EVALUATION OF THE POTENTIAL FOR RESTORING COMMERCIALLY VIABLE OYSTER HARVESTING IN SUWANNEE SOUND

ECT
Environmental Consulting & Technology, Inc.

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EXECUTIVE SUMMARY

Salmonella has been detected in both oysters and in the Suwannee River above and below the Town of Suwannee. According to the Florida Department of Health (FDOH), nearly all of the onsite sewage treatment and disposal systems (OSTDSs) in the Town of Suwannee were considered noncompliant with onsite system regulations in effect in 1990. These OSTDSs were identified as one of the sources for fecal contamination of the oysters in Suwannee Sound and adjacent area; consequently, plans were approved to construct a central wastewater treatment plant (WWTP) to help alleviate the problem. The facility became operational in October 1997 and connections to the system began immediately. A total of 850 OSTDSs were purged and abandoned at the same time each household was connected to the WWTP system. By the end of November or mid-December 1997, all but about 50 of the OSTDSs were closed; the remaining OSTDSs were closed by March 1998.

The hypothesis we proposed to test in this study was that, with the connection of the residences of the Town of Suwannee to a central WWTP and subsequent abandonment of the OSTDSs, sewage contamination would decrease and, consequently, commercially viable oyster harvesting in Suwannee Sound could be restored.

A study plan was implemented to examine the pre- and post-construction water qaulity to document potential improvements following closure of the OSTDSs. The plan consisted of baseline monitoring of fecal coliform, *Salmonella* occurrence, total nitrate nitrite, and total kjeldahl nitrogen. These same analyses plus *Salmonella* serotyping were repeated in the post-construction monitoring.

Our results showed that total and fecal coliform concentrations were relatively high throughout the entire study. The average fecal coliform counts in the canals of the town was about three times as high as the river and exceeded the Class III standard for fresh and marine water. We believe that the heavy rains associated with El Niño have obscured the positive effects on water quality brought about by the Town of Suwannee switching to a WWTP. Certainly during the first few weeks of the post-construction sampling (prior to the frequent

rains of December 1997 and January 1998), there was some indication that fecal coliform levels were lower.

Salmonella serotyping identified 10 different serotypes of the approximately 2,700 known serotypes within the genus of *Salmonella*. It was not possible, however, to correlate the observed species with possible sources. The complexities of analyzing for *Salmonella* were apparent as discrepancies were observed between the serotyping results and the presence/absence data. Consequently, the *Salmonella* results are presented as a qualitative description of the general trends rather than a quantitative analysis. The general trends observed during the study were:

1. There were far more occurrences of *Salmonella* at the river stations than in the canal stations.
2. *Salmonella* was always present at the upstream control station (Station 10) and the main channel, downstream station (Station 8).
3. There were more occurrences of *Salmonella* during post-construction monitoring in the canals than pre-construction (36.7 and 13.8 percent, respectively).
4. Pre- and post-construction occurrences of *Salmonella* were comparable in the river.
5. There appeared to be a negative correlation between fecal coliform and *Salmonella*, i.e., as the amount of fecal coliform increased, the occurrence of *Salmonella* decreased.

The goal of the study was to determine if installing a central wastewater treatment system in the Town of Suwannee and closing all of the OSTDSs would help restore a viable commercial oyster harvesting industry. Since the oyster harvesting was closed because of *Salmonella* contamination, the question becomes "is the Town of Suwannee the source of *Salmonella*, and if so, will the installation of a WWTP reduce or eliminate this source?" This study indicates that the primary source of *Salmonella* is not the Town of Suwannee but rather the Suwannee River upstream of the town. The upstream stations had higher occurrences of

Salmonella than the canals of the town. Consequently, if input from the canals were totally eliminated, there still would be a major source of *Salmonella* to Suwannee Sound.

Since *Salmonella* was identified in the canals (although less frequently than in the river), eliminating this source would help. The post-construction occurrences of *Salmonella*, however, were higher than the pre-construction values even though the OSTDSs were closed and no longer a potential source. We believe that the post-construction monitoring results were distorted by the extensive rains resulting from El Niño. These rains may have caused the more frequent occurrences of *Salmonella* in the canals. However, since the OSTDSs were closed and not a possible source of *Salmonella*, the extensive rains contributed *Salmonella* from other sources. Consequently, it follows that installing the WWTP and closing the OSTDSs did not reduce the *Salmonella* source and probably did not substantially contribute to opening the oyster reefs for production.

Although it is unlikely that the WWTP will substantially reduce the source of *Salmonella* to the oyster reefs, other positive effects are expected on water quality. The fecal coliform concentrations in the canals were very high. There did appear to be improvement in these values during the weekly sampling until the extensive rains began and masked the results. Although the improvement resulting from the WWTP could not be documented during this study, an extensive baseline database has been established that can readily be used for comparison in subsequent years.

1.0 INTRODUCTION

1.1 PROJECT HISTORY

A cooperative study by the Florida Department of Natural Resources (FDNR, now the Florida Department of Environmental Protection [FDEP]), the Florida Department of Agriculture and Consumer Services (FDACS), and the U.S. Food and Drug Administration (FDA) in 1990 (Glatzer, 1990), investigated an incident of gastroenteritis in Florida during the fall and winter of 1989-90. At least two of the cases were indicative of salmonellosis. Samples of oysters from Louisiana and Florida were analyzed for *Salmonella*. About 39 percent of the oysters tested positive for *Salmonella*; approximately 90 percent of these oysters were from Suwannee Sound and adjacent areas to the north and south—Horseshoe Beach and Cedar Key, respectively. In addition, *Salmonella* was detected in water samples taken above and below the Town of Suwannee. Other possible sources identified by Glatzer (1990) were the waterfowl and wildlife in the area. In May 1990 FDNR reclassified the oyster areas of Suwannee Sound. This reclassification included closure line changes and a new management plan based on rainfall amount.

According to the Florida Department of Health and Rehabilitative Services (FDHRS, 1991), now the Florida Department of Health (FDOH), the Town of Suwannee had a total of 717 onsite sewage and treatment disposal systems (OSTDSs). Of these, seven (i.e., <1 percent) systems were considered adequate. The remaining 710 inadequate OSTDSs were identified as one of the sources for fecal contamination of the oysters in Suwannee Sound and adjacent areas. Because of the number of inadequate OSTDSs, plans were approved to construct a central wastewater treatment plant (WWTP). The facility became operational in October 1997 and connections to the system began immediately. The OSTDSs were pumped out and abandoned (filled with sand) at the same time each household was connected to the WWTP system. By the end of November or mid-December 1997 all but about 50 of the OSTDSs were closed. The remaining 50 OSTDSs were closed by March 1998. Instead of the 717 OSTDSs initially reported by FDHRS (1991), 850 OSTDSs were found; all were properly abandoned.

The hypothesis we proposed to test in this study was that, with the connection of the residences of the Town of Suwannee to a central WWTP and subsequent abandonment of the OSTDSs, sewage contamination would decrease and, consequently, commercially viable oyster harvesting in Suwannee Sound could be restored. In the following subsections, we present a description of the study site (Subsection 1.2) and the overall goals and objectives of this study (Subsection 1.3).

1.2 SITE DESCRIPTION

This study concentrated on the area surrounding the Town of Suwannee which is located about 2 miles upstream on the Suwannee River in Dixie County. The study area extended from the mouths of two of the major channels of the Suwannee River (Alligator Pass and Wadley Pass) to a point about 4.5 miles upstream of the mouth of Alligator Pass (Figure 1.2-1). The Suwannee River at this point is the boundary between Dixie and Levy Counties in northwestern peninsular Florida.

Virtually all of this study took place within the lower Suwannee River Basin which encompasses an area of about 1,600 square miles (mi^2) (Suwannee River Water Management District [SRWMD], 1988); the entire Suwannee River drainage basin encompasses an area of 10,050 mi^2, of which 4,322 mi^2 lie within Florida (Heuberger and Quintana, 1997a). Our study area lies within the Coastal Swamp physiographic region. According to the SRWMD (1988), this area consists of muds and silts that support marsh grasses. The area transitions seaward from freshwater to brackish to saltwater marsh. SRWMD (1988) characterized this area as a relatively low energy environment. Near the coast, the topography is low and virtually featureless.

According to the SRWMD (1988), the lower Suwannee basin is characterized by humid, subtropical summers with winters more characteristic of a southern temperate climate. The annual average precipitation measured at Steinhatchee, located 30 miles northwest of the Town of Suwannee, is 58.83 inches (based on 39 years of data). The highest rainfall occurs during the summer months of June through August and is frequently associated with localized convectional thunderstorms (SRWMD, 1988). During the winter, rainfall is

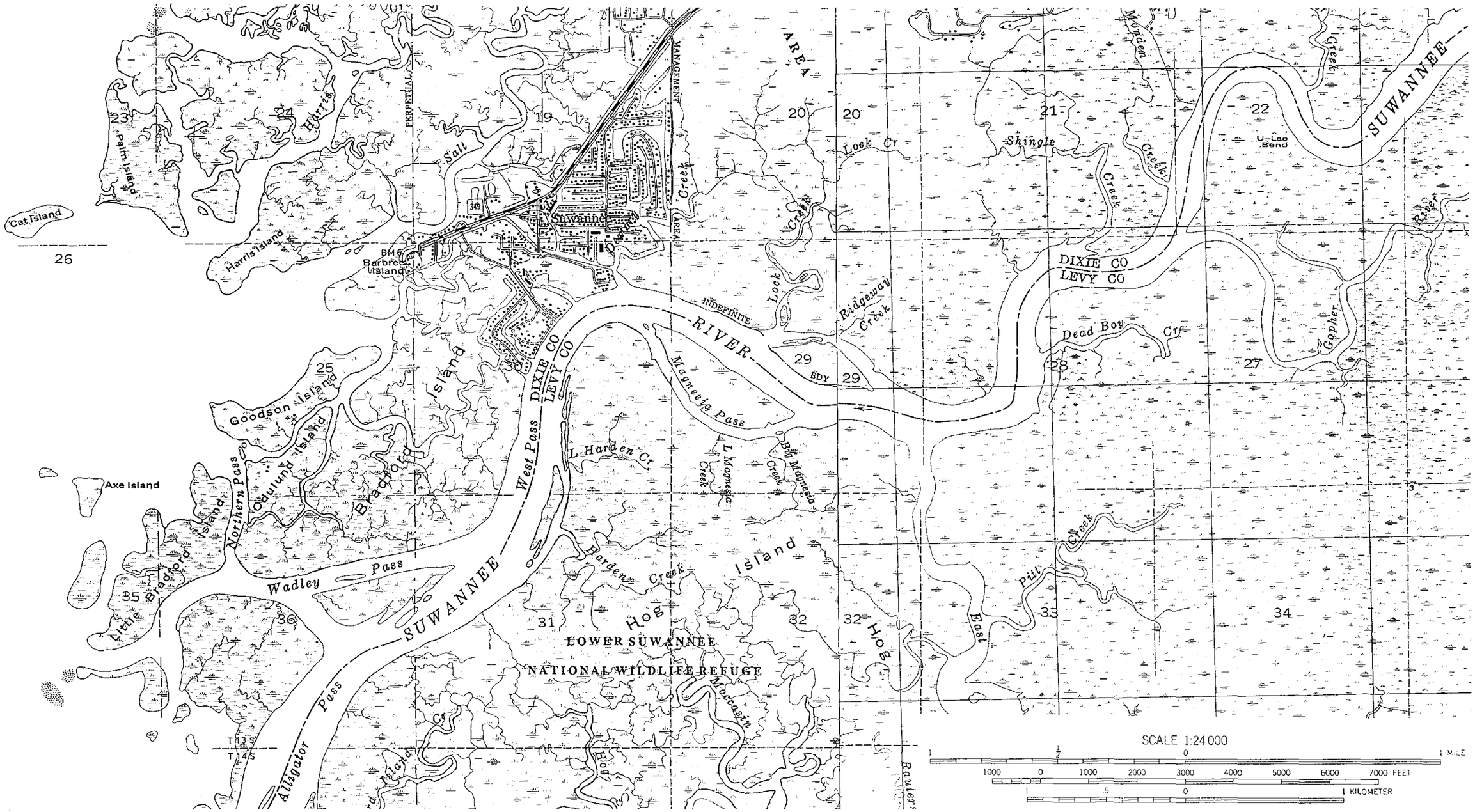

FIGURE 1.2-1.

STUDY AREA FOR FLORIDA DEPARTMENT OF HEALTH SUWANNEE STUDY

Source: USGS, 1993a; USGS, 1993b; ECT, 1998

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associated with the passage of weather fronts. These storms normally are more regional in distribution and longer in duration (SRWMD, 1988). The period of lowest rainfall occurs between October and November. According to the SRWMD (1988), the average evapotranspiration rate for the area is 42 inches per year, i.e., about 75 percent of the total annual precipitation.

Contributions to the Suwannee River streamflow include runoff from rainfall (according to the U.S. Geological Survey [USGS] [1997] to be 14.76 inches), the Santa Fe and Withlacoochee Rivers, other tributaries, and numerous springs. According to the USGS (1997), the median flow for the Suwannee River near Wilcox, Florida (about 25 miles upstream of the Town of Suwannee), from Water Years (WY) 1931 through 1996, was 8,360 cubic feet per second (cfs); the annual mean flow during this period was 10,470 cfs. These flows are somewhat lower than the flows expected at the mouth of the Suwannee River since the drainage area of the Suwannee near Wilcox is 9,640 mi^2 (i.e., about 85 percent of the total drainage basin). The lowest daily flow (2,960 cfs) occurred on October 25, 1981; the highest daily flow (84,700 cfs) occurred on April 14, 1948. The mean monthly flow for the Suwannee River (WY1993-1994) and monthly mean precipitation for Steinhatchee are summarized in Figure 1.2-2. It is apparent from this figure that the months of November and December are relatively dry with monthly rainfall <4 inches per month. Mean monthly streamflows on the Suwannee River near Wilcox are also at their lowest being about 7,700 and 8,000 cfs, respectively, for these two months. November and December, therefore, were considered to be the best months during which to conduct the sampling since dilution by the Suwannee River would, in theory, be the lowest.

The Suwannee River in the vicinity of the Town of Suwannee is tidally influenced. The tides are semidiurnal with a mean tide and tidal range of 1.8 and 2.4 feet (ft), respectively. At mean higher high water (MHHW), the tide rises to 3.4 ft. Water levels in the Suwannee River near the Town of Suwannee are affected, not only by the tides, but also by river flow and wind.

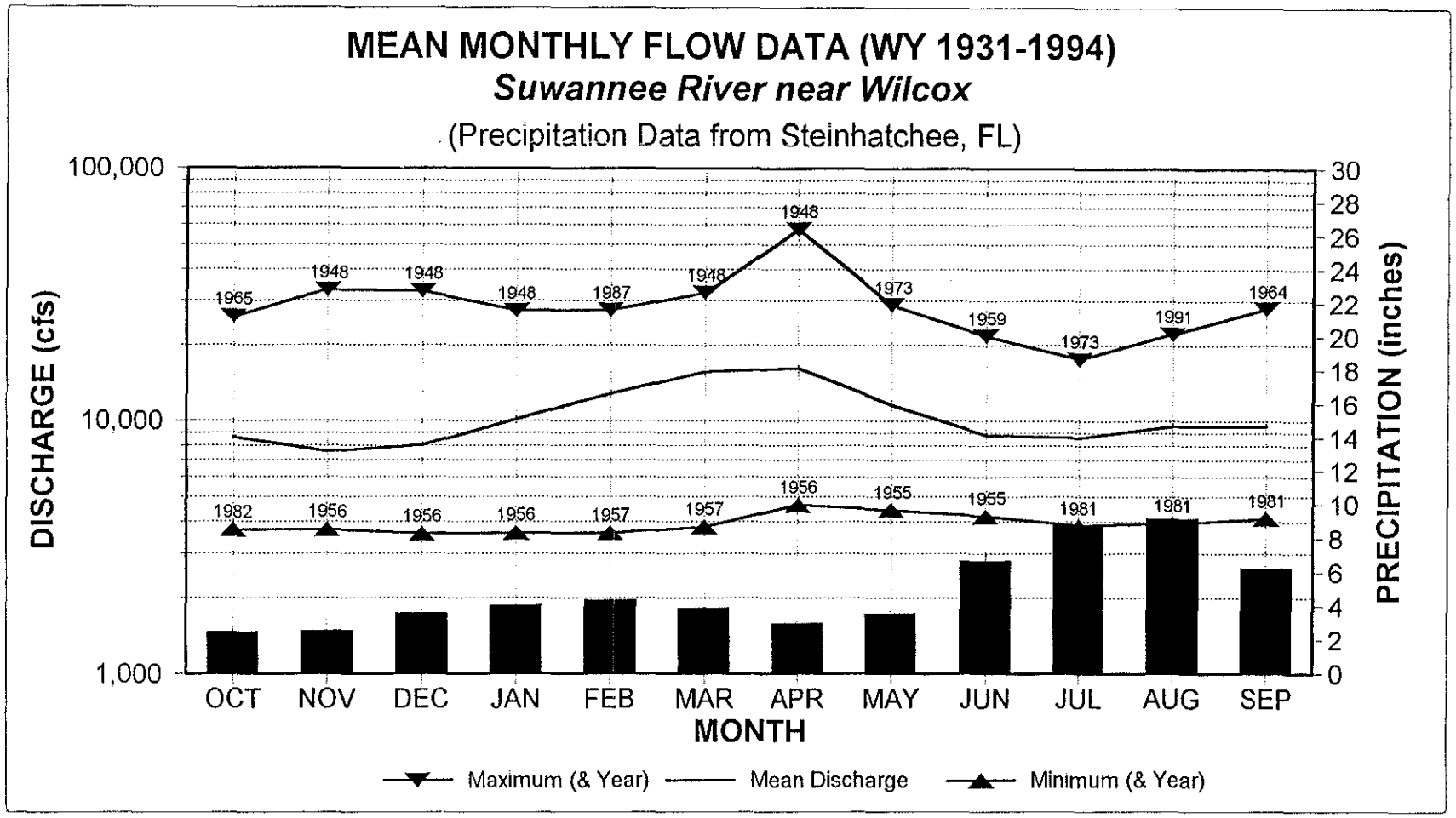

FIGURE 1.2-2.
MAXIMUM, MEAN MONTHLY, AND MINIMUM FLOWS FOR THE SUWANNEE RIVER NEAR WILCOX, FLORIDA, AND MEAN MONTHLY PRECIPITATION AT STEINHATCHEE, FLORIDA

Source: USGS, 1993a; USGS, 1993b; ECT, 1998.

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The Suwannee River is designated as an Outstanding Florida Water. According to Hand *et al.* (1994), the water quality is generally good in all reaches of the lower Suwannee River. Hand *et al.* (1994) identified several pollutant sources to the lower Suwannee River including Occidental's phosphorus mining operation, Gold Kist, Inc.'s poultry processing plant, as well as other poultry facilities, dairies, and septic tanks. In addition, the Withlacoochee, a major tributary to the Suwannee, receives effluent from several WWTPs and a pulp mill in Georgia. The Town of Suwannee has been identified by numerous authors (Hand *et al* [1994], Glatzer [1990] to name a few) as a source of pollution as a result of inadequate OSTDSs. The new WWTP in the Town of Suwannee resulted in the closure of all septic tanks, with the treated effluent being sprayed on land about 5 miles from the river.

1.3 GOALS AND OBJECTIVES

The goal of this project was to evaluate the potential for restoration of commercially viable oyster harvesting in Suwannee Sound following the connection of the Town of Suwannee to a WWTP. The specific objectives included:

- Conduct a preliminary online literature search to identify and evaluate various methods for detecting domestic sewage in receiving waters.
- Prepare a plan of study (POS) and quality assurance project plan (QAPP) that would lay out a sampling strategy to meet the goal of the project.
- Conduct pre-construction (of the WWTP) field sampling that would: (1) determine the optimum day of the week to sample, if any; (2) confirm that low tide was the ideal worst-case time to sample; (3) evaluate the various methods selected for detection of domestic sewage; and (4) quantify water quality conditions in the Suwannee River in the vicinity of the Town of Suwannee prior to the construction of the WWTP and subsequent abandonment of the OSTDSs.
- Conduct post-construction sampling in order to determine what changes, if any, resulted from the Town of Suwannee converting from OSTDSs to the WWTP with land disposal.

- Evaluate the field data and data from other sources in light of the information obtained from the ongoing online literature search and determine if there has been any change in water quality and if the change is statistically significant.

2.0 LITERATURE REVIEW

Online searches of scientific literature databases, library searches, and personal contacts were made to assemble information to support this study. The first objective of the literature collection task was to provide information to support the development of the POS. The other objective of the literature review was to provide information to assist researchers in interpreting the results of this study.

The information collected from the online searches, libraries, and other sources were entered into the free-form database askSam®. This database program is capable of handling large quantities of textual information, automatic assignation of fields, comprehensive queries, sorting, and reporting. Once the bibliographic data were entered into askSam®, queries were made and reports produced for the researchers involved in this project. As additional publications were located, these were added to the database so that it remained up-to-date throughout the project.

The sources of information queried included:

Online Databases

- Water Resources Abstracts.
- CAB Abstracts.
- Pollution Abstracts.
- INSPEC.
- Ei Compendex Plus.
- NTIS.
- Medline.
- Life Sciences Collection.

Agencies and Organizations

- Florida Department of Health (FDOH).
- Florida Department of Environmental Protection (FDEP).
- Suwannee River Water Management District (SRWMD).

- U.S. Environmental Protection Agency (USEPA).
- U.S. Fish and Wildlife Service (USFWS).
- U.S. Geological Survey (USGS).
- National Oceanic and Atmospheric Administration's (NOAA's) National Climatic Data Center (NCDC).
- NOAA's National Data Buoy Center (NDBC).
- University of Florida (UF).
- Library system of Florida's universities.

2.1 OTHER STUDIES OF SEWAGE TREATMENT PROBLEMS

Over 400 literature citations were recorded into the database. The following are a few examples of studies that provide relevant information to this project. Miller (1992) studied the migration of OSTDS effluent in the Northern Midlands area of Palm Beach County, Florida, where the topography is flat, the soils are poorly drained, and near-surface marl layers retard rainfall infiltration and cause frequent flooding. Although this study was not conducted on the coast, the water quality data presented provide an indication of how far pollutants from OSTDS effluent (in this study, nutrients) can migrate. Miller (1992) found that in shallow wells at distances of 24 and 38 ft from the outlet of the OSTDS, the total Kjeldahl nitrogen (TKN) decreased from 4.2 milligrams per liter as nitrogen (mg/L-N) at 24 ft from the source to 3.30 mg/L-N at 38 ft from the source (the TKN concentration at the outlet of the OSTDS was not reported). Because of the anoxic conditions in the ground water, nitrate nitrogen was at or just below the method detection limit of 0.02 mg/L-N. The background concentrations of TKN and nitrate nitrogen obtained from a well upgradient of the OSTDS were 0.43 and <0.02 mg/L-N, respectively. Consequently, there was approximately a ten-fold increase in TKN 24-ft downgradient of the source compared to the upgradient value. Two other OSTDS sites showed similar concentrations of TKN and nitrate nitrogen. These results indicate that TKN concentrations in ground water are elevated in the vicinity of an OSTDS and that this TKN can migrate (with only minimal attenuation) over distances comparable to those that exist in the Town of Suwannee.

LaPointe and Clark (1992) studied nutrient inputs from OSTDSs in the Florida Keys and the resulting coastal eutrophication. According to LaPointe and Clark (1992), approximately 65 percent of the domestic wastewater in the Florida Keys is disposed of via some 30,000 OSTDSs. The leachate from these OSTDSs increase the nutrient concentrations in the underlying limestone. The release of this nutrient rich water is enhanced by tides and rainfall thereby enhancing coastal eutrophication. LaPointe and Clark (1992) reported total nitrate concentrations >0.8 micromoles (μM) in the canal systems and nearshore seagrass meadows off the Florida Keys. They also stated that the percentage of total nitrogen available as dissolved inorganic nitrogen (18 percent), relative to dissolved organic nitrogen and particulate nitrogen (50 and 31 percent, respectively), was highest in the canal and seagrass systems and lowest offshore in the patch and bank reef where dissolved inorganic nitrogen was only 8 percent of the total nitrogen. These data suggest that there is a rapid biological uptake of dissolved inorganic nitrogen in the canals and seagrass beds.

LaPointe and Clark (1992) also reported that dissolved oxygen (DO) concentrations, in particular early morning concentrations, correlated significantly and negatively with nutrient concentrations in the canals and seagrass beds. In fact, lower and often hypoxic conditions (DO <2.5 mg/L) were observed.

LaPointe and Clark (1992) conclude that human activities, in particular, OSTDSs enrich ground waters with nutrients which in turn enrich the nearshore coastal waters. This leads to algal blooms and low DO concentrations which degrade water quality and marine habitat.

Unlike Miller (1992) and LaPointe and Clark (1992) who studied nonmicrobiological contamination, Weiskel *et al* (1996) studied microbiological contamination in a coastal embayment (Buttermilk Bay, Cape Cod, Massachusetts) where the most likely sources of fecal bacterial contamination were OSTDSs, domestic animals, and wildlife. According to Weiskel *et al* (1996), direct fecal coliform inputs to the bay occurred primarily in winter and from waterfowl, which accounted for 33×10^{12} fecal coliforms per year (67 percent of the total annual loading). Although OSTDSs were the single largest source of fecal coliform in the watershed (460×10^{12} fecal coliforms per year), they only contribute a minute fraction

(<0.006 33 × 10^{12} fecal coliforms per year or <0.01 percent) of the annual input to the bay due to attenuation during subsurface transport. Surface water flows, on the other hand, contributed 12 × 10^{12} fecal coliforms per year (24 percent of the annual input to the bay), all from animal sources according to Weiskel *et al.* (1996). They also reported that wet-weather flows associated with short-duration rain events had a disproportionately high impact on nearshore fecal coliform levels. Other sources of fecal coliform included shoreline deposits of decaying vegetation (6 percent of annual input) and subtidal sediment resuspension (<3 percent of annual input).

In their conclusions, Weiskel *et al.* (1996) states that . . .

> "On-site septic systems are a demonstrated source of fecal bacteria to coastal waters in low-lying, fine-grained geologic settings where saturated soils enhance bacterial survival and breakout of effluent at the land surface is common . . . However, in permeable, moderate-relief settings like Cape Cod [the location of that study], where depths to the water table are great and low-moisture, well-aerated conditions prevail above the water table, septic systems do not appear to be a significant source of fecal bacteria to coastal waters."

The preceding conclusion implies that, in an area similar to that of the Town of Suwannee, where OSTDSs lie in saturated soils, they should be considered as significant sources of fecal bacteria.

Pommepuy *et al.* (1992) studied the die-off rates of *Escherichia coli* and *Salmonella* in the waters off France (the English Channel and the Mediterranean Sea). Pommepuy *et al.* (1992) investigated the apparent mortality or T90, i.e., time needed for 90 percent of bacteria to be unable to cultivate) for *Escherichia coli* and *Salmonella* in sediments and water. They report, based on their experiments and the work of others, that the T90 for *Escherichia coli* varies from 6 to 20 days and that *Salmonella* can survive for several weeks in sediments.

Again from their work and others, Pommepuy *et al.* (1992) report that the survival of *Escherichia coli* and *Salmonella* in the water column is affected by a number of factors including the quantity of organic matter (as nutrients or osmoprotectors in saltwater), the intensity of light at depth in the water column, and the water temperature. According to

Pommepuy *et al.* (1992), the greater the quantity of organic matter in the water the greater the probability that more nutrients and osmoprotectors are available to nourish the bacteria and protect them from osmotic shock resulting from dehydration. In addition, higher concentrations of organic matter generally equate with higher turbidity which protects the bacteria from the lethal effects of sunlight. Pommepuy *et al.* (1992) reported that, according to Rhodes and Kator (1988), *Salmonella* spp. populations exhibited less mortality and stress than did *Escherichia coli* at low temperatures (<10 °C).

Pommepuy *et al.* (1992) concluded . . .

> "The behavior of fecal bacteria is closely dependent on the environment's water or sediment quality. In coastal areas, fecal bacteria and pathogenic bacteria [such] as *Salmonella*, are able to find necessary elements for life: nutrients and osmotic compounds enable them to endure high salinity. On the other hand, suspended matter drastically impairs the visual clarity of water and therefore, by light scattering, protects bacteria from a bactericidal sunlight effect.
>
> On Mediterranean coasts, oligotrophic water and high solar radiation due to the climate greatly diminish the survival time of fecal bacteria in surface water: T90 are very short (<2 hours) at the surface; but in deep waters, in the same region, where the wastewaters plume is trapped under the thermocline, the T90 could be longer (several tens of hours).
>
> In the English Channel, waters and sediments are rich in organic matter; in addition the cloudy system and high turbidity significantly increase fecal bacterial survival: T90 may be very long, from several tens to several hundreds of hours."

The preceding discussions indicate that OSTDS effluent can be transported via ground water over distances comparable to the distances found in the Town of Suwannee between OSTDS drainfields and open water. Moreover, given unsuitable geohydrologic conditions, OSTDSs can become a significant source of fecal bacteria as well as nutrients. Weiskel *et al.* (1996), however, report that other sources of fecal bacteria must be considered including those from direct inputs such as water fowl and indirect inputs from surface water. Finally, fecal bacteria, given the suitable environmental conditions (such as high organic matter and, consequently, high turbidity), can survive for up to hundreds of hours in the estuarine environment.

In the following subsection, we review some of the studies that have been conducted to date on the Suwannee River Estuary.

2.2 PREVIOUS SUWANNEE RIVER STUDIES

Of the earlier studies identified of the Suwannee River and Estuary, few, if any, examined the occurrence of *Salmonella*. Coffin (1982), provided time series plots (from 1971 to 1981) for various inorganic water chemistry parameters for the Suwannee River near Wilcox, Florida. Of these parameters, nitrate nitrogen was the most relevant. Coffin (1982) reported nitrate nitrogen concentrations that ranged between 0.02 and 0.90 mg/L-N; the mean concentration appeared to be about 0.3 mg/L-N. The Coffin (1982) report did not, however, include any microbiological data.

Hu (1983), on the other hand, did concentrate on microbiology in the Suwannee Estuary; however, *Salmonella* was not one of the targeted genera. Hu (1983) investigated other pathogens and reported that ... "*Pseudomonas aeruginosa* [isolated at all six stations during all three sampling events], *Edwardsiella tarda*, *Aeromonas hydrophila*, *Chromobacterium* sp., and *Vibrio parahaemolyticus* were found frequently in the estuary." Hu (1983) noted that the highest total coliform counts were observed at Station 5 and Station 6. Hu's (1983) Station 5 was located in the main channel of the Suwannee River about ½ mile upstream of the Town of Suwannee; Station 6 was located in a dredged canal in the center of a newly developed housing area containing septic tanks in the Town of Suwannee. All samples were collected at low tide. The highest total coliform concentrations in water at Stations 5 and 6, respectively, were 15 and 43 most probable number per 100 milliliters (MPN/100 mL). The total coliform concentrations in sediments at Stations 5 and 6 were 93 and 23 most probable number per gram (MPN/g). Hu (1983) concluded that the results of his study ... "indicate that a number of opportunistic pathogens are found in the Suwannee River estuary and, therefore, it would be virtually impossible to harvest seafoods from these areas which would be free of all pathogens."

Wolfe and Wolfe (1985) presented the results of a relatively comprehensive water quality investigation of the Suwannee River Estuary. The data, collected by the SRWMD, were

obtained from stations located throughout Suwannee Sound and up to 4.5 miles upstream on the Suwannee River and all of East Pass. The emphasis of Wolfe and Wolfe (1985) was on correlating various parameters with either river stage or salinity. They did not report any microbiological data.

Like Wolfe and Wolfe (1985), Fellers (1993) also summarized SRWMD water quality data collected between February 1989 and January 1992; however, these data were collected exclusively from the Suwannee River (i.e., not Suwannee Sound). Three of these stations fell within our study area. These stations were Station 275 located about 3 miles upstream of the Town of Suwannee, Station 305 located below the Town of Suwannee in West Pass immediately before Wadley Pass and Alligator Pass, and Station 410 located in East Pass about 1.5 miles upstream of the Gulf of Mexico. The median concentrations of those parameters most relevant to this study are summarized in Table 2.2-1.

Table 2.2-1. Median Values for Water Quality Data Collected by SRWMD

Parameter	Station 275	Station 305	Station 410
Conductivity (μmhos/cm)	304	500	440
Salinity (‰)	0.0	0.5	4.0
Hydrogen Ion Activity (pH)	7.7	7.6	7.5
Dissolved Oxygen (mg/L)	6.6	5.8	6.0
Water Temperature (°C)	22.2	22.7	25.0
Secchi Transparency (m)	2.0	1.0	1.4
Total Kjeldahl Nitrogen (mg/L-N)	0.26	0.50	0.49
Total Nitrate + Nitrite Nitrogen (mg/l-N)	0.505	0.375	0.460
Total Coliform (MPN/100 mL)	80	80	90
Fecal Coliform (MPN/100 mL)	10	30	20

μmhos/cm micromhos per centimeter
‰ parts per thousand
mg/L milligrams per liter
°C degrees Celsius
m meters
mg/L-N milligrams per liter as nitrogen
MPN/100 mL most probable number per 100 milliliters

Sources: Fellers, 1993; ECT, 1998.

These data indicate that fecal coliform was higher at Station 305 located downstream of the Town of Suwannee. No other microbiological data were summarized in Fellers (1993).

