CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The following conclusions were drawn from the batch leaching tests and lysimeter tests:

1. The results from the batch leaching tests wherein the TCLP was used showed that the concentrations of two of the five wood samples exceeded the US TC limit for arsenic (5 mg/L). The results from the batch tests using the WET illustrated that the concentrations of three of the five samples exceeded the STLC level for arsenic (5 mg/L). However, almost all samples leached out less than the standard limits for both chromium and copper. Only one sample that was put through the WET leached an amount of chromium that was higher than the standard limit of 5 mg/L.

2. The CCA-solution penetrated through the inner part of the hardwood better than softwood and most of the metal contents from the CCA solution were fixed in the outer 6/10" layer of the wood.

3. In general, higher fractions of metals were extracted by the WET, compared with the TCLP.

4. The results of ash from the burning of CCA-treated wood being put through the TCLP and WET showed that very high concentrations of arsenic, chromium, and copper were produced when compared with those values in the untreated samples, and the concentrations were above the US TC and STLC levels. In addition, chromium provided the largest fraction that leached out due to the alkalinity of the ash.

5. The results from the CCA-treated wood monofill lysimeter (Lysimeter No. 2) contained the highest metal concentrations, compared with the other scenarios. The arsenic, chromium, and copper concentrations in the leachates generated from Lysimeters Nos. 1 and 2 in ranges <0.005-0.02, <0.06, <0.05, <0.005-88.6, <0.06-134, and <0.05-48.4 mg/L, respectively. The metal concentrations in the

leachate generated from the CCA-treated wood monofill scenario, which only contained CCA-treated wood, were significantly higher than those of the leachate from the untreated wood monofill.

6. The arsenic, chromium, and copper concentrations in the leachate generated from Lysimeter Nos. 3 and 4, which were filled with C&D debris, ranged from <0.005-0.02, <0.06, <0.05-1.13, <0.05-2.58, <0.06-2.02, and <0.05-0.89 mg/L, respectively. The average concentrations of arsenic and chromium in the leachate generated from Lysimeter No. 4 were significantly higher than those from Lysimeter No. 3.

7. In the MSW lysimeters, the arsenic, chromium, and copper concentrations in the leachate generated from Lysimeter Nos. 5 and 6 ranged from <0.005-0.02, <0.06-0.08, <0.05-0.08, <0.005-6.16, <0.06-0.08, and <0.05-0.13 mg/L, respectively. The average concentration of arsenic from the MSW lysimeter with CCA-treated wood was significantly higher than the average arsenic concentration from the MSW lysimeter with untreated wood.

8. In the lysimeter test, only the arsenic concentrations from the simulated wood monofill, C&D debris landfill, and MSW landfill surpassed the amount that is equal to ten times the Groundwater Standard for Drinking Purposes in Thailand. Therefore, arsenic appears to be a potential groundwater contamination risk when the above mentioned disposal options are employed.

5.2 Recommendations for the proper management of CCA-treated wood

1. Due to the high potential risk of groundwater contaminated by CCA-treated wood, CCA-treated wood should be phased out and treated by other means that result in less pollution to the environment to ensure safe levels for human contact.

2. When the CCA-treated wood is produced by a factory, it should be labeled with its heavy metal contents: arsenic, chromium, and copper. In addition, when CCA-treated wood is removed from service, the ultimate option for the management of CCA-treated wood would be to keep the source separate and store it inside a roofed area since it would need to be managed as a hazardous waste.

3. The government sector should produce set of regulations about leachable metals from CCA-treated wood and ash from the burning of CCA-treated wood in order to prevent certain household activities, e.g., storing CCA-treated wood directly in yards and using it as firewood, from contributing to groundwater contamination.

4. In order to recover energy from burning CCA-treated wood, its ash should be managed as a hazardous waste.

5.3 Recommendations for future research

1. According to the results obtained, it might not be possible to automatically classify all CCA-treated woods as hazardous wastes. More CCA-treated samples should be collected and analyzed through further leaching tests in order to gain more information for a future disposal plan for CCA-treated woods.

2. In this study, the MSW lysimeter tests were conducted while the wastes were in the acidogenic phase when the metal contents are generally high. More studies should be performed in order to gain additional information on the leaching that occurs during the methanogenic phase.