eligible facilities damaged by landslides or slopes that failed during an event that resulted in a Presidentially-declared emergency or major disaster.

IV. SCOPE AND AUDIENCE:

The policy is applicable to all major disasters and emergencies declared on or after the date of publication of this policy. It is intended for use by personnel involved in the administration of the Public Assistance Program.

V. AUTHORITY:

Sections 403, **Essential Assistance**, 406, **Repair, Restoration, and Replacement of Damaged Facilities**, and 502, **Federal Emergency Assistance**, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S.C. 5121-5206, and Title 44 Code of Federal Regulations (CFR) Part 206, **Federal Disaster Assistance**.

VI. BACKGROUND:

A landslide is the downward and outward movement of slope-forming materials, such as rocks, soil, and artificial fill. Landslides are generally caused by triggering events (e.g., earthquakes, heavy rains, floods, and volcanic activity) that may destabilize or weaken an earthen slope and cause it to fail. A triggering event increases the gravitational influence on the slope, which overburdens the slope's resisting strength causing it to fail. Slope saturation by water is the most common triggering event that causes landslides. Periods of intense rainfall, rapid snowmelt, or changes in groundwater levels can saturate the upper part of a slope and weaken its slope-forming material and cause it to fail.

Landslides may also be triggered by human activity. The excavation of a slope, placement of fill at its crest, deforestation and overgrazing, irrigation, mining, road building and the drawdown



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of reservoirs can weaken a slope's stability. While landslides generally occur in mountainous regions, they can also occur in low-relief areas as a result of cut-and-fill failures caused by activities such as roadway or building excavations, or the collapse of mine-waste piles. Improperly or poorly conceived construction projects can cause slope failures by increasing slope angle, decreasing the slope's toe or lateral support, loading the head of an existing or potential landslide, or inducing slope creep. Additionally, structures that are built on expansive soils, such as clay, clay stone or shale – which shrink or swell in relation to the moisture content of the soil – may experience shifting, cracking, and breakage.

Slopes that have failed can be expected to experience future slope failures as a result of the same geologic, geomorphic, and hydrologic conditions that caused past and present failures. However, the absence of a past event in a specific area does not preclude future slope failures. All slopes are unstable in geological time. The geologic history of an area directly determines or contributes to the conditions that lead to slope failures. While physical measures can be taken to attempt to control or stabilize failed slopes, it is not possible or feasible to prevent all slope movements. See FEMA 182, **Landslide Loss Reduction: A Guide for State and Local Government Planning**, Earthquake Hazards Reduction Series 52 for additional information.

VII. POLICY:

A. Definitions

1. Artificial fill refers to a foundational layer of well-graded soil material that is designed and compacted to engineered specifications in order to support a roadbed, building, or other structure.
2. Debris flow refers to rapid mass movement in which loose soils, rocks, and organic matter combine with entrained air and water to form slurry that flows downslope.
3. Immediate threat is defined in 44 CFR §206.221(c), **Definitions, Immediate Threat**, as "the threat of additional damage or destruction from an event which can reasonably be expected to occur within five years;" i.e., a 20 percent chance of occurrence per year.
4. Integral ground refers to natural or improved ground upon which an eligible facility is located and which is essential to support the structural integrity and utility of the facility.
5. Landslide refers to the downward and outward movement of slope-forming materials including soil, artificial fill, or a combination of these materials.



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6. Natural ground refers to unimproved ground existing at its original location of formation or deposition that has not been reworked, mechanically altered, constructed, or improved. Natural ground may constitute part of the integral ground supporting a facility. (See Attachment, Figures 1 and 2.)

7. Slope creep refers to imperceptibly slow, steady downward movement of slope-forming material. The movement is caused by shear stresses that are sufficient to cause permanent deformation of the slope but too small to produce an immediate slope failure.

8. Slope failure refers to limited ground movement, tens of feet high and up to several hundred feet long, which transports earthen debris downhill by sliding, rolling, falling, or slumping.

