# FECAL COLIFORM CONCENTRATION IN SURFACE RUNOFF FROM PASTURES WITH APPLIED DAIRY MANURE

A Thesis

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# ABSTRACT

This study examined the magnitude of release of fecal coliform indicator bacteria in surface runoff from pasture amended with dairy manure. The experiment was conducted at Southeast Research Station in Franklinton, Louisiana between March and June, 2001. The experiment was designed to compare the effects of two methods of manure application on fecal coliform release. Manure application simulating natural deposition by cattle (Treatment A) was compared to that of land application of manure as fertilizer (Treatment B). Application of inorganic fertilizer was used as the control. Each Treatment was applied to three field plots. Simulated rainfalls were conducted on plots within hours of initial manure application and approximately 2, 7 and 14 days following initial manure application. This sequence of manure application and subsequent rainfall events was repeated three times. Runoff samples were analyzed for fecal coliform analyses using Membrane Filtration (APHA, 1995). Also, the IDEXX Quanti-Tray-Colilert total coliform method was experimentally modified to determine its validity for enumerating fecal coliforms.

Fecal coliform results indicated that Treatment B had significantly higher fecal coliforms in runoff than Treatment A. Fecal coliforms in runoff from manure-amended plots were well above the 200 CFU/100 ml recreational water use standard, with typical counts ranging from 1,000 to 1,000,000 CFU/100 ml for Treatment A and 10,000 to 10,000,000 CFU/100 ml for Treatment B.  Fecal coliform concentrations in the runoff from the second or third rainfall event were often higher than those from the initial rainfall after manure application. Both manure Treatments had significantly higher fecal coliforms in runoff than the control. Typical counts from the control plots ranged from 10 to 1,000 CFU/100 ml.

The modified Quanti-Tray method produced results that were significantly correlated with those of membrane filtration for both manure Treatments. However, the control Treatment did not show similar correlation. In addition, paired t-tests indicated that the results of the Quanti-Tray method were not significantly different from those of membrane filtration for both manure Treatments. However, the results of the two methods were significantly different for the control Treatment.

# INTRODUCTION AND LITERATURE REVIEW

Wastes produced in livestock production are increasingly applied to agricultural soils for either disposal and/or nutrient recycling (Coyne et al., 1995). Once manure is land applied, it becomes a potential agricultural non-point source of pollution. Pasturing operations can also contribute to this type of pollution (Moore et al., 1989). One of the main concerns with land application of animal manure is that bacterial pathogens will reach groundwater and/or surface water via runoff during or after storm events (Stoddard et al., 1998). Surface runoff from agricultural soils treated with manure may exceed water quality standards for fecal bacteria (Coyne et al., 1995). Infectious diseases of microbiological etiology, originating in man and other animals, can be transmitted through waters that receive animal wastes. Thus, human and livestock exposure to surface or groundwater contaminated with fecal bacteria is an important water quality concern (Stoddard et al., 1998).

After land application, fecal organisms are largely retained at or near the soil surface, thereby creating greater potential for pollution of surface water via runoff. Organisms isolated in runoff have been found to be in direct relation to counts in soils (Van Donsel et al., 1967). The number of bacteria lost from the soil system is a function of die-off, infiltration and runoff (Crane and Moore, 1986). Factors influencing microbial transport include advection, dispersion, soil adsorption, filtration, soil moisture content, soil water flux, rainfall intensity and soil management (Reddy et al., 1981). Furthermore, several factors influence the degree to which livestock grazing serves as a non-point source of water pollution, such as stocking density, length of grazing period and uniformity of manure dispersal by grazing livestock (Thelin and Gifford, 1983).

Kress and Gifford (1984) reviewed literature in which conflicting results were reported on the impact of grazing cattle on surface water quality. Buckhouse and Gifford (1976) found no significant difference in indicator bacteria numbers between a grazed and an ungrazed, semiarid, rangeland pasture. Moore et al. (1989) reported that in many studies, little difference was seen between areas used as pastures for grazing/manure application and control areas where manure was not present. This finding has been attributed to contamination from wild animals (Schepers and Doran, 1980 in Moore et al., 1989) and/or to somewhat stable bacterial background populations in the soil.

Conversely, Bohn and Buckhouse (1981) in Kress and Gifford (1984) found that grazed sites had higher fecal coliform counts than ungrazed sites. Doran and Linn (1979) in Kress and Gifford (1984) found that fecal coliform concentration was 5 to 10 times higher in the runoff from grazed areas than from ungrazed areas. Stephenson and Street (1978) in Kress and Gifford (1984) found that fecal coliform contents in a rangeland stream increased after cattle were introduced, and the bacterial counts remained high for three months after the cattle were removed. Similar findings were observed by Howell et al. (1995).

Rainfall intensity and recurrent rainfall have been studied with respect to their affect on fecal coliform release. Kress and Gifford (1984) found that rainfall intensity had little effect on peak coliform release from fecal deposits that were 2 or 10 days old, comparing intensities of 23 mm/h (0.9 in/h), 51 mm/h (2 in/h) and 69 mm/h (2.7 in/h). However, at 20 days, the effect of rainfall intensity was significant, exhibiting an inverse relationship between intensity and peak coliform counts. The same study also found that peak fecal coliform counts were significantly lowered when the fecal deposits received more than one rainfall. The authors attributed this decline to the loss of bacteria from the fecal deposits during the previous wettings.

Protective practices can be implemented to decrease surface water pollution from runoff. These practices are referred to as best management practices (BMPs) and include facilities or structures, management practices or vegetative cover. Managing manure waste can improve the overall farming operation while improving the environment and reducing fertilizer cost. A waste management system should be part of a total soil and water conservation plan for farms producing livestock. No single dairy waste management practice can meet the needs of every dairy. A combination of waste management practices is generally most effective. The BMP system should be determined by the type of pollutant; the source of the pollutant; the agricultural, climatic, and environmental conditions; the economic situation of the farm operator; and the experiences of the system designers. Critical areas that contribute the largest proportion of pollutants to a water body should be identified and prioritized for implementation of a BMP system (Osmond et al., 1995). Farmers must understand the impact of their current operations on water quality in order to determine the need for a BMP system and to identify a BMP system suitable to their specific situation.

Bacteriological water quality is determined by examining water samples for the presence of indicator organisms. Members of two groups, coliforms and fecal streptococci, are used as indicators of fecal contamination. Although they are generally not harmful themselves, they indicate the possible presence of pathogenic bacteria, viruses and protozoans that also live in human and animal digestive systems (USEPA, 1997). Measurement of the quantity of fecal coliform bacteria is one of the most commonly used methods to establish the quality of natural waters (Valiela et al., 1991). Fecal coliform bacteria are a subgroup of total coliform bacteria and are fecal-specific in origin. Their ability to grow at an elevated temperature (44.5°C) separates the fecal coliforms from the total coliforms and makes it a more accurate indicator of fecal contamination by warm-blooded animals. However, even the fecal coliform group contains a genus, *Klebsiella*, with species that are not exclusively fecal in origin (USEPA, 1997). For recreational waters, the fecal coliform group was the primary bacteria indicator until relatively recently, when EPA began recommending *E. coli* and enterococci as better indicators of health risk from water contact (USEPA, 1997). However, some states, including Louisiana, have not adopted the use of *E. coli* as the indicator organism as a replacement for fecal coliforms (USEPA, 2002). In states that have not adopted *E. coli* as the indicator organism, fecal coliforms are generally monitored to determine whether the water meets state water quality standards (USEPA, 1997).

The importance of fecal coliforms as indicator organisms depends in part upon their ability to survive outside the intestinal tract. Once transferred from their natural environment, organisms generally die off shortly thereafter. Fecal contamination of the soil and subsequent entry of the fecal bacteria into a water body is dependent on survival of the organisms in the soil and the potential of the organisms to be transported by storm water runoff. Several factors are known to influence the survival of indicator organisms in a soil-waste system including temperature, pH, moisture, nutrient supply and solar radiation (Reddy et al., 1981; Crane and Moore, 1986; Howell et al., 1996; Burkhardt et al., 2000). Predation has also been examined with respect to its effect on fecal coliform survival. Davies et al. (1995) conducted a controlled laboratory study in which the inhibition of protozoan predators with cycloheximide allowed the fecal coliforms to grow in the sediment, whereas the presence of predators resulted in a net die-off. However, Auer and Niehaus (1993) considered bacterial phages and toxins, algal toxins and predation to have minor impact on coliform loss.

Increase in temperature has been found to increase the decay rate for most organisms (Reddy et al., 1981). Canale et al. (1973) found that the first-order rate coefficient for fecal coliform decay is dependent on temperature. Howell et al. (1996) examined fecal coliform death rates in response to ambient temperature. Their results also suggest that temperature is directly related to fecal coliform death. Likewise, Crane and Moore (1986) observed that lower temperatures increased survival time, while elevated temperatures, especially combined with dry conditions, will effectively increase die-off rates. Extremes in temperature seem to be most disruptive to bacterial survival (Crane and Moore, 1986). Van Donsel et al. (1967) observed a rapid decline in fecal coliform concentration during freezing weather and more rapid death rates during the summer when extreme temperatures were observed. In contrast, Auer and Niehaus (1993) observed no significant relationship between death rate and temperature in a controlled laboratory study.

Many researchers have shown that seasonal changes have a large influence on die-off and transport rates of indicator organisms (Crane and Moore, 1986). Stoddard et al. (1998) found that fecal coliform mortality was significantly affected by season in that mortality was delayed in spring, but began immediately in the fall. This seasonal affect is likely correlated with temperature, since it was noted that the immediate decline observed in the fall was likely due to freezing conditions. Buckhouse and Gifford (1976) found that fecal coliform concentrations were diurnal and seasonally cyclic in the stream they were studying.

Often coinciding with seasonal and thermal effects, solar radiation can also be a prominent factor in reducing bacterial numbers (Reddy et al., 1981; Crane and Moore, 1986).

The fecal coliform death rate, determined from a field experiment, was found to be significantly related to irradiance (Auer and Niehaus, 1993). In contrast, Canale et al. (1973) found that the first-order rate coefficient is relatively independent of illumination and season of year.

Extremes in pH, such as values outside of the range of 5.8-8.4, are detrimental to bacterial survival (Reddy et al., 1981; Crane and Moore, 1986). Generally, lower soil moisture content is associated with increased bacterial die-off rates (Reddy et al., 1981). Crane and Moore (1986) stated that a major reason for bacterial die-off in soil was that the microorganisms were highly ineffective in lowering their metabolic requirements when placed in an environment of lower nutrient availability. In sum, almost all environmental factors have the capacity to reduce enteric indicator populations when it becomes the limiting or excessive variable in the bacterial environment (Crane and Moore, 1986).

Although few bacteria are capable of long-term survival when subjected to unnatural conditions (Henis, 1987), viable fecal coliform bacteria have been detected in fecal deposits after extended periods of time, even greater than one year if conditions are favorable (Thelin and Gifford, 1983). Buckhouse and Gifford (1976) in Kress and Gifford (1984) have detected viable fecal coliforms in cow feces after seven weeks under hot, dry summer range conditions. Thus, fecal deposits are capable of providing a long-term source of potential pollution to surrounding areas (Thelin and Gifford, 1983). The fecal deposit appears to act as a protective medium for the bacteria within by forming a crust, thus decreasing interaction of the bacteria with the soil, atmosphere and/or rain (Stoddard et al., 1998). Thelin and Gifford (1983) found fecal coliforms in the range of 40,000 colony forming units (CFU)/100 ml in runoff from fecal deposits after thirty days without rainfall.

Not only have coliform bacteria been found to survive outside of the intestinal tract, but they also have been found to exhibit regrowth in certain conditions (Crane and Moore, 1986), despite the contention that enteric bacteria do not normally multiply outside of the host (Henis, 1987). Fecal coliform regrowth in soil (Van Donsel et al., 1967), sediment (Davies et al., 1995) and runoff water (Dutka, 1973) has been frequently reported (Doran and Linn, 1979 and Crane et al., 1980 in Howell et al., 1996). Moist conditions, mild temperatures, and manure crusting are believed to contribute to regrowth (Stoddard et al., 1998). Bacteria adsorbed to sediment particles may be protected from the influence of such factors as UV radiation, high salinity, heavy metal toxicity, and attack by bacteriophage (Davies et al., 1995). Additionally, fecal bacteria are able to obtain nutrients associated with the sediment particles (Davies et al., 1995) or within the feces (Van Donsel et al., 1967). In many studies, an initial rise in coliform bacteria was noticed in both soil and in water (Dewedar and Baghat, 1995). Howell et al. (1996) observed an increase in fecal coliform counts in feces-amended sediments from day 0 to 3 of incubation. Van Donsel et al. (1967) noted evidence of soil coliform growth following rainfall. Clemm (1977) in Kress and Gifford (1984) found there was an initial increase in the number of indicator bacteria in cow feces for the first two weeks following deposition.

According to Thelin and Gifford (1983) the fecal coliform population, while still in the bovine systems, is constantly in the exponential phase. This steady state is possible because cattle average twelve defecations per day, which produces a continuous input/output situation. Once voided from the body, the fecal coliform population immediately goes into a retardation phase in which the population's specific growth rate declines until growth ceases. In the situation studied, this decline in growth rate was rapid, with growth ceasing less than one day after the feces were voided (Thelin and Gifford (1983). The progressive decline of the specific growth rate in this stage was due to nutrient depletion.

Their capacity to survive and/or grow under external environmental conditions is limited, however, with the eventual result being the onset of cell death and lysis (Thelin and Gifford, 1983). Van Donsel et al. (1967) found that the 90% reduction times for fecal coliform ranged from 3.3 days in the summer to 13.4 days in autumn. Stoddard et al. (1998) found that fecal coliform concentrations in soil leachate usually declined below detectable levels within 60 days of manure application, whereas fecal coliform concentrations in the soil declined to background levels in about 6 months after spring manure applications and within 2 months after fall manure applications.

Mathematical models of bacterial growth and decay can be used to estimate the number of bacteria available to contaminate the soil, groundwater and surface waters (Moore et al., 1989). However, there has been incongruity in the literature concerning the type of kinetics governing enteric microorganism decay. A considerable amount of research supports first order decay kinetics (Canale et al., 1973; Reddy et al., 1981; Thelin and Gifford, 1983; Crane and Moore, 1986; Valiela et al., 1991; Auer and Niehaus, 1993; Dewedar and Baghat, 1995; and Stoddard et al., 1998). This model assumes no initial regrowth or stationary period prior to die-off. The application of the usual decay model can be confounded by other factors such as growth and predation (Davies et al., 1995). Nevertheless, the first order model has been used with moderate success by many researchers (Crane and Moore, 1986).

Conversely, some researchers have developed more complex kinetic models empirically (Howell et al., 1996). In fact, Moore et al. (1989) reported that some fifteen equations were cited that have been used to describe bacterial die-off. However, these models must be used with caution due to the lack of data in the literature correlating these models to measured die-off in soil and water systems (Crane and Moore, 1986). Furthermore, models with too many variables are often over-fit and are only applicable within a limited range of conditions.

Fecal coliforms are traditionally analyzed using the membrane filtration (MF) or most probable number (MPN) test. Both of these methods are labor and materials intensive, and require precise control of laboratory conditions and a high degree of technical skill to perform and interpret results (Elmund et al., 1999). A relatively new method, the Quanti-Tray-Colilert system (developed by IDEXX Laboratories, Inc.), was designed to measure *E. coli* and total coliforms simultaneously (Elmund et al., 1999). Colilert is US EPA-approved for quantifying *E. coli* and total coliforms and is included in Standard Methods for the Examination of Water and Wastewater, 20$^{th}$ Edition. This method is much simpler to inoculate, requiring less manipulation, and thus has less chance for human error. Time studies indicate that the Quanti-Tray system requires significantly less time per sample for setup, reading, and recording of results (Budnick et al., 1996).

The Colilert reagent is a defined substrate MUG-based media for detecting total coliforms and *E. coli*. According to Elmund et al. (1999), use of defined substrate MUG-based media (Colilert) to specifically detect *E. coli* is direct, reliable and easy to interpret. The reagent shelf life and storage conditions are preferable (one year from manufacture at room temperature) to those for MF agar plate media (two weeks after preparation refrigerated) (Budnick et al., 1996). Per the Quanti-Tray method, 100-ml water samples (diluted with sterile water, if necessary) are combined with pre-measured packets of Colilert reagent in polystyrene bottles and mixed via rigorous shaking. The mixture is then poured into a Quanti-Tray, a sterile plastic disposable panel consisting of a number of smaller separate compartments (wells).

These wells are hermetically sealed off from each other using the Quanti-Tray Sealer (available from IDEXX Laboratories, Inc.) to distribute the sample mixture into all of the wells.

The Quanti-Tray system provides a most probable numbers (MPN) total coliform result based on the presence or absence of yellow color and the presence or absence of fluorescence in the individual Quanti-Tray wells after incubation at 35$^{o}$C (Fricker et al., 1997). Quantitative results are available within 24 hours. The presence of yellow pigmentation in a well is considered a positive reaction indicating the presence of total coliforms, whereas wells showing no color are considered negative for total coliforms. Wells that fluoresce under UV light are considered positive for the presence of *E. coli*. The positive wells on each tray are counted and compared to a reference table that gives corresponding MPN count of TC or *E. coli* per 100 mL.

Fricker et al. (1997) found a significant positive correlation between the MF technique using membrane lauryl sulphate broth (MLSB) and Quanti-Tray-Colilert reagent for the recovery of coliforms and *E. coli* in drinking water samples, with correlation coefficients of 0.87 and 0.89, respectively. This research study also found that all of the 1296 yellow, non-fluorescing wells examined were shown to contain coliforms and none contained *E. coli.* Also, all of the 160 wells that fluoresced contained *E. coli*.

Elmund et al. (1999) found the Quanti-Tray technique using Colilert reagent to be an effective method for quantifying total coliform and *E. coli* populations in wastewater and river water. Their finding indicates that the Quanti-Tray method may be preferable to the MF method because thermotolerant *Klebsiella pneumoniae* was found to interfere with fecal coliform recovery on the MF m-FC media, but interference was not observed in the enumeration of *E. coli* by the Quanti-Tray technique. Approximately 15% of *Klebsiella* are thermotolerant and can grow at 44.5$^{o}$C, appearing as fecal coliforms in standard MPN and MF fecal coliform tests (Bagley and Seidler, 1977), and approximately 10% of *E. coli* are not thermotolerant (Dufour, 1977; Caplenas and Kanarek, 1984). An increasing number of instances were noted where elevated fecal coliform counts were recorded even though no evidence of fecal pollution from humans or animals could be found. These elevated fecal coliform densities were invariably due to the *Klebsiella* species (James and Evison, 1979).

One drawback of the Quanti-Tray method is that there is currently no available procedure for quantifying fecal coliforms. To determine whether or not the Quanti-Tray system can accurately quantify fecal coliforms using Colilert reagent, the incubation temperature will be raised to 44.5$^{o}$C, the temperature selective for the fecal coliform subgroup of total coliforms. Subsequently, the recovery of fecal coliforms from the Quanti-Tray method at this higher temperature will be directly compared to the recovery of fecal coliforms from the MF technique. This study will also help determine whether the Quanti-Tray method is a viable option for enumerating coliforms in more concentrated wastewaters than drinking water for which it was designed.

# OBJECTIVES

The purpose of the research is to quantify microbial pollutant transport in surface runoff over manure-amended dairy pasture. The specific objectives are as follows:

1. To determine the fecal coliform concentrations in surface runoff after simulated rainfall from field pasture plots as affected by method of manure application and recurrent rainfall as compared to control plots.
2. To directly compare the Quanti-Tray-Colilert method with membrane filtration (using mFC agar) for the quantification of fecal coliforms in agricultural runoff samples.

# MATERIALS AND METHODS

## 1. Experimental Site Determination

This research took place at the Southeast Research Station (SERS), Louisiana Agricultural Experiment Station, Franklinton, LA, which is in the Bogue Chitto watershed. Less than 20% of assessed rivers in this watershed meet all of their designated uses based on 1994 and 1996 state information (US EPA, Office of Water, 1998). The river that is directly affected by runoff from SERS is the Bogue Chitto River, which is listed on the 2000 Clean Water Act Section 303(d) List of impaired waters (33 FR 26.303(d)) due to exceeding bacterial water quality standards. Prior studies at SERS have indicated that high concentrations of bacteria are carried off with agricultural runoff from pasture with manure application (Drapcho and Beatty, 1995).

SERS has a dairy research herd of 160 milking age animals and 150 replacements. On average, mature dairy animals (640 kg or 1,400 lb) are confined in the milking parlor and holding areas 8 hours per day throughout the year. During summer and fall, the milking cows are held in the feeding/free stall area with access to the loafing lots for 16 hours a day. During winter and spring, the milking cattle graze on ryegrass pastures 6 hours a day and are held in the feeding/free stall area for 10 hours per day. Replacement heifers and dry cows are kept on pasture year round.

The soils on the station are primarily Tangi silt loam and Savannah and Ruston fine silt loams with 1 to 3 and 3 to 8% slopes, respectively. These soils overall have moderate to slow water permeability. Water is perched in the Tangi and Savannah soils above the fragipan at a depth of 1.5 to 3 feet from December through April. These soils are listed as highly or potentially highly erodible (USDA-NRCS, 1996).

## 2. Field Plot Installation and Maintenance

Nine 1.5 m x 2.0 m plots were constructed in a 3 x 3 plot pattern in Bermuda grass pasture with Tangi silt loam with an average slope of 3%. No dairy manure had been applied to this pasture site for six years prior to the study. Impervious sheet metal borders were buried to a depth of approximately 15 cm (6 in) around each plot to divert runoff from surrounding pastures. A runoff collection trough, consisting of a 10.2 cm (4 in) PVC pipe cut in half lengthwise, was installed at the bottom of each plot by excavating soil and placing a layer of cement beneath the PVC. A tubing fitting was installed at the bottom corner of each trough to serve as a sample collection port. Field plots were maintained by periodically clipping the grass to a 6-cm height and lightly raking the plots to remove clippings. The water collection troughs in each plot were wiped using paper towels and then rinsed with the supply rainwater prior to each rainfall simulation.

## 3. Manure Application

The experimental treatment in this study included two categories of manure application (Treatments A and B) and one control category (Treatment C). Both manure Treatments consisted of dairy manure loadings of 504 kilograms per hectare (151 grams per plot), which is equivalent to waste deposited by approximately 10 mature dairy cows per hectare. This grazing density is currently used at SERS, in a rotation of three days of grazing approximately every two weeks. Manure was collected from the feed stall in the morning. Treatment A manure application method was designed to simulate natural deposition of manure from cows. To achieve this, manure was deposited on the field plot in one spot approximately one foot down from the up-slope border of the plot and equidistant from either side of the plot. Treatment B manure application method was designed to simulate land application of waste for nutrient supply or disposal purposes. To achieve this, manure was uniformly spread over the entire area of the plot. The control (Treatment C) consisted of the application of commercial inorganic fertilizer at a loading equivalent to 0.85 g Nitrogen and 0.13 g Phosphorus per plot to simulate the nutrients deposited by grazing animals without deposition of fecal microorganisms. These nutrient loadings reflect the equivalent nutrient amounts in the manure applied per plot, and were based on the dairy waste speciation reported in the Agricultural Waste Management Field Handbook (1992) of 0.45 kg Nitrogen per day per 1000 kg cow and 0.07 kg Phosphorus per day per 1000 kg cow for lactating cows. The three Treatments were distributed among the nine plots using the Latin square design, in which each Treatment was replicated only once in a given row or column. Plots were labeled according to their Treatment (A, B or C) and row (1, 2 or 3).

**4. Rainfall Simulation**

Before beginning the experiment, the conductivity of the water available at the site was measured to determine whether deionization would be necessary to reduce conductivity to the level of natural rainfall, which is approximately 20 μS. The measured conductivity of the water was between 20 to 30 μS; thus, it was not necessary to filter the water prior to use. During simulations, water was transferred via gravity-flow through heavy-duty hosing from an above ground water storage vessel directly to the rainfall simulator.

Rainfall simulations were conducted using a TLALOC 3000 Rainfall Simulator (Joern Inc.). By adjusting a pressure gauge on the influent piping of the simulator, the rainfall intensity could be regulated. For this research, the desired rainfall intensity was 6.4 cm/hr, which is a standard intensity used for rainfall simulations studies. This intensity represents a moderate rainfall intensity and is slightly less than that of a 1-year, 30-minute rainfall in southeastern

Louisiana (NWS, 1977). To determine the pressure that corresponded with this desired rainfall intensity, test simulations were conducted on nearby pasture outside the realm of the research pasture. Five rain gauges were placed in an arranged pattern (one in each corner of the plot and one in the center of the plot) within the rainfall-subjected area to determine the intensity at different pressures. A pressure of approximately 2.5 to 4.0 PSI was found to produce rainfall intensities in the vicinity of the desired range.

Rain gauges were positioned in the same pattern during the actual simulations to verify the intensity of each rainfall. Rainwater was collected from the rain gauges for on-site analysis of pH, conductivity and temperature immediately upon collection. The remaining rainwater was stored in polyethylene bottles in a cooler on ice for QA/QC analysis in the laboratory.

The Day 0 rainfall events began approximately two hours after the initial manure application. Subsequent rainfall events were scheduled approximately 2, 7, and 14 days following the initial rainfall. For each rainfall event, the order in which plots received rainfall was varied, in an attempt to counterbalance any effects related to time of day (i.e., solar radiation, temperature, soil moisture content, length of time following manure application, etc.). This sequence of rainfall simulations was repeated a total of three times, herein referred to as Series I, II and III.

**5. Collection and Analysis of Surface Runoff Samples**

Surface runoff from the plots was transferred via a peristaltic pump from the collection trough at the base of the plots into a 25-L polyethylene carboy. During the beginning of each simulated rainfall, the troughs were visually monitored for the presence of water to determine the onset of runoff, at which time the pump was turned on to begin collecting runoff. Runoff was collected throughout the remainder of the rainfall, and continued until runoff subsided.. A volume of at least three liters of runoff water was a conservative estimate of the quantity necessary to conduct all sample analyses. Since the volume of runoff obtained is a function of the initial soil moisture, the duration of the rainfall required to achieve this total runoff volume varied for each rainfall simulation. Rainfall durations of at least 15 minutes were desired, and were only terminated prematurely when the volume collected approached the maximum capacity of the carboy.

Once the total runoff had been collected from a plot, the volume was mixed by placing the carboy on a large magnetic stir plate, supplemented with approximately five minutes of circulation by inserting both the suction and discharge ends of the tubing from the peristaltic pump into the carboy. While mixing via the stir plate, subsamples were rotationally pumped into two new 500-ml polyethylene bottles for later nutrient analyses and three sterile Whirl-Pak bags for later microbial analyses. Conductivity, pH and temperature of the runoff water were measured on-site after subsampling.  Samples were placed in coolers on ice for transport to the water quality lab in the Department of Biological and Agricultural Engineering (BAE) at Louisiana State University (LSU).

**6.  Analytical Procedures**

Upon arrival at the water quality lab, the sample bottles from each plot were sent to the Agricultural Chemistry Laboratory at Louisiana State University for analysis of nitrogen (N), phosphorus (P), and potassium (K).  The three Whirl-Pak samples from each plot were analyzed in the BAE Water Quality Laboratory as field replicates for total suspended solids (TSS), chemical oxygen demand (COD), fecal coliforms (FC), total coliforms (TC) and *E. coli*. For these analyses, two to three lab replicates were performed for each field replicate.  TSS was determined using Method 2540 D Standard Methods (APHA, 1995). COD was determined following Method 5520 D of Standard Methods using micro COD vials (Bioscience, Inc.). Microbial analyses were performed within 24 hours of collection and the methods are described in the following paragraphs..

Fecal coliform analysis of the runoff samples was initially performed using the membrane filtration (MF) technique (Method 9222D) of Standard Methods (APHA, 1995). Ten milliliters of diluted samples were filtered through presterilized, gridded 0.45 μm membrane filters and subsequently placed on mFC agar plates. The plates were then incubated at 44.5$^{o}$C for 24 hours, after which glistening colonies that were blue to dark blue were identified as positive fecal coliform colonies.

In addition, the IDEXX Quanti-Tray method was experimentally modified by performing incubation at 44.5$^{o}$C instead of 35$^{o}$C to evaluate whether the Colilert reagent would select for fecal coliforms instead of total coliforms for which the test was designed. Following the 24-hour incubation, yellow cells were identified and counted as positive for the presence of fecal coliforms; while cells that fluoresced under UV-light were identified and counted as positive for the presence of *E. coli*. Simultaneously, incubation at 35$^{o}$C was performed on replicate samples for total coliform and *E. coli* enumeration. Using a reference table well counts were then converted to corresponding MPN counts of FC, TC or *E. coli* per 100 mL. Dilutions for the Quanti-Tray (at both temperatures) and membrane filtration analyses were prepared using subsamples from the same field replicates.

# RESULTS

## 1. Field Data

The dates of manure applications and subsequent rainfall events within each Series are summarized in Table 1. Due to logistical constraints, the intervals between rainfall events varied slightly from the proposed schedule. As a result of weather conditions, the fifth rainfall event of Series I was conducted on two separate days (Day 30 and 32). The simulated rainfalls conducted on these two days will collectively be referred to as I30 in the text and on graphs. For statistical analyses, the actual rainfall days will be used.

Table 1. Summary of manure application and rainfall dates.

| | Manure Application & Initial Rainfall | Subsequent Dates of Rainfalls | | | |
|---|---|---|---|---|---|
| | | Rain 2 | Rain 3 | Rain 4 | Rain 5 |
| **Series I** | 3/24/01 | 3/26/01 | 3/31/01 | 4/6/01 | 4/23-25/01 |
| **Series II** | 5/2/01 | 5/5/01 | 5/9/01 | 5/16/01 | n/a* |
| **Series III** | 5/26/01 | 5/29/01 | 6/2/01 | 6/13/01 | n/a* |

* Series II and III did not have a fifth rainfall event.

Occasionally, the runoff from plots had to be excluded from analysis due to various problems in the field. These plots included Series I Day 0 Plot C2, Series I Day 7 Plot A1 and Series II Day 0 Plot C3. Also, during membrane filtration lab analyses of fecal coliforms, some plates were not countable because the dilutions were either over- or underestimated. These plots included Series II Day 3 Plot C3, Series II Day 14 Plots C1 and C3, Series III Day 0 Plots C1 and C3, and Series III Day 7 Plot B3. A summary of the number of valid and missing Plot data for each Treatment within a Series is displayed in Table 2. The presence of ambiguous colonies possibly due to interference from other bacteria on the Treatment C plates was the main reason for indeterminate plate counts.

Table 2. Summary of valid and missing plot data.

| | Treatment | Plots | | |
|---|---|---|---|---|
| | | **Valid** | **Missing** | **Total** |
| **Series I** | **A** | 14 | 1 | 15 |
| | **B** | 15 | 0 | 15 |
| | **C** | 14 | 1 | 15 |
| **Series II** | **A** | 12 | 0 | 12 |
| | **B** | 12 | 0 | 12 |
| | **C** | 8 | 4 | 12 |
| **Series III** | **A** | 12 | 0 | 12 |
| | **B** | 11 | 1 | 12 |
| | **C** | 10 | 2 | 12 |

A complete account of the field data is located in Table A1 of Appendix A, and includes a summary of the following data for each rainfall simulation: date and time; rain duration; pressure gauge reading on simulator; rain gauge readings and average rain intensity; rain and runoff temperature, pH, and conductivity; and runoff volume. The descriptive statistics of the field parameters are summarized in Table A2 of Appendix A. Actual rainfall intensities were well above the proposed intensity of 6.4 cm/hr, ranging from 7.3 to 16.7 cm/hr with an average of 11.9 cm/hr. The variability in rainfall intensity was due to the inconsistent functioning of the pressure gauge on the rainfall simulator.

Field parameters were tested for variability across Treatments using analysis of variance (ANOVA) for each Series. The results indicate that none of the field parameters were significantly different across Treatments for each Series (Table A3 of Appendix A). Therefore, with the exception of runoff volume used to compute fecal coliform loading, field data were not included as predictors or covariates of fecal coliform concentration in the statistical analyses for determination of differences in Treatments.

## 2. Fecal Coliform Data from Membrane Filtration

Rainwater was analyzed for fecal coliforms using the membrane filtration method as a quality assurance/quality control measure. No dilutions were performed on the rainwater samples. The number of fecal coliforms in the rainwater was found to be insignificant (typically less than 1 CFU/100 ml). The raw fecal coliform data are tabulated in Tables A4 and A5 of Appendix A. To calculate the concentrations of each lab replicate, the average plate count for each dilution was multiplied by the relevant dilution factor. Concentrations were not calculated when plates had either zero colonies or the colonies were too numerous to count (TNTC). Instead, the zero and TNTC concentrations are represented as less than (<) the equivalent concentration of 1 CFU per plate and greater than (>) the equivalent of 100 CFU per plate, respectively. However, these estimates were not used in calculating the mean concentration of the field replicates. The final column in Table A5 represents the average fecal coliform concentration over the valid dilutions for each field replicate.

Fecal coliform concentrations and fecal coliform loadings were examined in this study. Fecal coliform loadings were calculated for each field replicate using the following equation:

$$FC\ Loading\ (CFU) = \frac{FC\ conc}{100\ ml} \times \frac{1000\ ml}{L} \times Runoff\ Volume\ (L) \qquad \text{(Eqn. 1)}$$

The fecal coliform data are summarized by Plot for each simulated rainfall in Table A6 of Appendix A. The geometric means of the fecal coliform concentrations varied one to two orders of magnitude among plots of a given Treatment (Figures 1 – 9). Fecal coliform concentrations resulting from Treatments A and B were well above the 200 CFU/100 ml standard for recreational water use, with typical counts observed within the range of 1,000 –

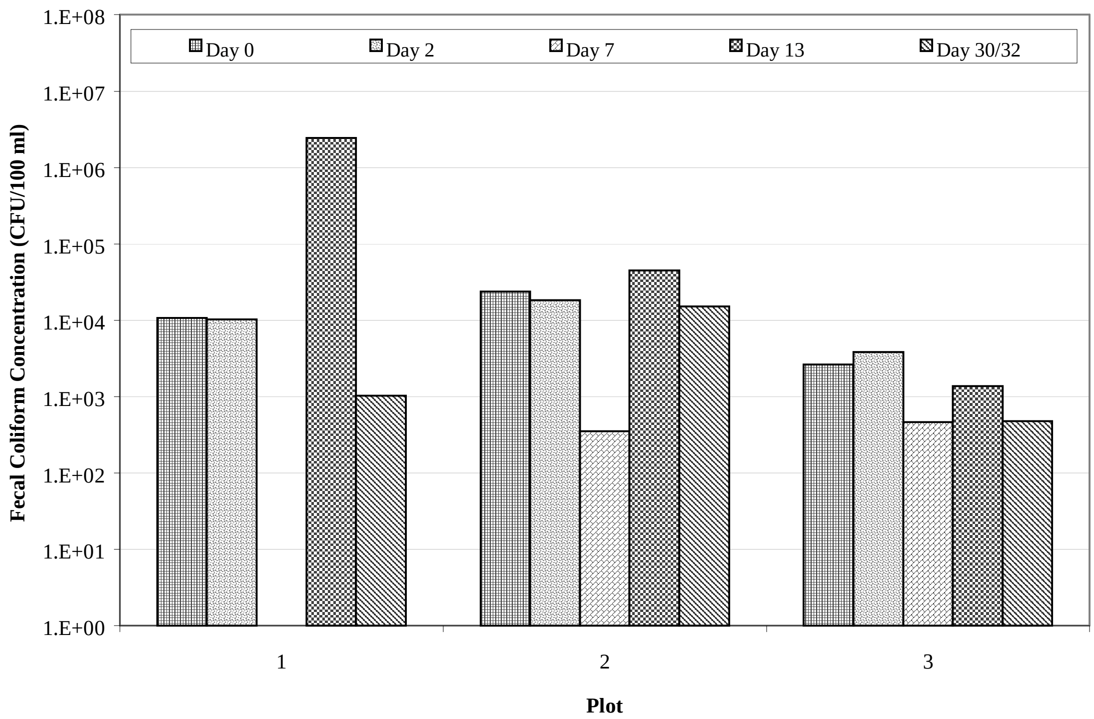


Figure 1. Series I Treatment A fecal coliform concentration over time by plot.

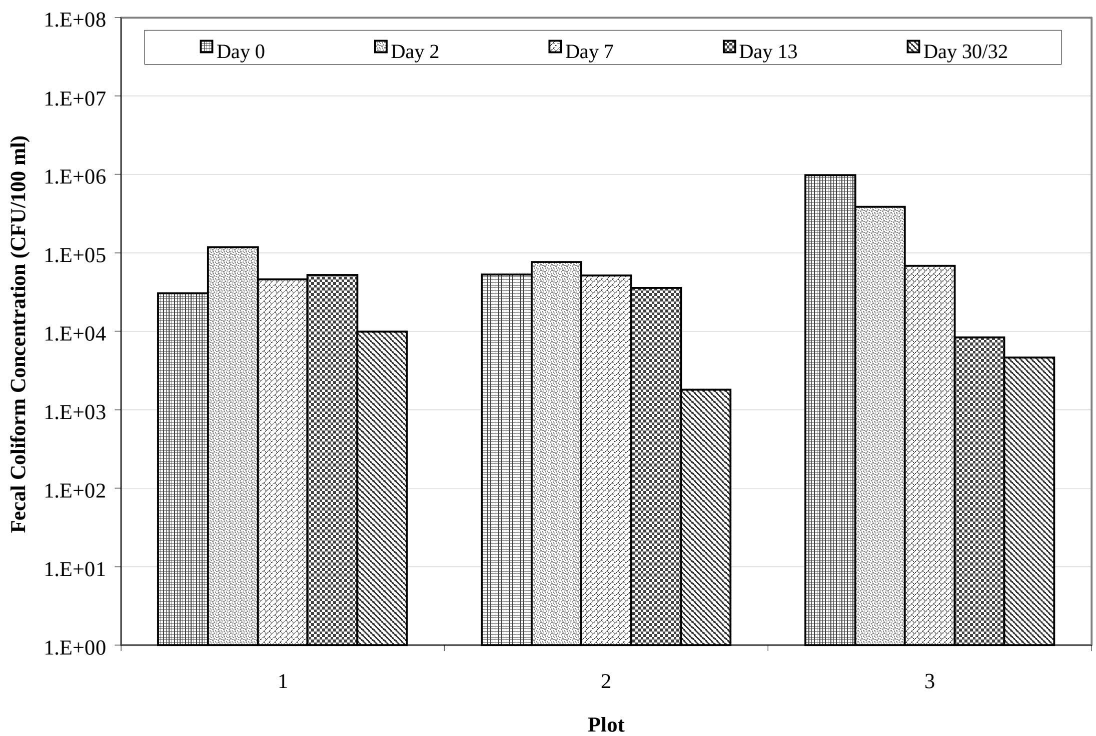


Figure 2. Series I Treatment B fecal coliform concentration over time by plot.

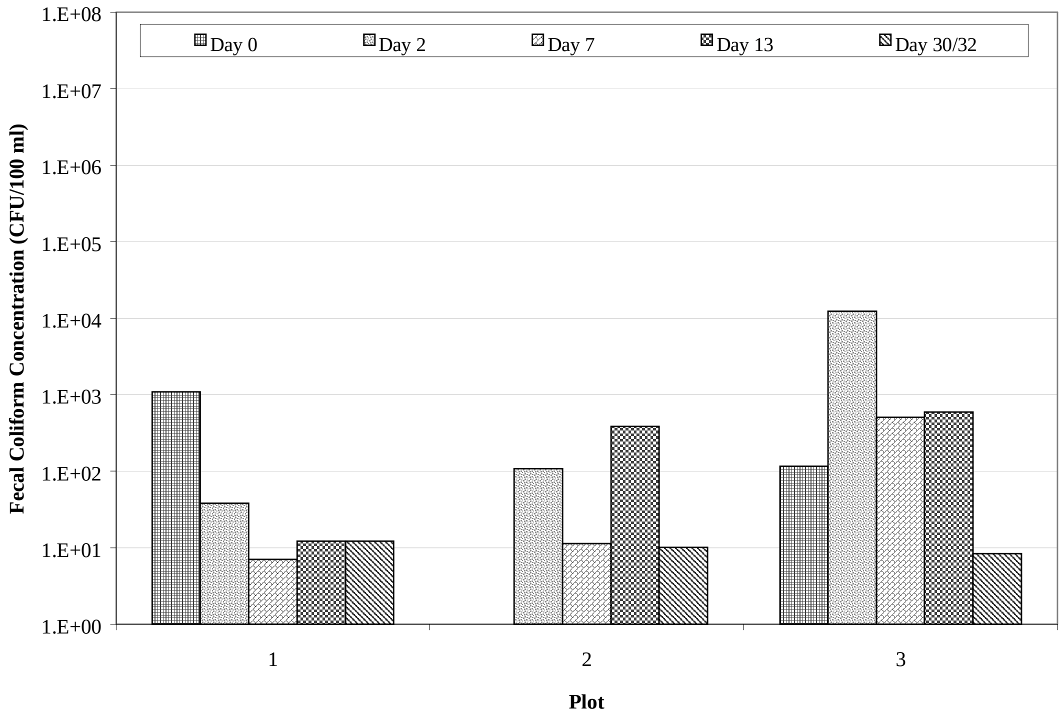


Figure 3. Series I Treatment C fecal coliform concentration over time by plot.

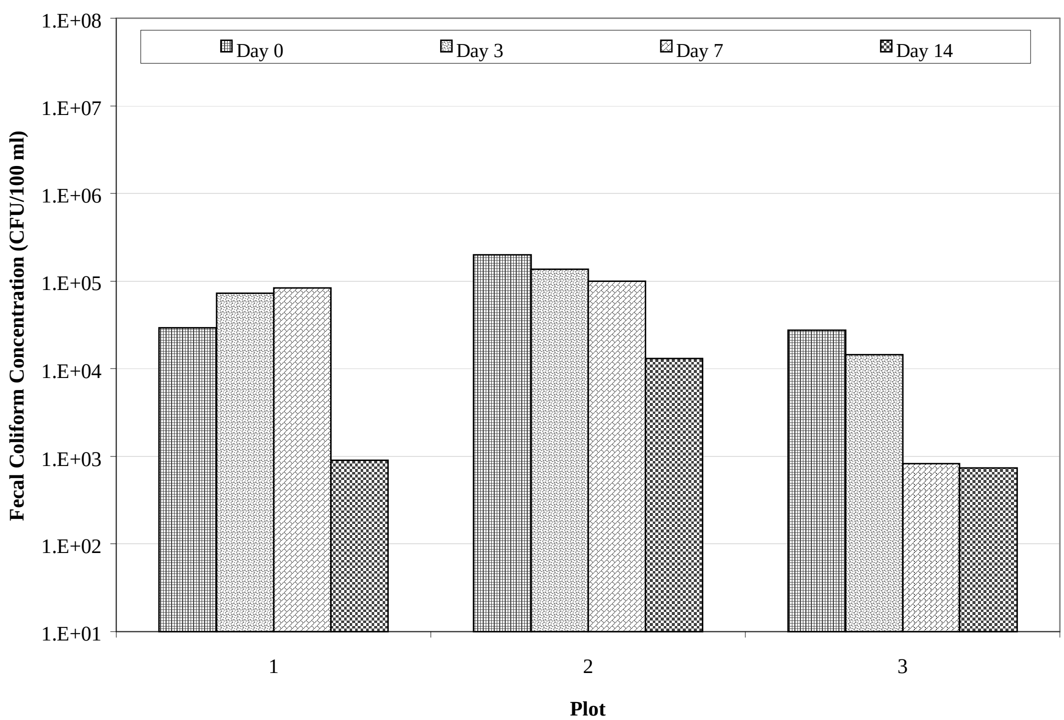


Figure 4. Series II Treatment A fecal coliform concentration over time by plot.

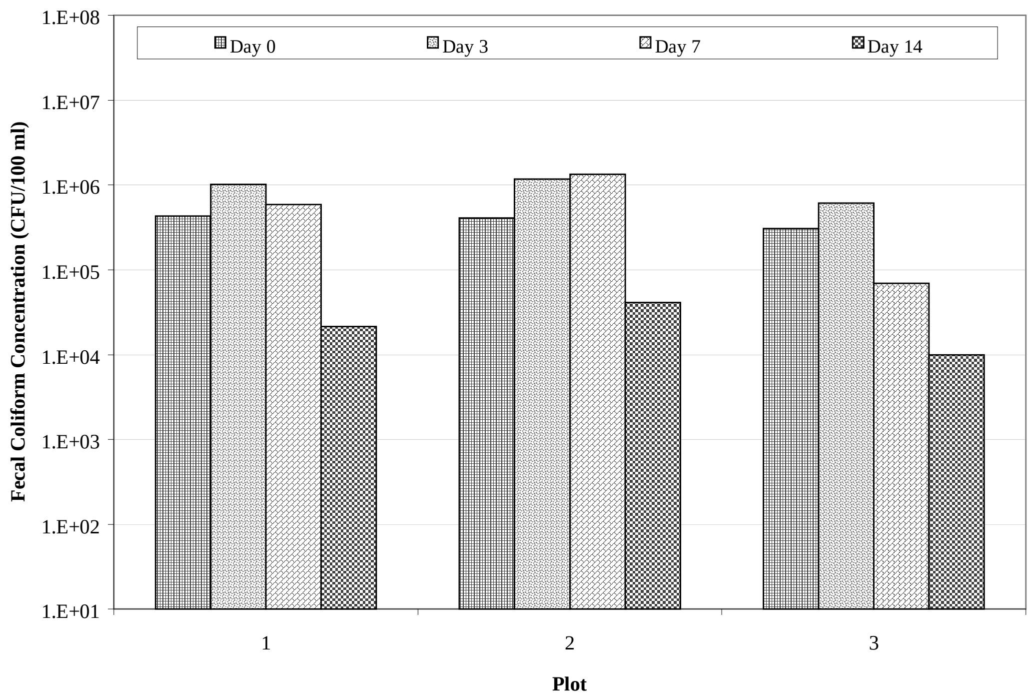


Figure 5. Series II Treatment B fecal coliform concentration over time by plot.

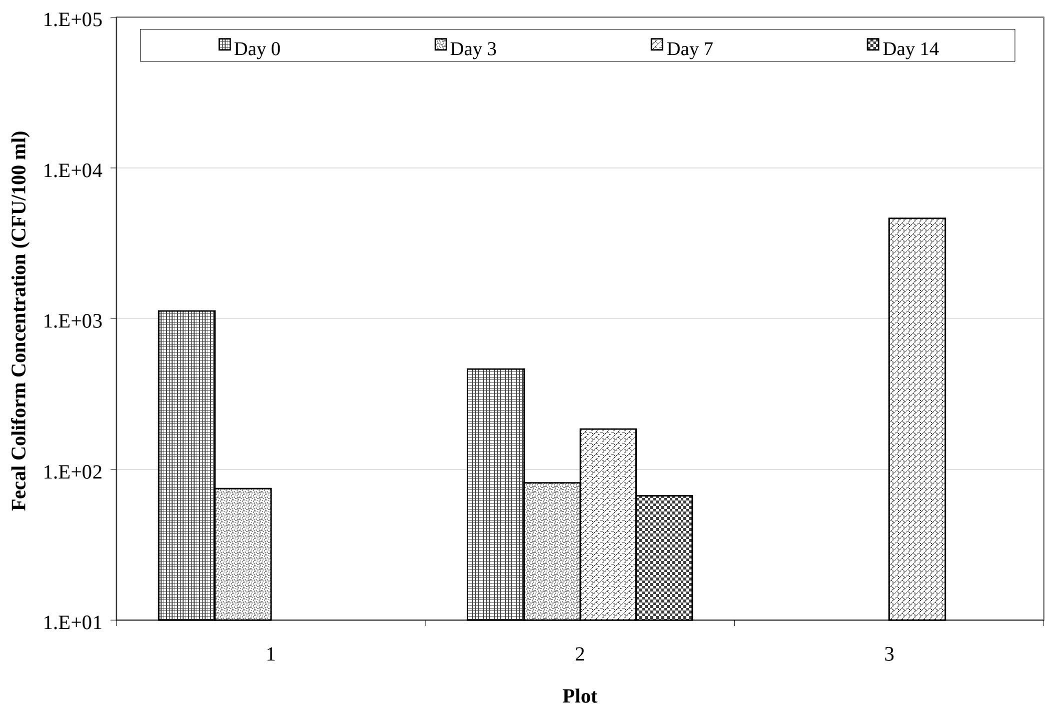


Figure 6. Series II Treatment C fecal coliform concentration over time by plot.

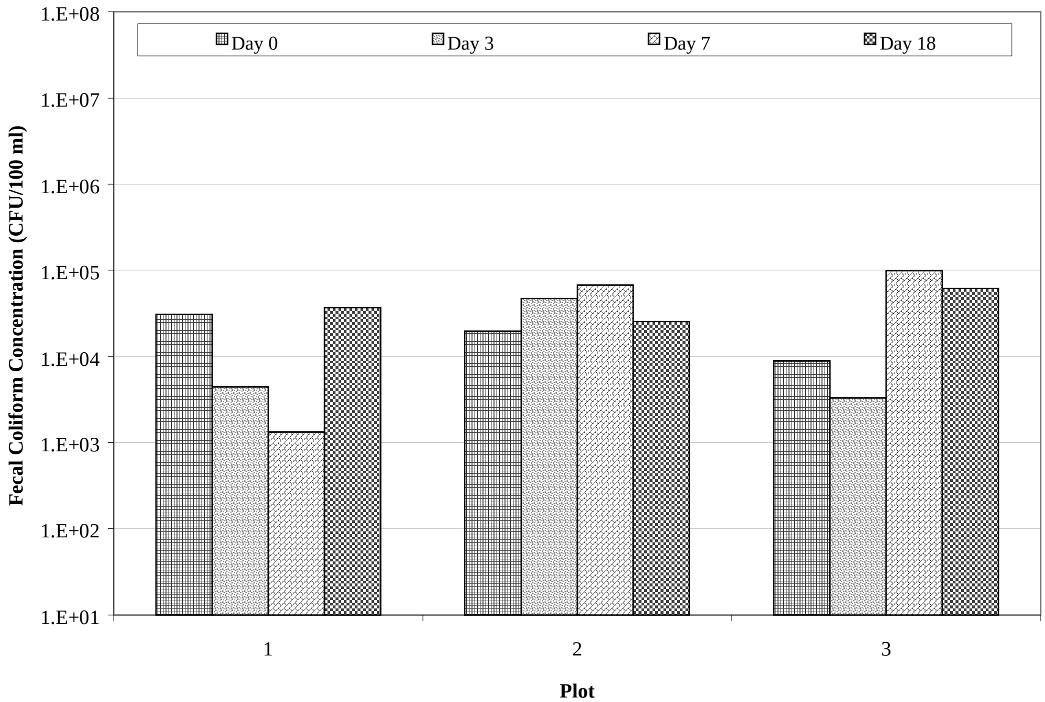


Figure 7. Series III Treatment A fecal coliform concentration over time by plot.

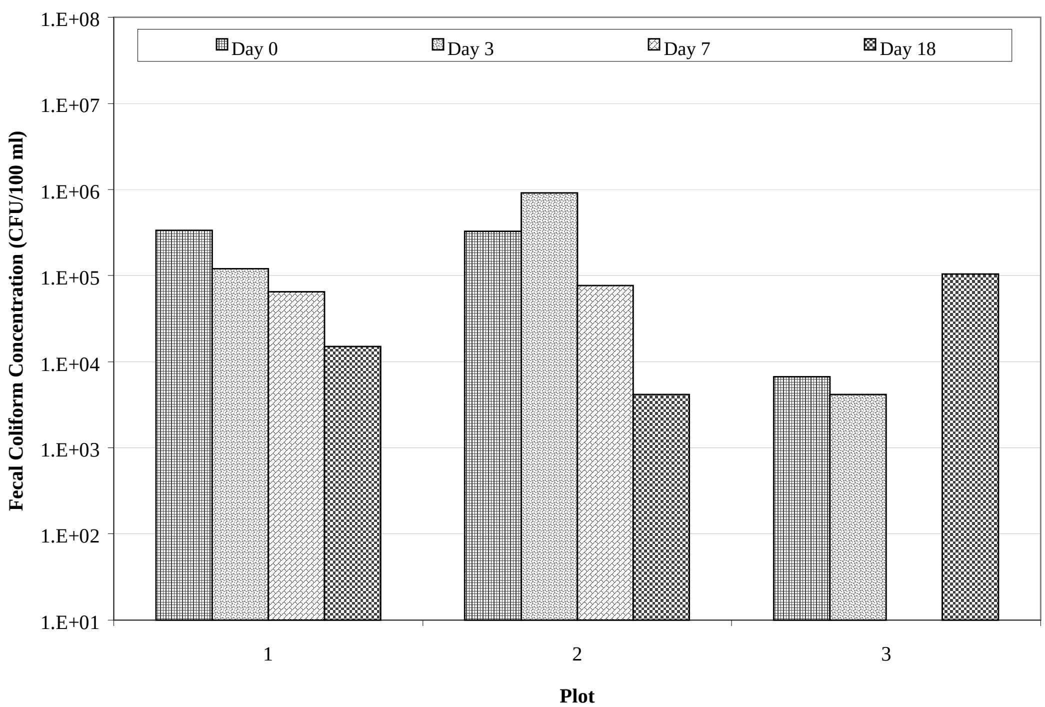


Figure 8. Series III Treatment B fecal coliform concentration over time by plot.

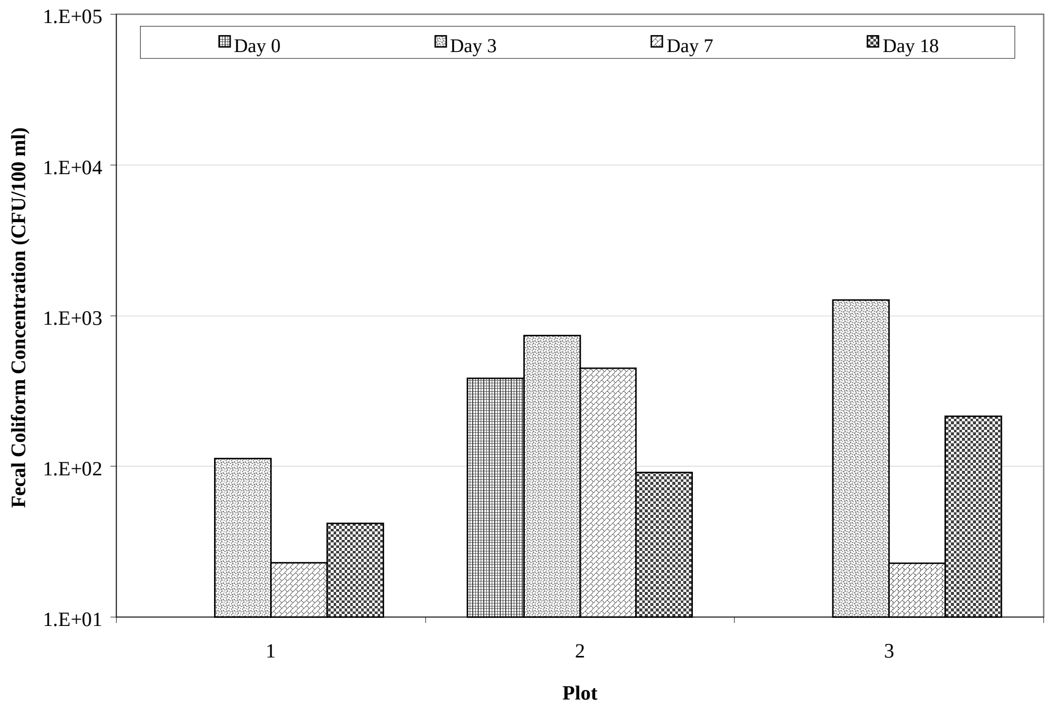


Figure 9. Series III Treatment C fecal coliform concentration over time by plot.

100,000 CFU/100 ml for Treatment A and 10,000 – 1,000,000 for Treatment B. The fecal coliform concentrations of the control plots were typically between 10 and 1,000 CFU/100 ml.

Fecal coliform concentration and loading data for Treatment B were for the most part higher than those of both Treatments A and C during all three Series (Figures 10 – 15). The exceptions to this finding occurred with Treatment A on the fourth rainfall events of both Series I and Series III, in which the fecal coliform data for Treatment A were higher than those of Treatment B (Figures 10, 12, 13 and 15). The fecal coliform data for the control Treatment were consistently lower than for those of both Treatments A and B. These graphs suggest that the method of manure application does have an effect on fecal coliform counts in runoff Arrows along the x-axis indicate when natural rainfall occurred.

Evident throughout all Series, the slopes of the Treatment lines were unequal to zero, indicating that time and/or recurrent rainfall had an effect on fecal coliform counts. The overall

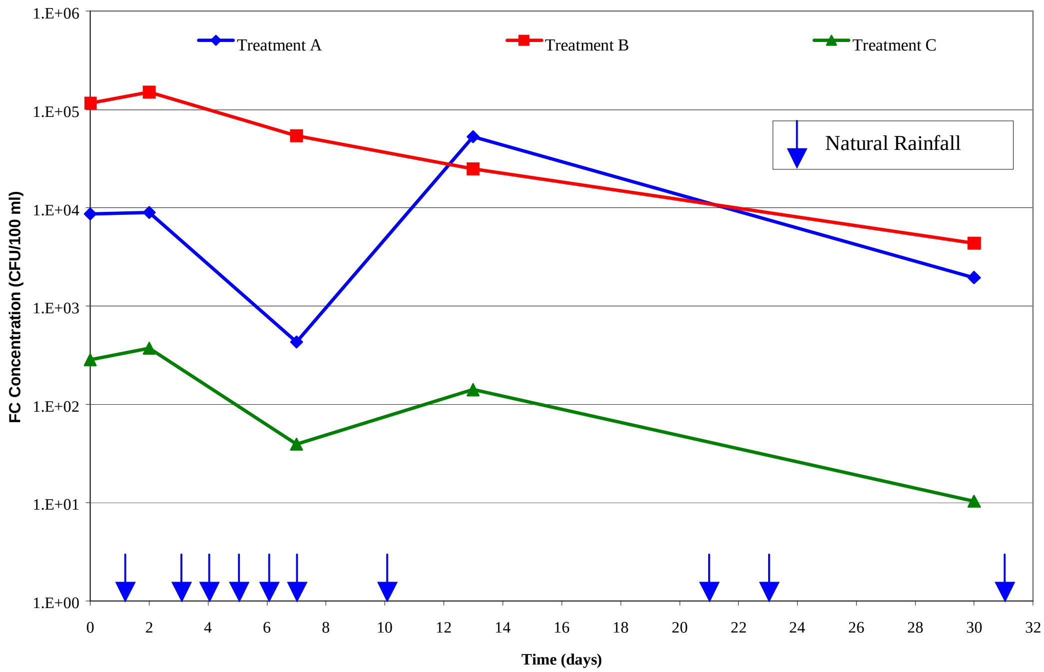


Figure 10. Series I fecal coliform concentration versus time.

