

Reclamation Manual

Directives and Standards

Subject:	Landslide Surveillance Program
Purpose:	The purpose of the Landslide Surveillance Program is to decrease the potential for damage and loss of life as a result of landslides. Also of concern are operational impacts to associated facilities located in, or adjacent to, landslide areas. This Directive and Standard (D&S) establishes the requirements for landslide surveillance and reporting.
Authority:	Reclamation Project Act of 1902 and Supplementary Acts
Approving Official:	Director, Dam Safety and Infrastructure
Contact:	Asset Management Division (86-67200)

1. **Introduction.** The Landslide Surveillance Program was established to monitor landslide areas associated with the construction or operation of project facilities for which the Bureau of Reclamation is responsible and that pose a significant threat to Reclamation personnel and public safety or could result in substantial property damage.
2. **Applicability.** This D&S applies to all Reclamation staff and offices having jurisdiction and oversight responsibility for known landslide areas, or those areas recognized as having potential for landslides at, or adjacent to, Reclamation facilities that could be affected by operations or could affect operations, access, structural stability of the facility, or safety of Reclamation personnel and the public.
3. **Landslide Register Data and Format.** Dam Safety and Infrastructure's Asset Management Division (AMD), in coordination with the Technical Service Center (TSC) Engineering Geology Group, will maintain a comprehensive listing of landslide areas with descriptive data in Geographic Information System (GIS) database format. The Landslide Register will include known landslide areas and areas with potential for future soil or rock slope movement.
 - A. AMD will assign a program lead to administer the Landslide Surveillance Program and manage Landslide Register activities in coordination with the Landslide Register Coordinator.
 - B. The TSC Engineering Geology Group will assign a Landslide Register Coordinator to manage the landslide database and coordinate with regional geologists to update the information in the database.
4. **Landslides to be Reported.** Regional geologists are responsible for coordinating the use of the Landslide Register to report known and potential landslide areas that have been, or could be, aggravated by the construction or operation of Reclamation project facilities and pose a

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potential hazard to Reclamation personnel, the public, project facilities, or private property. In emergencies, the facility's Emergency Action Plan will dictate notification procedures.

- A. **Landslides Near High and Significant Hazard Potential Dams.** Regional geologists will promptly report observations of any unusual or new occurrences to the following individuals: Landslide Register Coordinator, Dam Safety Office program manager for the region, and Landslide Surveillance Program Lead. For new occurrences, the regional geologist will also request a meeting with a Technical Review Team to discuss the condition and make recommendations regarding facility operations and remedial actions, if needed.
 - B. **Landslides Near Associated Facilities (Facilities Other Than High and Significant Hazard Potential Dams).** For unusual or new landslide areas observed near or around associated facilities, regional geologists will notify the Landslide Register Coordinator and the Landslide Surveillance Program Lead.
 - C. **Landslides Near Power Facilities.** If unusual or new landslide areas are observed adjacent to power facilities, regional geologists will promptly notify the TSC Hydropower Diagnostics & SCADA Group manager, Power Resources Office manager, Landslide Surveillance Program Lead, and Landslide Register Coordinator.
 - D. **Other Potentially Affected Areas.** The regional geologist will promptly notify the Landslide Register Coordinator and the Landslide Surveillance Program Lead of unusual or new landslide areas observed on federal land adjacent to recreation areas, utility crossings, easements, private property, etc.
 - E. **Slides During Construction Activities.** Landslide conditions created during construction of a project are to be inspected and documented by a qualified geologist prior to continuation of work, and the regional geologist will promptly notify the Landslide Register Coordinator and the Landslide Surveillance Program Lead. The landslide may be omitted from the Landslide Register if the entire landslide area is removed during construction. Landslides that are not removed must be reported in the Landslide Register.
 - F. **Deletion of Landslides from the Landslide Register.** If the regional geologist determines that a landslide in the Landslide Register no longer meets the reporting criteria of this program, the regional geologist will notify the Landslide Register Coordinator. The Landslide Register Coordinator will preserve the historical data associated with the landslide by maintaining a list of inactive landslides in the GIS database.
5. **Instructions Regarding Landslide Surveillance and Operating Restrictions.** Each region's operation and maintenance (O&M), geology, and geotechnical personnel will jointly review proposed instructions pertaining to landslide surveillance and operating

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restrictions prior to including them in the Standing Operating Procedures (SOPs). Associated facilities may need special instructions documented where no SOPs exist.