B. Eligible Work

1. Section 403, **Essential Assistance** (42 U.S.C. 5170b)

Pursuant to 44 CFR §206.225(a)(3), **Emergency Work, General**, FEMA may fund emergency protective measures to stabilize slopes that failed as a direct result of a Presidentially declared disaster if the measure (1) lessens or eliminates immediate threats to life, public health and safety; or (2) is cost effective and lessens or eliminates immediate threats of significant additional damage to improved property. Emergency protective measures should be the least costly option necessary to alleviate the threat and should be consistent with sound engineering practice.

a) Reasonable costs for site inspections and limited geotechnical assessments to determine if the failed slope poses an immediate threat to lives, public health and safety, or improved property are eligible.

b) Examples of eligible emergency protective measures include but are not limited to:

- i. Temporary drainage measures;
- ii. Temporary ground protection to better stabilize the mass (e.g., riprap, sheeting);
- iii. Partial excavation at the head of a sliding mass to reduce driving force;



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- iv. Backfilling or buttressing at the toe of a sliding mass (e.g., gabions, rock toes, cribwalls, binwalls, soldier pile walls);
- v. Installation of barriers to redirect debris flows; and
- vi. Temporary relocation of a facility's function.

2. Section 407, **Debris Removal** (42 U.S.C. 5173)

Pursuant to 44 CFR §206.224, **Debris Removal**, removal of debris generated by a slope failure is eligible when necessary to eliminate immediate threats to life, public health and safety or eliminate immediate threats of significant damage to improved property, or to ensure the economic recovery of the affected community to the benefit of the community-at-large.

3. Section 406, **Repair, Restoration, and Replacement of Damaged Facilities** (42 U.S.C. 5172)

FEMA must determine the stability of the site where the damaged facility is located before it can approve funding to repair or restore an eligible facility and its integral ground. Reasonable costs for site inspections and limited geotechnical assessments to determine site stability and the exact cause of the slope failure are eligible.

a) If the site is stable, FEMA will fund the permanent repair or restoration of an eligible facility and its integral ground.

b) If the site is unstable and the instability is the direct result of the declared disaster (i.e., there is no evidence of instability after the facility was constructed and before the disaster), FEMA will fund the permanent repair or restoration of an eligible facility and its integral ground.

c) Pursuant to 44 CFR §206.226(g), *Relocation*, FEMA may approve the permanent relocation of a facility if it determines that the facility is and will be subject to repetitive heavy damage. FEMA will make this determination on a case-by-case basis. If the site will likely fail again, FEMA may determine that it is not wise to restore the eligible facility in its original location. If FEMA approves permanent relocation of a facility, eligible work would include land acquisition and ancillary facilities, such as roads and utilities, and demolition and removal of the old facility.



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d) Pursuant to 44 CFR §206.203(d)(2), **Federal Grant Assistance**, *Funding Options, Alternate Projects*, an applicant may request an alternate project if the repair, restoration, or replacement of a facility is not feasible due to soil instability. (See Attachment, Figure 3). Additional guidance is available in Disaster Assistance Policy DAP9525.13, *Alternate Projects*.

e) Pursuant to 44 CFR §206.226(e) **Restoration of damaged facilities**, *Hazard mitigation*, FEMA may provide discretionary hazard mitigation funding under Section 406 of the Stafford Act in conjunction with the repair of eligible disaster-damaged facilities. The mitigation measures must be related to eligible disaster-related damage and should directly reduce the potential of future, similar disaster damages to the eligible facility. This work is usually performed on the parts of the facility that were actually damaged by the disaster. FEMA will consider exceptions to this provision on a case-by-case basis:

- i. Mitigation measures must be cost effective and appropriate for the damaged facility and address the triggering event that caused the slope failure.
- ii. Mitigation measures should not require or induce further destabilization of the slope during work.
- iii. When possible, mitigation measures should increase slope stability by reducing the amount of ground water that is able to collect and rise in the slope or collect in the foundation of a facility.
- iv. Mitigation may include replacing failed integral ground with fill that is well-graded material, designed and compacted to engineered specifications to support the eligible facility.