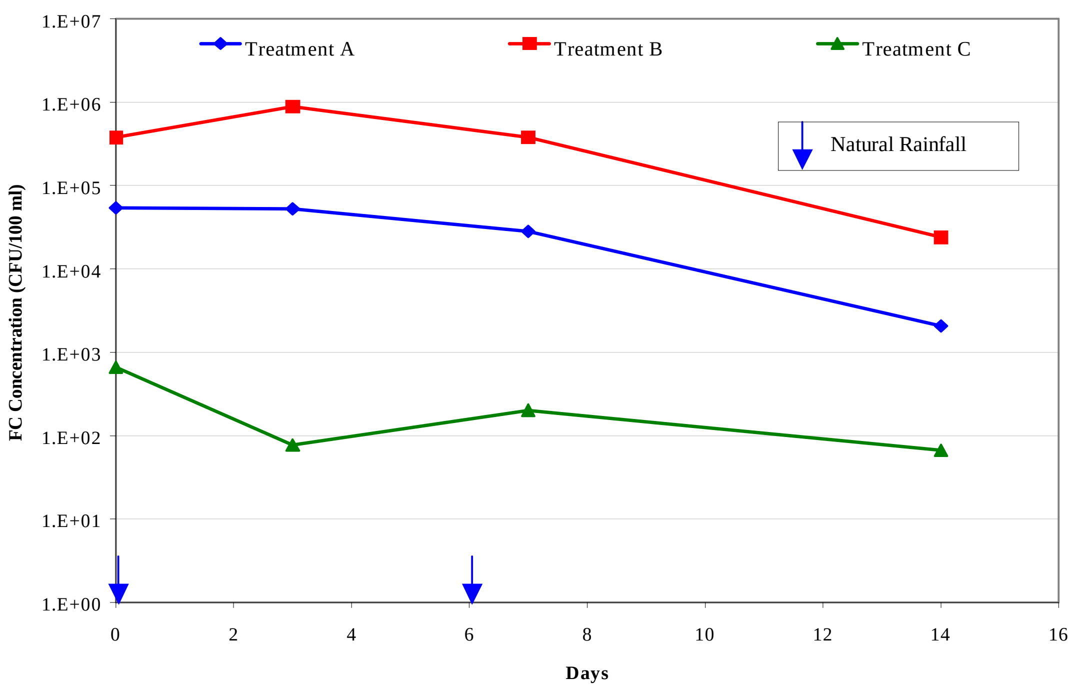


Figure 11. Series II fecal coliform concentration versus time.

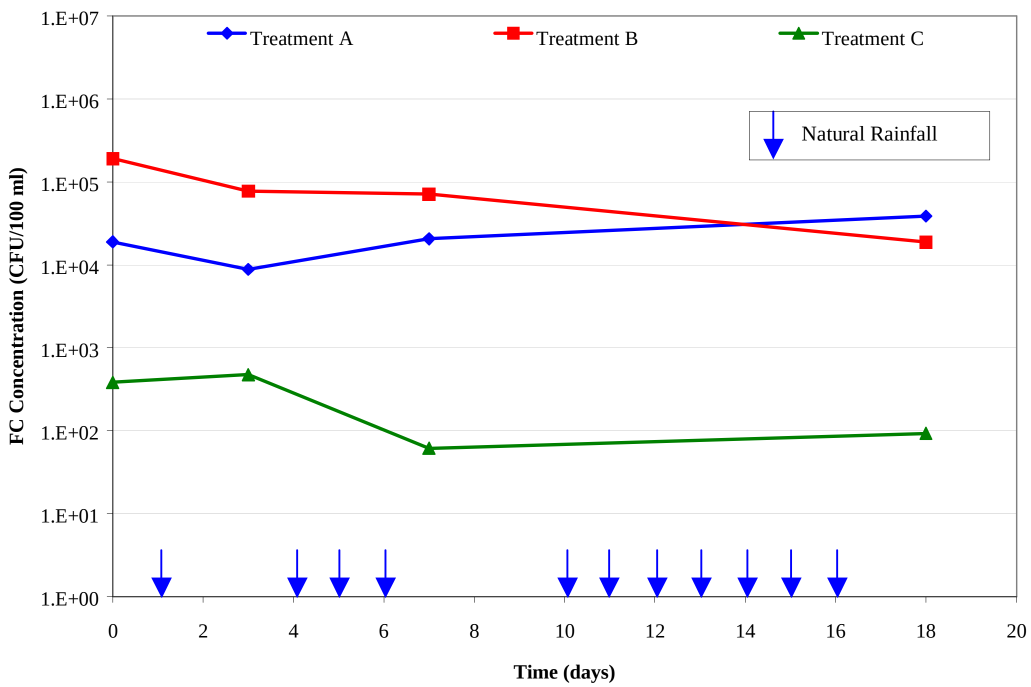


Figure 12. Series III fecal coliform concentration versus time.

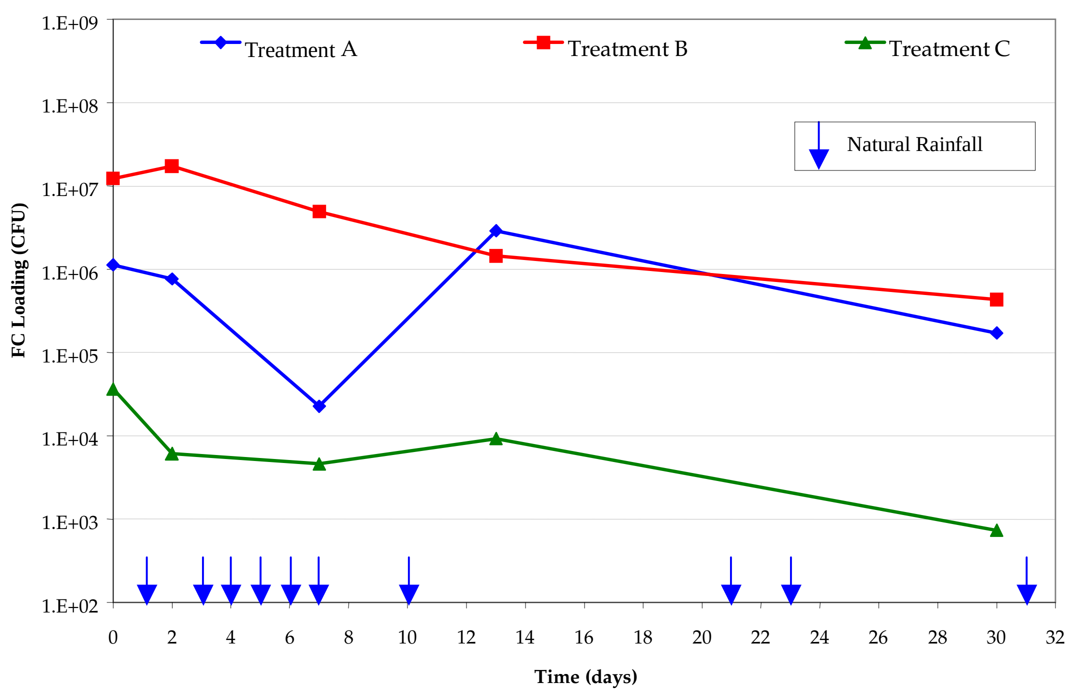


Figure 13. Series I fecal coliform loading versus time.

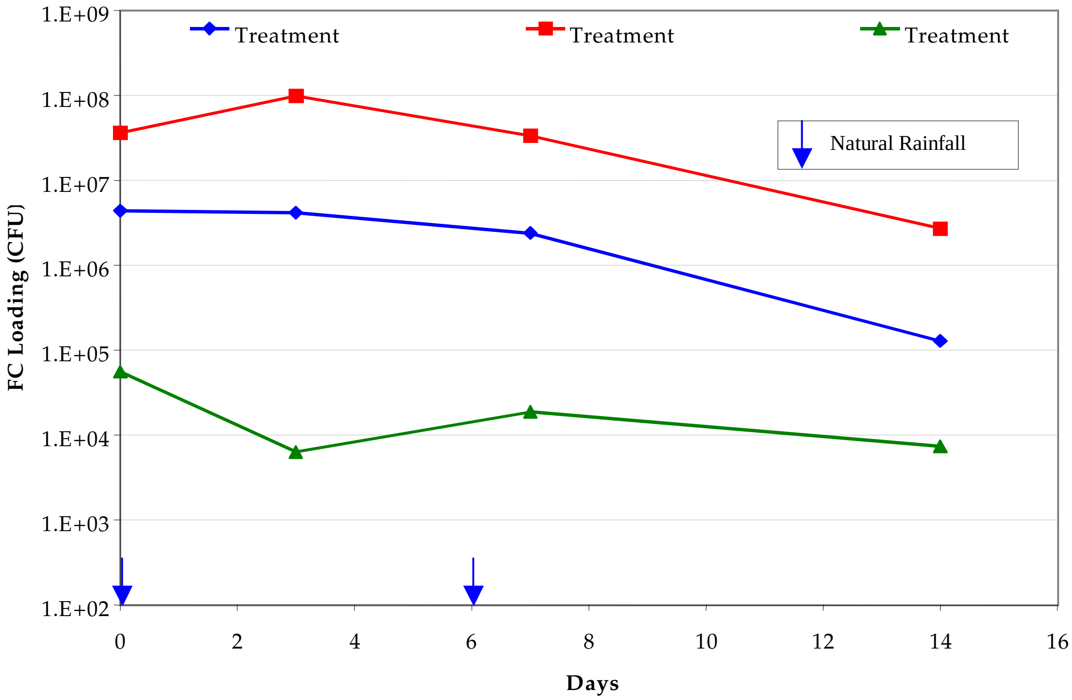


Figure 14. Series II fecal coliform loading versus time.

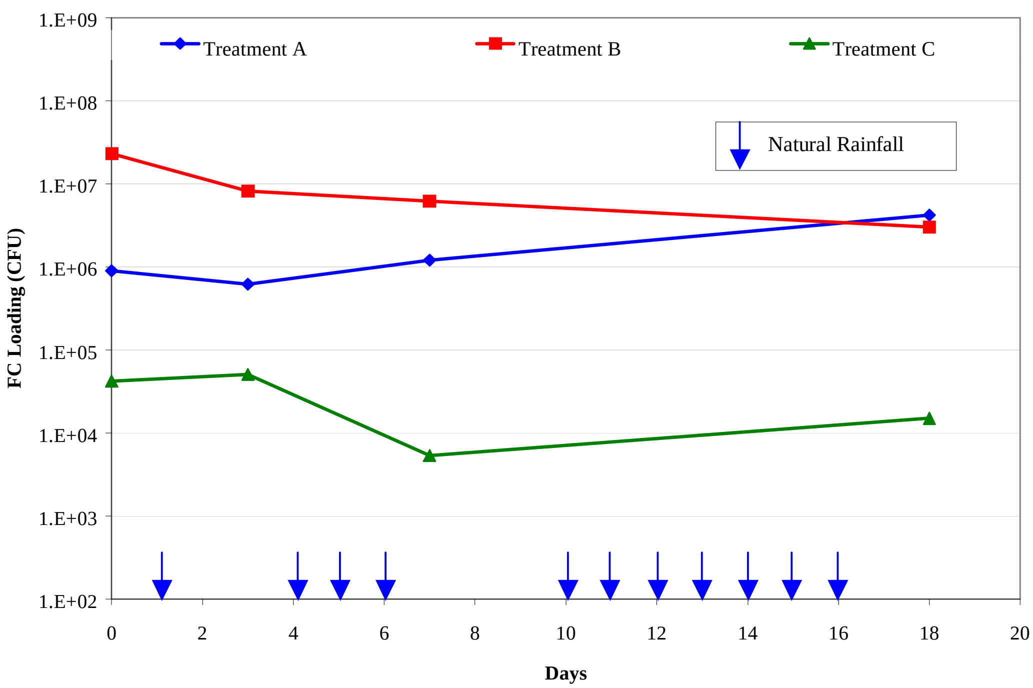


Figure 15. Series III fecal coliform loading versus time.

trend for all Treatments appeared to be a net decay with time, although growth was also observed. Not only did Treatment and time/recurrent rainfall appear to have an effect on fecal coliform counts in runoff, but there also appears to be some interaction between these two factors. Interaction occurs when the effects of one variable are not the same across the levels of the other variable (Becker and Coolidge, 1991). Visually, an interaction is described as a set of nonparallel lines. Interaction is most evident in Series I (Figures 10 and 13). Interaction does not appear to occur in Series II, where the lines are approximately parallel (Figures 11 and 14), and is questionable in Series III (Figures 12 and 15).

Fecal coliform data for Treatment B more closely and consistently resembled that of first order decay kinetics than those of either Treatment A or C for all three Series (Figures 16 - 21). The trends displayed by Treatments A and C were clearly more erratic over the three Series, often exhibiting no apparent trend with time. Fecal coliform counts were higher during Series II than during Series I and III for Treatments A and B from Day 0 through Day 7. Treatment C did not appear to vary across Series.

### 3. Statistical Analyses of Treatment Effect on Fecal Coliform Loading

To determine if the fecal coliform counts in surface runoff were affected by method of manure application (Treatment), a comparative analysis must be performed on the data. ANOVA is one of the most popular methods for determining whether differences exist between groups. However, ANOVA is a parametric procedure and is only appropriate if:

- there are independent, replicate experimental units for each treatment,
- each treatment is sampled from a normally distributed population, and
- variances for each treatment are equal or similar.

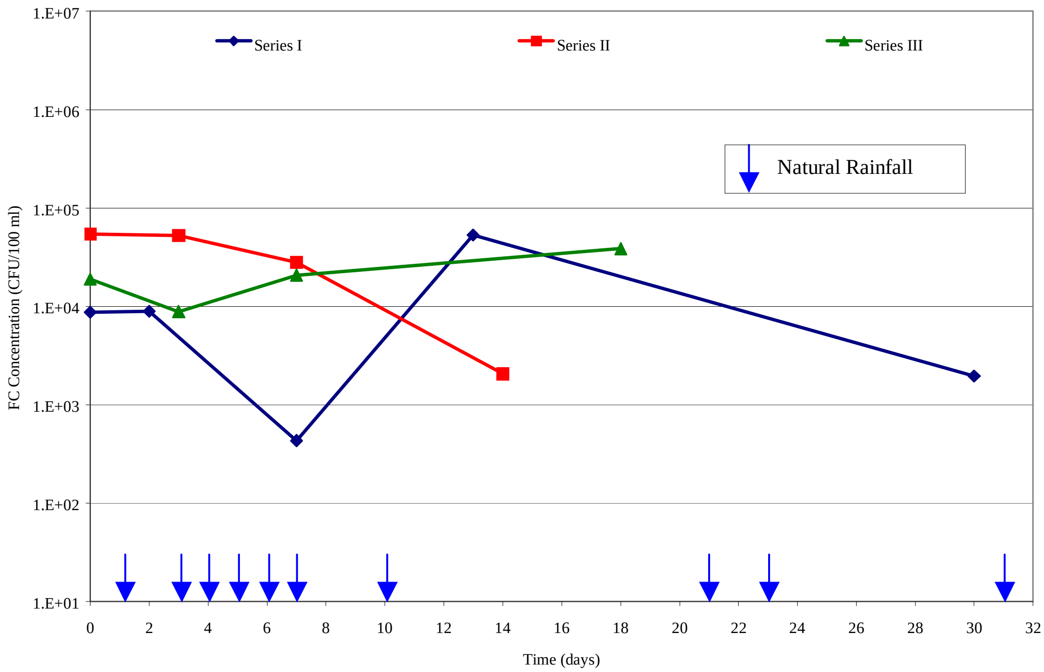


Figure 16. Treatment A fecal coliform concentration versus time.

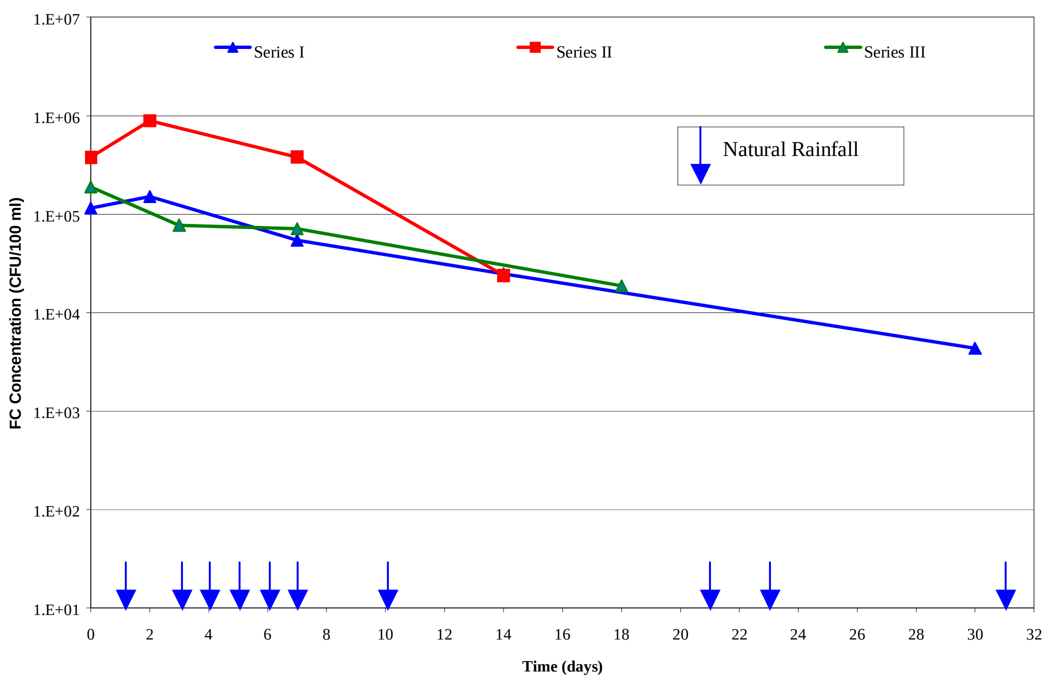


Figure 17. Treatment B fecal coliform concentration versus time.

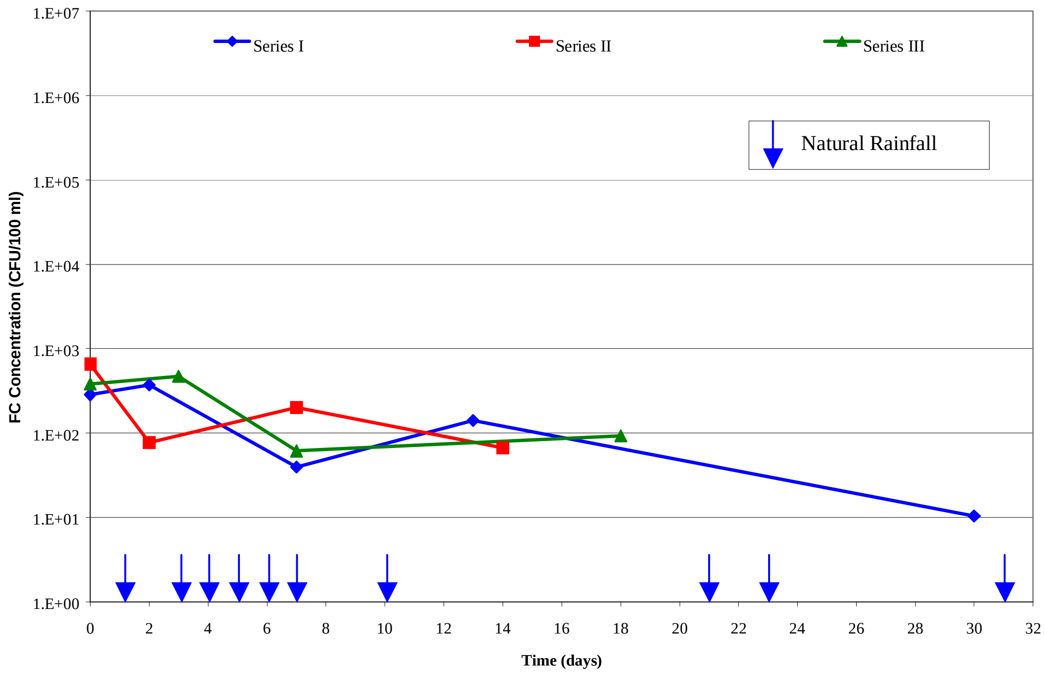


Figure 18. Treatment C fecal coliform concentration versus time.

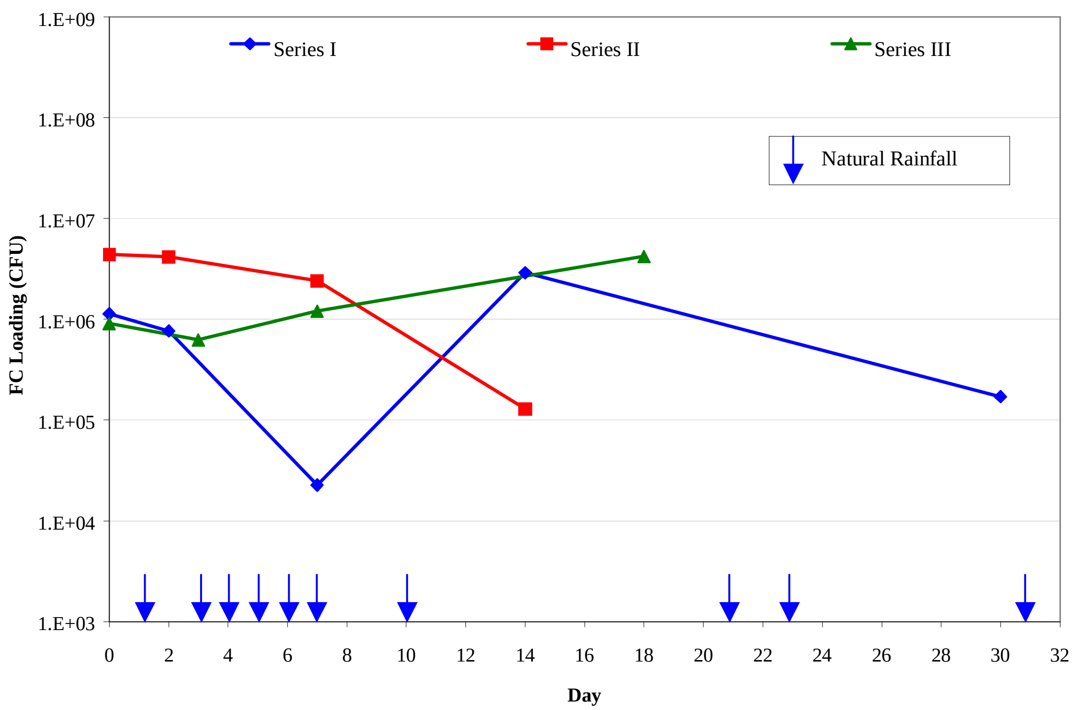


Figure 19. Treatment A fecal coliform loading versus time.

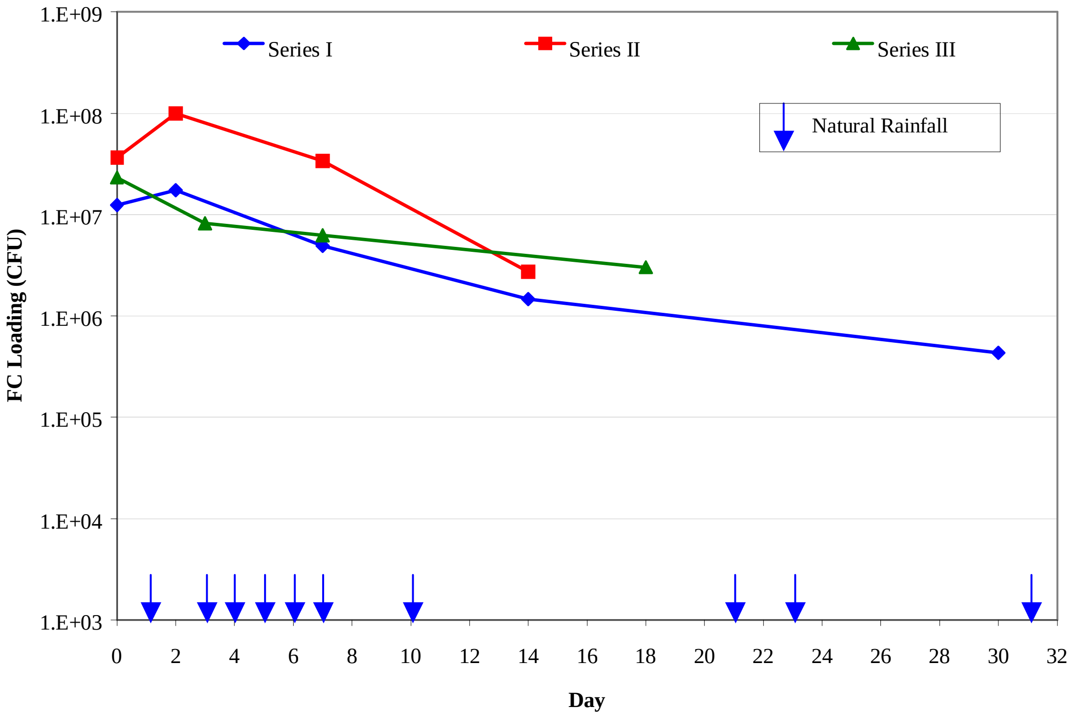


Figure 20. Treatment B fecal coliform loading versus time.

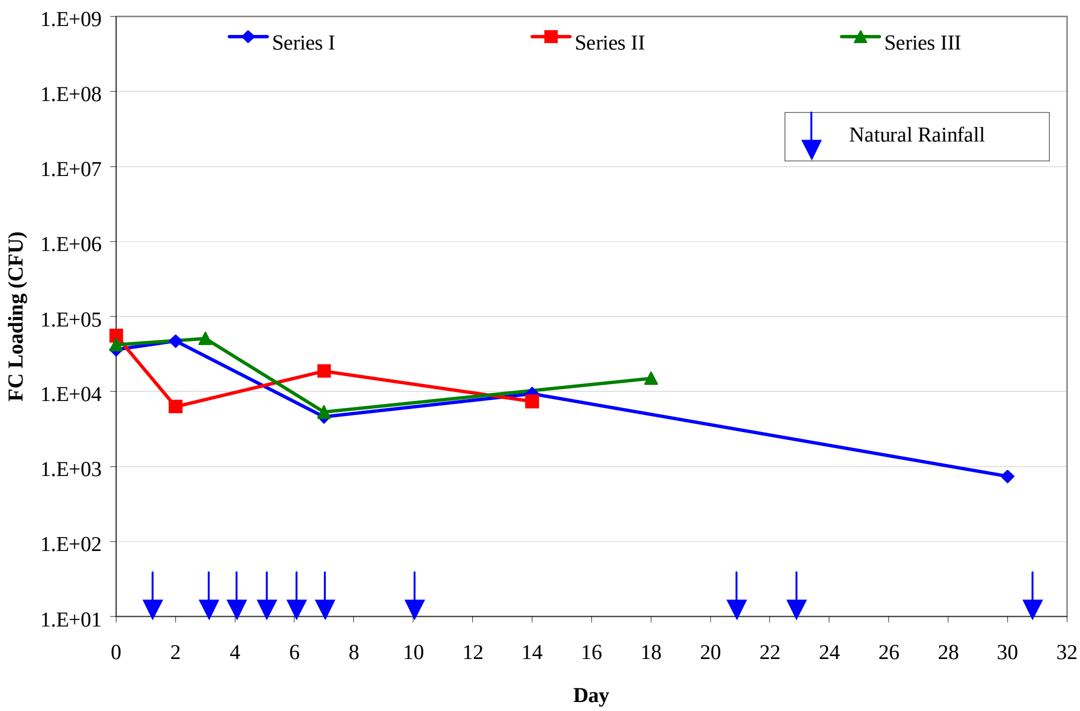


Figure 21. Treatment C fecal coliform loading versus time.

The first assumption is an essential component of experimental design, which was accomplished through replication of Treatments and random assignment of Treatments to Plots. The second and third assumptions can be tested using the data obtained from the experiment (USEPA, 1998a). Therefore, prior to conducting ANOVA, tests for normality and equality of variances should be performed.

Data can be tested for normality using the Shapiro-Wilk test, which is one of the most powerful tests available for detecting departures from a hypothesized normal distribution for data sets less than or equal to 50. For larger data sets, the Kolmogorov-Smirnov (K-S) test, using the probabilities developed by Lilliefors, may be used to evaluate the fit of a hypothesized normal distribution. A rejection of the null hypothesis indicates that the distribution of the data is significantly different that that of a normal distribution (Gupta, 1999).

The Shapiro-Wilk test was used to determine whether fecal coliform data were normally distributed. Fecal coliform loading was selected as the dependent variable over fecal coliform concentration for statistical evaluation to account for differences in runoff volume. Normality was rejected for all Treatments within each Series for all three data sets. When the assumption of normality for ANOVA cannot be maintained, two courses of action are available. The preferred approach entails transforming the variables to be analyzed in such a manner that the resulting transformed data meet the assumptions of the analysis. The normal-theory procedures can then be applied to the transformed data (Gilbert, 1987). If transforming the data fails to normalize the data sets, non-parametric tests are often required.

It is common practice to transform data before conducting ANOVA to achieve constant variance and normality. Pollution data will frequently exhibit normalized distributions after a natural log transformation. Concurrently, logarithmic transformations are often required in the analysis of variables related to the growth of organisms. Thus, the fecal coliform loading field replicates were natural log-transformed and tested for normality using the Shapiro-Wilk test (Table 3). The null hypothesis of normally distributed data was rejected at the p = 0.01 level for Treatment A and C in Series I, for Treatment B in Series II, and Treatment A in Series III. Outliers are a common cause of departures from normality and/or equality of variances. Since not all data sets were normalized through the transformation, the transformed data were tested for outliers.

Table 3. Shapiro-Wilk test of normality.

| | | Treatment | Statistic | df | Sig. |
|---|---|---|---|---|---|
| **ln FC Loading (CFU/)** | **Series I** | **A[1]** | 0.886/0.877 | 40/37 | 0.010(*) |
| | | **B** | 0.950 | 45 | 0.08 |
| | | **C[1]** | 0.912/0.941 | 39/36 | 0.010(*) /0.082 |
| | **Series II** | **A** | 0.921 | 35 | 0.028 |
| | | **B** | 0.894 | 31 | 0.010(*) |
| | | **C** | 0.955 | 18 | 0.731 |
| | **Series III** | **A** | 0.911 | 35 | 0.011 |
| | | **B** | 0.929 | 31 | 0.052 |
| | | **C** | 0.922 | 30 | 0.196 |

* This is an upper bound of the true significance.

1. The first number represents data before the removal of outliers and the second is after removal, if different from before.

Box and whisker plots (Figures 22 – 24) were used as a preliminary detection method for outliers. The length of the rectangle visually depicts the spread of the values of fecal coliform loading for each Treatment and the horizontal dark line within the rectangle represents the location of the mean. Further out than the rectangle are the "whiskers," which mark the

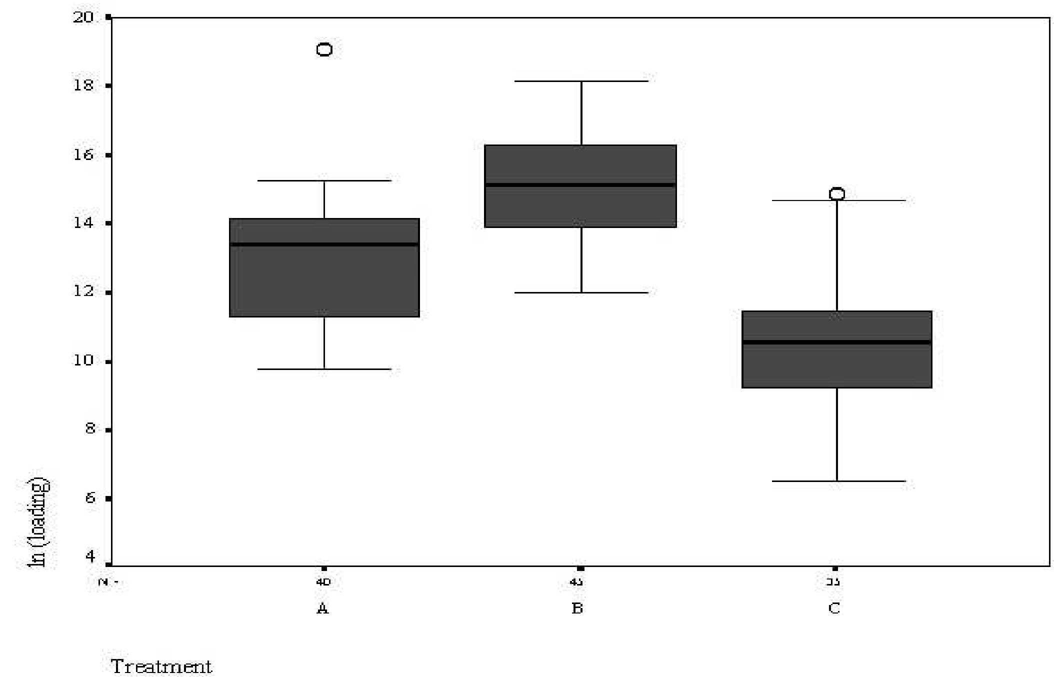


Figure 22. Series I box and whisker plots.

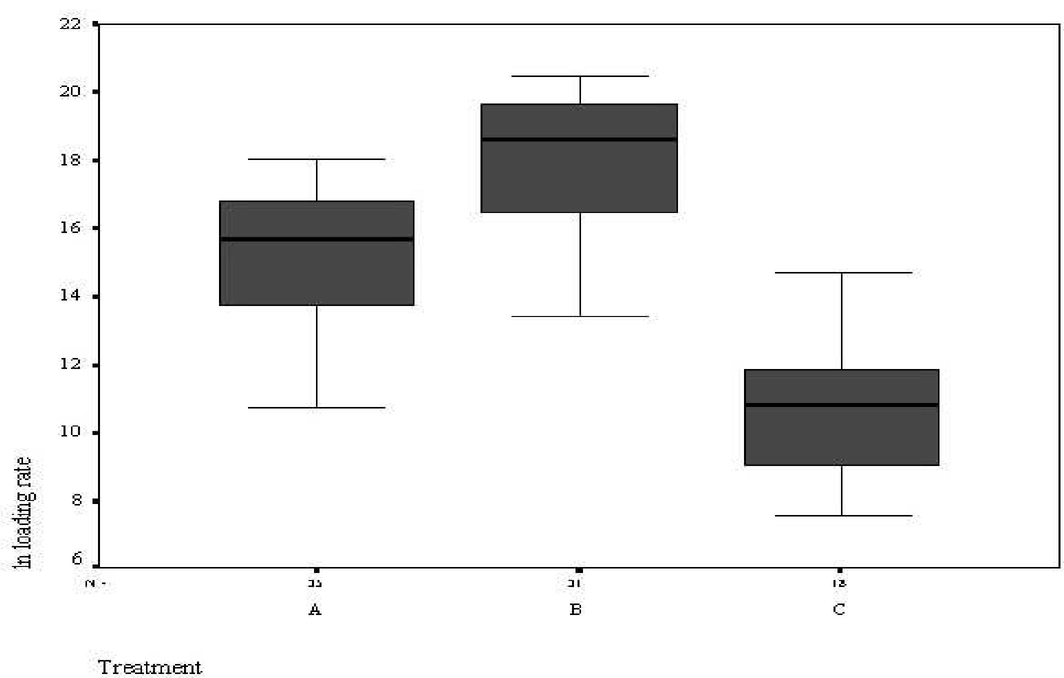


Figure 23. Series II box and whisker plots.

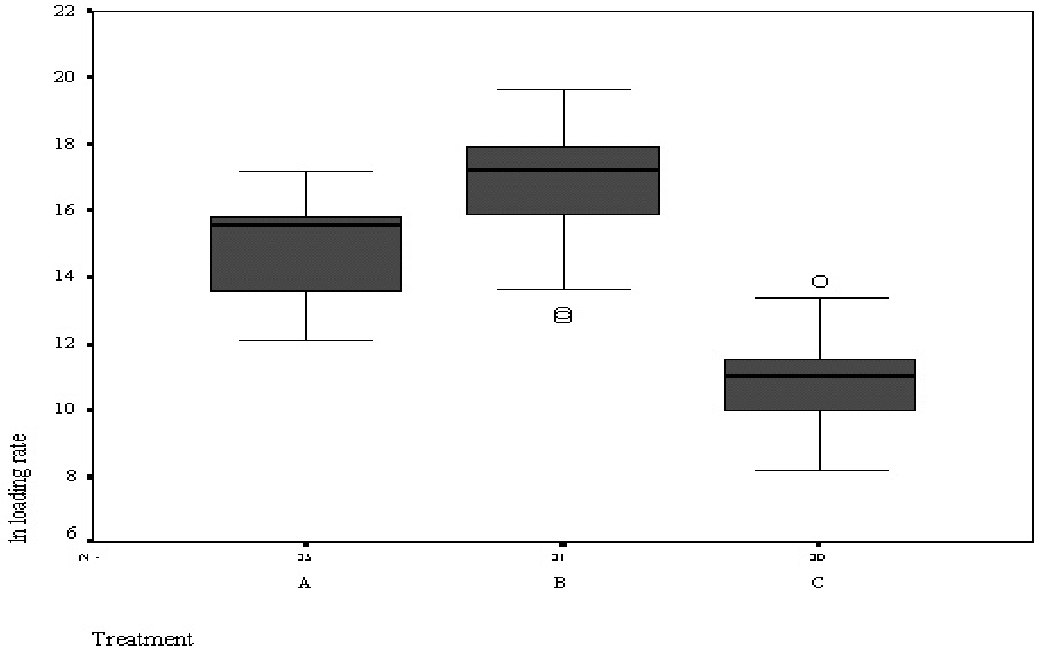


Figure 24. Series III box and whisker plots.

smallest and largest observations that are not outliers. Data points beyond the upper or lower whiskers were singled out for further examination. Field notes were then reviewed to identify possible reasons for the atypical data. Data were removed from the data set when it was probable that the results were distorted due to some identified source, or the data appeared to be too extreme to occur by chance. Removed outliers included all sample replicates from Series I Day 13 Plot A1 and Series I Day 2 Plot C3. Compared to the other plots receiving Treatment A (Plots A2 and A3) on Day 13, the fecal coliform data from Plot A1 were two to three orders of magnitude greater (Figure 1). Similarly, the fecal coliform data from Plot C3 were approximately two orders of magnitude greater than those of C1 and C2 on Day 2 (Figure 3). There were no obvious reasons for the occurrence of the Series I Day 13 Plot A1 outliers, but these were removed due to the extremity of the values. However, for the Series I Day 2 Plot C3 outliers, a field problem had occurred that could have potentially caused the increased concentrations, which further validated their removal. Removal of the outliers in Series III could not be justified by extremity or other explanations. Figures 25 – 30 display the fecal coliform data over time after the removal of the outliers.

The fecal coliform loading data for Treatment C became normal after elimination of the outliers; however, the distribution for Treatment A remained non-normal (Table 3). As previously noted, when transforming the data does not manage to make the data meet the required assumptions, it is often necessary to resort to using a non-parametric (distribution-free) method.

The Kruskal-Wallis *H* test is the non-parametric analogue of the one-way ANOVA. The Kruskal-Wallis test statistic, *H*, is a measure of the deviations of the observed average ranks for the groups from the value expected if the null hypothesis of no differences among the data sets is true. Like ANOVA, it tests whether or not several independent samples are significantly different from one another. Unlike ANOVA, unfortunately, there are no options available for post-hoc analysis to reveal the nature of the differences. Since determining the nature of the differences among Treatments is a fundamental objective of this study, the Kruskal-Wallis test does not have the ability to produce the desired level of comparison. Thus, even though the assumptions of normality are only approximately met for some data sets through transformation and removal of outliers, the use of ANOVA is preferable to the use of Kruskal-Wallis for the comparison of the effects of Treatments.

Equality of variance in a set of samples is another important precondition for several statistical tests. The choice of post hoc test used to compare means when ANOVA yields a

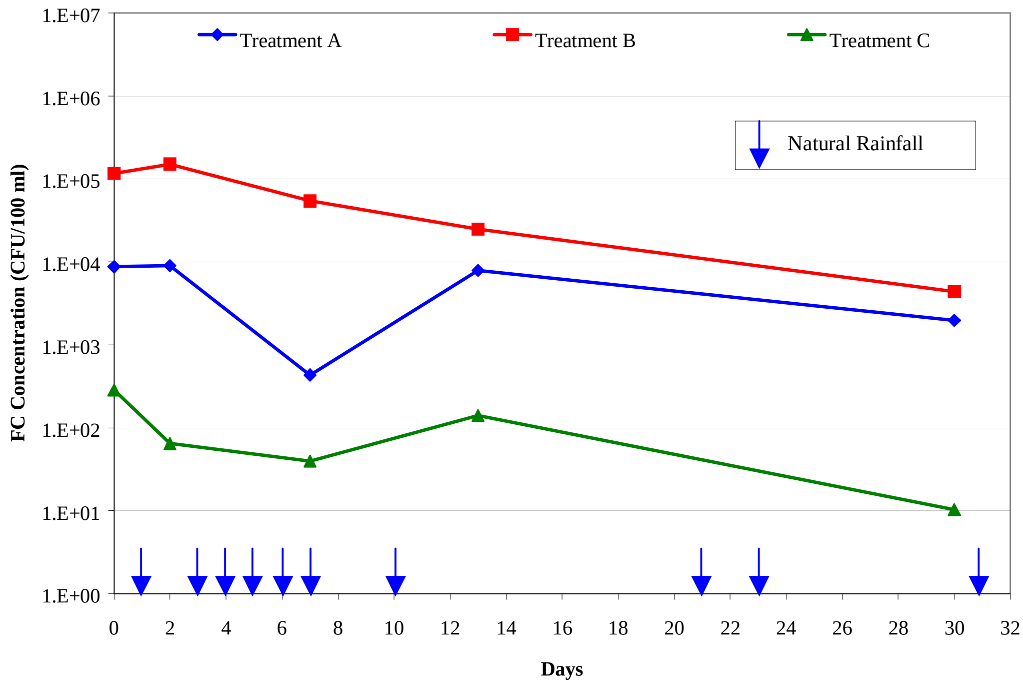


Figure 25. Series I fecal coliform concentrations versus time (outliers removed).

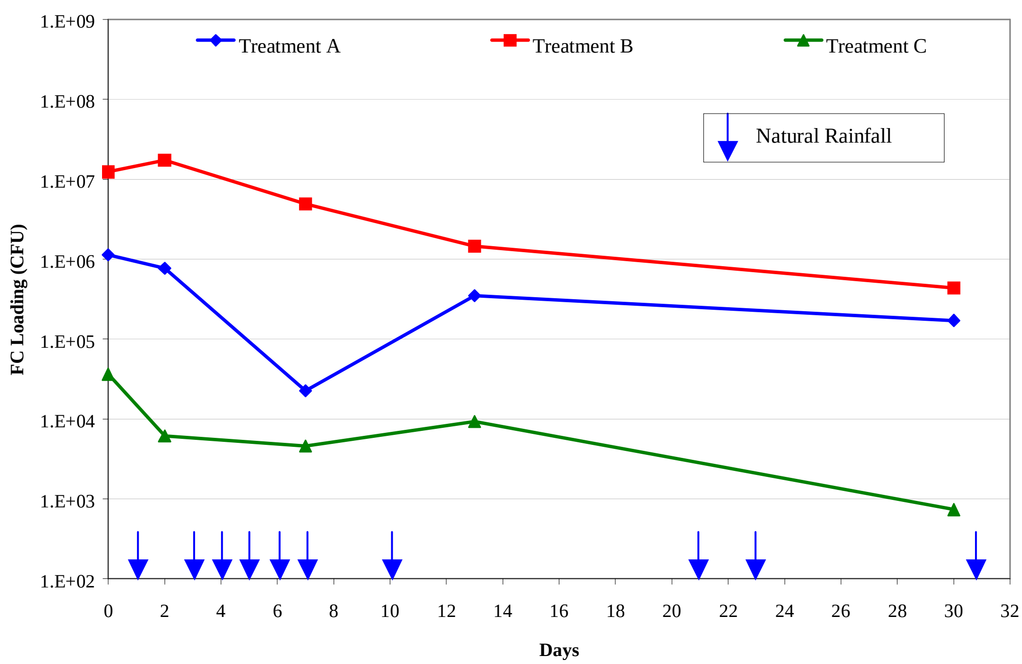


Figure 26. Series I fecal coliform loadings versus time (outliers removed).

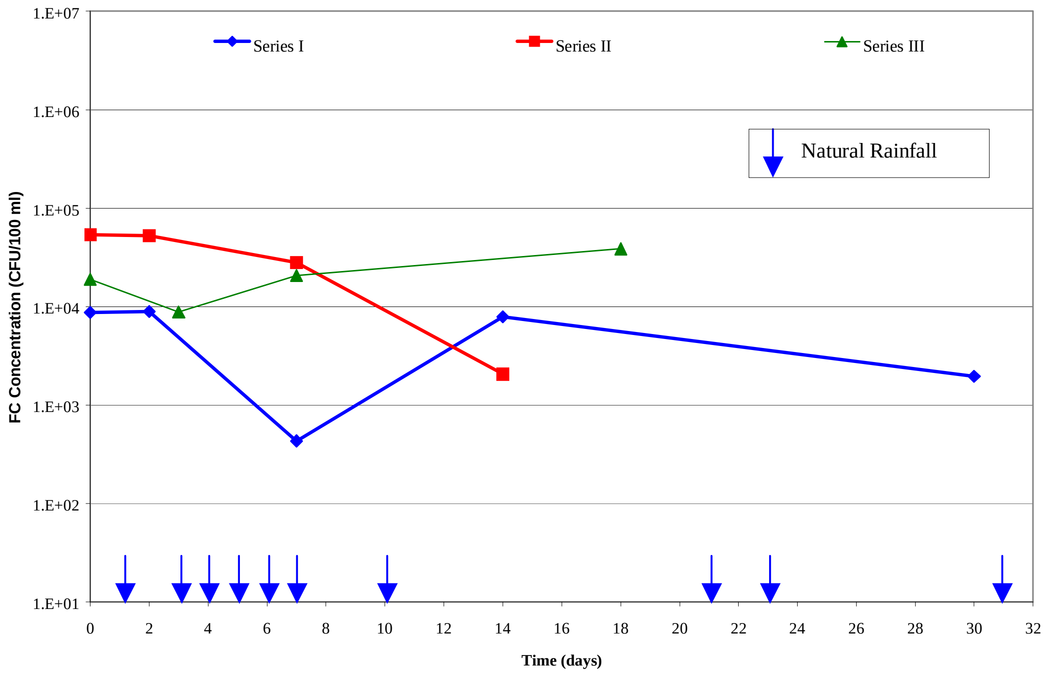


Figure 27. Treatment A fecal coliform concentrations versus time (outliers removed).

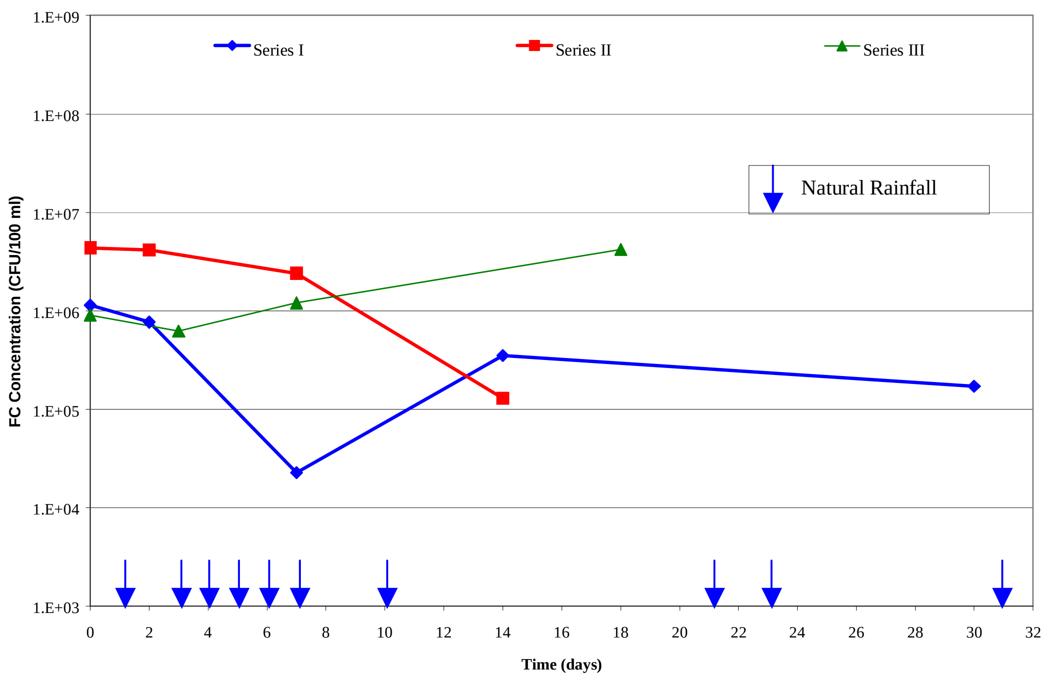


Figure 28. Treatment A fecal coliform loadings versus time (outliers removed).

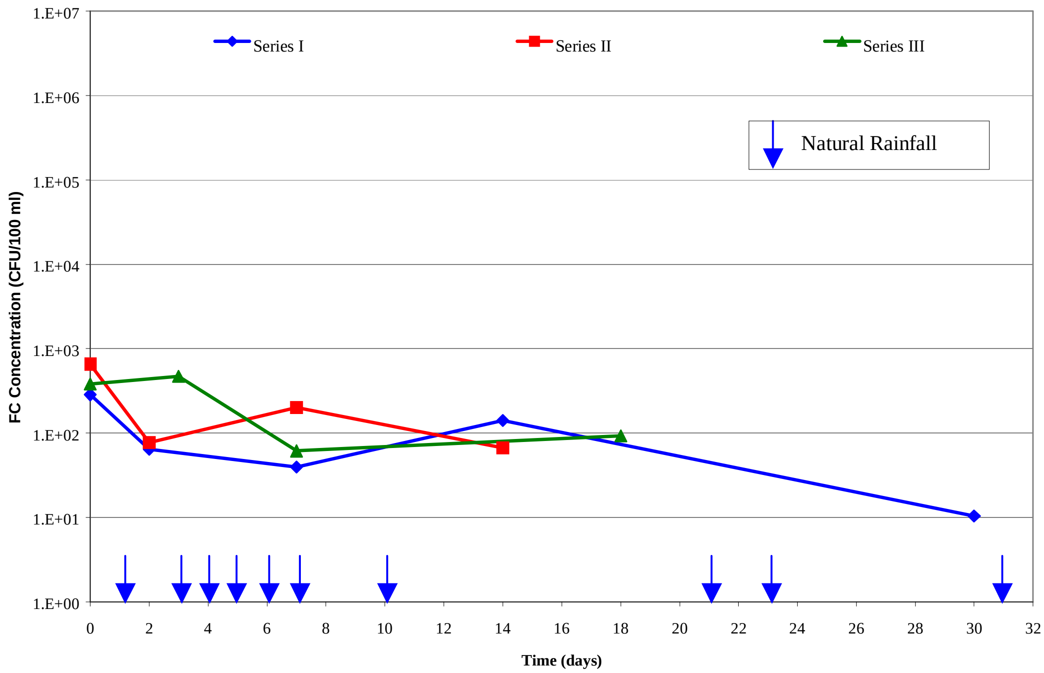


Figure 29. Treatment C fecal coliform concentrations versus time (outliers removed).

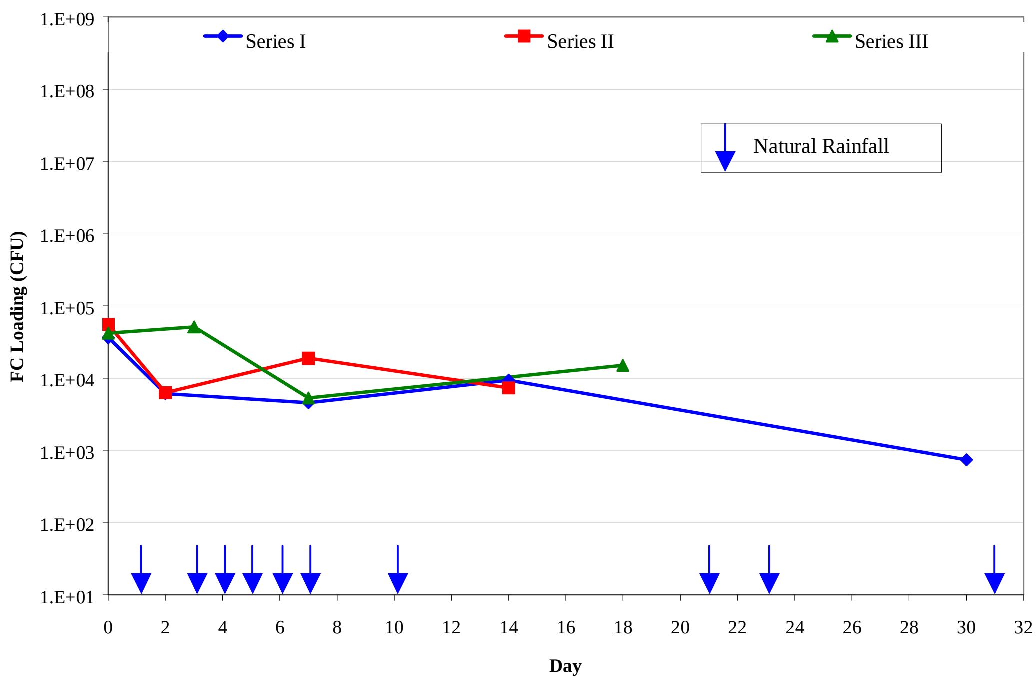


Figure 30. Treatment C fecal coliform loadings versus time (outliers removed).

significant result will depend on whether the variances across groups are equal or not. Tukey's Honestly Significant Difference (HSD) and Tamhane's T2 are the most frequently applied post hoc comparison test statistics for equal and non-equal variances, respectively. However, Tukey's HSD is not exact if group sizes are unequal. Thus, Sidak's *t* test was chosen as the parametric post hoc analysis for this study. Sidak's test is more conservative than Tukey's HSD (As, 2000). Data should initially be tested for equal variances to determine which post hoc test is appropriate.

Bartlett's test is frequently recommended for testing the assumption of equal variances. However, Bartlett's test was not available with the statistical software used for this research (SPSS® Graduate Pack 10.0 for Windows). Furthermore, Bartlett's test is sensitive to departures from normality in the data and significance may indicate non-normality rather than unequal variances. Since some of the data sets in this study do not meet the assumption of normality, a more robust test was preferred. The test for homogeneity of variance available with SPSS® is Levene's test, which is less sensitive to departures from normality than Bartlett's test. Levene's test is computed to test the null hypothesis that the error variance of the dependent variable is equal across groups of the independent variable.

Levene's test was conducted on the natural log transformed fecal coliform loading data to test the assumption of homogeneity of variance (Table 4). For all data sets, the null hypothesis of homogeneity of variances could not be rejected. These results indicate that the assumption of equal variances is maintained for all data sets. Thus Sidak's test is an appropriate post hoc analysis for determining the nature of the differences between groups following a significant ANOVA.

Table 4. Levene's test for homogeneity of variance using ln (FC loading).

| Series | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| **I** | 0.628 | 2 | 92 | 0.536 |
| **II** | 0.239 | 2 | 58 | 0.788 |
| **III** | 0.176 | 2 | 75 | 0.839 |

Univariate ANOVAs were computed to examine the effects of Treatment on the natural log-transformed fecal coliform loading data within each Series. The univariate ANOVA procedure provides regression analysis and analysis of variance for one dependent variable by one or more factors and/or covariates (SPSS® Inc., 1999). Because the fecal coliform data will vary over time with respect to growth, decay and physical removal via runoff, Day of rainfall simulation was included as a covariate to serve as a control variable for Treatment. In this way, the effect of Treatment was tested after adjusting for the effect of Day. Day of rainfall simulation was also used as a quantitative predictor variable in defining the regression model. Since a linear relationship is estimated for natural log-transformed fecal coliform loading by Day, the regression model assumes no initial regrowth or stationary period prior to die-off. Thus, the analysis was performed excluding data from Day 0 since some regrowth was noted between Day 0 and the second rainfall events. The Type IV sum-of-squares method was chosen to partition the sums of squares in the analysis because this method is designed for situations in which there are missing cells of data. Type IV distributes the contrasts being made among the parameters in F to all higher-level effects equitably (SPSS Inc., 1999). Since pairwise comparisons can only be performed for fixed main effects (Treatment), the post hoc tests were run separately for each individual Day. The SPSS® syntax used for this analysis is given in Appendix B.

The descriptive statistics for the fecal coliform loading data for each Treatment are summarized in Table 5. The main effect of Treatment on fecal coliform loading was significant ($p < .05$) for all Series (Table 6). The main effect of Day was significant ($p < .05$) for Series I and II only. The interaction of Treatment with Day was significant ($p < .05$) for Series I and III only. Thus, both the main effects of Treatment and Day along with interaction were significant for Series I; while both main effects, but not interaction, were significant for Series II; and the main effect of Treatment, but not Day, and interaction were significant for Series III. The net decay coefficients were calculated from the regression model for each Treatment within each Series (Table 7). The decay coefficients vary with respect to Treatment and Series.

Separate univariate ANOVAs were performed to determine whether there was a difference in Treatments at specified Days (Table 8). Treatments were compared at the day of the second rainfall event through the last rainfall event of each Series using marginal means estimated from the model at the given Days (Table A6, Appendix A). Since means were

Table 5. Descriptives using dependent variable: ln (FC loading) for Day > 0.

| | **Treatment** | **Mean** | **Std. Deviation** | **N** |
|---|---|---|---|---|
| **Series I** | **A** | 12.3983 | 1.7794 | 28 |
| | **B** | 14.8138 | 1.7312 | 36 |
| | **C** | 8.2209 | 2.0172 | 31 |
| | **Total** | 11.9505 | 3.3333 | 95 |
| **Series II** | **A** | 13.8687 | 2.2760 | 26 |
| | **B** | 17.1545 | 2.0358 | 22 |
| | **C** | 9.3492 | 2.2294 | 13 |
| | **Total** | 14.0906 | 3.5968 | 61 |
| **Series III** | **A** | 14.1979 | 1.5207 | 27 |
| | **B** | 15.4754 | 1.7010 | 24 |
| | **C** | 9.6808 | 1.6198 | 27 |
| | **Total** | 13.0274 | 2.9676 | 78 |

Table 6. Test of between-subject effects using dependent variable: ln (FC Loading).

| | Source | Type IV SS | df | MS | F | Sig. |
|---|---|---|---|---|---|---|
| Series I | **Corrected Model** | 818.843[a] | 5 | 163.769 | 64.61 | 0.000 |
| | **Intercept** | 6164.805 | 1 | 6164.805 | 2432.11 | 0.000 |
| | **DAY** | 67.672 | 1 | 67.672 | 26.70 | 0.000 |
| | **TREAT** | 328.030 | 2 | 164.015 | 64.71 | 0.000 |
| | **TREAT * DAY** | 15.992 | 2 | 7.996 | 3.16 | 0.047 |
| | **Error** | 225.593 | 89 | 2.535 | | |
| | **Total** | 14611.805 | 95 | | | |
| | **Corrected Total** | 1044.436 | 94 | | | |
| Series II | **Corrected Model** | 600.023[b] | 5 | 120.005 | 37.46 | 0.000 |
| | **Intercept** | 2781.982 | 1 | 2781.982 | 868.33 | 0.000 |
| | **DAY** | 25.472 | 1 | 25.472 | 7.95 | 0.007 |
| | **TREAT** | 197.933 | 2 | 98.967 | 30.89 | 0.000 |
| | **TREAT * DAY** | 16.762 | 2 | 8.381 | 2.62 | 0.082 |
| | **Error** | 176.211 | 55 | 3.204 | | |
| | **Total** | 12887.440 | 61 | | | |
| | **Corrected Total** | 776.234 | 60 | | | |
| Series III | **Corrected Model** | 506.858[c] | 5 | 101.372 | 42.62 | 0.000 |
| | **Intercept** | 4243.627 | 1 | 4243.627 | 1784.34 | 0.000 |
| | **DAY** | 0.068 | 1 | 0.068 | 0.03 | 0.866 |
| | **TREAT** | 147.703 | 2 | 73.851 | 31.05 | 0.000 |
| | **TREAT * DAY** | 23.578 | 2 | 11.789 | 4.96 | 0.010 |
| | **Error** | 171.235 | 72 | 2.378 | | |
| | **Total** | 13915.621 | 78 | | | |
| | **Corrected Total** | 678.093 | 77 | | | |

a. R Squared = .784 b. R Squared = .773 c. R Squared = .747

Table 7. Net FC decay coefficients.

| | Series I | Series II | Series III |
|---|---|---|---|
| Treatment A | 0.031 | 0.326 | 0.124 |
| Treatment B | 0.118 | 0.328 | 0.066 |
| Treatment C | 0.077 | 0.076 | 0.044 |

Table 8. Anova table comparing Treatments at specified Days.

| | | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|---|
| Series I | Day 2 | Contrast | 382.726 | 2 | 191.363 | 75.496 | 0.000 |
| | | Error | 225.593 | 89 | 2.535 | | |
| | Day 7 | Contrast | 560.131 | 2 | 280.065 | 110.49 | 0.000 |
| | | Error | 225.593 | 89 | 2.535 | | |
| | Day 14 | Contrast | 714.558 | 2 | 357.279 | 140.952 | 0.000 |
| | | Error | 225.593 | 89 | 2.535 | | |
| | Day 30 | Contrast | 200.534 | 2 | 100.267 | 39.557 | 0.000 |
| | | Error | 225.593 | 89 | 2.535 | | |
| Series II | Day 3 | Contrast | 360.275 | 2 | 180.137 | 56.226 | 0.000 |
| | | Error | 176.211 | 55 | 3.204 | | |
| | Day 7 | Contrast | 462.342 | 2 | 231.171 | 72.155 | 0.000 |
| | | Error | 176.211 | 55 | 3.204 | | |
| | Day 14 | Contrast | 46.087 | 2 | 23.043 | 7.192 | 0.002 |
| | | Error | 176.211 | 55 | 3.204 | | |
| Series III | Day 3 | Contrast | 229.931 | 2 | 114.966 | 48.346 | 0.000 |
| | | Error | 171.235 | 72 | 2.378 | | |
| | Day 7 | Contrast | 411.527 | 2 | 205.764 | 86.518 | 0.000 |
| | | Error | 171.235 | 72 | 2.378 | | |
| | Day 14 | Contrast | 352.403 | 2 | 176.201 | 74.088 | 0.000 |
| | | Error | 171.235 | 72 | 2.378 | | |
| | Day 18 | Contrast | 211.36 | 2 | 105.68 | 44.436 | 0.000 |
| | | Error | 171.235 | 72 | 2.378 | | |

computed from the model, Days used to compare Treatments were not limited to the Days of actual rainfall events.

