

CONTENT

	Page
Chapter 1 Introduction	1
Chapter 2 Literature Review	
2.1 Water Resources	6
2.2 Groundwater	8
2.3 Increasing Water Supply	12
2.3.1 Diversions	
2.3.2 Damming	
2.3.3 Desalination	
2.3.4 Cloud Seeding	
2.4 Water pollution	19
2.4.1 Definition	
2.4.2 Types of water pollutants	
2.4.2.1 Biological Agents	
2.4.2.2 Energy-Rich Organic Chemicals	
2.4.2.3 Biochemical Oxygen Demand	
2.4.2.4 Inorganic Chemicals That Enrich	
2.4.2.5 Chemical Poisons	
2.4.2.6 Heat	
2.4.2.7 Floating Solids and Liquids	

- 2.4.2.8 Suspended or Sedimentary Solids
- 2.4.2.9 Color
- 2.4.2.10 Radioactive Substances
- 2.4.2.11 Inorganic Salts, Acids and Alkalis

2.5 Water pollution sources	35
2.5.1 Municipal Sewage	
2.5.2 Water Pollutants from Farms	
2.5.3 Water Pollution from the Production of Coal	
2.5.4 Water Pollution from the Production, Transports, and Use of Oil	
2.6 The pollution of Groundwater	41

Chapter 3 Experimental

3.1 Field sites	43
3.2 Sampling	44
3.3 Derivation of interstitial water from soil	46
3.4 Atomic Absorption Spectroscopy (AAS)	46
3.5 Soil Properties	49
3.6 Determination of the moisture content	49
3.7 Determination of the pH value	51

Chapter 4 Results and Discussion

4.1 Introduction	53
4.2 Heavy metals and their concentration	53
4.3 Heavy metal distribution in landfill at Sabak Bernam	69
4.4 Soil moisture content	72
4.5 pH of soil	73
4.6 Influence of soil pH and soil moisture on heavy metal distribution	74

Chapter 5 Barrier Design and Performance Evaluation

5.1 Introduction	82
5.2 Type of lining system	84
5.3 Calculation of leachate quantity	86
5.4 The transmissivity of the leachate collection layer	86
5.5 The hydraulic conductivity, k	87
5.6 An example	88

Chapter 6 Conclusions and Suggestions for Further Work

6.1 Hypothesis of the present investigation	90
6.2 Suggestions for further work	93
Appendix A	94
Appendix B	97
References	98