CHAPTER 5

CONCLUSION AND RECOMMENDATION

By applying the resistivity and very low frequency electromagnetic methods, the contamination of groundwater has been characterized. Most other case studies of the geophysical mapping of pollution about disposal sites similar results as this study. That is, resistivity survey is usually successful in outlining the broad pattern of contaminant plume where the contamination is concentrated. However, the suitability of a particular landfill site is suitable for specific geophysical monitoring or mapping depends on specific local geologic conditions. Consequently, each landfill site provides difference results. For this study, geophysical surveys at the Mae-Hia landfill site leads to the following conclusion:

1. Electrical resistivity and very low frequency electromagnetic surveys could be combined together to determine groundwater contamination at the Mae-Hia landfill site. The electrical properties of the subsurface might be directly related to leachate in groundwater. In the resistivity survey, low resistivity zones of less than 20 ohm-m might indicate the contaminant plume. In very low frequency electromagnetic survey, high relative current density zones might represent the contaminated zone.

2. Electrical resistivity sounding alone could be used to outline the contaminated area and also provide information concerning the distribution and geometry of a leachate plume. If the very low frequency electromagnetic survey is considered in isolation, the contaminant plume could not be interpreted easily. The obscure interpretation might be caused by the clay contents in the subsurface and/or power lines in the area. However, it might identify relatively broad areas of contaminant plume by detecting the edges of broad conductive zone. When compare with other methods, this method is also convenient, fast, and inexpensive.

3. The combination of geophysical surveys and available hydrochemical data of shallow well water near the landfill helped interpret that the pattern of contaminant migration extends east, northeast and southeast from the landfill along local groundwater flow direction. The depth of contaminated zone extends from 4 to 16 meters and its transverse width varies from 200 to 400 meters. The longitudinal length is at least 500 meters.

4. The geologic model of the study area can be obtained from geophysical surveys and available borehole data. Intermediate resistivities might correspond to fine-grained materials. The rising clay layer could in fact have produced the anomaly pattern, which could be misinterpreted as the aquifer contamination.

5. The comparison of resistivity obtained from geophysical surveys and the resistivity obtained from hydrochemical data show that, after being abandoned for more than 10 years, the landfill is still producing leachate that engender groundwater contamination. The higher concentration of chloride and total dissolved solids has decreased the resistivity of the groundwater.

The most obvious recommendation is that there is an evidence of the contaminant plume migration in the northeastern part of the area as seen in resistivity maps, but that the plume boundaries cannot be determined because of the lack of sounding stations in the northern part of area. Thus, more sounding stations in the northern and northeastern parts of study area may better define contaminant plume boundaries. Moreover, there is another evidence of the contaminant plume migration downward to the deeper aquifer as seen in resistivity profiles. Surveys with longer total electrode spacing and/or with other geophysical survey are recommended.

Since there are no borehole data in the study area, a simple geologic structure was interpreted instead of a complex structure in order to avoid departing greatly from the truth. The available borehole data used in this study were obtained from wells

located far from the study area. Thus, drilled wells are needed to verify the geophysical interpretation.

The comparison of resistivity obtained from geophysical surveys (aquifer resistivity) and that derived from hydrochemical data (resistivity of sampled groundwater) are not exactly in practicality. However, these two resistivities have a positive linear relationship (Archie's law) (Yang *et al.*, 1999).