Significant differences were found among the Treatments for all Days analyzed within each Series. Therefore, pairwise comparisons using the Sidak adjustment for multiple comparisons were computed for each Day to determine the nature of the differences (Table 9). The results indicate that fecal coliform loadings for Treatment B were significantly higher than

Table 9. Sidak pairwise comparisons among Treatments at specified Days.

| | | (I) Treatment | (J) Treatment | Mean Difference (I-J) | Std. Error | Sig.[a] | 95% Confidence Interval for Difference[a] Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|---|---|
| Series I | Day = 2 | A | B | -3.374(*) | 0.574 | 0.000 | -4.771 | -1.976 |
| | | | C | 3.634(*) | 0.607 | 0.000 | 2.157 | 5.111 |
| | | B | A | 3.374(*) | 0.574 | 0.000 | 1.976 | 4.771 |
| | | | C | 7.008(*) | 0.571 | 0.000 | 5.619 | 8.397 |
| | | C | A | -3.634(*) | 0.607 | 0.000 | -5.111 | -2.157 |
| | | | B | -7.008(*) | 0.571 | 0.000 | -8.397 | -5.619 |
| | Day = 7 | A | B | -2.938(*) | 0.466 | 0.000 | -4.073 | -1.804 |
| | | | C | 3.863(*) | 0.49 | 0.000 | 2.670 | 5.056 |
| | | B | A | 2.938(*) | 0.466 | 0.000 | 1.804 | 4.073 |
| | | | C | 6.801(*) | 0.458 | 0.000 | 5.688 | 7.915 |
| | | C | A | -3.863(*) | 0.49 | 0.000 | -5.056 | -2.670 |
| | | | B | -6.801(*) | 0.458 | 0.000 | -7.915 | -5.688 |
| | Day = 14 | A | B | -2.328(*) | 0.402 | 0.000 | -3.305 | -1.351 |
| | | | C | 4.184(*) | | 0.000 | 3.173 | 5.194 |
| | | B | A | 2.328(*) | 0.402 | 0.000 | 1.351 | 3.305 |
| | | | C | 6.512(*) | 0.39 | 0.000 | 5.562 | 7.462 |
| | | C | A | -4.184(*) | 0.415 | 0.000 | -5.194 | -3.173 |
| | | | B | -6.512(*) | 0.39 | 0.000 | -7.462 | -5.562 |
| | Day = 30 | A | B | -0.934 | 0.69 | 0.447 | -2.612 | 0.745 |
| | | | C | 4.916(*) | 0.711 | 0.000 | 3.186 | 6.647 |
| | | B | A | 0.934 | 0.69 | 0.447 | -0.745 | 2.612 |
| | | | C | 5.850(*) | 0.698 | 0.000 | 4.151 | 7.550 |
| | | C | A | -4.916(*) | 0.711 | 0.000 | -6.647 | -3.186 |
| | | | B | -5.850(*) | 0.698 | 0.000 | -7.550 | -4.151 |
| Series II | Day = 3 | A | B | -2.997(*) | 0.75 | 0.001 | -4.844 | -1.151 |
| | | | C | 6.392(*) | 0.874 | 0.000 | 4.239 | 8.545 |
| | | B | A | 2.997(*) | 0.75 | 0.001 | 1.151 | 4.844 |
| | | | C | 9.390(*) | 0.888 | 0.000 | 7.204 | 11.575 |
| | | C | A | -6.392(*) | 0.874 | 0.000 | -8.545 | -4.239 |
| | | | B | -9.390(*) | 0.888 | 0.000 | -11.575 | -7.204 |
| | Day = 7 | A | B | -2.992(*) | 0.525 | 0.000 | -4.284 | -1.700 |
| | | | C | 4.782(*) | 0.635 | 0.000 | 3.218 | 6.346 |
| | | B | A | 2.992(*) | 0.525 | 0.000 | 1.700 | 4.284 |
| | | | C | 7.774(*) | 0.648 | 0.000 | 6.178 | 9.369 |
| | | C | A | -4.782(*) | 0.635 | 0.000 | -6.346 | -3.218 |
| | | | B | -7.774(*) | 0.648 | 0.000 | -9.369 | -6.178 |

Table 9. Continued.

| | | (I) Treatment | (J) Treatment | Mean Difference (I-J) | Std. Error | Sig.[a] | 95% Confidence Interval for Difference[a] | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower Bound | Upper Bound |
| Series II | Day = 14 | A | B | -2.982(*) | 0.937 | 0.007 | -5.290 | -0.674 |
| | | | C | 1.964 | 1.53 | 0.497 | -1.805 | 5.732 |
| | | B | A | 2.982(*) | 0.937 | 0.007 | 0.674 | 5.290 |
| | | | C | 4.946(*) | 1.601 | 0.009 | 1.002 | 8.890 |
| | | C | A | -1.964 | 1.53 | 0.497 | -5.732 | 1.805 |
| | | | B | -4.946(*) | 1.601 | 0.009 | -8.890 | -1.002 |
| Series III | Day = 3 | A | B | -2.507(*) | 0.611 | 0.000 | -3.999 | -1.014 |
| | | | C | 3.450(*) | 0.593 | 0.000 | 2.000 | 4.900 |
| | | B | A | 2.507(*) | 0.611 | 0.000 | 1.014 | 3.999 |
| | | | C | 5.956(*) | 0.611 | 0.000 | 4.464 | 7.449 |
| | | C | A | -3.450(*) | 0.593 | 0.000 | -4.900 | -2.000 |
| | | | B | -5.956(*) | 0.611 | 0.000 | -7.449 | -4.464 |
| | Day = 7 | A | B | -1.743(*) | 0.463 | 0.001 | -2.875 | -0.611 |
| | | | C | 4.124(*) | 0.447 | 0.000 | 3.030 | 5.217 |
| | | B | A | 1.743(*) | 0.463 | 0.001 | 0.611 | 2.875 |
| | | | C | 5.866(*) | 0.463 | 0.000 | 4.734 | 6.998 |
| | | C | A | -4.124(*) | 0.447 | 0.000 | -5.217 | -3.030 |
| | | | B | -5.866(*) | 0.463 | 0.000 | -6.998 | -4.734 |
| | Day = 14 | A | B | -0.406 | 0.527 | 0.828 | -1.693 | 0.882 |
| | | | C | 5.304(*) | 0.521 | 0.000 | 4.030 | 6.577 |
| | | B | A | 0.406 | 0.527 | 0.828 | -0.882 | 1.693 |
| | | | C | 5.709(*) | 0.527 | 0.000 | 4.421 | 6.997 |
| | | C | A | -5.304(*) | 0.521 | 0.000 | -6.577 | -4.030 |
| | | | B | -5.709(*) | 0.527 | 0.000 | -6.997 | -4.421 |
| | Day = 18 | A | B | 0.358 | 0.713 | 0.944 | -1.384 | 2.101 |
| | | | C | 5.978(*) | 0.711 | 0.000 | 4.240 | 7.715 |
| | | B | A | -0.358 | 0.713 | 0.944 | -2.101 | 1.384 |
| | | | C | 5.619(*) | 0.713 | 0.000 | 3.877 | 7.362 |
| | | C | A | -5.978(*) | 0.711 | 0.000 | -7.715 | -4.240 |
| | | | B | -5.619(*) | 0.713 | 0.000 | -7.362 | -3.877 |

* Significant at p = 0.01.

those for Treatment A at Days 0 – 7 in all Series. However, by the final rainfall events of Series I (Day 30) and Series III (Day 18), fecal coliform loadings were not significantly different between Treatments A and B. Treatment A was significantly higher than the control on all days within all Series except for the last day of rainfall in Series II, Day 14.

Since Day 0 was not used in the regression model, separate one-way ANOVAs were performed for each Series to determine if Treatments were significantly different on Day 0 (Table 10). Significant differences were found between Treatments for all Series on Day 0. Pairwise comparisons using the Sidak adjustment indicate that on Day 0, fecal coliform loadings from Treatment B plots were significantly higher than those from Treatment A plots, and fecal coliform loadings from Treatment A plots were significantly higher than those from the control plots for all Series (Table 11).

Table 10. Anova table comparing Treatments at Day 0.

| | Source | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **Series I Day = 0** | **Between Groups** | 109.726 | 2 | 54.863 | 19.397 | 0.000 |
| | **Within Groups** | 56.568 | 20 | 2.828 | | |
| | **Total** | 166.294 | 22 | | | |
| **Series II Day = 0** | **Between Groups** | 135.498 | 2 | 67.749 | 59.928 | 0.000 |
| | **Within Groups** | 22.610 | 20 | 1.131 | | |
| | **Total** | 158.108 | 22 | | | |
| **Series III Day = 0** | **Between Groups** | 91.695 | 2 | 45.848 | 20.511 | 0.000 |
| | **Within Groups** | 33.529 | 15 | 2.235 | | |
| | **Total** | 125.224 | 17 | | | |

Table 11. Sidak pairwise comparisons among Treatments at Day 0.

| | (I) Treatment | (J) Treatment | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound |
| Series I Day 0 | A | B | -2.3870(*) | .7928 | .021 | -4.4520 | -.3219 |
| | | C | 3.4421(*) | .9381 | .005 | .9987 | 5.8855 |
| | B | A | 2.3870(*) | .7928 | .021 | .3219 | 4.4520 |
| | | C | 5.8291(*) | .9381 | .000 | 3.3857 | 8.2725 |
| | C | A | -3.4421(*) | .9381 | .005 | -5.8855 | -.9987 |
| | | B | -5.8291(*) | .9381 | .000 | -8.2725 | -3.3857 |
| Series II Day 0 | A | B | -2.1205(*) | .5012 | .001 | -3.4261 | -.8150 |
| | | C | 4.3671(*) | .5931 | .000 | 2.8224 | 5.9119 |
| | B | A | 2.1205(*) | .5012 | .001 | .8150 | 3.4261 |
| | | C | 6.4876(*) | .5931 | .000 | 4.9429 | 8.0324 |
| | C | A | -4.3671(*) | .5931 | .000 | -5.9119 | -2.8224 |
| | | B | -6.4876(*) | .5931 | .000 | -8.0324 | -4.9429 |
| Series III Day 0 | A | B | -3.2429(*) | .7738 | .002 | -5.3207 | -1.1651 |
| | | C | 3.0663(*) | 1.0122 | .025 | .3484 | 5.7842 |
| | B | A | 3.2429(*) | .7738 | .002 | 1.1651 | 5.3207 |
| | | C | 6.3092(*) | 1.0317 | .000 | 3.5389 | 9.0796 |
| | C | A | -3.0663(*) | 1.0122 | .025 | -5.7842 | -.3484 |
| | | B | -6.3092(*) | 1.0317 | .000 | -9.0796 | -3.5389 |

* Significant at $p < 0.001$.

**4. Observed Fecal Coliform Differences across Series**

To determine whether there were any differences in fecal coliform loadings across Series for each Treatment, univariate ANOVAs were performed using natural log-transformed fecal coliform loading as the dependent variable and Series as the independent category variable. As done for the analysis of Treatment effects, Day of rainfall was entered as a covariate to serve as a control variable for Series by adjusting for the effect of Day. Likewise, the analysis for effects of Series was performed excluding data from Day 0 to remove the regrowth or stationary period prior to die-off from the model. In addition, since the length of each Series was different, the model was determined using Day 2 - Day 14, the final rainfall day of the shortest Series.

The descriptive statistics for the fecal coliform data for each Series are summarized in Table 12. Results of the univariate ANOVAs (Table 13) indicate that significant differences in fecal coliform loading exist across Series for Treatment A ($F(2, 57) = 7.65$, $p = 0.001$), Treatment B ($F(2, 58) = 6.15$, $p = 0.004$) and Treatment C ($F(2, 48) = 3.85$, $p < 0.05$). The main effect of Day was only significant for Series II ($F(1, 58) = 17.645$, $p = 0.006$). Interaction of Series with Day was only significant for Series I ($F(2, 48) = 4.09$, $p = 0.022$).

Table 12. Descriptives: ln (FC Loading) for Day > 0 and < 15.

| | Series | Mean | Std. Deviation | N |
|---|---|---|---|---|
| **Treatment A** | **I** | 12.5617 | 1.8246 | 19 |
| | **II** | 13.8687 | 2.2760 | 26 |
| | **III** | 13.6711 | 1.5958 | 18 |
| | **Total** | 13.4181 | 2.0204 | 63 |
| **Treatment B** | **I** | 15.4235 | 1.5144 | 27 |
| | **II** | 17.1545 | 2.0358 | 22 |
| | **III** | 15.8091 | 1.7796 | 15 |
| | **Total** | 16.1089 | 1.9069 | 64 |
| **Treatment C** | **I** | 8.7860 | 2.0066 | 23 |
| | **II** | 9.3492 | 2.2294 | 13 |
| | **III** | 9.7121 | 1.9436 | 18 |
| | **Total** | 9.2303 | 2.0436 | 54 |

Table 13. Test of between-subject effects using dependent variable: ln (FC Loading).

| | Source | Type IV Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Treatment A | **Corrected Model** | 84.783[a] | 5 | 16.957 | 5.74 | 0.000 |
| | **Intercept** | 2548.186 | 1 | 2548.186 | 862.97 | 0.000 |
| | **DAY** | 3.390 | 1 | 3.390 | 1.15 | 0.288 |
| | **SERIES** | 45.154 | 2 | 22.577 | 7.65 | 0.001 |
| | **SERIES * DAY** | 24.169 | 2 | 12.085 | 4.09 | 0.022 |
| | **Error** | 168.310 | 57 | 2.953 | | |
| | **Total** | 11595.893 | 63 | | | |
| | **Corrected Total** | 253.092 | 62 | | | |
| Treatment B | **Corrected Model** | 105.834[b] | 5 | 21.167 | 9.96 | 0.000 |
| | **Intercept** | 3693.166 | 1 | 3693.166 | 1737.96 | 0.000 |
| | **DAY** | 17.645 | 1 | 17.645 | 8.30 | 0.006 |
| | **SERIES** | 26.130 | 2 | 13.065 | 6.15 | 0.004 |
| | **SERIES * DAY** | 4.470 | 2 | 2.235 | 1.05 | 0.356 |
| | **Error** | 123.250 | 58 | 2.125 | | |
| | **Total** | 16836.830 | 64 | | | |
| | **Corrected Total** | 229.083 | 63 | | | |
| Treatment C | **Corrected Model** | 33.456[c] | 5 | 6.691 | 1.71 | 0.151 |
| | **Intercept** | 910.319 | 1 | 910.319 | 232.56 | 0.000 |
| | **DAY** | 7.853 | 1 | 7.853 | 2.01 | 0.163 |
| | **SERIES** | 30.114 | 2 | 15.057 | 3.85 | 0.028 |
| | **SERIES * DAY** | 24.374 | 2 | 12.187 | 3.11 | 0.054 |
| | **Error** | 187.890 | 48 | 3.914 | | |
| | **Total** | 4822.039 | 54 | | | |
| | **Corrected Total** | 221.346 | 53 | | | |

a. R Squared = .335 b. R Squared = .462 c. R Squared = .151

Differences were tested among Series at Days 3, 7 and 14 for all Treatments by performing separate univariate ANOVAs (Table 14). Significant differences were found to exist for Treatment A, Days 3 and 7; Treatment B, Days 3 and 7; and Treatment C, Day 3 (p <

0.05). The Levene statistic indicated that the assumption of homogeneity of variance was valid for fecal coliform loading across Treatments (Table 15). Pairwise comparisons using the Sidak adjustment for multiple comparisons (Table 16) indicated that for Treatments A and B, the fecal coliform loading at Day 3 was significantly higher in Series II than in Series I and III, and at Day 7, significantly higher in Series II than in Series I. Although not significant, the fecal coliform loading for Series II at Day 7 was also higher than that of Series III for Treatments A and B. Fecal coliform loading data in Series I and III were not significantly different on any Day for Treatments A and B. Fecal coliform loadings for Treatment C of Series III were significantly higher than Series I and II for Day 3.

Since Day 0 was not used in the regression model, separate one-way ANOVAs were performed for each Treatment to determine if fecal coliform loadings differed on Day 0 across Series. Significant differences were not found between initial fecal coliform counts of each Series for any of the Treatments ($p > 0.01$).

Upon completion of the three rainfall simulation Series, it was observed that the temperature ranges during each Series may have played a role in the observed fecal coliform decay. Higher temperatures would be expected to increase the decay rate of the fecal coliforms, potentially resulting in fewer fecal coliform counts in runoff. Since ambient air temperature was not measured during the experiment, runoff temperatures were compared assuming a linear relationship with air temperature. The descriptive statistics for runoff temperature are summarized in Table 17. Results of a one-way ANOVA indicate that runoff temperature differed significantly across Series ($F(2, 109) = 35.243$, $p < 0.001$). The Levene statistic indicated that the assumption of homogeneity of variances was valid for runoff temperature data across Series. Post hoc analyses of this data indicate that the mean runoff temperature in

Series I (22.97 ± 3.59°C) was lower than that of Series II (26.39 ± 3.05°C), and Series II was lower than Series III (29.11 ± 2.79°C) (Table 17).

Table 14. ANOVA table comparing Series at specified Days.

| | | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|---|
| Treatment A | Day 3 | Contrast | 46.965 | 2 | 23.483 | 7.953 | 0.001 |
| | | Error | 168.31 | 57 | 2.953 | | |
| | Day 7 | Contrast | 32.421 | 2 | 16.211 | 5.490 | 0.007 |
| | | Error | 168.31 | 57 | 2.953 | | |
| | Day 14 | Contrast | 8.371 | 2 | 4.185 | 1.417 | 0.251 |
| | | Error | 168.31 | 57 | 2.953 | | |
| Treatment B | Day 3 | Contrast | 40.487 | 2 | 20.243 | 9.526 | 0.000 |
| | | Error | 123.25 | 58 | 2.125 | | |
| | Day 7 | Contrast | 37.026 | 2 | 18.513 | 8.712 | 0.000 |
| | | Error | 123.25 | 58 | 2.125 | | |
| | Day 14 | Contrast | 3.7 | 2 | 1.85 | 0.871 | 0.424 |
| | | Error | 123.25 | 58 | 2.125 | | |
| Treatment C | Day 3 | Contrast | 26.106 | 2 | 13.053 | 3.335 | 0.044 |
| | | Error | 187.89 | 48 | 3.914 | | |
| | Day 7 | Contrast | 4.702 | 2 | 2.351 | 0.601 | 0.553 |
| | | Error | 187.89 | 48 | 3.914 | | |
| | Day 14 | Contrast | 17.37 | 2 | 8.685 | 2.219 | 0.120 |
| | | Error | 187.89 | 48 | 3.914 | | |

The F-value tests the effect of Series. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

Table 15. Levene' s test for homogeneity of variance using ln (FC loading).

| Treatment | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| A | 0.135 | 2 | 60 | 0.874 |
| B | 1.635 | 2 | 61 | 0.203 |
| C | 1.016 | 2 | 51 | 0.369 |

Table 16. Sidak pairwise comparisons among Treatments at specified Days.

| Treatment | Day | (I) Series | (J) Series | Mean Difference (I-J) | Std. Error | Sig. | 95% CI Lower Bound | 95% CI Upper Bound |
|---|---|---|---|---|---|---|---|---|
| **Treatment A** | **Day = 3** | **I** | **II** | -2.650(*) | 0.698 | 0.001 | -4.368 | -0.932 |
| | | | **III** | -0.479 | 0.753 | 0.894 | -2.332 | 1.374 |
| | | **II** | **I** | 2.650(*) | 0.698 | 0.001 | 0.932 | 4.368 |
| | | | **III** | 2.171(*) | 0.759 | 0.018 | 0.304 | 4.038 |
| | | **III** | **I** | 0.479 | 0.753 | 0.894 | -1.374 | 2.332 |
| | | | **II** | -2.171(*) | 0.759 | 0.018 | -4.038 | -0.304 |
| | **Day = 7** | **I** | **II** | -1.686(*) | 0.526 | 0.007 | -2.979 | -0.393 |
| | | | **III** | -1.479 | 0.696 | 0.110 | -3.192 | 0.234 |
| | | **II** | **I** | 1.686(*) | 0.526 | 0.007 | 0.393 | 2.979 |
| | | | **III** | 0.207 | 0.669 | 0.986 | -1.438 | 1.852 |
| | | **III** | **I** | 1.479 | 0.696 | 0.110 | -0.234 | 3.192 |
| | | | **II** | -0.207 | 0.669 | 0.986 | -1.852 | 1.438 |
| **Treatment B** | **Day = 3** | **I** | **II** | -2.115(*) | 0.588 | 0.002 | -3.561 | -0.668 |
| | | | **III** | 0.475 | 0.623 | 0.832 | -1.056 | 2.007 |
| | | **II** | **I** | 2.115(*) | 0.588 | 0.002 | 0.668 | 3.561 |
| | | | **III** | 2.590(*) | 0.656 | 0.001 | 0.977 | 4.203 |
| | | **III** | **I** | -0.475 | 0.623 | 0.832 | -2.007 | 1.056 |
| | | | **II** | -2.590(*) | 0.656 | 0.001 | -4.203 | -0.977 |
| | **Day = 7** | **I** | **II** | -1.701(*) | 0.419 | 0.000 | -2.732 | -0.670 |
| | | | **III** | -0.144 | 0.658 | 0.995 | -1.763 | 1.474 |
| | | **II** | **I** | 1.701(*) | 0.419 | 0.000 | 0.670 | 2.732 |
| | | | **III** | 1.557 | 0.671 | 0.070 | -0.094 | 3.207 |
| | | **III** | **I** | 0.144 | 0.658 | 0.995 | -1.474 | 1.763 |
| | | | **II** | -1.557 | 0.671 | 0.070 | -3.207 | 0.094 |
| **Treatment C** | **Day = 3** | **I** | **II** | -0.571 | 0.998 | 0.921 | -3.040 | 1.899 |
| | | | **III** | -2.290(*) | 0.909 | 0.045 | -4.540 | -0.040 |
| | | **II** | **I** | 0.571 | 0.998 | 0.921 | -1.899 | 3.040 |
| | | | **III** | -1.72 | 1.020 | 0.267 | -4.242 | 0.803 |
| | | **III** | **I** | 2.290(*) | 0.909 | 0.045 | 0.040 | 4.540 |
| | | | **II** | 1.72 | 1.020 | 0.267 | -0.803 | 4.242 |

* Significant at $p < 0.05$.

Table 17. Intensity and runoff temperature descriptive statistics across Series.

| | | N | Mean | Std. Dev. | Std. Error | 95% CI for Mean | | Min. | Max. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| Intensity | I | 43 | 4.647 | 0.725 | 0.111 | 4.423 | 4.870 | 3.18 | 6.56 |
| | II | 36 | 5.066 | 0.612 | 0.102 | 4.859 | 5.273 | 4.15 | 6.21 |
| | III | 36 | 4.266 | 0.745 | 0.124 | 4.014 | 4.518 | 2.89 | 5.69 |
| | Total | 115 | 4.659 | 0.762 | 0.071 | 4.518 | 4.800 | 2.89 | 6.56 |
| Runoff Temperature | I | 42 | 22.969 | 3.594 | 0.555 | 21.849 | 24.089 | 17.50 | 30.00 |
| | II | 36 | 26.392 | 3.048 | 0.508 | 25.360 | 27.423 | 20.70 | 31.60 |
| | III | 34 | 29.106 | 2.790 | 0.478 | 28.133 | 30.079 | 23.10 | 34.60 |
| | Total | 112 | 25.932 | 4.061 | 0.384 | 25.172 | 26.692 | 17.50 | 34.60 |

Table 18. Comparisons of rainfall intensity and runoff temperature across Treatment.

| Dependent Variable | (I) SERIES | (J) SERIES | Mean Difference (I-J) | Std. Error | Sig. | 95% CI | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound |
| Rainfall Intensity | I | II | -.4196(*) | 0.1578 | 0.024 | -0.794 | -0.045 |
| | | III | .3804(*) | 0.1578 | 0.046 | 0.006 | 0.755 |
| | II | I | .4196(*) | 0.1578 | 0.024 | 0.045 | 0.794 |
| | | III | .8000(*) | 0.1646 | 0.000 | 0.409 | 1.191 |
| | III | I | -.3804(*) | 0.1578 | 0.046 | -0.755 | -0.006 |
| | | II | -.8000(*) | 0.1646 | 0.000 | -1.191 | -0.409 |
| Runoff Temperature | I | II | -3.423(*) | 0.725 | 0.000 | -5.146 | -1.699 |
| | | III | -6.137(*) | 0.737 | 0.000 | -7.887 | -4.386 |
| | II | I | 3.423(*) | 0.725 | 0.000 | 1.699 | 5.146 |
| | | III | -2.714(*) | 0.764 | 0.002 | -4.529 | -0.900 |
| | III | I | 6.137(*) | 0.737 | 0.000 | 4.386 | 7.887 |
| | | II | 2.714(*) | 0.764 | 0.002 | 0.900 | 4.529 |

Prior experiments have shown that rainfall intensity can affect fecal coliform counts in runoff (Kress and Gifford, 1984); thus, this parameter was compared across Series as well. Descriptive statistics for rainfall intensity are summarized in Table 17. Results of a one-way ANOVA indicate that rainfall intensity also differed significantly across Series ($F(2, 112) = 11.815$, $p < 0.001$). The Levene statistic indicated that the assumption of homogeneity of variances was valid for rainfall intensity data across Series. Post hoc analyses of this data indicated that the mean rainfall intensity in Series III (4.27 ± 0.75 in/hour) was lower than that of Series I (4.65 ± 0.73 in/hour), and Series I was lower than Series II (5.07 ± 0.61) (Table 18).

**5. Quanti-Tray Fecal Coliform Data**

The raw fecal coliform and total coliform data, each with their paired *E. coli* data, from the Quanti-Tray analysis of runoff samples are tabulated in Tables A8 and A9, respectively, of Appendix A. Reported MPN numbers were retrieved from the reference table. Many zero values were observed, causing a technical problem since the logarithm of zero is negative infinity. To compensate for this limitation, a value of one was added to all MPN counts prior to multiplication by the dilution factor. Thus, the transformation can be represented by the following equation:

$$\ln[(\text{MPN from table} + 1) * \text{dilution factor}] \qquad \text{(Eqn. 2)}$$

Membrane filtration fecal coliform results are plotted against Quanti-Tray fecal coliform results on a log-log axis for each Treatment (Figures 31 – 33). A positive linear relationship between the test methods for Treatments A and B is evident; however, the data for Treatment C do not appear to be linearly related. It is possible that outliers may exist that are obscuring a possible correlation for Treatment C. Five data points appearing to be possible outliers are identified on the graph (Figure 33) with their x, y-coordinates and are colored red.

The presumed outliers included all three samples from Series III Day 18 and both samples from Series I Day 32. A review of the field notes indicated no obvious reasons to suspect these data as outliers. However, when the presumed outliers were removed from the data set (Figure 31), the $R^2$ was considerably improved (0.0841 to 0.7835). A possible reason for the presence of outliers in the control treatment is that the results of the control treatment from both the Quanti-Tray and membrane filtration analyses were ambiguous and difficult to interpret, thus potentially resulting in inaccurate readings.

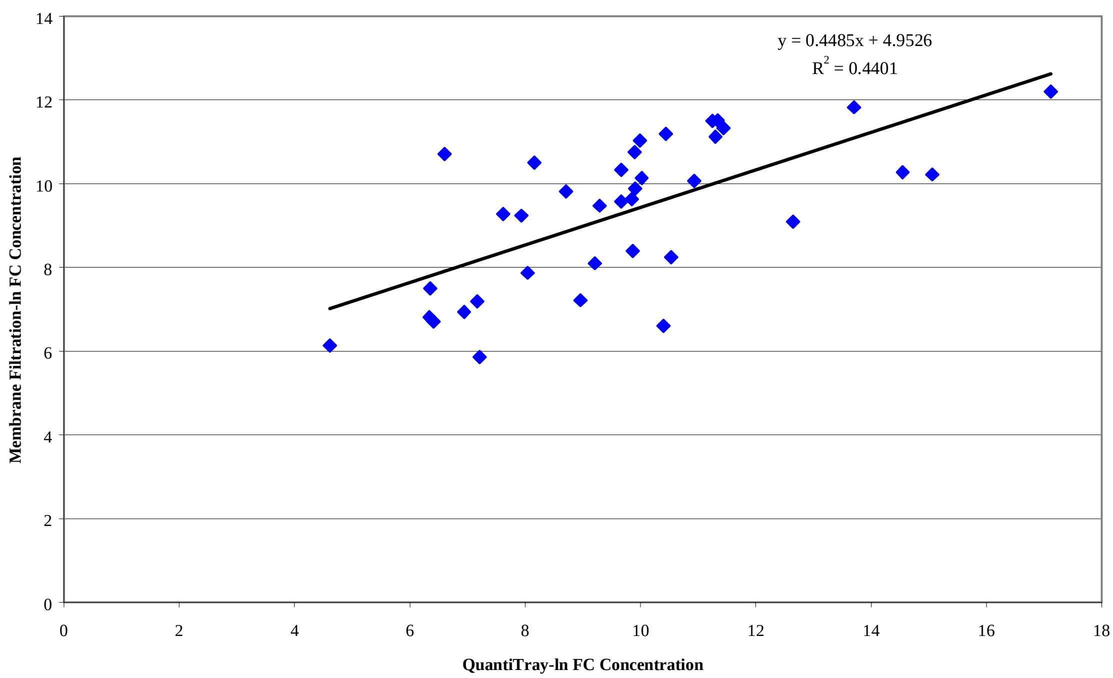


Figure 31. Treatment A fecal coliform concentrations: MF versus Quanti-Tray.

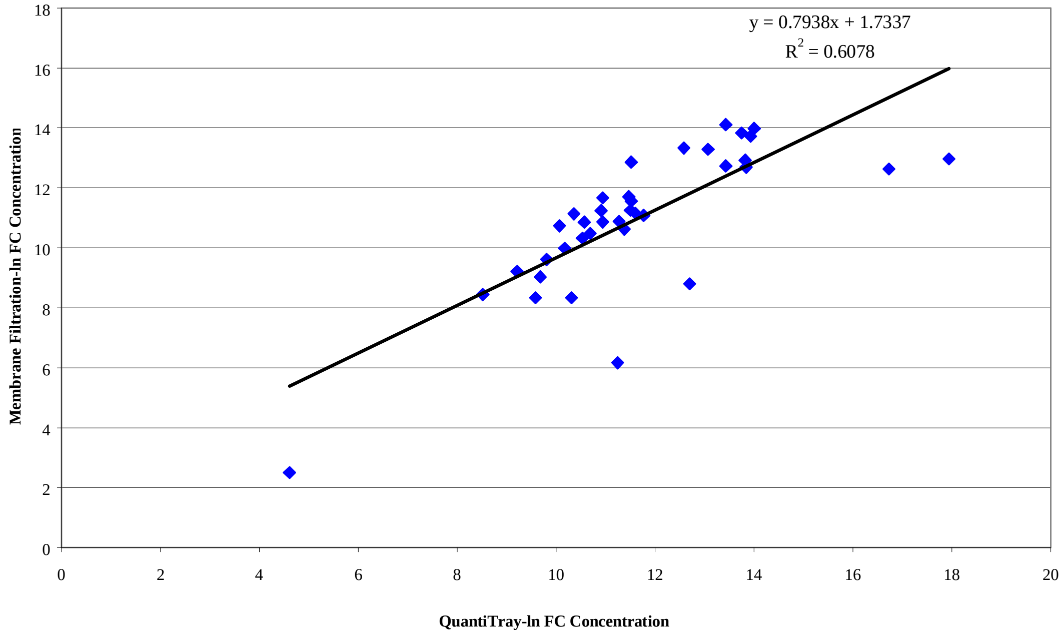


Figure 32. Treatment B fecal coliform concentrations: MF versus Quanti-Tray.

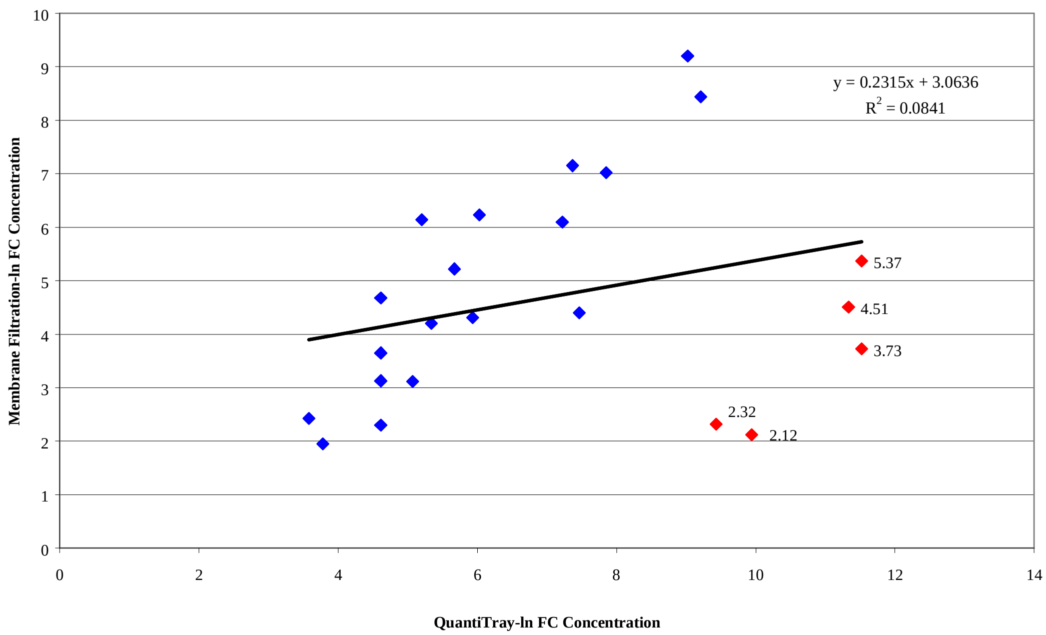


Figure 33. Treatment C fecal coliform concentrations: MF versus Quanti-Tray.

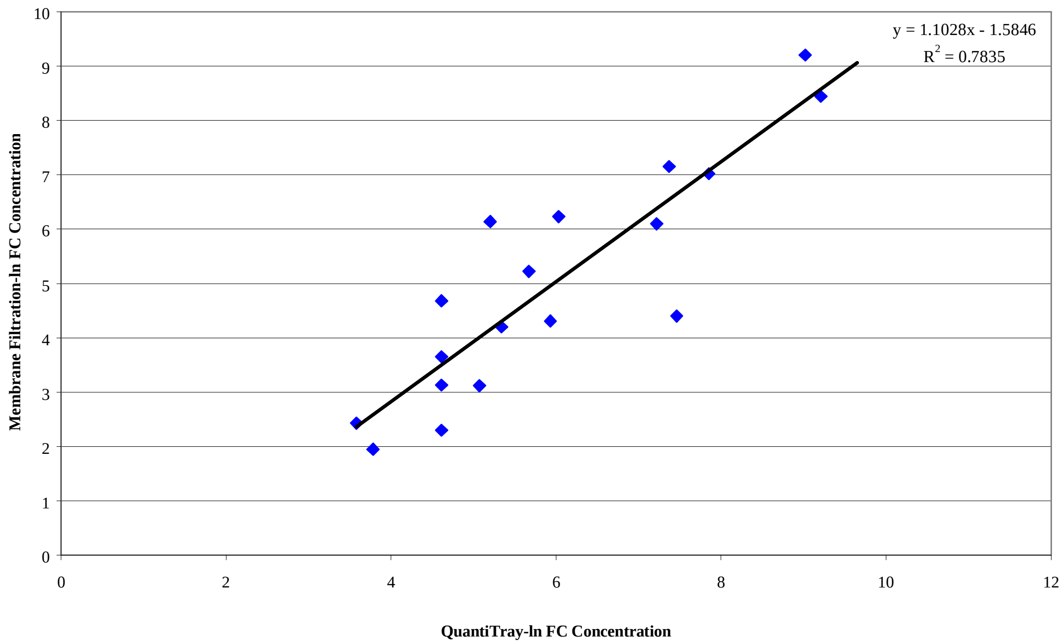


Figure 34. Treatment C fecal coliform concentrations: MF versus Quanti-Tray (outliers removed).

### 6. Formal Evaluation of the Quanti-Tray Method for Enumerating Fecal Coliforms

Correlational analyses are designed to determine the strength of association between variables without specifying which variable is dependent or independent. Commonly, correlated variables are effects of a common cause (Sokal, 1995). The Pearson correlation coefficient determines the strength of the linear relationship between two variables. The correlation coefficient ranges from -1.0 to +1.0, and is calculated for each pair of variables. Scores close to 0 represent a weak relationship, while scores close to -1.0 or +1.0 represent a strong relationship. A significant correlation indicates a reliable relationship, but not necessarily a strong correlation. Thus, with enough subjects, a very small correlation can be significant. Generally, correlations greater than 0.7 are considered strong, less than 0.3 are considered weak, and between 0.3 and 0.7 are considered moderate (Cronk, 1999).

Correlational analyses of the fecal coliform concentration results of the Quanti-Tray and membrane filtration methods were conducted to evaluate the concurrent validity between the test methods. Concurrent validity is a measure of the degree of correlation between experimental measurement items and known and accepted standard measures. The descriptive statistics of the data sets are summarized in Table 19. Pearson's *r* correlation coefficients were calculated for each Treatment to evaluate the relationships among the results of membrane filtration, Quanti-Tray at 35$^{o}$C, and Quanti-Tray at 44.5$^{o}$C (Table 20). For Treatment A, a moderate positive correlation was found between MF and Quanti-Tray at 44.5$^{o}$C and between MF and Quanti-Tray at 35$^{o}$C. For Treatment B, a moderate positive correlation was found between MF and Quanti-Tray at 35$^{o}$C, and a strong positive correlation was between MF and Quanti-Tray at 44.5$^{o}$C. However, for Treatment C (all data included), weak correlations that were not significant were found between all pairs of test methods. Statistical analyses were not performed for Treatment C data with the potential outliers removed since there was no rationale for their occurrence.

Table 19. Means used to compare enumeration methods.

| | | Mean | Std. Dev. | N |
|---|---|---|---|---|
| **Treatment A** | **ln FC MF** | 9.3586 | 1.8409 | 107 |
| | **ln TC QT** | 10.9826 | 2.5975 | 87 |
| | **ln FC QT** | 9.7977 | 2.6887 | 110 |
| **Treatment B** | **ln FC MF** | 11.3090 | 1.8627 | 107 |
| | **ln TC QT** | 11.9813 | 2.2334 | 77 |
| | **ln FC QT** | 11.2912 | 2.5047 | 105 |
| **Treatment C** | **ln FC MF** | 4.6740 | 1.9175 | 84 |
| | **ln TC QT** | 9.7196 | 1.6147 | 54 |
| | **ln FC QT** | 6.9173 | 2.5454 | 79 |

MF = Membrane Filtration.
QT = Quanti-Tray.

Table 20. Pearson correlation coefficients between fecal coliform enumeration methods.

| | | | ln FC Membrane Filtration | ln TC QuantiTray | ln FC QuantiTray |
|---|---|---|---|---|---|
| Treatment A | ln FC Membrane Filtration | Pearson's r | 1 | .410(**) | .567(**) |
| | | Sig. (2-tailed) | | 0.000 | 0.000 |
| | | N | 107 | 80 | 103 |
| | ln TC QuantiTray | Pearson's r | .410(**) | 1 | .791(**) |
| | | Sig. (2-tailed) | 0.000 | | 0.000 |
| | | N | 80 | 87 | 87 |
| | ln FC QuantiTray | Pearson's r | .567(**) | .791(**) | 1 |
| | | Sig. (2-tailed) | 0.000 | 0.000 | |
| | | N | 103 | 87 | 110 |
| Treatment B | ln FC Membrane Filtration | Pearson's r | 1 | .422(**) | .753(**) |
| | | Sig. (2-tailed) | | 0.000 | 0.000 |
| | | N | 107 | 68 | 95 |
| | ln TC QuantiTray | Pearson's r | .422(**) | 1 | .801(**) |
| | | Sig. (2-tailed) | 0.000 | | 0.000 |
| | | N | 68 | 77 | 77 |
| | ln FC QuantiTray | Pearson's r | .753(**) | .801(**) | 1 |
| | | Sig. (2-tailed) | 0.000 | 0.000 | |
| | | N | 95 | 77 | 105 |
| Treatment C | ln FC Membrane Filtration | Pearson's r | 1 | -0.168 | 0.255 |
| | | Sig. (2-tailed) | | 0.335 | 0.056 |
| | | N | 84 | 35 | 57 |
| | ln TC QuantiTray | Pearson's r | -0.168 | 1 | 0.178 |
| | | Sig. (2-tailed) | 0.335 | | 0.198 |
| | | N | 35 | 54 | 54 |
| | ln FC QuantiTray | Pearson's r | 0.255 | 0.178 | 1 |
| | | Sig. (2-tailed) | 0.056 | 0.198 | |
| | | N | 57 | 54 | 79 |

** Correlation is significant at the 0.01 level (2-tailed).

Since correlational analysis only determines the strength of the linear relationship between two variables, paired t-tests were also conducted on the results of the Quanti-Tray and membrane filtration methods to determine if the mean difference between pairs of data was significantly different from zero (Table 21). These results indicate that at a significance level of 0.01, the two tests did not produce significantly different results for Treatment A ($t(102) = 2.429$, $p > 0.01$) or Treatment B ($t(94) = 2.185$, $p > 0.01$). However, results from the two tests were significantly different for Treatment C ($t(56) = 6.910$, $p < 0.01$).

Table 21. Paired samples t-test comparing FC enumeration methods.

| Treatment | Mean Difference | Std. Dev. | Std. Error | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| **A** | -0.5398 | 2.2554 | 0.2222 | -2.429 | 102 | 0.017 |
| **B** | -0.3419 | 1.5248 | 0.1560 | -2.18 | 94 | 0.031 |
| **C** | -2.5610 | 2.7982 | 0.3706 | -6.910 | 56 | 0.000 |

### 7. Quanti-Tray *E. coli* Results

*E. coli* counts were calculated for each sample from the results of the Quanti-Tray analysis at both incubation temperatures (Table 22). For Treatment A, *E. coli* counts represented approximately 45% of the fecal coliform counts and approximately 34% of total coliform counts. Similarly, for Treatment B, *E. coli* counts represented approximately 52% of the fecal coliform counts and approximately 35% of total coliform counts. For Treatment C, however, *E. coli* represents a smaller portion of fecal coliform counts (26%), and a much smaller portion of total coliform counts (< 1%). As expected, *E. coli* does not represent a large portion of total coliforms. However, these results imply that a large portion of non-*E. coli* bacteria are represented as fecal coliforms.

### 8. Formal Evaluation of Quanti-Tray *E. coli* Results

To determine whether there were any differences in *E. coli* percentages of total or fecal coliforms across Treatments, univariate ANOVAs were performed using data from Day 2 - Day 14 over all Series with day of rainfall as a covariate (Table 23). Results indicate that there were

Table 22. *E. coli* fraction of fecal and total coliforms using Quanti-Tray.

| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound |
| ***E. coli*/FC** | **A** | 98 | 0.446 | 0.384 | 0.039 | 0.369 | 0.523 |
| | **B** | 90 | 0.521 | 0.330 | 0.035 | 0.452 | 0.590 |
| | **C** | 57 | 0.264 | 0.395 | 0.052 | 0.159 | 0.369 |
| | **Total** | 245 | 0.431 | 0.379 | 0.024 | 0.383 | 0.479 |
| ***E. coli*/TC** | **A** | 80 | 0.340 | 0.466 | 0.052 | 0.236 | 0.444 |
| | **B** | 70 | 0.352 | 0.403 | 0.048 | 0.256 | 0.448 |
| | **C** | 54 | 0.009 | 0.024 | 0.003 | 0.003 | 0.016 |
| | **Total** | 204 | 0.257 | 0.403 | 0.028 | 0.201 | 0.312 |

Table 23. ANOVA table comparing *E. coli* fractions among Treatments from Day 2 - 14.

| Source | | Type IV Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| ***E. coli*/FC** | **Corrected Model** | 1.399 | 5 | 0.280 | 2.013 | 0.083 |
| | **Intercept** | 7.285 | 1 | 7.285 | 52.410 | 0.000 |
| | **DAY** | 0.210 | 1 | 0.210 | 1.508 | 0.222 |
| | **TREAT** | 0.364 | 2 | 0.182 | 1.310 | 0.274 |
| | **TREAT * DAY** | 0.182 | 2 | 0.091 | 0.654 | 0.522 |
| | **Error** | 14.595 | 105 | 0.139 | | |
| | **Total** | 44.915 | 111 | | | |
| | **Corrected Total** | 15.995 | 110 | | | |
| ***E. coli*/TC** | **Corrected Model** | 10.466 | 5 | 2.093 | 15.294 | 0.000 |
| | **Intercept** | 9.903 | 1 | 9.903 | 72.356 | 0.000 |
| | **DAY** | 3.174 | 1 | 3.174 | 23.195 | 0.000 |
| | **TREAT** | 4.431 | 2 | 2.215 | 16.187 | 0.000 |
| | **TREAT * DAY** | 1.640 | 2 | 0.820 | 5.991 | 0.003 |
| | **Error** | 14.370 | 105 | 0.137 | | |
| | **Total** | 39.593 | 111 | | | |
| | **Corrected Total** | 24.836 | 110 | | | |

R Squared (FC) = .087 (Adjusted R Squared = .044)

R Squared (TC) = .421 (Adjusted R Squared = .394) significant differences in *E. coli* fractions of total coliforms across Treatments ($p < 0.0005$), but the same was not true for fecal coliforms ($p > .1$).

Descriptive statistics of *E. coli* fractions of total and fecal coliforms at Days 0, 2, 7 and 14 are represented in Table 24. The means for Days 2 – 14 are estimates from the model. Separate univariate ANOVAs were performed comparing *E. coli* fractions of total coliforms at Days 2 – 14 (Table 25). These results indicate that at Day 2 and 7, *E. coli* fractions of total coliforms were significantly different across Treatments. A significant difference was not found for Day 14. A separate one-way ANOVA was performed using data from Day 0 to determine whether differences in *E. coli* fractions of total or fecal coliforms exist across Treatments (Table 26). Results indicate that significant differences exist in *E. coli* fractions of total, but not fecal, coliforms across Treatments.

The significant main effects were further analyzed by pairwise comparisons using the Sidak adjustment for multiple comparisons (Table 27). At Day 0, *E. coli* fractions of total coliforms were significantly higher for Treatment B than for the control. At Days 2 and 7, *E. coli* fractions of total coliforms were significantly higher for both Treatments A and B than for the control.

**9. Other Laboratory Data for Runoff**

Nitrogen (N), phosphorus (P), and potassium (K) data, analyzed by the Agricultural Chemistry Lab, were not directly used to meet the objectives of this study, but the results are tabulated in Table A11 of Appendix A in the event that they are needed by future researchers. Likewise, the results of the total suspended solids (TSS) and chemical oxygen demand (COD) analyses of the runoff samples are tabulated in Tables A12 and A13 of Appendix A. Fecal coliform data from membrane filtration are plotted against TSS and COD data individually for each Treatment in Figures 35 –37 and Figures 38 – 40, respectively, indicating no apparent linear relationship.

Table 24. Descriptives by Day of *E. coli* fractions of total and fecal coliforms.

| | | | Mean | Std. Error | 95% CI | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| **Day = 0** | ***E. coli* /FC** | A | 0.391 | 0.083 | 0.220 | 0.562 |
| | | B | 0.598 | 0.075 | 0.442 | 0.754 |
| | | C | 0.358 | 0.143 | 0.019 | 0.697 |
| | ***E. coli*/TC** | A | 0.178 | 0.062 | 0.045 | 0.311 |
| | | B | 0.272 | 0.069 | 0.118 | 0.427 |
| | | C | 0.020 | 0.010 | -0.003 | 0.044 |
| **Day = 2** | ***E. coli* /FC** | A | 0.542 | 0.100 | 0.344 | 0.741 |
| | | B | 0.709 | 0.110 | 0.491 | 0.928 |
| | | C | 0.408 | 0.123 | 0.165 | 0.651 |
| | ***E. coli*/TC** | A | 0.952 | 0.099 | 0.755 | 1.149 |
| | | B | 0.783 | 0.109 | 0.566 | 0.999 |
| | | C | 0.023 | 0.122 | -0.218 | 0.264 |
| **Day = 7** | ***E. coli* /FC** | A | 0.549 | 0.058 | 0.435 | 0.663 |
| | | B | 0.604 | 0.063 | 0.479 | 0.729 |
| | | C | 0.344 | 0.074 | 0.198 | 0.491 |
| | ***E. coli*/TC** | A | 0.568 | 0.057 | 0.455 | 0.681 |
| | | B | 0.546 | 0.062 | 0.422 | 0.669 |
| | | C | 0.013 | 0.073 | -0.133 | 0.158 |
| **Day = 14** | ***E. coli* /FC** | A | 0.558 | 0.091 | 0.378 | 0.737 |
| | | B | 0.457 | 0.107 | 0.245 | 0.669 |
| | | C | 0.255 | 0.132 | -0.007 | 0.518 |
| | ***E. coli*/TC** | A | 0.031 | 0.090 | -0.147 | 0.209 |
| | | B | 0.214 | 0.106 | 0.004 | 0.424 |
| | | C | -0.002 | 0.131 | -0.263 | 0.258 |

Table 25. Univariate ANOVAs comparing *E. coli* fraction of TC at specified Days.

| *E. coli*/TC | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Day 2 | Contrast | 5.102 | 2 | 2.551 | 18.640 | 0.000 |
| | Error | 14.370 | 105 | 0.137 | | |
| Day 7 | Contrast | 5.690 | 2 | 2.845 | 20.79 | 0.000 |
| | Error | 14.370 | 105 | 0.137 | | |
| Day 14 | Contrast | 0.312 | 2 | 0.156 | 1.139 | 0.324 |
| | Error | 14.370 | 105 | 0.137 | | |

Table 26. ANOVA table comparing *E. coli* fractions among Treatments at Day 0.

| **Day = 0** | | **Sum of Squares** | **df** | **Mean Square** | **F** | **Sig.** |
|---|---|---|---|---|---|---|
| ***E. coli*/TC** | Between Groups | 0.318 | 2 | 0.159 | 3.563 | 0.040 |
| | Within Groups | 1.472 | 33 | 0.045 | | |
| | Total | 1.790 | 35 | | | |
| ***E. coli* /FC** | Between Groups | 0.580 | 2 | 0.290 | 2.018 | 0.144 |
| | Within Groups | 7.038 | 49 | 0.144 | | |
| | Total | 7.618 | 51 | | | |

Table 27. Pairwise comparisons of *E. coli* fractions of total coliforms using Sidak' s adjustment for multiple comparisons.

| ***E. coli* Fraction (TC)** | **(I) Treatment** | **(J) Treatment** | **Mean Difference (I-J)** | **Std. Error** | **Sig.** | **95% CI** | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Lower Bound** | **Upper Bound** |
| **Day = 0** | A | B | -0.094 | 0.083 | 0.601 | -0.302 | 0.114 |
| | | C | 0.158 | 0.088 | 0.225 | -0.063 | 0.379 |
| | B | A | 0.094 | 0.083 | 0.601 | -0.114 | 0.302 |
| | | C | 0.252 (*) | 0.095 | 0.036 | 0.013 | 0.491 |
| | C | A | -0.158 | 0.088 | 0.225 | -0.379 | 0.063 |
| | | B | -0.252 (*) | 0.095 | 0.036 | -0.491 | -0.013 |
| **Day = 2** | A | B | 0.169 | 0.148 | 0.586 | -0.189 | 0.528 |
| | | C | 0.929(*) | 0.157 | 0.000 | 0.548 | 1.309 |
| | B | A | -0.169 | 0.148 | 0.586 | -0.528 | 0.189 |
| | | C | 0.759(*) | 0.163 | 0.000 | 0.363 | 1.156 |
| | C | A | -0.929(*) | 0.157 | 0.000 | -1.309 | -0.548 |
| | | B | -0.759(*) | 0.163 | 0.000 | -1.156 | -0.363 |
| **Day = 7** | A | B | 0.023 | 0.085 | 0.991 | -0.183 | 0.228 |
| | | C | 0.556(*) | 0.093 | 0.000 | 0.330 | 0.781 |
| | B | A | -0.023 | 0.085 | 0.991 | -0.228 | 0.183 |
| | | C | 0.533(*) | 0.096 | 0.000 | 0.299 | 0.767 |
| | C | A | -0.556(*) | 0.093 | 0.000 | -0.781 | -0.330 |
| | | B | -0.533(*) | 0.096 | 0.000 | -0.767 | -0.299 |

* The mean difference is significant at $p < 0.05$.

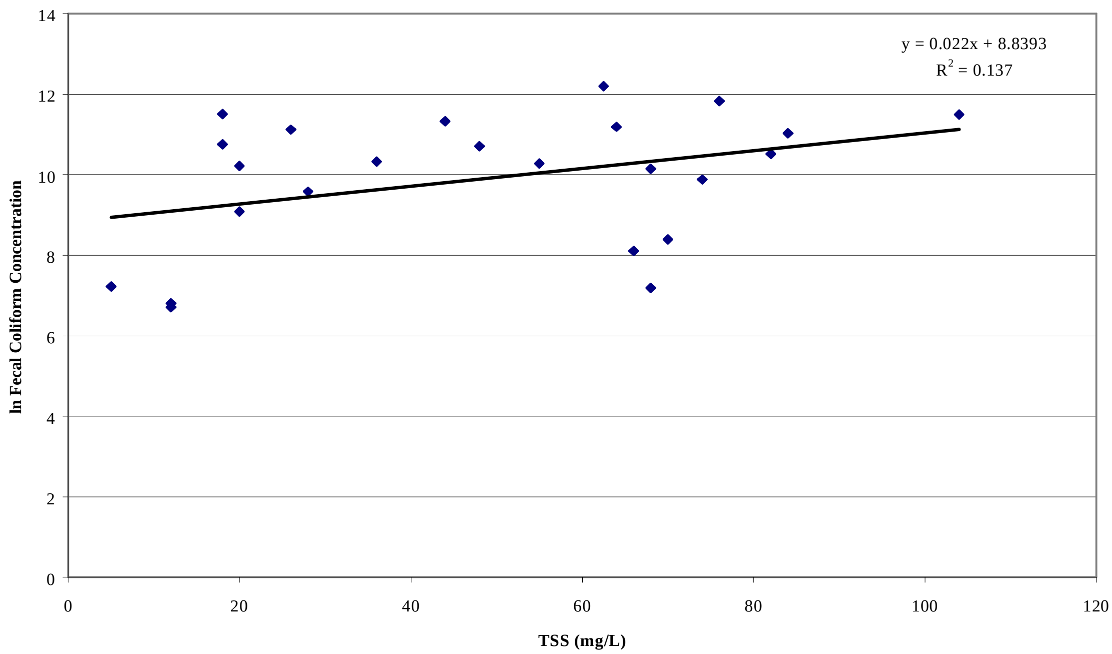


Figure 35. Treatment A: ln fecal coliform concentration versus total suspended solids.

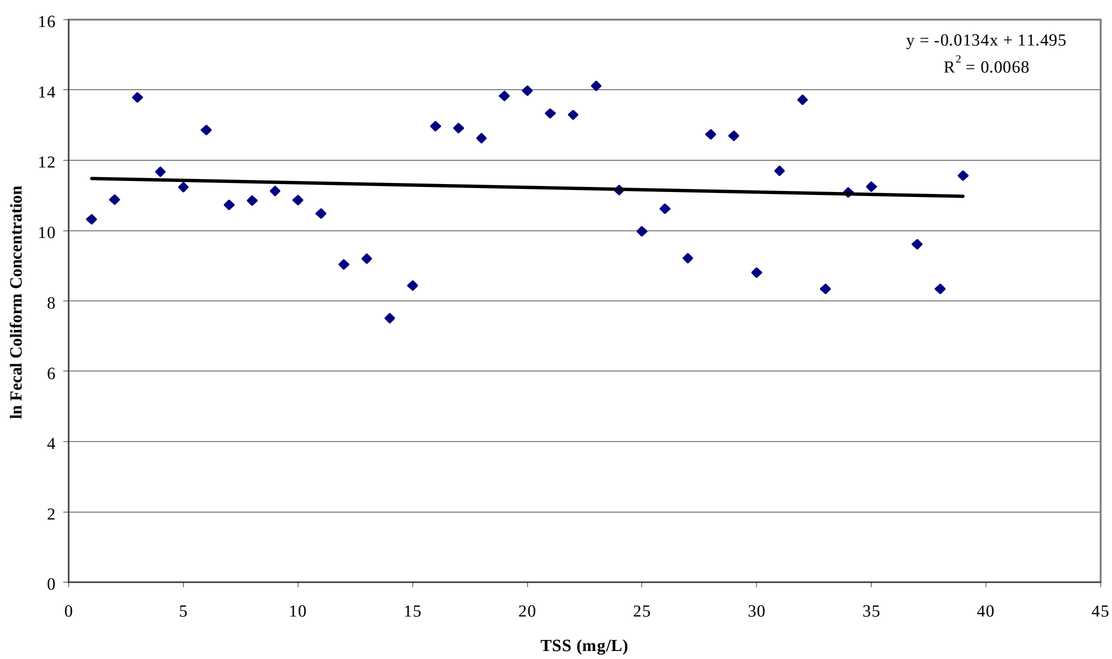


Figure 36. Treatment B: ln fecal coliform concentration versus total suspended solids.

