Geological Faults in the Texas Gulf Coast Region

The following guidelines present appropriate levels of investigative effort to provide information necessary for making sound judgements concerning the impact of geologic faults on development projects. These guidelines outline a reasonable level of effort that is intended- to satisfy the FHA-VA requirement for geologic fault studies. A greater or lesser scope of work may be appropriate for other types of projects.

Geologic fault studies are similar to flood plain studies in that they do not represent an exact or absolute warranty, but rather they provide a means for the management of risk.

The guidelines are divided into three levels of effort, termed phases.

Phase I

A Phase I investigation includes the following elements:

1. Literature Review. This includes a search for, and study of, published data on surface faults in the area of the site, including such sources as the U.S. Geological Survey fault maps, Houston Geological Society publications, professional papers, academic theses, and technical reports. It should also include study and interpretation of topographic maps as well as maps and papers on subsurface geology.

2. Remote Sensing Study. Aerial photographs and false color infra-red imagery, where available, should be studied. Airphotos of the area taken under various conditions and in several different years, including some taken prior to substantial disturbance or covering the natural ground surface, should be examined.

3. Field Reconnaissance. This includes a visit to the study area and vicinity by either a qualified geologist and/or qualified engineer to examine the area for physical evidence of a possible fault or faults. Physical evidence includes, but is not limited to, a) natural topographic scarps, b) soil layer displacements that may be recognized in ditches, creek banks and trenches, c) breaks in pavements, d) distress in existing buildings, and e) vertical offsets in fences.

In most cases, the Phase I study is sufficient to determine whether or not the probability of the existence of a fault on the site is high enough to warrant further study. However, in the event that after completion of the Phase I study, sufficient evidence is gathered to indicate that a fault may be present within the study area, a Phase II study is recommended.

Phase II

A Phase II study involves gathering new or existing subsurface data within an area determined in Phase I to potentially include a geologic fault.

Existing data can include logs of water, oil, and/or gas wells and data from previous investigations. These logs are effective in planning a geophysical borehole program and in some cases may eliminate the need for new geophysical borinqs.

Most investigations do require new geophysical borings. Borings are typically about 300 feet deep, except in those areas where specific data indicates shallow or greater depths are appropriate. The borings are drilled on a line about perpendicular to the anticipated surface trace of the fault, typically on 500 to 1000 foot centers. Additional borings may be required where stratigraphic conditions require further clarification. At least two borings are required to establish the presence or absence of a fault, one boring on either the upthrown or the downthrown side of the fault and one that clearly penetrates the fault. When fault penetration is not achieved, three holes must be drilled. Currently a downhole geophysical tool that records spontaneous electrical potential and single point resistance gives the best data for correlation of stratigraphy.

The relative vertical position of common sedimentary units revealed by the logs is analyzed to identify displacement that may be attributed to fault movement. If no evidence of displacement is established, the study may be terminated.

Phase III

If a geologic fault is found on the site, and its surface trace needs to be delineated, a third phase of investigation is required. A Phase III investigation utilizes electrical- ly logged boreholes, and/or topographic surveys to map the fault trace. Where a fault scarp with sufficient topographic relief is present, ground surface profiles surveyed by conventional techniques may be sufficient to locate the fault trace. In using geophysical borings, the fault should be penetrated with at least two borings, on one or more lines, about perpendicular to the fault trace, so that the surface position of the fault can be determined by upward projection from it's known subsurface positions. The number of borings to be drilled will be determined by such factors as the local variability of subsurface layers, characteristics of the fault, and the degree of accuracy which the fault trace must be located. Criteria developed for siting structures near the fault should consider the surface area disturbed by the fault, the uncertainties in locating the surface trace of the fault, and the clearance needed to provide an appropriate margin of safety.