Perhaps the publications most germane to this project are: (1) the *Special Study of Incidence of Salmonella in Suwannee Sound, October 23 - November 8, 1990* prepared by FDNR, FDACS, and the FDA in 1990 (Glatzer, editor, 1990); (2) a *Special Study of Incidence of Salmonella in Suwannee Sound, October 1997* (Heuberger and Quintana, 1997a); and (3) the *Comprehensive Shellfish Harvesting Area Survey of Suwannee Sound Dixie and Levy Counties, Florida* prepared by Heuberger and Quintana (1997b). The earlier report by Glatzer (1990), reported that *Salmonella* was detected in water samples taken above and below the Town of Suwannee. According to this study, the occurrence of *Salmonella* increased in the town, as did the level of pollution indicators suggesting that the Town of Suwannee was at least one of the sources of *Salmonella*. A report titled the *Suwannee River Floodplain Onsite Sewage Disposal System Inventory*, prepared by FDHRS (1991) concluded that within the Town of Suwannee, as of December 29, 1990, only seven of the 717 OSTDSs inspected complied with onsite system regulation in effect in 1990. It should be noted that this inventory was conducted in a period of relative drought which means that the worst-case scenario was not observed.

Glatzer (1990) reported that eight of the ten oyster sampling stations in Suwannee Sound tested positive for *Salmonella*. Concentrations as high as 40 *Salmonella* per 100 grams of tissue were observed. They also reported that there did not appear to be a correlation between fecal coliform indicators and *Salmonella* in the oyster tissue or the overlying water. Glatzer (1990) did report that there was a slight tendency for higher *Salmonella* recovery in areas with higher fecal coliform levels. Glatzer (1990) concluded that the "source[s] of contamination in the area include: the Suwannee River, the town of Suwannee, and large numbers of waterfowl and wildlife."

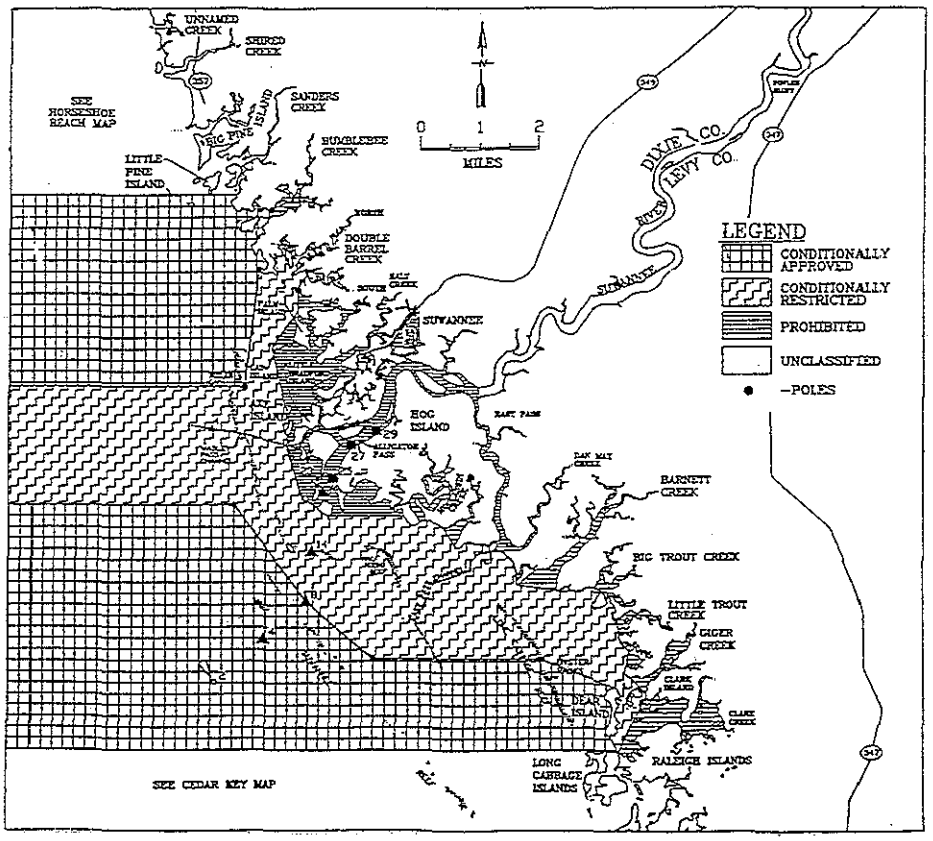
FDEP conducted a special sampling program for *Salmonella* during October 14, 1997. Ten stations representing proposed "Conditionally Approved" and "Conditionally Restricted" classification areas (Figure 2.2-1) were sampled; samples were not collected in the Suwannee River. Water samples were collected from all 10 stations; oyster samples were collected from four stations. The results of the FDEP study done by Heuberger and Quintana (1997a) are compared with the results of the Glatzer (1990) study in Table 2.2-2.

Table 2.2-2. Comparison of 1990 and 1997 *Salmonella* Study Results

	Presence (●)/Absence (○) of *Salmonella*			
	1997 Study		1990 Study	
Station	Water	Oysters	Water	Oysters
214	○			
222	○	○	●	●
224	○			
229	○			
231	○	○	○	●
237	○	○	○	●
238	○		●	○
247	○			
401	○	○		
420	○		●	●

Blanks indicate not sampled.
Sources: Glatzer, 1990; Heuberger and Quintana, 1997a.

The data presented in Table 2.2-2 shows that *Salmonella* was not detected at any station in 1997; however, it should be pointed out that the 1997 data represent a single sampling event that took place on October 14, 1997, whereas the 1990 data are based on samples collected during 11 sampling events conducted from October 23 through November 8, 1990 (Glatzer, 1990).



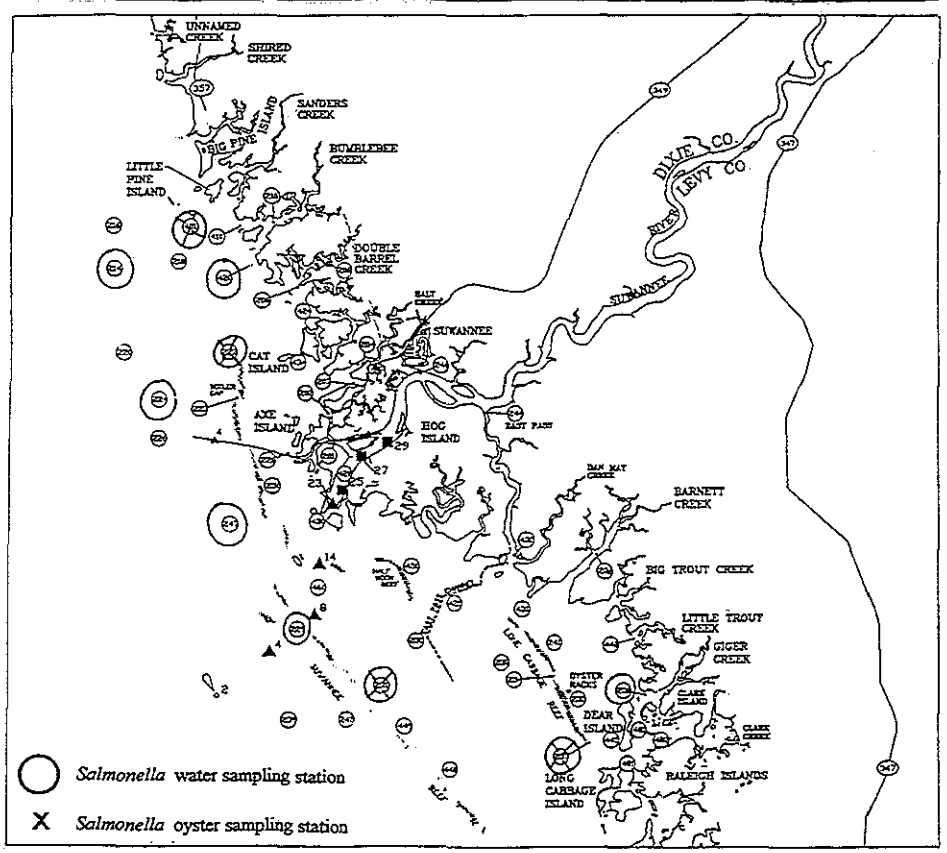


FIGURE 2.2-1.
PROPOSED SHELLFISH HARVESTING AREA CLASSIFICATIONS AND SALMONELLA FDEP SAMPLING LOCATIONS DURING OCTOBER 1997
Source: Heuberger and Quintana, 1997a; ECT, 1998.

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Heuberger and Quintana (1997b) discussed microbiological (fecal and total coliform) and other water quality data from 51 stations located in the lower Suwannee River and Suwannee Sound collected by FDEP during 192 sampling events conducted from January 1989 through September 1997. Heuberger and Quintana (1997a), using ANOVA, evaluated the relationship between fecal coliform and tidal stage. According to their analysis, fecal coliform levels were highest from low ebb tide to high flood and significantly different from high flood to low ebb. They also reported significant correlations between fecal coliform and rainfall and river stage (the latter 1 day prior to sampling) measured at Manatee Springs State Park near Chiefland, Florida.

3.0 STUDY DESIGN

3.1 SAMPLING PROGRAM

The field data collection task of this study was divided into two distinct phases that, in theory, differed only in the time during which they were conducted. These phases were:

1. A pre-construction monitoring program designed to establish baseline conditions during a 2-month period prior to construction.
2. A post-construction monitoring program that duplicated as closely as practical the pre-construction monitoring to assess the effects of the WWTP.

3.1.1 SAMPLING SCHEDULE AND FREQUENCY

The pre- and post-construction sampling were linked to the completion date for the Town of Suwannee's WWTP and abandonment of the town's OSTDSs—originally scheduled for August 15, 1997. The OSTDS abandonment was delayed, and the actual abandonment of the OSTDSs extended beyond November 1997 which resulted in some modifications of the study design. These modifications are summarized in Subsection 3.2; details of these modifications are discussed in the appropriate sections of this report.

The post-construction sampling had to be conducted long enough after construction to ensure that there were no residual effects from the recently abandoned OSTDSs. According to Sherman (personal communication, 1996), the surficial aquifer conductivities were expected to be high because much of the Town of Suwannee is built on fill placed directly over cypress trees felled in the 1950s. We conservatively assumed that hydraulic conductivity is on the order of about 5 feet per day (ft/day); therefore, even with tidal influence, most of the residual effluent would be flushed out within 4 weeks. Post-construction sampling, therefore, should have begun in December 1997 (because of the late completion date); however, in an effort to keep as many factors constant as possible between pre- and post-construction sampling, post-construction sampling commenced at the beginning of November 1997 so that we could compare identical sampling periods. To compensate for the late completion date and to ensure that any residual effects from the OSTDSs were absent, the sampling was extended an additional month, i.e., until the end of January 1998.

In addition to construction-related scheduling considerations, we also attempted to coordinate field sampling with the tides, rainfall, river flow, water temperature, and FDEP's sampling program being conducted in Suwannee Sound.

By sampling during the same months (November and December of 1996 and 1997), we attempted to sample when rainfall, streamflow, and air and water temperatures should have been similar. Monthly streamflow for the Suwannee River near Wilcox, Florida, (based on 63 years of data [USGS, 1996]), and monthly precipitation at Steinhatchee, Florida (based on 39 years of data [NCDC, 1996]), were presented in Figure 1.2-2. The stream flow data, represented as a series of line graphs, depict the mean monthly flow and the maximum and minimum monthly flow (with the year of occurrence indicated). Mean monthly precipitation is represented by the histogram in Figure 1.2-2. Our intention was to conduct the sampling during a period of relatively low flow on the Suwannee River so that the upstream effects of the river would not overwhelm the data collected in the vicinity of the Town of Suwannee. According to the data presented in Figure 1.2-2, historically, the mean monthly stream flow in the Suwannee River (near Wilcox) is <9,000 cfs during the months of October, November, December, June and July. As will be seen in subsequent sections of this report, streamflow was not comparable during the pre- and post-construction sampling.

One other event that had to be factored into the sampling schedule was the dredging that was conducted in the canals. This dredging, financed by the Federal Emergency Management Agency (FEMA), was in response to 1996's *storm of the century* which was blamed for the partial filling in of many canals in the Town of Suwannee. Sampling in recently dredged canals could distort the results, consequently, the dredging schedule was modified to accommodate our sampling schedule.

An initial, intensive daily sampling effort was conducted for 7 days during the pre-construction sampling to evaluate daily variability to determine the best day of the week for subsequent sampling. The results of this survey, presented in Subsection 4.4, did not indicate any identifiable daily pattern throughout the week. Therefore, we elected to conduct the weekly sampling every Monday.

It was during this week of intensive sampling that we conducted sampling over a complete tidal cycle with sampling every 2 to 3 hours during the tidal cycle (refer to Subsection 4.4). Because of boat problems, the last phase of the tidal cycle sampling (maximum ebb tide) was not completed. We believed that it was very important that sampling was conducted at about the same tidal phase. With this in mind, we always attempted to sample during the period roughly 2 hours before to 2 hours after low tide. The tidal cycle sampling confirmed that the time near low tide was indeed the best time to sample because the water flowing out of the canals was more representative of water resident in the canals. Sampling at high tide would have resulted in resident water being diluted by incoming tidal water from the Suwannee River.

Following the intensive 7-day survey, seven weekly sampling events were conducted during the pre-construction sampling. As discussed above, during the weekly sampling events, sampling was conducted every Monday during low tide.

For the post-construction sampling, Environmental Consulting & Technology, Inc. (ECT), and FDOH decided that it was not necessary to repeat either the tidal cycle or daily sampling. Therefore, we elected to conduct only the weekly sampling, again every Monday at low tide, but to extend the sampling for another month, i.e., through January 1998, to ensure that no residual effects remained following abandonment of the OSTDSs.

3.1.2 SAMPLING STATION LOCATIONS

Ten water quality locations (including one ground water station and one *control* station) were sampled during the field survey. The locations of these stations are shown in Figure 3.1-1. A shallow monitoring well (Station 1) was installed on a *typical* plot of land downgradient from an OSTDS to provide a ground water sample. The control surface water station (Station 10) was located 2 miles upstream of the Town of Suwannee and upstream of the maximum tidal excursion on the Suwannee River under median flow and maximum astronomical tide height conditions. The remaining surface water stations were located in the canals of the Town of Suwannee (Stations 2, 3, 4, 5, and 6) and in the major passes of the

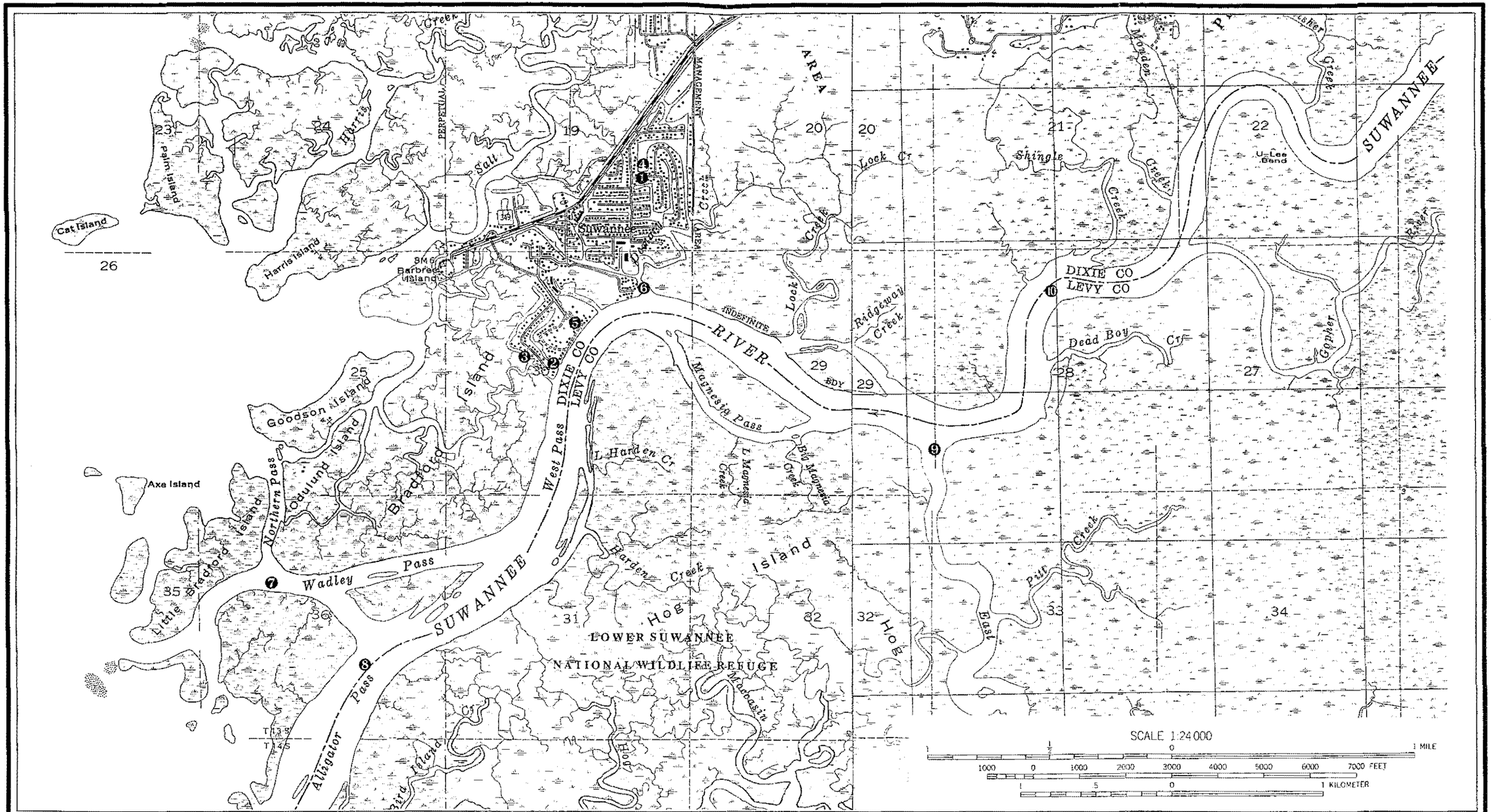

FIGURE 3.1-1.

ECT PRE- AND POST-CONSTRUCTION SAMPLING STATIONS

Source: USGS 1993a; USGS, 1993b; ECT, 1998

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Suwannee River delta, namely—East Pass (Station 9), Alligator Pass (Station 8), and Wadley Pass (Station 7).

3.1.3 SAMPLING PARAMETERS

The primary parameters examined at all 10 locations during the intensive daily and tidal cycle sampling and the weekly sampling were fecal coliform, *Salmonella* (presence and absence only), total nitrate + nitrite, and TKN, as well as temperature, conductivity, pH, DO, and oxidation-reduction potential (ORP) which was measured *in situ*. In addition to these parameters, during the intensive daily and tidal cycle sampling during the pre-construction study, five stations were selected for sampling coprostanol and epicoprostanol (one of these five stations was the ground water well [Station 1]). Coprostanol, and its epimer—epi-coprostanol, are fecal sterols indicative of mammalian (and some seabird) waste (Takada *et al.*, 1994). Because these fecal sterols have an affinity for organic matter, total organic carbon (TOC) and total suspended solids (TSS) were analyzed to aid in the interpretation of the fecal sterol results and to normalize the data for variations in TOC and TSS.

In addition to coprostanol and epicoprostanol, linear alkylbenzenes (LABs) were considered. LABs are associated with laundry detergents and, consequently, with domestic sewage. Eganhouse *et al.* (1988), however, reported LAB concentrations ranging from 150 to 7,300 micrograms per liter (μg/L), whereas coprostanol was present at levels *approximately one order of magnitude higher* suggesting that coprostanol would be present in considerably higher concentrations. The majority of the literature reviewed to date favors coprostanol analysis. Consequently, coprostanol analysis was incorporated into our study plan.

Well after sampling had commenced, we did receive a paper titled *Discriminant Analysis of Antibiotic Resistance Patterns in Fecal Streptococci, a Method to Differentiate Human and Animal Sources of Fecal Pollution in Natural Waters* (Wiggins, 1996). According to Wiggins (1996), using five antibiotics, he was able to correctly identify 74 percent of the isolates into one of six possible sources (beef, chicken, dairy, human, turkey, or wild). Ninety-two percent of the human isolates were correctly identified. Wiggins (1996) concluded that this discriminant analysis holds promise as a method to determine the sources

of fecal pollution in natural waters. Although too late to be included in this study, this method should be evaluated for any further studies similar to ours.

One other method that should perhaps be investigated in future studies was that suggested by Dr. John Paul of the University of South Florida (personal communication, March 6, 1998). According to Paul (1998), he is working with coliphages (bacteriophages specific to *Escherichia coli*) to identify the host of the *Escherichia coli*. According to Paul (1998), there are four types of coliphages: Type 1 is associated with bovine species, Types 2 and 3 with humans, and Type 4 with birds. He also suggested that it might be possible to *seed* effluent from septic tanks with a bacteriophage (a special strain from Hawaii) to use as a tracer. He said that a similar approach was used in the Florida Keys where bacteriophages were found in surface waters in as little as 10 hours after their introduction into the OSTDS via the toilet.

The sampling parameters for each type of field event for both pre- and post-construction sampling are summarized in Table 3.1-1.

Table 3.1-1. Sampling Event Parameter Summary

	Number of Stations per Parameter per Event*		
Parameter	Intensive Daily	Tidal Cycle	Weekly
Total Coliform	10	10	10
Fecal Coliform	10	10	10
Salmonella	10	10	10
Total Nitrate + Nitrite	10	10	10
Total Kjeldahl Nitrogen	10	10	10
Coprostanol and Epicoprostanol†	5	5	---
Total Organic Carbon†	5	5	---
Total Suspended Solids†	5	5	---
Temperature	10	10	10
Conductivity	10	10	10
pH	10	10	10
Dissolved Oxygen	10	10	10

* Includes pre- and post-construction sampling but does not include equipment blanks or field duplicates which were collected according to the project QAPP.

† Pre-construction sampling only.

Source: ECT, 1998.

Modifications to the original sampling plan and detailed descriptions of the field and analytical methods are discussed in Subsections 3.2 and 3.3, respectively.

3.2 STUDY MODIFICATIONS

Although several of the study modifications have already been alluded to in the preceding discussion, we will summarize all program modifications in this section.

Because the majority of the septic tanks were not abandoned until the end of November 1997, ECT and FDOH personnel decided to extend the weekly sampling by one month to the end of January 1998 to ensure that the residual effects of the OSTDSs had dissipated. This extension was possible because we had determined that there was no further need for daily or tidal cycle sampling since we had already determined that the period just before low tide was the optimal (worst case) time to sample and that there were no observable daily variations.

Another modification also made the schedule extension possible. This was the deletion of the expensive coprostanol analysis and the associated analyses for TSS and TOC from the program. The coprostanol analysis of the pre-construction samples revealed that virtually all of the results were below the method detection limit (MDL). As a result, ECT and FDOH personnel decided to delete coprostanol analysis from the post-construction sampling and transfer the remaining funds to extend the sampling schedule and conduct *Salmonella* serotyping. Serotyping is a method used to identify individual species (serotypes) of *Salmonella* which can help determine the distribution and possible sources of *Salmonella* in the area. Serotyping is discussed in detail later.

Because the coprostanol results were unsuitable as an indicator of domestic sewage, we elected to perform *Salmonella* serotyping on selected post-construction samples. Prior to making this decision, a reconnaissance field sampling trip was conducted in August 1997 to: (1) confirm the existence of *Salmonella* and (2) determine if there might be any consistent pattern with respect to serotypes and location in the Suwannee River. The data, discussed

in Subsection 3.3.3, were sufficiently encouraging for the study team to plan *Salmonella* serotyping for as many post-construction samples as possible in an effort to determine possible sources for *Salmonella*.

3.3 SAMPLING AND ANALYTICAL METHODS

3.3.1 FIELD SAMPLING PROCEDURES

The field sampling procedures followed by ECT were those described in FDEP's (formerly the Florida Department of Environmental Regulation's [FDER's]) *Standard Operating Procedures for Laboratory Operations and Sample Collection Activities* (FDER, 1992).

Water temperature, specific conductivity, pH, DO, and ORP were measured *in situ* with a Hydrolab Surveyor II®. In addition, transparency was measured *in situ* with a Secchi disk.

Given the geometry of the finger canals, river channel, and tidal flows, we expected the water to be mixed vertically above the saltwater wedge of the Suwannee Estuary. A surface sample, therefore, was considered representative of conditions at depth—at least in the area of interest above the saltwater wedge, if one existed. Consequently, all water samples, with the exception of the ground water sample, consisted of a surface grab sample. The sample container served as the sampling device which eliminated the need for an intermediate sampler that would require field decontamination (discouraged by FDEP), and expensive, sterile devices for microbiological and organic sampling at depth.

The sample containers for total nitrate + nitrite, TKN, TSS, TOC, and extractable organics (i.e., coprostanol and epicoprostanol) were rinsed three times with sample water, per FDEP's standard operating procedures (SOPs), and filled with sample. The total nitrate + nitrite, TSS, and extractable organics sample containers were labeled and placed in an ice chest with wet ice to keep the samples at 4 degrees Celsius (°C). The TOC and TKN samples were acidified to pH <2 with sulfuric acid and placed in an ice chest to keep the samples at 4°C.

The sterile Whirlpak® containers used for coliform samples were *not* rinsed; the Cubitainers® used to collect the *Salmonella* samples were rinsed three times. Extreme care was

exercised by the field team to ensure that they did not contact any internal surface of any of the sample containers. The field team members wore disposable, unpowdered, latex gloves for sampling; these gloves were replaced at each new location. Pursuant to FDEP's SOPs, the sampling team collected the organic samples (coprostanol and epicoprostanol), then the microbiological samples, and finally, the inorganics. Given our interest in determining if there was vertical stratification, we elected to conduct the *in situ* measurements prior to the water sampling.

Surface water, as previously stated, was collected as a surface grab sample following the procedures described in Section 4.2.3 of FDEP's SOPs; the single ground water sample, however, was collected with an intermediate device, i.e., a bailer. Since the bailer was dedicated to the well and left inside of the well between samplings, field decontamination or the use of pre-cleaned bailers was not necessary. The well was purged per FDEP's SOPs. The bailer was carefully filled and rinsed prior to sampling as a result of the purging process. The samples were collected in the following order:

1. Extractable organics.
2. Microbiological samples.
3. Inorganics (total nitrate + nitrite, TKN, TSS, and TOC).

Field quality control (QC) samples included duplicate samples (10 percent of total samples) and precleaned field equipment blanks (5 percent). For this study, precleaned equipment was defined as either the bailer (for Station 1) or the pre-cleaned sampling containers for each of the surface water stations. The station selected for duplicate sample and the precleaned equipment blank were randomly selected by the field team leader. The Hydrolab Surveyor II® was calibrated at the beginning and end of each sampling day. Laboratory QC was according to each laboratory's CompQAP and FDEP's requirements.

3.3.2 ANALYTICAL METHODS

3.3.2.1 Inorganic and Organic Water Quality Analyses

As stated above, water temperature, specific conductivity, pH, DO, and ORP were measured *in situ* with a Hydrolab Surveyor II®. The depth of the individual readings was determined by the graduations on the Hydrolab® cable. Secchi disk transparency was read directly from the graduated line attached to the Secchi disk. Analytical methods used for water quality samples are summarized in Table 3.3-1.

Table 3.3-1 Inorganic and Organic Water Quality Laboratory Methods

Analyte	Method
Total Nitrate + Nitrite	EPA 353.2
Total Kjeldahl Nitrogen	EPA 351.2
Total Suspended Solids	EPA 160.2
Total Organic Carbon	EPA 415.1
Coprostanol/Epicoprostanol	after Sherblom and Eganhouse (1991)

Source: ECT, 1998.

The microbiology analytical methods are discussed in the following subsection.

3.3.2.2 Microbiological Water Quality Analyses

Total Coliform and Fecal Coliform Determination

A 5-tube, 3-dilution fermentation technique was used in the determination of both total and fecal coliform with results reported in terms of the Most Probable Number (MPN) of organisms present and was taken from the *Standard Methods for the Examination of Water and Wastewater, 18th Edition* (APHA *et al.*, 1992). The MPN represents an estimate of the mean density of coliforms in the analyzed sample.

Total Coliform

There were two phases for the MPN determination of total coliform. The first was the presumptive phase which employed Lauryl Tryptose broth (LTB) and the second was the confirmation phase which used Brilliant Green Lactose Bile broth (BG).

Presumptive Phase—There were three rows of five tubes in this technique. The first row of tubes were filled with 10 milliliters (mL) of double strength (2X) LTB, while the remaining two rows were filled with 10 mL of single strength (1X) LTB. Each LTB tube had an inner, inverted Durham tube which detected the presence of gas production. From the collected Suwannee River water sample, 10 mL of water sample was added to each of the five 2X tubes in the first row. To the second row of five tubes (1X) 1 mL of water sample was added, and to the third row of five tubes (1X) 0.1 mL of water sample was added. All tubes were then incubated at 35°C for 48 hours after which all tubes were then examined for gas formation. Gas was produced if the inner, inverted Durham tube had gas present. This result represented a positive presumptive reaction. All positive tubes were then submitted for the confirmation phase.

Confirmation Phase— From each positive presumptive LTB tube, 0.5 mL was transferred to a corresponding tube containing 10 mL of BG, also with an inner, inverted Durham tube. The inoculated BG tubes were then incubated at 35 °C for 24 hours. After incubation, all BG tubes were examined for gas formation by checking the inner, inverted Durham tube. Again, gas production represented a positive confirmation reaction. The number of positive tubes per row was recorded and resulting three-number code was checked against a MPN table to determine the Most Probable Number of total coliforms present.

Fecal Coliform

Elevated temperatures are used to separate organisms of the coliform group into those of fecal origin and those derived from nonfecal sources (APHA *et al.*, 1992). A single medium of A-1 can be used in a direct test, thus eliminating the presumptive-confirmation phases used for total coliform MPN determination. The fecal coliform MPN also used a 5-tube,

3-dilution format except that the medium used was A-1 double strength (2X) in the first row of five tubes and single strength (1X) concentration in the remaining two rows of five. All A-1 tubes had inner, inverted Durham tubes which allowed for checking of gas formation. The A-1 tubes were serially inoculated as above for total coliform. Inoculated A-1 tubes were first incubated at 35 °C for 3 hours after which time the tubes were transferred to a water bath at 44.5 °C and incubated for an additional 21 hours. After appropriate incubation, A-1 tubes were then examined for gas formation. Gas production was a positive reaction and indicated coliforms of fecal origin (from intestines of warm-blooded animals).

Isolation and Identification Procedure for *Salmonella*

At present, there is no standardized method for the isolation of *Salmonella* from water (APHA, *et al.*, 1992). The procedure outlined here is a compilation and modification of several widely used and accepted procedures described in APHA *et al* (1992), the *Bacteriological Analytical Manual, 8th Edition* (FDA, 1995), and the *Microbiology Laboratory Guidebook, 3rd Edition* (USDA/FSIS, 1998).

Concentration

It is usually necessary to examine a relatively large sample to isolate pathogenic organisms. This is due to the fact that these organisms are present in much smaller numbers than coliforms in the environment (APHA *et al*, 1992). The concentration technique used for this project was based on membrane filtration. One liter of river water sample was filtered through a sterile 0.45-micrometer (μm) pore/47-millimeter (mm) diameter membrane filter. The membrane was then aseptically placed into a sterile WhirlPak® bag and 100 mL of sterile 0.1-percent peptone water (PW) added. The bag containing the membrane and PW was then stomached for 1 minute to agitate and loosen any bacteria adhering to the membrane. An additional 125 mL of sterile 0.1-percent PW was then added to the bag and the resulting mixture incubated at 35°C for 24 hours. This procedure was replicated for each sample analyzed.

Selective Enrichment and Growth

Selective enrichment of the concentrated sample was necessary to suppress nonpathogenic bacteria and promote growth of *Salmonella* organisms. Since no single enrichment medium allows for optimal growth of *Salmonella*, two selective enrichment media were used in parallel for maximum *Salmonella* recovery. The two selective media employed were: (1) Selenite Cystine (SC) broth, and (2) Tetrathionate (TT) broth. For each sample, 0.5 mL of the concentration mix was transferred into two tubes with one tube containing 10 mL of SC broth and the second tube containing 10 mL of TT broth. The SC broth tube was then incubated at 35°C for 24 hours and the TT broth tube incubated at 42°C for the same 24 hours. The higher temperature of 42°C for enrichment enhanced the isolation of many salmonellae while reducing competing organisms. There are certain *Salmonella* serotypes, however, that will not grow at this elevated temperature and thus, the lower incubation temperature of 35°C was selected.

There are several solid mediums that can be used for the isolation of *Salmonella*; these can be classified into those that: (1) contain bile salts or sodium desoxycholate as inhibitors, such as xylose lysine desoxycholate agar (XLD), or (2) contain brilliant green dye, such as brilliant green sulfa agar (BGS) (APHA *et al.*, 1992). A third type of media also was chosen—double modified lysine iron agar (DMLIA) (*Journal of Food Protection*, May 1988, Volume 51, No. 5, pp. 391-396), which would offer little inhibition and would provide a good growth medium to bacterial organisms.

After the 24-hour incubation period of the SC and TT broths was complete, one tri-plate containing all three selective agars (XLD, BGS, and DMLIA) was streaked using a sterile loop for each enrichment broth and these tri-plates were then incubated at 35°C for 24 hours. At the end of tri-plate incubation period, each agar type on the tri-plate was examined for typical *Salmonella* growth. Typical *Salmonella* colonies examined for were as follows: (1) XLD - pink colonies with or without black centers (FDA, 1995), (2) BGS - smooth, pink and opaque colonies with edge surrounded by a red color, and (3) DMLIA - Purple colonies with or without black centers (USDA/FSIS, 1998).