6. **Landslide Register Updates.** Regional and area office staff with responsibility for maintaining landslide data will update the Landslide Register throughout the year based on observations, measurements, and other data. Regional geologists will review regional data in the Landslide Register annually to ensure that the list of landslides and descriptive data are current. The regional geologist will notify the Landslide Register Coordinator of any significant changes to the data in the Landslide Register. The Landslide Register Coordinator will review the regional updates to the Landslide Register data annually and submit a verification of program data to the Landslide Surveillance Program Lead, with copies to the Dam Safety Office and the TSC Geotechnical Services Office.
7. **Regional Files and Special Reports.** Each region will maintain a file on each landslide area listed in the Landslide Register and will store all existing and new records for each site. Record copies of the completed technical evaluation reports with all revisions will be maintained in the Facilities site of the Enterprise Content System (ECS). The regional geologist is responsible for notifying TSC Geotechnical Services Division of new or unusual landslide activities judged to pose a hazard to Reclamation project operations, facilities, personnel, or the public.
8. **Landslide Classification.** Landslides will be classified and appropriate information provided in accordance with “Landslide Register Data Requirements.”
9. **Landslide Examinations.**
 - A. **Examinations of Landslides Near High and Significant Hazard Potential Dams.**
 - (1) Area managers will ensure that active landslides listed in the Landslide Register, and unlisted landslides that are actively moving, will be examined by qualified regional or area office personnel and revised or new data uploaded to the Landslide Register in accordance with guidance provided by the TSC Engineering Geology Group.
 - (2) Landslides will be examined annually unless otherwise specified in the SOP or the Schedule for Periodic Readings (Form L-23). Each region’s O&M and geology or geotechnical personnel will coordinate to budget and schedule landslide examinations and reporting.
 - (3) The Comprehensive Review (CR) process will be used to evaluate landslides that have the potential to cause dam failure or impact appurtenant facilities at the dam. The CR team will identify landslides with potential to cause or contribute to the failure of a high or significant hazard potential dam.

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- B. Examinations of Landslides Near Associated Facilities (Facilities Other Than High and Significant Hazard Potential Dams).** The regional director, or manager with delegated responsibility for managing a facility, with input from geologic and geotechnical staff, will determine the hazard of this type of landslide, monitoring frequency, and if mitigation is necessary. However, no overall risk will be assigned to this type of landslide in the Landslide Register.
- C. Examinations of Potential or Inactive Landslides.** Potential and inactive landslides will be examined at least once every three years. Special examinations will be made following unusual events listed under paragraph 10.E of this D&S.
- D. Examination Scheduling.** As appropriate, examinations of landslides that would directly affect high and significant hazard potential dams will be coordinated among regional office geologic and geotechnical staff, area offices, and the TSC Inspections and Emergency Management Group. Regional geologists will be responsible for determining the appropriate expertise, qualifications, and experience necessary for staff to conduct these examinations. Landslide examinations related to facilities reviewed under regional Periodic Facility Reviews (PFRs), or reviews under the Associated Facilities Review of Operation and Maintenance (RO&M) Program, will be coordinated among regional and area office personnel when landslide examinations do not coincide with a PFR or RO&M examination.
- E. Special Examinations.** Active landslides listed in the Landslide Register will be examined immediately following unusual events, including seismic events, significant or rapid reservoir drawdowns, heavy precipitation, or fire. Special examinations will be performed by the regional or area office personnel, or the TSC at the request of regional office geologic and geotechnical staff.
- F. Funding.** Unless otherwise noted, costs associated with the periodic examination and monitoring of landslides will be non-reimbursable. Evaluations of landslides required to address dam safety issues will be funded in accordance with the requirements of Reclamation Manual (RM) Policy, *Decisions Related to Dam Safety Issues* (FAC P02).
- G. Policy, Guidance, and Training.**
- (1) The Director, Dam Safety and Infrastructure is responsible for establishing and maintaining policy and D&Ss for landslide surveillance and reporting as well as coordinating and providing training, facility review workshop opportunities, and other related activities for involved Reclamation offices and staff.
 - (2) The Chief, Dam Safety Office is responsible for incorporating guidance on landslide surveillance into formal facility reviews under the SEED Program for high and significant hazard potential dams.