C. Ineligible Work

1. Permanent repair to stabilize natural ground that is not integral to an eligible facility's function is ineligible. (See Attachment, Figure 2).
2. Permanent repair or restoration of natural ground is ineligible.
3. Restoration of a facility's integral ground is ineligible if the site instability was NOT caused by the disaster (i.e., there is evidence of instability after the facility was constructed and before the disaster).



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VIII. RESPONSIBLE OFFICE: Recovery Directorate (Public Assistance Division)

IX. SUPERSESSION: This policy supersedes Recovery Policy RP9524.2, *Landslides and Slope Failures*, dated May 23, 2006.

X. REVIEW DATE: This policy does not automatically expire, but will be reviewed three years from the date of publication.

A handwritten signature in cursive script, appearing to read "Deborah Ingram", written over a horizontal line.

Deborah Ingram
Acting Assistant Administrator
Recovery Directorate



Attachment

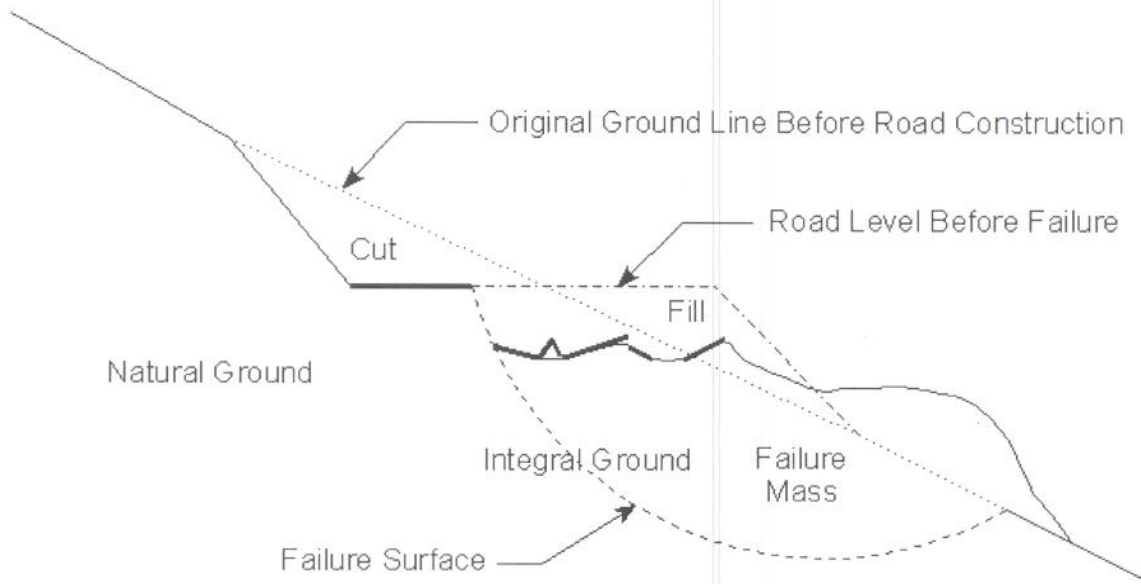


Figure 1: Slope failure in a typical cut-and-fill road section. Restoration of integral ground is a necessary component of work required to repair the road, and would involve excavation slightly beyond the limits of the failure surface.