A well-isolated, suspect *Salmonella* colony from each agar type was then picked with a sterile inoculating needle and a slant tube containing Triple Sugar Iron agar (TSI) was inoculated by stabbing its butt once and streaking the slant. Without flaming, a second slant tube containing Lysine Iron agar (LIA) was inoculated by stabbing its butt twice and then streaking the slant (FDA, 1995). A third tube, containing Tryptic Soy broth (TSB), also was inoculated so that the suspect *Salmonella* colony would be grown in suspension. All TSI, LIA and TSB tubes were then incubated at 35°C for 24 hours. Both TSI and LIA slants were capped loosely to maintain aerobic conditions and to prevent excessive hydrogen sulfide (H_2S) production.

Identification

After slant tube incubation, both TSI and LIA slant tubes were then analyzed with regards to Table 3.3-2:

Table 3.3-2. Salmonella Identification

Triple Sugar Iron Agar			Lysine Iron Agar		Polyvalent		
Butt	Slant	H_2S	Butt	H_2S	O	H	Disposition
Y	R	+	P	+	+	+	Salmonella
Y	R	+	P	+	+	-	B&MT
Y	R	+	P	+	-	+	B&MT
Y	R	-	P	-			B&MT
Y	R	-	Y	-	+	+	B&MT
Y	R	-	Y	-	-	-	Discard
Y	R	+	Y	+/-			Discard
Y	Y	-	Y/P	-			Discard
Y	Y	+	P	+			B&MT
NC	NC						Discard

Y=Yellow (acidic); R=Red (alkaline); P=Purple (alkaline); B&MT=Biochemical and Motility Tests; NC=No Change in color from uninoculated medium. H_2S=black color; with or without gas.

Depending on TSI and LIA slant results, the suspect colony was either (1) discarded, or (2) a serological polyvalent somatic (O) and polyvalent flagellar (H) test was conducted as follows:

1. For polyvalent somatic (O) testing, one drop of 0.85-percent saline was placed on a clean, sterile slide. A sterile inoculating loop was used to collect a sample of culture from the LIA slant tube and then suspended in the saline drop. One drop of *Salmonella* O (A-I and VI) anti-serum (Difco, catalog No. 2264-47-2) was then added. The slide was then rocked gently back and forth to mix the saline-culture suspension and the poly O anti-serum. Agglutination, appearing as tiny granules, was taken as a positive reaction.
2. For polyvalent flagellar (H) testing, 500 microliters (μL) of Formalyzed saline and 500 μL poly H (A-Z) anti-serum (Difco, catalog No. 2406-47-1) were dispensed into a sterile test tube. From the TSB tube, 1 mL of the culture broth was added to the Formalyzed saline-poly H prepared tube. The tube was then mixed, capped and placed in a 50°C water bath for 2 hours. At the end of 2 hours, the tube was examined to see if agglutination took place. Agglutination was positive if a cloudy lump had appeared at the bottom of the tube.

Only those suspect cultures which clearly tested positive for both polyvalent somatic (O) and polyvalent flagellar (H) were then identified as *Salmonella*. The remaining suspect colonies, now dependent upon the polyvalent testing, were either discarded, or subjected to biochemical and motility testing (FDA, 1995).

Biochemical testing was done using the bioMérieux Vitek API 20E (catalog No. 20179) test strip for gram negative bacteria. The test strip has twenty capsules with each capsule containing a specific biochemical substrate incorporated into it and either a dye (phenol red or bromothymol blue) or iron salts as indicators for negative or positive reactions to the substrate. To run the bioMérieux Vitek API 20E biochemical test strip, a sterile inoculating loop was used to collect a sample of culture from the TSB tube and then streaked onto a MacConkey agar plate. All MacConkey agar plates were then incubated at 35°C for 24 hours. Upon completion of MacConkey plate incubation, the plates were examined for typical *Salmonella* growth which would appear transparent and colorless, sometimes with a dark center. A sterile wooden applicator stick was then used to select a well-isolated

suspect *Salmonella* colony. The applicator stick was immersed into a test tube containing 5 mL of sterile 0.85-percent saline and gently agitated so as to inoculate the saline. The tube part of each capsule on the API 20E biochemical test strip was then filled with the saline inoculated solution using a sterile Pasteur pipet. All API 20E biochemical test strips were incubated at 35°C for 24 hours and then read for either negative or positive results. The resulting indicator code, based on negative or positive biochemical reaction, was then matched to a API 20E biochemical analytical profile index (Analytab Product, 9th Edition). The code would either indicate *Salmonella* or some other gram negative bacteria.

Motility testing was done using a Motility test medium (semisolid) as described in the FDA BAM.

Serotype Determination

Confirmed *Salmonella* was streaked on Heart Infusion (HI) agar plates (Difco, catalog No. 0044-17-9) from the LIA tube. The HI plates were incubated at 35 °C for 24 hours and then stored at 3-5°C for holding until all Suwannee River water samples had been collected and analyzed. Upon completion of all sample analysis, all stored *Salmonella* cultures were re-struck on HI plates again to prepare fresh cultures. From the re-struck HI plates, a well-isolated *Salmonella* colony was picked and transferred to a slant tube containing HI agar. Heart infusion slant tubes were incubated at 35 °C for 24 hours. After incubation, all HI slant tubes were place in biohazard mailers and shipped overnight to the U.S. Department of Agriculture, National Veterinary Services Laboratory (P.O. Box 844, Ames Iowa, 50010) for serotyping. Serotyping typically took about 1.5 weeks with the results being mailed back to our laboratory.

3.4 SUPPLEMENTAL DATA

In addition to the data collected by ECT in the field, we also obtained data from a number of other sources, either to augment our data or to aid in interpreting the data collected. A brief description of these data and their sources are discussed below.

Predicted tide data were obtained from the program *Tides & Currents*®. These tidal data were extracted at 5-minute intervals and imported into the spreadsheet Quattro Pro® for subsequent plotting. Station sampling times were plotted on graphs of the predicted tide data to confirm that sampling occurred near low tide. USGS collects stage data in the Suwannee Estuary; however, the system is not fully operational, therefore, we cannot compare predicted tides with actual tides which are heavily influenced by the local wind.

Additional water quality data were obtained from the SRWMD. The SRWMD collects data monthly from a number of stations located in the Suwannee River Estuary. These data include the same *in situ* measurements made by ECT, as well as various analyses including color, solids, alkalinity, organic carbon, nutrients, major cations and anions, chlorophyll, coliform, and fecal streptococci. These data were obtained from the SRWMD for the months during which the pre- and post-construction sampling was conducted. In addition to these water quality data, we also obtained water quality data from FDEP. FDEP's data included near-surface and near-bottom water temperature, salinity, and DO measured *in situ*. In addition, FDEP collected pH, turbidity, and fecal coliform data. Several of FDEP's stations were collocated with our stations. In theory, this permitted us to compare our data with FDEP's data; however, often FDEP did not collect data on the same day, or if they did, the data were not collected during the same stage of the tide. Therefore, any comparisons of the two data sets should be used cautiously.

In addition to water quality data, streamflow data were obtained from the USGS in Tallahassee. USGS provided streamflow data for the Suwannee River at Branford and near Wilcox (Station #s 02320500 and 02323500, respectively) and the Santa Fe River near Fort White (Station #02322500). These data were provided in the form of daily mean values for the months during which we conducted our pre- and post-construction sampling. We used the streamflow data for the Suwannee River near Wilcox in our interpretation of the study results.

Daily precipitation and maximum and minimum air temperature data were obtained from the NOAA National Weather Service's Steinhatchee Station through NCDC. In addition to these

data, we also downloaded hourly meteorological data from NDBC's world-wide web site. These data (air temperature, atmospheric pressure, and windspeed and direction) were collected by NDBC's C-MAN (Coastal-Marine Automated Network) stations located on either side of Suwannee at Cedar Key (Station #CDRF1) and Keaton Beach (Station #KTNF1), Florida.

Daily water use data for the Town of Suwannee during the pre- and post-construction sampling periods was obtained from the Suwannee Water and Sewer District. These data were collected to determine if any particular day of the week might be best for sampling.

4.0 RESULTS AND DISCUSSION

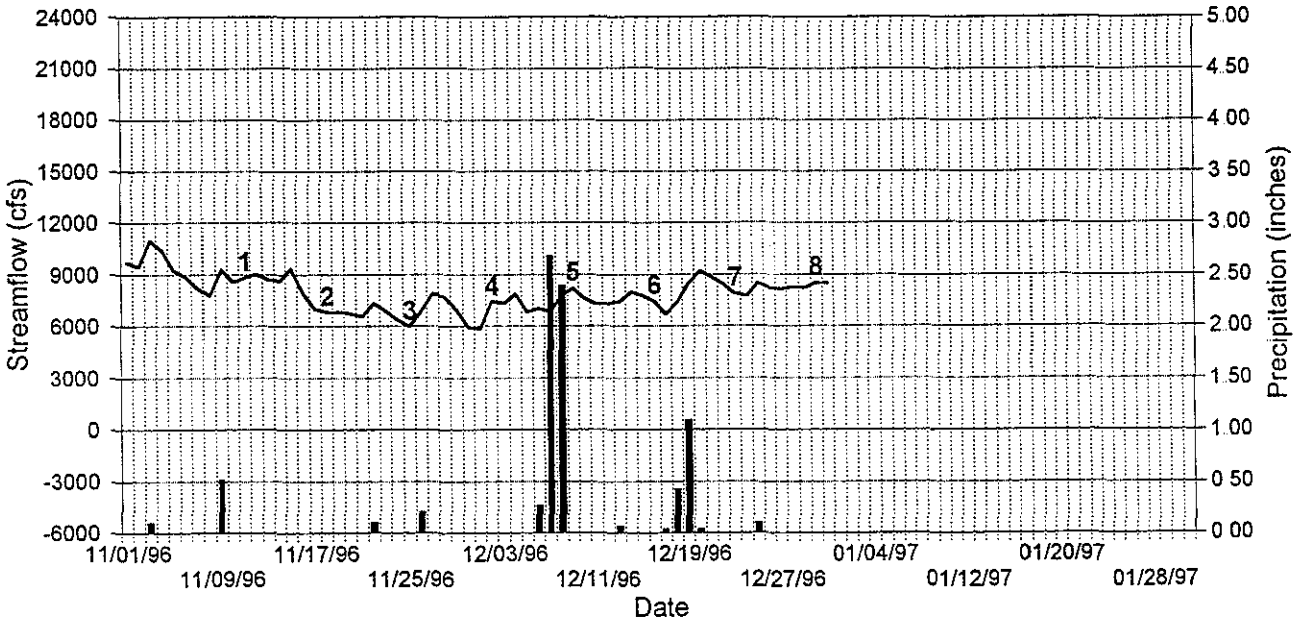
4.1 RAINFALL, STREAMFLOW, AND WATER USE

Precipitation data for the pre- and post-construction periods were obtained from NCDC (1997a and 1997b and 1998, respectively) for Steinhatchee, Florida. The daily rainfall, as well as the mean daily streamflow on the Suwannee River near Wilcox, Florida, during the pre- and post-construction sampling periods are shown in Figure 4.1-1. Rainfall was markedly different between the pre- and post-construction sampling periods. The total rainfall in November and December 1996 was 8.07 inches; in November and December 1997, the total was 11.44 inches (142 percent of the 1996 total). Another 9.42 inches fell during January 1998. The frequency, in addition to the quantity of rain, differed between the two sampling periods. In the months of November and December, there were 13 days of rain and 28 days in 1996 and 1997, respectively. During the pre-construction sampling period, 63 percent of the rain that fell in November and December 1996, fell in only 2 days (December 7 and 8). Rain storms of this magnitude only occurred in January 1998 of the post-construction sampling period. We attribute the differences between the two sampling periods to one of the strongest El Niños on record which occurred during the winter of 1997-98.

The difference in the rainfall during the pre- and post-construction sampling periods was also reflected in markedly different streamflow on the Suwannee River measured near Wilcox, Florida. The median flow during the pre- and post-construction sampling periods was 7,860 and 14,800 cfs, respectively; the maximum for each period was 11,000 and 22,700 cfs, respectively. November 1997 streamflows actually started out lower than in November 1996, however, within a week, the 1997-98 streamflow on the Suwannee River surpassed the flows observed during 1996, and these flows remained high for the duration of the study. This observation is best demonstrated in Figure 4.1-2 which shows the streamflow during the pre- and post-construction sampling periods. Because sampling was not conducted for a third month (January 1997) during the pre-construction sampling period, the flow data for January were not included in this figure. The statistics for the months of November and December (based on WY1931-1994) are presented in the box in Figure 4.1-2. During the

Streamflow and Precipitation

Pre-Construction



Post-Construction

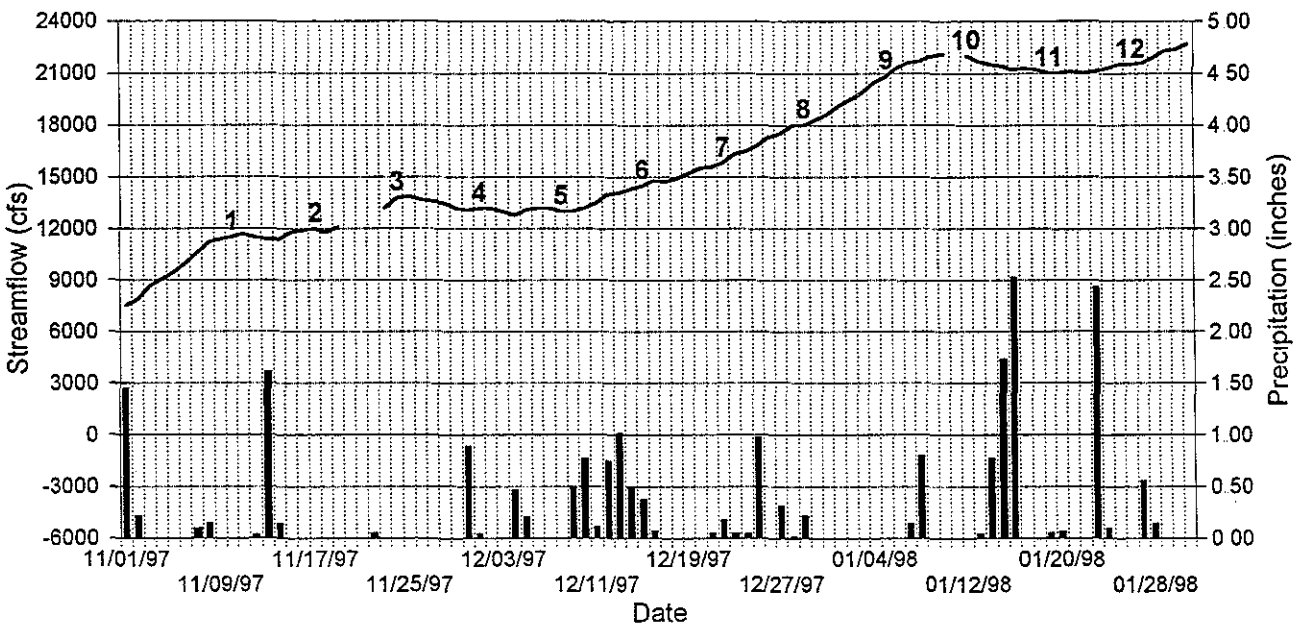


FIGURE 4.1-1.
DAILY PRECIPITATION AND DAILY MEAN STREAMFLOW ON SUWANNEE RIVER (NUMBERS ABOVE STREAMFLOW GRAPH DENOTE SAMPLING EVENTS)
Sources: NCDC, 1998, 1997a, 1997b; USGS, 1998 1997b; ECT 1998.

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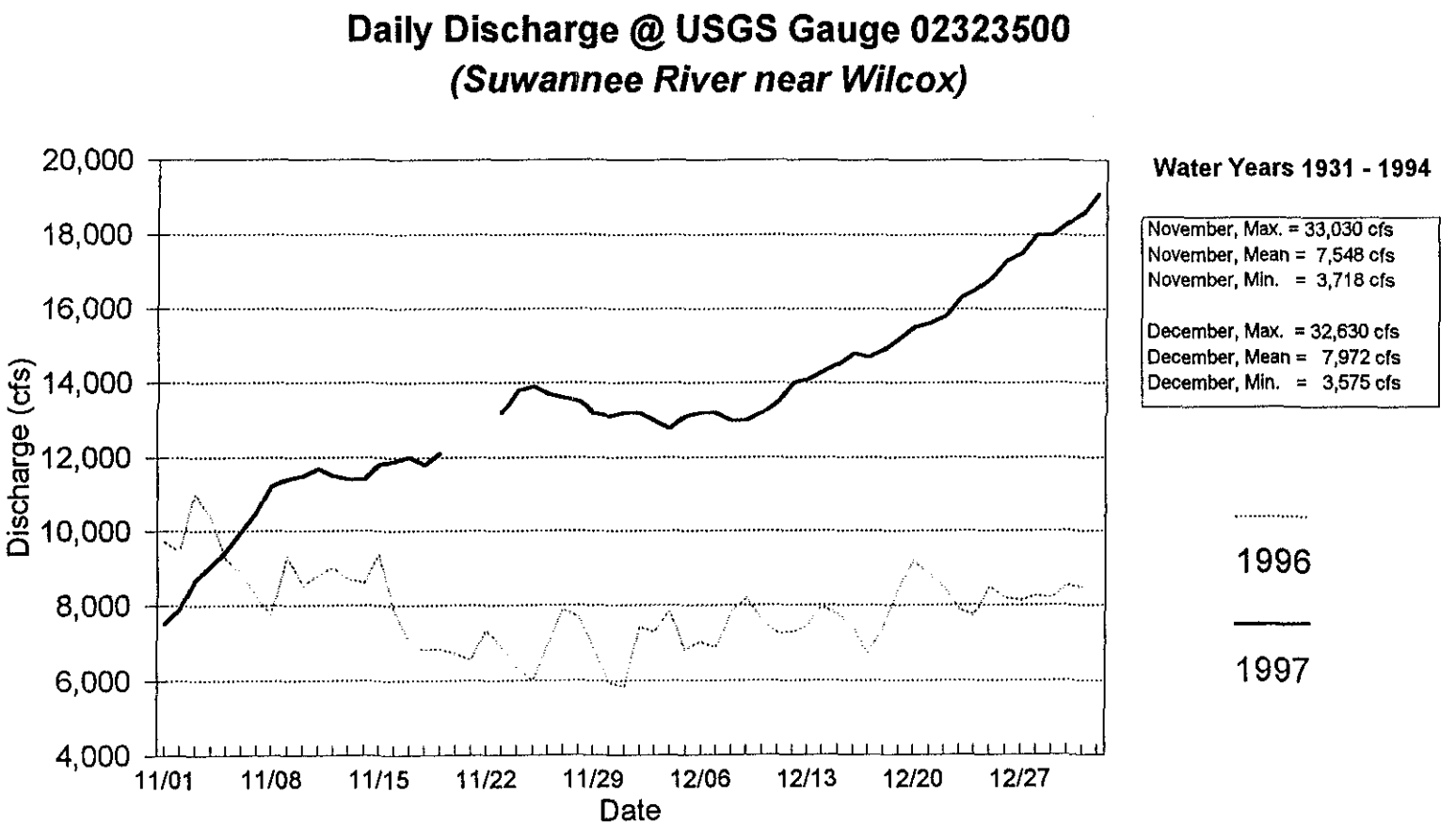

FIGURE 4.1-2
COMPARISON OF DAILY MEAN STREAMFLOW ON THE SUWANNEE RIVER NEAR WILCOX, FLORIDA, DURING NOVEMBER AND DECEMBER 1996 AND 1997

Sources: USGS, 1998, 1997b; ECT, 1998.

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pre-construction sampling period, streamflow near Wilcox was very close to the overall monthly mean value of 7,548 and 7,972 cfs for November and December. The streamflows measured during the post-construction period rapidly approached the maxima reported for November and December.

A comparison of the daily water use for the Town of Suwannee during the pre- and post-construction sampling periods is presented in Figure 4.1-3. Although mean water use was fairly constant for the pre- and post-construction sampling periods (111,600 and 108,700, respectively), the pre-construction sampling period revealed more day-to-day variability. A peak centered around Thanksgiving consistently appeared during both sampling periods.

4.2 WATER QUALITY

The discussion of water quality will primarily concentrate on the data collected by our study team, however, when appropriate, data collected by others will be included in the discussion.

4.2.1 *IN SITU* PARAMETERS

The data measured *in situ* with the Hydrolab Surveyor II® and the Secchi disk during the pre- and post-construction periods are included in Appendix A. At the surface water stations (Stations 2 through 10) and in water depths over 2 meters, measurements were made near-surface, mid-depth, and near-bottom. It should be noted that the tidal cycle, daily, and weekly water quality data tables include only the near-surface *in situ* measurements. The following discussion primarily focuses on the differences in the near-surface values measured at the surface water stations.

There were only relatively minor differences in water temperature, conductivity, pH, and DO between canal and river stations. Evidence of a salt wedge was never observed during the post-construction sampling period when flows on the Suwannee River were high. During pre-construction sampling, especially during the flood tide of the tidal cycle sampling, a salt wedge was observed at Station 7 where the surface salinity was 11.29 parts per thousand (‰) and bottom salinity was 17.18 ‰, and at Station 8 where the salinity ranged from 2.61 to

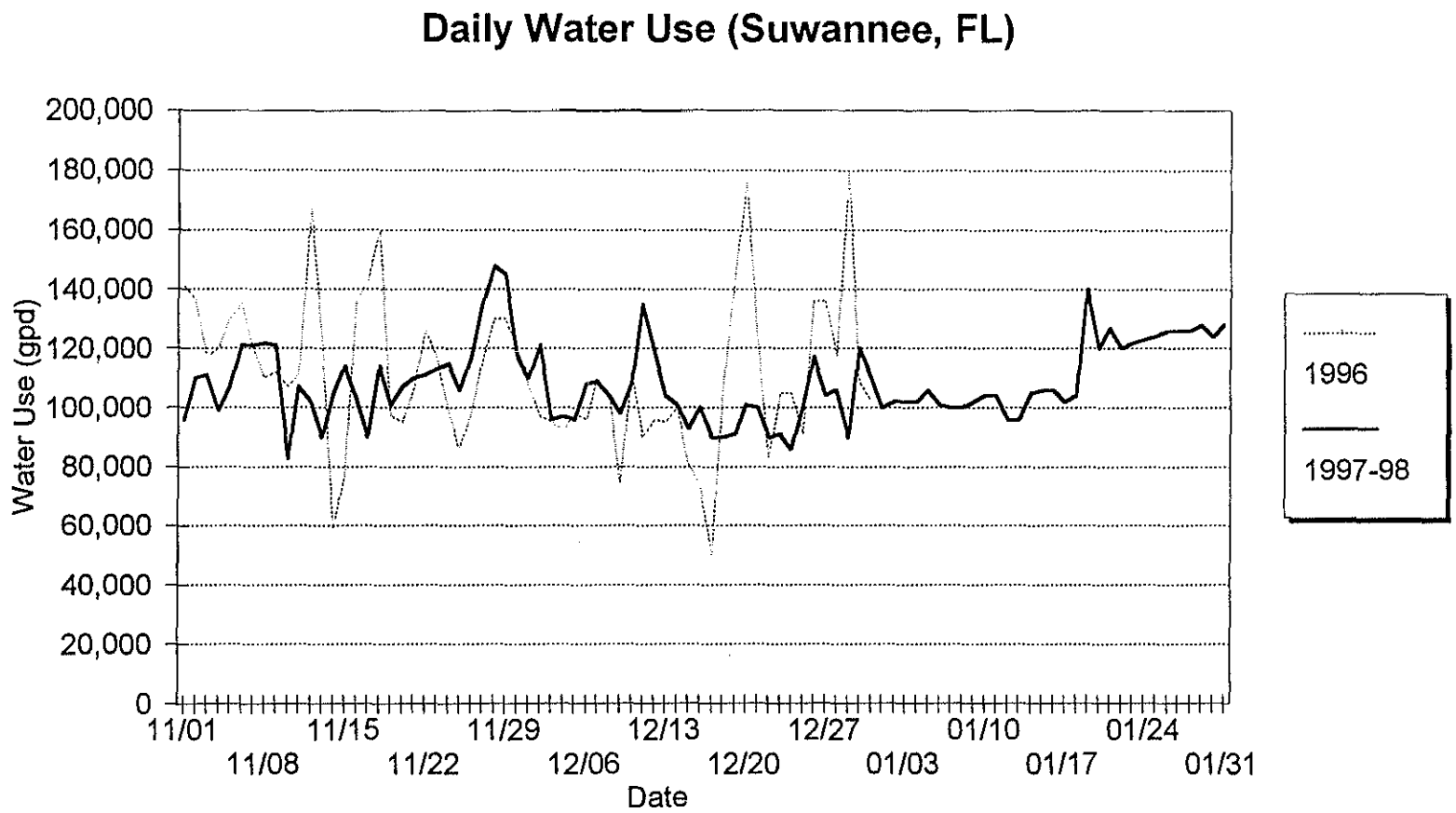

FIGURE 4.1-3.
PRE- AND POST-CONSTRUCTION (1996 AND 1997-98, RESPECTIVELY) DAILY WATER USE FOR THE TOWN OF SUWANNEE

Source: Suwannee Water and Sewer District, 1997, 1998.

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8.99 ‰ from surface to bottom. Occasionally salt water was observed in the canals during the pre-construction sampling period, however, the salinity never exceeded 5.45 ‰, which occurred at Station 2 on November 8, 1996.

In addition to examining for salt water intrusion, the *in situ* data was used to examine vertical temperature gradients. A large temperature gradient would indicate vertical stratification. The temperature difference between the surface and bottom (see Appendix A) was generally less than 0.1°C, which suggests the water column is well mixed. That absence of thermal stratification further supports using surface water sampling for the water quality program.

4.2.2 NUTRIENTS

Weekly water quality data are tabulated in Appendix B. Samples were collected for total nitrate + nitrite nitrogen and for total Kjeldahl nitrogen (the sum of organic and ammonia nitrogen). Pre- and post-construction total nitrate + nitrite concentrations are summarized in Figure 4.2-1. The most notable observation from this figure was that pre-construction total nitrate + nitrite mean concentrations were nearly five times higher than the post-construction mean concentrations (0.75 and 0.15 mg/L-N, respectively). The fact that median river flows were nearly twice as high during the post-construction period suggests that dilution was, in part, responsible for the differences in the total nitrate + nitrite concentrations. Dilution alone, however, does not explain the difference. Given that the difference between pre- and post-construction total nitrate + nitrite concentration was generally the same for the canals and the river stations (including the control station) implies that this difference was not the result of the Town of Suwannee converting from OSTDSs to the WWTP.

A close examination of Figure 4.2-1 reveals that the nitrate + nitrite concentrations in the canals (shaded area of the histogram) were somewhat lower than the river stations during both the pre- and post-construction periods. This observation is more apparent in Figure 4.2-2 which shows the pre- and post-construction mean concentration of total nitrate + nitrite in the canal and river stations by sampling event. As in Figure 4.2-1, the pre-

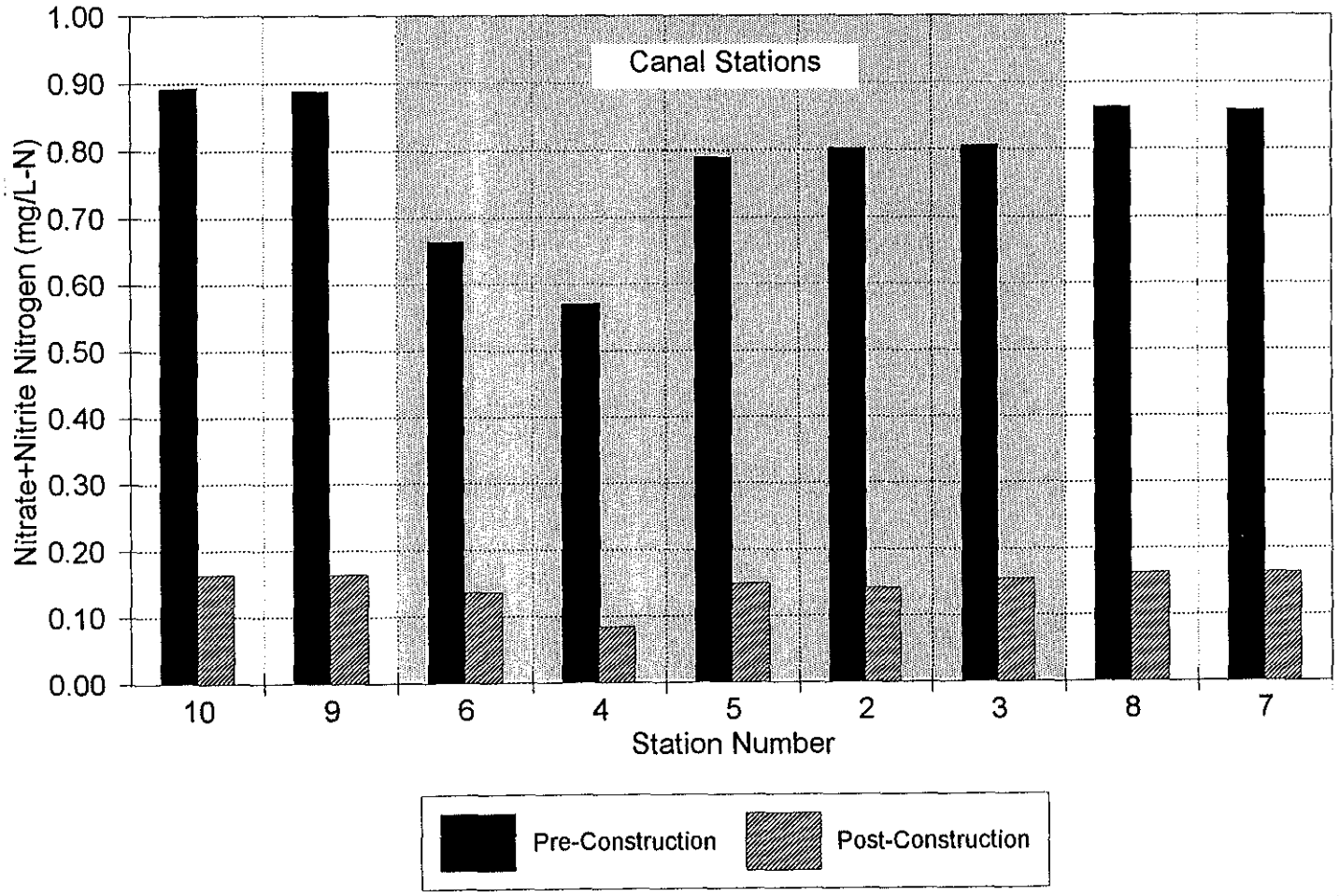

FIGURE 4.2-1.
MEAN TOTAL NITRATE + NITRITE NITROGEN CONCENTRATION BY STATION FOR THE PRE- AND POST-CONSTRUCTION SAMPLING PERIODS

Source: ECT, 1998.

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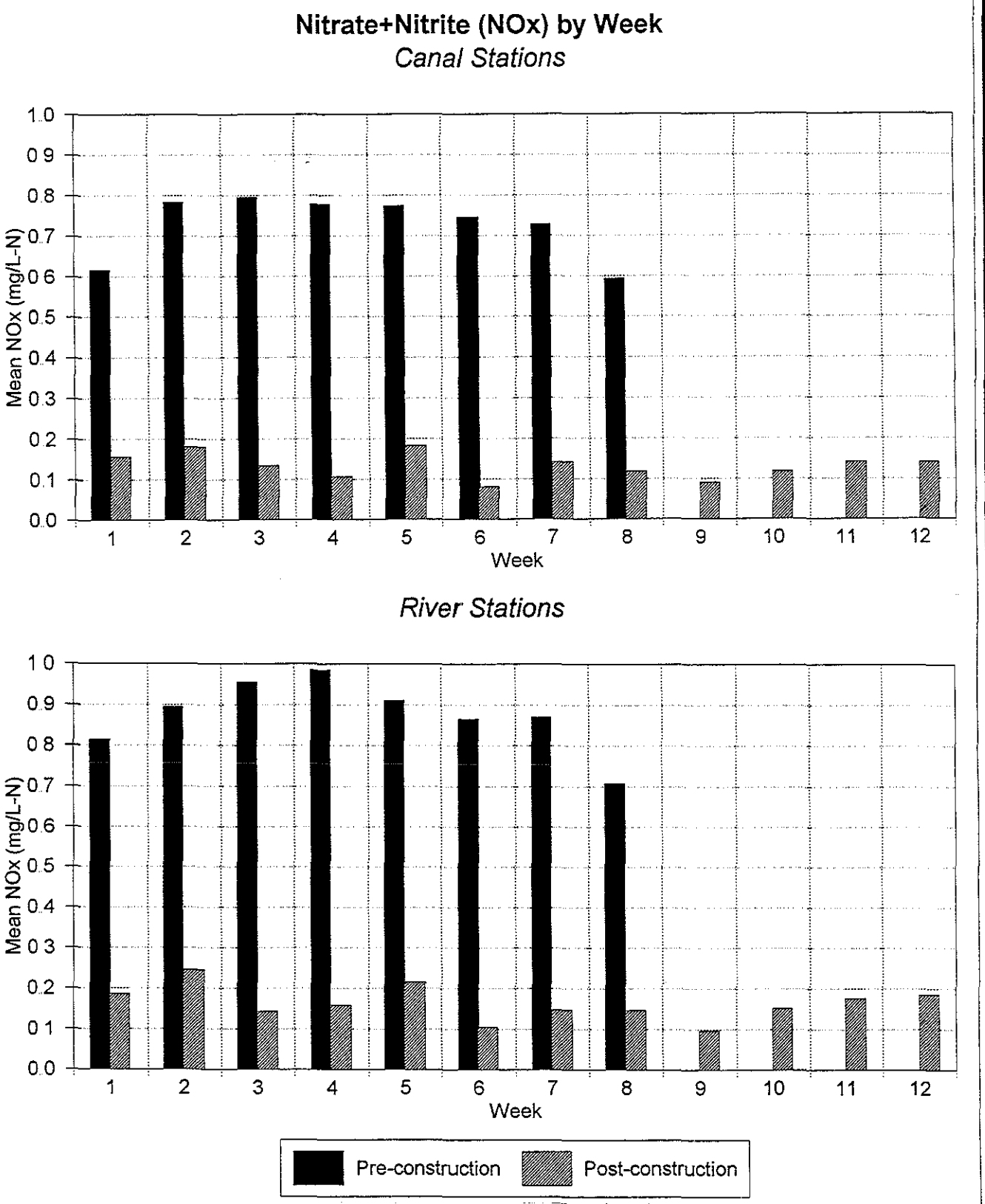

FIGURE 4.2-2
MEAN TOTAL NITRATE + NITRITE CONCENTRATION FOR CANAL AND RIVER STATIONS BY WEEK

Source: ECT, 1998

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construction concentrations are on the order of five times higher than the post-construction concentrations (for the 8 comparable weeks).

