Memorandum

**Date**: September 24, 2013

**To:** Professor Deborah Sills

**From**: Nikki Silva

**Re**: Sorption

**Objective**

Chlordane is a highly toxic chemical that was popularly used to kill insects, but was banned in the U.S. in the late 1980s. Despite being banned over 25 years ago, chlordane is still detected in groundwater in rural areas of the U.S. Environmental engineers struggle with treating chlordane-contaminated water. In Ames, Iowa the influent water to a drinking water plant is contaminated with chlordane. The treatment process that is being considered uses granulated activated carbon (GAC), which sorbs chlordane.

The objective of this experiment was to asses whether treating the contaminated water with GAC will reduce chlordane concentrations to below its maximum contaminant level of 2 ppb. The experiment will help determine the parameters for the sorption isotherm of chlordane on GAC. Based on the model parameters, a bench-scale treatment unit will be designed.

**Methods**

Based on the data collected, an appropriate model was fitted to the data. Both sorption isotherms, Linear and Freundlich, were investigated to fit the data. The linear model is described as Equation 1 in appendix A and the Freundlich model is described as Equation 2 in appendix A. The sorption data used to fit the appropriate model consists of dissolved chlordane concentration Caq (mg/L) vs absorbed chlordane concentration Cabsorbed (mg/[gGAC]). The KaleidaGraph software was used to fit the data set of to the two isotherm models and find the best fit.

**Results and Discussion**

The results of the data are shown in figure 1. The data presented in figure 1 shows the relationship between Caq and Cabsorbed and uses a Frendlich model to best fit the data. Our results show that K, the Freundligh isotherm coefficient was equal to 245 (mg/g)(L/mg) and 1/n, the Freundlich isotherm intensity parameter was 0.4. It is clear that a linear model was not the most appropriate model to best fit the data.

**Figure 1.** The data set of dissolved chlordane concentration vs absorbed chlordane concentration. Circles represent data points and the line represents the best fit line. The fitted model represent the Freundlich model. The values for K and 1/n are 245 ((mg/g)(L/mg)) and 0.4 respectively.

Appendix A: Equations

(1)

(2)

Where,

q= mass of absorbate absorbed per mass of absorbent at equilibrium (mg/g),

C= concentration of absorbate in the aqueous phase at equilibrium (mg/L),

K= Freundlich isotherm solid-water partition coefficient ((mg/g)(L/mg)), and

1/n= Frendlich isotherm intensity parameter (unitless).