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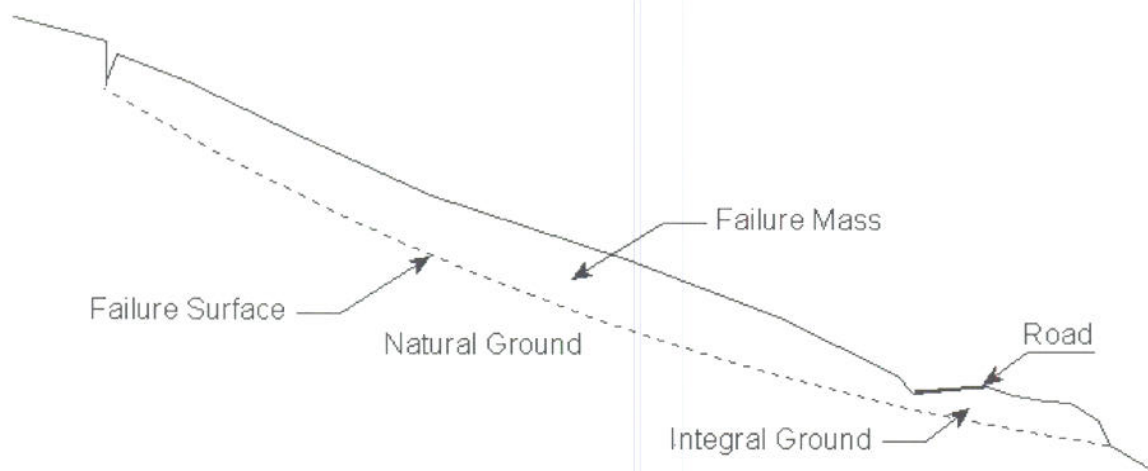


Figure 2: Failure of a large lateral extent of natural ground. The failure mass which threatens the road, an eligible facility, is primarily comprised of natural ground. The segment of natural ground integral to the support of the road is eligible for repair or restoration. The natural ground along the failed slope is not integral to the road's support and is subsequently ineligible for Public Assistance funding.



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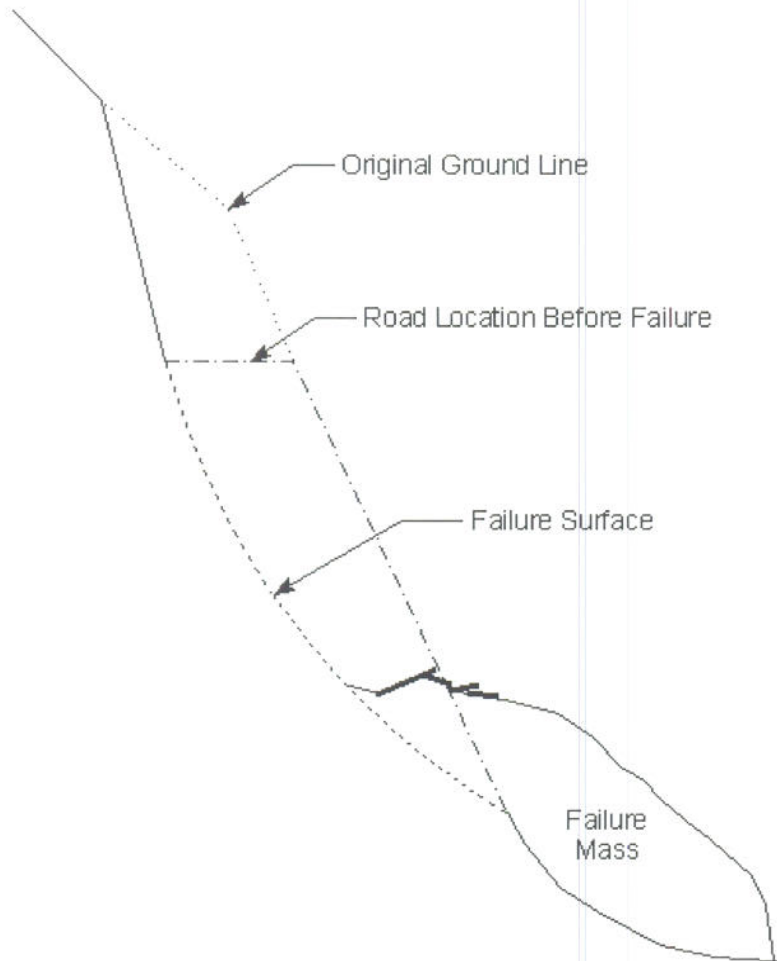


Figure 3: Special Considerations and Alternate Projects. This figure demonstrates a failure of a slope along a road constructed by excavating into a hillside. In this case, it may be more cost effective to pursue other options, such as an alternate project, under the Public Assistance Program.