Post-construction total Kjeldahl nitrogen (TKN) concentrations, as shown in Figure 4.2-3, on the other hand, were nearly twice as high as the pre-construction concentrations. The one surface water station that differed was canal Station 4 which was located far back in a dead end area of the Town of Suwannee's canal system. Nonetheless, post-construction TKN concentrations were still higher at this station. A histogram of the mean TKN concentrations for the canal and river stations plotted against sampling event reflects these same trends (Figure 4.2-4).

The high TKN values are probably the result of high organic nitrogen from runoff during the extensive rainfall resulting from the El Niño event which approximately doubled the river flow from the previous year.

The results from the ground water sample near the septic tank drainfield (Station 1) indicated a significant reduction in nitrate + nitrite values. The preconstruction values averaged 1.88 mg/L-N and the post-construction values were reduced to an average of 0.12 mg/L-N, a 15-fold reduction. The average TKN was also reduced from an average of 7.44 mg/L-N to 3.76 mg/L-N. It was apparent that the septic tank drainfield was the major source for nitrogen in the ground water and the statistics suggest that closure of the septic tank reduced the nitrogen levels in the ground water; however, the data presented in Figure 4.2-5 for Station 1 are less conclusive.

4.2.3 COPROSTANOL

As stated earlier, coprostanol and its epimer, epicoprostanol, proved to be unsuitable as an indicator of fecal material. Of the 46 samples analyzed for coprostanol, only two samples were above the MDL of 0.01 micrograms per gram of total suspended solids (μg/g TSS). The two coprostanol *hits* were at Station 4 on November 9, 1996 (0.01 μg/g TSS) and Station 2 on November 11, 1996 (0.03 μg/g TSS). Both of these values are very close to the

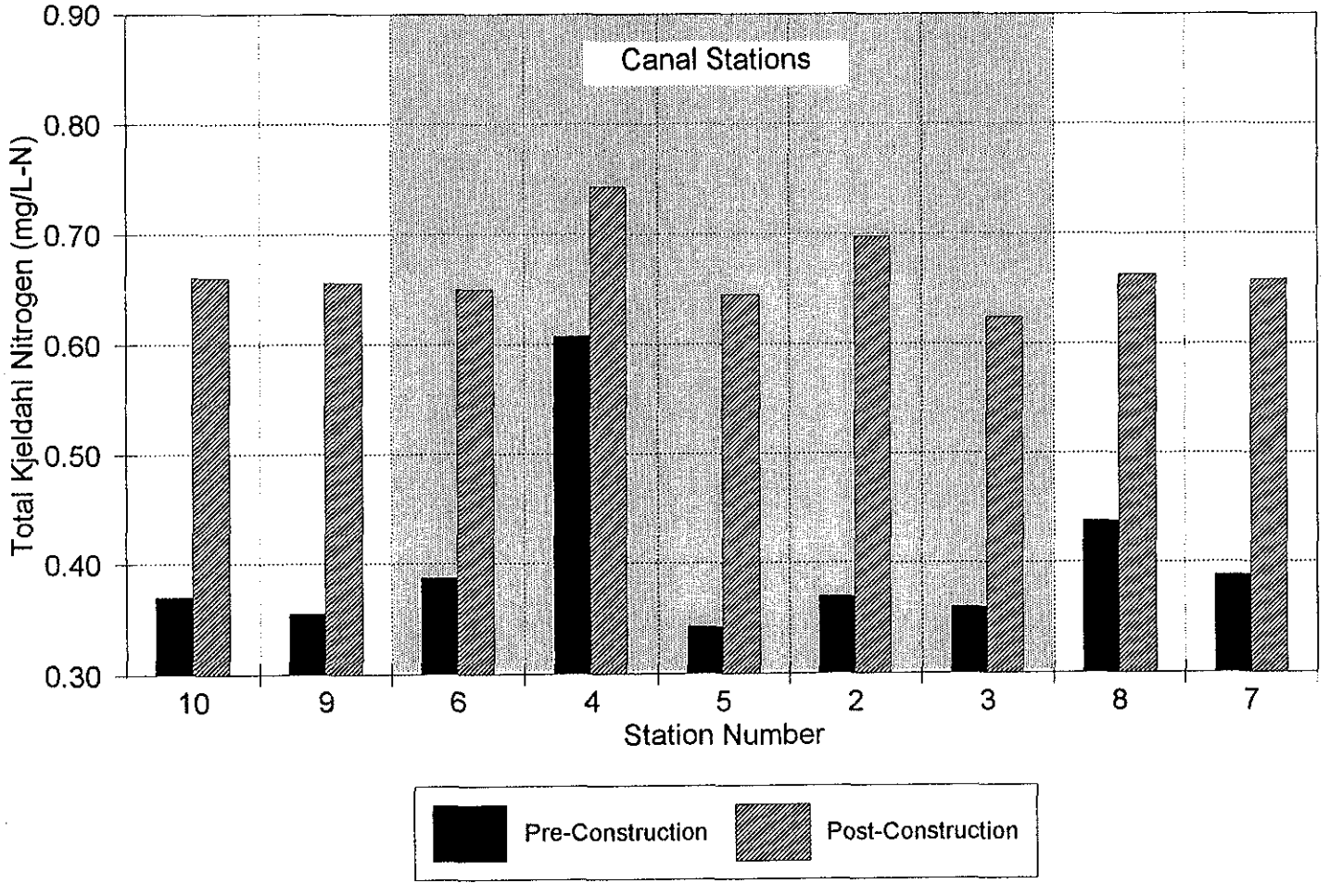

FIGURE 4.2-3.
MEAN TOTAL KJELDAHL NITROGEN (AMMONIA + ORGANIC NITROGEN) CONCENTRATION BY STATION FOR PRE- AND POST-CONSTRUCTION SAMPLING PERIODS

Source: ECT, 1998.

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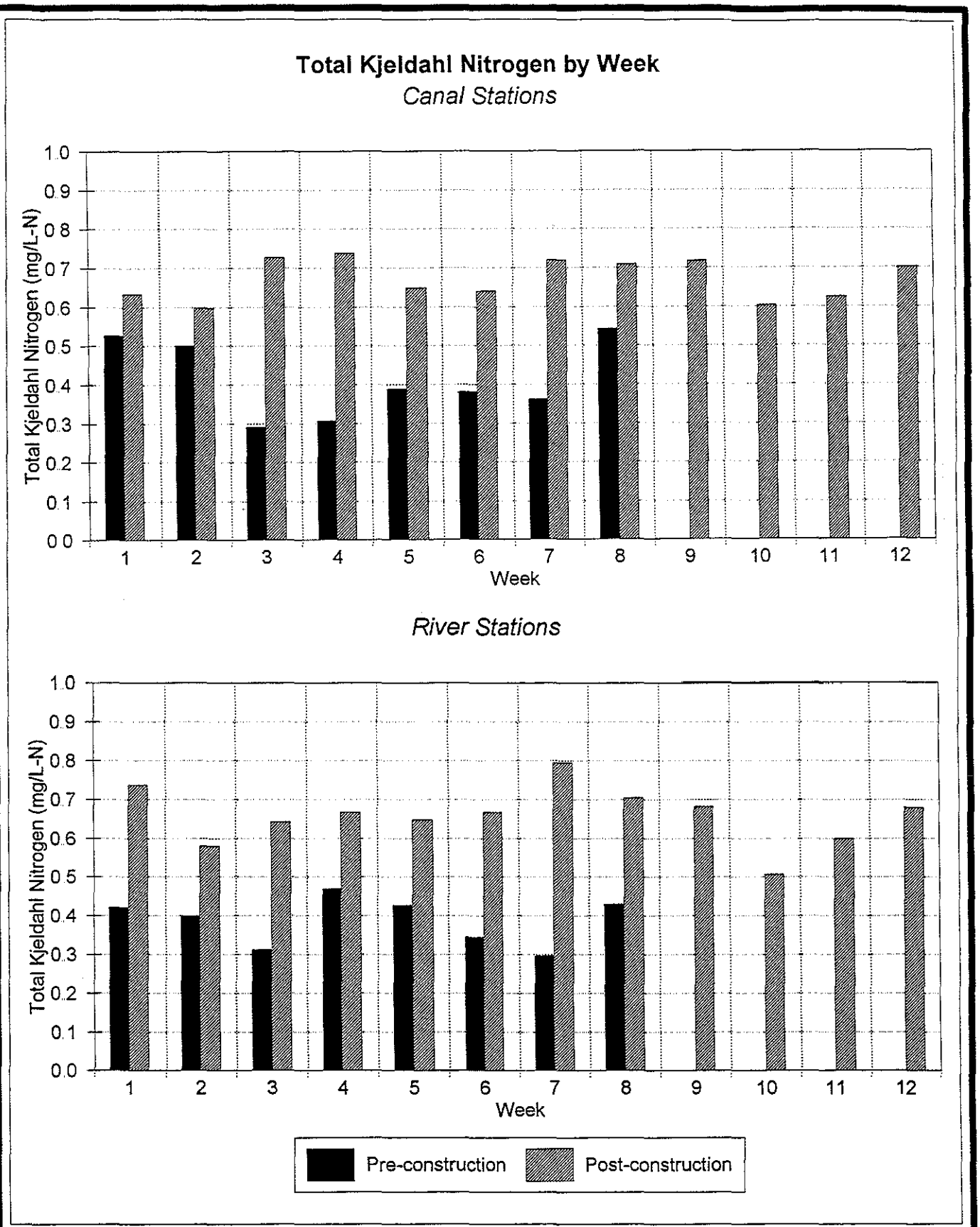

FIGURE 4.2-4.
MEAN TOTAL KJELDAHL NITROGEN CONCENTRATION FOR CANAL AND RIVER STATIONS BY WEEK

Source: ECT. 1998.

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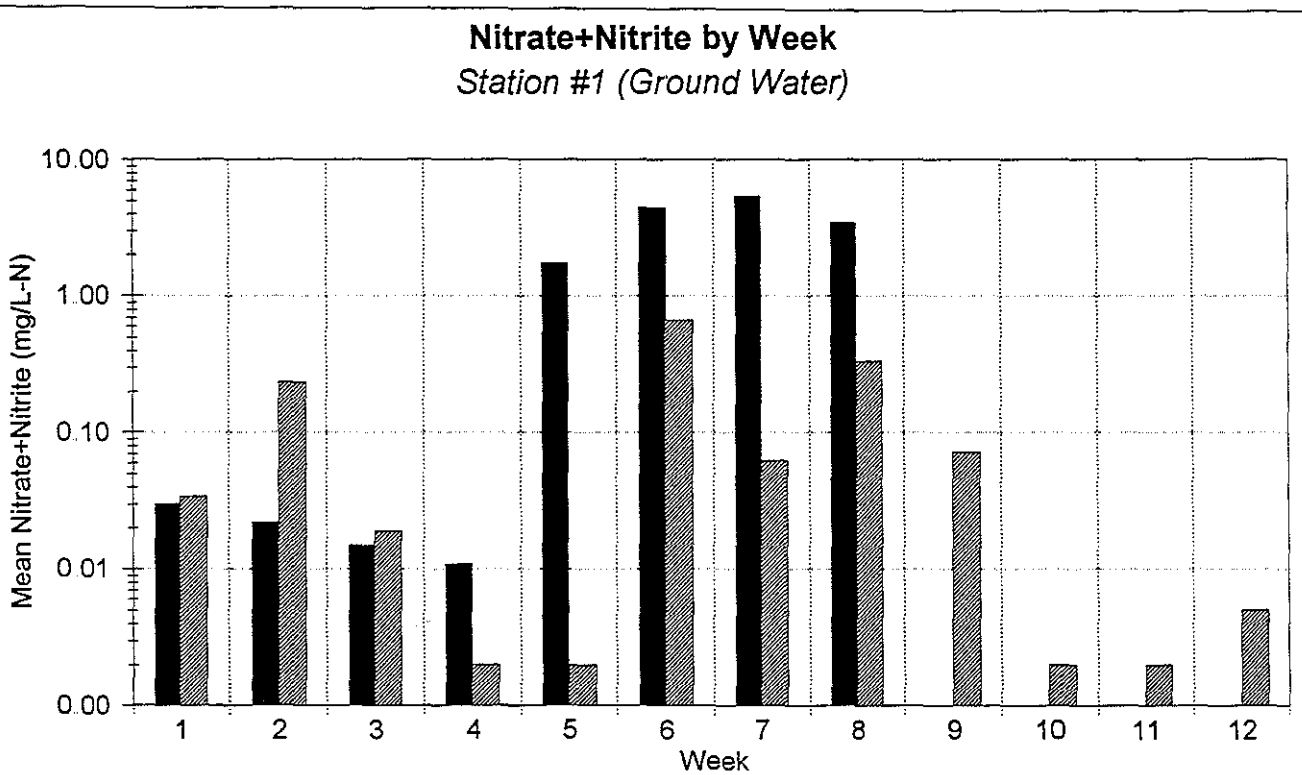

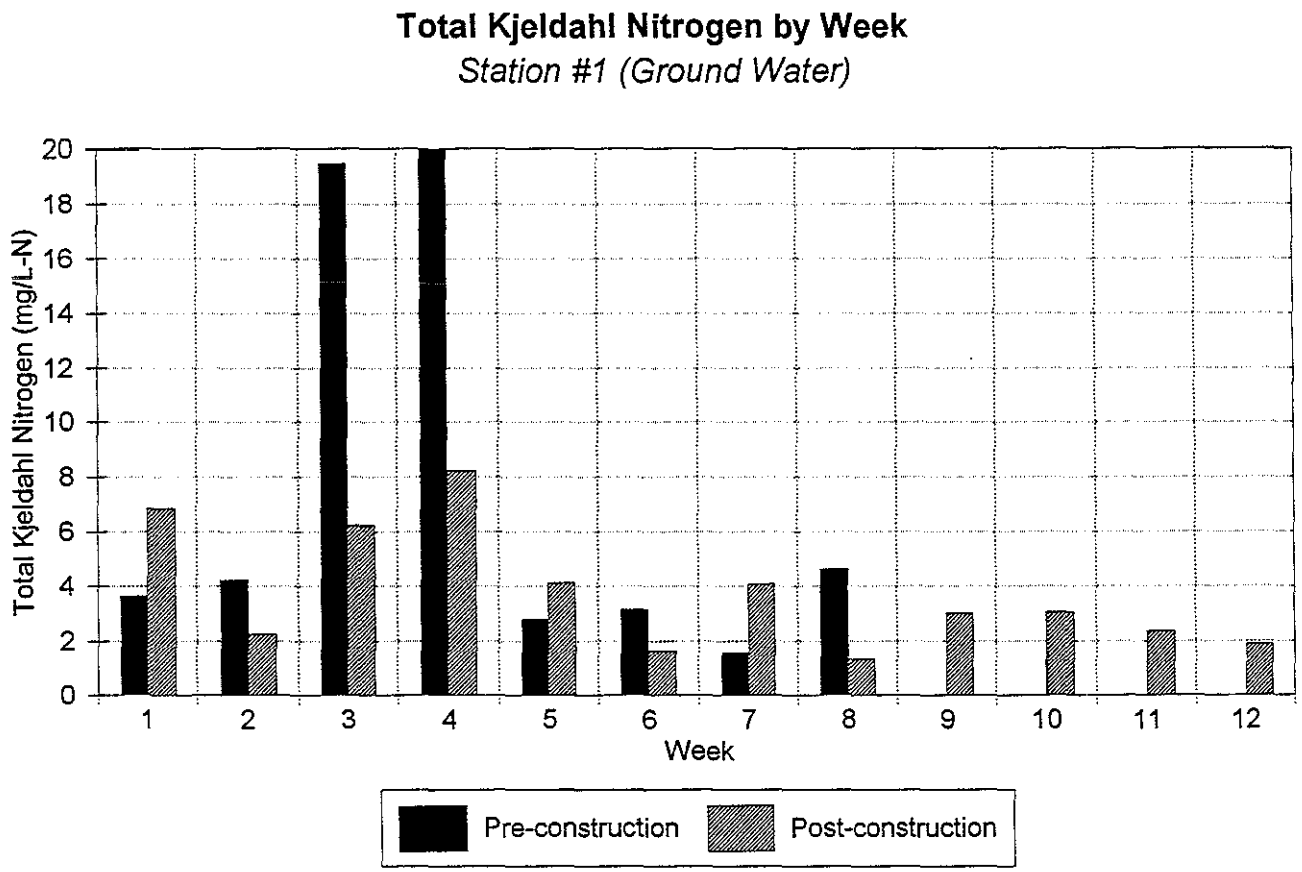

FIGURE 4.2-5.
COMPARISON OF PRE- AND POST-CONSTRUCTION NITRATE + NITRITE AND TKN CONCENTRATIONS FOR STATION #1 (GROUND WATER)
Source: ECT, 1998.

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MDL. Epicoprostanol was detected twice—once at Station 4 on November 12, 1996 (0.15 μg/g TSS) and once at Station 7 on November 12, 1996 (0.01 μg/g TSS). Based on our observations regarding coprostanol and epicoprostanol and after re-examining the literature, we have concluded that coprostanol and its epimer may be suitable for tracing fecal coliform but probably from a point source rather than nonpoint sources such as OSTDSs where the TSS values are expected to be relatively high.

Numerous researchers have successfully measured coprostanol in sediments, however, Bartlett (1987) has reported that coprostanol concentrations have remained unchanged in sediments for periods as long as 54 days. This observation places some limitations on using coprostanol as a fecal indicator in sediments, especially if the intent is to determine recent changes in fecal contamination.

4.3 MICROBIOLOGY

Three sets of microbiological data were examined for this project. As discussed previously, the initial, pre-construction sampling was conducted between November 6, 1996 and December 30, 1996. During this time, 10 stations were analyzed over 17 sampling events consisting of three tidal cycle events, seven daily events, and seven weekly events. The three tidal cycle sampling events on November 11, 1996, were designated Group I through III.

During August 1997, we conducted a reconnaissance level sampling in order to: (1) determine the extent of *Salmonella* presence farther upstream on the Suwannee River and (2) evaluate viability and utility of *Salmonella* serotyping in an effort to identify potential sources of *Salmonella* and determine whether or not serotyping should be incorporated into the post-construction sampling. *Salmonella* serotyping was not employed during the pre-construction sampling; however, upon review of the results obtained from this sampling event, we decided that Salmonella serotyping would be conducted for the post-construction evaluation portion of this project.

The post-construction sampling was conducted from November 10, 1997 to January 26, 1998. The post-construction evaluation investigated the same 10 stations. The difference between the pre- and post-construction evaluations was that the post-construction evaluation covered 12 weekly sampling events and it was extended an extra month (through January 1998). Unlike the pre-construction analyses, the post-construction analyses also included the isolation and identification of *Salmonella* colonies.

Each data set consists of two microbial analyses. One analysis examines total and fecal coliform MPN levels present, expressed as MPN per 100 mL; the second analysis focuses on the presence or absence of *Salmonella*. As previously mentioned, the pre-construction evaluation data shows only the presence or absence of *Salmonella* for each station analyzed. The August 7, 1997, reconnaissance and the post-construction data include, not only the presence or absence of *Salmonella*, but also the *Salmonella* serotype for each station. In the following subsections, we summarize our observations regarding microbiological results concentrating on the data from the weekly sampling events for the pre- and post-construction sampling periods. Tidal cycle and daily sampling events and the results of the August 1997 reconnaissance sampling are discussed separately in Subsection 4.4 (Special Sampling).

4.3.1 COLIFORM

Tabulations of weekly coliform (and other water quality data) for the pre- and post-construction periods are included in tables in Appendix B. These tables include basic statistics (mean, maximum, minimum, and standard deviation) for these water quality data. All coliform data for the pre-construction and post-construction sampling periods are included in the tables of Appendix C.

Figure 4.3-1 compares the geometric mean coliform counts of each of the nine surface water stations (canal stations 2 through 6 and river stations 7 through 10) for the pre- and post-construction weekly sampling events (n = 8 and 12, respectively). The stations are arranged on the x-axis in ascending order by distance downstream from Station 10 (control station). It is apparent from the histogram that the fecal coliform geometric means for the canal stations (shaded area) are higher than the river stations by at least a factor of two during both

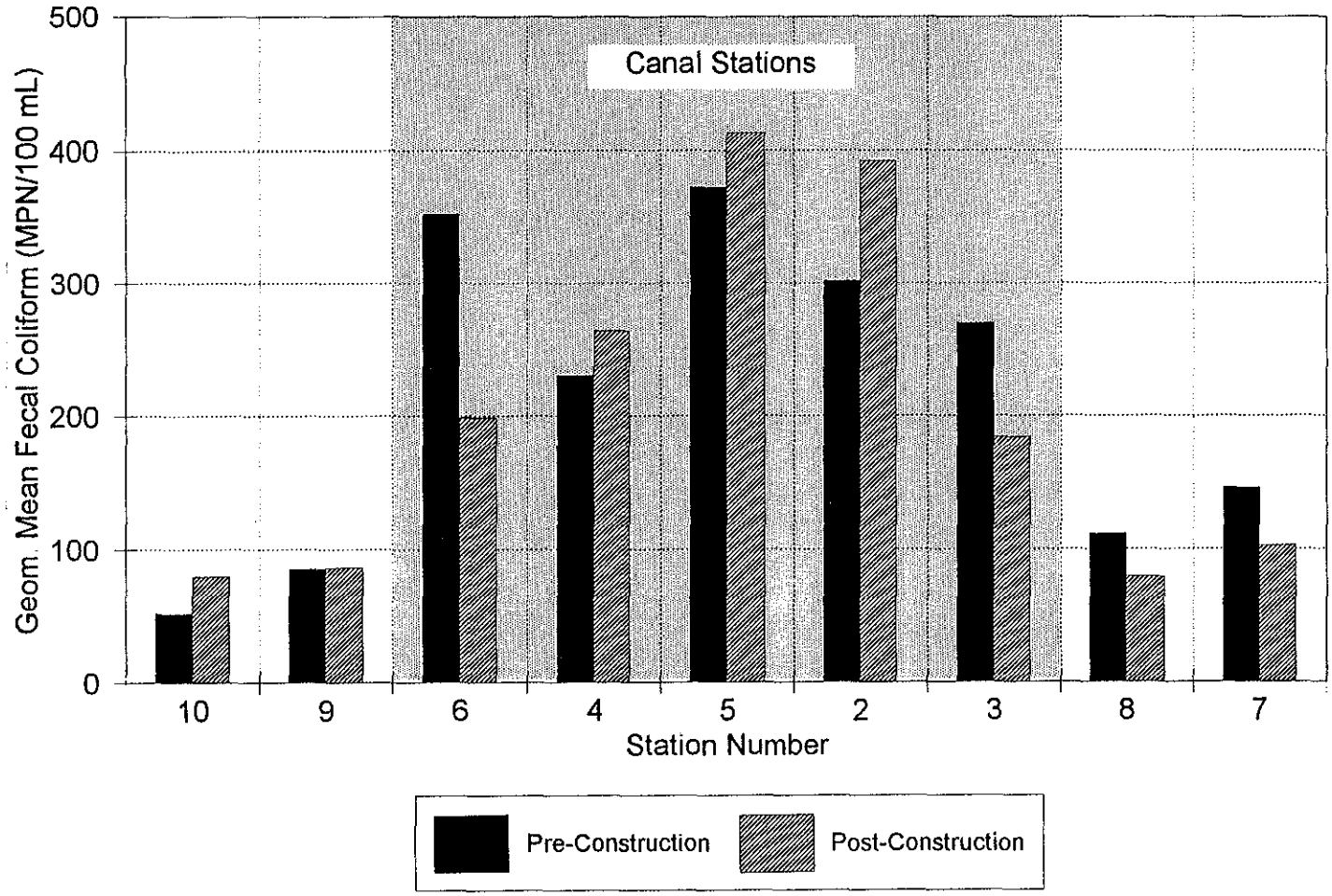

FIGURE 4.3-1.
GEOMETRIC MEAN FECAL COLIFORM CONCENTRATION BY STATION FOR PRE- AND POST-CONSTRUCTION PERIODS

Source: ECT, 1998.

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the pre- and post-construction periods suggesting that the Town of Suwannee is a major source of fecal coliform. The pre- and post-construction geometric mean fecal coliform values in the canals were all above 180 MPN/100 mL. The highest fecal coliform concentrations were in excess of 1,600 MPN/100 mL. Upstream of the Town of Suwannee (Stations 9 and 10), the geometric mean fecal coliform values for an individual measurement on the river were never above 100 MPN/100 mL, however, occasionally high coliform values (up to 920 MPN/100 mL) were observed. The geometric mean fecal coliform values at the downstream river stations were higher than the upstream stations indicating that the Town of Suwannee does impact the downstream water quality. This impact was particularly notable at Station 7 (Wadley Pass) which is out of the mainstream of the Suwannee River and, apparently, more under the influence of the water issuing from the canals in the Town of Suwannee. The geometric mean fecal coliform values at Station 7 were higher than those at Station 8 (Alligator Pass) during the pre- and post-construction periods.

The comparison of the fecal coliform values by station shows that geometric means were higher during post-construction for at least 4 of the 9 stations. However, an examination of geometric mean values of all stations plotted versus weekly sampling event (Figure 4.3-2) reveals that for at least the second through the fifth weeks, the post-construction means (of all stations) were less than the pre-construction geometric mean values. The precipitation data presented in Figure 4.1-1 may, in part, explain why the post-construction fecal coliform concentrations were lower during this period. It is apparent from Figure 4.1-1 that weeks 2 through 5 were relatively dry during the post-construction sampling. Up until week 5, conditions were nearly comparable with respect to rainfall, although streamflow was somewhat elevated. During the pre-construction sampling, the days just before the week 5 sampling were the wettest of the two months, nonetheless, the geometric mean fecal coliform value for all surface water stations was still greater than the post-construction value. We surmise that, until the full effects of El Niño were felt, the results indicate that fecal coliform had indeed decreased from pre- to post-construction sampling in the canals.

However, this cannot necessarily be attributed to the positive affects of the WWTP because there was a comparable reduction in the control (river) stations. It appears that other

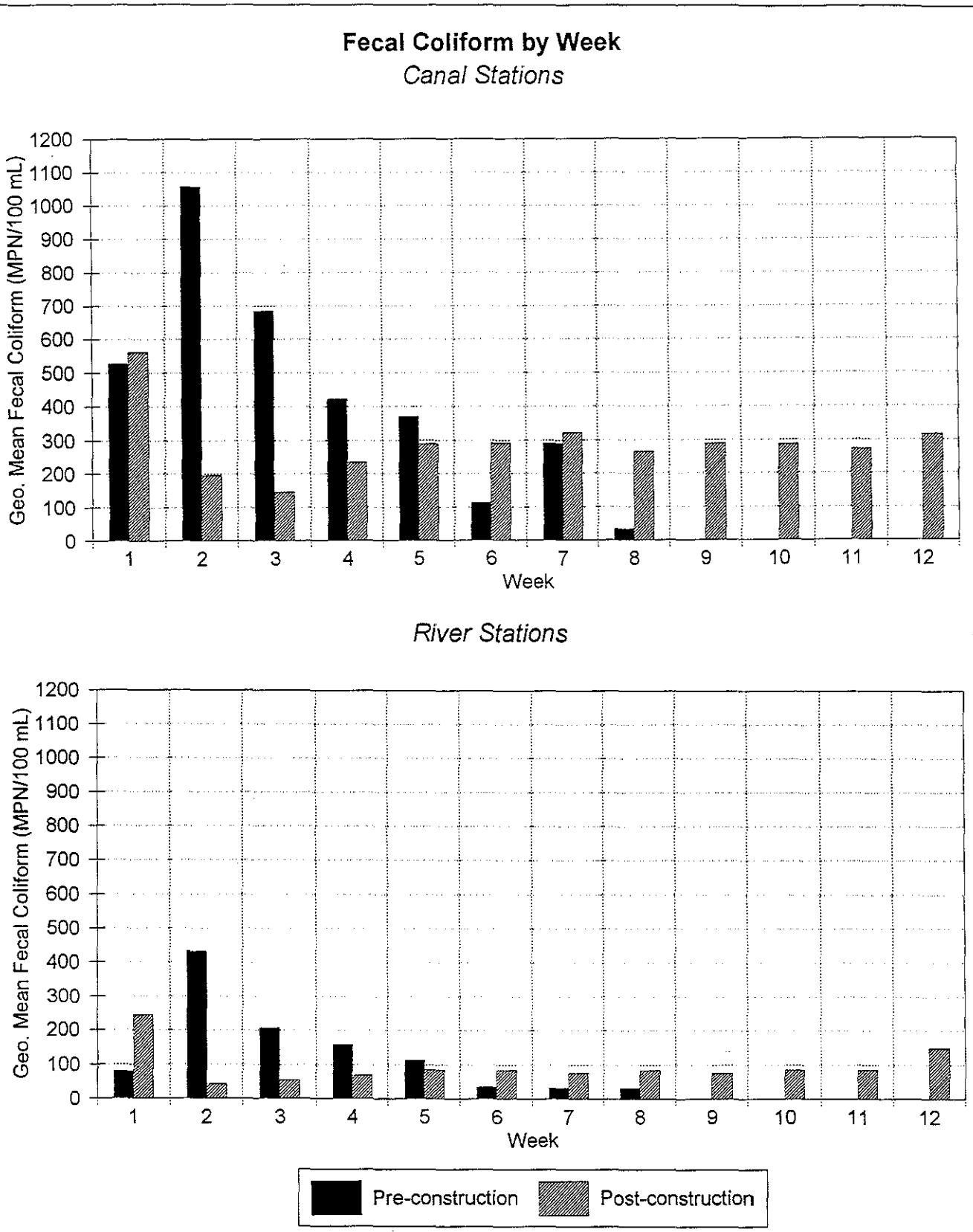

FIGURE 4.3-2.
GEOMETRIC MEAN FECAL COLIFORM
CONCENTRATION FOR CANAL AND RIVER STATIONS

Source: ECT, 1998.

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influences such as rainfall and river flow were the primary factors controlling the fecal coliform counts, and any beneficial effects of the WWTP were masked by the extremely high rainfall that occurred during the post-construction monitoring period.

Station 1, the only ground water sampling station, had the lowest geometric mean fecal coliform values during pre-construction and post-construction (36 and 2 MPN/100 mL, respectively) even though, during the pre-construction periods, fecal coliform counts in excess of 1,600 MPN/100 mL were observed. During the post-construction sampling period, fecal coliform never exceeded 5 MPN/100 mL. This latter result indicates that there was a change in ground water quality from pre- to post-construction with a reduction in fecal coliform following the closure of the OSTDS. This is clearly demonstrated by the data presented in Figure 4.3-3.

One last observation that can be made by examining the tables in Appendix C is that, generally, total coliform and fecal coliform values were nearly identical. This means that virtually all of the coliform in the Suwannee River and canal system is fecal in origin.

4.3.2 *SALMONELLA*

All of the pre- and post-construction *Salmonella* data (presence/absence and serotypes) are included in Appendix C.

The fact that *Salmonella* was ***always*** present at the control station (Station 10), well above any influence from the Town of Suwannee was arguably the most remarkable finding of this study. Figure 4.3-4 indicates that *Salmonella* was present 100 percent of the time at Stations 10 and 8 (Alligator Pass) during the pre- and post-construction sampling periods. *Salmonella* also was present at Station 9 (East Pass) 80 percent of the time. *Salmonella* occurred at Station 7, located in Wadley Pass outside of the mainstream Suwannee River, 33 percent of the time during post-construction and never during the pre-construction period.

