Prepared for:
The Municipality of Anchorage Planning Department
and the Geotechnical Advisory Commission

Downtown Anchorage Seismic Risk Assessment & Land Use Regulations to Mitigate Seismic Risk

Prepared by:

MMI Engineering, Inc.
1915 63rd St. NE
Tacoma, Washington 98422

Project Number MMW550
Submitted to the Municipality on December 29, 2010

Finalized on March 25, 2013
by the Municipality of Anchorage
Community Development Department/Planning Division

Graben formation on 4th Avenue near C Street, Anchorage, 1964 Alaska Earthquake

Pressure ridge at toe of L Street slide, Anchorage, 1964 Alaska Earthquake

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DEFINITION OF TERMS

Bootlegger Cove Clay – clay deposit underlying downtown Anchorage that failed during the 1964 Alaska Earthquake.

Building Loss Ratio - dollar value of building damage (structural + non-structural) divided by building replacement value.

Casualty Severity Level – four point scale of the extent of injury, with 4 being the worst (death).

Design Ground Motion – shaking intensity for which a building is designed to perform at a prescribed level of performance such as life safety or continuous operation. The shaking intensity is provided at various shaking frequencies of vibration. The representative subsurface conditions for the ground motion must be specified such as whether it is on bedrock or at the surface where it has been amplified or deamplified.

Design Level Earthquake – earthquake ground motion selected for which the building structural design is prepared for a specified level of performance, i.e., collapse prevention.

Earthquake Scenario – a planning tool that defines the size, location, and intensity of an earthquake along with a description of the expected damage.

Fragility – relationship between shaking intensity and expected level of damage shown as a percentage.

Geologic Hazard – geologic structure that has the potential to fail resulting in loss of life or loss of property. Examples include landslides and liquefaction.

Graben – a block of ground forming behind or between larger blocks of ground that are moving apart. In some cases a graben can subside vertically such as occurred in the 1964 Great Alaska Earthquake in downtown Anchorage. (See Figure 1.2.)

Ground Failure – loss of soil bearing or structural capacity.

Hazard Risk – the probability of a hazard event occurring, coupled with the consequences of its occurrence.

HAZUS Model Building Type – system of building categories based on the type of structural system, e.g., braced steel frame, moment concrete frame, concrete shear wall, etc.

HAZUS Occupancy Class - buildings classified into three broad occupancy/use-related categories: residential, commercial/institutional, and industrial. These categories are used to determine the non-structural element make-up of the buildings and the nature and value of their contents.

Mat Foundation – large concrete foundation structure acting as a single element supporting a building. It could be thought of as a concrete barge supporting a building.

Maximum Total Deaths – the greater of day time and night time expected deaths.

North American Plate – tectonic plate covering the U.S. including Alaska, Canada, and the western side of the Atlantic Ocean.

Pacific Plate – tectonic plate covering much of the North Pacific, which moves northwest under the North American Plate in Alaska.

Pressure Ridge – soil plowed up in front of movement of large moving block of soil such as occurred in the 1964 Great Alaska Earthquake in downtown Anchorage. (See Figure 1.2.)

Probabilistic Ground Motion – the ground motion resulting from an earthquake with a given probability of occurrence in a defined time period (or recurrence interval), e.g., ground motion for an earthquake that has a 10% chance of exceedance in 50 years, or a 475-year return period.

Prototypical Building – a category of future typical buildings with specific use and parameters.

Seismic Hazard Zone (also Zone, Hazard Zone) – area with similar geotechnical parameters that would be expected to have similar response characteristics in an earthquake.

Sensitivity Analysis – the study of how the variation of one parameter in a model can affect the results.

Shake Map – A ground motion map produced by the USGS for earthquakes and earthquake scenarios.

Shallow Foundation – A foundation with structural members developing their capacity below frost level and/or just below the depth of the building basement. In the case of this study, a Shallow Foundation is intended to mean a series of small shallow foundations that perform independently with only limited structural interconnection with grade beams.

Subduction Fault – the interface of one tectonic plate sliding under another tectonic plate, e.g., the Pacific Plate subducting under the North American Plate.

ACRONYMS

ATC – Applied Technology Council

DHS – Department of Homeland Security

FEMA – Federal Emergency Management Agency

GIS – Geographical Information System

HAZUS – Hazards US

IBC – International Building Code

PGD – Permanent Ground Deformation

USGS – United States Geologic Survey