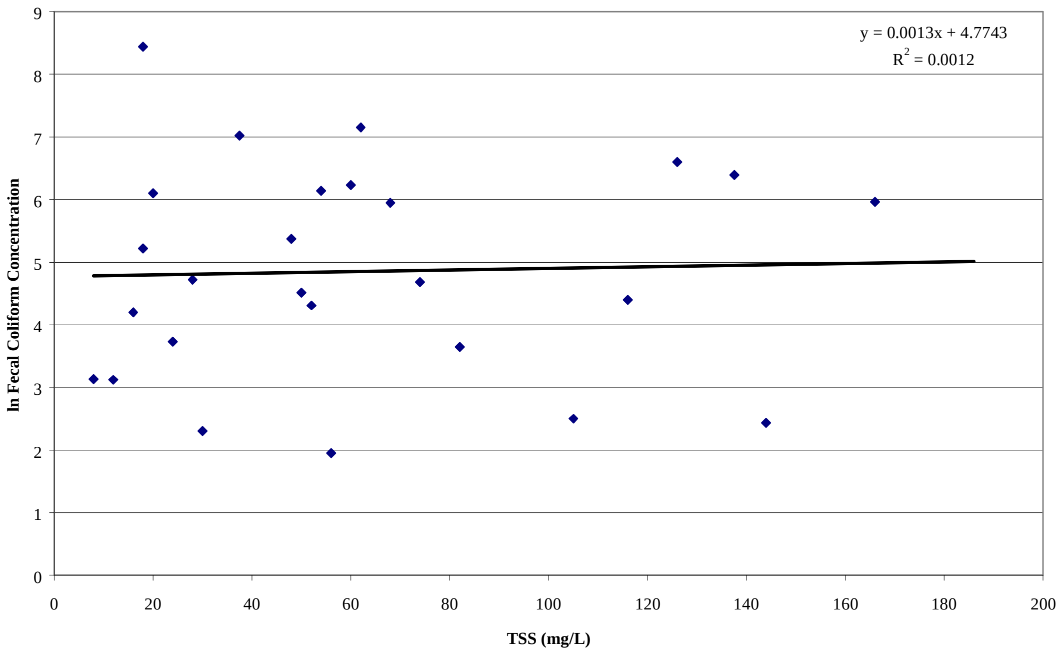


Figure 37. Treatment C: ln fecal coliform concentration versus total suspended solids.

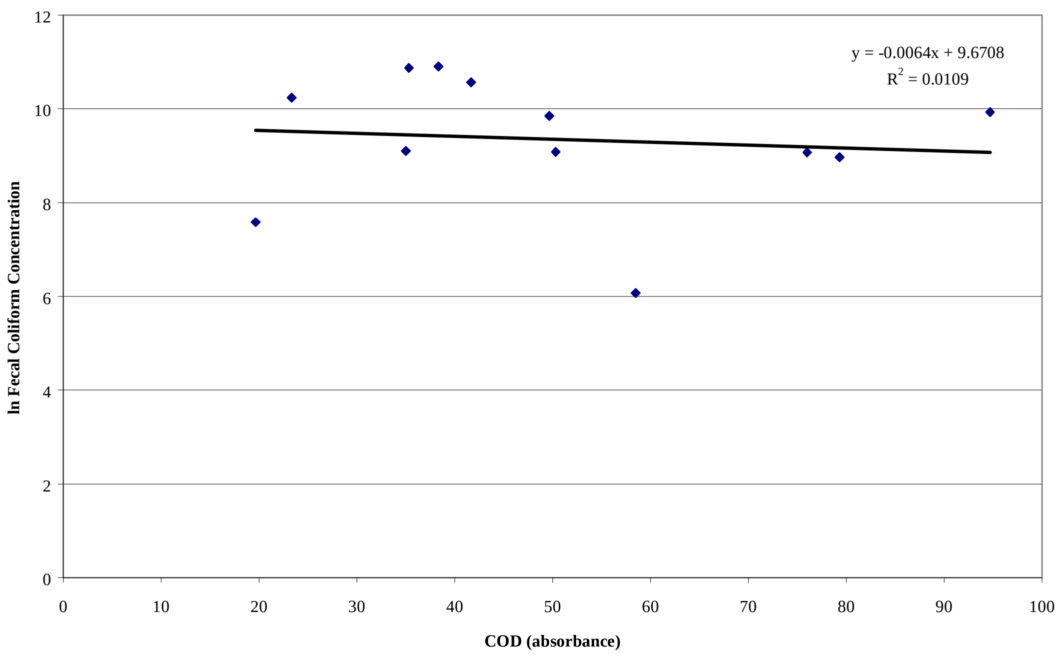


Figure 38. Treatment A: ln fecal coliform concentration versus COD.

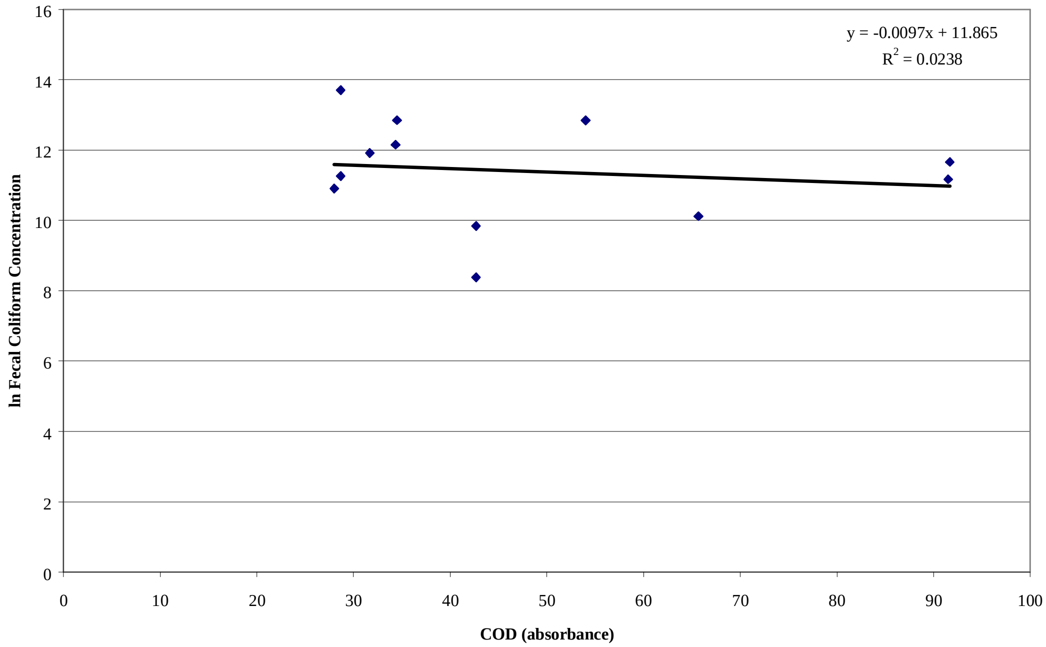


Figure 39. Treatment B: ln fecal coliform concentration versus COD.

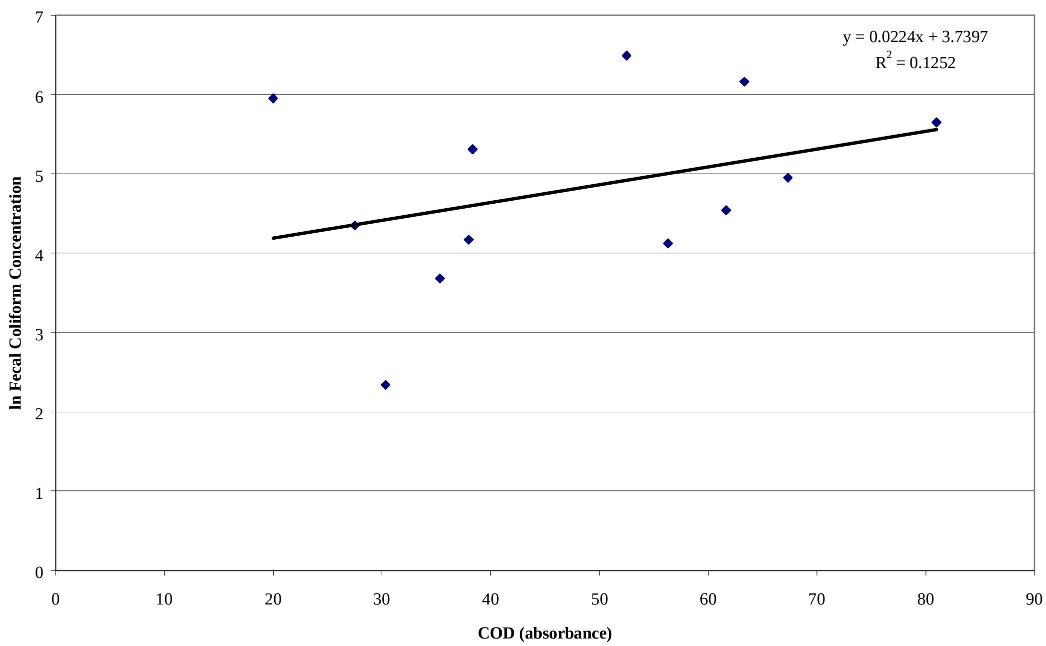


Figure 40. Treatment C: ln fecal coliform concentration versus COD.

# DISCUSSION

Prior studies have found that bacterial contamination of agricultural waters often exceeds the primary contact standard of 200 fecal coliforms per 100 milliliters of water (Walker et al., 1990 in Coyne et al., 1995). The results of this experiment indicate that at a loading of 10 dairy cows per hectare, the potential exists for fecal coliform concentration in runoff to exceed this standard. However, these concentrations were obtained from runoff that had traversed a very small distance under high rainfall intensities. In addition, the first rainfall event of each Series was representative of a worst-case event in which manure application was followed after only a brief interval by a high intensity rain. It is reasonable to expect that concentrations in runoff entering surface water would be much lower for cattle grazing at greater distances from the water body, less extreme rainfall intensities and longer intervals between waste application and runoff-producing rainfall (Crane et al., 1983 in Coyne et al., 1995).

## 1. Method of Manure Application

The results of the present research indicate that fecal coliform concentration in runoff from pasture was significantly influenced by method of manure application. Fecal coliform counts isolated in runoff from plots representative of cattle grazing (Treatment A) were significantly lower than those from plots with land-applied manure (Treatment B). This finding was consistent in all Series. The effect of manure crusting may have played a role in limiting the number of fecal coliforms available for transport to surface waters via runoff for the manure deposit plots. Prior studies have indicated that the external crust of the manure deposit may facilitate bacterial growth by providing a shelter for bacteria from environmental factors; however, the fecal coliform count within the fecal deposit is not of major concern from a water quality standpoint if the hydrophobic properties of the crust inhibit their contact with runoff water. Another possibility for this occurrence is that the available surface area of manure is greater for pasture with land-applied manure than for manure applied as discrete deposits, thus increasing the potential contact area between raindrops and manure. In addition, the relative distance of the manure to the collection trough could have influenced fecal coliform counts in runoff. The land-applied treatment consisted of portions of manure over all areas of the plot, whereas the cattle grazing treatment had the entire manure deposit approximately one foot from the top border of the plot. Thus, more manure was closer to the trough in the land-applied treatment. Kunkle (1970) in Thelin and Gifford (1983) found that grazing near a channel significantly impacted stream bacterial densities, while grazing some distance form the channel area had very little impact.

The presence of fecal coliforms in the runoff from the control plots could possibly be attributed to contamination by wildlife and/or a somewhat stable bacterial background population in the soil (Moore et al., 1989). Van Donsel et al. (1967) suggested that insects that come in contact with manure could potentially distribute fecal coliforms to runoff and surface water. In many studies, little difference in fecal coliform counts is seen between areas used as pastures and control areas where manure has not been spread (McCaskey et al., 1971; Robbins et al., 1971; Doran and Linn, 1979; Kunkle, 1979). Although fecal coliform counts were observed in the runoff from the control plots, manure-amended plots contributed significantly greater amounts of fecal coliforms than the control plots in the current study.

Ambiguous colonies were consistently observed on the Treatment C plates. When streaked on EMB agar, these colonies were typically not *E. coli* (unpublished data). Concurrently, only 26% of fecal coliform counts by Quanti-Tray were identified as *E. coli* for the control plots, therefore indicating a high presence of non-fecal organisms in fecal coliform counts. Interference from other thermotolerant bacteria was assumed to be the explanation for this occurrence. Standard fecal coliform methods have been found to lack specificity and sensitivity, often enumerating false positives such as *Klebsiella spp.*, *Enterobacter spp*., and non-*E. coli Escherichia spp* (Bagley and Seidler, 1977; Caplenas and Kanarek, 1984; and U.S. EPA, 1986). It is possible that low concentrations of these non-fecal organisms are naturally present in the soil, thus explaining why interference was not as common with the manure-amended plots that were commonly diluted in the range of 1:10,000 to 1:1,000,000. Thus, care should be taken when drawing conclusions based on fecal coliform data from the control plots.

Fecal coliform loading from plots with land-applied manure exhibited trends resembling that of first-order logarithmic decay following the second rainfall event (Figure 20). Fecal coliform loading from plots with manure deposits did not display a consistent trend with respect to Series (Figure 28). Fecal coliform loading from the manure deposit plots during Series I displayed the most erratic trend, in which levels decline from Days 2 to 7 and then increase again from Days 7 to 14. During Series II, the fecal coliform loading trend for the manure deposit plots was approximately parallel to that of the land-applied manure plots between Day 3 and Day 14 (Figure 14).

Fecal coliform regrowth appeared to occur during each Series, but not for every Treatment, and not always on the same Day of rainfall. This phenomenon has been noticed in many other studies. It should be noted that some resolution in population changes may be lost during the intervals between rainfalls when samples were not collected. In addition, it cannot be determined to what extent regrowth contributed to the observed higher counts versus other factors that influence the amount of bacteria available to be transported in runoff. Fecal coliform loading from plots with manure deposits exhibited an increase between Day 7 and Day 13 during Series I and between Day 3 and Day 18 during Series III; however, no apparent regrowth occurred during Series II (Figure 28). Fecal coliform loading from plots with land-applied manure exhibited an initial increase between the first and second rainfall events during Series I and II; however, no apparent regrowth occurred during Series III (Figure 20). The fecal coliform loading from the control plots exhibited peaks on different days for all three Series, which may be due to random variances. Apparent regrowth may be attributed to several factors, such as increased moisture content from the prior rainfalls. Van Donsel et al. (1967) observed evidence of soil coliform regrowth following rainfall.

**2. Potential Influences of Temperature and Rainfall Intensity**

Results of this study also suggest that fecal coliform levels in surface runoff may be higher when temperatures are mild (Series II) rather than at either extreme (Series I and III). Most research studies have found that decay rate is greatly affected by temperature. Increased temperatures are well correlated with increased fecal coliform death rates. Stoddard et al. (1998) also found that fecal coliform decay was delayed in the spring, but began immediately in the fall when freezing conditions were observed. In accord with this finding, Van Donsel et al. (1967) studied fecal coliforms on soil over the four seasons and found the highest die-off rates in the summer, followed by winter, fall and then spring. In a controlled experiment studying the decay of fecal coliform bacteria as a function of temperature in low dissolved oxygen dairy wastewater under batch conditions, fecal coliform dark decay constants increased from 0.102 to 0.770 d-1 as temperatures increased from 18 to 32˚C, (Scott, 2000).

Rainfall intensity was significantly higher during Series II when fecal coliform loadings were also at their highest. Higher rainfall intensities have been associated with higher fecal coliform counts in runoff. The impact of the raindrops on the manure could possibly dislodge portions of manure, thereby exposing more bacteria to the rainwater. The higher intensity could also increase the flow of runoff along the surface, potentially disturbing more sediment and causing a larger number of bacteria to be transported with the runoff.

Caution is recommended when interpreting these results since not all environmental factors were examined for effect on fecal coliform decay. Other factors or a combination of factors, such as sunlight, soil moisture content, etc., could have been responsible for the increased fecal coliform counts observed during Series II.

**3. Quanti-Tray Method for Enumerating Fecal Coliforms**

The Quanti-Tray method using Colilert reagent may be an acceptable alternative to the standard method of membrane filtration for the enumeration of fecal coliforms. Although the Colilert reagent was designed for total coliform enumeration at an incubation of $35^{o}$C, the results of this study indicate that when incubated at $44.5^{o}$C, counts are significantly correlated with and not statistically different from fecal coliform results provided by membrane filtration for runoff samples from manure-amended pasture.

The Quanti-Tray method did not correlate well with membrane filtration for enumeration of fecal coliforms in runoff samples from the control plots. This finding may be related to the interference of other organisms evident with membrane filtration at low dilutions. Very few of the colonies on plates from the control plots tested positive for *E. coli*. Thus, it is possible that counts were overestimated using the membrane filtration method. However, the ambiguous results were not limited to that of membrane filtration. The Quanti-Tray method also produced results that were unclear when identifying positive wells for both coliform and *E. coli* determination. Added to this uncertainty was the fact that results were interpreted by more than one researcher. Since the results of neither test can be validated, care must be taken when drawing conclusions from the findings of the control plots.

# CONCLUSION

This study determined fecal coliform loadings for two methods of manure application under southeastern Louisiana conditions that could be used for tailoring best management practices (BMPs) to decrease fecal coliform transport to surface waters. BMPs can be either structural (for example, waste lagoons, terraces, grass filter strips, sediment basins, or fencing) or they can be managerial (for example, rotational grazing, fertilizer or pesticide management, or conservation tillage). Combinations of BMPs that control the same pollutant are generally most effective.

Rotational grazing has been suggested for improving the quality of runoff from pasture (Edwards et al., 2000). Since fecal coliform counts from simulated grazed pasture were typically at least an order of magnitude less than those from pasture with land applied manure, farmers may decide to allow cattle to graze instead of land applying manure. In addition, repeated manure applications did not exhibit a cumulative effect on fecal coliform concentrations in runoff for the manure application intervals in this study.

The results of this study also provide further validation of published findings relating to fecal coliform loading as influenced by method of manure application, age of fecal matter, and recurrent rainfall. Also, higher fecal coliform loadings were observed during mild temperatures and high rainfall intensities, supporting similar findings of other researchers. In addition, the Quanti-Tray method using Colilert reagent exhibited a significant positive correlation with membrane filtration when experimentally modified to produce fecal coliform counts. Further investigation is needed to determine the source of non-*E. coli* growth in both Quanti-Tray and membrane filtration methods.

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# APPENDIX A

# RAW DATA

Table A1. Field data.

| Series | Day | Treat | Plot | Time After App. (days) | Rain | | Rain Gage Level (in) | | | | | Rain Descriptives | | | | Runoff Descriptives | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Time (h) | Press (PSI) | 1 | 2 | 3 | 4 | 5 | Inten (in/h) | pH | Cond (u℧) | Temp (ºF) | Vol (L) | pH | Cond (u℧) | Temp (ºF) |
| I | 0 | A | 1 | 0.09 | 0.50 | 4 | 1.9 | 2.3 | 1.4 | 2.7 | 0.8 | 3.64 | 7 | 30 | \ | 8 | 7.4 | 70 | 23.8 |
| I | 0 | A | 2 | 0.21 | 0.50 | 3.2 | 3 | 1.8 | 5 | 3.6 | 3 | 6.56 | 7 | 30 | 19 | 14 | 7.1 | 70 | 20.1 |
| I | 0 | A | 3 | 0.33 | 0.33 | 3 | 0.1 | 1.6 | 3 | 2.9 | 0.3 | 4.74 | 7 | 30 | 17.1 | 21 | 7 | 110 | 18.9 |
| I | 0 | B | 1 | 0.13 | 0.50 | 3.3 | 2.1 | 1.7 | 2 | 2.2 | 1.7 | 3.88 | 7 | 30 | 20.1 | 9 | 7.4 | 80 | 21.6 |
| I | 0 | B | 2 | 0.27 | 0.33 | 3 | 1 | 1.3 | 1.8 | 2.2 | 1.2 | 4.47 | 7 | 30 | 18.5 | 19 | 6.9 | 60 | 19.5 |
| I | 0 | B | 3 | 0.36 | 0.42 | 3 | 0.8 | 1.7 | 4.1 | 1.7 | 2.3 | 5.09 | 6 | 30 | 17.3 | 7 | 7.1 | 100 | 18.3 |
| I | 0 | C | 1 | 0.18 | 0.50 | 3.3 | 2.8 | 1.9 | 2.3 | 3.7 | 1.5 | 4.88 | 7 | 30 | 18.6 | 11 | 7.1 | 70 | \ |
| I | 0 | C | 2 | 0.25 | 0.42 | 3 | 2 | 1.5 | 2.7 | 3 | 1.4 | 5.09 | \ | \ | \ | \ | \ | \ | \ |
| I | 0 | C | 3 | 0.30 | 0.33 | 3.2 | 1 | 1.2 | 1.5 | 3 | 0.8 | 4.50 | 7 | 30 | 17.5 | 14 | 7.1 | 90 | 18.5 |
| I | 2 | A | 1 | 2.22 | 0.33 | 3 | 2.2 | 1.2 | 2.1 | 1.2 | 1.5 | 4.92 | 7 | 20 | 13.4 | 9 | 6.3 | 50 | 17.6 |
| I | 2 | A | 2 | 2.14 | 0.33 | 3.5 | 1.4 | 1.3 | 1.9 | 2 | 1.4 | 4.80 | 7 | 20 | 13.4 | 5 | 7.1 | 50 | 18.4 |
| I | 2 | A | 3 | 2.03 | 0.33 | 3.2 | 0.8 | 1.2 | 2.5 | 2.5 | 1.7 | 5.22 | 7 | 30 | 18.1 | 14 | 7.1 | 50 | 19.3 |
| I | 2 | B | 1 | 2.20 | 0.33 | 3 | 1.8 | 1.8 | 1.4 | 0.4 | 2.3 | 4.62 | 7 | 20 | 13.3 | 12 | 6.9 | 50 | 18.3 |
| I | 2 | B | 2 | 2.08 | 0.33 | 3 | 1.7 | 1.1 | 1 | 2.3 | 1.5 | 4.56 | 7 | 30 | 16.9 | 14 | 7.1 | 50 | 18.6 |
| I | 2 | B | 3 | 2.01 | 0.33 | 3.3 | 1.1 | 1.2 | 3.6 | 1.4 | 2.1 | 5.64 | 7 | 30 | 14.6 | 9 | 7.1 | 60 | 17.6 |
| I | 2 | C | 1 | 2.17 | 0.33 | 4 | 1.4 | 1.2 | 1.8 | 1.9 | 1.8 | 4.86 | 7 | 20 | 13.3 | 7 | 6.9 | 60 | 17.5 |
| I | 2 | C | 2 | 2.11 | 0.42 | 3.3 | 1.5 | 1.4 | 1.2 | 2.3 | 1.4 | 3.74 | 7 | 20 | 17.6 | 13 | 7.1 | 40 | 19.9 |
| I | 2 | C | 3 | 2.05 | 0.31 | 3.3 | 1.3 | 2.1 | 2.1 | 1.1 | 1.8 | 5.45 | 7 | 20 | 19 | 22 | 7.1 | 50 | 20.5 |
| I | 7 | A | 1 | 7.10 | 0.33 | 2.5 | 1.9 | 1.2 | 1.6 | 2.3 | 1.5 | 5.10 | | | | | | | |
| I | 7 | A | 2 | 7.02 | 0.33 | 2.5 | 1.8 | 1.9 | 0.7 | 2 | 1.5 | 4.74 | 7 | 20 | 20.9 | 6 | 7.5 | 50 | 24.7 |
| I | 7 | A | 3 | 7.18 | 0.33 | 3 | 1.3 | 1.6 | 1.7 | 1.1 | 1.1 | 4.08 | 7 | 20 | 19.4 | 5 | 7.4 | 60 | 23 |
| I | 7 | B | 1 | 7.08 | 0.33 | 2.5 | 1.7 | 1.2 | 1.9 | 1.9 | 1.2 | 4.74 | 7 | 30 | 19.7 | 6 | 7.3 | 50 | 23.9 |
| I | 7 | B | 2 | 6.97 | 0.33 | 2.9 | | | | | | | 7 | 20 | 19.1 | 25 | 7.3 | 40 | 21 |
| I | 7 | B | 3 | 7.18 | 0.42 | 3 | 1.8 | 1.5 | 2.2 | 2.5 | 1.6 | 4.61 | 6 | 20 | 18.2 | 5 | 7.1 | 70 | 22.1 |
| I | 7 | C | 1 | 7.05 | 0.33 | 2.4 | 1.8 | 1.2 | 1.8 | 1.1 | 1.1 | 4.20 | 7 | 20 | 19.3 | 11 | 7.2 | 60 | 22.5 |
| I | 7 | C | 2 | 7.00 | 0.33 | 3 | 1.5 | 1.9 | 1.9 | 1.2 | 1.5 | 4.80 | 7 | 20 | 19.8 | 6 | 7.4 | 50 | 22.5 |
| I | 7 | C | 3 | 7.13 | 0.33 | 3 | 1.5 | 1.1 | 1.8 | 1.4 | 1.8 | 4.56 | 7 | 20 | 19.8 | 20 | 7.3 | 50 | 23.1 |
| I | 13 | A | 1 | 13.23 | 0.33 | 3 | 1.1 | 1.2 | 1.4 | 1.4 | 1 | 3.66 | 7 | 30 | 23.4 | 8 | 7 | 90 | 25 |
| I | 13 | A | 2 | 13.14 | 0.58 | 3 | 2 | 2 | 2.1 | 2.6 | 2.2 | 3.74 | 7 | 30 | 22.3 | 4 | 7.4 | 130 | 27.8 |
| I | 13 | A | 3 | 13.03 | 0.42 | 3.2 | 1.7 | 1.2 | 2.1 | 2 | 1.6 | 4.13 | 7 | 30 | 23.5 | 5 | 7.1 | 80 | 28.3 |
| I | 13 | B | 1 | 13.20 | 0.42 | 3 | 1.5 | 1.5 | 1.8 | 1.8 | 1.8 | 4.03 | 7 | 30 | 22.5 | 5 | 7.4 | 100 | 25.8 |
| I | 13 | B | 2 | 13.09 | 0.33 | 3 | 1.2 | 1.2 | 1.6 | 1.5 | 1.2 | 4.02 | 7 | 30 | 24.6 | 8 | 7.2 | 110 | 27.5 |
| I | 13 | B | 3 | 12.97 | 0.58 | 3.2 | 3.7 | 1.9 | 2.9 | 3.5 | 2.7 | 5.04 | 7 | 20 | 22.9 | 5 | 7.5 | 50 | 26.2 |
| I | 13 | C | 1 | 13.18 | 0.42 | 3 | 1.7 | 1.3 | 1.7 | 1.8 | 1.5 | 3.84 | 7 | 30 | 22.6 | 9 | 7.3 | 120 | 25.7 |
| I | 13 | C | 2 | 13.12 | 0.42 | 3 | 1.3 | 1.1 | 1.7 | 1.4 | 1.5 | 3.36 | 7 | 30 | 23.3 | 4 | 7.4 | 110 | 30 |
| I | 13 | C | 3 | 13.06 | 0.33 | 2.8 | 1.5 | 1.2 | 1.3 | 1 | 1.4 | 3.84 | 7 | 30 | 23.4 | 8 | 7.4 | 90 | 27.8 |
| I | 30 | A | 1 | 30.07 | 0.33 | 3 | 1.7 | 0.9 | 1.7 | 2.1 | 1.4 | 4.65 | 7 | 30 | 25.7 | 14 | 7 | 70 | 28.1 |
| I | 30 | A | 2 | 30.15 | 0.67 | 3 | 4.2 | 2 | 4.5 | 3.3 | 2.4 | 4.91 | 6 | 30 | 24.8 | 8 | 7.1 | 60 | 26.3 |
| I | 32 | A | 3 | 32.18 | 0.50 | 3 | 2.9 | 1.6 | 2.7 | 3.6 | 2.6 | 5.36 | 7 | 30 | 18 | 6 | 7.2 | 70 | 24.5 |
| I | 30 | B | 1 | 30.10 | 0.42 | 3 | 2.5 | 1.3 | 2.9 | 3.1 | 2.2 | 5.76 | 7 | 30 | 24.5 | 12 | 7.1 | 60 | 27 |
| I | 32 | B | 2 | 32.11 | 0.33 | 3 | 1.7 | 1.2 | 1.7 | 2.3 | 2 | 5.34 | 7 | 30 | 20.4 | 11 | 7 | 60 | 24.3 |
| I | 32 | B | 3 | 32.21 | 0.75 | 3 | 3.9 | 2.4 | 3.7 | 5 | 4.5 | 5.20 | 7 | 20 | 16.6 | 7.5 | 7.2 | 80 | 22.4 |
| I | 30 | C | 1 | 30.12 | 0.42 | 3 | 2.9 | 1.2 | 2.6 | 3.1 | 2.2 | 5.76 | 7 | 30 | 25.6 | 5 | 7.2 | 70 | 27.2 |
| I | 32 | C | 2 | 32.04 | 0.67 | 3 | 0.4 | 3.1 | 3.7 | 0.9 | 2.5 | 3.18 | 7 | 30 | 22.7 | 5 | 7.4 | 70 | 26.1 |
| I | 32 | C | 3 | 32.15 | 0.33 | 3 | 2.1 | 1.2 | 1.9 | 2.4 | 1.7 | 5.58 | 7 | 20 | 19.8 | 20 | 7.1 | 70 | 23.5 |
| II | 0 | A | 1 | 0.18 | 0.25 | 3 | 1.9 | 1 | 2.3 | 0.9 | 1.4 | 6.00 | 7 | 30 | 26.2 | 8 | 7 | 80 | 28.6 |
| II | 0 | A | 2 | 0.08 | 0.58 | 3 | 3.8 | 1.8 | 3.5 | 3.8 | 3.1 | 5.49 | 7 | 30 | 22.2 | 11 | 7.3 | 90 | 25.3 |
| II | 0 | A | 3 | 0.30 | 0.42 | 3 | 2.7 | 1.4 | 2.5 | 2.9 | 1.9 | 5.47 | 7 | 30 | 20 | 6 | 7.1 | 70 | 21.7 |
| II | 0 | B | 1 | 0.20 | 0.33 | 3 | 1.9 | 1.1 | 2.6 | 1.7 | 1.2 | 5.10 | 7 | 30 | 24.3 | 10 | 7 | 90 | 28.1 |
| II | 0 | B | 2 | 0.16 | 0.33 | 3.1 | 1.9 | 1.5 | 1.8 | 3 | 2.2 | 6.21 | 7 | 30 | 23.8 | 18 | 7 | 70 | 27.2 |

Table A1. Continued.

| Series | Day | Treat | Plot | Time After App. (days) | Rain Time (h) | Rain Press (PSI) | Rain Gage Level (in) 1 | 2 | 3 | 4 | 5 | Rain Descriptives Inten (in/h) | pH | Cond (u℧) | Temp (°F) | Runoff Descriptives Vol (L) | pH | Cond (u℧) | Temp (°F) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| II | 0 | B | 3 | 0.26 | 0.75 | 3 | 4.2 | 2.3 | 5.1 | 4 | 3.1 | 4.99 | 7 | 20 | 21.5 | 5 | 7.4 | 70 | 24.9 |
| II | 0 | C | 1 | 0.23 | 0.58 | 3 | 3.5 | 1.9 | 2.9 | 4.7 | 3.7 | 5.69 | 7 | 30 | 24.9 | 10 | 7.5 | 80 | 28.7 |
| II | 0 | C | 2 | 0.12 | 0.42 | 3.2 | 2.6 | 1.5 | 2.9 | 2.5 | 2.4 | 5.64 | 7 | 30 | 23 | 7.5 | 7 | 110 | 25.5 |
| II | 0 | C | 3 | 0.33 | 0.25 | 3.2 | 1.3 | 0.8 | 1.6 | 2 | 1.6 | 5.84 | 7 | 30 | 19.8 | 13 | 6.9 | 80 | 21.7 |
| II | 3 | A | 1 | 3.12 | 0.33 | 3.8 | | 1.5 | 1.4 | 1.8 | 1.5 | 4.54 | 7 | 30 | 23.1 | 10 | 7.1 | 80 | 26.9 |
| II | 3 | A | 2 | 3.04 | 0.42 | 3.5 | 3.1 | 1.6 | 1.5 | 3.1 | 3.2 | 6.00 | 7 | 30 | 20.8 | 9 | 7.3 | 60 | 22.1 |
| II | 3 | A | 3 | 2.98 | 0.42 | 3.5 | 3.5 | 1.8 | 2 | 4.1 | 1.5 | 6.19 | 7 | 30 | 20.5 | 5.5 | 7.3 | 60 | 22.2 |
| II | 3 | B | 1 | 3.14 | 0.33 | 3.8 | 1.5 | 1.2 | 1.9 | 1.8 | 1.6 | 4.80 | 7 | 30 | 22.7 | 8.5 | 7.2 | 90 | 27.7 |
| II | 3 | B | 2 | 3.10 | 0.33 | 3.5 | 2.4 | 1.2 | 1.8 | 1.9 | 1.4 | 5.22 | 7 | 30 | 22.7 | 15 | 7.1 | 70 | 26.1 |
| II | 3 | B | 3 | 3.00 | 0.67 | 3.3 | 2 | 2.4 | 4.9 | 5.1 | 4.4 | 5.61 | 7 | 30 | 20 | 10 | 7.3 | 60 | 21.6 |
| II | 3 | C | 1 | 3.17 | 0.50 | 3.5 | 1.9 | 1.7 | 1.3 | 2.4 | 3.2 | 4.20 | 7 | 30 | 22.9 | 8 | 7.5 | 70 | 26.5 |
| II | 3 | C | 2 | 3.07 | 0.33 | 3.5 | 2.4 | 1.2 | 1.8 | 1.9 | 1.4 | 5.22 | 7 | 30 | 21.1 | 8.5 | 7.1 | 50 | 23 |
| II | 3 | C | 3 | 2.95 | 0.25 | 3.5 | 1.5 | 1 | 0.8 | 1.9 | 1.1 | 5.00 | 7 | 30 | 19.1 | 18 | 7.1 | 60 | 20.7 |
| II | 7 | A | 1 | 7.01 | 0.33 | 4 | 1.8 | 1.2 | 1.7 | 2 | 1.7 | 5.01 | 7 | 20 | 23.3 | 14 | 7.1 | 60 | 26.2 |
| II | 7 | A | 2 | 7.08 | 0.67 | 3.9 | 2.2 | 2.3 | 2.6 | 4.8 | 2.8 | 4.37 | 7 | 20 | 24.8 | 6 | 7.3 | 60 | 31.6 |
| II | 7 | A | 3 | 7.18 | 0.42 | 4 | 1.6 | | 2.3 | 2.1 | 1.2 | 4.29 | 7 | 30 | 22.9 | 7 | 7.1 | 60 | 26.8 |
| II | 7 | B | 1 | 6.98 | 0.33 | 3.9 | 1.9 | 1.1 | 1.8 | 2 | 1.8 | 5.13 | 7 | 30 | 23 | 17 | 7.1 | 60 | 25 |
| II | 7 | B | 2 | 7.03 | 0.33 | 3.9 | 2.2 | 1.1 | 1.2 | 2 | 2.2 | 5.16 | 7 | 30 | 22.5 | 17 | 7.1 | 60 | 26.7 |
| II | 7 | B | 3 | 7.13 | 1.08 | 4 | 4.8 | 3.8 | 4.9 | 4.8 | 4.8 | 4.24 | 7 | 30 | 22 | 2.5 | 7.2 | 60 | 24.7 |
| II | 7 | C | 1 | 6.96 | 0.33 | 3.9 | 1.9 | 1.1 | 2.2 | 1.9 | 1.7 | 5.25 | 7 | 30 | 22.2 | 6.5 | 7.2 | 70 | 24.2 |
| II | 7 | C | 2 | 7.05 | 0.50 | 4 | 1.5 | 2 | 2.1 | 3.5 | 1.6 | 4.28 | 7 | 30 | 22.3 | 10 | 6.9 | 50 | 30 |
| II | 7 | C | 3 | 7.20 | 0.25 | 4 | 1.5 | 0.8 | 1.2 | 1.7 | 1.6 | 5.44 | 7 | 30 | 23.1 | 12 | 6.9 | 60 | 27.4 |
| II | 14 | A | 1 | 14.16 | 0.42 | 4 | 2 | | 1.5 | 1.8 | 1.8 | 4.26 | 7 | 20 | 22.8 | 10 | 7 | 70 | 30.5 |
| II | 14 | A | 2 | 14.07 | 0.50 | 3.8 | 2.3 | 1.6 | 2.5 | 3 | 2 | 4.54 | 7 | 20 | 24.1 | 3.5 | 7.2 | 90 | 31.4 |
| II | 14 | A | 3 | 13.98 | 0.50 | 4 | 3 | 1.5 | 2.9 | 2.8 | 2.8 | 5.20 | 7 | 20 | 21.8 | 7 | 7.3 | 60 | 25.9 |
| II | 14 | B | 1 | 14.18 | 0.42 | 3.6 | 2.5 | 1.4 | 2 | 2.4 | 1.9 | 4.87 | 7 | 20 | 22.8 | 14 | 7.1 | 70 | 29.5 |
| II | 14 | B | 2 | 14.13 | 0.42 | 4 | 2.4 | 1.4 | 1.7 | 1.4 | 1.8 | 4.15 | 7 | 20 | 24.4 | 14 | 7.1 | 70 | 31.2 |
| II | 14 | B | 3 | 14.00 | 0.75 | 3.5 | 4.7 | 2.4 | 4.3 | 5 | 4.1 | 5.47 | 7 | 20 | 22.6 | 5 | 7.3 | 70 | 25.7 |
| II | 14 | C | 1 | 14.21 | 0.50 | 3.6 | 2.7 | 1.6 | 2.2 | 2.8 | 2.5 | 4.70 | 7 | 20 | 23.8 | 10 | 7.1 | 90 | 28.5 |
| II | 14 | C | 2 | 14.10 | 0.50 | 3.8 | 2.5 | 1.6 | 1.9 | 2.1 | 2.3 | 4.16 | 7 | 20 | 24.1 | 11 | 7.1 | 60 | 31.4 |
| II | 14 | C | 3 | 13.96 | 0.25 | 4 | | 0.8 | 1.2 | 1.5 | 1.2 | 4.65 | 7 | 20 | 24.4 | 13 | 7.1 | 70 | 24.9 |
| III | 0 | A | 1 | 0.14 | 0.42 | 4 | 1.8 | 1.3 | 2 | 1.4 | 2.7 | 4.34 | 7 | | 24.5 | 7 | 7.1 | | |
| III | 0 | A | 2 | 0.23 | 0.58 | 4 | 2.1 | 2 | 2.9 | 3 | 2.1 | 4.13 | 7 | | 24.3 | 5 | 7 | | 31.7 |
| III | 0 | A | 3 | 0.31 | 0.58 | 4 | 2.7 | 1.7 | 1.9 | 3.1 | 1.9 | 3.87 | 7 | | 22.3 | 2.5 | 7.3 | | 27.8 |
| III | 0 | B | 1 | 0.11 | 0.50 | 4 | 3.3 | 1.6 | 2.7 | 2.9 | 2.5 | 5.20 | 7 | | 23.6 | 20 | 7 | | 29.3 |
| III | 0 | B | 2 | 0.17 | 0.42 | 4 | 2.2 | | 2.1 | 1.9 | 1.8 | 4.74 | 7 | | 23.4 | 10 | 7.1 | | 31.1 |
| III | 0 | B | 3 | 0.25 | 0.92 | 4 | 3.5 | 2.9 | 3.7 | 5 | 4.5 | 4.28 | 7 | | 22.7 | 5 | 7.4 | | 29.8 |
| III | 0 | C | 1 | 0.08 | 0.50 | 3.8 | 3.1 | 1.7 | 2.5 | 2.8 | 2.6 | 5.08 | 7 | | 24.9 | 8 | 7.3 | | 29.4 |
| III | 0 | C | 2 | 0.19 | 0.50 | 3.7 | 2.7 | 1.7 | 2.2 | 2.2 | 2.6 | 4.56 | 7 | | 25.7 | 11 | 7 | | 32 |
| III | 0 | C | 3 | 0.34 | 0.33 | 4 | 1.8 | 1.1 | 1.4 | 1.5 | 1.3 | 4.26 | 7 | | 22.3 | 7 | 7.1 | | 24.9 |
| III | 3 | A | 1 | 3.16 | 0.42 | 4 | 3 | 1.4 | 1.8 | 1.8 | 2.3 | 4.94 | 7 | 30 | 27.3 | 10 | 7.1 | 60 | 33.1 |
| III | 3 | A | 2 | 3.03 | 0.67 | 4 | 4.9 | 2.4 | 2.7 | 3.9 | 3.9 | 5.34 | 7 | 20 | 27.2 | 7 | 7.2 | 50 | 31.8 |
| III | 3 | A | 3 | 2.94 | 0.58 | 4.5 | 3 | 2 | 2.2 | 2 | 2.5 | 3.98 | 7 | 30 | 24.1 | 5 | 7.2 | 70 | 25.3 |
| III | 3 | B | 1 | 3.19 | 0.42 | 4 | 4.5 | 1.4 | 2 | 2 | 2 | 5.69 | 7 | 20 | 26.4 | 12 | 7.2 | 70 | 32.1 |
| III | 3 | B | 2 | 3.13 | 0.33 | 4 | | | 1.3 | 1.7 | 2.5 | 5.50 | 7 | 30 | 30.5 | 9 | 7.4 | 60 | 32.6 |
| III | 3 | B | 3 | 2.98 | 0.92 | 4.5 | 5 | 3.2 | 3.8 | 3.7 | 4.8 | 4.46 | 7 | 30 | 25.6 | 12 | 7.4 | 60 | 27.6 |
| III | 3 | C | 1 | 2.71 | 0.50 | 4 | 2.6 | 1.9 | 2.2 | 1.8 | 2 | 4.20 | 7 | 20 | 26.5 | 11 | 7.2 | 70 | 30.3 |
| III | 3 | C | 2 | 3.07 | 0.42 | 4 | 2.8 | 1.5 | 1.7 | 1.9 | 2.2 | 4.80 | 7 | 30 | 27.5 | 6 | 7.2 | 70 | 29.4 |
| III | 3 | C | 3 | 2.92 | 0.33 | 4 | 1.5 | 1.3 | 1.1 | 1.3 | 1.5 | 3.90 | 7 | 30 | 23.1 | 19 | 7.2 | 60 | 23.8 |
| III | 7 | A | 1 | 6.98 | 0.33 | 4.5 | 2.1 | 1.3 | 1.7 | 2.2 | 2 | 5.55 | 7 | 20 | 24.3 | 8 | 7.1 | 50 | 27.2 |

Table A1. Continued.

| Series | Day | Treat | Plot | Time After App. (days) | Rain | | Rain Gage Level (in) | | | | | Rain Descriptives | | | | Runoff Descriptives | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Time (h) | Press (PSI) | 1 | 2 | 3 | 4 | 5 | Inten (in/h) | pH | Cond (u℧) | Temp (°F) | Vol (L) | pH | Cond (u℧) | Temp (°F) |
| III | 7 | A | 2 | 7.08 | 0.50 | 3.5 | 2.8 | 1.7 | 1.8 | 2.2 | 2.4 | 4.36 | 7 | 20 | 29.7 | 5.5 | 7.4 | 50 | 31.3 |
| III | 7 | A | 3 | 7.15 | 0.67 | 3.5 | 3.1 | 2.2 | 2.3 | 2.5 | 3.5 | 4.08 | 7 | 30 | 25.5 | 4.5 | 7.4 | 80 | 34.6 |
| III | 7 | B | 1 | 6.96 | 0.33 | 4.5 | 1.6 | 1.1 | 1.4 | 1.8 | 1.6 | 4.50 | 7 | 30 | 22.6 | 7 | 7.2 | 60 | 25 |
| III | 7 | B | 2 | 7.01 | 0.33 | 4 | 0.8 | 1.3 | 0.9 | 1 | 0.8 | 2.89 | 7 | 20 | 25.4 | 11 | 7.1 | 60 | 26.6 |
| III | 7 | B | 3 | 7.11 | 0.58 | 4 | 2.8 | 1.9 | 2.3 | 2.2 | 2.7 | 4.08 | 7 | 20 | 27.7 | 8 | 7.4 | 20 | |
| III | 7 | C | 1 | 6.93 | 0.50 | 4.5 | 2.5 | 1.7 | 2.3 | 2.6 | 1.8 | 4.36 | 7 | 30 | 21.6 | 10 | 7.5 | 70 | 23.1 |
| III | 7 | C | 2 | 7.04 | 0.42 | 4 | 2.9 | 1.7 | 2.2 | 2.2 | 2.5 | 5.52 | 7 | 30 | 29 | 12 | 7.1 | 50 | 31.6 |
| III | 7 | C | 3 | 7.19 | 0.25 | 4 | 1.3 | 0.9 | 0.8 | 0.9 | 1.1 | 3.96 | 7 | 20 | 28.1 | 5.5 | 7 | 60 | 31 |
| III | 18 | A | 1 | 18.05 | 0.25 | 4.5 | 0.7 | 0.7 | 0.9 | 1.1 | 0.9 | 3.44 | 7 | 30 | 27.8 | 18 | 7.4 | 60 | 29.6 |
| III | 18 | A | 2 | 17.99 | 0.33 | 4.5 | 1 | 1.1 | 1.5 | 1.5 | 1 | 3.60 | 7 | 30 | 27.2 | 9 | 7.4 | 70 | 29.2 |
| III | 18 | A | 3 | 17.93 | 0.33 | 4.5 | 0.9 | 1.1 | 1.2 | 1.2 | 1.1 | 3.27 | 7 | 30 | 27.3 | 8 | 7.4 | 70 | 27.1 |
| III | 18 | B | 1 | 18.07 | 0.25 | 4.5 | 0.8 | 0.8 | 1.1 | 1.2 | 0.8 | 3.60 | 7 | 30 | 27.1 | 15 | 7.4 | 70 | 28.3 |
| III | 18 | B | 2 | 18.03 | 0.25 | 4.5 | 0.9 | 0.8 | 0.8 | 0.9 | 1.1 | 3.44 | 7 | 30 | 27.3 | 16 | 7.4 | 60 | 29.4 |
| III | 18 | B | 3 | 17.96 | 0.33 | 4.5 | 1.4 | 1 | 1.2 | 1.5 | 1 | 3.60 | 7 | 30 | 28.8 | 18 | 7.4 | 80 | 28 |
| III | 18 | C | 1 | 17.92 | 0.17 | 4.5 | 0.5 | 0.5 | 0.5 | 0.7 | 0.5 | 3.18 | 7 | 30 | 24.9 | 17 | 7.4 | 80 | 25.7 |
| III | 18 | C | 2 | 18.01 | 0.33 | 4.5 | 1.1 | 1.3 | 1.5 | 1.3 | 1 | 3.69 | 7 | 30 | 26.1 | 19 | 7.4 | 50 | 29.9 |
| III | 18 | C | 3 | 18.09 | 0.33 | 4.5 | 0.7 | | 1.4 | 1.3 | 0.9 | 3.19 | 7 | 30 | 27.8 | 13 | 7.2 | 80 | 30 |

Table A2. Descriptive statistics for field data.

| Parameter | Treatment | N | Mean | Std. Dev. | Std. Error | 95% Confidence Interval for Mean | | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| **Series I** | | | | | | | | | |
| **Rain Duration (h)** | **A** | 15 | 0.41 | 0.11 | 0.03 | 0.35 | 0.47 | 0.33 | 0.67 |
| | **B** | 15 | 0.41 | 0.12 | 0.03 | 0.34 | 0.48 | 0.33 | 0.75 |
| | **C** | 15 | 0.39 | 0.10 | 0.02 | 0.34 | 0.45 | 0.31 | 0.67 |
| | **Total** | 45 | 0.40 | 0.11 | 0.02 | 0.37 | 0.44 | 0.31 | 0.75 |
| **Pressure (PSI)** | **A** | 15 | 3.07 | 0.36 | 0.09 | 2.88 | 3.27 | 2.50 | 4.00 |
| | **B** | 15 | 3.01 | 0.18 | 0.05 | 2.91 | 3.12 | 2.50 | 3.30 |
| | **C** | 15 | 3.09 | 0.34 | 0.09 | 2.90 | 3.27 | 2.40 | 4.00 |
| | **Total** | 45 | 3.06 | 0.30 | 0.04 | 2.97 | 3.15 | 2.40 | 4.00 |
| **Rain Amount (in)** | **A** | 15 | 1.93 | 0.64 | 0.17 | 1.57 | 2.28 | 1.22 | 3.28 |
| | **B** | 14 | 2.00 | 0.69 | 0.18 | 1.60 | 2.40 | 1.34 | 3.90 |
| | **C** | 15 | 1.74 | 0.37 | 0.09 | 1.54 | 1.94 | 1.28 | 2.44 |
| | **Total** | 44 | 1.89 | 0.58 | 0.09 | 1.71 | 2.06 | 1.22 | 3.90 |
| **Rain Intensity (in/h)** | **A** | 15 | 4.68 | 0.77 | 0.20 | 4.26 | 5.11 | 3.64 | 6.56 |
| | **B** | 14 | 4.79 | 0.59 | 0.16 | 4.45 | 5.13 | 3.88 | 5.76 |
| | **C** | 15 | 4.51 | 0.80 | 0.21 | 4.07 | 4.95 | 3.18 | 5.76 |
| | **Total** | 44 | 4.66 | 0.72 | 0.11 | 4.44 | 4.88 | 3.18 | 6.56 |
| **Rain pH** | **A** | 14 | 6.74 | 0.13 | 0.03 | 6.67 | 6.82 | 6.40 | 6.90 |
| | **B** | 15 | 6.75 | 0.22 | 0.06 | 6.63 | 6.88 | 6.30 | 7.10 |
| | **C** | 14 | 6.76 | 0.14 | 0.04 | 6.68 | 6.84 | 6.50 | 7.10 |
| | **Total** | 43 | 6.75 | 0.17 | 0.03 | 6.70 | 6.80 | 6.30 | 7.10 |
| **Rain Conductivity (µmho)** | **A** | 14 | 72.14 | 23.92 | 6.39 | 58.33 | 85.95 | 50.00 | 130.00 |
| | **B** | 15 | 68.00 | 21.45 | 5.54 | 56.12 | 79.88 | 40.00 | 110.00 |
| | **C** | 14 | 71.43 | 23.49 | 6.28 | 57.87 | 84.99 | 40.00 | 120.00 |
| | **Total** | 43 | 70.47 | 22.46 | 3.43 | 63.55 | 77.38 | 40.00 | 130.00 |

Table A2. Continued.

| Parameter | Treatment | N | Mean | Std. Dev. | Std. Error | 95% CI for Mean | | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| **Series I** | | | | | | | | | |
| Rain Temperature ($^oC$) | **A** | 13 | 19.92 | 3.98 | 1.10 | 17.52 | 22.33 | 13.40 | 25.70 |
| | **B** | 15 | 19.28 | 3.35 | 0.87 | 17.42 | 21.14 | 13.30 | 24.60 |
| | **C** | 14 | 20.16 | 3.14 | 0.84 | 18.35 | 21.98 | 13.30 | 25.60 |
| | **Total** | 42 | 19.77 | 3.43 | 0.53 | 18.71 | 20.84 | 13.30 | 25.70 |
| Runoff Volume (L) | **A** | 14 | 9.00 | 4.78 | 1.28 | 6.24 | 11.76 | 4.00 | 20.50 |
| | **B** | 15 | 10.30 | 5.62 | 1.45 | 7.19 | 13.41 | 5.00 | 25.00 |
| | **C** | 14 | 11.04 | 6.02 | 1.61 | 7.56 | 14.51 | 4.00 | 22.00 |
| | **Total** | 43 | 10.12 | 5.43 | 0.83 | 8.44 | 11.79 | 4.00 | 25.00 |
| Runoff pH | **A** | 14 | 7.12 | 0.29 | 0.08 | 6.95 | 7.29 | 6.30 | 7.50 |
| | **B** | 15 | 7.17 | 0.18 | 0.05 | 7.07 | 7.27 | 6.90 | 7.50 |
| | **C** | 14 | 7.21 | 0.16 | 0.04 | 7.12 | 7.30 | 6.90 | 7.40 |
| | **Total** | 43 | 7.17 | 0.21 | 0.03 | 7.10 | 7.24 | 6.30 | 7.50 |
| Runoff Conductivity (µmho) | **A** | 14 | 72.14 | 23.92 | 6.39 | 58.33 | 85.95 | 50.00 | 130.00 |
| | **B** | 15 | 68.00 | 21.45 | 5.54 | 56.12 | 79.88 | 40.00 | 110.00 |
| | **C** | 14 | 71.43 | 23.49 | 6.28 | 57.87 | 84.99 | 40.00 | 120.00 |
| | **Total** | 43 | 70.47 | 22.46 | 3.43 | 63.55 | 77.38 | 40.00 | 130.00 |
| Runoff Temperature ($^oC$) | **A** | 14 | 23.27 | 3.78 | 1.01 | 21.09 | 25.46 | 17.60 | 28.30 |
| | **B** | 15 | 22.27 | 3.39 | 0.88 | 20.40 | 24.15 | 17.60 | 27.50 |
| | **C** | 13 | 23.45 | 3.78 | 1.05 | 21.16 | 25.73 | 17.50 | 30.00 |
| | **Total** | 42 | 22.97 | 3.59 | 0.55 | 21.85 | 24.09 | 17.50 | 30.00 |
| Runoff Rate (L/h) | **A** | 14 | 23.77 | 15.53 | 4.15 | 14.80 | 32.73 | 7.00 | 62.00 |
| | **B** | 15 | 28.05 | 18.93 | 4.89 | 17.57 | 38.54 | 9.00 | 76.00 |
| | **C** | 14 | 30.95 | 20.27 | 5.42 | 19.25 | 42.65 | 7.00 | 71.00 |
| | **Total** | 43 | 27.60 | 18.17 | 2.77 | 22.01 | 33.19 | 7.00 | 76.00 |

Table A2. Continued.

| Parameter | Treatment | N | Mean | Std. Dev. | Std. Error | 95% CI for Mean | | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| **Series II** | | | | | | | | | |
| **Rain Duration (h)** | **A** | 12 | 0.44 | 0.11 | 0.03 | 0.37 | 0.51 | 0.25 | 0.67 |
| | **B** | 12 | 0.51 | 0.25 | 0.07 | 0.35 | 0.66 | 0.33 | 1.08 |
| | **C** | 12 | 0.39 | 0.12 | 0.04 | 0.31 | 0.47 | 0.25 | 0.58 |
| | **Total** | 36 | 0.44 | 0.18 | 0.03 | 0.38 | 0.50 | 0.25 | 1.08 |
| **Pressure (PSI)** | **A** | 12 | 3.63 | 0.42 | 0.12 | 3.36 | 3.89 | 3.00 | 4.00 |
| | **B** | 12 | 3.55 | 0.38 | 0.11 | 3.31 | 3.79 | 3.00 | 4.00 |
| | **C** | 12 | 3.60 | 0.35 | 0.10 | 3.38 | 3.82 | 3.00 | 4.00 |
| | **Total** | 36 | 3.59 | 0.37 | 0.06 | 3.47 | 3.72 | 3.00 | 4.00 |
| **Rain Amount (in)** | **A** | 12 | 2.22 | 0.56 | 0.16 | 1.86 | 2.57 | 1.50 | 3.20 |
| | **B** | 12 | 2.54 | 1.14 | 0.33 | 1.82 | 3.26 | 1.60 | 4.59 |
| | **C** | 12 | 1.92 | 0.61 | 0.18 | 1.54 | 2.31 | 1.16 | 3.32 |
| | **Total** | 36 | 2.23 | 0.83 | 0.14 | 1.94 | 2.51 | 1.16 | 4.59 |
| **Rain Intensity (in/h)** | **A** | 12 | 5.11 | 0.72 | 0.21 | 4.66 | 5.57 | 4.26 | 6.19 |
| | **B** | 12 | 5.08 | 0.56 | 0.16 | 4.72 | 5.43 | 4.15 | 6.21 |
| | **C** | 12 | 5.01 | 0.60 | 0.17 | 4.62 | 5.39 | 4.16 | 5.84 |
| | **Total** | 36 | 5.07 | 0.61 | 0.10 | 4.86 | 5.27 | 4.15 | 6.21 |
| **Rain pH** | **A** | 12 | 6.75 | 0.14 | 0.04 | 6.66 | 6.84 | 6.50 | 6.90 |
| | **B** | 12 | 6.67 | 0.15 | 0.04 | 6.57 | 6.76 | 6.50 | 6.90 |
| | **C** | 12 | 6.76 | 0.15 | 0.04 | 6.66 | 6.85 | 6.50 | 6.90 |
| | **Total** | 36 | 6.73 | 0.15 | 0.02 | 6.67 | 6.78 | 6.50 | 6.90 |
| **Rain Conductivity (µmho)** | **A** | 12 | 25.83 | 5.15 | 1.49 | 22.56 | 29.11 | 20.00 | 30.00 |
| | **B** | 12 | 26.67 | 4.92 | 1.42 | 23.54 | 29.80 | 20.00 | 30.00 |
| | **C** | 12 | 27.50 | 4.52 | 1.31 | 24.63 | 30.37 | 20.00 | 30.00 |
| | **Total** | 36 | 26.67 | 4.78 | 0.80 | 25.05 | 28.28 | 20.00 | 30.00 |

Table A2. Continued.

| Parameter | Treatment | N | Mean | Std. Dev. | Std. Error | 95% CI for Mean | | Min. | Max. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| **Series II** | | | | | | | | | |
| **Rain Temperature ($^oC$)** | **A** | 12 | 22.71 | 1.81 | 0.52 | 21.56 | 23.86 | 20.00 | 26.20 |
| | **B** | 12 | 22.69 | 1.21 | 0.35 | 21.92 | 23.46 | 20.00 | 24.40 |
| | **C** | 12 | 22.56 | 1.79 | 0.52 | 21.42 | 23.70 | 19.10 | 24.90 |
| | **Total** | 36 | 22.65 | 1.58 | 0.26 | 22.12 | 23.19 | 19.10 | 26.20 |
| **Runoff Volume (L)** | **A** | 12 | 8.08 | 2.87 | 0.83 | 6.26 | 9.90 | 3.50 | 14.00 |
| | **B** | 12 | 11.29 | 5.23 | 1.51 | 7.97 | 14.61 | 2.50 | 18.00 |
| | **C** | 12 | 10.63 | 3.12 | 0.90 | 8.64 | 12.61 | 6.50 | 18.00 |
| | **Total** | 36 | 10.00 | 4.02 | 0.67 | 8.64 | 11.36 | 2.50 | 18.00 |
| **Runoff pH** | **A** | 12 | 7.18 | 0.12 | 0.04 | 7.10 | 7.25 | 7.00 | 7.30 |
| | **B** | 12 | 7.16 | 0.12 | 0.04 | 7.08 | 7.24 | 7.00 | 7.40 |
| | **C** | 12 | 7.12 | 0.20 | 0.06 | 6.99 | 7.25 | 6.90 | 7.50 |
| | **Total** | 36 | 7.15 | 0.15 | 0.03 | 7.10 | 7.20 | 6.90 | 7.50 |
| **Runoff Conductivity (µmho)** | **A** | 12 | 70.00 | 12.06 | 3.48 | 62.34 | 77.66 | 60.00 | 90.00 |
| | **B** | 12 | 70.00 | 10.44 | 3.02 | 63.36 | 76.64 | 60.00 | 90.00 |
| | **C** | 12 | 70.83 | 17.30 | 4.99 | 59.84 | 81.82 | 50.00 | 110.00 |
| | **Total** | 36 | 70.28 | 13.20 | 2.20 | 65.81 | 74.74 | 50.00 | 110.00 |
| **Runoff Temperature ($^oC$)** | **A** | 12 | 26.60 | 3.48 | 1.01 | 24.39 | 28.81 | 21.70 | 31.60 |
| | **B** | 12 | 26.53 | 2.49 | 0.72 | 24.95 | 28.12 | 21.60 | 31.20 |
| | **C** | 12 | 26.04 | 3.32 | 0.96 | 23.93 | 28.15 | 20.70 | 31.40 |
| | **Total** | 36 | 26.39 | 3.05 | 0.51 | 25.36 | 27.42 | 20.70 | 31.60 |
| **Runoff Rate (L/h)** | **A** | 12 | 20.24 | 10.39 | 3.00 | 13.64 | 26.85 | 7.00 | 42.00 |
| | **B** | 12 | 29.57 | 18.65 | 5.38 | 17.72 | 41.42 | 2.00 | 55.00 |
| | **C** | 12 | 31.88 | 18.85 | 5.44 | 19.90 | 43.86 | 16.00 | 72.00 |
| | **Total** | 36 | 27.23 | 16.76 | 2.79 | 21.56 | 32.90 | 2.00 | 72.00 |

Table A2. Continued.