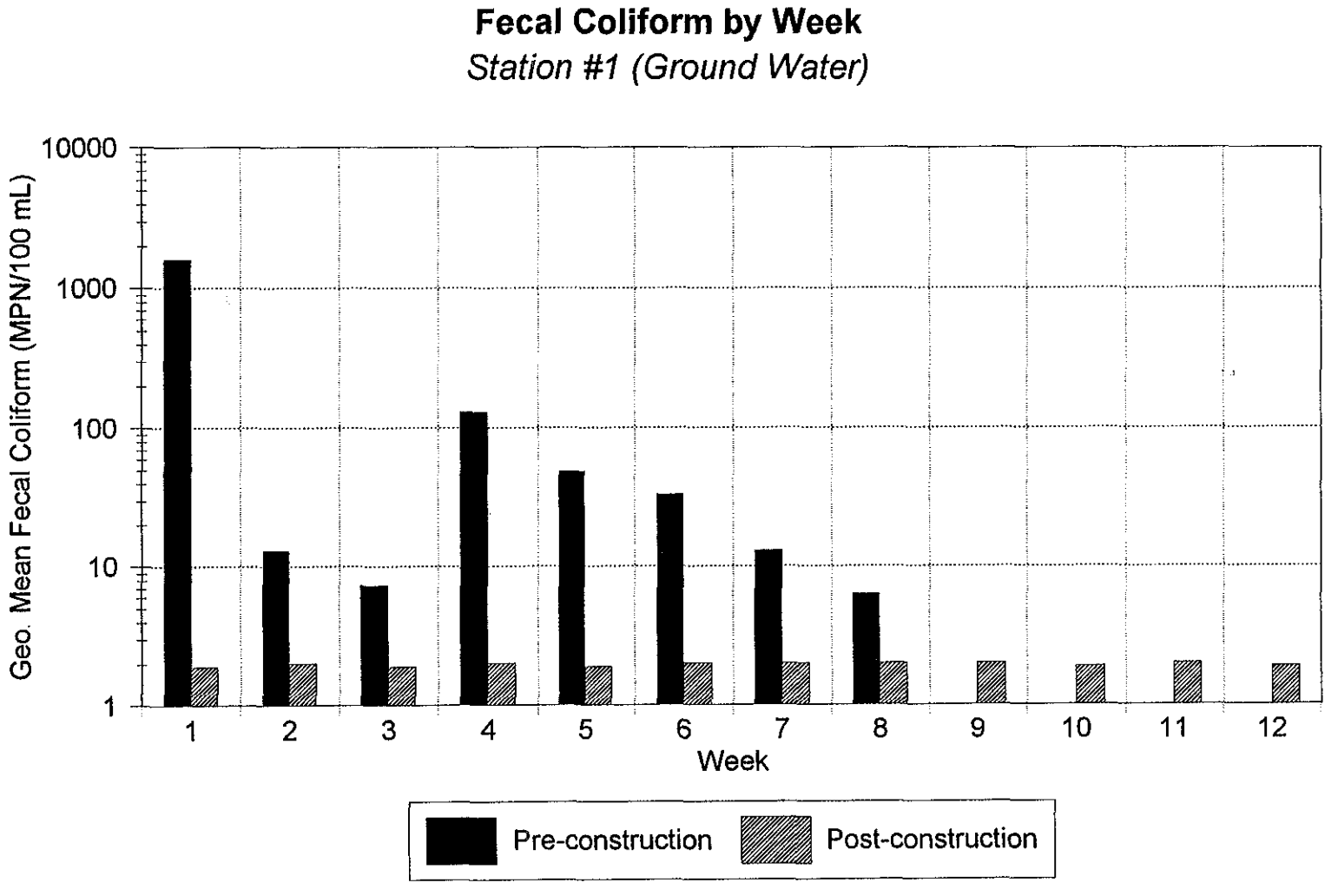

FIGURE 4.3-3
COMPARISON OF PRE- AND POST-CONSTRUCTION GEOMETRIC MEAN FECAL COLIFORM BY WEEK FOR THE GROUND WATER STATION (STATION #1)

Source: ECT, 1998.

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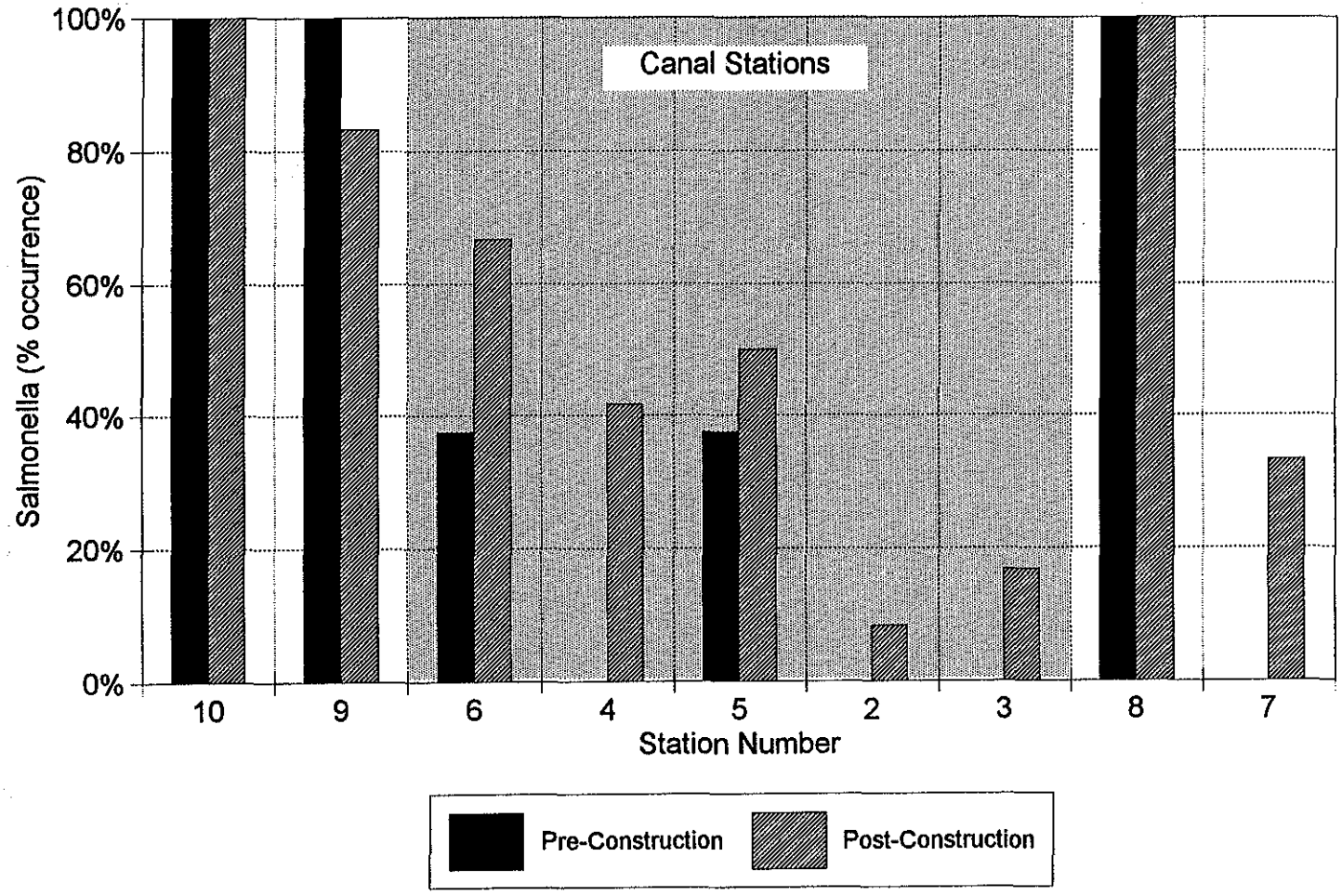

FIGURE 4.3-4.

PERCENT OCCURRENCE OF *SALMONELLA* BY STATION FOR PRE- AND POST-CONSTRUCTION SAMPLING PERIODS FOR CANAL AND RIVER STATIONS BY WEEK

Source: ECT, 1998.

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The occurrence of *Salmonella* in the canal stations (Stations 2 through 6) was more variable. During the pre-construction period, *Salmonella* was only observed at Stations 5 and 6 (38 percent of the time for each station). *Salmonella* was observed at all canal stations during the post-construction period (Figure 4.3-4). The percent occurrence in the canal stations (shaded portion of Figure 4.3-4) ranged from 8 percent at Station 2 to 67 percent at Station 6. Although it is possible that the higher river flows during the post-construction period could have increased the occurrence of *Salmonella* at those canal stations located in the mouths of the canals, this explanation is less plausible at Station 4, located far back in a dead end portion of one of the canals. Figure 4.3-5 shows the same *Salmonella* data plotted versus week for the pre- and post-construction sampling periods.

During the reconnaissance conducted in August 1997, the following *Salmonella* serotypes were isolated and identified: *S. gaminara*, *S. hartford*, *S. inverness*, *S. javiana*, *S. muenchen*, *S. rubislaw*, and *S. tallahassee*. This is consistent with findings in the study conducted jointly by FDNR, FDACS, and the FDA entitled "*Special Study of Incidence of Salmonella in Suwannee Sound, Florida*" (Glatzer, 1990). In that cooperative study, 14 different serotypes were identified at various locations around Suwannee Sound. With the exceptions of serotypes *S. javiana* and *S. rubislaw*, all serotypes isolated during our study were identified in the earlier 1990 cooperative study.

During the post-construction sampling, the serotypes *S. allandale*, *S. montevideo*, and the possible *S. arizonae* subspecies were identified, in addition to the serotypes identified during August 1997 reconnaissance. The possible *S. arizonae* serotype was isolated from Station 8 during three different sampling events. In each case, *Salmonella* identification was accomplished using the API 20E biochemical reaction method which yielded a BPIC of 7-504-542 with "excellent" identification for the isolation. According to the API 20E biochemical analytical profile index, this code matched *Salmonella* - subgenus 3, of which *S. arizonae* is classified. It is our conclusion that sample numbers 30A, 32B, and 36A in Appendix C, Table 8 are *Salmonella* serotype *S. arizonae*.

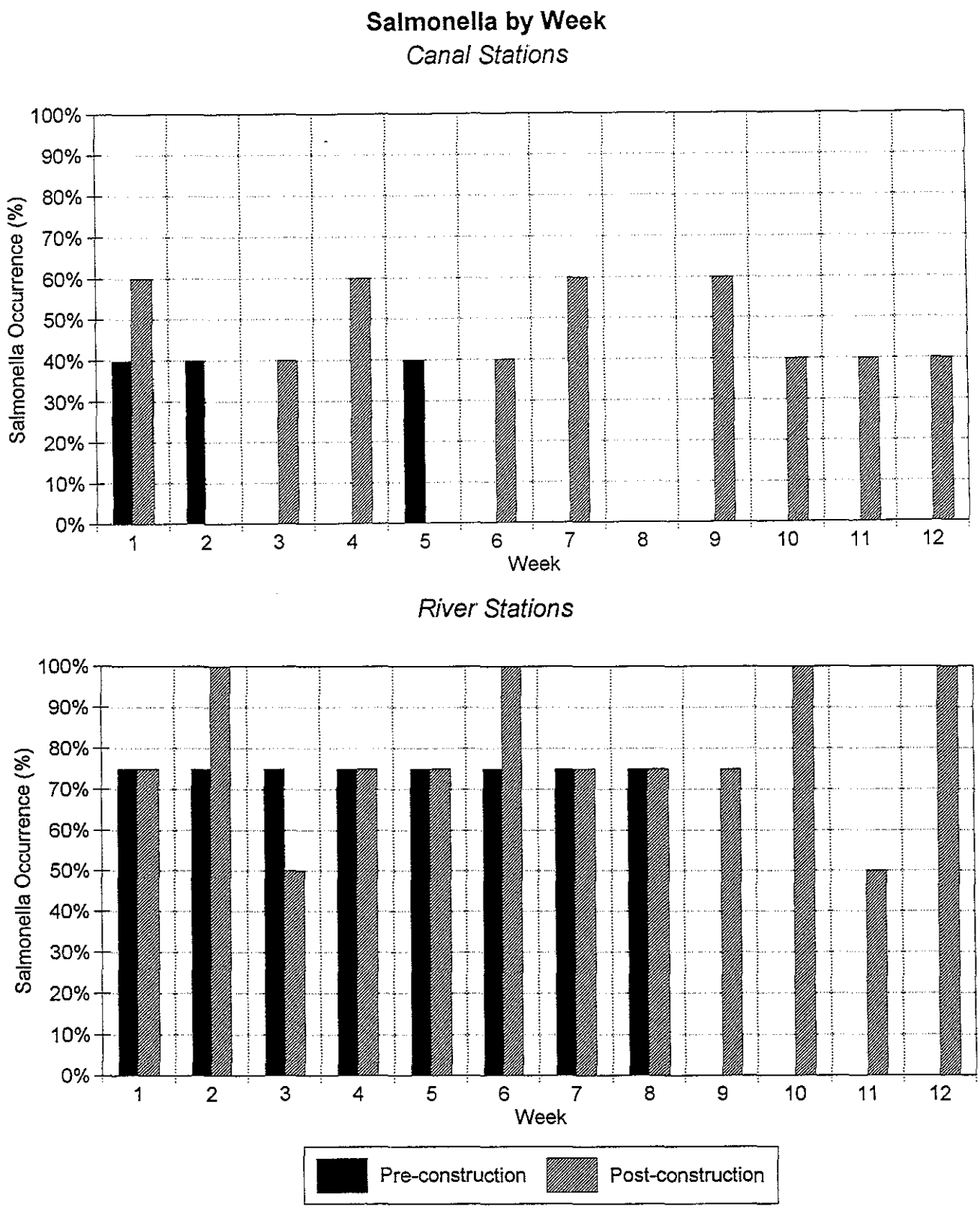

FIGURE 4.3-5
PERCENT OCCURRENCE OF *SALMONELLA* FOR CANAL AND RIVER STATIONS BY WEEK

Source: ECT, 1998

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The *Salmonella* serotypes identified in the Town of Suwannee's canals were *S. hartford*, *S. muenchen*, *S. javiana*, *S. rubislaw*, and *S. inverness*. Main channel Suwannee River *Salmonella* serotypes identified were: *S. allandale*, *S. arizonae*, *S. gaminara*, *S. hartford*, *S. inverness*, *S. javiana*, *S. montevideo*, *S. rubislaw*, and *S. tallahassee*. *Salmonella rubislaw*, however, was only found in the Suwannee River downstream of the Town of Suwannee.

As with the aforementioned cooperative study (Glatzer, 1990), the most consistent *Salmonella* isolations occurred in the Suwannee River (Stations 8, 9, and 10). The canals off the Suwannee River (Stations 5 and 6) also showed moderate rates of *Salmonella* isolation. All other stations sampled showed sporadic isolations of *Salmonella*. *Salmonella* was never isolated from Station 1 (ground water) during either the pre or post-construction sampling. Main channel Suwannee River *Salmonella* serotypes identified during this study, which matched main channel serotypes of the 1990 study, included *S. allandale*, *S. hartford*, *S. inverness*, *S. muenchen*, and *S. tallahassee*. Both studies also identified the presence of *Salmonella* serotypes *S. gaminara* and *S. montevideo*. The post-construction evaluation, unlike the 1990 study, also identified *Salmonella* serotypes *S. arizonae*, *S. javiana*, and *S. rubislaw*. Conversely, there were several *Salmonella* serotypes isolated during the 1990 study (Glatzer, 1990) that were not isolated during the post-construction evaluation. These included *S. daytona*, *S. typhimurium*, *S. braenderup*, *S. paratyphi* B, and *S. aqua*.

The process of analyzing for *Salmonella* proved to be complicated and somewhat of an art. On several of the samples, the biochemical testing indicated the presence of *Salmonella*, but subsequent serotyping indicated the colonies were not *Salmonella*. For consistency with the pre-construction sampling (when serotyping was not conducted), a positive biochemical result was recorded as a positive *Salmonella* reading even if the subsequent serotyping results indicated no *Salmonella*. Consequently, the data might be somewhat biased in reporting *Salmonella* when it is not present. Of the 120 colonies submitted for serotyping, eight tested to be "not *Salmonella*." Two colonies were submitted from each positive *Salmonella* sample for testing. For three of the samples, both colonies were negative for *Salmonella*, and for two of the samples, one colony was negative and one was *Salmonella*. This accounts for the eight negative serotyping results.

These discrepancies were described to illustrate the complexities in analyzing for *Salmonella*. Consequently, the results should be used to identify trends rather than a quantitative treatment.

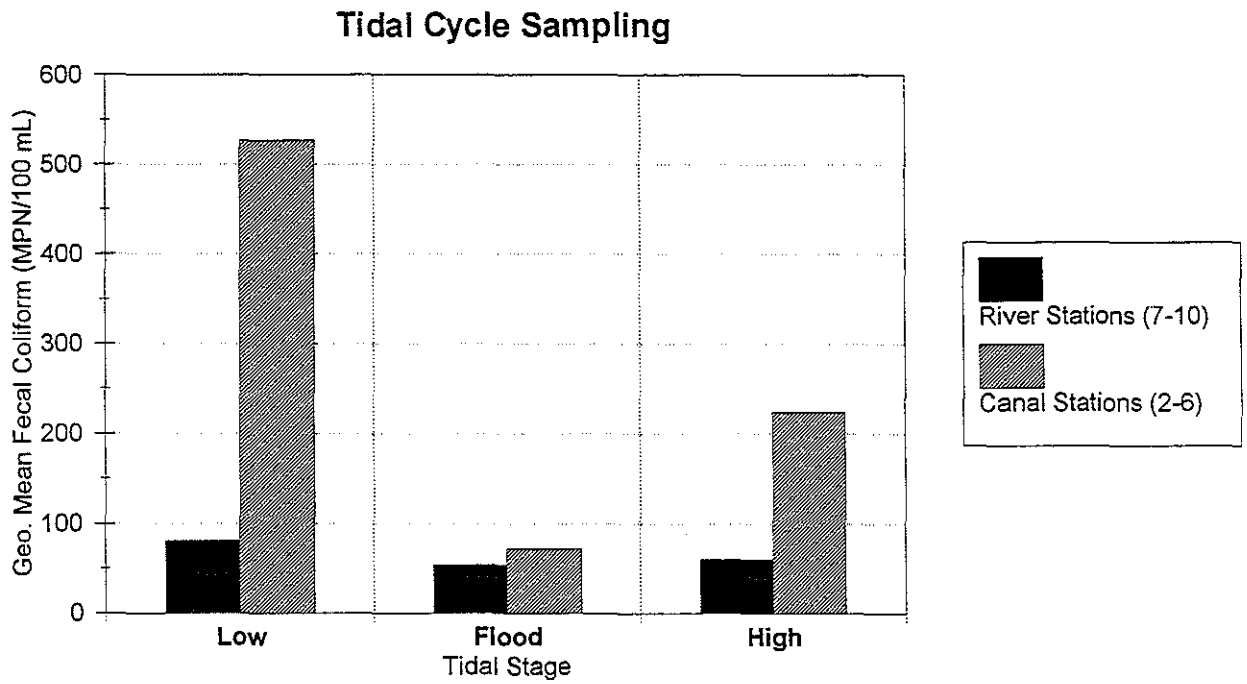
4.4 SPECIAL SAMPLING

The special sampling included the August 1997 reconnaissance to evaluate the viability of *Salmonella* serotyping (discussed above) and the tidal cycle and daily sampling that was conducted during the pre-construction sampling period. The latter two special sampling types are discussed below.

Tidal cycle sampling was conducted to confirm that the period just before low tide was the optimum time to sample the worst case conditions. The results of the tidal cycle sampling are tabulated in Appendix D. A summary of key observations is included here.

Tidal cycle sampling was conducted at low, flood, and high tide. A maximum ebb tide sampling was not conducted because of a problem with the boat motor. The results of the tidal cycle sampling are summarized in Figure 4.4-1. It is apparent from this figure that the tidal stage had little influence on the geometric mean fecal coliform concentrations of the river stations; however, the difference in fecal coliform levels for the canal stations is pronounced. The data in Figure 4.4-1 show that the geometric mean fecal coliform concentrations in the canals ranged from a maximum of about 525 MPN/100 mL at low tide to a minimum of 75 MPN/100 mL at flood tide. Fecal coliform levels began to increase again at high tide. The results of the tidal cycle sampling confirmed that low tide was the optimal time to sample to assure the samples are most representative of resident canal water with minimal dilution from incoming water from the river.

The results of the daily sampling conducted during the pre-construction sampling period are presented in Figure 4.4-1. This figure presents the geometric mean fecal coliform levels for the canal and river stations plotted for each day of the week.



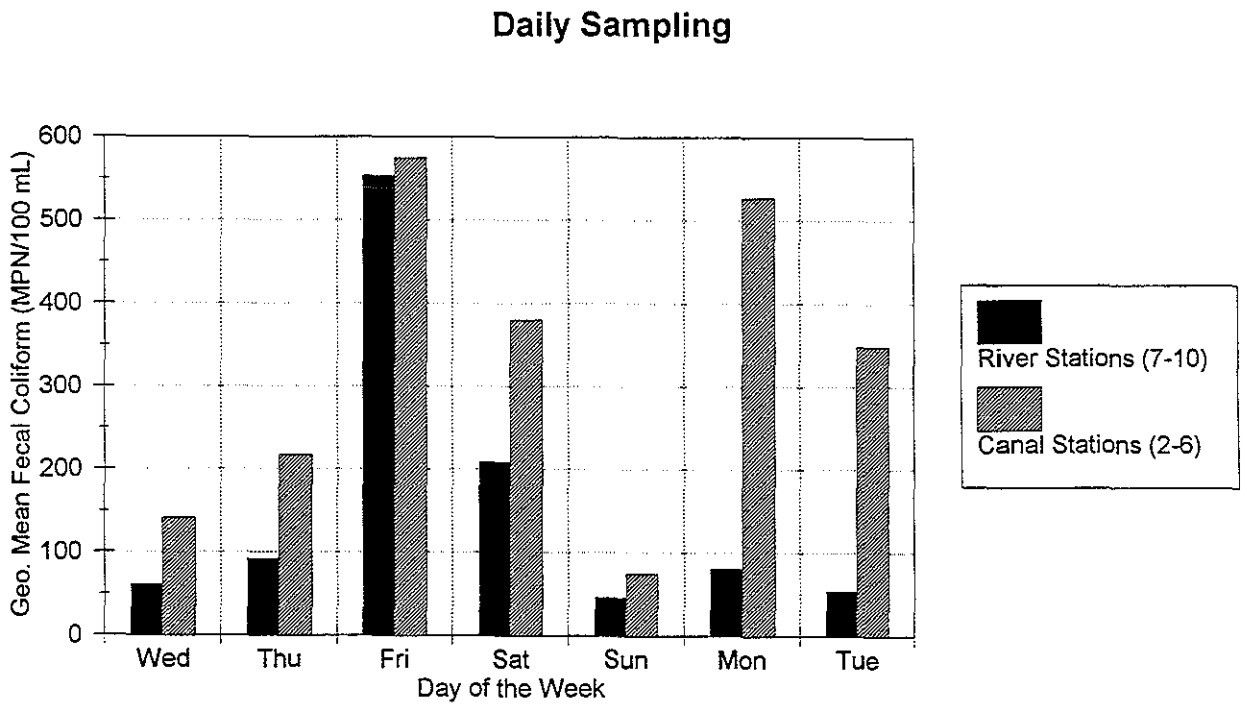


FIGURE 4.4-1.
FECAL COLIFORM RESULTS FROM TIDAL CYCLE AND DAILY SAMPLING

Source: ECT, 1998.

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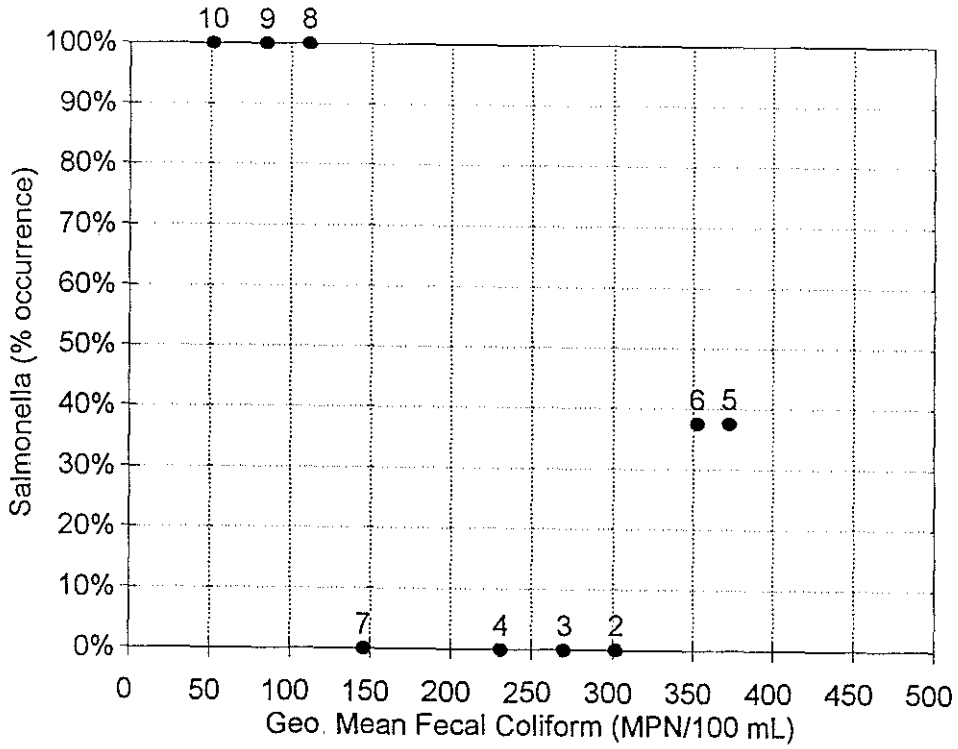
The highest values in the canals occurred on Friday, Saturday, and Monday. There were no other obvious daily variances in the other water quality parameters except that nitrate-nitrite was typically higher on Monday or Tuesday. Because of these small differences and because of logistical considerations, the weekly sampling was conducted on Monday.

In addition to special sampling, we conducted some additional analyses of some of the data. The data presented in Figure 4.4-2 compares *Salmonella* occurrence with geometric mean fecal coliform. Because *Salmonella* was essentially always present or always absent in various stations during the preconstruction period, it is difficult to identify any definite trends. Data collected during the post-construction sampling, however, do seem to show a negative correlation ($r^2 = 0.3868$), i.e., as *Salmonella* occurrence increases, fecal coliform decreases.

We also compared our fecal coliform data with the data collected by FDEP (Figure 4.4-3). The correlation coefficient of $r^2 = 0.3031$ indicate some positive correlation; however, it is not as strong as one might hope. We attribute this weak correlation to the fact that, although FDEP collected their sample on the same day, they did not necessarily collect the sample at the same stage of the tide. As we have seen in Figure 4.4-1, this can be important, particularly with the canal stations.

Fecal Coliform vs Salmonella

Pre-construction



Post-construction

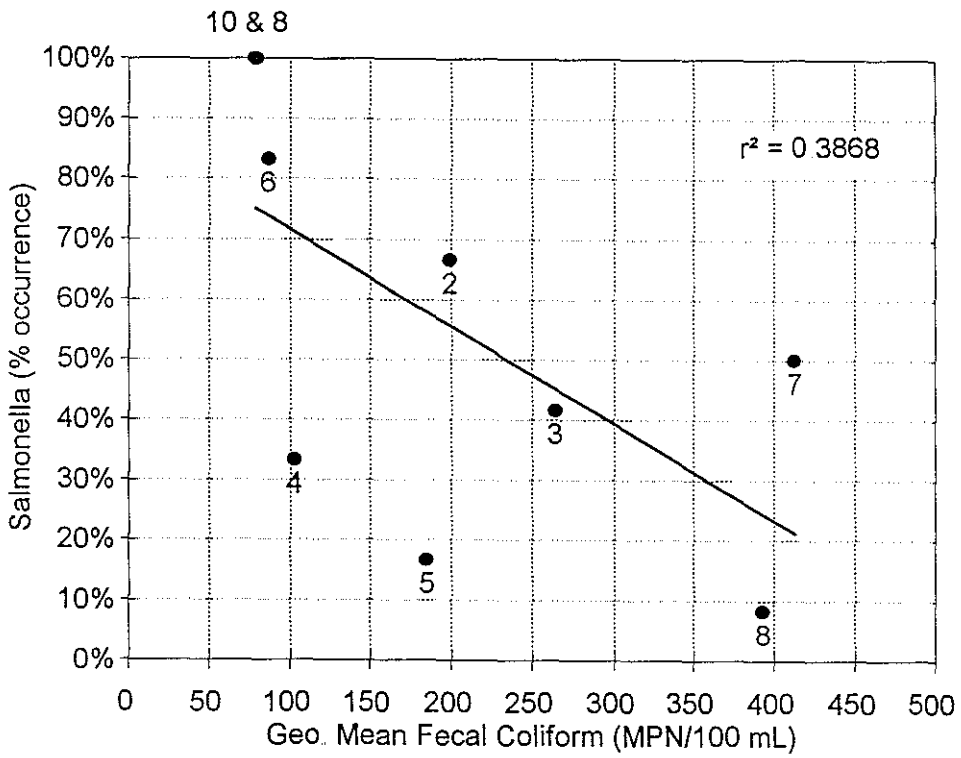


FIGURE 4 4-2.
COMPARISON OF GEOMETRIC MEAN FECAL COLIFORM CONCENTRATION WITH *SALMONELLA* OCCURRENCE
Source: ECT, 1998.

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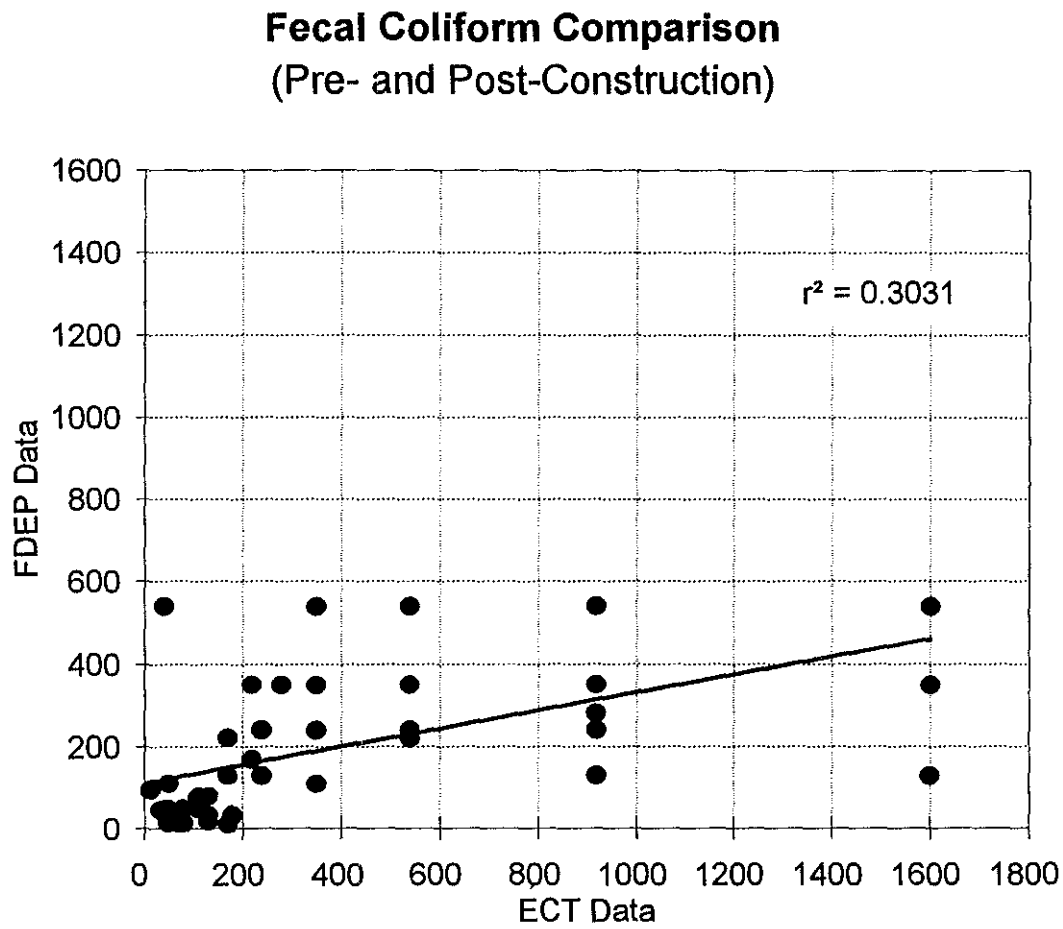

FIGURE 4.4-3.
REGRESSION ANALYSIS AND COMPARISON OF ECT AND FDEP FECAL COLIFORM DATA
(SAMPLES COLLECTED ON SAME DAY BUT NOT NECESSARILY AT SAME TIDAL STAGE)

Source: ECT, 1998; FDEP, 1998.

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5.0 SUMMARY AND CONCLUSIONS

5.1 SUMMARY

Pre- and post-construction water quality is summarized in Table 5.1-1. We believe that El Niño has obscured the positive effects on water quality brought about by the Town of Suwannee switching to a WWTP. Certainly during the first few weeks of the post-construction sampling (prior to the frequent rains of December 1997 and January 1998), there was some indication that fecal coliform levels were lower.

A comparison of the values in Table 5.1-1 shows that overall the geometric mean fecal coliform increased at most stations as did the occurrence of *Salmonella*. Similarly, TKN increased at every station. Total nitrate + nitrite nitrogen decreased by a factor of five at the canal stations. However, there was a comparable decrease at the control station and the other river stations such that the improvement could not be attributed to the WWTP.

Total and fecal coliform MPN levels were relatively high throughout the entire study. Coliform contamination of the Suwannee River is of fecal origin both above and below the Town of Suwannee. Station 5 in the canals had the highest average of fecal coliform MPN levels while Station 1 (ground water well) had the lowest. The average fecal coliform counts in the canals was about three times as high as the river and exceeded the Class III standard for fresh and marine water of 800 MPN/100 mL on any one day of the month.

