CHAPTER X

CONCLUSIONS

The knowledge obtained in the present study done in various aspects, namely geologic, geomorphologic, geophysical, hydrologic,and field geotechnical investigations plus the results of the specimens laboratorial tests and back analyses on the slope stability, could be summarized as follows:

1) The highway embankment was constructed atop an active old natural landslide scarp in colluvial mass which is underlain by the bedrocks composing of impervious mudstone and siltstone of Phu Kradung Formation.

2) The filled material and colluvial mass are loose to medium and very loose to medium soils respectively. The permeability test on filled material and colluvial soil indicates a practically impermeable and poor drainage condition in these masses respectively.

3) The soil in the study area have a low swelling potential.

4) Soaked CBR test, the 1985-filled material is rating as poor to fair subgrade.

5) The natural water content of filled materials was almost at a saturated condition at shallow depth in period of high rainfall.

6) It was noted that surface flowage and subsurface

water in the recharge area above have fed into and been discharged in a zone in the embankment failure area. As the natural drainages in this discharge zone were blocked by the filled material, the artesian condition was observed both in the sliding mass and colluvial mass.

7) The slope failures were noted to relate directly to the intensity of rainfall.

8) The colluvial mass was expected to contain weak planes developed during creep or slide movement. These weak planes should locate at or adjacent to the colluvium/residual soil or /rock interface. The shear strength parameters along these weak planes thus should be reduced to their residual values. And as the failures of colluvial slopes mostly occur along these weak planes, these residual shear strength parameters are recommended for the stability computation.

9) The repeat cycle performance of consolidated drained reversing direct shear box tests was carried out to determine the residual shear strength of existing failure surfaces or shear zone soil.

10) Stability analysis of colluvial slopes was carried out in terms of effective stress. The failure surfaces of arbitrary shape or non-circular are the most common mode of failure for colluvial slopes. The ground water is critical factor that affects the stability of this slope. The factor of safety decreases where as the water level rises.

11) The failure surfaces with the least factor of safety for all modes of failures discovered coincided with major cracks of each failure at the ground surface.

The following conclusions are drawn from the above summaries.

1) The repeating landslides which control the embankment failure occurred as the highway was constructed atop a progressive natural landslide area.

2) A groundwater discharged zone was observed in this unstable area. As the construction of highway embankment was done to block the natural drainages being continue from the water discharge zone, an artesian condition occurs in the colluvial mass. The high pore water pressure together with the lowering of shear strength to the residual value along the existing failure surface are the major factors to accelerate the movement or controlling the stability of this slope.

3) Computation results also indicate that this colluvial slope is in unstable condition.