| Parameter | Treatment | N | Mean | Std. Dev. | Std. Error | 95% CI for Mean | | Min. | Max. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| **Series III** | | | | | | | | | |
| **Rain Duration (h)** | **A** | 12 | 0.47 | 0.14 | 0.04 | 0.38 | 0.56 | 0.25 | 0.67 |
| | **B** | 12 | 0.47 | 0.23 | 0.07 | 0.32 | 0.61 | 0.25 | 0.92 |
| | **C** | 12 | 0.38 | 0.11 | 0.03 | 0.31 | 0.45 | 0.17 | 0.50 |
| | **Total** | 36 | 0.44 | 0.17 | 0.03 | 0.38 | 0.50 | 0.17 | 0.92 |
| **Pressure (PSI)** | **A** | 12 | 4.13 | 0.38 | 0.11 | 3.89 | 4.36 | 3.50 | 4.50 |
| | **B** | 12 | 4.21 | 0.26 | 0.07 | 4.04 | 4.37 | 4.00 | 4.50 |
| | **C** | 12 | 4.13 | 0.29 | 0.08 | 3.94 | 4.31 | 3.70 | 4.50 |
| | **Total** | 36 | 4.15 | 0.31 | 0.05 | 4.05 | 4.26 | 3.50 | 4.50 |
| **Rain Amount (in)** | **A** | 12 | 2.03 | 0.75 | 0.22 | 1.55 | 2.50 | 0.86 | 3.56 |
| | **B** | 12 | 2.05 | 1.09 | 0.32 | 1.35 | 2.74 | 0.86 | 4.09 |
| | **C** | 12 | 1.66 | 0.65 | 0.19 | 1.25 | 2.07 | 0.53 | 2.54 |
| | **Total** | 36 | 1.91 | 0.85 | 0.14 | 1.63 | 2.20 | 0.53 | 4.09 |
| **Rain Intensity (in/hr)** | **A** | 12 | 4.24 | 0.72 | 0.21 | 3.79 | 4.70 | 3.27 | 5.55 |
| | **B** | 12 | 4.33 | 0.86 | 0.25 | 3.78 | 4.88 | 2.89 | 5.69 |
| | **C** | 12 | 4.23 | 0.71 | 0.20 | 3.78 | 4.67 | 3.18 | 5.52 |
| | **Total** | 36 | 4.27 | 0.75 | 0.12 | 4.01 | 4.52 | 2.89 | 5.69 |
| **Rain pH** | **A** | 12 | 6.78 | 0.20 | 0.06 | 6.65 | 6.91 | 6.60 | 7.10 |
| | **B** | 12 | 6.75 | 0.16 | 0.05 | 6.65 | 6.85 | 6.60 | 7.10 |
| | **C** | 12 | 6.78 | 0.24 | 0.07 | 6.62 | 6.93 | 6.50 | 7.30 |
| | **Total** | 36 | 6.77 | 0.20 | 0.03 | 6.70 | 6.84 | 6.50 | 7.30 |
| **Rain Conductivity (µmh)** | **A** | 9 | 26.67 | 5.00 | 1.67 | 22.82 | 30.51 | 20.00 | 30.00 |
| | **B** | 9 | 26.67 | 5.00 | 1.67 | 22.82 | 30.51 | 20.00 | 30.00 |
| | **C** | 9 | 27.78 | 4.41 | 1.47 | 24.39 | 31.17 | 20.00 | 30.00 |
| | **Total** | 27 | 27.04 | 4.65 | 0.90 | 25.20 | 28.88 | 20.00 | 30.00 |

Table A2. Continued.

| Parameter | Treatment | N | Mean | Std. Dev. | Std. Error | 95% CI for Mean | | Min. | Max. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| **Series III** | | | | | | | | | |
| **Rain Temperature ($^oC$)** | **A** | 12 | 25.96 | 2.11 | 0.61 | 24.62 | 27.30 | 22.30 | 29.70 |
| | **B** | 12 | 25.93 | 2.51 | 0.73 | 24.33 | 27.52 | 22.60 | 30.50 |
| | **C** | 12 | 25.63 | 2.36 | 0.68 | 24.12 | 27.13 | 21.60 | 29.00 |
| | **Total** | 36 | 25.84 | 2.27 | 0.38 | 25.07 | 26.60 | 21.60 | 30.50 |
| **Runoff Volume (L)** | **A** | 12 | 7.46 | 3.93 | 1.14 | 4.96 | 9.96 | 2.50 | 18.00 |
| | **B** | 12 | 11.79 | 4.53 | 1.31 | 8.92 | 14.67 | 5.00 | 20.00 |
| | **C** | 12 | 11.54 | 4.74 | 1.37 | 8.53 | 14.55 | 5.50 | 19.00 |
| | **Total** | 36 | 10.26 | 4.73 | 0.79 | 8.66 | 11.87 | 2.50 | 20.00 |
| **Runoff pH** | **A** | 12 | 7.25 | 0.15 | 0.04 | 7.15 | 7.35 | 7.00 | 7.40 |
| | **B** | 12 | 7.28 | 0.15 | 0.04 | 7.19 | 7.38 | 7.00 | 7.40 |
| | **C** | 12 | 7.22 | 0.16 | 0.05 | 7.12 | 7.32 | 7.00 | 7.50 |
| | **Total** | 36 | 7.25 | 0.15 | 0.03 | 7.20 | 7.30 | 7.00 | 7.50 |
| **Runoff Conductivity (µmho)** | **A** | 9 | 62.22 | 10.93 | 3.64 | 53.82 | 70.62 | 50.00 | 80.00 |
| | **B** | 9 | 60.00 | 16.58 | 5.53 | 47.25 | 72.75 | 20.00 | 80.00 |
| | **C** | 9 | 65.56 | 11.30 | 3.77 | 56.87 | 74.24 | 50.00 | 80.00 |
| | **Total** | 27 | 62.59 | 12.89 | 2.48 | 57.49 | 67.69 | 20.00 | 80.00 |
| **Runoff Temperature ($^oC$)** | **A** | 11 | 29.88 | 2.87 | 0.87 | 27.95 | 31.81 | 25.30 | 34.60 |
| | **B** | 11 | 29.07 | 2.30 | 0.69 | 27.53 | 30.62 | 25.00 | 32.60 |
| | **C** | 12 | 28.43 | 3.15 | 0.91 | 26.42 | 30.43 | 23.10 | 32.00 |
| | **Total** | 34 | 29.11 | 2.79 | 0.48 | 28.13 | 30.08 | 23.10 | 34.60 |
| **Runoff Rate (L/h)** | **A** | 12 | 19.83 | 18.27 | 5.27 | 8.22 | 31.44 | 4.00 | 72.00 |
| | **B** | 12 | 31.77 | 18.83 | 5.44 | 19.81 | 43.74 | 5.00 | 62.00 |
| | **C** | 12 | 35.05 | 25.26 | 7.29 | 19.00 | 51.10 | 14.00 | 100.00 |
| | **Total** | 36 | 28.88 | 21.47 | 3.58 | 21.62 | 36.15 | 4.00 | 100.00 |

Table A3. ANOVAs for field parameters.

| ANOVA | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **Series I** | | | | | | |
| **Rain Duration (h)** | **Between Groups** | 0.003 | 2 | 0.001 | 0.119 | 0.888 |
| | **Within Groups** | 0.509 | 42 | 0.012 | | |
| | **Total** | 0.512 | 44 | | | |
| **Pressure (PSI)** | **Between Groups** | 0.046 | 2 | 0.023 | 0.249 | 0.781 |
| | **Within Groups** | 3.864 | 42 | 0.092 | | |
| | **Total** | 3.910 | 44 | | | |
| **Rain Amount (in)** | **Between Groups** | 0.535 | 2 | 0.267 | 0.793 | 0.459 |
| | **Within Groups** | 13.824 | 41 | 0.337 | | |
| | **Total** | 14.359 | 43 | | | |
| **Rain Intensity (in/hr)** | **Between Groups** | 0.569 | 2 | 0.285 | 0.537 | 0.588 |
| | **Within Groups** | 21.721 | 41 | 0.530 | | |
| | **Total** | 22.291 | 43 | | | |
| **Rain pH** | **Between Groups** | 0.002 | 2 | 0.001 | 0.027 | 0.974 |
| | **Within Groups** | 1.146 | 40 | 0.029 | | |
| | **Total** | 1.147 | 42 | | | |
| **Rain Conductivity** | **Between Groups** | 35.604 | 2 | 17.802 | 0.735 | 0.486 |
| | **Within Groups** | 969.048 | 40 | 24.226 | | |
| | **Total** | 1004.651 | 42 | | | |
| **Rain Temperature** | **Between Groups** | 6.082 | 2 | 3.041 | 0.250 | 0.780 |
| | **Within Groups** | 475.179 | 39 | 12.184 | | |
| | **Total** | 481.261 | 41 | | | |
| **Runoff Volume (L)** | **Between Groups** | 29.786 | 2 | 14.893 | 0.492 | 0.615 |
| | **Within Groups** | 1209.632 | 40 | 30.241 | | |
| | **Total** | 1239.419 | 42 | | | |
| **Runoff pH** | **Between Groups** | 0.061 | 2 | 0.030 | 0.649 | 0.528 |
| | **Within Groups** | 1.870 | 40 | 0.047 | | |
| | **Total** | 1.931 | 42 | | | |
| **Runoff Conductivity** | **Between Groups** | 143.555 | 2 | 71.777 | 0.136 | 0.873 |
| | **Within Groups** | 21047.143 | 40 | 526.179 | | |
| | **Total** | 21190.698 | 42 | | | |
| **Runoff Temperature** | **Between Groups** | 11.500 | 2 | 5.750 | 0.433 | 0.652 |
| | **Within Groups** | 518.110 | 39 | 13.285 | | |
| | **Total** | 529.610 | 41 | | | |
| **Runoff Rate (L/h)** | **Between Groups** | 366.314 | 2 | 183.157 | 0.543 | 0.585 |
| | **Within Groups** | 13493.095 | 40 | 337.327 | | |
| | **Total** | 13859.408 | 42 | | | |

Table A3. Continued.

| | ANOVA | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **Series II** | | | | | | |
| **Rain Duration (h)** | **Between Groups** | 0.083 | 2 | 0.042 | 1.392 | 0.263 |
| | **Within Groups** | 0.989 | 33 | 0.030 | | |
| | **Total** | 1.072 | 35 | | | |
| **Pressure (PSI)** | **Between Groups** | 0.035 | 2 | 0.018 | 0.120 | 0.887 |
| | **Within Groups** | 4.813 | 33 | 0.146 | | |
| | **Total** | 4.848 | 35 | | | |
| **Rain Amount (in)** | **Between Groups** | 2.288 | 2 | 1.144 | 1.733 | 0.193 |
| | **Within Groups** | 21.790 | 33 | 0.660 | | |
| | **Total** | 24.078 | 35 | | | |
| **Rain Intensity (in/hr)** | **Between Groups** | 0.072 | 2 | 0.036 | 0.092 | 0.913 |
| | **Within Groups** | 13.047 | 33 | 0.395 | | |
| | **Total** | 13.119 | 35 | | | |
| **Rain pH** | **Between Groups** | 0.062 | 2 | 0.031 | 1.442 | 0.251 |
| | **Within Groups** | 0.706 | 33 | 0.021 | | |
| | **Total** | 0.768 | 35 | | | |
| **Rain Conductivity** | **Between Groups** | 16.667 | 2 | 8.333 | 0.351 | 0.707 |
| | **Within Groups** | 783.333 | 33 | 23.737 | | |
| | **Total** | 800.000 | 35 | | | |
| **Rain Temperature** | **Between Groups** | 0.162 | 2 | 0.081 | 0.031 | 0.970 |
| | **Within Groups** | 87.307 | 33 | 2.646 | | |
| | **Total** | 87.470 | 35 | | | |
| **Runoff Volume (L)** | **Between Groups** | 68.792 | 2 | 34.396 | 2.278 | 0.118 |
| | **Within Groups** | 498.208 | 33 | 15.097 | | |
| | **Total** | 567.000 | 35 | | | |
| **Runoff pH** | **Between Groups** | 0.022 | 2 | 0.011 | 0.453 | 0.639 |
| | **Within Groups** | 0.788 | 33 | 0.024 | | |
| | **Total** | 0.810 | 35 | | | |
| **Runoff Conductivity** | **Between Groups** | 5.556 | 2 | 2.778 | 0.015 | 0.985 |
| | **Within Groups** | 6091.667 | 33 | 184.596 | | |
| | **Total** | 6097.222 | 35 | | | |
| **Runoff Temperature** | **Between Groups** | 2.232 | 2 | 1.116 | 0.114 | 0.893 |
| | **Within Groups** | 322.976 | 33 | 9.787 | | |
| | **Total** | 325.208 | 35 | | | |
| **Runoff Rate (L/h)** | **Between Groups** | 910.571 | 2 | 455.285 | 1.684 | 0.201 |
| | **Within Groups** | 8921.227 | 33 | 270.340 | | |
| | **Total** | 9831.798 | 35 | | | |

Table A3. Continued.

| | ANOVA | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **Series III** | | | | | | |
| **Rain Duration (h)** | **Between Groups** | 0.060 | 2 | 0.030 | 1.038 | 0.365 |
| | **Within Groups** | 0.959 | 33 | 0.029 | | |
| | **Total** | 1.019 | 35 | | | |
| **Pressure (PSI)** | **Between Groups** | 0.056 | 2 | 0.028 | 0.283 | 0.755 |
| | **Within Groups** | 3.234 | 33 | 0.098 | | |
| | **Total** | 3.290 | 35 | | | |
| **Rain Amount (in)** | **Between Groups** | 1.139 | 2 | 0.570 | 0.786 | 0.464 |
| | **Within Groups** | 23.919 | 33 | 0.725 | | |
| | **Total** | 25.058 | 35 | | | |
| **Rain Intensity (in/hr)** | **Between Groups** | 0.079 | 2 | 0.040 | 0.067 | 0.935 |
| | **Within Groups** | 19.355 | 33 | 0.587 | | |
| | **Total** | 19.434 | 35 | | | |
| **Rain pH** | **Between Groups** | 0.007 | 2 | 0.004 | 0.087 | 0.917 |
| | **Within Groups** | 1.369 | 33 | 0.041 | | |
| | **Total** | 1.376 | 35 | | | |
| **Rain Conductivity** | **Between Groups** | 7.407 | 2 | 3.704 | 0.160 | 0.853 |
| | **Within Groups** | 555.556 | 24 | 23.148 | | |
| | **Total** | 562.963 | 26 | | | |
| **Rain Temperature** | **Between Groups** | 0.809 | 2 | 0.404 | 0.074 | 0.929 |
| | **Within Groups** | 179.654 | 33 | 5.444 | | |
| | **Total** | 180.463 | 35 | | | |
| **Runoff Volume (L)** | **Between Groups** | 142.056 | 2 | 71.028 | 3.650 | 0.037 |
| | **Within Groups** | 642.188 | 33 | 19.460 | | |
| | **Total** | 784.243 | 35 | | | |
| **Runoff pH** | **Between Groups** | 0.027 | 2 | 0.013 | 0.562 | 0.576 |
| | **Within Groups** | 0.783 | 33 | 0.024 | | |
| | **Total** | 0.810 | 35 | | | |
| **Runoff Conductivity** | **Between Groups** | 140.741 | 2 | 70.370 | 0.404 | 0.672 |
| | **Within Groups** | 4177.778 | 24 | 174.074 | | |
| | **Total** | 4318.519 | 26 | | | |
| **Runoff Temperature** | **Between Groups** | 12.198 | 2 | 6.099 | 0.773 | 0.470 |
| | **Within Groups** | 244.601 | 31 | 7.890 | | |
| | **Total** | 256.799 | 33 | | | |
| **Runoff Rate (L/h)** | **Between Groups** | 1540.493 | 2 | 770.246 | 1.742 | 0.191 |
| | **Within Groups** | 14591.179 | 33 | 442.157 | | |
| | **Total** | 16131.672 | 35 | | | |

Table A4. Fecal coliform raw data from membrane filtration analysis.

| | | | | | 5.E-01 | 5.E-01 | 5.E-01 | 5.E-01 | 2.5E-01 | 2.5E-01 | 2.5E-01 | 2.5E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-05 | 1.E-05 | 1.E-05 | 1.E-05 | 1.E-06 | 1.E-06 | 1.E-06 | 1.E-06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SR | DAY | TR | PL | SMP | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | AVG |
| I | 0 | A | 1 | a | | | | | | | | | | | | | | 150 | 193 | | | 171.50 | | | | | | 0 | 0 | | | 0.00 | 0 | 0 | | 0.00 | 0 | 0 | | 0.00 |
| I | 0 | A | 1 | b | | | | | | | | | | | | | | 137 | 112 | | | 124.50 | | | | | | 1 | 0 | | | 0.50 | 0 | 0 | | 0.00 | 0 | 0 | | 0.00 |
| I | 0 | A | 1 | c | | | | | | | | | | | | | | 91 | 142 | | | 116.50 | | | | | | 1 | 0 | | | 0.50 | 0 | 0 | | 0.00 | 0 | 0 | | 0.00 |
| I | 0 | A | 2 | a | | | | | | | | | | | | | | 120 | 200 | | | 160.00 | 24 | 4 | | | 14.00 | 3 | 0 | | | 1.50 | 0 | 0 | | 0.00 | | | | |
| I | 0 | A | 2 | b | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 0 | 0 | | | 0.00 | 3 | 0 | | | 1.50 | 0 | 0 | | 0.00 | | | | |
| I | 0 | A | 2 | c | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | | | | | | 5 | 4 | | | 4.50 | 1 | 0 | | 0.50 | 0 | 0 | | 0.00 |
| I | 0 | A | 3 | a | | | | | | | | | | | | | | 20 | 20 | | | 20.00 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | 0 | 0 | | 0.00 | | | | |
| I | 0 | A | 3 | b | | | | | | | | | | | | | | 20 | 21 | | | 20.50 | 1 | 2 | | | 1.50 | 1 | 0 | | | 0.50 | 0 | 0 | | 0.00 | | | | |
| I | 0 | A | 3 | c | | | | | | | | | | | | | | 30 | 32 | | | 31.00 | | | | | | 0 | 0 | | | 0.00 | 0 | 0 | | 0.00 | 0 | 0 | | 0.00 |
| I | 0 | B | 1 | a | | | | | | | | | | | | | | 106 | TNTC | | | TNTC | | | | | | 2 | 3 | | | 2.50 | 0 | 0 | | 0.00 | 0 | 0 | | 0.00 |
| I | 0 | B | 1 | b | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | | | | | | 3 | 6 | | | 4.50 | 0 | 0 | | 0.00 | 0 | 0 | | 0.00 |
| I | 0 | B | 1 | c | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | | | | | | 3 | 2 | | | 2.50 | 0 | 0 | | 0.00 | 0 | 0 | | 0.00 |
| I | 0 | B | 2 | a | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 62 | 61 | | | 61.50 | 3 | 0 | | | 1.50 | 0 | 0 | | 0.00 | 0 | 0 | | 0.00 |
| I | 0 | B | 2 | b | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 48 | 49 | | | 48.50 | 13 | 5 | | | 9.00 | 1 | 0 | | 0.50 | 0 | 0 | | 0.00 |
| I | 0 | B | 2 | c | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 59 | 52 | | | 55.50 | 10 | 4 | | | 7.00 | 0 | 0 | | 0.00 | 0 | 0 | | 0.00 |
| I | 0 | B | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | 71 | 91 | | | 81.00 | 7 | 7 | | 7.00 | 2 | 0 | | 1.00 |
| I | 0 | B | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | 75 | 67 | | | 71.00 | 8 | 3 | | 5.50 | 2 | 2 | | 2.00 |
| I | 0 | B | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | 70 | 75 | | | 72.50 | 6 | 10 | | 8.00 | 2 | 1 | | 1.50 |
| I | 0 | C | 1 | a | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 14 | 29 | | | 21.50 | 1 | 1 | | | 1.00 | | | | | | | | |
| I | 0 | C | 1 | b | | | | | | | | | | | | | | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | |
| I | 0 | C | 1 | c | | | | | | | | | | | | | | 3 | 0 | 0 | 0 | 0.75 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | |
| I | 0 | C | 2 | a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I | 0 | C | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I | 0 | C | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I | 0 | C | 3 | a | | | | | | | | | 2 | 4 | | | 3.00 | 6 | 8 | | | 7.00 | 1 | 0 | | | 0.50 | 0 | 0 | | | 0.00 | | | | | | | | |
| I | 0 | C | 3 | b | | | | | | | | | 1 | 0 | | | 0.50 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | |
| I | 0 | C | 3 | c | | | | | | | | | 1 | 0 | | | 0.50 | 6 | 1 | | | 3.50 | 1 | 3 | | | 2.00 | 0 | 0 | | | 0.00 | | | | | | | | |
| I | 2 | A | 1 | a | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 2 | 5 | TNTC | TNTC | 3.50 | 1 | 0 | | | 0.50 | | | | | | | | |
| I | 2 | A | 1 | b | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 9 | 17 | | | 13.00 | 1 | 1 | | | 1.00 | | | | | | | | |
| I | 2 | A | 1 | c | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 33 | 31 | 26 | 2 | 23.00 | 3 | 0 | | | 1.50 | | | | | | | | |
| I | 2 | A | 2 | a | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 5 | 4 | 8 | 6 | 5.75 | 0 | 0 | | | 0.00 | | | | | | | | |
| I | 2 | A | 2 | b | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 40 | 55 | 11 | 9 | 28.75 | 0 | 5 | | | 2.50 | | | | | | | | |
| I | 2 | A | 2 | c | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 52 | 53 | 6 | 8 | 29.75 | 5 | 5 | | | 5.00 | | | | | | | | |
| I | 2 | A | 3 | a | | | | | | | | | | | | | | 34 | 27 | | | 30.50 | 2 | 0 | | | 1.00 | 0 | 0 | | | 0.00 | | | | | | | | |
| I | 2 | A | 3 | b | | | | | | | | | | | | | | 20 | 20 | | | 20.00 | 2 | 4 | | | 3.00 | 3 | 2 | | | 2.50 | | | | | | | | |
| I | 2 | A | 3 | c | | | | | | | | | | | | | | 37 | 23 | | | 30.00 | 3 | 2 | | | 2.50 | 0 | 0 | | | 0.00 | | | | | | | | |
| I | 2 | B | 1 | a | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 102 | 94 | | | 98.00 | 9 | 12 | | | 10.50 | | | | | | | | |
| I | 2 | B | 1 | b | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | TNTC | TNTC | | | TNTC | 22 | 18 | | | 20.00 | | | | | | | | |
| I | 2 | B | 1 | c | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | TNTC | TNTC | | | TNTC | 5 | 11 | | | 8.00 | | | | | | | | |
| I | 2 | B | 2 | a | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 74 | 70 | | | 72.00 | 2 | 6 | | | 4.00 | | | | | | | | |
| I | 2 | B | 2 | b | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 88 | 98 | | | 93.00 | 9 | 5 | | | 7.00 | | | | | | | | |
| I | 2 | B | 2 | c | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 83 | 91 | | | 87.00 | 9 | 12 | | | 10.50 | | | | | | | | |
| I | 2 | B | 3 | a | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | TNTC | TNTC | | | TNTC | 34 | 46 | | | 40.00 | | | | | | | | |
| I | 2 | B | 3 | b | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | TNTC | TNTC | | | TNTC | 39 | 35 | | | 37.00 | | | | | | | | |
| I | 2 | B | 3 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 36 | 40 | | | 38.00 | | | | | | | | |
| I | 2 | C | 1 | a | | | | | | | | | 6 | 5 | | | 5.50 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 2 | C | 1 | b | | | | | | | | | 5 | 1 | | | 3.00 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 2 | C | 1 | c | | | | | | | | | 4 | 3 | | | 3.50 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 2 | C | 2 | a | | | | | | | | | 10 | 9 | | | 9.50 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 2 | C | 2 | b | | | | | | | | | 10 | 15 | | | 12.50 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 2 | C | 2 | c | | | | | | | | | 12 | 9 | | | 10.50 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 2 | C | 3 | a | | | | | | | | | TNTC | TNTC | | | TNTC | 106 | 113 | | | 109.50 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 2 | C | 3 | b | | | | | | | | | TNTC | TNTC | | | TNTC | 107 | 289 | | | 198.00 | 7 | 5 | | | 6.00 | | | | | | | | | | | | | |
| I | 2 | C | 3 | c | | | | | | | | | TNTC | TNTC | | | TNTC | 94 | 175 | | | 134.50 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 7 | A | 1 | a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I | 7 | A | 1 | b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I | 7 | A | 1 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I | 7 | A | 2 | a | | | | | | | | | | | | | | 6 | 1 | | | 3.50 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 7 | A | 2 | b | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | | | | | | | | | | | | | | | | | | |
| I | 7 | A | 2 | c | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | | | | | | | | | | | | | | | | | | |
| I | 7 | A | 3 | a | | | | | | | | | | | | | | 9 | 3 | | | 6.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 7 | A | 3 | b | | | | | | | | | | | | | | 4 | 5 | | | 4.50 | 1 | 0 | | | 0.50 | | | | | | | | | | | | | |
| I | 7 | A | 3 | c | | | | | | | | | | | | | | 3 | 4 | | | 3.50 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 7 | B | 1 | a | | | | | | | | | | | | | | | | | | | 18 | 0 | | | 9.00 | 0 | 0 | | | 0.00 | | | | | | | | |
| I | 7 | B | 1 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 5 | 2 | | | 3.50 | | | | | | | | |
| I | 7 | B | 1 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 30 | 30 | | | 30.00 | | | | | | | | |
| I | 7 | B | 2 | a | | | | | | | | | | | | | | | | | | | 0 | 1 | | | 0.50 | 3 | 1 | | | 2.00 | | | | | | | | |
| I | 7 | B | 2 | b | | | | | | | | | | | | | | | | | | | 99 | 119 | | | 109.00 | 7 | 2 | | | 4.50 | | | | | | | | |
| I | 7 | B | 2 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | | | TNTC | 18 | 17 | | | 17.50 | | | | | | | | |
| I | 7 | B | 3 | a | | | | | | | | | | | | | | | | | | | 65 | 70 | | | 67.50 | 7 | 0 | | | 3.50 | | | | | | | | |
| I | 7 | B | 3 | b | | | | | | | | | | | | | | | | | | | 84 | 90 | | | 87.00 | 10 | 6 | | | 8.00 | | | | | | | | |
| I | 7 | B | 3 | c | | | | | | | | | | | | | | | | | | | 67 | 62 | | | 64.50 | 5 | 12 | | | 8.50 | | | | | | | | |
| I | 7 | C | 1 | a | 1 | 1 | | 1.00 | | | | | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | | | | | | |
| I | 7 | C | 1 | b | 4 | 3 | | 3.50 | | | | | 1 | 0 | | | 0.50 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | | | | | | |
| I | 7 | C | 1 | c | 2 | 4 | | 3.00 | | | | | 4 | 2 | | | 3.00 | 1 | 0 | | | 0.50 | | | | | | | | | | | | | | | | | | |
| I | 7 | C | 2 | a | | | | | 0 | 0 | | 0.00 | 0 | 0 | | | 0.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | | | | | | |
| I | 7 | C | 2 | b | | | | | 0 | 0 | | 0.00 | 1 | 0 | | | 0.50 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | | | | | | |
| I | 7 | C | 2 | c | | | | | 2 | 2 | | 2.00 | 1 | 3 | | | 2.00 | 0 | 1 | | | 0.50 | | | | | | | | | | | | | | | | | | |
| I | 7 | C | 3 | a | | | | | | | | | 45 | | | | 45.00 | 6 | 6 | | | 6.00 | 1 | 0 | | | 0.50 | | | | | | | | | | | | | |
| I | 7 | C | 3 | b | | | | | | | | | | | | | | 5 | 2 | | | 3.50 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| I | 7 | C | 3 | c | | | | | | | | | | | | | | 10 | 9 | | | 9.50 | 1 | 0 | | | 0.50 | | | | | | | | | | | | | |
| I | 13 | A | 1 | a | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 261 | 264 | 221 | | 248.67 | | | | | | | | |
| I | 13 | A | 1 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 229 | 241 | 253 | | 241.00 | | | | | | | | |
| I | 13 | A | 1 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 249 | 242 | 248 | | 246.33 | | | | | | | | |

Table A4. Continued.

| SR | DAY | TR | PL | SMP | 5.E-01 PL CNT | 5.E-01 PL CNT | 5.E-01 PL CNT | 5.E-01 AVG | 2.5E-01 PL CNT | 2.5E-01 PL CNT | 2.5E-01 PL CNT | 2.5E-01 AVG | 1.E-01 PL CNT | 1.E-01 PL CNT | 1.E-01 PL CNT | 1.E-01 PL CNT | 1.E-01 AVG | 1.E-02 PL CNT | 1.E-02 PL CNT | 1.E-02 PL CNT | 1.E-02 PL CNT | 1.E-02 AVG | 1.E-03 PL CNT | 1.E-03 PL CNT | 1.E-03 PL CNT | 1.E-03 PL CNT | 1.E-03 AVG | 1.E-04 PL CNT | 1.E-04 PL CNT | 1.E-04 PL CNT | 1.E-04 PL CNT | 1.E-04 AVG | 1.E-05 PL CNT | 1.E-05 PL CNT | 1.E-05 PL CNT | 1.E-05 AVG | 1.E-06 PL CNT | 1.E-06 PL CNT | 1.E-06 PL CNT | 1.E-06 AVG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 13 | A | 2 | a | | | | | | | | | | | | | | | | | | | 54 | 58 | 42 | | 51.33 | 2 | 5 | 3 | | 3.33 | | | | | | | | |
| I | 13 | A | 2 | b | | | | | | | | | | | | | | | | | | | 74 | 74 | 88 | | 78.67 | 2 | 5 | 4 | | 3.67 | | | | | | | | |
| I | 13 | A | 2 | c | | | | | | | | | | | | | | | | | | | 34 | 55 | 39 | | 42.67 | 3 | 0 | 6 | | 3.00 | | | | | | | | |
| I | 13 | A | 3 | a | | | | | | | | | | | | | | 64 | 59 | 57 | | 60.00 | 10 | 5 | 8 | | 7.67 | | | | | | | | | | | | | |
| I | 13 | A | 3 | b | | | | | | | | | | | | | | 6 | 7 | 9 | | 7.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | |
| I | 13 | A | 3 | c | | | | | | | | | | | | | | 5 | 1 | 5 | | 3.67 | 1 | 1 | 0 | | 0.67 | | | | | | | | | | | | | |
| I | 13 | B | 1 | a | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 10 | 11 | 14 | 15 | 12.50 | | | | | | | | |
| I | 13 | B | 1 | b | | | | | | | | | | | | | | | | | | | 27 | 34 | 23 | | 28.00 | 5 | 5 | 3 | 16 | 7.25 | | | | | | | | |
| I | 13 | B | 1 | c | | | | | | | | | | | | | | | | | | | 26 | 27 | 30 | | 27.67 | 3 | 2 | 0 | | 1.67 | | | | | | | | |
| I | 13 | B | 2 | a | | | | | | | | | | | | | | | | | | | 32 | 22 | 27 | | 27.00 | 1 | 3 | 2 | 1 | 1.75 | | | | | | | | |
| I | 13 | B | 2 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 10 | 11 | 9 | 2 | 8.00 | | | | | | | | |
| I | 13 | B | 2 | c | | | | | | | | | | | | | | | | | | | 29 | 30 | 24 | | 27.67 | 5 | 2 | 0 | | 2.33 | | | | | | | | |
| I | 13 | B | 3 | a | | | | | | | | | | | | | | | | | | | 8 | 3 | 3 | | 4.67 | 9 | 10 | | | 9.50 | | | | | | | | |
| I | 13 | B | 3 | b | | | | | | | | | | | | | | | | | | | 4 | 2 | 5 | | 3.67 | 1 | 0 | 0 | | 0.33 | | | | | | | | |
| I | 13 | B | 3 | c | | | | | | | | | | | | | | | | | | | 6 | 2 | 2 | | 3.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| I | 13 | C | 1 | a | 1 | | | 1.00 | 1 | 1 | | 1.00 | 1 | 1 | 0 | 5 | 1.75 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 13 | C | 1 | b | 8 | | | 8.00 | 5 | 4 | | 4.50 | 3 | 2 | 3 | 1 | 2.25 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 13 | C | 1 | c | 2 | | | 2.00 | 2 | 2 | | 2.00 | 3 | 3 | 1 | | 2.33 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 13 | C | 2 | a | | | | | TNTC | TNTC | | TNTC | 15 | 13 | 1 | 1 | 7.50 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 13 | C | 2 | b | | | | | TNTC | TNTC | | TNTC | 76 | 51 | 53 | | 60.00 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 13 | C | 2 | c | | | | | TNTC | TNTC | | TNTC | 142 | 123 | 125 | | 130.00 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 13 | C | 3 | a | | | | | | | | | 19 | 17 | 16 | | 17.33 | 2 | 30 | 1 | 1 | 8.50 | | | | | | | | | | | | | | | | | | |
| I | 13 | C | 3 | b | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 0 | 2 | 3 | | 1.67 | | | | | | | | | | | | | | | | | | |
| I | 13 | C | 3 | c | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 30 | 28 | 16 | | 24.67 | | | | | | | | | | | | | | | | | | |
| I | 30 | A | 1 | a | | | | | | | | | | | | | | | | | | | 2 | 1 | 0 | | 1.00 | 0 | 0 | 0 | | 0.00 | 0 | 0 | 0 | 0.00 | | | | |
| I | 30 | A | 1 | b | | | | | | | | | | | | | | | | | | | 1 | 0 | 0 | | 0.33 | 0 | 0 | 0 | | 0.00 | 0 | 0 | 0 | 0.00 | | | | |
| I | 30 | A | 1 | c | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | 1 | 0 | 0 | | 0.33 | 0 | 0 | 0 | 0.00 | | | | |
| I | 30 | A | 2 | a | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 20 | 20 | 12 | | 17.33 | | | | | | | | | | | | | |
| I | 30 | A | 2 | b | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 17 | 6 | 21 | | 14.67 | | | | | | | | | | | | | |
| I | 30 | A | 2 | c | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 12 | 19 | 11 | | 14.00 | | | | | | | | | | | | | |
| I | 32 | A | 3 | a | | | | | | | | | | | | | | 7 | 2 | 7 | | 5.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | |
| I | 32 | A | 3 | b | | | | | | | | | | | | | | 3 | 6 | | | 4.50 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | |
| I | 32 | A | 3 | c | | | | | | | | | | | | | | 2 | 3 | 2 | | 2.33 | 0 | 1 | 1 | | 0.67 | | | | | | | | | | | | | |
| I | 30 | B | 1 | a | | | | | | | | | | | | | | 82 | 117 | 73 | | 90.67 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | |
| I | 30 | B | 1 | b | | | | | | | | | | | | | | 90 | TNTC | TNTC | | TNTC | 17 | 9 | 10 | | 12.00 | | | | | | | | | | | | | |
| I | 30 | B | 1 | c | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 10 | 7 | 10 | | 9.00 | | | | | | | | | | | | | |
| I | 32 | B | 2 | a | | | | | | | | | | | | | | 23 | 28 | 10 | | 20.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | |
| I | 32 | B | 2 | b | | | | | | | | | | | | | | 39 | 15 | 24 | | 26.00 | 1 | 1 | 2 | | 1.33 | | | | | | | | | | | | | |
| I | 32 | B | 2 | c | | | | | | | | | | | | | | 20 | 23 | 17 | | 20.00 | 2 | 1 | 0 | | 1.00 | | | | | | | | | | | | | |
| I | 32 | B | 3 | a | | | | | | | | | | | | | | 60 | 52 | 36 | | 49.33 | 3 | 6 | 6 | | 5.00 | | | | | | | | | | | | | |
| I | 32 | B | 3 | b | | | | | | | | | | | | | | 50 | 43 | 35 | | 42.67 | 5 | 5 | 4 | | 4.67 | | | | | | | | | | | | | |
| I | 32 | B | 3 | c | | | | | | | | | | | | | | 47 | 45 | 37 | | 43.00 | 3 | 6 | 5 | | 4.67 | | | | | | | | | | | | | |
| I | 30 | C | 1 | a | 1 | 3 | 0 | 1.33 | | | | | 1 | 3 | 0 | | 1.33 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 30 | C | 1 | b | 7 | 8 | 10 | 8.33 | | | | | 3 | 6 | 1 | | 3.33 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 30 | C | 1 | c | 2 | 5 | 4 | 3.67 | | | | | 1 | 2 | 0 | | 1.00 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 32 | C | 2 | a | 1 | 4 | | 2.50 | | | | | 1 | 0 | | | 0.50 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 32 | C | 2 | b | 3 | | | 3.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I | 32 | C | 2 | c | | | | | | | | | 2 | 5 | | | 3.50 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 32 | C | 3 | a | | | | | | | | | 2 | 0 | 0 | | 0.67 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 32 | C | 3 | b | | | | | | | | | 1 | | | | 1.00 | | | | | | | | | | | | | | | | | | | | | | | |
| I | 32 | C | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| II | 0 | A | 1 | a | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 0 | | 0.67 | 1 | 1 | 0 | 0.67 | | | | |
| II | 0 | A | 1 | b | | | | | | | | | | | | | | | | | | | | | | | | 4 | 1 | 1 | | 2.00 | 0 | 0 | 0 | 0.00 | | | | |
| II | 0 | A | 1 | c | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | 1 | 0 | 0 | 0.33 | | | | |
| II | 0 | A | 2 | a | | | | | | | | | | | | | | | | | | | | | | | | 14 | 16 | 13 | | 14.33 | | | | | | | | |
| II | 0 | A | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | 26 | 23 | 17 | | 22.00 | | | | | | | | |
| II | 0 | A | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | 29 | 19 | 12 | | 20.00 | 2 | 5 | 2 | 3.00 | | | | |
| II | 0 | A | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | 2 | 0 | 0 | | 0.67 | 2 | 1 | 0 | 1.00 | | | | |
| II | 0 | A | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | 2 | 1 | 0 | | 1.00 | 1 | 1 | 0 | 0.67 | | | | |
| II | 0 | A | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | 3 | 0 | 0 | | 1.00 | 0 | 0 | 0 | 0.00 | | | | |
| II | 0 | B | 1 | a | | | | | | | | | | | | | | | | | | | | | | | | 25 | 27 | 13 | 29 | 23.50 | | | | | | | | |
| II | 0 | B | 1 | b | | | | | | | | | | | | | | | | | | | | | | | | 25 | 33 | 42 | | 33.33 | 9 | 4 | 6 | 6.33 | | | | |
| II | 0 | B | 1 | c | | | | | | | | | | | | | | | | | | | | | | | | 53 | 39 | 59 | | 50.33 | 7 | 6 | 4 | 5.67 | 1 | 1 | 1 | 1.00 |
| II | 0 | B | 2 | a | | | | | | | | | | | | | | | | | | | | | | | | 52 | 30 | 16 | | 32.67 | 2 | 3 | 3 | 2.67 | | | | |
| II | 0 | B | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | 17 | 18 | 5 | | 13.33 | 2 | 4 | 3 | 3.00 | | | | |
| II | 0 | B | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | 71 | 60 | 35 | | 55.33 | 14 | 19 | 7 | 13.33 | 2 | 2 | 0 | 1.33 |
| II | 0 | B | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | 15 | 32 | 19 | | 22.00 | 1 | 4 | 0 | 1.67 | 1 | 0 | 0 | 0.33 |
| II | 0 | B | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | 25 | 23 | 14 | | 20.67 | 3 | 3 | 0 | 2.00 | | | | |
| II | 0 | B | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | 36 | 21 | 20 | | 25.67 | 3 | 6 | 6 | 5.00 | 1 | 1 | 1 | 1.00 |
| II | 0 | C | 1 | a | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| II | 0 | C | 1 | b | | | | | | | | | | | | | | 21 | 10 | 11 | | 14.00 | 1 | 2 | 2 | | 1.67 | | | | | | | | | | | | | |
| II | 0 | C | 1 | c | | | | | | | | | | | | | | 6 | 3 | 0 | | 3.00 | 1 | 1 | 2 | | 1.33 | | | | | | | | | | | | | |
| II | 0 | C | 2 | a | | | | | | | | | | | | | | 4 | 3 | 0 | | 2.33 | 1 | 0 | 0 | | 0.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| II | 0 | C | 2 | b | | | | | | | | | | | | | | 5 | 5 | 0 | | 3.33 | 0 | 1 | 1 | | 0.67 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| II | 0 | C | 2 | c | | | | | | | | | | | | | | 7 | 9 | 5 | | 7.00 | 0 | 0 | 0 | | 0.00 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| II | 0 | C | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | | | | | | | | |
| II | 0 | C | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | | | | | | | | |
| II | 0 | C | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | | | | | | | | |
| II | 3 | A | 1 | a | | | | | | | | | | | | | | | | | | | 44 | 61 | 60 | | 55.00 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| II | 3 | A | 1 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 9 | 6 | 9 | | 8.00 | | | | | | | | |
| II | 3 | A | 1 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 8 | 12 | 6 | | 8.67 | | | | | | | | |
| II | 3 | A | 2 | a | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 25 | 30 | 29 | | 28.00 | | | | | | | | |
| II | 3 | A | 2 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 10 | 16 | 14 | | 13.33 | | | | | | | | |
| II | 3 | A | 2 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 5 | 7 | 9 | | 7.00 | | | | | | | | |

Table A4. Continued.

| | | | | | 5.E-01 | 5.E-01 | 5.E-01 | 5.E-01 | 2.5E-01 | 2.5E-01 | 2.5E-01 | 2.5E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-05 | 1.E-05 | 1.E-05 | 1.E-05 | 1.E-06 | 1.E-06 | 1.E-06 | 1.E-06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SR | DAY | TR | PL | SMP | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | AVG | PL CNT | PL CNT | PL CNT | AVG |
| II | 3 | A | 3 | a | | | | | | | | | | | | | | | | | | | 20 | 18 | 17 | | 18.33 | 2 | 2 | 0 | | 1.33 | | | | | | | | |
| II | 3 | A | 3 | b | | | | | | | | | | | | | | | | | | | 20 | 17 | 21 | | 19.33 | 1 | 2 | 0 | | 1.00 | | | | | | | | |
| II | 3 | A | 3 | c | | | | | | | | | | | | | | | | | | | 16 | 16 | 16 | | 16.00 | 1 | 2 | 0 | | 1.00 | | | | | | | | |
| II | 3 | B | 1 | a | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| II | 3 | B | 1 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 91 | 101 | 93 | | 95.00 | | | | | | | | |
| II | 3 | B | 1 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 99 | 116 | 109 | | 108.00 | | | | | | | | |
| II | 3 | B | 2 | a | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 125 | 149 | 129 | | 134.33 | | | | | | | | |
| II | 3 | B | 2 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 144 | 130 | 126 | | 133.33 | | | | | | | | |
| II | 3 | B | 2 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 159 | 22 | | | 90.50 | | | | | | | | |
| II | 3 | B | 3 | a | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 75 | 72 | 51 | | 66.00 | | | | | | | | |
| II | 3 | B | 3 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 53 | 54 | 76 | | 61.00 | | | | | | | | |
| II | 3 | B | 3 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 52 | 58 | 62 | | 57.33 | | | | | | | | |
| II | 3 | C | 1 | a | | | | | | | | | 5 | 0 | | | 2.50 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| II | 3 | C | 1 | b | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 2 | 1 | 0 | | 1.00 | | | | | | | | | | | | | | | | | | |
| II | 3 | C | 1 | c | | | | | | | | | 18 | 23 | 18 | | 19.67 | 3 | 1 | 0 | | 1.33 | | | | | | | | | | | | | | | | | | |
| II | 3 | C | 2 | a | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| II | 3 | C | 2 | b | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 1 | 0 | 0 | | 0.33 | | | | | | | | | | | | | | | | | | |
| II | 3 | C | 2 | c | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 5 | 1 | 0 | | 2.00 | | | | | | | | | | | | | | | | | | |
| II | 3 | C | 3 | a | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | TNTC | TNTC | TNTC | | TNTC | | | | | | | | | | | | | | | | | | |
| II | 3 | C | 3 | b | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | TNTC | TNTC | TNTC | | TNTC | | | | | | | | | | | | | | | | | | |
| II | 3 | C | 3 | c | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | TNTC | TNTC | TNTC | | TNTC | | | | | | | | | | | | | | | | | | |
| II | 7 | A | 1 | a | | | | | | | | | | | | | | | | | | | 25 | 37 | 49 | | 37.00 | 2 | 0 | 0 | | 0.67 | | | | | | | | |
| II | 7 | A | 1 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 19 | 17 | 11 | | 15.67 | | | | | | | | |
| II | 7 | A | 1 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 17 | 16 | 17 | | 16.67 | | | | | | | | |
| II | 7 | A | 2 | a | | | | | | | | | | | | | | | | | | | 103 | 59 | 62 | | 74.67 | 3 | 4 | 1 | | 2.67 | | | | | | | | |
| II | 7 | A | 2 | b | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 12 | 12 | 11 | | 11.67 | | | | | | | | |
| II | 7 | A | 2 | c | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 20 | 20 | 11 | | 17.00 | | | | | | | | |
| II | 7 | A | 3 | a | | | | | | | | | | | | | | | | | | | 1 | 1 | 0 | | 0.67 | | | | | | | | | | | | | |
| II | 7 | A | 3 | b | | | | | | | | | | | | | | | | | | | 1 | 2 | 0 | | 1.00 | | | | | | | | | | | | | |
| II | 7 | A | 3 | c | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | |
| II | 7 | B | 1 | a | | | | | | | | | | | | | | | | | | | | | | | | 45 | 45 | 23 | | 37.67 | 4 | 6 | 6 | 5.33 | | | | |
| II | 7 | B | 1 | b | | | | | | | | | | | | | | | | | | | | | | | | 52 | 54 | | | 53.00 | 6 | 9 | 7 | 7.33 | | | | |
| II | 7 | B | 1 | c | | | | | | | | | | | | | | | | | | | | | | | | 71 | 71 | 65 | | 69.00 | 11 | 3 | 8 | 7.33 | | | | |
| II | 7 | B | 2 | a | | | | | | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 14 | 18 | 4 | 12.00 | | | | |
| II | 7 | B | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 10 | 14 | 16 | 13.33 | | | | |
| II | 7 | B | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 16 | 14 | 15 | 15.00 | | | | |
| II | 7 | B | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | 2 | 1 | 0 | 1.00 | | | | |
| II | 7 | B | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | 8 | 4 | 0 | | 4.00 | 2 | 1 | 0 | 1.00 | | | | |
| II | 7 | B | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | 9 | 4 | 6 | | 6.33 | 1 | 0 | 0 | 0.33 | | | | |
| II | 7 | C | 1 | a | | | | | | | | | 0 | 0 | 0 | | 0.00 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| II | 7 | C | 1 | b | | | | | | | | | 1 | 2 | 0 | | 1.00 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| II | 7 | C | 1 | c | | | | | | | | | 1 | 2 | 0 | | 1.00 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| II | 7 | C | 2 | a | | | | | | | | | 4 | 0 | 0 | | 1.33 | 1 | 0 | 0 | | 0.33 | | | | | | | | | | | | | | | | | | |
| II | 7 | C | 2 | b | | | | | | | | | 6 | 4 | 4 | | 4.67 | 5 | 10 | 5 | | 6.67 | | | | | | | | | | | | | | | | | | |
| II | 7 | C | 2 | c | | | | | | | | | 79 | | | | 79.00 | 5 | 7 | 10 | | 7.33 | | | | | | | | | | | | | | | | | | |
| II | 7 | C | 3 | a | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 50 | 45 | 30 | | 41.67 | | | | | | | | | | | | | | | | | | |
| II | 7 | C | 3 | b | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 58 | 47 | 50 | | 51.67 | | | | | | | | | | | | | | | | | | |
| II | 7 | C | 3 | c | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | | | | | | | | | | | | | | | | | | | | | | | |
| II | 14 | A | 1 | a | | | | | | | | | | | | | | | | | | | 1 | 0 | 0 | | 0.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| II | 14 | A | 1 | b | | | | | | | | | | | | | | | | | | | 2 | 0 | 0 | | 0.67 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| II | 14 | A | 1 | c | | | | | | | | | | | | | | | | | | | 3 | 4 | 3 | | 3.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| II | 14 | A | 2 | a | | | | | | | | | | | | | | | | | | | 11 | 8 | 1 | | 6.67 | 2 | 0 | 0 | | 0.67 | | | | | | | | |
| II | 14 | A | 2 | b | | | | | | | | | | | | | | | | | | | 22 | 21 | | | 21.50 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| II | 14 | A | 2 | c | | | | | | | | | | | | | | | | | | | 22 | 29 | 23 | | 24.67 | 1 | 0 | 1 | | 0.67 | | | | | | | | |
| II | 14 | A | 3 | a | | | | | | | | | | | | | | 4 | 6 | 0 | | 3.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | |
| II | 14 | A | 3 | b | | | | | | | | | | | | | | 10 | 7 | 10 | | 9.00 | 1 | 1 | 2 | | 1.33 | | | | | | | | | | | | | |
| II | 14 | A | 3 | c | | | | | | | | | | | | | | 11 | 9 | 5 | | 8.33 | 1 | 2 | 1 | | 1.33 | | | | | | | | | | | | | |
| II | 14 | B | 1 | a | | | | | | | | | | | | | | | | | | | | | | | | 3 | 1 | 3 | | 2.33 | 0 | 0 | 0 | 0.00 | | | | |
| II | 14 | B | 1 | b | | | | | | | | | | | | | | | | | | | | | | | | 2 | 2 | 2 | | 2.00 | 0 | 0 | 0 | 0.00 | | | | |
| II | 14 | B | 1 | c | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | 0 | 0 | 0 | 0.00 | | | | |
| II | 14 | B | 2 | a | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | 0 | 0 | 0 | 0.00 | | | | |
| II | 14 | B | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | 1.00 | 2 | 0 | 0 | 0.67 | | | | |
| II | 14 | B | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | 6 | 5 | 2 | | 4.33 | 0 | 0 | 0 | 0.00 | | | | |
| II | 14 | B | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | 0 | 0 | 0 | 0.00 | | | | |
| II | 14 | B | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | 0 | 0 | 0 | 0.00 | | | | |
| II | 14 | B | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | 2 | | 1.00 | 0 | 0 | 0 | 0.00 | | | | |
| II | 14 | C | 1 | a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| II | 14 | C | 1 | b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| II | 14 | C | 1 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| II | 14 | C | 2 | a | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| II | 14 | C | 2 | b | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| II | 14 | C | 2 | c | | | | | | | | | | | | | | 2 | 0 | 0 | | 0.67 | | | | | | | | | | | | | | | | | | |
| II | 14 | C | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| II | 14 | C | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| II | 14 | C | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| III | 0 | A | 1 | a | | | | | | | | | | | | | | | | | | | 5 | 5 | 15 | | 8.33 | 1 | 1 | 4 | | 2.00 | | | | | | | | |
| III | 0 | A | 1 | b | | | | | | | | | | | | | | | | | | | 33 | 33 | 38 | | 34.67 | 4 | 4 | 1 | | 3.00 | 1 | 0 | 0 | 0.33 | | | | |
| III | 0 | A | 1 | c | | | | | | | | | | | | | | | | | | | 49 | 66 | 75 | | 63.33 | 5 | 4 | 9 | | 6.00 | | | | | | | | |
| III | 0 | A | 2 | a | | | | | | | | | | | | | | | | | | | 10 | 12 | 17 | | 13.00 | 1 | 0 | 0 | | 0.33 | | | | | | | | |
| III | 0 | A | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | 5 | 4 | 6 | | 5.00 | 1 | 0 | 0 | 0.33 | | | | |
| III | 0 | A | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | 1.00 | 1 | 0 | 0 | 0.33 | | | | |
| III | 0 | A | 3 | a | | | | | | | | | | | | | | | | | | | 3 | 7 | 6 | | 5.33 | 1 | 0 | 0 | | 0.33 | | | | | | | | |
| III | 0 | A | 3 | b | | | | | | | | | | | | | | | | | | | 4 | 3 | 2 | | 3.00 | 0 | 0 | 0 | | 0.00 | 1 | 0 | 0 | 0.33 | | | | |
| III | 0 | A | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | 0.00 | | | | | | | | |

Table A4. Continued.

| | | | | | 5.E-01 | 5.E-01 | 5.E-01 | 5.E-01 | 2.5E-01 | 2.5E-01 | 2.5E-01 | 2.5E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-05 | 1.E-05 | 1.E-05 | 1.E-05 | 1.E-06 | 1.E-06 | 1.E-06 | 1.E-06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SR** | **DAY** | **TR** | **PL** | **SMP** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** |
| III | 0 | B | 1 | a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 7 | 5 | 5 | 5.67 | | | | |
| III | 0 | B | 1 | b | | | | | | | | | | | | | | | | | | | | | | | | 24 | 34 | 20 | | 26.00 | 1 | 0 | 0 | 0.33 | | | | |
| III | 0 | B | 1 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 5 | 6 | 4.67 | | | | |
| III | 0 | B | 2 | a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 5 | 11 | 13 | 9.67 | 1 | 0 | 0 | 0.33 |
| III | 0 | B | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | 2 | 5 | 3.00 | 1 | 0 | 0 | 0.33 |
| III | 0 | B | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 2 | 2 | 1.67 | | | | |
| III | 0 | B | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 0 | | 0.67 | | | | | | | | |
| III | 0 | B | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | 0.00 | | | | |
| III | 0 | B | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | 0.00 | | | | |
| III | 0 | C | 1 | a | | | | | | | | | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | | | | | | |
| III | 0 | C | 1 | b | | | | | | | | | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | | | | | | |
| III | 0 | C | 1 | c | | | | | | | | | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | | | | | | |
| III | 0 | C | 2 | a | | | | | | | | | | | | | | 4 | 4 | 6 | | 4.67 | | | | | | | | | | | | | | | | | | |
| III | 0 | C | 2 | b | | | | | | | | | | | | | | 6 | 4 | 2 | | 4.00 | | | | | | | | | | | | | | | | | | |
| III | 0 | C | 2 | c | | | | | | | | | | | | | | 4 | 5 | 0 | | 3.00 | | | | | | | | | | | | | | | | | | |
| III | 0 | C | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| III | 0 | C | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| III | 0 | C | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| III | 3 | A | 1 | a | | | | | | | | | | | | | | | | | | | 5 | 11 | 4 | | 6.67 | 0 | 0 | 0 | | 0.00 | | | | | | | | |
| III | 3 | A | 1 | b | | | | | | | | | | | | | | | | | | | 3 | 4 | 4 | | 3.67 | 1 | 0 | 0 | | 0.33 | | | | | | | | |
| III | 3 | A | 1 | c | | | | | | | | | | | | | | | | | | | 7 | 2 | 3 | | 4.00 | 1 | 0 | 0 | | 0.33 | | | | | | | | |
| III | 3 | A | 2 | a | | | | | | | | | | | | | | | | | | | 45 | 46 | 52 | | 47.67 | 4 | 3 | 1 | | 2.67 | | | | | | | | |
| III | 3 | A | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | 4 | 4 | 8 | | 5.33 | | | | | | | | |
| III | 3 | A | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | 5 | 5 | 6 | | 5.33 | | | | | | | | |
| III | 3 | A | 3 | a | | | | | | | | | | | | | | | | | | | 4 | 5 | 0 | | 3.00 | 1 | 1 | 0 | | 0.67 | | | | | | | | |
| III | 3 | A | 3 | b | | | | | | | | | | | | | | | | | | | 4 | 2 | 2 | | 2.67 | 1 | 0 | 0 | | 0.33 | | | | | | | | |
| III | 3 | A | 3 | c | | | | | | | | | | | | | | | | | | | 1 | 3 | 1 | | 1.67 | 1 | 0 | 0 | | 0.33 | | | | | | | | |
| III | 3 | B | 1 | a | | | | | | | | | | | | | | | | | | | | | | | | 11 | 12 | 6 | | 9.67 | 3 | 0 | 0 | 1.00 | | | | |
| III | 3 | B | 1 | b | | | | | | | | | | | | | | | | | | | | | | | | 14 | 15 | 11 | | 13.33 | 1 | 2 | 3 | 2.00 | | | | |
| III | 3 | B | 1 | c | | | | | | | | | | | | | | | | | | | | | | | | 10 | 12 | 13 | | 11.67 | 0 | 1 | 2 | 1.00 | | | | |
| III | 3 | B | 2 | a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6 | 8 | 12 | 8.67 | | | | |
| III | 3 | B | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 8 | 8 | 5 | 7.00 | | | | |
| III | 3 | B | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 17 | 8 | | 12.50 | | | | |
| III | 3 | B | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | 0 | | 0.33 | 0 | 0 | 0 | 0.00 | | | | |
| III | 3 | B | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | 0 | | 0.33 | 0 | 0 | 0 | 0.00 | | | | |
| III | 3 | B | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 0 | | 0.67 | 0 | 0 | 0 | 0.00 | | | | |
| III | 3 | C | 1 | a | | | | | | | | | | | | | | 2 | 0 | 1 | | 1.00 | 1 | 0 | 0 | | 0.33 | | | | | | | | | | | | | |
| III | 3 | C | 1 | b | | | | | | | | | | | | | | 1 | 0 | 0 | | 0.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | |
| III | 3 | C | 1 | c | | | | | | | | | | | | | | 3 | 1 | | | 2.00 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| III | 3 | C | 2 | a | | | | | | | | | | | | | | 8 | 1 | | | 4.50 | 0 | 0 | | | 0.00 | | | | | | | | | | | | | |
| III | 3 | C | 2 | b | | | | | | | | | | | | | | 11 | 7 | | | 9.00 | 1 | 0 | | | 0.50 | | | | | | | | | | | | | |
| III | 3 | C | 2 | c | | | | | | | | | | | | | | 11 | 10 | | | 10.50 | 2 | 1 | | | 1.50 | | | | | | | | | | | | | |
| III | 3 | C | 3 | a | | | | | | | | | | | | | | 9 | 15 | | | 12.00 | 1 | 1 | | | 1.00 | | | | | | | | | | | | | |
| III | 3 | C | 3 | b | | | | | | | | | | | | | | | | | | | 1 | 1 | | | 1.00 | | | | | | | | | | | | | |
| III | 3 | C | 3 | c | | | | | | | | | | | | | | 14 | 11 | | | 12.50 | 3 | 2 | | | 2.50 | | | | | | | | | | | | | |
| III | 7 | A | 1 | a | | | | | | | | | | | | | | 13 | 14 | 12 | | 13.00 | 1 | 2 | 0 | | 1.00 | | | | | | | | | | | | | |
| III | 7 | A | 1 | b | | | | | | | | | | | | | | 7 | 26 | 21 | | 18.00 | 2 | 0 | 1 | | 1.00 | | | | | | | | | | | | | |
| III | 7 | A | 1 | c | | | | | | | | | | | | | | 14 | 18 | 14 | | 15.33 | 0 | 3 | 1 | | 1.33 | | | | | | | | | | | | | |
| III | 7 | A | 2 | a | | | | | | | | | | | | | | | | | | | 41 | 51 | 29 | | 40.33 | 7 | 10 | 6 | | 7.67 | | | | | | | | |
| III | 7 | A | 2 | b | | | | | | | | | | | | | | | | | | | 40 | 43 | 41 | | 41.33 | 10 | 10 | 13 | | 11.00 | | | | | | | | |
| III | 7 | A | 2 | c | | | | | | | | | | | | | | | | | | | 49 | 45 | 39 | | 44.33 | 8 | 11 | 9 | | 9.33 | | | | | | | | |
| III | 7 | A | 3 | a | | | | | | | | | | | | | | | | | | | 70 | 93 | 100 | | 87.67 | | | | | | | | | | | | | |
| III | 7 | A | 3 | b | | | | | | | | | | | | | | | | | | | 105 | 114 | 119 | | 112.67 | | | | | | | | | | | | | |
| III | 7 | A | 3 | c | | | | | | | | | | | | | | | | | | | 107 | 95 | 92 | | 98.00 | | | | | | | | | | | | | |
| III | 7 | B | 1 | a | | | | | | | | | | | | | | | | | | | | | | | | 7 | 3 | 2 | | 4.00 | 0 | 0 | 0 | 0.00 | | | | |
| III | 7 | B | 1 | b | | | | | | | | | | | | | | | | | | | | | | | | 11 | 14 | 3 | | 9.33 | 1 | 0 | 0 | 0.33 | | | | |
| III | 7 | B | 1 | c | | | | | | | | | | | | | | | | | | | | | | | | 9 | 7 | 9 | | 8.33 | 3 | 1 | 0 | 1.33 | | | | |
| III | 7 | B | 2 | a | | | | | | | | | | | | | | | | | | | | | | | | 4 | 3 | 0 | | 2.33 | 1 | 0 | 0 | 0.33 | | | | |
| III | 7 | B | 2 | b | | | | | | | | | | | | | | | | | | | | | | | | 12 | 11 | 12 | | 11.67 | 2 | 2 | 0 | 1.33 | | | | |
| III | 7 | B | 2 | c | | | | | | | | | | | | | | | | | | | | | | | | 12 | 15 | 11 | | 12.67 | 1 | 2 | 1 | 1.33 | | | | |
| III | 7 | B | 3 | a | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| III | 7 | B | 3 | b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| III | 7 | B | 3 | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| III | 7 | C | 1 | a | | | | | | | | | 3 | 2 | 5 | | 3.33 | 1 | 0 | 0 | | 0.33 | | | | | | | | | | | | | | | | | | |
| III | 7 | C | 1 | b | | | | | | | | | 1 | 0 | 0 | | 0.33 | 1 | 0 | 0 | | 0.33 | | | | | | | | | | | | | | | | | | |
| III | 7 | C | 1 | c | | | | | | | | | 4 | 2 | 0 | | 2.00 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| III | 7 | C | 2 | a | | | | | | | | | 56 | 55 | 32 | | 47.67 | 4 | 0 | 0 | | 1.33 | | | | | | | | | | | | | | | | | | |
| III | 7 | C | 2 | b | | | | | | | | | 61 | 52 | 65 | | 59.33 | 3 | 8 | 6 | | 5.67 | | | | | | | | | | | | | | | | | | |
| III | 7 | C | 2 | c | | | | | | | | | 44 | 44 | 47 | | 45.00 | 6 | 6 | 5 | | 5.67 | | | | | | | | | | | | | | | | | | |
| III | 7 | C | 3 | a | | | | | | | | | 3 | 4 | 0 | | 2.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| III | 7 | C | 3 | b | | | | | | | | | 1 | 0 | 2 | | 1.00 | 1 | 0 | 0 | | 0.33 | | | | | | | | | | | | | | | | | | |
| III | 7 | C | 3 | c | | | | | | | | | 3 | 2 | 2 | | 2.33 | 0 | 0 | 0 | | 0.00 | | | | | | | | | | | | | | | | | | |
| III | 18 | A | 1 | a | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 44 | 21 | 41 | | 35.33 | | | | | | | | | | | | | |
| III | 18 | A | 1 | b | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 52 | 35 | 33 | | 40.00 | | | | | | | | | | | | | |
| III | 18 | A | 1 | c | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 32 | 29 | 45 | | 35.33 | | | | | | | | | | | | | |
| III | 18 | A | 2 | a | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 25 | 30 | 23 | | 26.00 | | | | | | | | | | | | | |
| III | 18 | A | 2 | b | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 29 | 23 | 28 | | 26.67 | | | | | | | | | | | | | |
| III | 18 | A | 2 | c | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 13 | 29 | 28 | | 23.33 | | | | | | | | | | | | | |
| III | 18 | A | 3 | a | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 62 | 61 | 59 | | 60.67 | | | | | | | | | | | | | |
| III | 18 | A | 3 | b | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 68 | 67 | 54 | | 63.00 | | | | | | | | | | | | | |
| III | 18 | A | 3 | c | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 63 | 58 | 62 | | 61.00 | | | | | | | | | | | | | |
| III | 18 | B | 1 | a | | | | | | | | | | | | | | 101 | 104 | 115 | | 106.67 | 22 | 12 | 15 | | 16.33 | | | | | | | | | | | | | |
| III | 18 | B | 1 | b | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 20 | 14 | 8 | | 14.00 | | | | | | | | | | | | | |
| III | 18 | B | 1 | c | | | | | | | | | | | | | | 111 | TNTC | TNTC | | TNTC | 23 | 17 | 12 | | 17.33 | | | | | | | | | | | | | |