Salmonella was always present in the Suwannee River and was found occasionally in the canals of the Town of Suwannee. *Salmonella* isolations occurred more frequently and consistently from the main channel of the river than from its canals and locations around the town itself. As shown by this study and the 1990 cooperative effort, the isolation and identification of *Salmonella* from the Suwannee River is high. As yet, no point sources of Salmonella have been identified.

Table 5.1-1. Weekly Mean Surface Water Quality Data Relative to Distance Downstream

Station No.	Distance Downstream (feet)	Geometric Mean Fecal Coliform (MPN/100 mL)		Salmonella Occurrence (%)		Mean Total Kjeldahl Nitrogen (mg/L-N)		Mean Total Nitrate+Nitrite Nitrogen (mg/L-N)	
		Pre-Const.	Post-Const.	Pre-Const.	Post-Const.	Pre-Const.	Post-Const.	Pre-Const.	Post-Const.
10	0	52	79	100%	100%	0.37	0.66	0.894	0.163
9	4400	85	86	100%	83%	0.36	0.66	0.889	0.164
6	11200	353	199	38%	67%	0.39	0.65	0.664	0.136
4	11200	231	264	0%	42%	0.61	0.74	0.571	0.084
5	12550	373	413	38%	50%	0.34	0.65	0.791	0.149
2	13500	302	393	0%	8%	0.37	0.70	0.803	0.141
3	13850	270	184	0%	17%	0.36	0.62	0.807	0.155
8	21650	112	79	100%	100%	0.44	0.66	0.864	0.163
7	22650	146	103	0%	33%	0.39	0.66	0.859	0.163

Note: The 1996 daily and tidal cycle data were excluded.

Source: ECT, 1998.

Salmonella serotyping identified 10 different serotypes of the approximately 2,700 known serotypes within the genus *Salmonella*. It was not possible to correlate the observed species with possible sources. The complexities of analyzing for *Salmonella* were apparent as discrepancies were observed between the serotyping results and the presence/absence data. Consequently, the *Salmonella* results are presented as a qualitative description of the general trends rather than a quantitative analysis. The general trends observed during the study are:

1. There were far more occurrences of *Salmonella* at the river stations than in the canal stations.
2. The upstream control station (Station 10) always had *Salmonella*.
3. There were more occurrences of *Salmonella* during post-construction monitoring in the canals than pre-construction (13.8 percent tested positive for pre-construction, and 36.7 percent tested positive during the post-construction sampling).
4. The pre- and post-construction occurrences of *Salmonella* were comparable in the river.
5. There appeared to be a negative correlation between fecal coliform and *Salmonella*. In other words, as the amount of fecal coliform increased, the occurrences of *Salmonella* decreased.

5.2 CONCLUSIONS

The goal of the study was to determine if installing a central wastewater treatment system in the Town of Suwannee and closing all of the OSTDSs would help restore a viable commercial oyster harvesting industry. Since the oyster harvesting was closed because of *Salmonella* contamination, the question becomes "is the Town of Suwannee the source of *Salmonella*, and if so, will the installation of a WWTP reduce or eliminate this source?" It appears that for this study site, the Town of Suwannee is not the primary source of *Salmonella*, but rather the Suwannee River upstream of the town. The upstream stations had higher occurrences of *Salmonella* than the canals of the town. Consequently, if input from the canals were totally eliminated, there still would be a major source of *Salmonella* to Suwannee Sound.

Since *Salmonella* was identified in the canals (although less frequently than in the river), eliminating this source would help. However, the post-construction occurrences of *Salmonella* were higher than the pre-construction values even though the OSTDSs were closed and no longer a potential source. The post-construction monitoring was distorted by the extensive rains resulting from El Niño, which are believed to have caused the more frequent occurrences of *Salmonella* in the canals. However, since the OSTDSs were closed and not a possible source of *Salmonella*, the extensive rains contributed *Salmonella* from other sources. Consequently, it follows that installing the WWTP and closing the OSTDSs did not reduce the *Salmonella* source and probably did not substantially contribute to opening the oyster reefs for production.

The oysters in Suwannee Sound were sampled for *Salmonella* on October 14, 1997, prior to the closing of the OSTDSs (Heuberger and Quintana, 1997a). Four tissue samples were all negative for *Salmonella*. This finding, in part, resulted in many of the reefs being reclassified as "Conditionally Approved" for oyster harvesting. Since these samples were taken prior to the closure of the OSTDSs, the positive result is not associated with the WWTP.

Although it is unlikely that the WWTP will substantially reduce the source of *Salmonella* to the oyster reefs, other positive effects are expected on water quality. The fecal coliform concentration in the canals were very high. There did appear to be improvement in these values during the weekly sampling until the extensive rains began and masked the results. Although the improvement resulting from the WWTP could not be documented during this study, an extensive baseline database has been established that can readily be used for comparison in subsequent years.

5.3 RECOMMENDATIONS

During this program several methods were used to help determine sources of contamination with varying success. Coprostanol analysis proved to be ineffective as an indicator of human waste, whereas serotyping held promise for helping to differentiate possible sources of *Salmonella*. This study was designed to determine the beneficial effects of the WWTP in restoring oyster harvesting that was closed because of *Salmonella* contamination. The study

results indicate the Town of Suwannee is not the primary source of *Salmonella* and, consequently, eliminating this source would not substantially benefit the oyster industry. Subsequent studies should focus on identifying the source(s) of *Salmonella* that is (are) contaminating the oyster beds. This would include serotyping (or possibly ribotyping) the *Salmonella* found on the oyster tissue. Upstream sources should then be investigated in an attempt to match the source with the species of *Salmonella* contaminating the oysters.

Subsequent studies designed to document improvement resulting from closure of OSTDSs should attempt to find a tracer chemical. Nitrate + nitrite analysis proved useful as did fecal coliform analysis. Attempts to differentiate human waste from other animals was not successful during this program. Other methods should be examined such as the method being used by Wiggens (1996) or use of coliphages (Paul, 1998). The use of other tracers such as coprostanol and linear alkylbenzenes (LABs) were ineffective in this study.

6.0 ACKNOWLEDGMENTS

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APPENDIX A

WATER QUALITY DATA MEASURED *IN SITU* BY ECT DURING THE PRE- AND POST-CONSTRUCTION SAMPLING PERIOD

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 1 (Monitor Well)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/18	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	19:18	19:12	19:15	08:55	09:30	09:15	13:00	17:00		09:30	14:10	09:00	13:00	07:20	12:30	07:45	11:15
Sample Depth, surface	m																	
Sample Depth, mid-depth	m																	
Sample Depth, bottom	m																	
Water Temperature, surface	°C	23.00	24.18	20.29	20.98	19.84	19.92	20.83	20.82				21.12	20.05	17.83	19.31	15.30	19.38
Water Temperature, mid-depth	°C																	
Water Temperature, bottom	°C																	
Conductance, surface	mmhos/cm	0.308	0.293	0.379	0.989	0.365	0.840	0.853	0.861		0.880		1.326	0.555	3.550	2.100	2.310	2.150
Conductance, mid-depth	mmhos/cm																	
Conductance, bottom	mmhos/cm																	
Salinity, surface	‰	0.11	0.10	0.15	0.48	0.14	0.40	0.41	0.41				0.66	0.24	0.14	0.06	1.20	1.12
Salinity, mid-depth	‰																	
Salinity, bottom	‰																	
pH, surface	su	6.68	6.40	6.26	6.24	6.26	6.34	6.31	6.35		6.65		6.21	6.56	6.70	6.49	6.74	6.41
pH, mid-depth	su																	
pH, bottom	su																	
DO, surface	mg/L	1.81	2.48	2.58	1.99	4.70	3.74	2.35	2.68				2.20	2.51	3.89	4.95	1.75	3.36
DO, mid-depth	mg/L																	
DO, bottom	mg/L																	
DO Saturation, surface	%	21%	29%	28%	22%	51%	41%	28%	30%				25%	27%	41%	53%	18%	36%
DO Saturation, mid-depth	%																	
DO Saturation, bottom	%																	
Sigma-t, surface	---	-2.316	-2.608	-1.680	-1.572	-1.592	-1.413	-1.600	-1.594				-1.467	-1.557	-1.205	-1.549	0.034	-0.756
Sigma-t, mid-depth	---																	
Sigma-t, bottom	---																	
ORP, surface	V	-0.096	-0.109	0.117	0.103	-0.068	-0.082	0.083	-0.106				-0.126	-0.107	0.083	0.003	0.037	
ORP, mid-depth	V																	
ORP, bottom	V																	
Transparency	m																	

Notes:

--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 2 (Canal)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/16	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	16:14	16:10	16:25	05:50	06:25	06:50	10:35	14:30	18:15	07:10	12:10	07:00	10:55	05:02	10:30	05:30	09:15
Sample Depth, surface	m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sample Depth, mid-depth	m	0.6	0.7	0.9	0.6		0.7	0.5	0.8	0.8		0.5	0.9	0.7	0.6	0.6	0.6	0.6
Sample Depth, bottom	m	1.2	1.5	1.8	1.1	0.8	1.3	1.0	1.7	1.5		1.0	1.8	1.4	1.1	1.5	1.1	1.1
Water Temperature, surface	°C	23.58	22.04	21.89	19.82	18.33	17.85	18.60	19.50	18.90		20.15	18.41	18.31	16.10	16.62	13.14	18.05
Water Temperature, mid-depth	°C	21.23	21.81	21.90	19.82		18.84	18.33	19.30	18.79		19.00	18.88	17.95	16.03	16.49	13.09	18.05
Water Temperature, bottom	°C	20.97	21.34	22.11	20.82	18.26	17.75	17.60	18.69	18.05		18.44	18.87	18.05	16.15	16.77	12.72	17.85
Conductance, surface	mmhos/cm	0.320	0.357	0.812	0.719	0.645	0.460	0.362	0.426	0.415	0.449	0.595	1.100	0.951	0.918	0.506	0.504	0.522
Conductance, mid-depth	mmhos/cm	0.344	0.362	0.658	0.767		0.466	0.404	0.411	0.450		0.700	16.100	0.958	0.905	0.522	0.523	0.544
Conductance, bottom	mmhos/cm	0.398	0.564	9.650	1.590	0.642	0.460	0.550	0.800	0.790		0.810	24.100	3.650	0.901	1.300	1.390	1.100
Salinity, surface	‰	0.12	0.14	0.27	0.33	0.29	0.19	0.14	0.17	0.17		0.27	0.54	0.46	0.44	0.22	0.22	0.23
Salinity, mid-depth	‰	0.13	0.14	0.30	0.36		0.20	0.16	0.17	0.19		0.32	9.43	0.46	0.43	0.23	0.23	0.24
Salinity, bottom	‰	0.16	0.25	5.45	0.81	0.29	0.19	0.24	0.38	0.37		0.38	14.63	1.95	0.43	0.85	0.70	0.54
pH, surface	su	7.29	7.24	7.13	6.87	6.83	6.98	7.05	7.04	7.13	7.32	7.01	7.47	7.64	7.55	7.19	7.33	7.42
pH, mid-depth	su	7.28	7.26	7.14	6.85		6.97	7.00	7.04	7.18		7.00	7.05	7.63	7.55	7.20	7.33	7.42
pH, bottom	su	7.32	7.27	6.63	6.65	6.84	6.98	6.94	6.93	7.01		6.97	7.12	7.38	7.54	7.02	7.14	7.38
DO, surface	mg/L	6.17	5.83	5.67	4.84	6.88	6.36	6.75	7.00	6.84		7.47	6.62	7.00	7.45	7.10	7.87	7.02
DO, mid-depth	mg/L	5.77	5.83	5.87	4.84		6.36	6.76	6.95	6.69		7.60	5.32	7.00	7.47	7.05	7.86	6.95
DO, bottom	mg/L	6.00	5.64	5.93	3.83	7.00	6.43	6.38	6.67	6.38		7.73	6.12	6.95	7.51	6.46	7.02	5.98
DO Saturation, surface	%	72%	66%	66%	52%	71%	67%	72%	76%	73%		82%	70%	74%	75%	72%	75%	74%
DO Saturation, mid-depth	%	64%	66%	66%	52%		68%	71%	75%	71%		81%	60%	73%	75%	72%	74%	73%
DO Saturation, bottom	%	67%	63%	70%	43%	74%	67%	66%	71%	67%		82%	71%	74%	76%	66%	66%	63%
Sigma-t, surface	---	-2.450	-2.072	-1.933	-1.401	-1.179	-1.166	-1.347	-1.496	-1.383		-1.562	-1.005	-1.048	-0.870	-0.929	-0.408	-1.177
Sigma-t, mid-depth	---	-1.896	-2.018	-1.917	-1.382		-1.351	-1.278	-1.464	-1.348		-1.285	5.673	-0.978	-0.864	-0.900	-0.394	-1.168
Sigma-t, bottom	---	-1.817	-1.839	-1.931	-1.292	-1.167	-1.147	-1.083	-1.183	-1.066		-1.131	9.615	0.143	-0.886	-0.624	0.019	-0.900
ORP, surface	V	0.202	0.200	0.180	0.156	0.204	0.159	0.096	0.111	0.132		0.154	0.062	0.147	0.177	0.127	0.197	0.152
ORP, mid-depth	V	0.207	0.203	0.182	0.156		0.158	0.098	0.109	0.135		0.152	0.056	0.141	0.171	0.124	0.195	0.151
ORP, bottom	V	0.209	0.209	0.213	0.165	0.205	0.156	0.103	0.111	0.146		0.150	0.130	0.143	0.197	0.127	0.208	0.150
Transparency	m	0.7	0.8	0.9			0.9	0.5	0.9		0.8	1.0	1.1	1.0		1.1		0.9

Notes:

--- = dimensionless

% = percent

°C = degrees celsius

DO = dissolved oxygen

EST = Eastern Standard Time

m = meters

mg/L = milligrams per liter

mmhos/cm = millimhos per centimeter @ 25 °C

ORP = oxidation-reduction potential

pH = hydrogen ion activity

‰ = parts per thousand

su = standard pH units

V = volts

Source: ECT, 1997.

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 3 (Canal)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/18	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	16:30	16:25	16:45	08:10	08:47	07:03	10:50	14:40	18:30	07:25	12:20	07:15	11:10	05:15	10:45	05:45	09:30
Sample Depth, surface	m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sample Depth, mid-depth	m	0.9	0.8	0.7	0.6	0.5	0.7	0.5	1.2	0.6		0.8	0.7	0.8	0.5	0.5	0.6	0.6
Sample Depth, bottom	m	1.8	1.7	1.5	1.2	0.1	1.4	1.0	2.4	1.1		1.9	1.4	1.5	1.0	1.0	1.2	1.1
Water Temperature, surface	°C	21.94	22.48	21.70	19.29	17.80	17.43	18.75	20.12	17.86		18.57	18.80	18.83	16.20	17.15	12.85	17.76
Water Temperature, mid-depth	°C	21.97	22.44	21.68	19.31	17.39	17.43	18.65	18.73	18.81		18.50	18.77	18.29	16.11	16.88	13.16	17.60
Water Temperature, bottom	°C	21.97	22.19	21.86	19.34	17.29	17.41	18.33	18.60	18.76		18.20	18.87	18.40	14.95	16.79	13.19	17.75
Conductance, surface	mmhos/cm	0.305	1.021	1.127	0.800	0.554	0.555	0.332	0.405	0.519	0.624	1.486	3.830	0.633	1.053	0.540	0.676	0.370
Conductance, mid-depth	mmhos/cm	0.305	1.064	1.269	0.805	0.650	0.553	0.390	0.800	0.525		1.760	4.050	0.661	1.150	0.547	0.801	0.393
Conductance, bottom	mmhos/cm	0.308	3.220	1.730	1.198	0.829	0.600	0.437	0.891	0.629		5.500	7.500	2.800	2.500	0.631	2.110	0.575
Salinity, surface	‰	0.11	0.50	0.55	0.38	0.24	0.24	0.12	0.16	0.22		0.75	2.05	0.29	0.51	0.24	0.31	0.14
Salinity, mid-depth	‰	0.11	0.52	0.63	0.38	0.30	0.24	0.15	0.38	0.23		0.90	2.18	0.30	0.57	0.24	0.38	0.16
Salinity, bottom	‰	0.11	1.71	0.88	0.59	0.39	0.27	0.18	0.43	0.28		3.01	4.17	1.48	1.31	0.29	1.09	0.25
pH, surface	su	7.27	7.19	7.08	6.97	6.98	7.01	7.06	7.05	7.14	7.25	6.49	7.26	7.71	7.67	7.19	7.44	7.43
pH, mid-depth	su	7.29	7.18	7.08	6.96	6.94	7.01	7.04	7.00	7.16		6.91	7.24	7.67	7.68	7.21	7.40	7.43
pH, bottom	su	7.32	7.01	7.04	6.93	6.95	7.01	7.03	6.99	7.19		6.57	7.26	7.47	7.60	7.25	7.21	7.34
DO, surface	mg/L	5.93	6.14	5.94	5.91	7.29	5.99	6.76	6.76	7.05		7.48	6.52	7.24	7.84	6.67	8.00	6.82
DO, mid-depth	mg/L	5.92	6.20	5.77	5.91	7.33	5.83	6.77	7.20	7.10		7.30	6.55	7.00	7.86	6.80	7.94	6.81
DO, bottom	mg/L	6.03	5.81	6.07	5.86	7.31	5.93	7.00	7.40	7.26		6.94	6.73	6.08	8.22	7.14	7.90	6.72
DO Saturation, surface	%	67%	70%	67%	64%	76%	62%	72%	74%	74%		80%	70%	77%	79%	69%	75%	71%
DO Saturation, mid-depth	%	67%	71%	65%	64%	76%	60%	72%	77%	76%		78%	71%	74%	79%	70%	75%	71%
DO Saturation, bottom	%	68%	67%	69%	47%	76%	61%	74%	84%	77%		74%	73%	65%	81%	73%	75%	70%
Sigma-t, surface	---	-2.070	-1.901	-1.678	-1.301	-1.118	-1.050	-1.388	-1.634	-1.143		-0.875	0.076	-1.280	-0.631	-1.007	-0.299	-1.186
Sigma-t, mid-depth	---	-2.077	-1.874	-1.615	-1.303	-1.004	-1.051	-1.345	-1.191	-1.320		-0.746	0.176	-1.165	-0.575	-0.957	-0.286	-1.148
Sigma-t, bottom	---	-2.076	-0.914	-1.419	0.482	-0.911	-1.028	-1.265	-1.128	-1.268		0.919	1.714	-0.287	0.181	-0.906	0.265	-1.100
ORP, surface	V	0.173	0.205	0.210	0.163	0.195	0.168	0.095	0.129	0.146		0.185	0.132	0.139	0.177	0.114	0.191	0.146
ORP, mid-depth	V	0.176	0.208	0.214	0.162	0.198	0.169	0.097	0.135	0.147		0.135	0.131	0.131	0.177	0.109	0.190	0.144
ORP, bottom	V	0.174	0.216	0.225	0.167	0.201	0.177	0.096	0.137	0.150		0.153	0.139	0.143	0.190	0.102	0.203	0.145
Transparency	m	0.8	0.7	0.5		0.9	0.9	1.0	0.9		0.9	1.0	0.8	1.1		1.0		0.9

Notes:

--- = dimensionless

% = percent

°C = degrees celsius

DO = dissolved oxygen

EST = Eastern Standard Time

m = meters

mg/L = milligrams per liter

mmhos/cm = millimhos per centimeter @ 25 °C

ORP = oxidation-reduction potential

pH = hydrogen ion activity

‰ = parts per thousand

su = standard pH units

V = volts

Source: ECT, 1997.

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 4 (Canal)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/18	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	19:10	19:17	19:05	08:35	09:30	09:15	13:00	16:45		09:30	14:10	09:00	13:00	07:15	12:30	07:45	11:15
Sample Depth, surface	m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2			0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sample Depth, mid-depth	m	0.5	0.8	0.5				0.6	0.5									
Sample Depth, bottom	m	1.0	1.0	0.9	0.5	0.5	0.5	1.1	1.0			0.5	0.5	0.8	0.5	0.8	0.8	0.5
Water Temperature, surface	°C	24.71	23.58	21.40	19.35	18.01	16.92	18.32	18.52				18.78	18.95	15.37	17.06	11.83	18.80
Water Temperature, mid-depth	°C	21.53	23.50	21.32				18.23	18.48									
Water Temperature, bottom	°C	21.42	22.77	21.26	19.30	17.95	16.65	18.14	18.43				18.76	18.85	14.80	17.13	11.78	18.82
Conductance, surface	mmhos/cm	0.516	0.463	0.484	0.555	0.665	0.680	0.686	0.661		0.672		0.705	1.082	0.694	0.752	0.718	0.535
Conductance, mid-depth	mmhos/cm	0.558	0.482	0.480				0.685	0.661									
Conductance, bottom	mmhos/cm	0.580	0.487	0.479	0.551	0.663	0.681	0.678	0.657				0.709	1.083	0.892	0.758	0.732	0.530
Salinity, surface	‰	0.22	0.19	0.21	0.24	0.30	0.31	0.31	0.30				0.33	0.53	0.43	0.35	0.33	0.23
Salinity, mid-depth	‰	0.25	0.20	0.20				0.31	0.30									
Salinity, bottom	‰	0.26	0.21	0.20	0.24	0.30	0.31	0.31	0.30				0.33	0.53	0.43	0.35	0.34	0.23
pH, surface	su	7.40	7.18	6.90	6.63	6.63	6.55	6.68	6.88		7.44		7.24	7.36	7.41	7.09	7.27	7.54
pH, mid-depth	su	7.27	7.16	6.89				6.64	6.84									
pH, bottom	su	7.32	7.06	6.86	6.58	6.65	6.38	6.22	6.78				7.27	7.24	7.43	7.13	7.28	7.50
DO, surface	mg/L	6.50	6.20	5.26	4.94	5.86	5.58	5.64	5.92				6.46	7.21	6.29	5.71	6.12	6.80
DO, mid-depth	mg/L	3.73	6.06	5.24				5.79	6.03									
DO, bottom	mg/L	3.23	3.35	5.39	5.06	6.01	5.91	5.56	6.14				7.17	7.52	6.72	5.61	6.22	7.00
DO Saturation, surface	%	77%	72%	59%	53%	62%	57%	60%	63%				69%	77%	63%	59%	56%	72%
DO Saturation, mid-depth	%	42%	71%	59%				61%	64%									
DO Saturation, bottom	%	36%	39%	60%	54%	63%	60%	59%	65%				76%	80%	66%	58%	57%	75%
Sigma-t, surface	---	-2.651	-2.391	-1.876	-1.415	-1.111	-0.908	-1.160	-1.193				-1.240	-1.117	-0.563	-0.903	-0.160	-1.314
Sigma-t, mid-depth	---	-1.875	-2.364	-1.860				-1.143	-1.201									
Sigma-t, bottom	---	-1.841	-2.188	-1.847	-1.406	-1.100	-0.861	-1.129	-1.208				-1.235	-1.097	0.477	-0.914	-1.480	-1.320
ORP, surface	V	0.195	0.084	0.246	0.193	0.205	0.156	0.157	0.172				0.171	0.181	0.185	0.118	0.205	0.126
ORP, mid-depth	V	0.208	0.076	0.252				0.158	0.175									
ORP, bottom	V	0.210	0.067	0.262	0.202	0.210	0.180	0.163	0.180				0.172	0.185	0.186	0.117	0.214	0.128
Transparency	m																	

Notes:

--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 5 (Canal)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/18	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	16:00	15:55	16:10	05:35	06:15	06:37	10:20	14:15	18:05	07:00	12:00	08:45	10:40	04:50	10:15	05:15	09:30
Sample Depth, surface	m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sample Depth, mid-depth	m		0.6	0.6					0.7	0.5		0.6	0.6	0.5		0.5	0.5	0.6
Sample Depth, bottom	m	0.5	1.2	1.2	0.6	0.6	0.6	0.5	1.5	1.0		1.1	1.1	1.0	0.6	1.0	1.0	1.1
Water Temperature, surface	°C	22.40	22.42	21.89	19.42	18.20	17.71	17.32	19.37	18.75		18.73	18.59	18.00	15.63	16.58	13.22	18.00
Water Temperature, mid-depth	°C		22.41	21.89					19.31	18.73		18.71	18.59	18.00		16.58	13.21	18.00
Water Temperature, bottom	°C	22.40	22.44	21.87	19.34	18.13	17.70	17.28	19.11	18.70		18.76	18.55	17.99	15.81	16.54	13.20	17.99
Conductance, surface	mmhos/cm	0.313	0.355	2.560	0.691	0.568	0.431	0.512	0.350	0.489	0.452	1.610	8.030	0.875	0.869	0.498	0.416	0.489
Conductance, mid-depth	mmhos/cm		0.356	2.600					0.350	0.489		1.610	8.130	0.879		0.497	0.416	0.492
Conductance, bottom	mmhos/cm	0.313	0.356	2.540	0.689	0.569	0.428	0.517	0.371	0.488		1.670	8.110	0.889	0.865	0.495	0.416	0.494
Salinity, surface	‰	0.11	0.14	1.34	0.43	0.25	0.18	0.22	0.13	0.21		0.82	4.48	0.42	0.41	0.21	0.17	0.21
Salinity, mid-depth	‰		0.14	1.37					0.13	0.21		0.82	4.54	0.42		0.21	0.17	0.21
Salinity, bottom	‰	0.11	0.14	1.33	0.43	0.25	0.18	0.22	0.14	0.21		0.85	4.53	0.43	0.41	0.21	0.17	0.21
pH, surface	su	7.20	7.18	6.79	6.60	6.76	6.90	6.90	7.03	7.08	7.20	6.80	7.02	7.35	7.43	7.12	7.14	7.25
pH, mid-depth	su		7.18	6.72					7.02	7.08		6.79	6.98	7.32		7.12	7.11	7.25
pH, bottom	su	7.30	7.18	6.69	6.43	6.74	6.86	6.91	7.00	7.14		6.70	6.89	7.31	7.39	7.15	7.08	7.19
DO, surface	mg/L	6.10	5.94	5.90	5.84	7.10	6.62	6.00	7.04	6.62		7.32	6.46	7.02	7.75	7.09	7.97	6.50
DO, mid-depth	mg/L		6.09	5.96					7.10	6.69		7.36	6.52	7.07		7.12	8.02	6.53
DO, bottom	mg/L	6.60	6.48	6.16	5.87	7.23	7.00	6.10	7.30	7.01		7.43	6.65	7.10	8.00	7.20	8.25	6.56
DO Saturation, surface	%	70%	68%	67%	63%	75%	69%	62%	76%	70%		78%	70%	74%	78%	72%	76%	68%
DO Saturation, mid-depth	%		70%	68%					76%	71%		79%	71%	74%		73%	76%	69%
DO Saturation, bottom	%	75%	74%	70%	63%	76%	73%	63%	78%	75%		79%	72%	75%	80%	73%	78%	69%
Sigma-t, surface	---	-2.172	-2.160	-1.123	-1.290	-1.186	-1.152	-1.048	-1.503	-1.324		-0.854	1.969	-1.022	-0.647	-0.926	-0.456	-1.182
Sigma-t, mid-depth	---		-2.157	-1.107					-1.491	-1.320		-0.850	2.014	-1.020		-0.926	-0.454	-1.180
Sigma-t, bottom	---	-2.172	-2.164	-1.127	-1.275	-1.173	-1.152	-1.039	-1.443	-1.314		-0.834	2.013	-1.014	-0.645	-0.920	-0.453	-1.178
ORP, surface	V	0.193	0.190	0.187	0.151	0.206	0.173	0.071	0.117	0.130		0.169	0.150	0.166	0.205	0.131	0.191	0.154
ORP, mid-depth	V		0.194	0.189					0.116	0.132		0.170	0.153	0.164		0.128	0.190	0.155
ORP, bottom	V	0.193	0.198	0.196	0.154	0.212	0.203	0.077	0.117	0.135		0.172	0.157	0.162	0.209	0.133	0.220	0.159
Transparency	m	0.6	0.7	0.5			0.6	0.9	0.9		0.9	1.1	0.8	1.0		1.0		1.1

Notes:

--- = dimensionless

% = percent

°C = degrees celsius

DO = dissolved oxygen

EST = Eastern Standard Time

m = meters

mg/L = milligrams per liter

mmhos/cm = millimhos per centimeter @ 25 °C

ORP = oxidation-reduction potential

pH = hydrogen ion activity

‰ = parts per thousand

su = standard pH units

V = volts

Source: ECT, 1997.

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 6 (Canal)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/18	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	15:37	15:27	15:50	05:18	05:50	06:20	10:10	14:00	17:55	06:57	11:45	06:30	10:25	04:30	10:00	05:00	08:45
Sample Depth, surface	m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sample Depth, mid-depth	m	0.9	1.1	1.2	0.9	1.0	0.8	0.9	1.5	1.0		1.2	0.7	1.0	1.1	1.2	1.2	1.0
Sample Depth, bottom	m	1.9	2.2	2.5	1.8	2.0	1.7	1.8	3.0	2.0		2.3	1.5	2.0	2.2	2.5	2.5	2.0
Water Temperature, surface	°C	22.40	22.63	21.79	19.62	18.10	17.27	18.69	19.30	18.95		18.25	18.51	17.63	16.17	16.10	12.52	17.77
Water Temperature, mid-depth	°C	22.50	22.64	21.81	19.58	17.92	17.29	18.59	19.08	18.93		18.19	18.51	17.63	16.11	16.04	12.52	17.76
Water Temperature, bottom	°C	22.70	22.71	21.82	19.51	17.84	17.27	18.35	18.43	18.91		18.28	18.50	17.59	16.05	16.00	12.53	17.71
Conductance, surface	mmhos/cm	0.366	0.658	0.705	0.492	0.417	0.420	0.303	0.307	0.333	0.377	0.600	1.910	0.614	0.559	0.399	0.477	0.369
Conductance, mid-depth	mmhos/cm	0.369	0.602	0.668	0.494	0.442	0.420	0.313	0.505	0.332		0.590	1.900	0.614	0.558	0.398	0.471	0.364
Conductance, bottom	mmhos/cm	2.456	0.654	1.009	0.495	0.444	0.442	0.327	1.152	0.332		0.580	1.940	0.611	0.556	0.397	0.469	0.357
Salinity, surface	‰	0.14	0.30	0.33	0.21	0.17	0.17	0.11	0.11	0.12		0.27	0.98	0.28	0.25	0.16	0.20	0.14
Salinity, mid-depth	‰	0.14	0.27	0.31	0.21	0.18	0.17	0.11	0.22	0.12		0.26	0.98	0.28	0.25	0.16	0.20	0.14
Salinity, bottom	‰	1.29	0.30	0.49	0.21	0.18	0.18	0.12	0.57	0.12		0.26	1.00	0.27	0.24	0.16	0.20	0.14
pH, surface	su	7.20	6.96	6.75	6.35	6.60	6.67	6.90	6.93	6.97	7.16	6.59	7.08	6.81	7.12	7.07	6.59	7.03
pH, mid-depth	su	7.20	6.85	6.72	6.28	6.53	6.62	6.83	6.85	6.90		6.53	7.07	6.70	6.99	7.10	6.47	7.00
pH, bottom	su	7.00	6.67	6.48	6.22	6.43	6.54	6.74	6.46	6.78		6.36	7.06	6.29	6.84	7.28	6.34	6.92
DO, surface	mg/L	4.80	5.59	5.61	4.86	6.41	5.70	6.78	6.92	6.62		6.50	5.86	5.50	6.88	6.64	6.90	5.95
DO, mid-depth	mg/L	4.80	5.60	5.64	4.84	6.23	5.72	6.68	6.90	6.65		6.51	5.93	5.50	6.90	6.65	7.04	5.99
DO, bottom	mg/L	5.40	6.05	5.90	4.80	6.37	5.83	6.79	6.96	6.73		6.74	6.00	5.60	7.02	6.78	7.37	6.10
DO Saturation, surface	%	55%	64%	63%	53%	67%	59%	72%	74%	71%		71%	62%	57%	70%	67%	64%	62%
DO Saturation, mid-depth	%	55%	64%	64%	52%	65%	59%	71%	74%	71%		69%	63%	57%	70%	67%	66%	63%
DO Saturation, bottom	%	62%	70%	67%	52%	67%	60%	72%	74%	72%		69%	64%	58%	71%	68%	69%	64%
Sigma-t, surface	---	-2.151	-2.085	-1.872	-1.495	-1.230	-1.078	-1.389	-1.507	-1.427		-1.196	-0.685	-1.062	-0.832	-0.887	-0.342	-1.189
Sigma-t, mid-depth	---	-2.173	-2.110	-1.892	-1.486	-1.186	-1.081	-1.365	-1.362	-1.423		-1.175	-0.689	-1.062	-0.822	-0.877	-0.345	1.189
Sigma-t, bottom	---	-1.355	-2.105	-1.754	-1.471	-1.171	-1.069	-1.314	-0.987	-1.419		-1.182	-0.671	-1.056	-0.813	-0.871	-0.347	1.183
ORP, surface	V	0.194	0.161	0.206	0.185	0.225	0.218	0.110	0.092	0.126		0.171	0.118	0.205	0.230	0.133	0.266	0.205
ORP, mid-depth	V	0.196	0.168	0.211	0.187	0.230	0.222	0.113	0.091	0.131		0.174	0.126	0.208	0.235	0.128	0.270	0.207
ORP, bottom	V	0.211	0.170	0.221	0.207	0.237	0.226	0.117	0.107	0.139		0.189	0.142	0.219	0.244	0.103	0.276	0.228
Transparency	m	0.7	0.9	0.5				1.0	1.0		0.9	1.0		1.3		1.1		1.0

Notes:

--- = dimensionless

% = percent

°C = degrees celsius

DO = dissolved oxygen

EST = Eastern Standard Time

m = meters

mg/L = milligrams per liter

mmhos/cm = millimhos per centimeter @ 25 °C

ORP = oxidation-reduction potential

pH = hydrogen ion activity

‰ = parts per thousand

su = standard pH units

V = volts

Source: ECT, 1997.