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10. Reports.

A. Written Reports of Special Examinations.

- (1) All special examination reports with recommendations on public safety posting, operating requirements, observation procedures, and remedial/stabilization plans will be reviewed by the regional geological or geotechnical representative and uploaded to ECS. The appropriate region, O&M, Geology/Geotechnical, and Dam Safety Offices will be consulted in developing recommendations.
- (2) Teams conducting CRs, PFRs, or RO&M examinations of a facility potentially affected by landslide areas will review the Landslide Register during the review process and request information on the implementation of established landslide surveillance procedures and approved recommendations. A discussion of the status will be included in the "Landslide" subparagraph of the Evaluation of Design, Analyses, and Construction section of the CR report. Regional Geologists' reports and recommendations on remedial actions concerning landslide areas, which could affect the structure being examined, will be made available to the regional office and TSC Geotechnical Services Division, Dam Safety Office, and AMD for landslides posing a risk of dam failure, before the examination.

B. Recommendations. If it is determined during an examination or review of a dam or associated facility that a landslide has not been formally examined, or a new landslide has been identified for inclusion in the Landslide Register but has not been entered, then a Category 2 O&M Recommendation will be made and included in the Evaluation of Design, Analyses, and Construction section of the CR or PFR report, or in the RO&M examination report, as applicable.

C. Photographs and Distribution of Examination Reports. Current photographs of all landslides identified as high hazard in the Landslide Register will be attached to written examination reports. Reports will be uploaded to ECS and notifications sent to the Landslide Register Coordinator, Dam Safety Office, and AMD.

11. Related D&Ss and Other Documents. For related and supporting RM D&Ss, see *Review of Operation and Maintenance (RO&M) Program Examination of Associated Facilities (Facilities Other Than High- and Significant-Hazard Dams)* (FAC 01-04); *Review/Examination Program for High and Significant Hazard Dams* (FAC 01-07); *Power Review of Operation and Maintenance (PRO&M) Program* (FAC 04-01); and *Guidelines for Comprehensive Facility Reviews, Section XIV entitled "Guidelines Regarding Landslide Evaluation."*

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12. Definitions.

- A. **Associated Facilities.** Reclamation water-related facilities, other than high- and significant-hazard dams, as defined in FAC 01-04 (<https://www.usbr.gov/recman/fac/fac01-04.pdf>).
- B. **High and Significant Hazard Potential Dams.** All dams presently classified as such under Reclamation's Safety Evaluation of Existing Dams Program, where failure or misoperation of the dam would probably cause loss of human life or would cause appreciable economic, environmental, or lifeline losses (rural area with notable agriculture, industry, work sites, or outstanding natural resources).
- C. **Landslide Hazard.** Potential for impacts associated with movement or failure of a soil or rock slope at, or adjacent to, Reclamation facilities that could affect operation, access, structural stability of the facility, or safety of Reclamation personnel or the public. Landslide hazards are categorized qualitatively by Reclamation personnel who possess a comprehensive understanding of landslide classification, movement processes, and likely failure velocity. The degree of hazard is classified as high, moderate, low, or nil. Potential and inactive landslide areas have the potential for movement or display evidence of historic movement. Categorization of hazards is influenced by the size (volume); proximity to structures including dams, associated facilities, and other property; and/or exposure to risk for Reclamation personnel and the public.

- 13. **Review Period.** Certification by the originating office will not exceed 4 years.

RECLAMATION MANUAL TRANSMITTAL SHEET

Effective Date: _____

Release No. _____

Ensure all employees needing this information are provided a copy of this release.

Reclamation Manual Release Number and Subject

Summary of Changes

NOTE: This Reclamation Manual release applies to all Reclamation employees. When an exclusive bargaining unit exists, changes to this release may be subject to the provisions of collective bargaining agreements.

Filing instructions

Remove Sheets

Insert Sheets

All Reclamation Manual releases are available at <http://www.usbr.gov/recman/>

Filed by: _____

Date: _____