Table A4. Continued.

| | | | | | 5.E-01 | 5.E-01 | 5.E-01 | 5.E-01 | 2.5E-01 | 2.5E-01 | 2.5E-01 | 2.5E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-01 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-02 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-03 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-04 | 1.E-05 | 1.E-05 | 1.E-05 | 1.E-05 | 1.E-06 | 1.E-06 | 1.E-06 | 1.E-06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SR** | **DAY** | **TR** | **PL** | **SMP** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** | **PL CNT** | **PL CNT** | **PL CNT** | **AVG** |
| III | 18 | B | 2 | a | | | | | | | | | | | | | | 63 | 23 | 20 | | 35.33 | 3 | 1 | 2 | | 2.00 | | | | | | | | | | | | | |
| III | 18 | B | 2 | b | | | | | | | | | | | | | | 79 | 77 | 66 | | 74.00 | 4 | 4 | 3 | | 3.67 | | | | | | | | | | | | | |
| III | 18 | B | 2 | c | | | | | | | | | | | | | | 73 | 59 | 68 | | 66.67 | 2 | 5 | 2 | | 3.00 | | | | | | | | | | | | | |
| III | 18 | B | 3 | a | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 106 | 92 | 106 | | 101.33 | | | | | | | | | | | | | |
| III | 18 | B | 3 | b | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 112 | 112 | 116 | | 113.33 | | | | | | | | | | | | | |
| III | 18 | B | 3 | c | | | | | | | | | | | | | | TNTC | TNTC | TNTC | | TNTC | 75 | 121 | 107 | | 101.00 | | | | | | | | | | | | | |
| III | 18 | C | 1 | a | | | | | | | | | 3 | 1 | 0 | | 1.33 | 1 | 0 | 0 | | 0.33 | | | | | | | | | | | | | | | | | | |
| III | 18 | C | 1 | b | | | | | | | | | 2 | 2 | 2 | | 2.00 | 1 | 1 | 1 | | 1.00 | | | | | | | | | | | | | | | | | | |
| III | 18 | C | 1 | c | | | | | | | | | 1 | 1 | 0 | | 0.67 | 1 | 1 | 1 | | 1.00 | | | | | | | | | | | | | | | | | | |
| III | 18 | C | 2 | a | | | | | | | | | 2 | 2 | 0 | | 1.33 | 1 | 1 | 3 | | 1.67 | | | | | | | | | | | | | | | | | | |
| III | 18 | C | 2 | b | | | | | | | | | 13 | 0 | 2 | | 5.00 | 1 | 1 | 0 | | 0.67 | | | | | | | | | | | | | | | | | | |
| III | 18 | C | 2 | c | | | | | | | | | 26 | 14 | 15 | | 18.33 | 2 | 1 | 0 | | 1.00 | | | | | | | | | | | | | | | | | | |
| III | 18 | C | 3 | a | | | | | | | | | 30 | 28 | 21 | | 26.33 | 3 | 2 | 2 | | 2.33 | | | | | | | | | | | | | | | | | | |
| III | 18 | C | 3 | b | | | | | | | | | 15 | 27 | 26 | | 22.67 | 3 | 3 | 2 | | 2.67 | | | | | | | | | | | | | | | | | | |
| III | 18 | C | 3 | c | | | | | | | | | 26 | 27 | 13 | | 22.00 | 2 | 1 | 0 | | 1.00 | | | | | | | | | | | | | | | | | | |

Table A5. Fecal coliform concentrations calculated from membrane filtration data.

| SR | DAY | TR | PL | SMP | 5.E-01 Conc | 3.E-01 Conc | 1.E-01 Conc | 1.E-02 Conc | 1.E-03 Conc | 1.E-04 Conc | 1.E-05 Conc | 1.E-06 Conc | Lab Rep Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 0 | A | 1 | a | | | | 17150 | | <10,000 | <100,000 | <1,000,000 | 17150 |
| I | 0 | A | 1 | b | | | | 12450 | | 5000 | <100,000 | <1,000,000 | 8725 |
| I | 0 | A | 1 | c | | | | 11650 | | 5000 | <100,000 | <1,000,000 | 8325 |
| I | 0 | A | 2 | a | | | | 16000 | 24000 | 15000 | <100,000 | | 18333 |
| I | 0 | A | 2 | b | | | | >10000 | | 15000 | <100,000 | | 15000 |
| I | 0 | A | 2 | c | | | | >10000 | | 45000 | 50000 | <1,000,000 | 47500 |
| I | 0 | A | 3 | a | | | | 2000 | <1000 | <10,000 | <100,000 | | 2000 |
| I | 0 | A | 3 | b | | | | 2050 | 1500 | 5000 | <100,000 | | 2850 |
| I | 0 | A | 3 | c | | | | 3100 | | <10,000 | <100,000 | <1,000,000 | 3100 |
| I | 0 | B | 1 | a | | | | >10000 | | 25000 | <100,000 | <1,000,000 | 25000 |
| I | 0 | B | 1 | b | | | | >10000 | | 45000 | <100,000 | <1,000,000 | 45000 |
| I | 0 | B | 1 | c | | | | >10000 | | 25000 | <100,000 | <1,000,000 | 25000 |
| I | 0 | B | 2 | a | | | | >10000 | 61500 | 15000 | <100,000 | <1,000,000 | 38250 |
| I | 0 | B | 2 | b | | | | >10000 | 48500 | 90000 | 50000 | <1,000,000 | 62833 |
| I | 0 | B | 2 | c | | | | >10000 | 55500 | 70000 | <100,000 | <1,000,000 | 62750 |
| I | 0 | B | 3 | a | | | | | | 810000 | 700000 | 1000000 | 836667 |
| I | 0 | B | 3 | b | | | | | | 710000 | 550000 | 2000000 | 1086667 |
| I | 0 | B | 3 | c | | | | | | 725000 | 800000 | 1500000 | 1008333 |
| I | 0 | C | 1 | a | | | | >10000 | 21500 | 10000 | | | 15750 |
| I | 0 | C | 1 | b | | | | <100 | <1000 | <10,000 | | | |
| I | 0 | C | 1 | c | | | | 75 | <1000 | <10,000 | | | 75 |
| I | 0 | C | 2 | a | | | | | | | | | |
| I | 0 | C | 2 | b | | | | | | | | | |
| I | 0 | C | 2 | c | | | | | | | | | |
| I | 0 | C | 3 | a | | | 30 | 700 | 500 | <10,000 | | | 410 |
| I | 0 | C | 3 | b | | | 5 | <100 | | <10,000 | | | 5 |
| I | 0 | C | 3 | c | | | 5 | 350 | 2000 | <10,000 | | | 785 |
| I | 2 | A | 1 | a | | | | >10000 | >100,000 | 5000 | | | 5000 |
| I | 2 | A | 1 | b | | | | >10000 | 13000 | 10000 | | | 11500 |
| I | 2 | A | 1 | c | | | | >10000 | 23000 | 15000 | | | 19000 |
| I | 2 | A | 2 | a | | | | >10000 | 5750 | <10,000 | | | 5750 |
| I | 2 | A | 2 | b | | | | >10000 | 28750 | 25000 | | | 26875 |
| I | 2 | A | 2 | c | | | | >10000 | 29750 | 50000 | | | 39875 |
| I | 2 | A | 3 | a | | | | 3050 | 1000 | <10,000 | | | 2025 |
| I | 2 | A | 3 | b | | | | 2000 | 3000 | 25000 | | | 10000 |
| I | 2 | A | 3 | c | | | | 3000 | 2500 | <10,000 | | | 2750 |
| I | 2 | B | 1 | a | | | | >10000 | 98000 | 105000 | | | 101500 |
| I | 2 | B | 1 | b | | | | >10000 | >100,000 | 200000 | | | 200000 |
| I | 2 | B | 1 | c | | | | >10000 | >100,000 | 80000 | | | 80000 |
| I | 2 | B | 2 | a | | | | >10000 | 72000 | 40000 | | | 56000 |
| I | 2 | B | 2 | b | | | | >10000 | 93000 | 70000 | | | 81500 |
| I | 2 | B | 2 | c | | | | >10000 | 87000 | 105000 | | | 96000 |
| I | 2 | B | 3 | a | | | | >10000 | >100,000 | 400000 | | | 400000 |
| I | 2 | B | 3 | b | | | | >10000 | >100,000 | 370000 | | | 370000 |
| I | 2 | B | 3 | c | | | | | >100,000 | 380000 | | | 380000 |
| I | 2 | C | 1 | a | | | 55 | <100 | <1000 | | | | 55 |
| I | 2 | C | 1 | b | | | 30 | <100 | <1000 | | | | 30 |
| I | 2 | C | 1 | c | | | 35 | <100 | <1000 | | | | 35 |
| I | 2 | C | 2 | a | | | 95 | <100 | <1000 | | | | 95 |
| I | 2 | C | 2 | b | | | 125 | <100 | <1000 | | | | 125 |
| I | 2 | C | 2 | c | | | 105 | <100 | <1000 | | | | 105 |
| I | 2 | C | 3 | a | | | >1000 | 10950 | <1000 | | | | 10950 |
| I | 2 | C | 3 | b | | | >1000 | 19800 | 6000 | | | | 12900 |
| I | 2 | C | 3 | c | | | >1000 | 13450 | <1000 | | | | 13450 |
| I | 7 | A | 1 | a | | | | | | | | | |
| I | 7 | A | 1 | b | | | | | | | | | |
| I | 7 | A | 1 | c | | | | | | | | | |
| I | 7 | A | 2 | a | | | | 350 | <1000 | | | | 350 |
| I | 7 | A | 2 | b | | | | >10000 | | | | | |
| I | 7 | A | 2 | c | | | | >10000 | | | | | |
| I | 7 | A | 3 | a | | | | 600 | <1000 | | | | 600 |
| I | 7 | A | 3 | b | | | | 450 | 500 | | | | 475 |
| I | 7 | A | 3 | c | | | | 350 | <1000 | | | | 350 |
| I | 7 | B | 1 | a | | | | | 9000 | <10,000 | | | 9000 |

Table A5. Continued.

| | | | | | 5.E-01 | 3.E-01 | 1.E-01 | 1.E-02 | 1.E-03 | 1.E-04 | 1.E-05 | 1.E-06 | Lab Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SR | DAY | TR | PL | SMP | Conc | Conc | Conc | Conc | Conc | Conc | Conc | Conc | Avg |
| I | 7 | B | 1 | b | | | | | >100,000 | 35000 | | | 35000 |
| I | 7 | B | 1 | c | | | | | >100,000 | 300000 | | | 300000 |
| I | 7 | B | 2 | a | | | | | 500 | 20000 | | | 10250 |
| I | 7 | B | 2 | b | | | | | 109000 | 45000 | | | 77000 |
| I | 7 | B | 2 | c | | | | | >100,000 | 175000 | | | 175000 |
| I | 7 | B | 3 | a | | | | | 67500 | 35000 | | | 51250 |
| I | 7 | B | 3 | b | | | | | 87000 | 80000 | | | 83500 |
| I | 7 | B | 3 | c | | | | | 64500 | 85000 | | | 74750 |
| I | 7 | C | 1 | a | 2 | | <10 | <100 | | | | | 2 |
| I | 7 | C | 1 | b | 7 | | 5 | <100 | | | | | 6 |
| I | 7 | C | 1 | c | 6 | | 30 | 50 | | | | | 29 |
| I | 7 | C | 2 | a | | <4 | <10 | <100 | | | | | |
| I | 7 | C | 2 | b | | <4 | 5 | <100 | | | | | 5 |
| I | 7 | C | 2 | c | | 8 | 20 | 50 | | | | | 26 |
| I | 7 | C | 3 | a | | | 450 | 600 | 500 | | | | 517 |
| I | 7 | C | 3 | b | | | | 350 | <1000 | | | | 350 |
| I | 7 | C | 3 | c | | | | 950 | 500 | | | | 725 |
| I | 13 | A | 1 | a | | | | | >100,000 | 2486667 | | | 2486667 |
| I | 13 | A | 1 | b | | | | | >100,000 | 2410000 | | | 2410000 |
| I | 13 | A | 1 | c | | | | | >100,000 | 2463333 | | | 2463333 |
| I | 13 | A | 2 | a | | | | | 51333 | 33333 | | | 42333 |
| I | 13 | A | 2 | b | | | | | 78667 | 36667 | | | 57667 |
| I | 13 | A | 2 | c | | | | | 42667 | 30000 | | | 36333 |
| I | 13 | A | 3 | a | | | | 6000 | 7667 | | | | 6833 |
| I | 13 | A | 3 | b | | | | 733 | <1000 | | | | 733 |
| I | 13 | A | 3 | c | | | | 367 | 667 | | | | 517 |
| I | 13 | B | 1 | a | | | | | >100,000 | 125000 | | | 125000 |
| I | 13 | B | 1 | b | | | | | 28000 | 72500 | | | 50250 |
| I | 13 | B | 1 | c | | | | | 27667 | 16667 | | | 22167 |
| I | 13 | B | 2 | a | | | | | 27000 | 17500 | | | 22250 |
| I | 13 | B | 2 | b | | | | | >100,000 | 80000 | | | 80000 |
| I | 13 | B | 2 | c | | | | | 27667 | 23333 | | | 25500 |
| I | 13 | B | 3 | a | | | | | 4667 | 95000 | | | 49833 |
| I | 13 | B | 3 | b | | | | | 3667 | 3333 | | | 3500 |
| I | 13 | B | 3 | c | | | | | 3333 | <10,000 | | | 3333 |
| I | 13 | C | 1 | a | 2 | 4 | 18 | | | | | | 8 |
| I | 13 | C | 1 | b | 16 | 18 | 23 | | | | | | 19 |
| I | 13 | C | 1 | c | 4 | 8 | 23 | | | | | | 12 |
| I | 13 | C | 2 | a | | >400 | 75 | | | | | | 75 |
| I | 13 | C | 2 | b | | >400 | 600 | | | | | | 600 |
| I | 13 | C | 2 | c | | >400 | 1300 | | | | | | 1300 |
| I | 13 | C | 3 | a | | | 173 | 850 | | | | | 512 |
| I | 13 | C | 3 | b | | | >1000 | 167 | | | | | 167 |
| I | 13 | C | 3 | c | | | >1000 | 2467 | | | | | 2467 |
| I | 30 | A | 1 | a | | | | | 1000 | <10,000 | <100,000 | | 1000 |
| I | 30 | A | 1 | b | | | | | 333 | <10,000 | <100,000 | | 333 |
| I | 30 | A | 1 | c | | | | | <1000 | 3333 | <100,000 | | 3333 |
| I | 30 | A | 2 | a | | | | >10000 | 17333 | | | | 17333 |
| I | 30 | A | 2 | b | | | | >10000 | 14667 | | | | 14667 |
| I | 30 | A | 2 | c | | | | >10000 | 14000 | | | | 14000 |
| I | 32 | A | 3 | a | | | | 533 | <1000 | | | | 533 |
| I | 32 | A | 3 | b | | | | 450 | <1000 | | | | 450 |
| I | 32 | A | 3 | c | | | | 233 | 667 | | | | 450 |
| I | 30 | B | 1 | a | | | | 9067 | <1000 | | | | 9067 |
| I | 30 | B | 1 | b | | | | >10000 | 12000 | | | | 12000 |
| I | 30 | B | 1 | c | | | | >10000 | 9000 | | | | 9000 |
| I | 32 | B | 2 | a | | | | 2033 | <1000 | | | | 2033 |
| I | 32 | B | 2 | b | | | | 2600 | 1333 | | | | 1967 |
| I | 32 | B | 2 | c | | | | 2000 | 1000 | | | | 1500 |
| I | 32 | B | 3 | a | | | | 4933 | 5000 | | | | 4967 |
| I | 32 | B | 3 | b | | | | 4267 | 4667 | | | | 4467 |
| I | 32 | B | 3 | c | | | | 4300 | 4667 | | | | 4483 |
| I | 30 | C | 1 | a | 3 | | 13 | | | | | | 8 |
| I | 30 | C | 1 | b | 17 | | 33 | | | | | | 25 |

Table A5. Continued.

| SR | DAY | TR | PL | SMP | 5.E-01 Conc | 3.E-01 Conc | 1.E-01 Conc | 1.E-02 Conc | 1.E-03 Conc | 1.E-04 Conc | 1.E-05 Conc | 1.E-06 Conc | Lab Rep Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 30 | C | 1 | c | 7 | | 10 | | | | | | 9 |
| I | 32 | C | 2 | a | 5 | | 5 | | | | | | 5 |
| I | 32 | C | 2 | b | 6 | | | | | | | | 6 |
| I | 32 | C | 2 | c | | | 35 | | | | | | 35 |
| I | 32 | C | 3 | a | | | 7 | | | | | | 7 |
| I | 32 | C | 3 | b | | | 10 | | | | | | 10 |
| I | 32 | C | 3 | c | | | | | | | | | |
| II | 0 | A | 1 | a | | | | | | 6667 | 66667 | | 36667 |
| II | 0 | A | 1 | b | | | | | | 20000 | <100,000 | | 20000 |
| II | 0 | A | 1 | c | | | | | | <10,000 | 33333 | | 33333 |
| II | 0 | A | 2 | a | | | | | | 143333 | | | 143333 |
| II | 0 | A | 2 | b | | | | | | 220000 | | | 220000 |
| II | 0 | A | 2 | c | | | | | | 200000 | 300000 | | 250000 |
| II | 0 | A | 3 | a | | | | | | 6667 | 100000 | | 53333 |
| II | 0 | A | 3 | b | | | | | | 10000 | 66667 | | 38333 |
| II | 0 | A | 3 | c | | | | | | 10000 | <100,000 | | 10000 |
| II | 0 | B | 1 | a | | | | | | 235000 | | | 235000 |
| II | 0 | B | 1 | b | | | | | | 333333 | 633333 | | 483333 |
| II | 0 | B | 1 | c | | | | | | 503333 | 566667 | 1000000 | 690000 |
| II | 0 | B | 2 | a | | | | | | 326667 | 266667 | | 296667 |
| II | 0 | B | 2 | b | | | | | | 133333 | 300000 | | 216667 |
| II | 0 | B | 2 | c | | | | | | 553333 | 1333333 | 1333333 | 1073333 |
| II | 0 | B | 3 | a | | | | | | 220000 | 166667 | 333333 | 240000 |
| II | 0 | B | 3 | b | | | | | | 206667 | 200000 | | 203333 |
| II | 0 | B | 3 | c | | | | | | 256667 | 500000 | 1000000 | 585556 |
| II | 0 | C | 1 | a | | | | <100 | | | | | |
| II | 0 | C | 1 | b | | | | 1400 | 1667 | | | | 1533 |
| II | 0 | C | 1 | c | | | | 300 | 1333 | | | | 817 |
| II | 0 | C | 2 | a | | | | 233 | 333 | <10,000 | | | 283 |
| II | 0 | C | 2 | b | | | | 333 | 667 | | | | 500 |
| II | 0 | C | 2 | c | | | | 700 | <1000 | <10,000 | | | 700 |
| II | 0 | C | 3 | a | | | | | | >1,000,000 | | | |
| II | 0 | C | 3 | b | | | | | | >1,000,000 | | | |
| II | 0 | C | 3 | c | | | | | | >1,000,000 | | | |
| II | 3 | A | 1 | a | | | | | 55000 | <10,000 | | | 55000 |
| II | 3 | A | 1 | b | | | | | >100,000 | 80000 | | | 80000 |
| II | 3 | A | 1 | c | | | | | >100,000 | 86667 | | | 86667 |
| II | 3 | A | 2 | a | | | | | >100,000 | 280000 | | | 280000 |
| II | 3 | A | 2 | b | | | | | >100,000 | 133333 | | | 133333 |
| II | 3 | A | 2 | c | | | | | >100,000 | 70000 | | | 70000 |
| II | 3 | A | 3 | a | | | | | 18333 | 13333 | | | 15833 |
| II | 3 | A | 3 | b | | | | | 19333 | 10000 | | | 14667 |
| II | 3 | A | 3 | c | | | | | 16000 | 10000 | | | 13000 |
| II | 3 | B | 1 | a | | | | | >100,000 | | | | |
| II | 3 | B | 1 | b | | | | | >100,000 | 950000 | | | 950000 |
| II | 3 | B | 1 | c | | | | | >100,000 | 1080000 | | | 1080000 |
| II | 3 | B | 2 | a | | | | | >100,000 | 1343333 | | | 1343333 |
| II | 3 | B | 2 | b | | | | | >100,000 | 1333333 | | | 1333333 |
| II | 3 | B | 2 | c | | | | | >100,000 | 905000 | | | 905000 |
| II | 3 | B | 3 | a | | | | | >100,000 | 660000 | | | 660000 |
| II | 3 | B | 3 | b | | | | | >100,000 | 610000 | | | 610000 |
| II | 3 | B | 3 | c | | | | | >100,000 | 573333 | | | 573333 |
| II | 3 | C | 1 | a | | | 25 | <100 | | | | | 25 |
| II | 3 | C | 1 | b | | | >1000 | 100 | | | | | 100 |
| II | 3 | C | 1 | c | | | 197 | 133 | | | | | 165 |
| II | 3 | C | 2 | a | | | >1000 | | | | | | |
| II | 3 | C | 2 | b | | | >1000 | 33 | | | | | 33 |
| II | 3 | C | 2 | c | | | >1000 | 200 | | | | | 200 |
| II | 3 | C | 3 | a | | | >1000 | >10000 | | | | | |
| II | 3 | C | 3 | b | | | >1000 | >10000 | | | | | |
| II | 3 | C | 3 | c | | | >1000 | >10000 | | | | | |
| II | 7 | A | 1 | a | | | | | 37000 | 6667 | | | 21833 |
| II | 7 | A | 1 | b | | | | | >100,000 | 156667 | | | 156667 |
| II | 7 | A | 1 | c | | | | | >100,000 | 166667 | | | 166667 |

Table A5. Continued.

| SR | DAY | TR | PL | SMP | 5.E-01 Conc | 3.E-01 Conc | 1.E-01 Conc | 1.E-02 Conc | 1.E-03 Conc | 1.E-04 Conc | 1.E-05 Conc | 1.E-06 Conc | Lab Rep Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| II | 7 | A | 2 | a | | | | | 74667 | 26667 | | | 50667 |
| II | 7 | A | 2 | b | | | | | >100,000 | 116667 | | | 116667 |
| II | 7 | A | 2 | c | | | | | >100,000 | 170000 | | | 170000 |
| II | 7 | A | 3 | a | | | | | 667 | | | | 667 |
| II | 7 | A | 3 | b | | | | | 1000 | | | | 1000 |
| II | 7 | A | 3 | c | | | | | <1000 | | | | |
| II | 7 | B | 1 | a | | | | | | 376667 | 533333 | | 455000 |
| II | 7 | B | 1 | b | | | | | | 530000 | 733333 | | 631667 |
| II | 7 | B | 1 | c | | | | | | 690000 | 733333 | | 711667 |
| II | 7 | B | 2 | a | | | | | | >1,000,000 | 1200000 | | 1200000 |
| II | 7 | B | 2 | b | | | | | | >1,000,000 | 1333333 | | 1333333 |
| II | 7 | B | 2 | c | | | | | | >1,000,000 | 1500000 | | 1500000 |
| II | 7 | B | 3 | a | | | | | | <10,000 | 100000 | | 100000 |
| II | 7 | B | 3 | b | | | | | | 40000 | 100000 | | 70000 |
| II | 7 | B | 3 | c | | | | | | 63333 | 33333 | | 48333 |
| II | 7 | C | 1 | a | | | <10 | <100 | | | | | |
| II | 7 | C | 1 | b | | | 10 | <100 | | | | | 10 |
| II | 7 | C | 1 | c | | | 10 | <100 | | | | | 10 |
| II | 7 | C | 2 | a | | | 13 | 33 | | | | | 23 |
| II | 7 | C | 2 | b | | | 47 | 667 | | | | | 357 |
| II | 7 | C | 2 | c | | | 790 | 733 | | | | | 762 |
| II | 7 | C | 3 | a | | | >1000 | 4167 | | | | | 4167 |
| II | 7 | C | 3 | b | | | >1000 | 5167 | | | | | 5167 |
| II | 7 | C | 3 | c | | | >1000 | | | | | | |
| II | 14 | A | 1 | a | | | | | 333 | <10,000 | | | 333 |
| II | 14 | A | 1 | b | | | | | 667 | <10,000 | | | 667 |
| II | 14 | A | 1 | c | | | | | 3333 | <10,000 | | | 3333 |
| II | 14 | A | 2 | a | | | | | 6667 | 6667 | | | 6667 |
| II | 14 | A | 2 | b | | | | | 21500 | <10,000 | | | 21500 |
| II | 14 | A | 2 | c | | | | | 24667 | 6667 | | | 15667 |
| II | 14 | A | 3 | a | | | | 333 | <1000 | | | | 333 |
| II | 14 | A | 3 | b | | | | 900 | 1333 | | | | 1117 |
| II | 14 | A | 3 | c | | | | 833 | 1333 | | | | 1083 |
| II | 14 | B | 1 | a | | | | | | 23333 | <100,000 | | 23333 |
| II | 14 | B | 1 | b | | | | | | 20000 | <100,000 | | 20000 |
| II | 14 | B | 1 | c | | | | | | <10,000 | <100,000 | | |
| II | 14 | B | 2 | a | | | | | | <10,000 | <100,000 | | |
| II | 14 | B | 2 | b | | | | | | 10000 | 66667 | | 38333 |
| II | 14 | B | 2 | c | | | | | | 43333 | <100,000 | | 43333 |
| II | 14 | B | 3 | a | | | | | | <10,000 | <100,000 | | |
| II | 14 | B | 3 | b | | | | | | <10,000 | <100,000 | | |
| II | 14 | B | 3 | c | | | | | | 10000 | <100,000 | | 10000 |
| II | 14 | C | 1 | a | | | | | | | | | |
| II | 14 | C | 1 | b | | | | | | | | | |
| II | 14 | C | 1 | c | | | | | | | | | |
| II | 14 | C | 2 | a | | | | <100 | | | | | |
| II | 14 | C | 2 | b | | | | <100 | | | | | |
| II | 14 | C | 2 | c | | | | 67 | | | | | 67 |
| II | 14 | C | 3 | a | | | | | | | | | |
| II | 14 | C | 3 | b | | | | | | | | | |
| II | 14 | C | 3 | c | | | | | | | | | |
| III | 0 | A | 1 | a | | | | | 8333 | 20000 | | | 14167 |
| III | 0 | A | 1 | b | | | | | 34667 | 30000 | 33333 | | 32667 |
| III | 0 | A | 1 | c | | | | | 63333 | 60000 | | | 61667 |
| III | 0 | A | 2 | a | | | | | 13000 | 3333 | | | 8167 |
| III | 0 | A | 2 | b | | | | | | 50000 | 33333 | | 41667 |
| III | 0 | A | 2 | c | | | | | | 10000 | 33333 | | 21667 |
| III | 0 | A | 3 | a | | | | | 5333 | 3333 | | | 4333 |
| III | 0 | A | 3 | b | | | | | 3000 | <10,000 | 33333 | | 18167 |
| III | 0 | A | 3 | c | | | | | | <10,000 | | | |
| III | 0 | B | 1 | a | | | | | | | 566667 | | 566667 |
| III | 0 | B | 1 | b | | | | | | 260000 | 33333 | | 146667 |
| III | 0 | B | 1 | c | | | | | | | 466667 | | 466667 |
| III | 0 | B | 2 | a | | | | | | | 966667 | 333333 | 650000 |

Table A5. Continued.

| SR | DAY | TR | PL | SMP | 5.E-01 Conc | 3.E-01 Conc | 1.E-01 Conc | 1.E-02 Conc | 1.E-03 Conc | 1.E-04 Conc | 1.E-05 Conc | 1.E-06 Conc | Lab Rep Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| III | 0 | B | 2 | b | | | | | | | 300000 | 333333 | 316667 |
| III | 0 | B | 2 | c | | | | | | | 166667 | | 166667 |
| III | 0 | B | 3 | a | | | | | | 6667 | | | 6667 |
| III | 0 | B | 3 | b | | | | | | | <100,000 | | |
| III | 0 | B | 3 | c | | | | | | | <100,000 | | |
| III | 0 | C | 1 | a | | | <10 | | | | | | |
| III | 0 | C | 1 | b | | | <10 | | | | | | |
| III | 0 | C | 1 | c | | | <10 | | | | | | |
| III | 0 | C | 2 | a | | | | 467 | | | | | 467 |
| III | 0 | C | 2 | b | | | | 400 | | | | | 400 |
| III | 0 | C | 2 | c | | | | 300 | | | | | 300 |
| III | 0 | C | 3 | a | | | | | | | | | |
| III | 0 | C | 3 | b | | | | | | | | | |
| III | 0 | C | 3 | c | | | | | | | | | |
| III | 3 | A | 1 | a | | | | | 6667 | <10,000 | | | 6667 |
| III | 3 | A | 1 | b | | | | | 3667 | 3333 | | | 3500 |
| III | 3 | A | 1 | c | | | | | 4000 | 3333 | | | 3667 |
| III | 3 | A | 2 | a | | | | | 47667 | 26667 | | | 37167 |
| III | 3 | A | 2 | b | | | | | | 53333 | | | 53333 |
| III | 3 | A | 2 | c | | | | | | 53333 | | | 53333 |
| III | 3 | A | 3 | a | | | | | 3000 | 6667 | | | 4833 |
| III | 3 | A | 3 | b | | | | | 2667 | 3333 | | | 3000 |
| III | 3 | A | 3 | c | | | | | 1667 | 3333 | | | 2500 |
| III | 3 | B | 1 | a | | | | | | 96667 | 100000 | | 98333 |
| III | 3 | B | 1 | b | | | | | | 133333 | 200000 | | 166667 |
| III | 3 | B | 1 | c | | | | | | 116667 | 100000 | | 108333 |
| III | 3 | B | 2 | a | | | | | | | 866667 | | 866667 |
| III | 3 | B | 2 | b | | | | | | | 700000 | | 700000 |
| III | 3 | B | 2 | c | | | | | | | 1250000 | | 1250000 |
| III | 3 | B | 3 | a | | | | | | 3333 | <100,000 | | 3333 |
| III | 3 | B | 3 | b | | | | | | 3333 | <100,000 | | 3333 |
| III | 3 | B | 3 | c | | | | | | 6667 | <100,000 | | 6667 |
| III | 3 | C | 1 | a | | | | 100 | 333 | | | | 217 |
| III | 3 | C | 1 | b | | | | 33 | <1000 | | | | 33 |
| III | 3 | C | 1 | c | | | | 200 | <1000 | | | | 200 |
| III | 3 | C | 2 | a | | | | 450 | <1000 | | | | 450 |
| III | 3 | C | 2 | b | | | | 900 | 500 | | | | 700 |
| III | 3 | C | 2 | c | | | | 1050 | 1500 | | | | 1275 |
| III | 3 | C | 3 | a | | | | 1200 | 1000 | | | | 1100 |
| III | 3 | C | 3 | b | | | | | 1000 | | | | 1000 |
| III | 3 | C | 3 | c | | | | 1250 | 2500 | | | | 1875 |
| III | 7 | A | 1 | a | | | | 1300 | 1000 | | | | 1150 |
| III | 7 | A | 1 | b | | | | 1800 | 1000 | | | | 1400 |
| III | 7 | A | 1 | c | | | | 1533 | 1333 | | | | 1433 |
| III | 7 | A | 2 | a | | | | | 40333 | 76667 | | | 58500 |
| III | 7 | A | 2 | b | | | | | 41333 | 110000 | | | 75667 |
| III | 7 | A | 2 | c | | | | | 44333 | 93333 | | | 68833 |
| III | 7 | A | 3 | a | | | | | 87667 | | | | 87667 |
| III | 7 | A | 3 | b | | | | | 112667 | | | | 112667 |
| III | 7 | A | 3 | c | | | | | 98000 | | | | 98000 |
| III | 7 | B | 1 | a | | | | | | 40000 | <100,000 | | 40000 |
| III | 7 | B | 1 | b | | | | | | 93333 | 33333 | | 63333 |
| III | 7 | B | 1 | c | | | | | | 83333 | 133333 | | 108333 |
| III | 7 | B | 2 | a | | | | | | 23333 | 33333 | | 28333 |
| III | 7 | B | 2 | b | | | | | | 116667 | 133333 | | 125000 |
| III | 7 | B | 2 | c | | | | | | 126667 | 133333 | | 130000 |
| III | 7 | B | 3 | a | | | | | | | | | |
| III | 7 | B | 3 | b | | | | | | | | | |
| III | 7 | B | 3 | c | | | | | | | | | |
| III | 7 | C | 1 | a | | | 33 | 33 | | | | | 33 |
| III | 7 | C | 1 | b | | | 3 | 33 | | | | | 18 |
| III | 7 | C | 1 | c | | | 20 | <100 | | | | | 20 |
| III | 7 | C | 2 | a | | | 477 | 133 | | | | | 305 |
| III | 7 | C | 2 | b | | | 593 | 567 | | | | | 580 |

Table A5. Continued.

| | | | | | 5.E-01 | 3.E-01 | 1.E-01 | 1.E-02 | 1.E-03 | 1.E-04 | 1.E-05 | 1.E-06 | Lab Rep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SR | DAY | TR | PL | SMP | Conc | Conc | Conc | Conc | Conc | Conc | Conc | Conc | Avg |
| III | 7 | C | 2 | c | | | 450 | 567 | | | | | 508 |
| III | 7 | C | 3 | a | | | 23 | <100 | | | | | 23 |
| III | 7 | C | 3 | b | | | 10 | 33 | | | | | 22 |
| III | 7 | C | 3 | c | | | 23 | <100 | | | | | 23 |
| III | 18 | A | 1 | a | | | | >10000 | 35333 | | | | 35333 |
| III | 18 | A | 1 | b | | | | >10000 | 40000 | | | | 40000 |
| III | 18 | A | 1 | c | | | | >10000 | 35333 | | | | 35333 |
| III | 18 | A | 2 | a | | | | >10000 | 26000 | | | | 26000 |
| III | 18 | A | 2 | b | | | | >10000 | 26667 | | | | 26667 |
| III | 18 | A | 2 | c | | | | >10000 | 23333 | | | | 23333 |
| III | 18 | A | 3 | a | | | | >10000 | 60667 | | | | 60667 |
| III | 18 | A | 3 | b | | | | >10000 | 63000 | | | | 63000 |
| III | 18 | A | 3 | c | | | | >10000 | 61000 | | | | 61000 |
| III | 18 | B | 1 | a | | | | 10667 | 16333 | | | | 13500 |
| III | 18 | B | 1 | b | | | | >10000 | 14000 | | | | 14000 |
| III | 18 | B | 1 | c | | | | >10000 | 17333 | | | | 17333 |
| III | 18 | B | 2 | a | | | | 3533 | 2000 | | | | 2767 |
| III | 18 | B | 2 | b | | | | 7400 | 3667 | | | | 5533 |
| III | 18 | B | 2 | c | | | | 6667 | 3000 | | | | 4833 |
| III | 18 | B | 3 | a | | | | >10000 | 101333 | | | | 101333 |
| III | 18 | B | 3 | b | | | | >10000 | 113333 | | | | 113333 |
| III | 18 | B | 3 | c | | | | >10000 | 101000 | | | | 101000 |
| III | 18 | C | 1 | a | | | 13 | 33 | | | | | 23 |
| III | 18 | C | 1 | b | | | 20 | 100 | | | | | 60 |
| III | 18 | C | 1 | c | | | 7 | 100 | | | | | 53 |
| III | 18 | C | 2 | a | | | 13 | 167 | | | | | 90 |
| III | 18 | C | 2 | b | | | 50 | 67 | | | | | 58 |
| III | 18 | C | 2 | c | | | 183 | 100 | | | | | 142 |
| III | 18 | C | 3 | a | | | 263 | 233 | | | | | 248 |
| III | 18 | C | 3 | b | | | 227 | 267 | | | | | 247 |
| III | 18 | C | 3 | c | | | 220 | 100 | | | | | 160 |

Table A6. Fecal coliform descriptive statistics by plot.

| Series | Day | Treat | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| I | 0 | A | 1 | Mean | 11400 | 912000 | 9.2836 | 14.3587 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev | 4984 | 398693 | 0.4044 | 0.4044 |
| | | | | Geomean | 10760 | 860785 | 9.2778 | 14.355 |
| | | | 2 | Mean | 26944 | 3637485 | 10.0669 | 15.6653 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 17880 | 2413741 | 0.6158 | 0.6158 |
| | | | | Geomean | 23551 | 3179361 | 10.0546 | 15.6574 |
| | | | 3 | Mean | 2650 | 543250 | 7.865 | 14.2967 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 577 | 118209 | 0.2326 | 0.2326 |
| | | | | Geomean | 2605 | 533949 | 7.8627 | 14.2954 |
| | | B | 1 | Mean | 31667 | 2850000 | 10.3226 | 15.5155 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 11547 | 1039230 | 0.3394 | 0.3394 |
| | | | | Geomean | 30411 | 2736991 | 10.3189 | 15.5131 |
| | | | 2 | Mean | 54611 | 10376090 | 10.8823 | 17.238 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 14169 | 2692129 | 0.2862 | 0.2862 |
| | | | | Geomean | 53229 | 10113417 | 10.8798 | 17.2364 |
| | | | 3 | Mean | 977222 | 68405563 | 13.7865 | 18.9025 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 127871 | 8950946 | 0.1346 | 0.1346 |
| | | | | Geomean | 971444 | 68001069 | 13.7861 | 18.9022 |
| | | C | 1 | Mean | 7913 | 870375 | 6.991 | 12.3847 |
| | | | | N | 2 | 2 | 2 | 2 |
| | | | | Std. Dev. | 11084 | 1219229 | 3.781 | 3.781 |
| | | | | Geomean | 1087 | 119554 | 6.4596 | 12.0926 |
| | | | 3 | Mean | 400 | 56000 | 4.7638 | 10.8141 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 390 | 54613 | 2.751 | 2.751 |
| | | | | Geomean | 117 | 16406 | 4.0112 | 10.5531 |

Table A6. Continued.

| Series | Day | Treat | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| I | 2 | A | 1 | Mean | 11833 | 1065000 | 9.2398 | 14.8483 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 7006 | 630535 | 0.6743 | 0.6743 |
| | | | | Geomean | 10299 | 926936 | 9.2232 | 14.838 |
| | | | 2 | Mean | 24167 | 1208333 | 9.8165 | 14.8372 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 17223 | 861148 | 1.0234 | 1.0234 |
| | | | | Geomean | 18333 | 916662 | 9.7796 | 14.8131 |
| | | | 3 | Mean | 4925 | 689500 | 8.2477 | 14.298 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 4410 | 617400 | 0.8476 | 0.8476 |
| | | | | Geomean | 3819 | 534623 | 8.2195 | 14.2815 |
| | | B | 1 | Mean | 127167 | 15260000 | 11.6746 | 17.5707 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 63985 | 7678203 | 0.4754 | 0.4754 |
| | | | | Geomean | 117543 | 14105114 | 11.6682 | 17.5665 |
| | | | 2 | Mean | 77833 | 10896667 | 11.2379 | 17.2882 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 20251 | 2835072 | 0.2763 | 0.2763 |
| | | | | Geomean | 75952 | 10633274 | 11.2356 | 17.2867 |
| | | | 3 | Mean | 383333 | 34500000 | 12.8561 | 18.4646 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 15275 | 1374773 | 3.96E-02 | 3.96E-02 |
| | | | | Geomean | 383132 | 34481881 | 12.8561 | 18.4646 |
| | | C | 1 | Mean | 40 | 2800 | 3.6546 | 9.0118 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 13 | 926 | 0.315 | 0.315 |
| | | | | Geomean | 39 | 2706 | 3.6458 | 9.0081 |
| | | | 2 | Mean | 108 | 14083 | 4.6787 | 10.4138 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 15 | 1986 | 0.1389 | 0.1389 |
| | | | | Geomean | 108 | 13992 | 4.6773 | 10.4131 |
| | | | 3 | Mean | 12433 | 2735333 | 9.4243 | 15.9891 |
| | | | | N | 3 | 3 | 3 | 3 |
| | | | | Std. Dev. | 1314 | 289016 | 0.1087 | 0.1087 |
| | | | | Geomean | 12385 | 2724780 | 9.4239 | 15.9888 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| I | 7 | A | 2 | **Mean** | 350 | 21000 | 5.8579 | 11.0609 |
| | | | | **N** | 1 | 1 | 1 | 1 |
| | | | | **Std. Dev.** | - | - | - | - |
| | | | | **Geomean** | 350 | 21000 | 5.8579 | 11.0609 |
| | | | 3 | **Mean** | 475 | 23750 | 6.1394 | 11.1601 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 125 | 6250 | 0.2703 | 0.2703 |
| | | | | **Geomean** | 464 | 23189 | 6.1354 | 11.1579 |
| | | B | 1 | **Mean** | 114667 | 6880000 | 10.7265 | 15.9295 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 161029 | 9661739 | 1.7681 | 1.7681 |
| | | | | **Geomean** | 45549 | 2732930 | 10.6309 | 15.8649 |
| | | | 2 | **Mean** | 87417 | 21854167 | 10.853 | 17.4832 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 82867 | 20716872 | 1.4601 | 1.4601 |
| | | | | **Geomean** | 51691 | 12922828 | 10.7849 | 17.4416 |
| | | | 3 | **Mean** | 69833 | 3491667 | 11.133 | 15.9125 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 16678 | 833885 | 0.2559 | 0.2559 |
| | | | | **Geomean** | 68391 | 3419536 | 11.131 | 15.9111 |
| | | C | 1 | **Mean** | 12 | 1295 | 1.9507 | 7.7134 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 15 | 1530 | 1.3441 | 1.3441 |
| | | | | **Geomean** | 7 | 739 | 1.6111 | 7.6361 |
| | | | 2 | **Mean** | 16 | 930 | 2.4338 | 7.6368 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 15 | 891 | 1.1658 | 1.1658 |
| | | | | **Geomean** | 11 | 684 | 2.2899 | 7.5922 |
| | | | 3 | **Mean** | 531 | 106133 | 6.2307 | 12.6377 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 188 | 37575 | 0.3644 | 0.3644 |
| | | | | **Geomean** | 508 | 101624 | 6.2236 | 12.6342 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| I | 14 | A | 1 | **Mean** | 2453333 | 196266667 | 14.7129 | 20.2036 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 39300 | 3143962 | 1.61E-02 | 1.61E-02 |
| | | | | **Geomean** | 2453123 | 196249814 | 14.7129 | 20.2036 |
| | | | 2 | **Mean** | 45444 | 1817773 | 10.7054 | 14.939 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 11002 | 440082 | 0.2353 | 0.2353 |
| | | | | **Geomean** | 44597 | 1783867 | 10.7037 | 14.9378 |
| | | | 3 | **Mean** | 2694 | 134717 | 7.2249 | 12.0044 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 3586 | 179291 | 1.4006 | 1.4006 |
| | | | | **Geomean** | 1373 | 68660 | 7.1397 | 11.952 |
| | | B | 1 | **Mean** | 65806 | 3290283 | 10.8557 | 15.6353 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 53152 | 2657603 | 0.8653 | 0.8653 |
| | | | | **Geomean** | 51830 | 2591519 | 10.8328 | 15.6193 |
| | | | 2 | **Mean** | 42583 | 3406667 | 10.4821 | 15.9728 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 32445 | 2595560 | 0.7028 | 0.7028 |
| | | | | **Geomean** | 35671 | 2853711 | 10.4668 | 15.9626 |
| | | | 3 | **Mean** | 18889 | 944433 | 9.0295 | 13.4863 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 26799 | 1339935 | 1.5477 | 1.5477 |
| | | | | **Geomean** | 8346 | 417295 | 8.9462 | 13.4294 |
| | | C | 1 | **Mean** | 13 | 1170 | 2.5029 | 7.8702 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 6 | 501 | 0.4328 | 0.4328 |
| | | | | **Geomean** | 12 | 1100 | 2.4779 | 7.8623 |
| | | | 2 | **Mean** | 658 | 26333 | 5.9615 | 10.5179 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 615 | 24583 | 1.4753 | 1.4753 |
| | | | | **Geomean** | 388 | 15528 | 5.8288 | 10.4458 |
| | | | 3 | **Mean** | 1049 | 83893 | 6.389 | 11.8797 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1240 | 99229 | 1.3527 | 1.3527 |
| | | | | **Geomean** | 595 | 47622 | 6.2944 | 11.8288 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| I | 30 | A | 1 | **Mean** | 1555 | 217747 | 6.9425 | 12.9928 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1575 | 220530 | 1.1521 | 1.1521 |
| | | | | **Geomean** | 1035 | 144951 | 6.8785 | 12.9588 |
| | | | 2 | **Mean** | 15333 | 1226667 | 9.6335 | 14.416 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1764 | 141087 | 0.1123 | 0.1123 |
| | | | | **Geomean** | 15268 | 1221437 | 9.6331 | 14.4157 |
| | | | 3 | **Mean** | 478 | 28660 | 6.1657 | 10.9532 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 48 | 2875 | 9.77E-02 | 9.77E-02 |
| | | | | **Geomean** | 476 | 28567 | 6.1652 | 10.9529 |
| | | B | 1 | **Mean** | 10022 | 1202680 | 9.2033 | 14.8583 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1713 | 205564 | 0.164 | 0.164 |
| | | | | **Geomean** | 9930 | 1191636 | 9.2024 | 14.8577 |
| | | | 2 | **Mean** | 1833 | 201667 | 7.5049 | 13.3141 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 291 | 31961 | 0.1668 | 0.1668 |
| | | | | **Geomean** | 1817 | 199865 | 7.5037 | 13.3134 |
| | | | 3 | **Mean** | 4639 | 347925 | 8.441 | 13.0462 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 284 | 21313 | 6.03E-02 | 6.03E-02 |
| | | | | **Geomean** | 4633 | 347500 | 8.4409 | 13.0461 |
| | | C | 1 | **Mean** | 14 | 700 | 2.4985 | 7.278 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 10 | 477 | 0.6266 | 0.6266 |
| | | | | **Geomean** | 12 | 608 | 2.4501 | 7.2606 |
| | | | 2 | **Mean** | 15 | 767 | 2.3188 | 6.6313 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 17 | 852 | 1.0747 | 1.0747 |
| | | | | **Geomean** | 10 | 508 | 2.1724 | 6.5763 |
| | | | 3 | **Mean** | 9 | 1700 | 2.1242 | 8.5312 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 2 | 424 | 0.2522 | 0.2522 |
| | | | | **Geomean** | 8 | 1673 | 2.1167 | 8.5294 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| II | 0 | A | 1 | **Mean** | 30000 | 2400000 | 10.2758 | 14.6578 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 8819.234 | 705538.7 | 0.3259 | 0.3259 |
| | | | | **Geomean** | 29021.95 | 2321756 | 10.2723 | 14.6554 |
| | | | 2 | **Mean** | 204444.3 | 22488877 | 12.2012 | 16.9017 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 55008.6 | 6050946 | 0.2914 | 0.2914 |
| | | | | **Geomean** | 199022.9 | 21892514 | 12.1988 | 16.9 |
| | | | 3 | **Mean** | 33888.67 | 2033320 | 10.2162 | 14.3106 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 22005.71 | 1320343 | 0.8866 | 0.8866 |
| | | | | **Geomean** | 27343.64 | 1640618 | 10.1898 | 14.2919 |
| | | B | 1 | **Mean** | 469444.3 | 46944433 | 12.9667 | 17.5719 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 227817.7 | 22781774 | 0.5488 | 0.5488 |
| | | | | **Geomean** | 427944.8 | 42794485 | 12.9589 | 17.5662 |
| | | | 2 | **Mean** | 528889 | 95200020 | 12.9243 | 18.1172 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 473196 | 85175280 | 0.8478 | 0.8478 |
| | | | | **Geomean** | 410140 | 73825206 | 12.9061 | 18.1042 |
| | | | 3 | **Mean** | 342963 | 17148150 | 12.6304 | 16.5425 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 210890.1 | 10544506 | 0.5689 | 0.5689 |
| | | | | **Geomean** | 305723.8 | 15286188 | 12.622 | 16.536 |
| | | C | 1 | **Mean** | 1175 | 117500 | 7.0203 | 11.6255 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 506.2885 | 50628.85 | 0.445 | 0.445 |
| | | | | **Geomean** | 1119.134 | 111913.4 | 7.0133 | 11.6212 |
| | | | 2 | **Mean** | 494.3333 | 37075 | 6.137 | 10.4545 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 208.5577 | 15641.83 | 0.4578 | 0.4578 |
| | | | | **Geomean** | 462.6844 | 34701.33 | 6.1255 | 10.4478 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| II | 3 | A | 1 | **Mean** | 73889 | 7388900 | 11.1916 | 16.9054 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 16695 | 1669455 | 0.2428 | 0.2428 |
| | | | | **Geomean** | 72516 | 7251627 | 11.1898 | 16.9042 |
| | | | 2 | **Mean** | 161111 | 14499990 | 11.8331 | 17.2004 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 107721 | 9694848 | 0.6937 | 0.6937 |
| | | | | **Geomean** | 137741 | 12396728 | 11.8196 | 17.1911 |
| | | | 3 | **Mean** | 14500 | 797500 | 9.5786 | 14.4535 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1424 | 78313 | 9.94E-02 | 9.94E-02 |
| | | | | **Geomean** | 14453 | 794899 | 9.5783 | 14.4532 |
| | | B | 1 | **Mean** | 1015000 | 86275000 | 13.8283 | 19.3797 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 91924 | 7813530 | 9.07E-02 | 9.07E-02 |
| | | | | **Geomean** | 1012917 | 86097909 | 13.8282 | 19.3796 |
| | | | 2 | **Mean** | 1193889 | 179083300 | 13.9765 | 20.0958 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 250235 | 37535232 | 0.2259 | 0.2259 |
| | | | | **Geomean** | 1174691 | 176203646 | 13.9753 | 20.095 |
| | | | 3 | **Mean** | 614444 | 61444433 | 13.3268 | 18.3325 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 43504 | 4350410 | 7.06E-02 | 7.06E-02 |
| | | | | **Geomean** | 613423 | 61342326 | 13.3267 | 18.3324 |
| | | C | 1 | **Mean** | 97 | 7733 | 4.31 | 9.3852 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 70 | 5605 | 0.9775 | 0.9775 |
| | | | | **Geomean** | 74 | 5955 | 4.23 | 9.3501 |
| | | | 2 | **Mean** | 117 | 9903 | 4.3974 | 9.9487 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 118 | 10037 | 1.2741 | 1.2741 |
| | | | | **Geomean** | 81 | 6905 | 4.3041 | 9.9079 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| II | 7 | A | 1 | **Mean** | 115056 | 16107793 | 11.3256 | 17.3759 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 80888 | 11324303 | 1.1561 | 1.1561 |
| | | | | **Geomean** | 82918 | 11608467 | 11.2846 | 17.3496 |
| | | | 2 | **Mean** | 112445 | 6746680 | 11.5146 | 16.0094 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 59778 | 3586707 | 0.6195 | 0.6195 |
| | | | | **Geomean** | 100163 | 6009781 | 11.5033 | 16.0013 |
| | | | 3 | **Mean** | 834 | 58345 | 6.7053 | 11.8213 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 235 | 16483 | 0.2864 | 0.2864 |
| | | | | **Geomean** | 817 | 57169 | 6.7022 | 11.8195 |
| | | B | 1 | **Mean** | 599445 | 101905593 | 13.2865 | 19.531 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 131332 | 22326506 | 0.2316 | 0.2316 |
| | | | | **Geomean** | 589195 | 100163093 | 13.2852 | 19.5301 |
| | | | 2 | **Mean** | 1344444 | 221833315 | 14.1073 | 20.3219 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 150308 | 24800876 | 0.1116 | 0.1116 |
| | | | | **Geomean** | 1338866 | 220912855 | 14.107 | 20.3217 |
| | | | 3 | **Mean** | 72778 | 1819442 | 11.1517 | 14.2936 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 25945 | 648631 | 0.3635 | 0.3635 |
| | | | | **Geomean** | 69681 | 1742023 | 11.1477 | 14.2905 |
| | | C | 1 | **Mean** | 10 | 650 | 2.3026 | 7.5856 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 0 | 0 | 0 | 0 |
| | | | | **Geomean** | 10 | 650 | 2.3026 | 7.5856 |
| | | | 2 | **Mean** | 381 | 38067 | 5.2164 | 10.5147 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 370 | 37007 | 1.8416 | 1.8416 |
| | | | | **Geomean** | 184 | 18427 | 4.9637 | 10.4001 |
| | | | 3 | **Mean** | 4667 | 560040 | 8.4425 | 14.6163 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 707 | 84853 | 0.1521 | 0.1521 |
| | | | | **Geomean** | 4640 | 556817 | 8.4418 | 14.6159 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| II | 14 | A | 1 | **Mean** | 1444 | 144433 | 6.8075 | 11.4127 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1644 | 164414 | 1.1816 | 1.1816 |
| | | | | **Geomean** | 905 | 90462 | 6.7414 | 11.3728 |
| | | | 2 | **Mean** | 14611 | 511397 | 9.48 | 13.0354 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 7473 | 261542 | 0.6057 | 0.6057 |
| | | | | **Geomean** | 13095 | 458338 | 9.4669 | 13.0259 |
| | | | 3 | **Mean** | 844 | 59103 | 6.6047 | 10.8532 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 443 | 31021 | 0.69 | 0.69 |
| | | | | **Geomean** | 739 | 51698 | 6.5796 | 10.8382 |
| | | B | 1 | **Mean** | 21667 | 3033310 | 9.9806 | 14.9222 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 2357 | 329950 | 0.109 | 0.109 |
| | | | | **Geomean** | 21602 | 3024324 | 9.9803 | 14.922 |
| | | | 2 | **Mean** | 40833 | 5716620 | 10.6154 | 15.557 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 3536 | 494975 | 8.67E-02 | 8.67E-02 |
| | | | | **Geomean** | 40756 | 5705896 | 10.6152 | 15.5569 |
| | | | 3 | **Mean** | 10000 | 500000 | 9.2103 | 13.1224 |
| | | | | **N** | 1 | 1 | 1 | 1 |
| | | | | **Std. Dev.** | - | - | - | - |
| | | | | **Geomean** | 10000 | 500000 | 9.2103 | 13.1224 |
| | | C | 2 | **Mean** | 67 | 7370 | 4.2047 | 8.9052 |
| | | | | **N** | 1 | 1 | 1 | 1 |
| | | | | **Std. Dev.** | - | - | - | - |
| | | | | **Geomean** | 67 | 7370 | 4.2047 | 8.9052 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| III | 0 | A | 1 | **Mean** | 36167 | 2531690 | 10.3274 | 14.5759 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 23943 | 1675985 | 0.7377 | 0.7377 |
| | | | | **Geomean** | 30560 | 2139167 | 10.3097 | 14.5634 |
| | | | 2 | **Mean** | 23834 | 1191683 | 9.8763 | 13.7883 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 16855 | 842739 | 0.8201 | 0.8201 |
| | | | | **Geomean** | 19463 | 973168 | 9.8533 | 13.7719 |
| | | | 3 | **Mean** | 11250 | 281250 | 9.0907 | 12.3096 |
| | | | | **N** | 2 | 2 | 2 | 2 |
| | | | | **Std. Dev.** | 9782 | 244553 | 1.0135 | 1.0135 |
| | | | | **Geomean** | 8872 | 221807 | 9.0624 | 12.2887 |
| | | B | 1 | **Mean** | 393334 | 78666733 | 12.7323 | 18.0306 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 219393 | 43878620 | 0.7308 | 0.7308 |
| | | | | **Geomean** | 338498 | 67699553 | 12.718 | 18.0206 |
| | | | 2 | **Mean** | 377778 | 37777800 | 12.6914 | 17.2965 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 247394 | 24739364 | 0.6809 | 0.6809 |
| | | | | **Geomean** | 324929 | 32492909 | 12.6792 | 17.2876 |
| | | | 3 | **Mean** | 6667 | 333350 | 8.8049 | 12.7169 |
| | | | | **N** | 1 | 1 | 1 | 1 |
| | | | | **Std. Dev.** | . | . | . | . |
| | | | | **Geomean** | 6667 | 333350 | 8.8049 | 12.7169 |
| | | C | 2 | **Mean** | 389 | 42790 | 5.9472 | 10.6477 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 84 | 9245 | 0.2246 | 0.2246 |
| | | | | **Geomean** | 383 | 42095 | 5.9443 | 10.6461 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| III | 3 | A | 1 | **Mean** | 4611 | 461133 | 8.3909 | 13.8635 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1782 | 178222 | 0.3593 | 0.3593 |
| | | | | **Geomean** | 4407 | 440660 | 8.3858 | 13.8605 |
| | | | 2 | **Mean** | 47944 | 3356103 | 10.7639 | 15.4129 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 9333 | 653341 | 0.2085 | 0.2085 |
| | | | | **Geomean** | 47284 | 3309898 | 10.7626 | 15.412 |
| | | | 3 | **Mean** | 3444 | 172217 | 8.1045 | 12.5613 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1228 | 61417 | 0.3404 | 0.3404 |
| | | | | **Geomean** | 3309 | 165474 | 8.0998 | 12.5582 |
| | | B | 1 | **Mean** | 124444 | 14311098 | 11.7043 | 17.3167 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 36906 | 4244209 | 0.2809 | 0.2809 |
| | | | | **Geomean** | 121089 | 13925188 | 11.702 | 17.3152 |
| | | | 2 | **Mean** | 938889 | 84500010 | 13.7233 | 19.3318 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 282023 | 25382076 | 0.2932 | 0.2932 |
| | | | | **Geomean** | 911913 | 82072176 | 13.7212 | 19.3303 |
| | | | 3 | **Mean** | 4444 | 511098 | 8.3427 | 13.171 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1925 | 221362 | 0.4003 | 0.4003 |
| | | | | **Geomean** | 4200 | 482946 | 8.3364 | 13.167 |
| | | C | 1 | **Mean** | 150 | 16500 | 4.7249 | 10.1185 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 102 | 11185 | 1.0646 | 1.0646 |
| | | | | **Geomean** | 113 | 12399 | 4.6364 | 10.0795 |
| | | | 2 | **Mean** | 808 | 48500 | 6.6037 | 11.5655 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 423 | 25382 | 0.5227 | 0.5227 |
| | | | | **Geomean** | 738 | 44268 | 6.59 | 11.5577 |
| | | | 3 | **Mean** | 1325 | 251750 | 7.1491 | 13.5047 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 479 | 90997 | 0.3388 | 0.3388 |
| | | | | **Geomean** | 1273 | 241853 | 7.1438 | 13.5019 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| III | 7 | A | 1 | **Mean** | 1328 | 106213 | 7.1864 | 12.6771 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 155 | 12380 | 0.1209 | 0.1209 |
| | | | | **Geomean** | 1321 | 105710 | 7.1857 | 12.6767 |
| | | | 2 | **Mean** | 67667 | 3721667 | 11.1168 | 15.8173 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 8643 | 475350 | 0.1301 | 0.1301 |
| | | | | **Geomean** | 67290 | 3700971 | 11.1163 | 15.8169 |
| | | | 3 | **Mean** | 99445 | 4475010 | 11.5021 | 15.7092 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 12562 | 565311 | 0.1257 | 0.1257 |
| | | | | **Geomean** | 98921 | 4451423 | 11.5016 | 15.7089 |
| | | B | 1 | **Mean** | 70555 | 4938873 | 11.0819 | 16.4391 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 34734 | 2431401 | 0.4987 | 0.4987 |
| | | | | **Geomean** | 64986 | 4548990 | 11.0745 | 16.434 |
| | | | 2 | **Mean** | 94444 | 10388877 | 11.2544 | 17.0635 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 57309 | 6303951 | 0.8685 | 0.8685 |
| | | | | **Geomean** | 77217 | 8493917 | 11.2313 | 17.0485 |
| | | C | 1 | **Mean** | 24 | 2367 | 3.1275 | 8.4259 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 8 | 814 | 0.3239 | 0.3239 |
| | | | | **Geomean** | 23 | 2282 | 3.1167 | 8.4218 |
| | | | 2 | **Mean** | 464 | 55720 | 6.1046 | 11.7596 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 143 | 17113 | 0.3393 | 0.3393 |
| | | | | **Geomean** | 448 | 53750 | 6.0982 | 11.7563 |
| | | | 3 | **Mean** | 23 | 1247 | 3.1207 | 8.5143 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1 | 32 | 2.57E-02 | 2.57E-02 |
| | | | | **Geomean** | 23 | 1246 | 3.1206 | 8.5143 |