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 7 (Wadley Pass)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/18	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	17:02	16:45	17:00	08:30	07:10	07:30	11:10	14:55		07:40	12:45	07:30	11:20	05:42	11:00	06:00	09:45
Sample Depth, surface	m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2			0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sample Depth, mid-depth	m	1.6	1.4	1.3	1.5	1.4	1.5	1.6	2.0			1.1	1.5	1.5	1.6	1.4	1.3	1.5
Sample Depth, bottom	m	3.2	2.8	2.6	2.9	2.8	3.0	3.2	4.0			3.2	3.0	3.0	3.5	2.8	2.5	3.0
Water Temperature, surface	°C	21.51	22.00	21.66	20.39	19.15	18.73	18.76	17.10			18.60	18.91	18.79	16.44	17.27	13.59	17.53
Water Temperature, mid-depth	°C	21.51	22.02	21.69	20.37	19.23	18.74	18.76	16.85			18.57	18.92	18.69	16.39	17.23	13.59	17.51
Water Temperature, bottom	°C	51.50	22.07	21.66	20.25	19.18	18.61	18.71	17.12			18.52	18.89	18.64	15.27	16.94	13.57	17.53
Conductance, surface	mmhos/cm	0.329	0.396	1.327	0.370	0.396	0.339	0.461	19.000		0.362	2.090	4.100	0.439	1.630	0.490	0.830	0.296
Conductance, mid-depth	mmhos/cm	0.329	0.376	1.350	0.377	0.460	0.346	0.461	22.000			2.270	4.300	0.448	5.100	0.670	1.020	0.300
Conductance, bottom	mmhos/cm	4.550	0.408	1.464	0.396	0.460	1.600	0.555	27.900			2.790	4.200	1.000	14.010	9.050	1.169	1.600
Salinity, surface	‰	0.12	0.16	0.66	0.14	0.16	0.13	0.19	11.29			1.08	2.21	0.18	0.83	0.21	0.28	0.10
Salinity, mid-depth	‰	0.12	0.15	0.68	0.15	0.19	0.13	0.19	13.24			1.18	2.32	0.19	2.78	0.31	0.50	0.11
Salinity, bottom	‰	0.19	0.16	0.74	0.16	0.20	0.81	0.24	17.18			1.47	2.26	0.49	0.70	5.09	0.56	0.92
pH, surface	su	7.42	7.36	7.10	7.11	7.07	7.18	7.07	7.00		7.31	7.00	7.30	7.63	7.78	7.28	7.47	7.52
pH, mid-depth	su	7.45	7.36	7.09	7.11	7.06	7.16	7.07	7.00			6.96	7.26	7.63	7.64	7.31	7.38	7.52
pH, bottom	su	7.06	7.45	7.07	7.08	7.04	7.00	7.04	6.99			6.94	7.27	7.61	7.48	6.91	7.23	7.30
DO, surface	mg/L	6.44	6.50	6.63	6.15	7.53	6.96	7.05	7.99			7.54	6.86	7.46	8.01	7.21	8.06	7.04
DO, mid-depth	mg/L	6.41	6.59	6.68	6.11	7.42	6.92	7.01	8.00			7.56	6.96	7.49	7.97	7.25	6.22	7.15
DO, bottom	mg/L	6.23	6.77	6.80	6.25	7.46	6.96	7.13	8.13			7.69	7.40	7.60	8.70	7.30	9.00	7.30
DO Saturation, surface	%	72%	74%	75%	68%	81%	74%	75%	88%			80%	74%	79%	82%	75%	77%	73%
DO Saturation, mid-depth	%	72%	75%	75%	67%	80%	74%	75%	88%			81%	75%	80%	82%	75%	79%	74%
DO Saturation, bottom	%	69%	77%	78%	69%	80%	74%	76%	92%			82%	80%	81%	87%	77%	86%	76%
Sigma-t, surface	---	-1.964	-2.047	-1.591	-1.704	-1.440	-1.382	-1.337	7.446			-0.627	0.170	-1.352	-0.428	-1.049	-0.415	-1.175
Sigma-t, mid-depth	---	-1.964	-2.059	-1.584	-1.697	-1.430	-1.381	-1.337	8.983			-0.545	0.255	-1.329	1.074	-0.967	-0.251	-1.170
Sigma-t, bottom	---	-1.811	-2.059	-1.760	-1.664	-1.412	-0.835	-1.289	11.922			-0.315	0.217	-1.091	-0.335	2.747	-0.186	-0.548
ORP, surface	V	0.160	0.184	0.210	0.165	0.176	0.173	0.132	0.148			0.175	0.139	0.168	0.171	0.119	0.201	0.134
ORP, mid-depth	V	0.157	0.185	0.213	0.166	0.179	0.174	0.133	0.150			0.177	0.141	0.166	0.184	0.114	0.208	0.128
ORP, bottom	V	0.179	0.186	0.220	0.172	0.180	0.191	0.136	0.153			0.183	0.140	0.168	0.202	0.133	0.229	0.138
Transparency	m	0.8				0.6	0.9	1.0	0.9		0.8			1.2		1.1		1.0

Notes:

--- = dimensionless

% = percent

°C = degrees celsius

DO = dissolved oxygen

EST = Eastern Standard Time

m = meters

mg/L = milligrams per liter

mmhos/cm = millimhos per centimeter @ 25 °C

ORP = oxidation-reduction potential

pH = hydrogen ion activity

‰ = parts per thousand

su = standard pH units

V = volts

Source: ECT, 1997.

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 8 (Alligator Pass)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/18	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	17:15	17:10	17:20	06:47	07:30	07:55	11:30	15:20		07:50	12:55	07:40	11:40	05:55	11:15	06:15	10:00
Sample Depth, surface	m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2			0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sample Depth, mid-depth	m	1.0	0.7	0.6		0.5	0.6	1.2	1.2			1.2	1.0	0.7	0.6	0.6	0.8	0.6
Sample Depth, bottom	m	2.1	1.5	1.2	0.5	1.0	1.1	2.5	2.5			2.5	2.0	1.5	1.2	1.1	1.6	0.9
Water Temperature, surface	°C	21.62	22.08	21.56	20.31	19.34	18.65	18.93	18.30			18.55	18.93	18.69	16.59	17.24	13.78	17.53
Water Temperature, mid-depth	°C	21.63	22.11	21.56		19.33	18.67	18.91	18.13			18.55	18.94	18.67	16.59	17.24	13.76	17.53
Water Temperature, bottom	°C	21.64	22.11	21.56	20.26	19.29	18.61	18.85	17.00			18.55	18.93	18.64	16.59	17.22	13.75	17.54
Conductance, surface	mmhos/cm	0.299	0.333	0.594	0.343	0.327	0.316	0.323	4.810		0.301	0.730	2.440	0.439	0.860	1.057	0.406	0.455
Conductance, mid-depth	mmhos/cm	0.300	0.332	0.599		0.328	0.315	0.324	5.400			0.762	2.470	0.436	0.876	1.048	0.412	0.469
Conductance, bottom	mmhos/cm	0.302	0.335	0.608	0.345	0.237	0.316	0.336	15.400			0.774	2.550	0.443	0.880	1.069	0.413	0.485
Salinity, surface	‰	0.11	0.12	0.27	0.13	0.12	0.12	0.12	2.61			0.34	1.28	0.18	0.41	0.52	0.16	0.19
Salinity, mid-depth	‰	0.11	0.12	0.27		0.12	0.11	0.12	2.95			0.36	1.29	0.18	0.42	0.51	0.17	0.20
Salinity, bottom	‰	0.11	0.13	0.27	0.13	0.07	0.12	0.13	8.99			0.36	1.34	0.18	0.42	0.52	0.17	0.21
pH, surface	su	7.40	7.37	7.20	7.05	7.07	7.19	7.11	7.34		7.30	7.04	7.34	7.67	7.85	7.15	7.50	7.46
pH, mid-depth	su	7.41	7.41	7.21		7.06	7.30	7.11	7.35			7.02	7.35	7.71	7.85	7.16	7.49	7.45
pH, bottom	su	7.48	7.48	7.22	7.05	7.07	7.50	7.10	7.26			7.06	7.35	7.77	7.89	7.19	7.47	7.45
DO, surface	mg/L	6.44	6.36	6.43	6.17	7.46	8.87	7.05	8.41			7.62	6.77	7.53	7.93	7.21	8.11	7.08
DO, mid-depth	mg/L	6.49	6.45	6.43		7.53	7.03	7.03	8.45			7.70	6.83	7.63	7.96	7.28	8.20	7.18
DO, bottom	mg/L	6.84	6.78	6.48	6.20	7.75	7.05	7.30	8.45			7.90	6.93	7.95	8.20	7.43	8.42	7.39
DO Saturation, surface	%	72%	72%	72%	68%	80%	73%	75%	90%			81%	73%	80%	81%	75%	86%	74%
DO Saturation, mid-depth	%	73%	73%	72%		81%	75%	75%	90%			82%	73%	81%	81%	75%	79%	75%
DO Saturation, bottom	%	77%	77%	73%	68%	83%	75%	78%	91%			84%	75%	84%	84%	77%	81%	77%
Sigma-t, surface	---	-2.001	-2.091	-1.866	-1.699	-1.506	-1.376	-1.427	0.598			-1.186	-0.543	-1.330	-0.777	-0.808	-0.534	-1.110
Sigma-t, mid-depth	---	-2.003	-2.098	-1.864		-1.504	-1.380	-1.423	0.889			-1.172	-0.533	-1.330	-0.770	-0.811	-0.529	-1.104
Sigma-t, bottom	---	-2.004	-2.097	-1.861	-1.667	-1.533	-1.368	-1.408	5.715			-1.167	-0.497	-1.321	-0.768	-0.799	-0.527	-1.099
ORP, surface	V	0.197	0.222	0.212	0.189	0.156	0.162	0.123	0.129			0.172	0.136	0.157	0.176	0.124	0.200	0.160
ORP, mid-depth	V	0.198	0.227	0.214		0.158	0.158	0.122	0.130			0.173	0.134	0.154	0.177	0.121	0.203	0.160
ORP, bottom	V	0.197	0.230	0.216	0.191	0.159	0.149	0.119	0.139			0.174	0.132	0.148	0.177	0.115	0.208	0.159
Transparency	m	0.8				0.5	0.7	1.0	0.8		0.9	0.9		1.1		1.0		0.9

Notes:

--- = dimensionless

% = percent

°C = degrees celsius

DO = dissolved oxygen

EST = Eastern Standard Time

m = meters

mg/L = milligrams per liter

mmhos/cm = millimhos per centimeter @ 25 °C

ORP = oxidation-reduction potential

pH = hydrogen ion activity

‰ = parts per thousand

su = standard pH units

V = volts

Source: ECT, 1997.

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 9 (East Pass)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/18	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	18:06	18:05	18:30	07:28	08:20	08:40	12:25	16:07		08:30	13:35	08:15	12:25	06:35	12:00	07:00	10:45
Sample Depth, surface	m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2			0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sample Depth, mid-depth	m	2.0	2.2	2.4	2.5	2.5	1.5	2.5	2.2			2.0	2.5	2.2	2.2	2.5	2.5	2.7
Sample Depth, bottom	m	4.0	4.5	4.8	5.0	5.0	3.0	5.0	4.5			4.0	5.0	4.5	5.5	5.0	5.0	5.5
Water Temperature, surface	°C	21.41	21.98	21.45	20.55	19.56	18.95	19.26	19.43			18.55	19.20	18.64	17.50	17.40	14.12	17.50
Water Temperature, mid-depth	°C	21.42	22.00	21.46	20.56	19.57	18.95	19.20	19.43			18.54	19.20	18.63	17.50	17.39	14.11	17.48
Water Temperature, bottom	°C	21.42	22.01	21.38	20.53	19.52	18.89	19.17	19.39			18.54	19.20	18.58	17.46	17.39	14.09	17.50
Conductance, surface	mmhos/cm	0.270	0.277	0.279	0.292	0.296	0.291	0.291	0.297		0.279	0.312	0.342	0.350	0.288	0.290	0.292	0.250
Conductance, mid-depth	mmhos/cm	0.270	0.277	0.279	0.292	0.296	0.290	0.292	0.297			0.312	0.340	0.350	0.334	0.289	0.293	0.250
Conductance, bottom	mmhos/cm	0.270	0.278	0.279	0.293	0.296	0.290	0.292	0.297			0.312	0.340	0.351	0.334	0.289	0.293	0.249
Salinity, surface	‰	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10			0.11	0.13	0.13	0.10	0.10	0.10	0.08
Salinity, mid-depth	‰	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10			0.11	0.13	0.13	0.12	0.10	0.10	0.08
Salinity, bottom	‰	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10			0.11	0.13	0.13	0.12	0.10	0.10	0.08
pH, surface	su	7.38	7.34	7.17	7.11	7.07	7.09	7.09	7.26		7.33	6.77	7.24	7.60	7.67	7.16	7.49	7.41
pH, mid-depth	su	7.40	7.37	7.17	7.10	7.06	7.07	7.09	7.26			6.73	7.19	7.62	7.66	77.16	7.47	7.38
pH, bottom	su	7.46	7.44	7.24	7.08	7.06	7.07	7.11	7.30			6.68	7.13	7.70	7.73	7.23	7.44	7.38
DO, surface	mg/L	6.41	6.16	6.24	6.09	7.45	6.69	6.70	6.80			7.50	6.69	7.34	7.61	7.06	7.96	7.10
DO, mid-depth	mg/L	6.50	6.34	6.36	6.15	7.44	6.72	6.73	6.84			7.57	6.79	7.38	7.71	7.10	8.00	7.21
DO, bottom	mg/L	6.83	6.77	6.50	6.39	8.00	6.82	6.90	7.05			7.84	7.05	7.49	7.96	7.32	8.25	7.21
DO Saturation, surface	%	72%	70%	70%	67%	81%	71%	72%	73%			80%	72%	78%	78%	73%	77%	74%
DO Saturation, mid-depth	%	73%	72%	71%	68%	80%	72%	72%	74%			80%	73%	78%	80%	74%	77%	75%
DO Saturation, bottom	%	77%	77%	73%	70%	86%	73%	74%	76%			83%	76%	79%	83%	76%	80%	78%
Sigma-t, surface	---	-1.986	-2.091	-1.971	-1.770	-1.563	-1.444	-1.505	-1.537			-1.358	-1.472	-1.360	-1.173	-1.154	-0.629	-1.189
Sigma-t, mid-depth	---	-1.968	-2.095	-1.973	-1.772	-1.565	-1.445	-1.493	-1.537			-1.356	-1.473	-1.358	-1.154	-1.153	-0.627	-1.185
Sigma-t, bottom	---	-1.966	-2.097	-1.956	-1.766	-1.555	-1.433	-1.487	-1.529			-1.356	-1.473	-1.348	-1.147	-1.153	-0.624	-1.189
ORP, surface	V	0.216	0.233	0.221	0.166	0.169	0.174	0.132	0.155			0.202	0.158	0.166	0.191	0.125	0.219	0.139
ORP, mid-depth	V	0.218	0.237	0.223	0.188	0.170	0.176	0.132	0.156			0.205	0.160	0.163	0.192	0.123	0.223	0.129
ORP, bottom	V	0.219	0.242	0.224	0.192	0.169	0.178	0.129	0.150			0.209	0.162	0.151	0.190	0.112	0.231	0.104
Transparency	m					0.9	0.9	1.0	0.9		0.9	1.0	1.1	1.2		1.1		1.0

Notes:

--- = dimensionless

% = percent

°C = degrees celsius

DO = dissolved oxygen

EST = Eastern Standard Time

m = meters

mg/L = milligrams per liter

mmhos/cm = millimhos per centimeter @ 25 °C

ORP = oxidation-reduction potential

pH = hydrogen ion activity

‰ = parts per thousand

su = standard pH units

V = volts

Source: ECT, 1997.

Table A-1. Water Quality Data Measured In Situ

Analyte	Units	Station 10 (Suwannee River Control)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/11	11/11	11/11	11/12	11/18	11/25	12/02	12/09	12/16	12/23	12/30
Time	EST	17:47	17:45	18:15	07:12	08:05	08:20	12:10	15:50		08:10	13:20	08:05	12:05	06:30	11:45	06:45	10:30
Sample Depth, surface	m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2			0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sample Depth, mid-depth	m	2.0	2.4	2.2	3.1	2.3	2.2	3.2	3.0			2.5	3.0	3.1	2.2	3.0	2.3	2.2
Sample Depth, bottom	m	4.1	4.7	5.5	6.2	5.5	5.5	7.5	6.0			5.0	6.0	6.3	5.5	6.0	5.5	4.5
Water Temperature, surface	°C	21.40	21.91	21.42	20.47	19.54	18.99	19.23	19.43			18.63	19.23	18.67	17.50	17.51	14.07	17.47
Water Temperature, mid-depth	°C	21.40	21.90	21.42	20.47	19.54	18.96	19.17	19.29			18.61	19.23	18.66	17.51	17.48	14.08	17.48
Water Temperature, bottom	°C	21.41	21.89	21.41	20.45	19.51	18.91	19.16	19.26			18.63	19.18	18.64	17.48	17.49	14.08	17.51
Conductance, surface	mmhos/cm	0.269	0.276	0.279	0.293	0.297	0.290	0.290	0.295		0.277	0.312	0.327	0.349	0.334	0.289	0.293	0.250
Conductance, mid-depth	mmhos/cm	0.270	0.275	0.279	0.293	0.296	0.290	0.290	0.295			0.312	0.328	0.349	0.334	0.288	0.293	0.250
Conductance, bottom	mmhos/cm	2.690	0.276	0.279	0.293	0.296	0.290	0.291	0.295			0.312	0.328	0.349	0.333	0.288	0.294	0.249
Salinity, surface	‰	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10			0.11	0.12	0.13	0.12	0.10	0.10	0.08
Salinity, mid-depth	‰	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10			0.11	0.12	0.13	0.12	0.10	0.10	0.08
Salinity, bottom	‰	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10			0.11	0.12	0.13	0.12	0.10	0.10	0.08
pH, surface	su	7.38	7.41	7.22	7.13	7.06	7.11	7.11	7.35		7.31	7.01	7.27	7.60	7.61	7.19	7.48	7.54
pH, mid-depth	su	7.39	7.43	7.23	7.12	7.04	7.10	7.12	7.37			6.94	7.31	7.59	7.60	7.19	7.47	7.53
pH, bottom	su	7.47	7.53	7.24	7.11	7.03	7.09	7.13	7.40			7.01	7.40	7.61	7.56	7.28	7.52	7.54
DO, surface	mg/L	6.39	6.37	6.28	6.14	7.38	6.70	6.78	6.87			7.54	6.77	7.47	7.56	6.94	7.93	6.96
DO, mid-depth	mg/L	6.42	6.43	6.31	6.15	7.42	6.70	6.76	6.79			7.67	6.82	7.48	7.59	6.96	7.97	7.04
DO, bottom	mg/L	6.48	6.68	6.37	6.18	7.43	6.78	7.03	6.86			7.90	7.00	7.55	7.82	7.03	8.27	7.31
DO Saturation, surface	%	72%	72%	70%	68%	80%	72%	73%	74%			80%	73%	79%	78%	72%	77%	72%
DO Saturation, mid-depth	%	72%	73%	71%	68%	80%	72%	73%	73%			81%	73%	79%	79%	72%	77%	73%
DO Saturation, bottom	%	73%	76%	71%	68%	80%	72%	75%	74%			84%	75%	80%	81%	73%	80%	76%
Sigma-t, surface	---	-1.964	-2.075	-1.964	-1.753	-1.559	-1.452	-1.500	-1.538			-1.373	-1.485	-1.366	-1.154	-1.175	-0.622	-1.184
Sigma-t, mid-depth	---	-1.964	-2.074	-1.964	-1.753	-1.559	-1.447	-1.488	-1.510			-1.370	-1.484	-1.364	-1.156	-1.170	-0.623	-1.185
Sigma-t, bottom	---	-1.966	-2.071	-1.962	-1.749	-1.553	-1.437	-1.485	-1.504			-1.373	-1.474	-1.360	-1.151	-1.171	-0.623	-1.191
ORP, surface	V	0.205	0.226	0.208	0.170	0.187	0.162	0.144	0.135			0.167	0.163	0.188	0.185	0.131	0.315	0.142
ORP, mid-depth	V	0.206	0.228	0.208	0.169	0.189	0.163	0.145	0.132			0.168	0.159	0.186	0.184	0.127	0.216	0.138
ORP, bottom	V	0.206	0.229	0.208	0.169	0.191	0.163	0.144	0.129			0.167	0.152	0.184	0.187	0.104	0.215	0.132
Transparency	m	0.8				0.9	0.9	1.2	1.0		1.0	0.9	1.0	1.6		1.1		1.0

Notes:

--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table A-2. Water Quality Data Measured *In Situ*

Analyte	Units	Station 1 (Monitor Well)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	17:40	11:32	17:10	10:00	15:42	10:10	14:50	09:47	13:45	09:09	12:45	08:33
Sample Depth, surface	m												
Sample Depth, mid-depth	m												
Sample Depth, bottom	m												
Water Temperature, surface	°C	22.61	20.56	20.27	20.85	19.83	16.72	19.67	16.82	19.59	17.95	18.73	17.35
Water Temperature, mid-depth	°C												
Water Temperature, bottom	°C												
Conductance, surface	mmhos/cm	0.611	0.399	0.530	0.620	0.389	0.305	0.441	0.119	0.412	0.396	0.363	0.334
Conductance, mid-depth	mmhos/cm												
Conductance, bottom	mmhos/cm												
Salinity, surface	‰		0.16	0.23	0.28	0.15	0.11	0.18	0.01	0.17	0.16	0.14	0.12
Salinity, mid-depth	‰												
Salinity, bottom	‰												
pH, surface	su	6.37	6.55	6.14	6.19	6.26	6.11	6.33	7.05	6.32	6.20	6.27	6.38
pH, mid-depth	su												
pH, bottom	su												
DO, surface	mg/L		1.89	2.26	2.15	2.10	2.86	2.38	2.34	2.01	2.78	3.00	1.94
DO, mid-depth	mg/L												
DO, bottom	mg/L												
DO Saturation, surface	%		21%	25%	24%	23%	29%	26%	24%	22%	29%	32%	20%
DO Saturation, mid-depth	%												
DO Saturation, bottom	%												
Sigma-t, surface	---		-1.729	-1.613	-1.700	-1.580	-1.029	-1.526	-1.123	-1.522	-1.211	-1.372	-1.127
Sigma-t, mid-depth	---												
Sigma-t, bottom	---												
ORP, surface	V	-0.233	-0.126	-0.150	-0.202	-0.183	0.024	-0.202	-0.119	-0.139	-0.101	-0.063	-0.042
ORP, mid-depth	V												
ORP, bottom	V												
Transparency	m												

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table A-2. Water Quality Data Measured In Situ

Analyte	Units	Station 2 (Canal)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	14:51	08:17	14:19	06:57	12:39	07:12	11:47	06:04	11:02	06:11	09:50	05:12
Sample Depth, surface	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.5	0.5	0.5	0.5
Sample Depth, mid-depth	m				0.8	0.8				1.0		1.0	
Sample Depth, bottom	m	1.2	1.2	1.0	1.6	1.6	1.2	1.7	1.4	1.7	1.1	1.9	1.3
Water Temperature, surface	°C	16.94	14.90	16.10	16.35	14.14	13.02	14.32	12.68	14.95	13.78	15.15	14.05
Water Temperature, mid-depth	°C				16.37	14.05				14.62		15.15	
Water Temperature, bottom	°C	17.15	14.85	16.08	16.36	13.86	13.02	13.82	12.69	13.40	13.74	15.00	14.03
Conductance, surface	mmhos/cm	0.372	0.508	0.301	0.215	0.227	0.223	0.171	0.168	0.191	0.147	0.150	0.180
Conductance, mid-depth	mmhos/cm				0.221	0.232				0.194		0.139	
Conductance, bottom	mmhos/cm	0.780	0.683	0.285	0.215	0.300	0.225	0.173	0.170	0.109	0.145	0.132	0.180
Salinity, surface	‰	0.15	0.22	0.11	0.06	0.07	0.07	0.04	0.04	0.05	0.02	0.03	0.04
Salinity, mid-depth	‰				0.06	0.07				0.05		0.02	
Salinity, bottom	‰	0.37	0.31	0.10	0.06	0.11	0.07	0.04	0.04	0.00	0.02	0.02	0.04
pH, surface	su	6.86	6.85	6.60	6.65	6.80	6.71	6.67	6.55	6.08	6.40	6.61	6.61
pH, mid-depth	su				6.66	6.81				6.06		6.65	
pH, bottom	su	6.70	6.77	6.63	6.68	6.78	6.72	6.72	6.58	6.17	6.35	6.66	6.62
DO, surface	mg/L	6.53	6.27	6.72	6.38	6.60	7.47	7.36	7.02	7.24	6.66	6.64	6.39
DO, mid-depth	mg/L				6.38	6.60				7.20		6.80	
DO, bottom	mg/L	6.06	5.94	6.92	6.54	6.49	7.71	7.32	7.39	7.64	7.30	7.10	6.62
DO Saturation, surface	%	67%	62%	68%	65%	64%	71%	71%	66%	71%	64%	66%	62%
DO Saturation, mid-depth	%				65%	64%				70%		67%	
DO Saturation, bottom	%	63%	58%	70%	66%	62%	73%	70%	69%	73%	70%	70%	64%
Sigma-t, surface	---	-1.040	-0.653	-0.927	-1.004	-0.659	-0.510	-0.708	-0.491	-0.792	-0.642	-0.839	-0.666
Sigma-t, mid-depth	---				-1.005	-0.644				-0.742		-0.844	
Sigma-t, bottom	---	-0.907	-0.572	-0.931	-1.006	-0.590	-0.510	-0.637	-0.491	-0.607	-0.638	-0.824	-0.663
ORP, surface	V	0.254	0.152	0.183	0.253	0.258	0.224	0.248	0.232	0.298	0.297	0.285	0.302
ORP, mid-depth	V				0.245	0.258				0.300		0.284	
ORP, bottom	V	0.256	0.162	0.187	0.270	0.259	0.222	0.243	0.229	0.295	0.292	0.283	0.310
Transparency	m	0.8	0.7	0.7	0.7	0.7	0.7	0.7		0.5		0.7	

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table A-2. Water Quality Data Measured In Situ

Analyte	Units	Station 3 (Canal)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	15:02	08:30	14:32	07:10	12:59	07:23	11:59	06:19	11:17	06:23	10:01	05:26
Sample Depth, surface	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5.0
Sample Depth, mid-depth	m					0.7						0.9	
Sample Depth, bottom	m	1.2	0.8	1.1	1.3	1.4	1.2	1.7	1.5	1.3	1.4	1.8	1.3
Water Temperature, surface	°C	17.52	14.64	16.04	16.05	14.66	12.71	13.45	12.53	13.24	13.50	14.92	13.39
Water Temperature, mid-depth	°C					16.64						14.92	
Water Temperature, bottom	°C	16.99	14.57	15.28	16.16	14.62	12.69	13.49	12.50	13.05	13.49	14.92	13.40
Conductance, surface	mmhos/cm	0.174	0.461	0.198	0.374	0.144	0.150	0.103	0.093	0.084	0.090	0.116	0.114
Conductance, mid-depth	mmhos/cm					0.144						0.116	
Conductance, bottom	mmhos/cm	0.336	0.387	0.159	0.635	0.145	0.150	0.103	0.093	0.082	0.091	0.116	0.112
Salinity, surface	‰	0.04	0.19	0.05	0.15	0.02	0.03	0.00	0.00	0.00	0.00	0.01	0.01
Salinity, mid-depth	‰					0.02						0.01	
Salinity, bottom	‰	0.13	0.15	0.03	0.29	0.02	0.03	0.00	0.00	0.00	0.00	0.01	0.01
pH, surface	su	6.92	6.85	6.70	6.68	6.80	6.76	6.60	6.57	6.12	6.47	6.65	6.62
pH, mid-depth	su					6.83						6.66	
pH, bottom	su	6.75	6.95	6.81	6.51	6.88	6.80	6.65	6.70	6.18	6.50	6.68	6.60
DO, surface	mg/L	6.83	6.71	7.32	6.82	7.10	7.89	8.12	7.66	7.79	7.44	7.21	7.46
DO, mid-depth	mg/L					7.19						7.33	
DO, bottom	mg/L	6.60	6.90	7.44	7.03	7.35	8.06	8.19	7.75	7.86	7.72	7.54	7.63
DO Saturation, surface	%	71%	66%	74%	69%	69%	74%	77%	72%	74%	71%	71%	71%
DO Saturation, mid-depth	%					70%						72%	
DO Saturation, bottom	%	68%	67%	74%	71%	72%	76%	78%	72%	74%	74%	74%	73%
Sigma-t, surface	---	-1.224	-0.634	-0.960	-0.889	-0.768	-0.502	-0.616	-0.500	-0.565	-0.623	-0.819	-0.604
Sigma-t, mid-depth	---					-0.765						-0.819	
Sigma-t, bottom	---	-1.063	-0.654	-0.856	-0.798	-0.762	-0.500	-0.622	-0.496	-0.589	-0.622	-0.819	-0.606
ORP, surface	V	0.269	0.155	0.198	0.260	0.258	0.222	0.265	0.239	0.310	0.285	0.281	0.297
ORP, mid-depth	V					0.254						0.281	
ORP, bottom	V	0.269	0.155	0.202	0.264	0.253	0.216	0.261	0.229	0.302	0.277	0.280	0.293
Transparency	m	0.8	0.7	0.6	0.6	0.7	0.7	0.7		0.8		0.7	

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table A-2. Water Quality Data Measured In Situ

Analyte	Units	Station 4 (Canal)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	16:42	10:46	16:28	09:20	14:57	09:23	13:55	08:54	13:25	08:30	12:03	07:39
Sample Depth, surface	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Depth, mid-depth	m	0.9											
Sample Depth, bottom	m	1.8			0.7			0.8		1.0		0.9	
Water Temperature, surface	°C	18.45	15.66	17.26	16.68	14.15	13.16	15.47	13.95	16.72	14.51	15.79	14.77
Water Temperature, mid-depth	°C	18.08											
Water Temperature, bottom	°C	18.11			16.65			15.39		16.02		15.82	
Conductance, surface	mmhos/cm	1.000	0.444	0.375	0.268	0.284	0.296	0.326	0.288	0.274	0.215	0.175	0.186
Conductance, mid-depth	mmhos/cm	1.048											
Conductance, bottom	mmhos/cm	1.042			0.267			0.332		0.285		0.175	
Salinity, surface	‰	0.49	0.18	0.15	0.09	0.10	0.10	0.12	0.10	0.09	0.06	0.04	0.05
Salinity, mid-depth	‰	0.51											
Salinity, bottom	‰	0.51			0.09			0.12		0.10		0.04	
pH, surface	su	6.78	6.88	6.23	6.46	6.24	6.43	6.32	6.67	6.34	6.45	6.45	6.74
pH, mid-depth	su	6.61											
pH, bottom	su	6.47			6.45			6.26		6.30		6.45	
DO, surface	mg/L	9.39	5.45	5.10	5.41	5.36	7.00	5.82	5.33	6.60	5.04	5.70	5.78
DO, mid-depth	mg/L	7.58											
DO, bottom	mg/L	7.56			5.71			5.50		5.62		5.62	
DO Saturation, surface	%	100%	54%	53%	55%	52%	66%	58%	51%	67%	49%	57%	57%
DO Saturation, mid-depth	%	80%											
DO Saturation, bottom	%	80%			58%			55%		57%		56%	
Sigma-t, surface	---	-1.054	-0.797	-1.094	-1.038	-0.637	-0.498	-0.816	-0.607	-1.042	-0.717	-0.929	-0.767
Sigma-t, mid-depth	---	-0.964											
Sigma-t, bottom	---	-0.973			-1.033			-0.801		-0.921		-0.934	
ORP, surface	V	0.206	0.162	0.228	0.294	0.332	0.287	0.313	0.335	0.287	0.294	0.366	0.387
ORP, mid-depth	V	0.205											
ORP, bottom	V	0.238			0.298			0.321		0.288		0.342	
Transparency	m	0.8								0.9			

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1998.

