Analysis the Faulting in Houston Area by Monitoring the Index Properties along I-10

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Abstract
In this study, the Houston area major faults along I-10 were identified using the USGS fault map. Ground data along I-10 were obtained from various sources. GIS software was used to effectively combine the flood channels, faults and the boreholes along I-10. Plotting of index properties, faults and Flood channels on single map showed that the index properties were affected by the presence of faults. The index properties like Liquid limit plotted at 3ft depth showed drastic variations over the fault location. The presence of flood channels along I-10 coincided with location of faults showing that the flood channels might be one of the causes to aggravate faulting.

1. Introduction

In geology, a fault is a planar fracture or discontinuity in a volume of rock, across which there has been significant displacement as a result of rock mass movement. Large faults within the Earth's crust result from the action of plate tectonic forces, with the largest forming the boundaries between the plates, such as subduction zones or transform faults. Energy release associated with rapid movement on active faults is the cause of most earthquakes.

The consequences of active faulting are many and, almost without exception costly and undesirable. Fault-related damage to residential, commercial, and industrial facilities and to the road net is commonly obvious, but perhaps of no greater importance than more subtle effects of faulting. Buried pipelines, for example, must experience the same amount of distortion as do streets and buildings at the surface, but damage becomes obvious only upon sudden failure of the pipe. Clogging of sewer lines by sediment and contamination of water supplies are known consequences that necessitate costly repairs.

The first and, to our knowledge, the only attempt to study short-term variations in fault movement was that of Reid (1973)[1], who, in 1971, installed instruments on three faults (Long Point, Piney Point East, and Eureka Heights) to measure both vertical and horizontal components of displacement.

2. Objective: The objective of the study was to find the dependence of faults on index properties.

3. Scope of the study

The total distance of the study was 21.5 miles from the starting to the ending point along I-10. The intersection of the faults and channels at corresponding distances is plotted in the along with the index properties. There were three major faults on the I-10, (Fig. 1&2)

1. Addicks Fault close to Addicks Howell and Katy freeway intersection
2. Long point fault with a rate of movement of 3.4cm/yr close to Beltway 8 and Katy Freeway intersection.
3. Piney point fault with a rate of movement of 0.3 to 2.3cm/yr.

4. Results and Discussion

For 3ft depth a total of 193 boreholes data was used. At 3ft depth, the presence of faulting was clearly indicated by the index properties showing abnormal changes. At 3ft the average liquid limit was 35 and standard deviation was 10 and a maximum of 79 was observed at the long point faulting system. (Fig.3). from the soil profiles along the long point fault, it was clearly evident that the faulting has moved the soil

layers in BR5-15 upwards and BR5-14 downwards leading to differential settlement. In BR5-14, the CH soil was found at 21ft from the top layer and was found at 19 ft. in BR5-15. Similarly the CL soil was found at 32 ft. from the top in BR5-14 and at 27ft in BR5-15. (Fig- 4)

Figure 1. Faulting in Houston area along with borehole data

Figure 2. Scope of the study along I-10

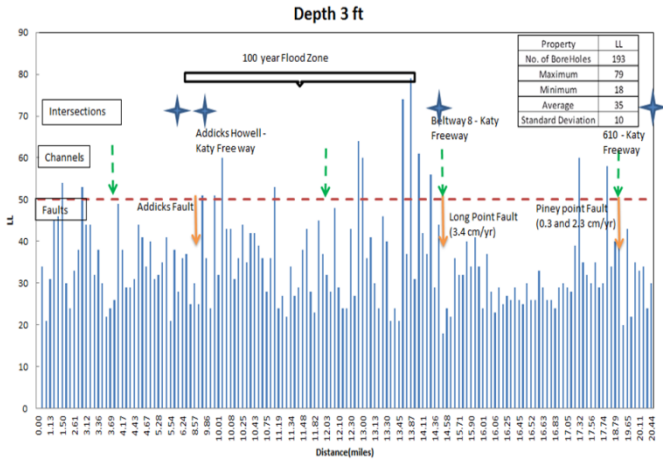

Figure 3. Liquid limit variation along I-10 with faults

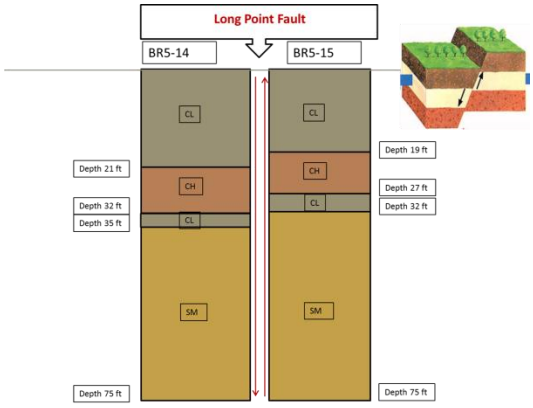

Figure 4. Soil profiles of two boreholes across the faulting

5. Conclusion

The variation of liquid limit shows that the flood channels mostly intersect with the faulting. The region before or after the faulting might experience a sudden change in index properties due to shift in the soil layers due to faulting.

6. Acknowledgements

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