Table A6. Continued.

| Series | Day | Treatment | Plot | | FC conc | FC loading (CFU) | ln FC conc | ln Loading |
|---|---|---|---|---|---|---|---|---|
| III | 18 | A | 1 | **Mean** | 36889 | 6639960 | 10.5139 | 15.7069 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 2694 | 485009 | 7.16E-02 | 7.16E-02 |
| | | | | **Geomean** | 36825 | 6628463 | 10.5138 | 15.7068 |
| | | | 2 | **Mean** | 25333 | 2280000 | 10.1382 | 14.638 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1764 | 158773 | 7.09E-02 | 7.09E-02 |
| | | | | **Geomean** | 25291 | 2276225 | 10.1381 | 14.6379 |
| | | | 3 | **Mean** | 61556 | 4924453 | 11.0276 | 15.4096 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1262 | 100949 | 2.04E-02 | 2.04E-02 |
| | | | | **Geomean** | 61547 | 4923768 | 11.0275 | 15.4096 |
| | | B | 1 | **Mean** | 14944 | 2241650 | 9.6059 | 14.6165 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 2084 | 312555 | 0.135 | 0.135 |
| | | | | **Geomean** | 14852 | 2227767 | 9.6052 | 14.6161 |
| | | | 2 | **Mean** | 4378 | 678538 | 8.3424 | 13.3858 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 1438 | 222908 | 0.3673 | 0.3673 |
| | | | | **Geomean** | 4198 | 650720 | 8.3369 | 13.3824 |
| | | | 3 | **Mean** | 105222 | 18939960 | 11.5624 | 16.7553 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 7026 | 1264735 | 6.56E-02 | 6.56E-02 |
| | | | | **Geomean** | 105069 | 18912491 | 11.5623 | 16.7552 |
| | | C | 1 | **Mean** | 45 | 7707 | 3.7334 | 8.8692 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 20 | 3341 | 0.5215 | 0.5215 |
| | | | | **Geomean** | 42 | 7109 | 3.7077 | 8.8587 |
| | | | 2 | **Mean** | 97 | 18367 | 4.5054 | 9.7524 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 42 | 8055 | 0.4477 | 0.4477 |
| | | | | **Geomean** | 91 | 17195 | 4.4905 | 9.7455 |
| | | | 3 | **Mean** | 218 | 28383 | 5.366 | 10.2335 |
| | | | | **N** | 3 | 3 | 3 | 3 |
| | | | | **Std. Dev.** | 51 | 6568 | 0.2519 | 0.2519 |
| | | | | **Geomean** | 214 | 27821 | 5.362 | 10.2314 |

Table A7. Estimated marginal means.

| Dependent Variable: ln Loading | | | | | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | **Day** | **Treatment** | **Mean** | **Std. Error** | **Lower Bound** | **Upper Bound** |
| **Series I** | **2** | **A** | 12.776 | 0.431 | 11.918 | 13.633 |
| | | **B** | 16.150 | 0.379 | 15.396 | 16.903 |
| | | **C** | 9.141 | 0.427 | 8.293 | 9.990 |
| | **7** | **A** | 12.622 | 0.352 | 11.922 | 13.322 |
| | | **B** | 15.560 | 0.305 | 14.953 | 16.167 |
| | | **C** | 8.759 | 0.341 | 8.082 | 9.436 |
| | **14** | **A** | 12.407 | 0.301 | 11.809 | 13.005 |
| | | **B** | 14.735 | 0.266 | 14.207 | 15.263 |
| | | **C** | 8.223 | 0.286 | 7.655 | 8.792 |
| | **30** | **A** | 11.916 | 0.497 | 10.928 | 12.903 |
| | | **B** | 12.850 | 0.478 | 11.899 | 13.800 |
| | | **C** | 6.999 | 0.509 | 5.989 | 8.010 |
| **Series II** | **3** | **A** | 15.513 | 0.519 | 14.473 | 16.552 |
| | | **B** | 18.510 | 0.541 | 17.426 | 19.594 |
| | | **C** | 9.120 | 0.704 | 7.710 | 10.530 |
| | **7** | **A** | 14.208 | 0.360 | 13.487 | 14.929 |
| | | **B** | 17.199 | 0.382 | 16.434 | 17.964 |
| | | **C** | 9.426 | 0.524 | 8.376 | 10.475 |
| | **14** | **A** | 11.924 | 0.572 | 10.777 | 13.071 |
| | | **B** | 14.905 | 0.742 | 13.418 | 16.393 |
| | | **C** | 9.960 | 1.419 | 7.116 | 12.804 |
| **Series III** | **3** | **A** | 13.410 | 0.419 | 12.574 | 14.246 |
| | | **B** | 15.916 | 0.444 | 15.032 | 16.801 |
| | | **C** | 9.960 | 0.419 | 9.124 | 10.796 |
| | **7** | **A** | 13.908 | 0.316 | 13.277 | 14.538 |
| | | **B** | 15.650 | 0.338 | 14.976 | 16.324 |
| | | **C** | 9.784 | 0.316 | 9.153 | 10.414 |
| | **14** | **A** | 14.779 | 0.368 | 14.044 | 15.513 |
| | | **B** | 15.184 | 0.376 | 14.434 | 15.935 |
| | | **C** | 9.475 | 0.368 | 8.740 | 10.210 |
| | **18** | **A** | 15.276 | 0.503 | 14.274 | 16.278 |
| | | **B** | 14.918 | 0.505 | 13.911 | 15.925 |
| | | **C** | 9.299 | 0.503 | 8.297 | 10.300 |

Table A8. Day 0 descriptives across Treatments.

| ln Loading | | N | Mean | Std. Dev. | Std. Error | 95% CI | | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| Series I Day 0 | A | 9 | 13.94 | 0.888 | 0.296 | 13.259 | 14.625 | 12.92 | 15.67 |
| | B | 9 | 16.33 | 1.418 | 0.473 | 15.239 | 17.419 | 14.63 | 18.15 |
| | C | 5 | 10.50 | 2.923 | 1.307 | 6.871 | 14.129 | 6.55 | 14.37 |
| | Total | 23 | 14.13 | 2.749 | 0.573 | 12.939 | 15.317 | 6.55 | 18.15 |
| Series II Day 0 | A | 9 | 15.29 | 1.315 | 0.438 | 14.280 | 16.300 | 13.30 | 17.13 |
| | B | 9 | 17.41 | 0.903 | 0.301 | 16.716 | 18.105 | 16.13 | 19.08 |
| | C | 5 | 10.92 | 0.752 | 0.336 | 9.989 | 11.857 | 9.96 | 11.94 |
| | Total | 23 | 15.17 | 2.681 | 0.559 | 14.011 | 16.330 | 9.96 | 19.08 |
| Series III Day 0 | A | 8 | 13.71 | 1.174 | 0.415 | 12.732 | 14.696 | 11.59 | 15.28 |
| | B | 7 | 16.96 | 1.991 | 0.752 | 15.116 | 18.798 | 12.72 | 18.55 |
| | C | 3 | 10.65 | 0.225 | 0.130 | 10.090 | 11.206 | 10.40 | 10.85 |
| | Total | 18 | 14.46 | 2.714 | 0.640 | 13.114 | 15.814 | 10.40 | 18.55 |

Table A9. QuantiTray raw data at incubation temperature of 44.5$^{o}$C.

| Sample Identification | | | | | | Fecal Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| I | 0 | A | 1 | a | 2 | 3 | 0 | 3.1 | 4.1 | 410 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 0 | A | 1 | b | 2 | 21 | 0 | 26.5 | 27.5 | 2750 | 18 | 0 | 21.8 | 22.8 | 2280 | 0.8226 |
| I | 0 | A | 1 | c | 2 | 39 | 2 | 74.4 | 75.4 | 7540 | 36 | 2 | 63.7 | 64.7 | 6470 | 0.8562 |
| I | 0 | A | 2 | a | 2 | 48 | 21 | 285.1 | 286.1 | 28610 | 48 | 18 | 248.9 | 249.9 | 24990 | 0.8730 |
| I | 0 | A | 2 | b | 2 | 48 | 40 | 689.3 | 690.3 | 69030 | 48 | 38 | 629.4 | 630.4 | 63040 | 0.9131 |
| I | 0 | A | 2 | c | 2 | 48 | 47 | 870.4 | 871.4 | 87140 | 48 | 45 | 870.4 | 871.4 | 87140 | 1.0000 |
| I | 0 | A | 3 | a | 2 | 16 | 3 | 22.6 | 23.6 | 2360 | 15 | 3 | 21.1 | 22.1 | 2210 | 0.9336 |
| I | 0 | A | 3 | b | 2 | 20 | 6 | 32.8 | 33.8 | 3380 | 18 | 6 | 29.4 | 30.4 | 3040 | 0.8963 |
| I | 0 | A | 3 | c | 2 | 24 | 3 | 35.9 | 36.9 | 3690 | 22 | 2 | 30.9 | 31.9 | 3190 | 0.8607 |
| I | 0 | B | 1 | a | 2 | 48 | 16 | 228.2 | 229.2 | 22920 | 47 | 12 | 172.3 | 173.3 | 17330 | 0.7550 |
| I | 0 | B | 1 | b | 2 | 48 | 40 | 689.3 | 690.3 | 69030 | 48 | 34 | 524.7 | 525.7 | 52570 | 0.7612 |
| I | 0 | B | 1 | c | 2 | 48 | 24 | 328.2 | 329.2 | 32920 | 48 | 23 | 313 | 314 | 31400 | 0.9537 |
| I | 0 | B | 2 | a | 2 | 48 | 46 | 913.9 | 914.9 | 91490 | 48 | 45 | 870.4 | 871.4 | 87140 | 0.9524 |
| I | 0 | B | 2 | b | 2 | 48 | 43 | 791.5 | 792.5 | 79250 | 48 | 41 | 721.5 | 722.5 | 72250 | 0.9116 |
| I | 0 | B | 2 | c | 2 | 48 | 39 | 658.6 | 659.6 | 65960 | 48 | 36 | 574.8 | 575.8 | 57580 | 0.8728 |
| I | 0 | B | 3 | a | No Data | | | | | | | | | | | |
| I | 0 | B | 3 | b | No Data | | | | | | | | | | | |
| I | 0 | B | 3 | c | No Data | | | | | | | | | | | |
| I | 0 | C | 1 | a | No Data | | | | | | | | | | | |
| I | 0 | C | 1 | b | No Data | | | | | | | | | | | |
| I | 0 | C | 1 | c | No Data | | | | | | | | | | | |
| I | 0 | C | 2 | a | No Data | | | | | | | | | | | |
| I | 0 | C | 2 | b | No Data | | | | | | | | | | | |
| I | 0 | C | 2 | c | No Data | | | | | | | | | | | |
| I | 0 | C | 3 | a | No Data | | | | | | | | | | | |
| I | 0 | C | 3 | b | No Data | | | | | | | | | | | |
| I | 0 | C | 3 | c | No Data | | | | | | | | | | | |
| I | 2 | A | 1 | a | 2 | 19 | 1 | 24.6 | 25.6 | 2560 | 11 | 1 | 13.4 | 14.4 | 1440 | 0.5447 |
| I | 2 | A | 1 | b | 2 | 38 | 9 | 86.2 | 87.2 | 8720 | 32 | 9 | 64.5 | 65.5 | 6550 | 0.7483 |
| I | 2 | A | 1 | c | 2 | 7 | 1 | 8.5 | 9.5 | 950 | 6 | 1 | 7.4 | 8.4 | 840 | 0.8706 |
| I | 2 | A | 2 | a | 2 | 19 | 0 | 23.3 | 24.3 | 2430 | 6 | 0 | 6.3 | 7.3 | 730 | 0.2704 |
| I | 2 | A | 2 | b | 2 | 26 | 7 | 45.9 | 46.9 | 4690 | 18 | 7 | 30.7 | 31.7 | 3170 | 0.6688 |
| I | 2 | A | 2 | c | 2 | 46 | 19 | 196.8 | 197.8 | 19780 | 44 | 18 | 158.5 | 159.5 | 15950 | 0.8054 |
| I | 2 | A | 3 | a | 2 | 32 | 6 | 59.1 | 60.1 | 6010 | 13 | 2 | 17.1 | 18.1 | 1810 | 0.2893 |
| I | 2 | A | 3 | b | 2 | 48 | 45 | 870.4 | 871.4 | 87140 | 16 | 0 | 18.9 | 19.9 | 1990 | 0.0217 |
| I | 2 | A | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 22 | 5 | 35 | 36 | 3600 | 0.0346 |
| I | 2 | B | 1 | a | 2 | 48 | 23 | 313 | 314 | 31400 | 48 | 19 | 260.2 | 261.2 | 26120 | 0.8313 |
| I | 2 | B | 1 | b | 2 | 48 | 45 | 870.4 | 871.4 | 87140 | 48 | 40 | 689.3 | 690.3 | 69030 | 0.7919 |
| I | 2 | B | 1 | c | 2 | 48 | 39 | 658.6 | 659.6 | 65960 | 48 | 34 | 524.7 | 525.7 | 52570 | 0.7967 |
| I | 2 | B | 2 | a | 2 | 48 | 37 | 601.5 | 602.5 | 60250 | 48 | 36 | 574.8 | 575.8 | 57580 | 0.9556 |
| I | 2 | B | 2 | b | 2 | 48 | 29 | 416 | 417 | 41700 | 48 | 28 | 396.8 | 397.8 | 39780 | 0.9538 |
| I | 2 | B | 2 | c | 2 | 48 | 39 | 658.6 | 659.6 | 65960 | 48 | 33 | 501.2 | 502.2 | 50220 | 0.7610 |
| I | 2 | B | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1.0000 |
| I | 2 | B | 3 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1.0000 |
| I | 2 | B | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1.0000 |
| I | 2 | C | 1 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 2 | C | 1 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 2 | C | 1 | c | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 2 | C | 2 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |

Table A9. Continued.

| Sample Identification | | | | | | Fecal Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| I | 2 | C | 2 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 2 | C | 2 | c | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 2 | C | 3 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 2 | C | 3 | b | 2 | 1 | 0 | 1 | 2 | 200 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 2 | C | 3 | c | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 7 | A | 1 | a | No Data | | | | | | | | | | | |
| I | 7 | A | 1 | b | No Data | | | | | | | | | | | |
| I | 7 | A | 1 | c | No Data | | | | | | | | | | | |
| I | 7 | A | 2 | a | 2 | 3 | 0 | 3.1 | 4.1 | 410 | 3 | 0 | 3.1 | 4.1 | 410 | 1.0000 |
| I | 7 | A | 2 | b | 2 | 4 | 0 | 4.1 | 5.1 | 510 | 4 | 0 | 4.1 | 5.1 | 510 | 1.0000 |
| I | 7 | A | 2 | c | 2 | 45 | 5 | 116.2 | 117.2 | 11720 | 22 | 3 | 32.3 | 33.3 | 3330 | 0.2780 |
| I | 7 | A | 3 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 7 | A | 3 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 7 | A | 3 | c | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 7 | B | 1 | a | 6 | 11 | 0 | 12.2 | 13.2 | 13200000 | 7 | 0 | 7.4 | 8.4 | 8400000 | 0.6066 |
| I | 7 | B | 1 | b | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 7 | B | 1 | c | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 7 | B | 2 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 7 | B | 2 | b | 4 | 7 | 1 | 8.5 | 9.5 | 95000 | 5 | 1 | 6.3 | 7.3 | 73000 | 0.7412 |
| I | 7 | B | 2 | c | 4 | 4 | 1 | 5.2 | 6.2 | 62000 | 3 | 1 | 4.1 | 5.1 | 51000 | 0.7885 |
| I | 7 | B | 3 | a | 4 | 4 | 1 | 5.2 | 6.2 | 62000 | 3 | 1 | 4.1 | 5.1 | 51000 | 0.7885 |
| I | 7 | B | 3 | b | 4 | 4 | 0 | 4.1 | 5.1 | 51000 | 3 | 0 | 3.1 | 4.1 | 41000 | 0.7561 |
| I | 7 | B | 3 | c | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 7 | C | 1 | a | 1 | 4 | 0 | 4.1 | 5.1 | 51 | 4 | 0 | 4.1 | 5.1 | 51 | 1.0000 |
| I | 7 | C | 1 | b | 1 | 3 | 0 | 3.1 | 4.1 | 41 | 3 | 0 | 3.1 | 4.1 | 41 | 1.0000 |
| I | 7 | C | 1 | c | 1 | 2 | 1 | 3 | 4 | 40 | 2 | 1 | 3 | 4 | 40 | 1.0000 |
| I | 7 | C | 2 | a | 1 | 4 | 0 | 4.1 | 5.1 | 51 | 0 | 0 | 0 | 1 | 10 | 0.0000 |
| I | 7 | C | 2 | b | 1 | 1 | 1 | 2 | 3 | 30 | 1 | 1 | 2 | 3 | 30 | 1.0000 |
| I | 7 | C | 2 | c | 1 | 2 | 0 | 2 | 3 | 30 | 1 | 0 | 1 | 2 | 20 | 0.5000 |
| I | 7 | C | 3 | a | 1 | 28 | 4 | 45.7 | 46.7 | 467 | 22 | 4 | 33.6 | 34.6 | 346 | 0.7352 |
| I | 7 | C | 3 | b | 2 | 4 | 0 | 4.1 | 5.1 | 510 | 3 | 0 | 3.1 | 4.1 | 410 | 0.7561 |
| I | 7 | C | 3 | c | 2 | 2 | 0 | 2 | 3 | 300 | 2 | 0 | 2 | 3 | 300 | 1.0000 |
| I | 13 | A | 1 | a | 2 | 8 | 0 | 8.6 | 9.6 | 960 | 8 | 0 | 8.6 | 9.6 | 960 | 1.0000 |
| I | 13 | A | 1 | b | 2 | 14 | 1 | 17.3 | 18.3 | 1830 | 13 | 1 | 16 | 17 | 1700 | 0.9249 |
| I | 13 | A | 1 | c | 2 | 43 | 14 | 131.7 | 132.7 | 13270 | 35 | 9 | 74.3 | 75.3 | 7530 | 0.5642 |
| I | 13 | A | 2 | a | 2 | 5 | 0 | 5.2 | 6.2 | 620 | 5 | 0 | 5.2 | 6.2 | 620 | 1.0000 |
| I | 13 | A | 2 | b | 2 | 16 | 1 | 20.1 | 21.1 | 2110 | 14 | 1 | 17.3 | 18.3 | 1830 | 0.8607 |
| I | 13 | A | 2 | c | 2 | 2 | 0 | 2 | 3 | 300 | 2 | 0 | 2 | 3 | 300 | 1.0000 |
| I | 13 | A | 3 | a | 2 | 41 | 40 | 219 | 220 | 22000 | 3 | 0 | 3.1 | 4.1 | 410 | 0.0142 |
| I | 13 | A | 3 | b | 2 | 23 | 0 | 29.9 | 30.9 | 3090 | 1 | 0 | 1 | 2 | 200 | 0.0334 |
| I | 13 | A | 3 | c | 2 | 36 | 4 | 67.7 | 68.7 | 6870 | 2 | 1 | 3 | 4 | 400 | 0.0443 |
| I | 13 | B | 1 | a | 4 | 4 | 1 | 5.2 | 6.2 | 62000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| I | 13 | B | 1 | b | 4 | 6 | 0 | 6.3 | 7.3 | 73000 | 4 | 0 | 4.1 | 5.1 | 51000 | 0.6508 |
| I | 13 | B | 1 | c | 4 | 2 | 1 | 3 | 4 | 40000 | 2 | 0 | 2 | 3 | 30000 | 0.6667 |
| I | 13 | B | 2 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 13 | B | 2 | b | 4 | 14 | 3 | 19.7 | 20.7 | 207000 | 14 | 3 | 19.7 | 20.7 | 207000 | 1.0000 |
| I | 13 | B | 2 | c | 4 | 3 | 0 | 3.1 | 4.1 | 41000 | 2 | 0 | 2 | 3 | 30000 | 0.6452 |
| I | 13 | B | 3 | a | 4 | 3 | 0 | 3.1 | 4.1 | 41000 | 1 | 0 | 1 | 2 | 20000 | 0.3226 |
| I | 13 | B | 3 | b | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |

Table A9. Continued.

| Sample Identification | | | | | | Fecal Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| I | 13 | B | 3 | c | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 13 | C | 1 | a | No Data | | | | | | | | | | | |
| I | 13 | C | 1 | b | No Data | | | | | | | | | | | |
| I | 13 | C | 1 | c | No Data | | | | | | | | | | | |
| I | 13 | C | 2 | a | No Data | | | | | | | | | | | |
| I | 13 | C | 2 | b | No Data | | | | | | | | | | | |
| I | 13 | C | 2 | c | No Data | | | | | | | | | | | |
| I | 13 | C | 3 | a | No Data | | | | | | | | | | | |
| I | 13 | C | 3 | b | No Data | | | | | | | | | | | |
| I | 13 | C | 3 | c | No Data | | | | | | | | | | | |
| I | 30 | A | 1 | a | 2 | 6 | 0 | 6.3 | 7.3 | 730 | | 0 | 6.3 | 7.3 | 730 | 1.0000 |
| I | 30 | A | 1 | b | 2 | 9 | 0 | 9.8 | 10.8 | 1080 | | 0 | 7.4 | 8.4 | 840 | 0.7551 |
| I | 30 | A | 1 | c | 2 | 9 | 3 | 13.1 | 14.1 | 1410 | | 3 | 11.9 | 12.9 | 1290 | 0.9084 |
| I | 30 | A | 2 | a | 2 | 48 | 19 | 260.2 | 261.2 | 26120 | 16 | 46 | 79.3 | 80.3 | 8030 | 0.3048 |
| I | 30 | A | 2 | b | 2 | 46 | 13 | 161.6 | 162.6 | 16260 | 19 | 0 | 23.3 | 24.3 | 2430 | 0.1442 |
| I | 30 | A | 2 | c | 2 | 48 | 7 | 159.7 | 160.7 | 16070 | 16 | 6 | 26.2 | 27.2 | 2720 | 0.1641 |
| I | 32 | A | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | | 0 | 0 | 1 | 100 | 0.0000 |
| I | 32 | A | 3 | b | 2 | 48 | 46 | 913.9 | 914.9 | 91490 | | 0 | 0 | 1 | 100 | 0.0000 |
| I | 32 | A | 3 | c | 2 | 47 | 38 | 472.1 | 473.1 | 47310 | | 0 | 0 | 1 | 100 | 0.0000 |
| I | 30 | B | 1 | a | 2 | 42 | 7 | 101.7 | 102.7 | 10270 | 26 | 6 | 44.3 | 45.3 | 4530 | 0.4356 |
| I | 30 | B | 1 | b | 2 | 29 | 1 | 43.2 | 44.2 | 4420 | 7 | 1 | 8.5 | 9.5 | 950 | 0.1968 |
| I | 30 | B | 1 | c | 2 | 46 | 5 | 125 | 126 | 12600 | 32 | 5 | 57.3 | 58.3 | 5830 | 0.4584 |
| I | 32 | B | 2 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 32 | B | 2 | b | 2 | 10 | 1 | 12.1 | 13.1 | 1310 | 56 | 0 | 6.3 | 7.3 | 730 | 0.5207 |
| I | 32 | B | 2 | c | 2 | 10 | 2 | 13.2 | 14.2 | 1420 | 9 | 2 | 12 | 13 | 1300 | 0.9091 |
| I | 32 | B | 3 | a | 2 | 31 | 6 | 56.3 | 57.3 | 5730 | 15 | 6 | 24.7 | 25.7 | 2570 | 0.4387 |
| I | 32 | B | 3 | b | 2 | 35 | 1 | 58.6 | 59.6 | 5960 | 14 | 0 | 16.1 | 17.1 | 1710 | 0.2747 |
| I | 32 | B | 3 | c | 2 | 25 | 2 | 36.4 | 37.4 | 3740 | 5 | 0 | 5.2 | 6.2 | 620 | 0.1429 |
| I | 30 | C | 1 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 30 | C | 1 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 30 | C | 1 | c | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| I | 32 | C | 2 | a | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 32 | C | 2 | b | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 32 | C | 2 | c | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 32 | C | 3 | a | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 32 | C | 3 | b | 2 | 48 | 3 | 137.9 | 138.9 | 13890 | 1 | 0 | 1 | 2 | 200 | 0.0073 |
| I | 32 | C | 3 | c | 2 | 48 | 30 | 436 | 437 | 43700 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 0 | A | 1 | a | 6 | 0 | 0 | 0 | 1 | 1000000 | 0 | 0 | 0 | 1 | 1000000 | ** |
| II | 0 | A | 1 | b | 6 | 2 | 0 | 2 | 3 | 3000000 | 0 | 0 | 0 | 1 | 1000000 | 0.0000 |
| II | 0 | A | 1 | c | 6 | 2 | 0 | 2 | 3 | 3000000 | 1 | 0 | 1 | 2 | 2000000 | 0.5000 |
| II | 0 | A | 2 | a | 6 | 25 | 0 | 33.5 | 34.5 | 34500000 | 7 | 0 | 7.4 | 8.4 | 8400000 | 0.2209 |
| II | 0 | A | 2 | b | 6 | 10 | 3 | 14.3 | 15.3 | 15300000 | 6 | 2 | 8.4 | 9.4 | 9400000 | 0.5874 |
| II | 0 | A | 2 | c | 6 | 26 | 1 | 36.9 | 37.9 | 37900000 | 12 | 0 | 13.5 | 14.5 | 14500000 | 0.3659 |
| II | 0 | A | 3 | a | 6 | 1 | 0 | 1 | 2 | 2000000 | 0 | 0 | 0 | 1 | 1000000 | 0.0000 |
| II | 0 | A | 3 | b | 6 | 2 | 2 | 4.1 | 5.1 | 5100000 | 2 | 0 | 2 | 3 | 3000000 | 0.4878 |
| II | 0 | A | 3 | c | 6 | 3 | 0 | 3.1 | 4.1 | 4100000 | 0 | 0 | 0 | 1 | 1000000 | 0.0000 |
| II | 0 | B | 1 | a | 6 | 22 | 1 | 29.5 | 30.5 | 30500000 | 12 | 0 | 13.5 | 14.5 | 14500000 | 0.4576 |
| II | 0 | B | 1 | b | 6 | 37 | 7 | 77.6 | 78.6 | 78600000 | 24 | 3 | 35.9 | 36.9 | 36900000 | 0.4626 |
| II | 0 | B | 1 | c | 6 | 41 | 8 | 98.7 | 99.7 | 99700000 | 24 | 5 | 38.8 | 39.8 | 39800000 | 0.3931 |

Table A9. Continued.

| Sample Identification | | | | | | Fecal Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| II | 0 | B | 2 | a | 6 | 0 | 0 | 0 | 1 | 1000000 | 0 | 0 | 0 | 1 | 1000000 | ** |
| II | 0 | B | 2 | b | 6 | 0 | 0 | 0 | 1 | 1000000 | 0 | 0 | 0 | 1 | 1000000 | ** |
| II | 0 | B | 2 | c | 6 | | | | | | No Data | | | | | |
| II | 0 | B | 3 | a | 6 | 10 | 0 | 11 | 12 | 12000000 | 6 | 0 | 6.3 | 7.3 | 7300000 | 0.5727 |
| II | 0 | B | 3 | b | 6 | 20 | 2 | 27.5 | 28.5 | 28500000 | 5 | 0 | 5.2 | 6.2 | 6200000 | 0.1891 |
| II | 0 | B | 3 | c | 6 | | | | | | No Data | | | | | |
| II | 0 | C | 1 | a | 2 | 16 | 2 | 21.3 | 22.3 | 2230 | 9 | 0 | 9.8 | 10.8 | 1080 | 0.4601 |
| II | 0 | C | 1 | b | 2 | 18 | 0 | 21.8 | 22.8 | 2280 | 15 | 0 | 17.5 | 18.5 | 1850 | 0.8028 |
| II | 0 | C | 1 | c | 2 | 23 | 2 | 32.7 | 33.7 | 3370 | 14 | 2 | 18.5 | 19.5 | 1950 | 0.5657 |
| II | 0 | C | 2 | a | 2 | 1 | 0 | 1 | 2 | 200 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 0 | C | 2 | b | 2 | 0 | 0 | 0 | 1 | 100 | 1 | 0 | 1 | 2 | 200 | ** |
| II | 0 | C | 2 | c | 2 | 2 | 0 | 2 | 3 | 300 | 2 | 0 | 2 | 3 | 300 | 1.0000 |
| II | 0 | C | 3 | a | 2 | 42 | 1 | 85.2 | 86.2 | 8620 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 0 | C | 3 | b | 2 | 47 | 16 | 198.9 | 199.9 | 19990 | 5 | 0 | 5.2 | 6.2 | 620 | 0.0261 |
| II | 0 | C | 3 | c | 2 | 47 | 18 | 214.2 | 215.2 | 21520 | 2 | 0 | 2 | 3 | 300 | 0.0093 |
| II | 3 | A | 1 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| II | 3 | A | 1 | b | 4 | 2 | 0 | 2 | 3 | 30000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| II | 3 | A | 1 | c | 4 | 11 | 0 | 12.2 | 13.2 | 132000 | 7 | 0 | 7.4 | 8.4 | 84000 | 0.6066 |
| II | 3 | A | 2 | a | 4 | 26 | 3 | 39.9 | 40.9 | 409000 | 13 | 0 | 14.8 | 15.8 | 158000 | 0.3709 |
| II | 3 | A | 2 | b | 4 | 46 | 15 | 172.5 | 173.5 | 1735000 | 24 | 0 | 31.7 | 32.7 | 327000 | 0.1838 |
| II | 3 | A | 2 | c | 4 | 44 | 2 | 99.1 | 100.1 | 1001000 | 20 | 0 | 24.9 | 25.9 | 259000 | 0.2513 |
| II | 3 | A | 3 | a | 4 | 1 | 0 | 1 | 2 | 20000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| II | 3 | A | 3 | b | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| II | 3 | A | 3 | c | 4 | 0 | 1 | 1 | 2 | 20000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| II | 3 | B | 1 | a | 4 | 35 | 4 | 64.4 | 65.4 | 654000 | 12 | 2 | 15.8 | 16.8 | 168000 | 0.2453 |
| II | 3 | B | 1 | b | 4 | 46 | 7 | 133.3 | 134.3 | 1343000 | 22 | 4 | 33.6 | 34.6 | 346000 | 0.2521 |
| II | 3 | B | 1 | c | 4 | | | | | | No Data | | | | | |
| II | 3 | B | 2 | a | 4 | 42 | 4 | 93.2 | 94.2 | 942000 | 15 | 0 | 17.5 | 18.5 | 185000 | 0.1878 |
| II | 3 | B | 2 | b | 4 | 40 | 5 | 85.7 | 86.7 | 867000 | 9 | 2 | 12 | 13 | 130000 | 0.1400 |
| II | 3 | B | 2 | c | 4 | 48 | 14 | 209.8 | 210.8 | 2108000 | 17 | 1 | 21.6 | 22.6 | 226000 | 0.1030 |
| II | 3 | B | 3 | a | 4 | 26 | 1 | 36.9 | 37.9 | 379000 | 10 | 1 | 12.1 | 13.1 | 131000 | 0.3279 |
| II | 3 | B | 3 | b | 4 | 12 | 0 | 13.5 | 14.5 | 145000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| II | 3 | B | 3 | c | 4 | 27 | 4 | 43.5 | 44.5 | 445000 | 7 | 1 | 8.5 | 9.5 | 95000 | 0.1954 |
| II | 3 | C | 1 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| II | 3 | C | 1 | b | 2 | 15 | 7 | 25.9 | 26.9 | 2690 | 1 | 0 | 1 | 2 | 200 | 0.0386 |
| II | 3 | C | 1 | c | 2 | 1 | 0 | 1 | 2 | 200 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 3 | C | 2 | a | 2 | 10 | 2 | 13.2 | 14.2 | 1420 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 3 | C | 2 | b | 2 | 19 | 1 | 24.6 | 25.6 | 2560 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 3 | C | 2 | c | 2 | 11 | 1 | 13.4 | 14.4 | 1440 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 3 | C | 3 | a | 2 | 15 | 10 | 29.6 | 30.6 | 3060 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 3 | C | 3 | b | 2 | 2 | 0 | 2 | 3 | 300 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 3 | C | 3 | c | 2 | 1 | 1 | 2 | 3 | 300 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 7 | A | 1 | a | 2 | 48 | 46 | 913.9 | 914.9 | 91490 | 48 | 44 | 829.7 | 830.7 | 83070 | 0.9079 |
| II | 7 | A | 1 | b | 2 | 48 | 46 | 913.9 | 914.9 | 91490 | 48 | 44 | 829.7 | 830.7 | 83070 | 0.9079 |
| II | 7 | A | 1 | c | 2 | 48 | 47 | 960.6 | 961.6 | 96160 | 48 | 43 | 791.5 | 792.5 | 79250 | 0.8240 |
| II | 7 | A | 2 | a | 2 | 48 | 46 | 913.9 | 914.9 | 91490 | 48 | 40 | 689.3 | 690.3 | 69030 | 0.7542 |
| II | 7 | A | 2 | b | 2 | 48 | 45 | 870.4 | 871.4 | 87140 | 48 | 41 | 721.5 | 722.5 | 72250 | 0.8289 |
| II | 7 | A | 2 | c | 2 | 48 | 42 | 755.5 | 756.5 | 75650 | 48 | 40 | 689.3 | 690.3 | 69030 | 0.9124 |
| II | 7 | A | 3 | a | 2 | 11 | 0 | 12.2 | 13.2 | 1320 | 3 | 0 | 3.1 | 4.1 | 410 | 0.2541 |

Table A9. Continued.

| Sample Identification | | | | | | Fecal Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| II | 7 | A | 3 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| II | 7 | A | 3 | c | 2 | 14 | 0 | 16.1 | 17.1 | 1710 | 4 | 0 | 4.1 | 5.1 | 510 | 0.2547 |
| II | 7 | B | 1 | a | 4 | 29 | 6 | 51.2 | 52.2 | 522000 | 20 | 2 | 27.5 | 28.5 | 285000 | 0.5371 |
| II | 7 | B | 1 | b | 4 | 22 | 2 | 30.9 | 31.9 | 319000 | 13 | 2 | 17.1 | 18.1 | 181000 | 0.5534 |
| II | 7 | B | 1 | c | 4 | 34 | 5 | 63.1 | 64.1 | 641000 | 15 | 4 | 22.3 | 23.3 | 233000 | 0.3534 |
| II | 7 | B | 2 | a | 4 | 28 | 1 | 41 | 42 | 420000 | 4 | 0 | 4.1 | 5.1 | 51000 | 0.1000 |
| II | 7 | B | 2 | b | 4 | 40 | 6 | 88.2 | 89.2 | 892000 | 19 | 0 | 23.3 | 24.3 | 243000 | 0.2642 |
| II | 7 | B | 2 | c | 4 | 38 | 8 | 83.9 | 84.9 | 849000 | 23 | 5 | 36.8 | 37.8 | 378000 | 0.4386 |
| II | 7 | B | 3 | a | 4 | 11 | 1 | 13.4 | 14.4 | 144000 | 4 | 1 | 5.2 | 6.2 | 62000 | 0.3881 |
| II | 7 | B | 3 | b | 4 | 9 | 0 | 9.8 | 10.8 | 108000 | 4 | 0 | 4.1 | 5.1 | 51000 | 0.4184 |
| II | 7 | B | 3 | c | 4 | 5 | 2 | 7.3 | 8.3 | 83000 | 1 | 0 | 1 | 2 | 20000 | 0.1370 |
| II | 7 | C | 1 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| II | 7 | C | 1 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| II | 7 | C | 1 | c | No Data | | | | | | | | | | | |
| II | 7 | C | 2 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | | 1 | 100 | ** |
| II | 7 | C | 2 | b | 2 | 6 | 1 | 7.4 | 8.4 | 840 | 5 | 0 | 5.2 | 6.2 | 620 | 0.7027 |
| II | 7 | C | 2 | c | No Data | | | | | | | | | | | |
| II | 7 | C | 3 | a | 2 | 48 | 15 | 218.7 | 219.7 | 21970 | 29 | 4 | 48 | 49 | 4900 | 0.2195 |
| II | 7 | C | 3 | b | 2 | 26 | 6 | 44.3 | 45.3 | 4530 | 24 | 6 | 40.2 | 41.2 | 4120 | 0.9074 |
| II | 7 | C | 3 | c | No Data | | | | | | | | | | | |
| II | 14 | A | 1 | a | 2 | 2 | 0 | 2 | 3 | 300 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | A | 1 | b | 2 | 6 | 1 | 7.4 | 8.4 | 840 | 5 | 1 | 6.3 | 7.3 | 730 | 0.8514 |
| II | 14 | A | 1 | c | 2 | 4 | 2 | 6.2 | 7.2 | 720 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | A | 2 | a | 2 | 43 | 6 | 105 | 106 | 10600 | 37 | 5 | 73.3 | 74.3 | 7430 | 0.6981 |
| II | 14 | A | 2 | b | 2 | 44 | 4 | 105.4 | 106.4 | 10640 | 35 | 2 | 60.5 | 61.5 | 6150 | 0.5740 |
| II | 14 | A | 2 | c | 2 | 41 | 13 | 113 | 114 | 11400 | 28 | 9 | 53.6 | 54.6 | 5460 | 0.4743 |
| II | 14 | A | 3 | a | 2 | 42 | 15 | 126.7 | 127.7 | 12770 | 8 | 0 | 8.6 | 9.6 | 960 | 0.0679 |
| II | 14 | A | 3 | b | 2 | 48 | 39 | 658.6 | 659.6 | 65960 | 2 | 0 | 2 | 3 | 300 | 0.0030 |
| II | 14 | A | 3 | c | 2 | 48 | 29 | 416 | 417 | 41700 | 6 | 0 | 6.3 | 7.3 | 730 | 0.0151 |
| II | 14 | B | 1 | a | 4 | 2 | 0 | 2 | 3 | 30000 | 1 | 0 | 1 | 2 | 20000 | 0.5000 |
| II | 14 | B | 1 | b | 4 | 1 | 0 | 1 | 2 | 20000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| II | 14 | B | 1 | c | 4 | 2 | 0 | 2 | 3 | 30000 | 1 | 0 | 1 | 2 | 20000 | 0.5000 |
| II | 14 | B | 2 | a | 4 | 7 | 0 | 7.4 | 8.4 | 84000 | 4 | 0 | 4.1 | 5.1 | 51000 | 0.5541 |
| II | 14 | B | 2 | b | 4 | 6 | 1 | 7.4 | 8.4 | 84000 | 4 | 0 | 4.1 | 5.1 | 51000 | 0.5541 |
| II | 14 | B | 2 | c | 4 | 7 | 1 | 8.5 | 9.5 | 95000 | 3 | 1 | 4.1 | 5.1 | 51000 | 0.4824 |
| II | 14 | B | 3 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| II | 14 | B | 3 | b | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| II | 14 | B | 3 | c | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| II | 14 | C | 1 | a | 2 | 4 | 0 | 4.1 | 5.1 | 510 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 1 | b | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 1 | c | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| II | 14 | C | 2 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 1 | 100 | ** |
| II | 14 | C | 2 | b | 2 | 2 | 0 | 2 | 3 | 300 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 2 | c | 2 | 2 | 0 | 2 | 3 | 300 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 3 | a | 2 | 48 | 16 | 228.2 | 229.2 | 22920 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 3 | b | 2 | 48 | 17 | 238.2 | 239.2 | 23920 | 1 | 0 | 1 | 2 | 200 | 0.0042 |
| II | 14 | C | 3 | c | 2 | 18 | 9 | 33.3 | 34.3 | 3430 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| III | 0 | A | 1 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| III | 0 | A | 1 | b | 4 | 1 | 0 | 1 | 2 | 20000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |

Table A9. Continued.

| Sample Identification | | | | | | Fecal Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^n$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| III | 0 | A | 1 | c | 4 | 1 | 0 | 1 | 2 | 20000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | A | 2 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| III | 0 | A | 2 | b | 4 | 3 | 0 | 3.1 | 4.1 | 41000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | A | 2 | c | 4 | 1 | 0 | 1 | 2 | 20000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | A | 3 | a | 4 | 16 | 2 | 21.3 | 22.3 | 223000 | 1 | 0 | 1 | 2 | 20000 | 0.0469 |
| III | 0 | A | 3 | b | 4 | 37 | 5 | 73.3 | 74.3 | 743000 | 1 | 0 | 1 | 2 | 20000 | 0.0136 |
| III | 0 | A | 3 | c | 4 | 13 | 2 | 17.1 | 18.1 | 181000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | B | 1 | a | 4 | 45 | 10 | 135.4 | 136.4 | 1364000 | 45 | 10 | 135.4 | 136.4 | 1364000 | 1.0000 |
| III | 0 | B | 1 | b | 4 | 14 | 0 | 16.1 | 17.1 | 171000 | 14 | 0 | 16.1 | 17.1 | 171000 | 1.0000 |
| III | 0 | B | 1 | c | 4 | 45 | 10 | 135.4 | 136.4 | 1364000 | 45 | 6 | 119.8 | 120.8 | 1208000 | 0.8848 |
| III | 0 | B | 2 | a | 4 | 44 | 9 | 122.3 | 123.3 | 1233000 | 39 | 7 | 86 | 87 | 870000 | 0.7032 |
| III | 0 | B | 2 | b | 4 | 35 | 4 | 64.4 | 65.4 | 654000 | 26 | 2 | 38.4 | 39.4 | 394000 | 0.5963 |
| III | 0 | B | 2 | c | 4 | 47 | 4 | 130.9 | 131.9 | 1319000 | 29 | 3 | 46.4 | 47.4 | 474000 | 0.3545 |
| III | 0 | B | 3 | a | 4 | 22 | 0 | 28.2 | 29.2 | 292000 | 3 | 0 | 3.1 | 4.1 | 41000 | 0.1099 |
| III | 0 | B | 3 | b | 4 | 14 | 4 | 20.9 | 21.9 | 219000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | B | 3 | c | 4 | 32 | 3 | 53.8 | 54.8 | 548000 | 2 | 0 | 2 | 3 | 30000 | 0.0372 |
| III | 0 | C | 1 | a | No Data | | | | | | | | | | | |
| III | 0 | C | 1 | b | No Data | | | | | | | | | | | |
| III | 0 | C | 1 | c | No Data | | | | | | | | | | | |
| III | 0 | C | 2 | a | No Data | | | | | | | | | | | |
| III | 0 | C | 2 | b | No Data | | | | | | | | | | | |
| III | 0 | C | 2 | c | No Data | | | | | | | | | | | |
| III | 0 | C | 3 | a | No Data | | | | | | | | | | | |
| III | 0 | C | 3 | b | No Data | | | | | | | | | | | |
| III | 0 | C | 3 | c | No Data | | | | | | | | | | | |
| III | 3 | A | 1 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| III | 3 | A | 1 | b | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| III | 3 | A | 1 | c | 4 | 6 | 0 | 6.3 | 7.3 | 73000 | 2 | 0 | 2 | 3 | 30000 | 0.3175 |
| III | 3 | A | 2 | a | 4 | 1 | 0 | 1 | 2 | 20000 | 1 | 0 | 1 | 2 | 20000 | 1.0000 |
| III | 3 | A | 2 | b | No Data | | | | | | | | | | | |
| III | 3 | A | 2 | c | No Data | | | | | | | | | | | |
| III | 3 | A | 3 | a | No Data | | | | | | | | | | | |
| III | 3 | A | 3 | b | No Data | | | | | | | | | | | |
| III | 3 | A | 3 | c | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | |
| III | 3 | B | 1 | a | 4 | 8 | 0 | 8.6 | 9.6 | 96000 | 7 | 0 | 7.4 | 8.4 | 84000 | 0.8605 |
| III | 3 | B | 1 | b | No Data | | | | | | | | | | | |
| III | 3 | B | 1 | c | No Data | | | | | | | | | | | |
| III | 3 | B | 2 | a | 4 | 43 | 8 | 111.2 | 112.2 | 1122000 | 40 | 6 | 88.2 | 89.2 | 892000 | 0.7932 |
| III | 3 | B | 2 | b | No Data | | | | | | | | | | | |
| III | 3 | B | 2 | c | No Data | | | | | | | | | | | |
| III | 3 | B | 3 | a | 4 | 2 | 0 | 2 | 3 | 30000 | 2 | 0 | 2 | 3 | 30000 | 1.0000 |
| III | 3 | B | 3 | b | No Data | | | | | | | | | | | |
| III | 3 | B | 3 | c | No Data | | | | | | | | | | | |
| III | 3 | C | 1 | a | No Data | | | | | | | | | | | |
| III | 3 | C | 1 | b | No Data | | | | | | | | | | | |
| III | 3 | C | 1 | c | No Data | | | | | | | | | | | |
| III | 3 | C | 2 | a | No Data | | | | | | | | | | | |
| III | 3 | C | 2 | b | No Data | | | | | | | | | | | |
| III | 3 | C | 2 | c | No Data | | | | | | | | | | | |

Table A9. Continued.

| Sample Identification | | | | | | Fecal Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| III | 3 | C | 3 | a | 2 | 13 | 0 | 14.8 | 15.8 | 1580 | 11 | 0 | 12.2 | 13.2 | 1320 | 0.8243 |
| III | 3 | C | 3 | b | No Data | | | | | | | | | | | |
| III | 3 | C | 3 | c | No Data | | | | | | | | | | | |
| III | 7 | A | 1 | a | 2 | 5 | 0 | 5.2 | 6.2 | 620 | 3 | 0 | 3.1 | 4.1 | 410 | 0.5962 |
| III | 7 | A | 1 | b | 2 | 8 | 0 | 8.6 | 9.6 | 960 | 6 | 0 | 6.3 | 7.3 | 730 | 0.7326 |
| III | 7 | A | 1 | c | 2 | 24 | 3 | 35.9 | 36.9 | 3690 | 8 | 1 | 9.7 | 10.7 | 1070 | 0.2702 |
| III | 7 | A | 2 | a | 2 | 48 | 43 | 791.5 | 792.5 | 79250 | 48 | 41 | 721.5 | 722.5 | 72250 | 0.9116 |
| III | 7 | A | 2 | b | 2 | 48 | 39 | 658.6 | 659.6 | 65960 | 48 | 37 | 601.5 | 602.5 | 60250 | 0.9133 |
| III | 7 | A | 2 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 48 | 42 | 755.5 | 756.5 | 75650 | 0.7472 |
| III | 7 | A | 3 | a | 2 | 48 | 37 | 601.5 | 602.5 | 60250 | 48 | 34 | 524.7 | 525.7 | 52570 | 0.8723 |
| III | 7 | A | 3 | b | 2 | 48 | 44 | 829.7 | 830.7 | 83070 | 48 | 44 | 829.7 | 830.7 | 83070 | 1.0000 |
| III | 7 | A | 3 | c | 2 | 48 | 46 | 913.9 | 914.9 | 91490 | 48 | 44 | 829.7 | 830.7 | 83070 | 0.9079 |
| III | 7 | B | 1 | a | 4 | 18 | 0 | 21.8 | 22.8 | 228000 | 7 | 0 | 7.4 | 8.4 | 84000 | 0.3394 |
| III | 7 | B | 1 | b | 4 | 9 | 4 | 14.2 | 15.2 | 152000 | 8 | 1 | 9.7 | 10.7 | 107000 | 0.6831 |
| III | 7 | B | 1 | c | 4 | 5 | 0 | 5.2 | 6.2 | 62000 | 4 | 0 | 4.1 | 5.1 | 51000 | 0.7885 |
| III | 7 | B | 2 | a | 4 | 7 | 1 | 8.5 | 9.5 | 95000 | 6 | 1 | 7.4 | 8.4 | 84000 | 0.8706 |
| III | 7 | B | 2 | b | 4 | 8 | 1 | 9.7 | 10.7 | 107000 | 8 | 1 | 9.7 | 10.7 | 107000 | 1.0000 |
| III | 7 | B | 2 | c | 4 | 7 | 1 | 8.5 | 9.5 | 95000 | 7 | 1 | 8.5 | 9.5 | 95000 | 1.0000 |
| III | 7 | B | 3 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 1 | 2 | 200 | ** |
| III | 7 | B | 3 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 1 | 2 | 200 | ** |
| III | 7 | B | 3 | c | 2 | 1 | 0 | 1 | 2 | 200 | 0 | 0 | 1 | 2 | 200 | 1.0000 |
| III | 7 | C | 1 | a | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 1 | 2 | 200 | ** |
| III | 7 | C | 1 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 1 | 2 | 200 | ** |
| III | 7 | C | 1 | c | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 1 | 2 | 200 | ** |
| III | 7 | C | 2 | a | 2 | 7 | 8 | 16.1 | 17.1 | 1710 | 0 | 0 | 1 | 2 | 200 | 0.0621 |
| III | 7 | C | 2 | b | 2 | 4 | 5 | 9.3 | 10.3 | 1030 | 3 | 0 | 3.1 | 4.1 | 410 | 0.3333 |
| III | 7 | C | 2 | c | 2 | 2 | 11 | 13.3 | 14.3 | 1430 | 0 | 0 | 1 | 2 | 200 | 0.0752 |
| III | 7 | C | 3 | a | 2 | 0 | 1 | 1 | 2 | 200 | 0 | 0 | 1 | 2 | 200 | 1.0000 |
| III | 7 | C | 3 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 1 | 2 | 200 | ** |
| III | 7 | C | 3 | c | 2 | 1 | 0 | 1 | 2 | 200 | 0 | 0 | 1 | 2 | 200 | 1.0000 |
| III | 18 | A | 1 | a | 2 | 39 | 1 | 72.2 | 73.2 | 7320 | 10 | 0 | 12.1 | 13.1 | 1310 | 0.1676 |
| III | 18 | A | 1 | b | 2 | 34 | 0 | 53.9 | 54.9 | 5490 | 9 | 0 | 9.8 | 10.8 | 1080 | 0.1818 |
| III | 18 | A | 1 | c | 2 | 9 | 0 | 9.8 | 10.8 | 1080 | 2 | 0 | 2 | 3 | 300 | 0.2041 |
| III | 18 | A | 2 | a | 2 | 43 | 0 | 87.6 | 88.6 | 8860 | 17 | 0 | 20.3 | 21.3 | 2130 | 0.2317 |
| III | 18 | A | 2 | b | 2 | 48 | 12 | 193.5 | 194.5 | 19450 | 22 | 0 | 32.3 | 33.3 | 3330 | 0.1669 |
| III | 18 | A | 2 | c | 2 | 48 | 39 | 658.6 | 659.6 | 65960 | 20 | 1 | 32.8 | 33.8 | 3380 | 0.0498 |
| III | 18 | A | 3 | a | 2 | 45 | 1 | 102.5 | 103.5 | 10350 | 2 | 41 | 2 | 3 | 300 | 0.0195 |
| III | 18 | A | 3 | b | 2 | 48 | 2 | 133.1 | 134.1 | 13410 | 5 | 37 | 5.2 | 6.2 | 620 | 0.0391 |
| III | 18 | A | 3 | c | 2 | 48 | 42 | 755.5 | 756.5 | 75650 | 2 | 42 | 2 | 3 | 300 | 0.0026 |
| III | 18 | B | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 41 | 34 | 101.4 | 102.4 | 10240 | 0.1003 |
| III | 18 | B | 1 | b | 2 | 5 | 0 | 5.2 | 6.2 | 620 | 2 | 44 | 2 | 3 | 300 | 0.3846 |
| III | 18 | B | 1 | c | 2 | 48 | 47 | 960.6 | 961.6 | 96160 | 46 | 44 | 137.6 | 138.6 | 13860 | 0.1432 |
| III | 18 | B | 2 | a | 2 | 48 | 6 | 153.9 | 154.9 | 15490 | 13 | 0 | 16 | 17 | 1700 | 0.1040 |
| III | 18 | B | 2 | b | 2 | 48 | 2 | 133.1 | 134.1 | 13410 | 9 | 1 | 9.8 | 10.8 | 1080 | 0.0736 |
| III | 18 | B | 2 | c | 2 | 48 | 4 | 143 | 144 | 14400 | 12 | 0 | 13.5 | 14.5 | 1450 | 0.0944 |
| III | 18 | B | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 6 | 1 | 6.3 | 7.3 | 730 | 0.0062 |
| III | 18 | B | 3 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 3 | 1 | 3.1 | 4.1 | 410 | 0.0031 |
| III | 18 | B | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 5 | 1 | 6.3 | 7.3 | 730 | 0.0062 |
| III | 18 | C | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |

Table A9. Continued.

| Sample Identification | | | | | | Fecal Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| III | 18 | C | 1 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 18 | C | 1 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 18 | C | 2 | a | 2 | 48 | 45 | 870.4 | 871.4 | 87140 | 3 | 0 | 3.1 | 4.1 | 410 | 0.0036 |
| III | 18 | C | 2 | b | 2 | 48 | 46 | 913.9 | 914.9 | 91490 | 3 | 0 | 3.1 | 4.1 | 410 | 0.0034 |
| III | 18 | C | 2 | c | 2 | 48 | 41 | 721.5 | 722.5 | 72250 | 2 | 0 | 2 | 3 | 300 | 0.0028 |
| III | 18 | C | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 18 | C | 3 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1 | 0 | 2 | 3 | 300 | 0.0020 |
| III | 18 | C | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 3 | 0 | 4.1 | 5.1 | 510 | 0.0041 |

* This value represents the fraction of the actual number of fluorescent over yellow wells (not after adding a value of 1).

