

Assessment of *E. coli* Pollution from Failing On-Site Sewage Facilities (OSSFs) to Dickinson Bayou

Introduction:

Since 1996, Dickinson Bayou, Dickinson Bay, and Galveston Bay have been listed as impaired due to bacteria. One hypothesis is that failing on-site sewage facilities (OSSFs) in these watersheds contributed to increased bacteria concentrations into these Bayous and Bays. Two types of OSSFs are typically found in these watersheds; anaerobic and aerobic systems. The anaerobic systems discharge partially treated effluent below the soil surface from gravel drainage trenches while the aerobic systems disperse treated effluent on the soil surface using spray nozzles. This project was designed to determine if either of the two systems was contributing to the elevated bacteria levels in these water bodies. *E. coli* concentrations were used to indicate the water quality at the monitoring sites.

Materials and Methods:

Two water quality monitoring stations were installed in the Dickinson Bayou watershed to estimate *E. coli* concentrations in surface runoff. One of the monitoring stations was placed in a neighborhood that uses OSSFs and the second station was placed in a neighborhood connected to a municipal wastewater treatment plant (WWTP). The site connected to the WWTP served as the control site.

Results:

Water quality samples were obtained for sixteen rainfall events at the site with OSSFs and twelve events at the site with no OSSFs. Nearly all sampling events had at least one sample with an *E. coli* concentration greater than the state maximum. However, the *E. coli* concentrations at the two sites were very statistically similar.

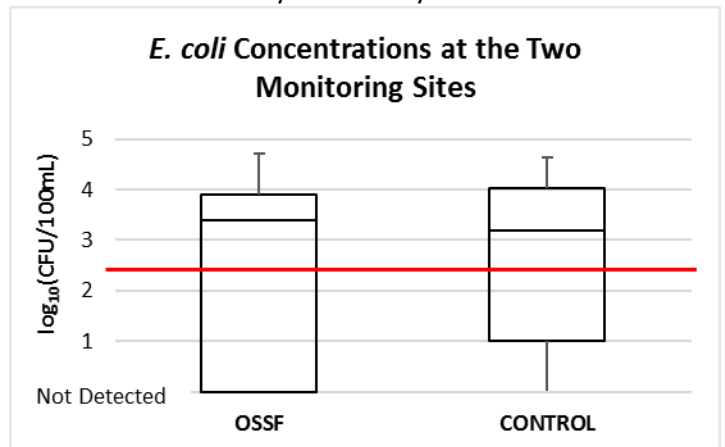


Figure 2. Box plots of the *E. coli* concentrations found in runoff at the two monitoring sites in the Dickinson Bayou watershed. The red line represents the Texas state contact limit of 126 CFU/100 mL.

The overall geometric mean *E. coli* concentration at the site with the OSSFs was 406 CFU/100mL, while the overall geometric mean for the control site was 314 CFU/100mL. Maximum concentrations were 52,000 CFU/100mL at the OSSF site and 44,000 CFU/100mL at the control site.

A bacterial source tracking (BST) analysis was performed on one sampling event. Seven *E. coli* isolates from the OSSF site and seven from the control site were tested against a database of known *E. coli* sources to determine the source of *E. coli* at each of the sites. It was found that both sites had human-borne *E. coli*.

Conclusions:

A definitive conclusion on whether or not OSSFs were contributing to the elevated bacteria levels in Dickinson Bayou could not be made at this time. After an initial BST analysis a human fecal presence was confirmed at both sites. It is most likely that OSSFs are the cause of the human-borne *E. coli* at the OSSF site and that broken or leaking municipal sewage lines are the cause of the human-borne *E. coli* at the control site.

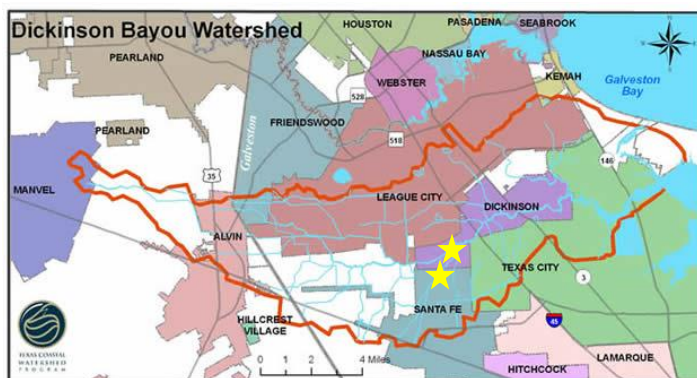


Figure 1. Locations of the two monitoring sites in the Dickinson Bayou watershed are indicated by the star symbols (DBWP, 2007).

Each monitoring station was equipped with a flow meter and an automatic water sampler. Samples were tested using EPA method 1603 and were occasionally split with a NELAP approved laboratory to validate the concentrations.



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