5.0 Accident Analysis

5.1 Introduction

Trail construction and use are relatively low-risk activities that can be expected to have minimal effects from accidents on workers and trail users. This chapter analyzes potential accidents associated with the three alternatives for trails management at LANL. The Proposed Action (establishment of a Trails Management Program) is discussed first, followed by a comparison of the Trails Closure Alternative and the No Action Alternatives. This section considers the activities of trails development and maintenance under construction hazards and trail use under operational hazards. Guidance used for the development of this section is primarily from the document titled *Analyzing Accidents Under NEPA* (DOE 2002).

An accident is an unplanned event or sequence of events that results in undesirable consequences. Accidents may be caused by equipment malfunction, human error, or natural phenomena. Accidents have an estimated frequency of occurrence of once per ten years to once per one million years (1×10^{-1}/yr to 1×10^{-6}/yr); whereas, occupational health incidences are expected, occurring at an estimated frequency of greater than or equal to once per year ($\geq 1 \times 10^{0}$/yr). For example, an occupational health incident might be a cut or animal bite; an accident might be a worker being struck by lightning. Accident impacts are often, but not always, much greater than occupational health impacts. The accidents of highest consequence that are likely to receive the most complete analyses are exposure to radiological or hazardous materials and lightning strikes.

Under NEPA, the purpose of performing accident analyses for this programmatic EA is to weigh accident issues among the trails alternatives such that the DOE can consider this information for making their decision on which alternative to pursue. The objectives are to (1) characterize the overall risk of injury, illness, or death to workers or the public resulting from accidents and (2) realistically qualify and/or quantify the increment in risk among the alternatives. The level of complexity of the analyses needs to be commensurate with the significance of the hazards.

The SWEIS (DOE 1999a) established the baseline risk for operations at LANL, and the accident analyses in this section tiers from the SWEIS to the extent possible. For example, the risk to trail users of an exposure to radiation or hazardous chemicals from an accident at LANL can be based on existing source terms in the SWEIS, but the main difference to be considered is the distance from the facility to persons on the trails.

Following DOE guidance, the process used to ultimately analyze accidents for trails activities included the identification and screening of accidents, the estimation of accident likelihood and potential consequences and health effects, and the estimation of risk. A limited spectrum of accidents was established that enabled the analysis of incremental risk, if any, for each alternative. Under the Proposed Action, it is anticipated that only standard industrial activities and processes would be performed, resulting primarily in potential accidents that are common to many other agencies nationwide that manage forested lands. As such, postulated accidents that occur on LANL trails are expected to affect only persons using or working on the trails.

5.2 Construction Accidents

Potential accidents were identified as being associated with the maintenance and upkeep of existing trails; the development of new trails; and the reclamation of trails. Accident

identification considered those hazards associated with cutting and vegetation removal, including the use of chainsaws, chipping, hand-held digging, and other mechanical processes; falling tree limbs, rockslides, and flash floods; lightning, wildfire, and other natural hazards; and the use of small construction vehicles and trucks. Workers developing or maintaining trails could potentially be exposed to radiation or hazardous chemicals in or from a PRS or from a release from an accident at a LANL facility. This accident type is considered under Operations Accidents.

Accidents were screened on the basis of suggested DOE criteria (DOE 2002). A wide range of effects can result from these activities, including minor perturbations such as scrapes, cuts, and bruises as well as more serious injury, illness, and death. These minor perturbations were screened out. Statistics on rates of illness, injury, and death are available for the occupation of forestry and were consulted and applied to this project (NSC 1994). In general, the risk of injury or death is extremely low so no serious accidents are expected from potential construction activities.

5.3 Operations Accidents

Operations are considered to be the phase of the Proposed Action or alternatives where trails are used by the general public or LANL workers. The traditional approach of accident analyses performed at LANL under NEPA has been to postulate accidents that originate at a facility, operation, or activity that is specifically and directly associated with the Proposed Action and to analyze effects that could occur to receptors located outwardly from the facility of origin. Trail using members of the public would be within the LANL boundary, so this NEPA analysis considers effects that could result from LANL's industrial setting upon these people, specifically effects that could occur in the vicinity of subject facilities of concern (DOE 1997).

Accidents involving the potential release of radiological or hazardous materials are somewhat unique to DOE facilities and were given special consideration for the Proposed Action because of public interest in this subject. Trail users represent receptors that could potentially be out of hearing range of LANL sirens or alarms; therefore, trails users would not necessarily be subject to DOE/LANL evacuation procedures. The potential effects from this type of accident are applicable to trails construction and maintenance workers as well as the public and other classes of users. However, in general, the risk of injury to the public from an operations accident at LANL is extremely low so no serious consequences are expected from potential operations accidents.

5.4 Comparison of Alternatives

5.4.1 Proposed Action

Trail construction and use are relatively low-risk activities that can be expected to have minimal effects on workers and trail users from accidents. Trails development, construction, management, and use are not inherently risky activities because the frequency of high-consequence accidents such as a person being struck by lightning or being consumed by wildfire is low. Under the Proposed Action there would be more trails work, maintenance, and, possibly, trail use, creating more opportunities for accidents; however, the risk would be reduced by enhanced training and worker protection, a safer design to the trail system, better maintenance,

and more safety information such as warning signs and alarms; all of which would occur under a Trails Management Program.

5.4.2 Trails Closure Alternative

As previously discussed, under this alternative there would be fewer trails and use would be restricted to workers at LANL and officially invited guests. Accident frequencies would be even less than with the Proposed Action. Generally, this alternative is the safest with regard to potential accident impacts because there would be fewer trails and less use of the remaining trails. In addition, fewer worker hours would be spent on trails. This alternative would most likely have a lower likelihood of accidents than the Proposed Action, which is expected to be minimal.

5.4.3 No Action Alternative

The No Action Alternative would include the continuation of current minimal trail maintenance and current use rates. No approved new trails would be constructed and only minimal improvements would be made to existing trails. Workers at LANL and some members of the public would continue to use existing trails and they may create new, unapproved trails. This alternative has the highest risk, comparatively, with regard to potential accidents because the controls that are applied under the proposed Trails Management Program that mitigate hazards are either non-existent or less effectively applied under this alternative. Nevertheless, like the other alternatives, trail use under this alternative is a relatively safe activity with high-consequence accidents likely to be absent.

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