** Percent not calculable due to total yellow wells (the denominator) having a value of zero.

Table A10. QuantiTray raw data at incubation temperature of 35°C.

| Sample Identification | | | | | | Total Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| I | 2 | A | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 48 | 40 | 689.3 | 690.3 | 69030 | 0.6817 |
| I | 2 | A | 1 | b | No Data | | | | | | | | | | | |
| I | 2 | A | 1 | c | No Data | | | | | | | | | | | |
| I | 2 | A | 2 | a | 2 | 48 | 45 | 870.4 | 871.4 | 87140 | 48 | 34 | 524.7 | 525.7 | 52570 | 0.6028 |
| I | 2 | A | 2 | b | No Data | | | | | | | | | | | |
| I | 2 | A | 2 | c | No Data | | | | | | | | | | | |
| I | 2 | A | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 25 | 3 | 37.9 | 38.9 | 3890 | 0.0375 |
| I | 2 | A | 3 | b | No Data | | | | | | | | | | | |
| I | 2 | A | 3 | c | No Data | | | | | | | | | | | |
| I | 2 | B | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 48 | 31 | 456.9 | 457.9 | 45790 | 0.4519 |
| I | 2 | B | 1 | b | No Data | | | | | | | | | | | |
| I | 2 | B | 1 | c | No Data | | | | | | | | | | | |
| I | 2 | B | 2 | a | 2 | 48 | 41 | 721.5 | 722.5 | 72250 | 48 | 31 | 456.9 | 457.9 | 45790 | 0.6333 |
| I | 2 | B | 2 | b | No Data | | | | | | | | | | | |
| I | 2 | B | 2 | c | No Data | | | | | | | | | | | |
| I | 2 | B | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1.0000 |
| I | 2 | B | 3 | b | No Data | | | | | | | | | | | |
| I | 2 | B | 3 | c | No Data | | | | | | | | | | | |
| I | 2 | C | 1 | a | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 2 | C | 1 | b | No Data | | | | | | | | | | | |
| I | 2 | C | 1 | c | No Data | | | | | | | | | | | |
| I | 2 | C | 2 | a | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 1 | 0 | 1 | 2 | 200 | 0.0081 |
| I | 2 | C | 2 | b | No Data | | | | | | | | | | | |
| I | 2 | C | 2 | c | No Data | | | | | | | | | | | |
| I | 2 | C | 3 | a | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 2 | C | 3 | b | No Data | | | | | | | | | | | |
| I | 2 | C | 3 | c | No Data | | | | | | | | | | | |
| I | 7 | A | 1 | a | No Data | | | | | | | | | | | |
| I | 7 | A | 1 | b | No Data | | | | | | | | | | | |
| I | 7 | A | 1 | c | No Data | | | | | | | | | | | |
| I | 7 | A | 2 | a | 2 | 5 | 0 | 5.2 | 6.2 | 620 | 2 | 0 | 2 | 3 | 300 | 0.3846 |
| I | 7 | A | 2 | b | 2 | 0 | 0 | 5.2 | 6.2 | 620 | 4 | 0 | 4.1 | 5.1 | 510 | 0.7885 |
| I | 7 | A | 2 | c | 2 | 6 | 1 | 7.4 | 8.4 | 840 | 4 | 0 | 4.1 | 5.1 | 510 | 0.5541 |
| I | 7 | A | 3 | a | 2 | 7 | 5 | 12.8 | 13.8 | 1380 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 7 | A | 3 | b | 2 | 8 | 2 | 10.8 | 11.8 | 1180 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 7 | A | 3 | c | 2 | 4 | 1 | 5.2 | 6.2 | 620 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 7 | B | 1 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 7 | B | 1 | b | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 7 | B | 1 | c | 4 | 1 | 0 | 1 | 2 | 20000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| I | 7 | B | 2 | a | 4 | 1 | 0 | 1 | 2 | 20000 | 1 | 0 | 1 | 2 | 20000 | 1.0000 |
| I | 7 | B | 2 | b | 4 | 17 | 3 | 24 | 25 | 250000 | 11 | 2 | 14.5 | 15.5 | 155000 | 0.6042 |
| I | 7 | B | 2 | c | 4 | 2 | 1 | 3 | 4 | 40000 | 2 | 1 | 3 | 4 | 40000 | 1.0000 |
| I | 7 | B | 3 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 7 | B | 3 | b | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| I | 7 | B | 3 | c | 4 | 1 | 1 | 2 | 3 | 30000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |

Table A10. Continued.

| Sample Identification | | | | | | Total Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| I | 7 | C | 1 | a | 1 | 48 | 48 | 1011.1 | 1012.1 | 10121 | 0 | 0 | 0 | 1 | 10 | 0.0000 |
| I | 7 | C | 1 | b | 1 | 48 | 48 | 1011.1 | 1012.1 | 10121 | 1 | 0 | 1 | 2 | 20 | 0.0010 |
| I | 7 | C | 1 | c | 1 | 48 | 48 | 1011.1 | 1012.1 | 10121 | 0 | 0 | 0 | 1 | 10 | 0.0000 |
| I | 7 | C | 2 | a | 1 | 48 | 48 | 1011.1 | 1012.1 | 10121 | 1 | 0 | 1 | 2 | 20 | 0.0010 |
| I | 7 | C | 2 | b | 1 | 48 | 48 | 1011.1 | 1012.1 | 10121 | 0 | 0 | 0 | 1 | 10 | 0.0000 |
| I | 7 | C | 2 | c | 1 | 48 | 48 | 1011.1 | 1012.1 | 10121 | 3 | 0 | 3.1 | 4.1 | 41 | 0.0031 |
| I | 7 | C | 3 | a | 1 | 48 | 48 | 1011.1 | 1012.1 | 10121 | 0 | 1 | 1 | 2 | 20 | 0.0010 |
| I | 7 | C | 3 | b | 2 | 19 | 2 | 25.9 | 26.9 | 2690 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 7 | C | 3 | c | 2 | 23 | 16 | 52.7 | 53.7 | 5370 | 2 | 0 | 2 | 3 | 300 | 0.0380 |
| I | 13 | A | 1 | a | 2 | 30 | 8 | 57.1 | 58.1 | 5810 | 8 | 1 | 9.7 | 10.7 | 1070 | 0.1699 |
| I | 13 | A | 1 | b | 2 | 44 | 14 | 141.4 | 142.4 | 14240 | 14 | 1 | 17.3 | 18.3 | 1830 | 0.1223 |
| I | 13 | A | 1 | c | 2 | 48 | 47 | 960.6 | 961.6 | 96160 | 46 | 27 | 258.9 | 259.9 | 25990 | 0.2695 |
| I | 13 | A | 2 | a | 2 | 45 | 5 | 116.2 | 117.2 | 11720 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 13 | A | 2 | b | 2 | 48 | 45 | 870.4 | 871.4 | 87140 | 7 | 1 | 8.5 | 9.5 | 950 | 0.0098 |
| I | 13 | A | 2 | c | 2 | 48 | 18 | 248.9 | 249.9 | 24990 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 13 | A | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 3 | 0 | 3.1 | 4.1 | 410 | 0.0031 |
| I | 13 | A | 3 | b | No Data | | | | | | | | | | | |
| I | 13 | A | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 13 | B | 1 | a | 4 | 46 | 18 | 248.9 | 249.9 | 2499000 | 8 | 0 | 8.6 | 9.6 | 96000 | 0.0346 |
| I | 13 | B | 1 | b | 4 | 48 | 45 | 870.4 | 871.4 | 8714000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| I | 13 | B | 1 | c | 4 | 38 | 10 | 88.6 | 89.6 | 896000 | 4 | 2 | 6.2 | 7.2 | 72000 | 0.0700 |
| I | 13 | B | 2 | a | 4 | 27 | 12 | 56 | 57 | 570000 | 2 | 0 | 2 | 3 | 30000 | 0.0357 |
| I | 13 | B | 2 | b | 4 | 47 | 13 | 178.5 | 179.5 | 1795000 | 1 | 2 | 3 | 4 | 40000 | 0.0168 |
| I | 13 | B | 2 | c | 4 | 22 | 0 | 28.2 | 29.2 | 292000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| I | 13 | B | 3 | a | 4 | 1 | 7 | 8.1 | 9.1 | 91000 | 1 | 0 | 1 | 2 | 20000 | 0.1235 |
| I | 13 | B | 3 | b | 4 | 0 | 3 | 3 | 4 | 40000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| I | 13 | B | 3 | c | No Data | | | | | | | | | | | |
| I | 13 | C | 1 | a | No Data | | | | | | | | | | | |
| I | 13 | C | 1 | b | No Data | | | | | | | | | | | |
| I | 13 | C | 1 | c | No Data | | | | | | | | | | | |
| I | 13 | C | 2 | a | No Data | | | | | | | | | | | |
| I | 13 | C | 2 | b | No Data | | | | | | | | | | | |
| I | 13 | C | 2 | c | No Data | | | | | | | | | | | |
| I | 13 | C | 3 | a | No Data | | | | | | | | | | | |
| I | 13 | C | 3 | b | No Data | | | | | | | | | | | |
| I | 13 | C | 3 | c | No Data | | | | | | | | | | | |
| I | 30 | A | 1 | a | No Data | | | | | | | | | | | |
| I | 30 | A | 1 | b | No Data | | | | | | | | | | | |
| I | 30 | A | 1 | c | No Data | | | | | | | | | | | |
| I | 30 | A | 2 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 24 | 12 | 49 | 50 | 5000 | 0.0485 |
| I | 30 | A | 2 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 14 | 11 | 29.3 | 30.3 | 3030 | 0.0290 |
| I | 30 | A | 2 | c | 2 | 48 | 24 | 328.2 | 329.2 | 32920 | 38 | 0 | 66.3 | 67.3 | 6730 | 0.2020 |
| I | 32 | A | 3 | a | No Data | | | | | | | | | | | |
| I | 32 | A | 3 | b | No Data | | | | | | | | | | | |
| I | 32 | A | 3 | c | No Data | | | | | | | | | | | |

Table A10. Continued.

| Sample Identification | | | | | | Total Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| I | 30 | B | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 33 | 4 | 58.3 | 59.3 | 5930 | 0.0577 |
| I | 30 | B | 1 | b | 2 | 27 | 11 | 54.4 | 55.4 | 5540 | 21 | 0 | 26.5 | 27.5 | 2750 | 0.4871 |
| I | 30 | B | 1 | c | 2 | 39 | 8 | 90.9 | 91.9 | 9190 | 34 | 5 | 63.1 | 64.1 | 6410 | 0.6942 |
| I | 32 | B | 2 | a | No Data | | | | | | | | | | | |
| I | 32 | B | 2 | b | No Data | | | | | | | | | | | |
| I | 32 | B | 2 | c | No Data | | | | | | | | | | | |
| I | 32 | B | 3 | a | No Data | | | | | | | | | | | |
| I | 32 | B | 3 | b | No Data | | | | | | | | | | | |
| I | 32 | B | 3 | c | No Data | | | | | | | | | | | |
| I | 30 | C | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 30 | C | 1 | b | 2 | 48 | 16 | 228.2 | 229.2 | 22920 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 30 | C | 1 | c | 2 | 48 | 7 | 159.7 | 160.7 | 16070 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| I | 32 | C | 2 | a | No Data | | | | | | | | | | | |
| I | 32 | C | 2 | b | No Data | | | | | | | | | | | |
| I | 32 | C | 2 | c | No Data | | | | | | | | | | | |
| I | 32 | C | 3 | a | No Data | | | | | | | | | | | |
| I | 32 | C | 3 | b | No Data | | | | | | | | | | | |
| I | 32 | C | 3 | c | No Data | | | | | | | | | | | |
| II | 0 | A | 1 | a | 6 | 1 | 0 | 1 | 2 | 2000000 | 0 | 0 | 0 | 1 | 1000000 | 0.0000 |
| II | 0 | A | 1 | b | 6 | 3 | 0 | 3.1 | 4.1 | 4100000 | 1 | 0 | 1 | 2 | 2000000 | 0.3226 |
| II | 0 | A | 1 | c | 6 | 2 | 0 | 2 | 3 | 3000000 | 1 | 0 | 1 | 2 | 2000000 | 0.5000 |
| II | 0 | A | 2 | a | 6 | 23 | 2 | 32.7 | 33.7 | 33700000 | 17 | 1 | 21.6 | 22.6 | 22600000 | 0.6606 |
| II | 0 | A | 2 | b | 6 | 26 | 6 | 44.3 | 45.3 | 45300000 | 21 | 4 | 31.8 | 32.8 | 32800000 | 0.7178 |
| II | 0 | A | 2 | c | 6 | 39 | 5 | 81.3 | 82.3 | 82300000 | 19 | 1 | 24.6 | 25.6 | 25600000 | 0.3026 |
| II | 0 | A | 3 | a | 6 | 11 | 2 | 14.5 | 15.5 | 15500000 | 0 | 0 | 0 | 1 | 1000000 | 0.0000 |
| II | 0 | A | 3 | b | 6 | 18 | 4 | 26.9 | 27.9 | 27900000 | 4 | 1 | 5.2 | 6.2 | 6200000 | 0.1933 |
| II | 0 | A | 3 | c | 6 | 16 | 7 | 27.5 | 28.5 | 28500000 | 1 | 0 | 1 | 2 | 2000000 | 0.0364 |
| II | 0 | B | 1 | a | 6 | 18 | 0 | 21.8 | 22.8 | 22800000 | 10 | 0 | 11 | 12 | 12000000 | 0.5046 |
| II | 0 | B | 1 | b | 6 | 40 | 8 | 93.3 | 94.3 | 94300000 | 23 | 2 | 32.7 | 33.7 | 33700000 | 0.3505 |
| II | 0 | B | 1 | c | 6 | 45 | 6 | 119.8 | 120.8 | 120800000 | 24 | 4 | 37.3 | 38.3 | 38300000 | 0.3114 |
| II | 0 | B | 2 | a | 6 | 0 | 0 | 0 | 1 | 1000000 | 0 | 0 | 0 | 1 | 1000000 | ** |
| II | 0 | B | 2 | b | 6 | 0 | 0 | 0 | 1 | 1000000 | 0 | 0 | 0 | 1 | 1000000 | ** |
| II | 0 | B | 2 | c | No Data | | | | | | | | | | | |
| II | 0 | B | 3 | a | No Data | | | | | | | | | | | |
| II | 0 | B | 3 | b | No Data | | | | | | | | | | | |
| II | 0 | B | 3 | c | No Data | | | | | | | | | | | |
| II | 0 | C | 1 | a | 2 | 48 | 13 | 201.4 | 202.4 | 20240 | 5 | 1 | 6.3 | 7.3 | 730 | 0.0313 |
| II | 0 | C | 1 | b | 2 | 48 | 10 | 178.9 | 179.9 | 17990 | 12 | 3 | 16.9 | 17.9 | 1790 | 0.0945 |
| II | 0 | C | 1 | c | 2 | 48 | 7 | 159.7 | 160.7 | 16070 | 4 | 1 | 5.2 | 6.2 | 620 | 0.0326 |
| II | 0 | C | 2 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1 | 0 | 1 | 2 | 200 | 0.0010 |
| II | 0 | C | 2 | b | 2 | 48 | 5 | 148.3 | 149.3 | 14930 | 1 | 0 | 1 | 2 | 200 | 0.0067 |
| II | 0 | C | 2 | c | 2 | 48 | 6 | 153.9 | 154.9 | 15490 | 2 | 0 | 2 | 3 | 300 | 0.0130 |
| II | 0 | C | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |
| II | 0 | C | 3 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1 | 0 | 1 | 2 | 200 | 0.0010 |
| II | 0 | C | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |

Table A10. Continued.

| Sample Identification | | | | | | Total Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| II | 3 | A | 1 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 1 | 2 | 20000 | ** |
| II | 3 | A | 1 | b | 4 | 2 | 1 | 3 | 4 | 40000 | 1 | 1 | 2 | 3 | 30000 | 0.6667 |
| II | 3 | A | 1 | c | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 1 | 2 | 20000 | ** |
| II | 3 | A | 2 | a | 4 | 9 | 3 | 13.1 | 14.1 | 141000 | 4 | 2 | 6.2 | 7.2 | 72000 | 0.4733 |
| II | 3 | A | 2 | b | 4 | 1 | 0 | 1 | 2 | 20000 | 2 | 1 | 3 | 4 | 40000 | 3.0000 |
| II | 3 | A | 2 | c | 4 | 8 | 1 | 9.7 | 10.7 | 107000 | 6 | 3 | 9.5 | 10.5 | 105000 | 0.9794 |
| II | 3 | A | 3 | a | 4 | 2 | 0 | 2 | 3 | 30000 | 0 | 0 | 1 | 2 | 20000 | 0.5000 |
| II | 3 | A | 3 | b | 4 | 1 | 0 | 1 | 2 | 20000 | 0 | 0 | 1 | 2 | 20000 | 1.0000 |
| II | 3 | A | 3 | c | 4 | 1 | 0 | 1 | 2 | 20000 | 1 | 0 | 1 | 2 | 20000 | 1.0000 |
| II | 3 | B | 1 | a | No Data | | | | | | | | | | | |
| II | 3 | B | 1 | b | No Data | | | | | | | | | | | |
| II | 3 | B | 1 | c | No Data | | | | | | | | | | | |
| II | 3 | B | 2 | a | No Data | | | | | | | | | | | |
| II | 3 | B | 2 | b | No Data | | | | | | | | | | | |
| II | 3 | B | 2 | c | No Data | | | | | | | | | | | |
| II | 3 | B | 3 | a | 4 | 11 | 1 | 13.4 | 14.4 | 144000 | 2 | 0 | 2 | 3 | 30000 | 0.1493 |
| II | 3 | B | 3 | b | 4 | 6 | 2 | 8.4 | 9.4 | 94000 | 4 | 1 | 5.2 | 6.2 | 62000 | 0.6190 |
| II | 3 | B | 3 | c | No Data | | | | | | | | | | | |
| II | 3 | C | 1 | a | 2 | 3 | 1 | 4.1 | 5.1 | 510 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 3 | C | 1 | b | 2 | 4 | 0 | 4.1 | 5.1 | 510 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 3 | C | 1 | c | 2 | 48 | 9 | 172.2 | 173.2 | 17320 | 1 | 0 | 1 | 2 | 200 | 0.0058 |
| II | 3 | C | 2 | a | 2 | 5 | 2 | 7.3 | 8.3 | 830 | 0 | 1 | 1 | 2 | 200 | 0.1370 |
| II | 3 | C | 2 | b | 2 | 4 | 3 | 7.2 | 8.2 | 820 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 3 | C | 2 | c | 2 | 48 | 3 | 137.9 | 138.9 | 13890 | 2 | 1 | 3 | 4 | 400 | 0.0218 |
| II | 3 | C | 3 | a | 2 | 48 | 25 | 344.1 | 345.1 | 34510 | 1 | 0 | 1 | 2 | 200 | 0.0029 |
| II | 3 | C | 3 | b | 2 | 20 | 5 | 31.4 | 32.4 | 3240 | 1 | 0 | 1 | 2 | 200 | 0.0318 |
| II | 3 | C | 3 | c | 2 | 21 | 3 | 30.5 | 31.5 | 3150 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 7 | A | 1 | a | 2 | 48 | 47 | 960.6 | 961.6 | 96160 | 48 | 46 | 913.9 | 914.9 | 91490 | 0.9514 |
| II | 7 | A | 1 | b | 2 | 48 | 47 | 960.6 | 961.6 | 96160 | 48 | 42 | 755.5 | 756.5 | 75650 | 0.7865 |
| II | 7 | A | 1 | c | 2 | 48 | 47 | 960.6 | 961.6 | 96160 | 48 | 42 | 755.5 | 756.5 | 75650 | 0.7865 |
| II | 7 | A | 2 | a | 2 | 48 | 47 | 960.6 | 961.6 | 96160 | 48 | 41 | 721.5 | 722.5 | 72250 | 0.7511 |
| II | 7 | A | 2 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 48 | 35 | 549.2 | 550.2 | 55020 | 0.5432 |
| II | 7 | A | 2 | c | 2 | 48 | 45 | 870.4 | 871.4 | 87140 | 48 | 37 | 601.5 | 602.5 | 60250 | 0.6911 |
| II | 7 | A | 3 | a | 2 | 48 | 6 | 153.9 | 154.9 | 15490 | 1 | 0 | 1 | 2 | 200 | 0.0065 |
| II | 7 | A | 3 | b | No Data | | | | | | | | | | | |
| II | 7 | A | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 7 | B | 1 | a | 4 | 48 | 4 | 48 | 49 | 490000 | 17 | 2 | 22.8 | 23.8 | 238000 | 0.4750 |
| II | 7 | B | 1 | b | 4 | 32 | 9 | 64.5 | 65.5 | 655000 | 13 | 7 | 23 | 24 | 240000 | 0.3566 |
| II | 7 | B | 1 | c | 4 | 35 | 11 | 78.4 | 79.4 | 794000 | 19 | 7 | 32.4 | 33.4 | 334000 | 0.4133 |
| II | 7 | B | 2 | a | 4 | 0 | 1 | 1 | 2 | 20000 | 1 | 1 | 2 | 3 | 30000 | 2.0000 |
| II | 7 | B | 2 | b | 4 | 38 | 2 | 70.6 | 71.6 | 716000 | 12 | 1 | 14.6 | 15.6 | 156000 | 0.2068 |
| II | 7 | B | 2 | c | 4 | 38 | 8 | 83.9 | 84.9 | 849000 | 12 | 3 | 16.9 | 17.9 | 179000 | 0.2014 |
| II | 7 | B | 3 | a | 4 | 3 | 0 | 3.1 | 4.1 | 41000 | 2 | 1 | 3 | 4 | 40000 | 0.9677 |
| II | 7 | B | 3 | b | 4 | 2 | 2 | 4.1 | 5.1 | 51000 | 2 | 1 | 3 | 4 | 40000 | 0.7317 |
| II | 7 | B | 3 | c | 4 | 5 | 2 | 7.3 | 8.3 | 83000 | 3 | 1 | 4.1 | 5.1 | 51000 | 0.5616 |

Table A10. Continued.

| Sample Identification | | | | | | Total Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| II | 7 | C | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 7 | C | 1 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 7 | C | 1 | c | No Data | | | | | | | | | | | |
| II | 7 | C | 2 | a | 2 | 48 | 47 | 960.6 | 961.6 | 96160 | 1 | 0 | 1 | 2 | 200 | 0.0010 |
| II | 7 | C | 2 | b | 2 | 38 | 11 | 91 | 92 | 9200 | 3 | 1 | 4.1 | 5.1 | 510 | 0.0451 |
| II | 7 | C | 2 | c | No Data | | | | | | | | | | | |
| II | 7 | C | 3 | a | No Data | | | | | | | | | | | |
| II | 7 | C | 3 | b | No Data | | | | | | | | | | | |
| II | 7 | C | 3 | c | No Data | | | | | | | | | | | |
| II | 14 | A | 1 | a | 2 | 6 | 2 | 8.4 | 9.4 | 940 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | A | 1 | b | 2 | 29 | 3 | 46.4 | 47.4 | 4740 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | A | 1 | c | 2 | 48 | 20 | 272.3 | 273.3 | 27330 | 3 | 0 | 3.1 | 4.1 | 410 | 0.0114 |
| II | 14 | A | 2 | a | 2 | 48 | 21 | 285.1 | 286.1 | 28610 | 19 | 4 | 28.5 | 29.5 | 2950 | 0.1000 |
| II | 14 | A | 2 | b | 2 | 48 | 42 | 755.5 | 756.5 | 75650 | 36 | 6 | 71.7 | 72.7 | 7270 | 0.0949 |
| II | 14 | A | 2 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 32 | 8 | 62.7 | 63.7 | 6370 | 0.0620 |
| II | 14 | A | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 7 | 0 | 7.4 | 8.4 | 840 | 0.0073 |
| II | 14 | A | 3 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 4 | 0 | 4.1 | 5.1 | 510 | 0.0041 |
| II | 14 | A | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 4 | 2 | 6.2 | 7.2 | 720 | 0.0061 |
| II | 14 | B | 1 | a | 4 | 5 | 0 | 5.2 | 6.2 | 62000 | 1 | 0 | 1 | 2 | 20000 | 0.1923 |
| II | 14 | B | 1 | b | 4 | 3 | 3 | 6.1 | 7.1 | 71000 | 3 | 0 | 3.1 | 4.1 | 41000 | 0.5082 |
| II | 14 | B | 1 | c | 4 | 10 | 6 | 17.7 | 18.7 | 187000 | 1 | 0 | 1 | 2 | 20000 | 0.0565 |
| II | 14 | B | 2 | a | 4 | 5 | 3 | 8.4 | 9.4 | 94000 | 3 | 0 | 3.1 | 4.1 | 41000 | 0.3690 |
| II | 14 | B | 2 | b | 4 | 9 | 2 | 12 | 13 | 130000 | 1 | 1 | 2 | 3 | 30000 | 0.1667 |
| II | 14 | B | 2 | c | 4 | 18 | 6 | 29.4 | 30.4 | 304000 | 2 | 1 | 3 | 4 | 40000 | 0.1020 |
| II | 14 | B | 3 | a | 4 | 9 | 0 | 9.8 | 10.8 | 108000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| II | 14 | B | 3 | b | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| II | 14 | B | 3 | c | 4 | 18 | 6 | 29.4 | 30.4 | 304000 | 2 | 1 | 3 | 4 | 40000 | 0.1020 |
| II | 14 | C | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 1 | b | 2 | 48 | 4 | 143 | 144 | 14400 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 1 | c | 2 | 48 | 7 | 159.7 | 160.7 | 16070 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 2 | a | 2 | 6 | 0 | 6.3 | 7.3 | 730 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 2 | b | 2 | 9 | 3 | 13.1 | 14.1 | 1410 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 2 | c | 2 | 7 | 1 | 8.5 | 9.5 | 950 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| II | 14 | C | 3 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1 | 0 | 1 | 2 | 200 | 0.0010 |
| II | 14 | C | 3 | c | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 0 | 0 | 0 | 1 | 100 | 0.0000 |
| III | 0 | A | 1 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| III | 0 | A | 1 | b | 4 | 8 | 0 | 8.6 | 9.6 | 96000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | A | 1 | c | 4 | 9 | 0 | 9.8 | 10.8 | 108000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | A | 2 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| III | 0 | A | 2 | b | 4 | 14 | 0 | 16.1 | 17.1 | 171000 | 1 | 0 | 1 | 2 | 20000 | 0.0621 |
| III | 0 | A | 2 | c | 4 | 15 | 0 | 17.5 | 18.5 | 185000 | 1 | 0 | 1 | 2 | 20000 | 0.0571 |
| III | 0 | A | 3 | a | 4 | 48 | 1 | 128.4 | 129.4 | 1294000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | A | 3 | b | 4 | 48 | 3 | 137.9 | 138.9 | 1389000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | A | 3 | c | 4 | 8 | 0 | 8.6 | 9.6 | 96000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |

Table A10. Continued.

| Sample Identification | | | | | | Total Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| III | 0 | B | 1 | a | No Data | | | | | | | | | | | |
| III | 0 | B | 1 | b | 4 | 37 | 0 | 62.9 | 63.9 | 639000 | 7 | 0 | 7.4 | 8.4 | 84000 | 0.1176 |
| III | 0 | B | 1 | c | 4 | 48 | 10 | 178.9 | 179.9 | 1799000 | 44 | 9 | 122.3 | 123.3 | 1233000 | 0.6836 |
| III | 0 | B | 2 | a | 4 | 48 | 8 | 165.8 | 166.8 | 1668000 | 40 | 5 | 85.7 | 86.7 | 867000 | 0.5169 |
| III | 0 | B | 2 | b | 4 | 48 | 3 | 137.9 | 138.9 | 1389000 | 25 | 1 | 35 | 36 | 360000 | 0.2538 |
| III | 0 | B | 2 | c | 4 | 48 | 4 | 143 | 144 | 1440000 | 24 | 2 | 34.5 | 35.5 | 355000 | 0.2413 |
| III | 0 | B | 3 | a | 4 | 48 | 0 | 123.9 | 124.9 | 1249000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | B | 3 | b | 4 | 48 | 0 | 123.9 | 124.9 | 1249000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 0 | B | 3 | c | 4 | 48 | 1 | 128.4 | 129.4 | 1294000 | 1 | 1 | 2 | 3 | 30000 | 0.0156 |
| III | 0 | C | 1 | a | No Data | | | | | | | | | | | |
| III | 0 | C | 1 | b | No Data | | | | | | | | | | | |
| III | 0 | C | 1 | c | No Data | | | | | | | | | | | |
| III | 0 | C | 2 | a | No Data | | | | | | | | | | | |
| III | 0 | C | 2 | b | No Data | | | | | | | | | | | |
| III | 0 | C | 2 | c | No Data | | | | | | | | | | | |
| III | 0 | C | 3 | a | No Data | | | | | | | | | | | |
| III | 0 | C | 3 | b | No Data | | | | | | | | | | | |
| III | 0 | C | 3 | c | No Data | | | | | | | | | | | |
| III | 3 | A | 1 | a | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| III | 3 | A | 1 | b | 4 | 1 | 0 | 1 | 2 | 20000 | 1 | 0 | 1 | 2 | 20000 | 1.0000 |
| III | 3 | A | 1 | c | 4 | 0 | 0 | 0 | 1 | 10000 | 0 | 0 | 0 | 1 | 10000 | ** |
| III | 3 | A | 2 | a | 4 | 1 | 0 | 1 | 2 | 20000 | 1 | 0 | 1 | 2 | 20000 | 1.0000 |
| III | 3 | A | 2 | b | No Data | | | | | | | | | | | |
| III | 3 | A | 2 | c | No Data | | | | | | | | | | | |
| III | 3 | A | 3 | a | No Data | | | | | | | | | | | |
| III | 3 | A | 3 | b | No Data | | | | | | | | | | | |
| III | 3 | A | 3 | c | 4 | 48 | 5 | 148.3 | 149.3 | 1493000 | 0 | 0 | 0 | 1 | 10000 | 0.0000 |
| III | 3 | B | 1 | a | 4 | 48 | 4 | 143 | 144 | 1440000 | 11 | 0 | 12.2 | 13.2 | 132000 | 0.0853 |
| III | 3 | B | 1 | b | No Data | | | | | | | | | | | |
| III | 3 | B | 1 | c | No Data | | | | | | | | | | | |
| III | 3 | B | 2 | a | 4 | 37 | 7 | 77.6 | 78.6 | 786000 | 41 | 6 | 93.3 | 94.3 | 943000 | 1.2023 |
| III | 3 | B | 2 | b | No Data | | | | | | | | | | | |
| III | 3 | B | 2 | c | No Data | | | | | | | | | | | |
| III | 3 | B | 3 | a | 4 | 5 | 1 | 6.3 | 7.3 | 73000 | 1 | 0 | 1 | 2 | 20000 | 0.1587 |
| III | 3 | B | 3 | b | No Data | | | | | | | | | | | |
| III | 3 | B | 3 | c | No Data | | | | | | | | | | | |
| III | 3 | C | 1 | a | No Data | | | | | | | | | | | |
| III | 3 | C | 1 | b | No Data | | | | | | | | | | | |
| III | 3 | C | 1 | c | No Data | | | | | | | | | | | |
| III | 3 | C | 2 | a | No Data | | | | | | | | | | | |
| III | 3 | C | 2 | b | No Data | | | | | | | | | | | |
| III | 3 | C | 2 | c | No Data | | | | | | | | | | | |
| III | 3 | C | 3 | a | No Data | | | | | | | | | | | |
| III | 3 | C | 3 | b | No Data | | | | | | | | | | | |
| III | 3 | C | 3 | c | No Data | | | | | | | | | | | |

Table A10. Continued.

| Sample Identification | | | | | | Total Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| III | 7 | A | 1 | a | 2 | 48 | 3 | 137.9 | 138.9 | 13890 | 5 | 1 | 6.3 | 7.3 | 730 | 0.0457 |
| III | 7 | A | 1 | b | 2 | 13 | 2 | 17.1 | 18.1 | 1810 | 4 | 0 | 4.1 | 5.1 | 510 | 0.2398 |
| III | 7 | A | 1 | c | 2 | 48 | 8 | 165.8 | 166.8 | 16680 | 7 | 0 | 7.4 | 8.4 | 840 | 0.0446 |
| III | 7 | A | 2 | a | 2 | 48 | 43 | 791.5 | 792.5 | 79250 | 48 | 39 | 658.6 | 659.6 | 65960 | 0.8321 |
| III | 7 | A | 2 | b | 2 | 48 | 42 | 755.5 | 756.5 | 75650 | 48 | 39 | 658.6 | 659.6 | 65960 | 0.8717 |
| III | 7 | A | 2 | c | 2 | 48 | 44 | 829.7 | 830.7 | 83070 | 48 | 40 | 689.3 | 690.3 | 69030 | 0.8308 |
| III | 7 | A | 3 | a | 2 | 48 | 41 | 721.5 | 722.5 | 72250 | 48 | 40 | 689.3 | 690.3 | 69030 | 0.9554 |
| III | 7 | A | 3 | b | 2 | 48 | 38 | 629.4 | 630.4 | 63040 | 48 | 32 | 478.6 | 479.6 | 47960 | 0.7604 |
| III | 7 | A | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 48 | 45 | 870.4 | 871.4 | 87140 | 0.8608 |
| III | 7 | B | 1 | a | 4 | 8 | 1 | 9.7 | 10.7 | 107000 | 6 | 0 | 6.3 | 7.3 | 73000 | 0.6495 |
| III | 7 | B | 1 | b | 4 | 6 | 0 | 6.3 | 7.3 | 73000 | 5 | 0 | 5.2 | 6.2 | 62000 | 0.8254 |
| III | 7 | B | 1 | c | 4 | 2 | 0 | 2 | 3 | 30000 | 3 | 0 | 3.1 | 4.1 | 41000 | 1.5500 |
| III | 7 | B | 2 | a | 4 | 8 | 0 | 8.6 | 9.6 | 96000 | 7 | 0 | 7.4 | 8.4 | 84000 | 0.8605 |
| III | 7 | B | 2 | b | 4 | 8 | 3 | 11.9 | 12.9 | 129000 | 6 | 2 | 8.4 | 9.4 | 94000 | 0.7059 |
| III | 7 | B | 2 | c | 4 | 15 | 1 | 18.7 | 19.7 | 197000 | 7 | 1 | 8.5 | 9.5 | 95000 | 0.4545 |
| III | 7 | B | 3 | a | 2 | 5 | 2 | 7.3 | 8.3 | 830 | 1 | 0 | 1 | 2 | 200 | 0.1370 |
| III | 7 | B | 3 | b | 2 | 9 | 1 | 10.9 | 11.9 | 1190 | 0 | 0 | 1 | 2 | 200 | 0.0917 |
| III | 7 | B | 3 | c | 2 | 5 | 0 | 5.2 | 6.2 | 620 | 0 | 0 | 1 | 2 | 200 | 0.1923 |
| III | 7 | C | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 7 | C | 1 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 7 | C | 1 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 3 | 1 | 4.1 | 5.1 | 510 | 0.0041 |
| III | 7 | C | 2 | a | No Data | | | | | | | | | | | |
| III | 7 | C | 2 | b | No Data | | | | | | | | | | | |
| III | 7 | C | 2 | c | No Data | | | | | | | | | | | |
| III | 7 | C | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 7 | C | 3 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 7 | C | 3 | c | No Data | | | | | | | | | | | |
| III | 18 | A | 1 | a | 2 | 48 | 14 | 209.8 | 210.8 | 21080 | 10 | 1 | 12.1 | 13.1 | 1310 | 0.0577 |
| III | 18 | A | 1 | b | 2 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 1 | 2 | 200 | ** |
| III | 18 | A | 1 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 15 | 0 | 17.5 | 18.5 | 1850 | 0.0173 |
| III | 18 | A | 2 | a | 2 | 48 | 11 | 186 | 187 | 18700 | 34 | 3 | 54.9 | 55.9 | 5590 | 0.2952 |
| III | 18 | A | 2 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 27 | 5 | 45 | 46 | 4600 | 0.0445 |
| III | 18 | A | 2 | c | 2 | 48 | 9 | 172.2 | 173.2 | 17320 | 9 | 2 | 12 | 13 | 1300 | 0.0697 |
| III | 18 | A | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 3 | 0 | 3.1 | 4.1 | 410 | 0.0031 |
| III | 18 | A | 3 | b | 2 | 8 | 1 | 9.7 | 10.7 | 1070 | 0 | 0 | 1 | 2 | 200 | 0.1031 |
| III | 18 | A | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 18 | B | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 39 | 6 | 83.6 | 84.6 | 8460 | 0.0827 |
| III | 18 | B | 1 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 45 | 9 | 131.3 | 132.3 | 13230 | 0.1299 |
| III | 18 | B | 1 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 37 | 11 | 86.5 | 87.5 | 8750 | 0.0856 |
| III | 18 | B | 2 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 12 | 1 | 14.6 | 15.6 | 1560 | 0.0144 |
| III | 18 | B | 2 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 8 | 0 | 8.6 | 9.6 | 960 | 0.0085 |
| III | 18 | B | 2 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 15 | 1 | 18.7 | 19.7 | 1970 | 0.0185 |
| III | 18 | B | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 2 | 0 | 2 | 3 | 300 | 0.0020 |
| III | 18 | B | 3 | b | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 4 | 0 | 4.1 | 5.1 | 510 | 0.0041 |
| III | 18 | B | 3 | c | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 4 | 1 | 5.2 | 6.2 | 620 | 0.0051 |

Table A10. Continued.

| Sample Identification | | | | | | Total Coliforms (Yellow Wells) | | | | | *E. Coli* (Fluorescent Wells) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treatment | Plot | Day | Dilution $10^{-n}$ | FC | | well count | well count+1 | (well count+1) | Large | Sm | well count | well count+1 | (well count+1) | E.coli/FC* |
| III | 18 | C | 1 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 0 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 18 | C | 1 | b | No Data | | | | | | | | | | | |
| III | 18 | C | 1 | c | No Data | | | | | | | | | | | |
| III | 18 | C | 2 | a | 2 | 48 | 0 | 123.9 | 124.9 | 12490 | 2 | 0 | 2 | 3 | 300 | 0.0161 |
| III | 18 | C | 2 | b | No Data | | | | | | | | | | | |
| III | 18 | C | 2 | c | No Data | | | | | | | | | | | |
| III | 18 | C | 3 | a | 2 | 48 | 48 | 1011.1 | 1012.1 | 101210 | 1 | 0 | 1 | 2 | 200 | 0.0010 |
| III | 18 | C | 3 | b | No Data | | | | | | | | | | | |
| III | 18 | C | 3 | c | No Data | | | | | | | | | | | |

* This value represents the fraction of the actual number of fluorescent over yellow wells (not after adding a value of 1).

** Percent not calculable due to total yellow wells (the denominator) having a value of zero.

Table A11. Nitrogen, phosphorus and potassium data for runoff samples.

| Sample ID | | | | N | P | K | Sample ID | | | | N | P | K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Day | Treat | Plot | (ppm) | (ppm) | (ppm) | Series | Day | Treat | Plot | (ppm) | (ppm) | (ppm) |
| I | 0 | A | 1 | 28 | 2.04 | 10.6 | II | 3 | C | 2 | 19 | 1.17 | 5.7 |
| I | 0 | A | 2 | 32 | 2.19 | 8.8 | II | 3 | C | 3 | 16 | 1.94 | 8.75 |
| I | 0 | A | 3 | 34 | 1.52 | 16.8 | II | 7 | A | 1 | 43 | 1.03 | 6.43 |
| I | 0 | B | 1 | 29 | 2.26 | 11.5 | II | 7 | A | 2 | 38 | 1.06 | 7.44 |
| I | 0 | B | 2 | 29 | 0.451 | 6.85 | II | 7 | A | 3 | | | |
| I | 0 | B | 3 | 33 | 1.18 | 14.3 | II | 7 | B | 1 | | | |
| I | 0 | C | 1 | 29 | 1.24 | 8.79 | II | 7 | B | 2 | 35 | 2.17 | 7.73 |
| I | 0 | C | 2 | | | | II | 7 | B | 3 | | | |
| I | 0 | C | 3 | 22 | 1.05 | 4.45 | II | 7 | C | 1 | | | |
| I | 2 | A | 1 | 40 | 0.774 | 5.71 | II | 7 | C | 2 | 35 | 1.06 | 4.87 |
| I | 2 | A | 2 | 41 | 0.762 | 4.43 | II | 7 | C | 3 | | | |
| I | 2 | A | 3 | 34 | 1.07 | 7.49 | II | 14 | A | 1 | | | |
| I | 2 | B | 1 | 39 | 0.447 | 5.04 | II | 14 | A | 2 | | | |
| I | 2 | B | 2 | 30 | 0.519 | 3.14 | II | 14 | A | 3 | | | |
| I | 2 | B | 3 | 28 | 0.666 | 8.38 | II | 14 | B | 1 | | | |
| I | 2 | C | 1 | 45 | 0.773 | 4.31 | II | 14 | B | 2 | | | |
| I | 2 | C | 2 | 26 | 0.395 | 2.89 | II | 14 | B | 3 | | | |
| I | 2 | C | 3 | 29 | 2.26 | 11.4 | II | 14 | C | 1 | | | |
| I | 7 | A | 1 | | | | II | 14 | C | 2 | | | |
| I | 7 | A | 2 | | | | II | 14 | C | 3 | | | |
| I | 7 | A | 3 | 16 | 0.985 | 10.1 | III | 3 | C | 2 | 35 | 1.18 | 4.86 |
| I | 7 | B | 1 | 18 | 1.2 | 6.55 | III | 3 | C | 3 | 29 | 1.82 | 7.23 |
| I | 7 | B | 2 | 13 | 0.623 | 2.45 | III | 7 | A | 1 | | | |
| I | 7 | B | 3 | 16 | 0.686 | 6.85 | III | 7 | A | 2 | | | |
| I | 7 | C | 1 | | | | III | 7 | A | 3 | | | |
| I | 7 | C | 2 | | | | III | 7 | B | 1 | | | |
| I | 7 | C | 3 | 16 | 0.869 | 4.29 | III | 7 | B | 2 | | | |
| I | 13 | A | 1 | 19 | 1.83 | 11.2 | III | 7 | B | 3 | | | |
| I | 13 | A | 2 | 21 | 2.76 | 18.2 | III | 7 | C | 1 | | | |
| I | 13 | A | 3 | 22 | 2.26 | 14.1 | III | 7 | C | 2 | | | |
| I | 13 | B | 1 | 24 | 2.11 | 15.3 | III | 7 | C | 3 | | | |
| I | 13 | B | 2 | 20 | 2.79 | 14.7 | III | 18 | A | 1 | | | |
| I | 13 | B | 3 | 18 | 0.303 | 6.17 | III | 18 | A | 2 | | | |
| I | 13 | C | 1 | 25 | 2.19 | 15.8 | III | 18 | A | 3 | | | |
| I | 13 | C | 2 | 19 | 3.2 | 15.9 | III | 18 | B | 1 | | | |
| I | 13 | C | 3 | 17 | 2.58 | 11.3 | III | 18 | B | 2 | | | |
| I | 30 | A | 1 | 18 | 1.41 | 9.74 | III | 18 | B | 3 | | | |
| I | 30 | A | 2 | 17 | 1.51 | 11.1 | III | 18 | C | 1 | | | |
| I | 32 | A | 3 | 16 | 1.7 | 11.7 | III | 18 | C | 2 | | | |
| I | 30 | B | 1 | 16 | 1.3 | 8.09 | III | 18 | C | 3 | | | |
| I | 32 | B | 2 | 26 | 2.36 | 10.4 | | | | | | | |
| I | 32 | B | 3 | 18 | 1.7 | 13.6 | | | | | | | |
| I | 30 | C | 1 | 19 | 2.52 | 13.2 | | | | | | | |
| I | 32 | C | 2 | 15 | 1.49 | 8.46 | | | | | | | |
| I | 32 | C | 3 | 18 | 2.54 | 13.3 | | | | | | | |

Table A12. TSS data for runoff samples.

| SERIES | DAY | TREAT | PLOT | TSS, mg/l Rep 1 | Rep 2 | Average |
|---|---|---|---|---|---|---|
| I | 0 | A | 1 | 100 | 104 | 102 |
| I | 0 | A | 2 | 28 | 28 | 28 |
| I | 0 | A | 3 | 76 | 80 | 78 |
| I | 0 | B | 1 | 76 | 96 | 86 |
| I | 0 | B | 2 | 80 | 72 | 76 |
| I | 0 | B | 3 | 220 | 228 | 224 |
| I | 0 | C | 1 | | n/a | |
| I | 0 | C | 2 | | n/a | |
| I | 0 | C | 3 | | n/a | |
| I | 2 | A | 1 | 28 | 24 | 26 |
| I | 2 | A | 2 | 156 | 140 | 148 |
| I | 2 | A | 3 | 20 | 16 | 18 |
| I | 2 | B | 1 | 244 | 216 | 230 |
| I | 2 | B | 2 | 104 | 104 | 104 |
| I | 2 | B | 3 | 148 | 168 | 158 |
| I | 2 | C | 1 | 96 | 68 | 82 |
| I | 2 | C | 2 | 64 | 84 | 74 |
| I | 2 | C | 3 | 196 | 176 | 186 |
| I | 7 | A | 1 | | n/a | |
| I | 7 | A | 2 | 76 | 52 | 64 |
| I | 7 | A | 3 | 48 | 40 | 44 |
| I | 7 | B | 1 | 152 | 156 | 154 |
| I | 7 | B | 2 | 24 | 32 | 28 |
| I | 7 | B | 3 | 80 | 60 | 70 |
| I | 7 | C | 1 | 60 | 52 | 56 |
| I | 7 | C | 2 | 132 | 156 | 144 |
| I | 7 | C | 3 | 60 | 60 | 60 |
| I | 13 | A | 1 | 180 | 196 | 188 |
| I | 13 | A | 2 | 48 | 48 | 48 |
| I | 13 | A | 3 | 5 | 5 | 5 |
| I | 13 | B | 1 | 72 | 68 | 70 |
| I | 13 | B | 2 | 50 | 30 | 40 |
| I | 13 | B | 3 | 32 | 40 | 36 |
| I | 13 | C | 1 | 110 | 100 | 105 |
| I | 13 | C | 2 | 168 | 164 | 166 |
| I | 13 | C | 3 | 145 | 130 | 137.5 |
| I | 30 | A | 1 | | n/a | |
| I | 30 | A | 2 | | n/a | |
| I | 32 | A | 3 | | n/a | |
| I | 30 | B | 1 | | n/a | |
| I | 32 | B | 2 | | n/a | |

Table A12. Continued.

| SERIES | DAY | TREAT | PLOT | TSS, mg/l Rep 1 | Rep 2 | Average |
|---|---|---|---|---|---|---|
| I | 32 | B | 3 | | n/a | |
| I | 30 | C | 1 | | n/a | |
| I | 32 | C | 2 | | n/a | |
| I | 32 | C | 3 | | n/a | |
| II | 0 | A | 1 | 60 | 50 | 55 |
| II | 0 | A | 2 | 55 | 70 | 62.5 |
| II | 0 | A | 3 | 16 | 24 | 20 |
| II | 0 | B | 1 | 32 | 28 | 30 |
| II | 0 | B | 2 | 35 | 50 | 42.5 |
| II | 0 | B | 3 | 60 | 85 | 72.5 |
| II | 0 | C | 1 | 35 | 40 | 37.5 |
| II | 0 | C | 2 | 52 | 56 | 54 |
| II | 0 | C | 3 | 130 | 120 | 125 |
| II | 3 | A | 1 | 60 | 68 | 64 |
| II | 3 | A | 2 | 76 | 76 | 76 |
| II | 3 | A | 3 | 36 | 20 | 28 |
| II | 3 | B | 1 | 48 | 64 | 56 |
| II | 3 | B | 2 | 64 | 52 | 58 |
| II | 3 | B | 3 | 20 | 20 | 20 |
| II | 3 | C | 1 | 44 | 60 | 52 |
| II | 3 | C | 2 | 136 | 96 | 116 |
| II | 3 | C | 3 | 20 | 24 | 22 |
| II | 7 | A | 1 | 44 | 44 | 44 |
| II | 7 | A | 2 | 20 | 16 | 18 |
| II | 7 | A | 3 | 16 | 8 | 12 |
| II | 7 | B | 1 | 28 | 28 | 28 |
| II | 7 | B | 2 | 28 | 20 | 24 |
| II | 7 | B | 3 | | n/a | |
| II | 7 | C | 1 | 32 | 28 | 30 |
| II | 7 | C | 2 | 16 | 20 | 18 |
| II | 7 | C | 3 | 20 | 16 | 18 |
| II | 14 | A | 1 | 12 | | 12 |
| II | 14 | A | 2 | | n/a | |
| II | 14 | A | 3 | | n/a | |
| II | 14 | B | 1 | 8 | 8 | 8 |
| II | 14 | B | 2 | 16 | 12 | 14 |
| II | 14 | B | 3 | 12 | 16 | 14 |
| II | 14 | C | 1 | 12 | 8 | 10 |
| II | 14 | C | 2 | 16 | 16 | 16 |
| II | 14 | C | 3 | 8 | 12 | 10 |
| III | 0 | A | 1 | 40 | 32 | 36 |

Table A12. Continued.

| SERIES | DAY | TREAT | PLOT | TSS, mg/l Rep 1 | Rep 2 | Average |
|---|---|---|---|---|---|---|
| III | 0 | A | 2 | 76 | 72 | 74 |
| III | 0 | A | 3 | 20 | 20 | 20 |
| III | 0 | B | 1 | 28 | 28 | 28 |
| III | 0 | B | 2 | 28 | 40 | 34 |
| III | 0 | B | 3 | 40 | 52 | 46 |
| III | 0 | C | 1 | 44 | 36 | 40 |
| III | 0 | C | 2 | 72 | 64 | 68 |
| III | 0 | C | 3 | n/a | 36 | 36 |
| III | 3 | A | 1 | 64 | 76 | 70 |
| III | 3 | A | 2 | 16 | 20 | 18 |
| III | 3 | A | 3 | 60 | 72 | 66 |
| III | 3 | B | 1 | 40 | 32 | 36 |
| III | 3 | B | 2 | 28 | 24 | 26 |
| III | 3 | B | 3 | 72 | 88 | 80 |
| III | 3 | C | 1 | 28 | 28 | 28 |
| III | 3 | C | 2 | 124 | 128 | 126 |
| III | 3 | C | 3 | 64 | 60 | 62 |
| III | 7 | A | 1 | 68 | 68 | 68 |
| III | 7 | A | 2 | 24 | 28 | 26 |
| III | 7 | A | 3 | 144 | 64 | 104 |
| III | 7 | B | 1 | 84 | 56 | 70 |
| III | 7 | B | 2 | 12 | | 12 |
| III | 7 | B | 3 | 20 | 36 | 28 |
| III | 7 | C | 1 | 8 | | 8 |
| III | 7 | C | 2 | 20 | 20 | 20 |
| III | 7 | C | 3 | 8 | 16 | 12 |
| III | 18 | A | 1 | 68 | 96 | 82 |
| III | 18 | A | 2 | 100 | 36 | 68 |
| III | 18 | A | 3 | 84 | 84 | 84 |
| III | 18 | B | 1 | 24 | 16 | 20 |
| III | 18 | B | 2 | 24 | 16 | 20 |
| III | 18 | B | 3 | 56 | 40 | 48 |
| III | 18 | C | 1 | 28 | 20 | 24 |
| III | 18 | C | 2 | 20 | 80 | 50 |
| III | 18 | C | 3 | 52 | 44 | 48 |

Table A13. COD results of runoff samples.

| | | | | COD (absorption) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SERIES | DAY | TREAT | PLOT | Rep1 | Rep2 | Rep3 | Rep4 | Rep5 | Rep6 | Mean |
| I | 0 | A | 1 | 79 | 99 | | | | | 89.00 |
| I | 0 | A | 2 | 71 | 59 | | | | | 65.00 |
| I | 0 | A | 3 | 102 | 59 | 56 | 79 | | | 74.00 |
| I | 0 | B | 1 | 107 | 87 | | | | | 97.00 |
| I | 0 | B | 2 | 74 | 107 | | | | | 90.50 |
| I | 0 | B | 3 | 99 | 74 | | | | | 86.50 |
| I | 0 | C | 1 | 56 | 64 | | | | | 60.00 |
| I | 0 | C | 2 | n/a | | | | | | |
| I | 0 | C | 3 | 102 | 102 | | | | | 102.00 |
| I | 2 | A | 1 | 54 | 41 | | | | | 47.50 |
| I | 2 | A | 2 | 0 | 29 | | | | | 14.50 |
| I | 2 | A | 3 | 37 | 47 | | | | | 42.00 |
| I | 2 | B | 1 | 32 | 61 | | | | | 46.50 |
| I | 2 | B | 2 | 0 | 7 | | | | | 3.50 |
| I | 2 | B | 3 | 49 | 39 | | | | | 44.00 |
| I | 2 | C | 1 | 66 | 12 | | | | | 39.00 |
| I | 2 | C | 2 | 2 | 34 | | | | | 18.00 |
| I | 2 | C | 3 | 49 | 64 | | | | | 56.50 |
| I | 7 | A | 1 | n/a | | | | | | |
| I | 7 | A | 2 | 47 | 61 | | | | | 54.00 |
| I | 7 | A | 3 | 69 | 57 | | | | | 63.00 |
| I | 7 | B | 1 | 61 | 44 | | | | | 52.50 |
| I | 7 | B | 2 | 8 | 13 | | | | | 10.50 |
| I | 7 | B | 3 | 26 | 13 | | | | | 19.50 |
| I | 7 | C | 1 | 41 | 51 | | | | | 46.00 |
| I | 7 | C | 2 | 38 | 33 | | | | | 35.50 |
| I | 7 | C | 3 | 28 | 20 | | | | | 24.00 |
| I | 13 | A | 1 | 84 | 91 | | | | | 87.50 |
| I | 13 | A | 2 | 96 | 99 | | | | | 97.50 |
| I | 13 | A | 3 | 53 | 51 | | | | | 52.00 |
| I | 13 | B | 1 | 104 | 38 | 71 | 69 | | | 70.50 |
| I | 13 | B | 2 | 99 | 99 | | | | | 99.00 |
| I | 13 | B | 3 | 40 | 23 | 20 | 23 | | | 26.50 |
| I | 13 | C | 1 | 51 | 63 | | | | | 57.00 |
| I | 13 | C | 2 | 81 | 68 | | | | | 74.50 |
| I | 13 | C | 3 | 66 | 73 | | | | | 69.50 |
| I | 30 | A | 1 | 17 | 14 | 13 | 18 | | | 15.50 |
| I | 30 | A | 2 | 18 | | 19 | | | | 18.50 |
| I | 32 | A | 3 | 20 | 28 | 28 | 21 | | | 24.25 |
| I | 30 | B | 1 | 63 | 45 | 44 | 66 | | | 54.50 |
| I | 32 | B | 2 | 38 | 23 | 40 | 29 | | | 32.50 |

Table A13. Continued.

| | | | | COD (absorption) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **SERIES** | **DAY** | **TREAT** | **PLOT** | **Rep1** | **Rep2** | **Rep3** | **Rep4** | **Rep5** | **Rep6** | **Mean** |
| I | 32 | B | 3 | 40 | | | | | | 40.00 |
| I | 30 | C | 1 | 21 | 43 | 15 | 45 | | | 31.00 |
| I | 32 | C | 2 | 34 | 16 | 19 | 33 | | | 25.50 |
| I | 32 | C | 3 | 30 | | 37 | | | | 33.50 |
| II | 0 | A | 1 | 23 | 35 | 26 | 37 | 46 | 39 | 34.33 |
| II | 0 | A | 2 | 60 | 33 | 15 | 55 | | 47 | 42.00 |
| II | 0 | A | 3 | 58 | 66 | | | 19 | 12 | 38.75 |
| II | 0 | B | 1 | 54 | | 30 | | 45 | 44 | 43.25 |
| II | 0 | B | 2 | 63 | | 57 | 65 | 71 | 70 | 65.20 |
| II | 0 | B | 3 | | 45 | 40 | 66 | 42 | 77 | 54.00 |
| II | 0 | C | 1 | 52 | 52 | | | 26 | 33 | 40.75 |
| II | 0 | C | 2 | 80 | | 72 | | 49 | 55 | 64.00 |
| II | 0 | C | 3 | 71 | | 56 | 99 | | | 75.33 |
| II | 3 | A | 1 | 25 | 68 | | | | | 46.50 |
| II | 3 | A | 2 | 31 | 26 | | | | | 28.50 |
| II | 3 | A | 3 | 40 | 20 | | | | | 30.00 |
| II | 3 | B | 1 | 44 | 31 | | | | | 37.50 |
| II | 3 | B | 2 | 26 | 34 | | | | | 30.00 |
| II | 3 | B | 3 | 21 | 14 | | | | | 17.50 |
| II | 3 | C | 1 | 37 | 40 | | | | | 38.50 |
| II | 3 | C | 2 | 9 | 23 | | | | | 16.00 |
| II | 3 | C | 3 | 34 | 34 | | | | | 34.00 |
| II | 7 | A | 1 | 34 | 27 | | | | | 30.50 |
| II | 7 | A | 2 | 21 | 10 | | | | | 15.50 |
| II | 7 | A | 3 | 18 | 28 | | | | | 23.00 |
| II | 7 | B | 1 | 37 | 41 | | | | | 39.00 |
| II | 7 | B | 2 | 23 | 36 | | | | | 29.50 |
| II | 7 | B | 3 | n/a | | | | | | |
| II | 7 | C | 1 | 79 | 62 | | | | | 70.50 |
| II | 7 | C | 2 | 15 | 12 | | | | | 13.50 |
| II | 7 | C | 3 | 27 | 33 | | | | | 30.00 |
| II | 14 | A | 1 | n/a | | | | | | |
| II | 14 | A | 2 | n/a | | | | | | |
| II | 14 | A | 3 | n/a | | | | | | |
| II | 14 | B | 1 | n/a | | | | | | |
| II | 14 | B | 2 | n/a | | | | | | |
| II | 14 | B | 3 | n/a | | | | | | |
| II | 14 | C | 1 | n/a | | | | | | |
| II | 14 | C | 2 | n/a | | | | | | |
| II | 14 | C | 3 | n/a | | | | | | |
| III | 0 | A | 1 | 25 | 21 | | | | | 23.00 |

Table A13. Continued.

| | | | | COD (absorption) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SERIES | DAY | TREAT | PLOT | Rep1 | Rep2 | Rep3 | Rep4 | Rep5 | Rep6 | Mean |
| III | 0 | A | 2 | 80 | 65 | | | | | 72.50 |
| III | 0 | A | 3 | 43 | 63 | | | | | 53.00 |
| III | 0 | B | 1 | 33 | 34 | | | | | 33.50 |
| III | 0 | B | 2 | 33 | 32 | | | | | 32.50 |
| III | 0 | B | 3 | 48 | 23 | | | | | 35.50 |
| III | 0 | C | 1 | 34 | 30 | | | | | 32.00 |
| III | 0 | C | 2 | 21 | 19 | | | | | 20.00 |
| III | 0 | C | 3 | 22 | 22 | | | | | 22.00 |
| III | 3 | A | 1 | 43 | 46 | | | | | 44.50 |
| III | 3 | A | 2 | 43 | 22 | | | | | 32.50 |
| III | 3 | A | 3 | 108 | 37 | | | | | 72.50 |
| III | 3 | B | 1 | 31 | 43 | | | | | 37.00 |
| III | 3 | B | 2 | 28 | 25 | | | | | 26.50 |
| III | 3 | B | 3 | 22 | 22 | | | | | 22.00 |
| III | 3 | C | 1 | 34 | 43 | | | | | 38.50 |
| III | 3 | C | 2 | 120 | 68 | | | | | 94.00 |
| III | 3 | C | 3 | 52 | 62 | | | | | 57.00 |
| III | 7 | A | 1 | 115 | 137 | | | | | 126.00 |
| III | 7 | A | 2 | 30 | 55 | | | | | 42.50 |
| III | 7 | A | 3 | 93 | 137 | | | | | 115.00 |
| III | 7 | B | 1 | 98 | 41 | | | | | 69.50 |
| III | 7 | B | 2 | 44 | 181 | | | | | 112.50 |
| III | 7 | B | 3 | 77 | 49 | | | | | 63.00 |
| III | 7 | C | 1 | 49 | 140 | | | | | 94.50 |
| III | 7 | C | 2 | 38 | 49 | | | | | 43.50 |
| III | 7 | C | 3 | 30 | 30 | | | | | 30.00 |
| III | 18 | A | 1 | 25 | 52 | 18 | 10 | 46 | 52 | 33.83 |
| III | 18 | A | 2 | | | 27 | 13 | 71 | 59 | 42.50 |
| III | 18 | A | 3 | 66 | 96 | 25 | 17 | 40 | 43 | 47.83 |
| III | 18 | B | 1 | | | 6 | 12 | 52 | 43 | 28.25 |
| III | 18 | B | 2 | 68 | 98 | 17 | 4 | 49 | 49 | 47.50 |
| III | 18 | B | 3 | | | 10 | 16 | 145 | 37 | 52.00 |
| III | 18 | C | 1 | 41 | 140 | 17 | -4 | 62 | 59 | 52.50 |
| III | 18 | C | 2 | | | 2 | -1 | 49 | 99 | 37.25 |
| III | 18 | C | 3 | 104 | 82 | 44 | 38 | 142 | 157 | 94.50 |

# APPENDIX B

## SPSS® SYNTAX

```
UNIANOVA
ln_load BY treat WITH day
/METHOD = SSTYPE(4)
/INTERCEPT = INCLUDE
/EMMEANS = TABLES(OVERALL) WITH(day=X)
/EMMEANS = TABLES(treat) WITH(day=X) COMPARE ADJ(SIDAK)
/PRINT = DESCRIPTIVE PARAMETER HOMOGENEITY
/CRITERIA = ALPHA(.05)
/DESIGN = day treat treat*day.
```

# VITA

Alyson Kristine Bertges was born in Falls Church, Virginia, on the sixteenth day of March, 1975. She graduated from Live Oak High School in the spring of 1993 and entered Louisiana State University (LSU) in Baton Rouge, Louisiana, in the fall of 1993. She obtained a Bachelor of Science in biological engineering from LSU in the spring of 1997.

She began graduate school at Texas A & M University in College Station, Texas, in the fall of 1997, but transferred back to LSU in the fall of 1998 to continue graduate school part time while working as a Research Associate in the Department of Biological and Agricultural Engineering. While attending graduate school, her emphasis of study was in environmental engineering with a focus in water quality.

She married Ryan Hubbs in 1999, taking the name Alyson Kristine Bertges Hubbs. In the summer of 2001, she began working for an environmental consulting firm as an environmental engineer specializing in air quality. She currently resides with her husband, four cats (Tiger, Bootsie, Smokey and Mocha) and two dogs (Sayan and Lacey) in Slidell, Louisiana. She received a Master of Science in Biological and Agricultural Engineering degree in December of 2002.