

APPENDIX E
HAZARD POTENTIAL CLASSIFICATION

E-1. Discussion. The current classification system used to evaluate the hydrologic hazard potential of dams was established in response to several dam failures in the early 1970's which resulted in significant loss of life and property damage. This classification system while useful for the evaluation of hazard to life and property, is deficient in that it does not consider the indirect losses of critical lifelines due to a dam failure. These losses, such as the loss of water supply, loss of key transportation or medical facilities, loss of power generation capability, or loss of navigation and environmental damage can have a significant impact on the public after a major hydrologic or seismic event. Some attempt has been made in the past to consider lifeline and environmental losses as economic losses; however, a standard classification system has not been established.

An additional deficiency in the existing classification system is in the potential loss of life posed by the significant and high classifications. The terms "few" under the significant category, and "high potential" under the high category are too vague and subject to interpretation. The following

is an attempt to quantify the loss of life associated with each level of hazard.

E-2. Classification System. Table E-1 establishes a classification system which groups losses into four general categories: loss of life, property, lifeline and environmental losses. This hazard classification is related to the functional integrity of the project, not the structural integrity of project features or components. Direct loss of life is quantified as either none, certain (one or more) or uncertain. Economic indirect losses are classified as either direct property, environmental or lifelines losses. Hazard ratings are based entirely upon the proximity of the project to population which would be at risk due to project failure or operation, and the impact upon life and property of the loss of essential services. A more detailed discussion on each of the four categories follows:

a. Loss of Life. If there is certainty that one or more lives will be lost due to failure or incorrect operation of the project, the project should be classified as high hazard. This certainty should be due to extensive residential or industrial development in the flood plain downstream of the project, and

should be confirmed by inundation mapping which considers population at risk, time of flood wave travel and warning time. If the loss of life potential is uncertain because the downstream flood plain development is predominately rural or agricultural, or is managed so that the land usage is for transient activities such as with day-use facilities, then a significant hazard rating should be appropriate. Only those projects with no permanent downstream development located in rural or agricultural areas with no expected loss of life can be considered to have a low hazard potential.

b. Property Losses. Property losses are classified as either: direct economic losses due to flood damaged homes, businesses, and infrastructure; or indirect economic losses due to the interruption of services provided by either the failed facility or by damaged property or infrastructure downstream.

Examples of indirect losses include:

(1) Loss of power generation capability at the failed dam (or at an inundated powerhouse downstream).

(2) Loss of navigation due to evacuation of the navigation pool at a failed

reservoir (or due to direct damage to a lock).

(3) Loss of water supply due to a reservoir emptied by a failed dam.

c. Lifelines Losses. Disruption of essential lifeline services or access to these services during or following a catastrophic event can result in indirect threats to life. The loss of key transportation links such as bridges or highways would prevent access to medical facilities at a time critically injured people need access the most. Another example would be the loss or damage to medical facilities.

d. Environmental Losses. Damage to the environment caused by project failure or operation can result in the need for mitigative measures, or can cause irreparable damage to the environment. Environmental damage estimates should consider the damage which would normally be caused by the flood event under which the project failure occurs. Only the incremental damage caused by the project failure should be attributed to project failure or operation. Some other examples of environmental impacts are:

(1) Environmental damage caused by the release of a reservoir contaminated by toxic or hazardous mine waste.

(2) Environmental damage caused by sediment released by a reservoir.

E-3. See Table E-1 for classifying Civil Works projects as low, significant, or high hazard.

TABLE E-1: HAZARD POTENTIAL CLASSIFICATION FOR CIVIL WORKS PROJECTS

<u>CATEGORY</u> ¹	<u>LOW</u>	<u>SIGNIFICANT</u>	<u>HIGH</u>
Direct Loss of Life ²	None expected (due to rural location with no permanent structures for human habitation)	Uncertain (rural location with few residences and only transient or industrial development)	Certain (one or more extensive residential, commercial or industrial development)
Lifeline Losses ³	No disruption of services - repairs are cosmetic or rapidly repairable damage	Disruption of essential facilities and access	Disruption of critical facilities and access
Property Losses ⁴	Private agricultural lands, equipment and isolated buildings	Major public and private facilities	Extensive public and private facilities
Environmental Losses ⁵	Minimal incremental damage	Major mitigation required	Extensive mitigation cost or impossible to mitigate

Notes:

1. Categories are based upon project performance and do not apply to individual structures within a project.

2. Loss of life potential based upon inundation mapping of area downstream of the project. Analyses of loss of life potential should take into account the extent of development and associated population at risk, time of flood wave travel and warning time.

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3. Indirect threats to life caused by the interruption of lifeline services due to project failure, or operation, i.e., direct loss of (or access to) critical medical facilities or loss of water or power supply, communications, power supply, etc.

4. Direct economic impact of value of property damages to project facilities and down stream property and indirect economic impact due to loss of project services, i.e., impact on navigation industry of the loss of a dam and navigation pool, or impact upon a community of the loss of water or power supply.

5. Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond which would normally be expected for the magnitude flood event under a without project conditions.