Table A-2. Water Quality Data Measured In Situ

Analyte	Units	Station 5 (Canal)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	14:39	08:05	14:08	06:47	12:28	07:02	11:35	05:53	10:50	06:01	09:36	05:02
Sample Depth, surface	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Depth, mid-depth	m												
Sample Depth, bottom	m	1.0			1.3	1.0	0.8	1.2	1.0	1.0	1.0	1.2	0.8
Water Temperature, surface	°C	17.42	14.52	15.71	16.11	14.27	12.90	13.77	12.52	13.53	13.68	15.00	13.57
Water Temperature, mid-depth	°C												
Water Temperature, bottom	°C	17.47			16.12	14.26	12.90	13.82	12.53	13.61	13.68	15.00	13.59
Conductance, surface	mmhos/cm	0.184	0.344	0.179	0.206	0.187	0.178	0.109	0.104	0.090	0.098	0.122	0.124
Conductance, mid-depth	mmhos/cm												
Conductance, bottom	mmhos/cm	0.188			0.205	0.187	0.176	0.110	0.102	0.089	0.098	0.122	0.124
Salinity, surface	‰	0.04	0.13	0.04	0.06	0.05	0.04	0.00	0.00	0.00	0.00	0.01	0.01
Salinity, mid-depth	‰												
Salinity, bottom	‰	0.05			0.06	0.05	0.04	0.00	0.00	0.00	0.00	0.01	0.01
pH, surface	su	6.81	6.89	6.67	6.69	6.88	6.77	6.71	6.59	6.08	6.49	6.72	6.65
pH, mid-depth	su												
pH, bottom	su	6.90			6.71	6.92	6.81	6.80	6.69	6.13	6.54	6.76	6.67
DO, surface	mg/L	6.60	6.78	7.49	6.75	6.91	7.71	8.08	7.62	7.81	7.18	6.93	7.33
DO, mid-depth	mg/L												
DO, bottom	mg/L	6.79			7.02	7.05	7.85	8.29	7.80	8.10	7.41	6.92	7.51
DO Saturation, surface	%	68%	66%	75%	68%	67%	73%	78%	71%	75%	69%	68%	70%
DO Saturation, mid-depth	%												
DO Saturation, bottom	%	70%			71%	68%	74%	80%	73%	77%	71%	68%	72%
Sigma-t, surface	---	-1.202	-0.665	-0.915	-0.968	-0.694	-0.514	-0.657	-0.498	-0.637	-0.647	-0.828	-0.626
Sigma-t, mid-depth	---												
Sigma-t, bottom	---	-1.209			-0.970	-0.693	-0.515	-0.663	-0.500	-0.638	-0.647	-0.828	-0.624
ORP, surface	V	0.255	0.155	0.220	0.269	0.247	0.210	0.239	0.229	0.289	0.305	0.281	0.309
ORP, mid-depth	V												
ORP, bottom	V	0.261			0.273	0.249	0.218	0.229	0.224	0.284	0.304	0.281	0.312
Transparency	m	0.6	0.6	0.6		0.6		0.7		0.8		0.7	

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table A-2. Water Quality Data Measured In Situ

Analyte	Units	Station 6 (Canal)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	14:22	07:49	13:52	06:33	12:17	06:49	11:23	05:37	10:35	05:47	09:21	04:49
Sample Depth, surface	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Depth, mid-depth	m	1.1	0.9	0.9	1.1	1.4	1.0	1.1	1.2	1.0	1.0	1.3	1.0
Sample Depth, bottom	m	2.2	1.7	1.9	2.2	2.7	2.0	2.2	2.4	2.0	2.1	2.6	2.0
Water Temperature, surface	°C	17.38	15.70	15.28	16.27	14.42	13.09	13.68	12.34	13.70	13.78	15.06	13.90
Water Temperature, mid-depth	°C	17.41	15.64	15.28	16.27	14.39	13.10	13.69	12.33	13.45	13.78	15.09	13.91
Water Temperature, bottom	°C	17.46	15.51	15.33	16.28	14.39	13.15	13.64	12.32	13.28	13.78	15.12	13.90
Conductance, surface	mmhos/cm	0.200	0.162	0.106	0.156	0.171	0.144	0.112	0.120	0.095	0.097	0.118	0.121
Conductance, mid-depth	mmhos/cm	0.200	0.165	0.107	0.155	0.174	0.147	0.115	0.120	0.097	0.096	0.116	0.120
Conductance, bottom	mmhos/cm	0.197	0.167	0.107	0.156	0.174	0.175	0.109	0.125	0.081	0.097	0.117	0.120
Salinity, surface	‰	0.05	0.03	0.00	0.03	0.04	0.02	0.01	0.01	0.00	0.00	0.01	0.01
Salinity, mid-depth	‰	0.05	0.03	0.00	0.03	0.04	0.02	0.01	0.01	0.00	0.00	0.01	0.01
Salinity, bottom	‰	0.05	0.03	0.00	0.03	0.04	0.04	0.00	0.01	0.00	0.00	0.01	0.01
pH, surface	su	6.85	7.04	6.70	6.66	6.93	6.82	6.70	6.64	5.90	6.55	6.72	6.61
pH, mid-depth	su	6.93	7.17	6.78	6.68	6.96	6.84	6.71	6.68	5.90	6.57	6.74	6.64
pH, bottom	su	7.00	7.43	6.83	6.73	7.02	6.83	6.76	6.76	6.00	6.63	6.80	6.70
DO, surface	mg/L	6.48	6.63	7.51	5.68	6.52	7.58	7.80	7.11	7.55	6.93	6.94	7.02
DO, mid-depth	mg/L	6.47	6.70	7.51	5.84	6.53	7.67	7.80	7.11	7.63	6.97	7.02	7.20
DO, bottom	mg/L	6.50	6.84	7.66	6.18	6.66	7.64	7.87	7.07	7.98	7.10	7.37	7.48
DO Saturation, surface	%	67%	66%	74%	57%	63%	72%	75%	66%	72%	66%	68%	68%
DO Saturation, mid-depth	%	67%	67%	74%	59%	64%	73%	75%	66%	73%	67%	69%	69%
DO Saturation, bottom	%	67%	68%	76%	63%	65%	72%	75%	66%	76%	68%	73%	72%
Sigma-t, surface	---	-1.188	-0.920	-0.877	-1.015	-0.722	-0.552	-0.643	-0.470	-0.650	-0.661	-0.839	-0.670
Sigma-t, mid-depth	---	-1.193	-0.909	-0.877	-1.016	-0.717	-0.552	-0.643	-0.469	-0.617	-0.661	-0.844	-0.671
Sigma-t, bottom	---	-1.204	-0.888	-0.885	-1.017	-0.717	-0.547	-0.639	-0.465	-0.594	-0.661	-0.848	-0.670
ORP, surface	V	0.264	0.201	0.227	0.281	0.254	0.234	0.255	0.247	0.304	0.312	0.271	0.324
ORP, mid-depth	V	0.270	0.203	0.235	0.282	0.252	0.230	0.257	0.242	0.311	0.310	0.263	0.322
ORP, bottom	V	0.279	0.206	0.262	0.283	0.249	0.226	0.256	0.237	0.311	0.308	0.239	0.320
Transparency	m	0.7	0.6	0.6		0.7		0.7		0.8		0.7	

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table A-2. Water Quality Data Measured In Situ

Analyte	Units	Station 7 (Wadley Pass)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	15:21	08:53	14:50	07:32	13:18	07:39	12:18	06:40	11:40	06:40	10:22	05:49
Sample Depth, surface	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Depth, mid-depth	m	1.2	1.2	1.1	1.4	1.1	1.2	1.4	1.1	1.3	1.0	1.4	1.0
Sample Depth, bottom	m	2.5	2.5	2.2	2.7	2.2	2.3	2.8	2.2	2.2	2.0	2.7	2.1
Water Temperature, surface	°C	17.11	15.70	15.13	15.98	14.82	13.06	13.27	12.86	13.34	13.94	14.91	13.60
Water Temperature, mid-depth	°C	17.12	15.67	15.13	15.99	14.81	13.05	13.27	12.83	13.34	13.94	14.91	13.60
Water Temperature, bottom	°C	17.14	15.59	15.13	15.98	14.76	13.05	13.31	12.83	13.39	13.95	14.91	13.60
Conductance, surface	mmhos/cm	0.158	0.164	0.132	0.137	0.164	0.119	0.105	0.090	0.085	0.089	0.115	0.109
Conductance, mid-depth	mmhos/cm	0.200	0.162	0.133	0.138	0.173	0.119	0.106	0.091	0.086	0.089	0.115	0.110
Conductance, bottom	mmhos/cm	0.955	0.164	0.133	0.139	1.418	0.121	0.108	0.091	0.089	0.089	0.116	0.110
Salinity, surface	‰	0.03	0.03	0.02	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Salinity, mid-depth	‰	0.05	0.03	0.02	0.02	0.04	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Salinity, bottom	‰	0.46	0.03	0.02	0.02	0.71	0.01	0.00	0.00	0.00	0.00	0.01	0.00
pH, surface	su	6.74	6.87	6.67	6.78	6.83	6.71	6.56	6.47	6.12	6.42	6.64	6.62
pH, mid-depth	su	6.86	6.89	6.69	6.72	6.90	6.72	6.58	6.50	6.19	6.41	6.65	6.64
pH, bottom	su	6.61	6.96	6.76	6.74	6.56	6.78	6.62	6.58	6.30	6.47	6.69	6.67
DO, surface	mg/L	7.06	7.09	7.73	7.11	7.12	7.92	8.22	7.70	7.91	7.21	7.25	7.55
DO, mid-depth	mg/L	7.08	7.22	7.82	7.15	7.20	8.01	8.27	7.80	7.96	7.30	7.25	7.64
DO, bottom	mg/L	7.25	7.55	8.10	7.27	7.40	8.29	8.35	8.10	8.21	7.73	7.38	7.82
DO Saturation, surface	%	73%	71%	76%	72%	70%	75%	78%	72%	75%	75%	71%	72%
DO Saturation, mid-depth	%	73%	72%	77%	72%	71%	76%	78%	73%	76%	70%	71%	73%
DO Saturation, bottom	%	75%	75%	80%	73%	73%	78%	79%	76%	78%	74%	73%	71%
Sigma-t, surface	---	-1.158	-0.919	-0.844	-0.975	-0.784	-0.559	-0.592	-0.541	-0.602	-0.683	-0.817	-0.634
Sigma-t, mid-depth	---	-1.142	-0.915	-0.843	-0.977	-0.778	-0.558	-0.591	-0.537	-0.602	-0.683	-0.817	-0.633
Sigma-t, bottom	---	-0.832	-0.902	-0.843	-0.975	-0.250	0.557	-0.596	-0.537	-0.609	-0.684	-0.817	-0.633
ORP, surface	V	0.245	0.158	0.186	0.244	0.238	0.234	0.250	0.236	0.278	0.293	0.266	0.302
ORP, mid-depth	V	0.247	0.156	0.190	0.248	0.236	0.231	0.251	0.234	0.280	0.295	0.270	0.301
ORP, bottom	V	0.262	0.151	0.194	0.251	0.251	0.226	0.251	0.231	0.277	0.297	0.274	0.300
Transparency	m	0.4	0.4	0.6	0.7	0.6	0.8	0.7		0.8		0.7	

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table A-2. Water Quality Data Measured In Situ

Analyte	Units	Station 8 (Alligator Pass)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	15:35	09:10	15:01	07:50	13:32	07:58	12:30	06:57	11:54	06:54	10:34	06:05
Sample Depth, surface	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Depth, mid-depth	m			0.9	1.4	1.4	1.2	1.4	0.8	1.3	1.0	1.4	1.0
Sample Depth, bottom	m	1.1	1.0	1.8	2.8	2.7	2.5	2.8	1.6	2.8	2.1	2.8	2.0
Water Temperature, surface	°C	17.05	15.67	15.05	15.92	14.84	13.09	13.22	12.77	13.16	14.04	14.88	13.62
Water Temperature, mid-depth	°C			15.05	15.94	14.84	13.08	13.19	12.76	13.15	14.06	14.88	13.62
Water Temperature, bottom	°C	17.06	15.64	15.08	15.93	14.83	13.06	13.22	12.77	13.21	14.05	14.90	13.61
Conductance, surface	mmhos/cm	0.129	0.153	0.114	0.129	0.144	0.112	0.098	0.090	0.078	0.089	0.114	0.107
Conductance, mid-depth	mmhos/cm			0.115	0.128	0.144	0.112	0.099	0.091	0.079	0.089	0.114	0.107
Conductance, bottom	mmhos/cm	0.133	0.154	0.117	0.130	0.145	0.112	0.099	0.090	0.080	0.089	0.114	0.107
Salinity, surface	‰	0.01	0.03	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Salinity, mid-depth	‰			0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Salinity, bottom	‰	0.02	0.03	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
pH, surface	su	6.71	6.80	6.62	6.72	6.75	6.71	6.53	6.45	6.10	6.42	6.63	6.66
pH, mid-depth	su			6.62	6.72	6.76	6.76	6.56	6.48	6.15	6.43	6.62	6.66
pH, bottom	su	6.82	6.82	6.69	6.75	6.81	6.81	6.61	6.56	6.21	6.46	6.67	6.70
DO, surface	mg/L	7.12	7.06	7.73	7.08	7.12	7.94	8.25	7.66	7.89	7.08	7.14	7.49
DO, mid-depth	mg/L			7.81	7.13	7.20	8.04	8.31	7.70	7.95	7.12	7.18	7.53
DO, bottom	mg/L	7.30	7.15	8.13	7.29	7.41	8.27	8.58	7.75	8.17	7.21	7.31	7.68
DO Saturation, surface	%	73%	71%	76%	71%	70%	75%	78%	72%	75%	68%	70%	72%
DO Saturation, mid-depth	%			77%	70%	70%	76%	79%	72%	75%	69%	71%	72%
DO Saturation, bottom	%	75%	71%	80%	73%	73%	78%	81%	73%	77%	70%	72%	73%
Sigma-t, surface	---	-1.159	-0.919	-0.839	-0.969	-0.795	-0.566	-0.587	-0.530	-0.579	0.697	-0.813	-0.637
Sigma-t, mid-depth	---			-0.843	-0.973	-0.795	-0.564	-0.583	-0.528	-0.578	-0.700	-0.813	-0.637
Sigma-t, bottom	---	-1.159	-0.914	-0.842	-0.970	-0.793	-0.562	-0.587	-0.530	-0.585	-0.698	-0.816	-0.636
ORP, surface	V	0.258	0.150	0.183	0.238	0.248	0.231	0.246	0.230	0.286	0.295	0.255	0.291
ORP, mid-depth	V			0.190	0.239	0.250	0.228	0.249	0.230	0.289	0.295	0.258	0.289
ORP, bottom	V	0.255	0.151	0.201	0.239	0.248	0.222	0.248	0.229	0.285	0.293	0.257	0.283
Transparency	m	0.5	0.4	0.7	0.7	0.6	0.6	0.7		0.8		0.7	

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table A-2. Water Quality Data Measured In Situ

Analyte	Units	Station 9 (East Pass)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	16:14	09:55	15:42	08:32	14:08	08:34	13:06	07:42	12:30	07:39	11:12	06:47
Sample Depth, surface	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Depth, mid-depth	m	2.2	2.6	2.2	2.5	2.2	2.2	2.4	2.6	2.4	2.8	2.7	3.0
Sample Depth, bottom	m	4.5	5.2	4.5	4.9	4.4	4.5	4.8	5.2	4.8	5.6	5.4	6.0
Water Temperature, surface	°C	16.80	16.00	14.80	16.06	14.76	13.15	13.06	12.90	12.90	14.02	14.85	13.51
Water Temperature, mid-depth	°C	16.80	15.99	14.79	16.05	14.75	13.15	13.06	12.89	12.91	14.02	14.85	13.52
Water Temperature, bottom	°C	16.80	15.98	14.77	16.04	14.75	13.12	13.08	12.89	12.96	14.01	14.86	13.51
Conductance, surface	mmhos/cm	0.109	0.137	0.100	0.126	0.134	0.113	0.097	0.088	0.078	0.089	0.114	0.110
Conductance, mid-depth	mmhos/cm	0.111	0.136	0.100	0.126	0.134	0.112	0.097	0.088	0.078	0.089	0.114	0.110
Conductance, bottom	mmhos/cm	0.110	0.136	0.098	0.127	0.134	0.113	0.097	0.088	0.077	0.088	0.114	0.109
Salinity, surface	‰	0.00	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Salinity, mid-depth	‰	0.00	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Salinity, bottom	‰	0.00	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
pH, surface	su	6.64	6.89	6.51	6.72	6.71	6.68	6.40	6.44	6.08	6.40	6.63	6.73
pH, mid-depth	su	6.64	6.72	6.50	6.73	6.74	6.68	6.40	6.45	6.12	6.37	6.63	6.80
pH, bottom	su	6.72	6.98	6.54	6.74	6.78	6.73	6.26	6.40	6.20	6.27	6.65	6.94
DO, surface	mg/L	7.10	6.76	7.62	6.73	7.02	7.78	8.22	7.58	7.83	7.10	7.07	7.44
DO, mid-depth	mg/L	7.14	6.89	7.71	6.77	7.06	7.87	8.32	7.69	7.92	7.18	7.19	7.54
DO, bottom	mg/L	7.28	6.80	7.97	6.89	7.15	8.02	8.74	7.88	8.10	7.36	7.45	7.76
DO Saturation, surface	%	73%	68%	75%	68%	69%	74%	78%	71%	74%	68%	69%	71%
DO Saturation, mid-depth	%	73%	69%	76%	68%	69%	74%	79%	72%	75%	69%	71%	72%
DO Saturation, bottom	%	74%	63%	78%	69%	70%	76%	83%	74%	76%	71%	73%	74%
Sigma-t, surface	---	-1.124	-0.979	-0.806	-0.993	-0.787	-0.573	-0.566	-0.546	-0.546	-0.694	-0.809	-0.671
Sigma-t, mid-depth	---	-1.123	-0.978	-0.805	-0.991	-0.786	-0.573	-0.566	-0.544	-0.547	-0.694	-0.809	-0.623
Sigma-t, bottom	---	-1.124	-0.976	-0.802	-0.989	-0.786	-0.569	-0.569	-0.544	-0.553	-0.693	-0.810	-0.622
ORP, surface	V	0.256	0.150	0.194	0.232	0.247	0.227	0.240	0.222	0.290	0.275	0.246	0.355
ORP, mid-depth	V	0.260	0.155	0.206	0.234	0.245	0.226	0.240	0.215	0.289	0.274	0.243	0.339
ORP, bottom	V	0.261	0.148	0.217	0.236	0.238	0.224	0.238	0.202	0.286	0.269	0.240	0.289
Transparency	m	0.4	0.3	0.6	0.7	0.7	0.8	0.6		0.8	0.7	0.7	

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table A-2. Water Quality Data Measured In Situ

Analyte	Units	Station 10 (Suwannee River Control)											
		1	2	3	4	5	6	7	8	9	10	11	12
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26
Time	EST	16:02	09:35	15:28	08:16	13:56	08:21	12:52	07:27	12:15	07:22	11:01	06:32
Sample Depth, surface	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Depth, mid-depth	m	1.7	2.4	2.0	2.2	2.0	2.0	2.3	2.6	2.4	2.5	2.6	3.0
Sample Depth, bottom	m	3.4	4.8	4.1	4.4	4.0	4.0	4.6	5.2	4.8	5.0	5.2	6.0
Water Temperature, surface	°C	16.70	15.96	14.75	16.05	14.73	13.14	13.06	12.93	12.86	14.03	14.83	13.49
Water Temperature, mid-depth	°C	16.71	15.96	14.76	16.05	14.72	13.12	13.05	12.93	12.87	14.04	14.83	13.47
Water Temperature, bottom	°C	16.70	15.93	14.76	16.05	14.71	13.09	13.08	12.90	13.00	14.02	14.83	13.46
Conductance, surface	mmhos/cm	0.108	0.136	0.097	0.126	0.134	0.113	0.098	0.088	0.079	0.089	0.113	0.109
Conductance, mid-depth	mmhos/cm	0.108	0.135	0.097	0.126	0.134	0.113	0.098	0.088	0.079	0.089	0.112	0.109
Conductance, bottom	mmhos/cm	0.108	0.136	0.097	0.125	0.133	0.113	0.097	0.086	0.078	0.089	0.112	0.109
Salinity, surface	‰	0.00	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Salinity, mid-depth	‰	0.00	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Salinity, bottom	‰	0.00	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
pH, surface	su	6.68	6.95	6.55	6.70	6.70	6.69	6.50	6.57	6.17	6.43	6.63	6.77
pH, mid-depth	su	6.72	7.00	6.59	6.69	6.69	6.69	6.56	6.63	6.24	6.39	6.62	6.84
pH, bottom	su	6.83	7.05	6.62	6.74	6.68	6.73	6.55	6.71	6.39	6.40	6.62	6.93
DO, surface	mg/L	7.17	6.87	7.65	6.85	7.16	7.84	8.13	7.62	7.86	7.04	7.03	7.42
DO, mid-depth	mg/L	7.21	6.87	7.73	7.04	7.32	7.97	8.24	7.72	7.89	7.13	7.08	7.42
DO, bottom	mg/L	7.48	6.86	7.88	7.44	7.74	8.16	8.37	7.91	8.10	7.27	7.24	7.52
DO Saturation, surface	%	73%	69%	75%	69%	70%	74%	77%	72%	74%	68%	69%	71%
DO Saturation, mid-depth	%	74%	69%	76%	71%	72%	75%	78%	73%	74%	69%	69%	71%
DO Saturation, bottom	%	76%	69%	77%	75%	76%	77%	79%	74%	76%	70%	71%	72%
Sigma-t, surface	---	-1.107	-0.973	-0.799	-0.991	-0.783	-0.572	-0.566	-0.550	-0.541	-0.695	-0.806	-0.619
Sigma-t, mid-depth	---	-1.109	-0.973	-0.800	-0.991	-0.781	-0.569	-0.565	-0.550	-0.542	-0.697	-0.807	-0.616
Sigma-t, bottom	---	-1.107	-0.968	-0.800	-0.992	-0.780	-0.565	-0.569	-0.546	-0.558	-0.694	-0.807	-0.615
ORP, surface	V	0.259	0.146	0.198	0.233	0.235	0.257	0.241	0.225	0.291	0.285	0.248	0.285
ORP, mid-depth	V	0.261	0.146	0.205	0.239	0.229	0.260	0.243	0.219	0.293	0.289	0.245	0.283
ORP, bottom	V	0.261	0.144	0.217	0.239	0.211	0.262	0.243	0.211	0.286	0.295	0.241	0.264
Transparency	m	0.6	0.5	0.7	0.7	0.8	0.8	0.7		0.7	0.7	0.7	

Notes:
--- = dimensionless
% = percent
°C = degrees celsius
DO = dissolved oxygen
EST = Eastern Standard Time
m = meters
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter @ 25 °C
ORP = oxidation-reduction potential
pH = hydrogen ion activity
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

APPENDIX B

WEEKLY WATER QUALITY COLLECTED BY ECT DURING THE PRE- AND POST-CONSTRUCTION SAMPLING PERIOD

Table B-1. Pre-Construction Water Quality Data

Analyte	Units	Station 1 (Monitor Well)								Station 1 (Monitor Well)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	09:15	14:10	09:00	13:00	07:20	12:30	07:45	11:15					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	19.92		21.12	20.05	17.83	19.31	15.30	19.38	18.99	21.12	15.30	1.76	7
Specific Conductance	mmhos/cm	0.840		1.326	0.555	3.550	2.100	2.310	2.150	1.833	3.550	0.555	0.943	7
Salinity	‰	0.40		0.66	0.24	0.14	0.06	1.20	1.12	0.55	1.20	0.06	0.43	7
Hydrogen Ion Activity (pH)	su	6.34		6.21	6.56	6.70	6.49	6.74	6.41	6.46	6.74	6.21	0.18	7
Dissolved Oxygen (DO)	mg/L	3.74		2.20	2.51	3.89	4.95	10.75	3.36	4.49	10.75	2.20	2.69	7
DO Saturation	%	41%		25%	27%	41%	53%	18%	36%	34%	53%	18%	0.11	7
Oxidation-Reduction Potential	V	-0.062		-0.126	-0.107	0.083	0.003	0.037		-0.029	0.083	-0.126	0.076	6
Transparency	m													
Nitrogen, Nitrate+Nitrite	mg/L-N	0.03	0.022	0.015	0.011	1.73	4.43	5.37	3.46	1.88	5.37	0.011	2.09	8
Nitrogen, Total Kjeldahl	mg/L-N	3.64	4.23	19.5	20.0	2.81	3.15	1.58	4.63	7.44	20.00	1.58	7.16	8
Fecal Coliform	MPN/100 mL	1601	13	7.3	130	49	33	13	6.3	36	1601	6		8
Total Coliform	MPN/100 mL	1601	13	7.3	130	49	33	33	6.3	40	1601	6		8
Salmonella	1/0	0	0	0	0	0	0	0	0		0			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-1. Pre-Construction Water Quality Data

Analyte	Units	Station 2 (Canal)								Station 2 (Canal)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	06:50	12:10	07:00	10:55	05:02	10:30	05:30	09:15					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	17.85	20.15	18.41	18.31	16.10	16.62	13.14	18.05	17.33	20.15	13.14	1.95	8
Specific Conductance	mmhos/cm	0.460	0.595	1.100	0.951	0.918	0.506	0.504	0.522	0.695	1.100	0.460	0.236	8
Salinity	‰	0.19	0.27	0.54	0.46	0.44	0.22	0.22	0.23	0.32	0.54	0.19	0.13	8
Hydrogen Ion Activity (pH)	su	6.98	7.01	7.47	7.64	7.55	7.19	7.33	7.42	7.26	7.64	6.98	0.23	8
Dissolved Oxygen (DO)	mg/L	6.36	7.47	6.62	7.00	7.45	7.10	7.87	7.02	7.11	7.87	6.36	0.45	8
DO Saturation	%	67%	82%	70%	74%	75%	72%	75%	74%	74%	82%	67%	0.04	8
Oxidation-Reduction Potential	V	0.159	0.154	0.062	0.147	0.177	0.127	0.197	0.152	0.147	0.197	0.062	0.037	8
Transparency	m	0.9	1.0	1.1	1.0		1.1		0.9	1.0	1.1	0.9	0.1	6
Nitrogen, Nitrate+Nitrite	mg/L-N	0.737	0.869	0.888	0.882	0.842	0.806	0.819	0.584	0.803	0.888	0.584	0.095	8
Nitrogen, Total Kjeldahl	mg/L-N	0.48	0.40	0.20	0.28	0.39	0.36	0.36	0.49	0.37	0.49	0.20	0.09	8
Fecal Coliform	MPN/100 mL	350	920	540	920	920	79	180	33	302	920	33		8
Total Coliform	MPN/100 mL	350	920	540	920	920	79	180	33	302	920	33		8
Salmonella	1/0	0	0	0	0	0	0	0	0		0			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = *degrees celsius*
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-1. *Pre-Construction Water Quality Data*

Analyte	Units	Station 3 (Canal)								Station 3 (Canal)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	07:03	12:20	07:15	11:10	05:15	10:45	05:45	09:30					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	17.43	18.57	18.80	18.83	16.20	17.15	12.85	17.76	17.20	18.83	12.85	1.85	6
Specific Conductance	mmhos/cm	0.555	1.486	3.830	0.633	1.053	0.540	0.676	0.370	1.143	3.830	0.370	1.068	8
Salinity	‰	0.24	0.75	2.05	0.29	0.51	0.24	0.31	0.14	0.57	2.05	0.14	0.59	8
Hydrogen Ion Activity (pH)	su	7.01	6.49	7.26	7.71	7.67	7.19	7.44	7.43	7.09	7.71	6.49	0.37	8
Dissolved Oxygen (DO)	mg/L	5.99	7.48	6.52	7.24	7.84	6.67	8.00	6.82	7.07	8.00	5.99	0.65	8
DO Saturation	%	62%	80%	70%	77%	79%	69%	75%	71%	73%	80%	62%	0.06	8
Oxidation-Reduction Potential	V	0.168	0.185	0.132	0.139	0.177	0.114	0.191	0.146	0.157	0.191	0.114	0.026	8
Transparency	m	0.9	1.0	0.8	1.1		1.0		0.9	1.0	1.1	0.8	0.1	6
Nitrogen, Nitrate+Nitrite	mg/L-N	0.724	0.805	0.870	0.921	0.878	0.806	0.800	0.653	0.807	0.921	0.653	0.081	8
Nitrogen, Total Kjeldahl	mg/L-N	0.52	0.37	0.28	0.29	0.33	0.34	0.31	0.44	0.36	0.52	0.28	0.08	8
Fecal Coliform	MPN/100 mL	130	1600	1600	350	180	49	350	79	270	1600	49		8
Total Coliform	MPN/100 mL	130	1600	1600	350	180	49	350	79	270	1600	49		8
Salmonella	1/0	0	0	0	0	0	0	0	0		0			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-1. Pre-Construction Water Quality Data

Analyte	Units	Station 4 (Canal)								Station 4 (Canal)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	09:15	14:10	09:00	13:00	07:15	12:30	07:45	11:15					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	16.92		18.78	18.95	15.37	17.06	11.83	18.80	16.82	18.95	11.83	2.37	7
Specific Conductance	mmhos/cm	0.680		0.705	1.082	0.894	0.752	0.718	0.535	0.767	1.082	0.535	0.162	7
Salinity	‰	0.31		0.33	0.53	0.43	0.35	0.33	0.23	0.36	0.53	0.23	0.09	7
Hydrogen Ion Activity (pH)	su	6.55		7.24	7.36	7.41	7.09	7.27	7.54	7.08	7.54	6.55	0.30	7
Dissolved Oxygen (DO)	mg/L	5.58		6.46	7.21	6.29	5.71	6.12	6.80	6.31	7.21	5.58	0.53	7
DO Saturation	%	57%		69%	77%	63%	59%	56%	72%	65%	77%	56%	0.07	7
Oxidation-Reduction Potential	V	0.156		0.171	0.181	0.185	0.118	0.205	0.129	0.164	0.205	0.118	0.029	7
Transparency	m													
Nitrogen, Nitrate+Nitrite	mg/L-N	0.342	0.594	0.644	0.718	0.576	0.616	0.531	0.543	0.571	0.718	0.342	0.103	8
Nitrogen, Total Kjeldahl	mg/L-N	0.70	0.96	0.42	0.38	0.54	0.49	0.51	0.86	0.61	0.96	0.38	0.20	8
Fecal Coliform	MPN/100 mL	1600	350	350	130	540	130	350	13	231	1600	13		8
Total Coliform	MPN/100 mL	1600	350	350	130	540	130	350	23	248	1600	23		8
Salmonella	1/0	0	0	0	0	0	0	0	0		0			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-1. Pre-Construction Water Quality Data

Analyte	Units	Station 5 (Canal)								Station 5 (Canal)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	06:37	12:00	06:45	10:40	04:50	10:15	05:15	09:00					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	17.71	18.73	18.59	18.00	15.83	16.58	13.22	18.00	17.08	18.73	13.22	1.72	8
Specific Conductance	mmhos/cm	0.431	1.610	8.030	0.875	0.869	0.498	0.416	0.489	1.652	8.030	0.416	2.439	8
Salinity	‰	0.18	0.82	4.48	0.42	0.41	0.21	0.17	0.21	0.86	4.48	0.17	1.38	8
Hydrogen Ion Activity (pH)	su	6.90	6.80	7.02	7.35	7.43	7.12	7.14	7.25	7.08	7.43	6.80	0.20	8
Dissolved Oxygen (DO)	mg/L	6.62	7.32	6.46	7.02	7.75	7.09	7.97	6.50	7.09	7.97	6.46	0.53	8
DO Saturation	%	69%	78%	70%	74%	78%	72%	76%	68%	73%	78%	68%	0.04	8
Oxidation-Reduction Potential	V	0.173	0.169	0.150	0.166	0.205	0.131	0.191	0.154	0.167	0.205	0.131	0.022	8
Transparency	m	0.6	1.1	0.8	1.0		1.0		1.1	0.9	1.1	0.6	0.2	6
Nitrogen, Nitrate+Nitrite	mg/L-N	0.732	0.837	0.771	0.866	0.879	0.785	0.82	0.638	0.791	0.879	0.638	0.074	8
Nitrogen, Total Kjeldahl	mg/L-N	0.39	0.37	0.26	0.28	0.33	0.36	0.30	0.45	0.34	0.45	0.26	0.06	8
Fecal Coliform	MPN/100 mL	1601	1601	920	350	220	110	170	110	373	1601	110		8
Total Coliform	MPN/100 mL	1601	1601	920	350	220	110	170	110	373	1601	110		8
Salmonella	1/0	1	1	0	0	1	0	0	0		3			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-1. Pre-Construction Water Quality Data

Analyte	Units	Station 6 (Canal)								Station 6 (Canal)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	06:20	11:45	06:30	10:25	04:30	10:00	05:00	08:45					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	17.27	18.25	18.51	17.63	16.17	16.10	12.52	17.77	16.78	18.51	12.52	1.81	8
Specific Conductance	mmhos/cm	0.420	0.600	1.910	0.614	0.559	0.399	0.477	0.369	0.669	1.910	0.369	0.477	8
Salinity	‰	0.17	0.27	0.98	0.28	0.25	0.16	0.20	0.14	0.31	0.98	0.14	0.26	8
Hydrogen Ion Activity (pH)	su	6.67	6.59	7.08	6.81	7.12	7.07	6.59	7.03	6.82	7.12	6.59	0.22	8
Dissolved Oxygen (DO)	mg/L	5.70	6.50	5.86	5.50	6.88	6.64	6.90	5.95	6.24	6.90	5.50	0.52	8
DO Saturation	%	59%	71%	62%	57%	70%	67%	64%	62%	64%	71%	57%	0.05	8
Oxidation-Reduction Potential	V	0.218	0.171	0.118	0.205	0.230	0.133	0.266	0.205	0.193	0.266	0.118	0.047	8
Transparency	m		1.0		1.3		1.1		1.0	1.1	1.3	1.0	0.1	4
Nitrogen, Nitrate+Nitrite	mg/L-N	0.543	0.819	0.807	0.507	0.697	0.717	0.671	0.554	0.664	0.819	0.507	0.112	8
Nitrogen, Total Kjeldahl	mg/L-N	0.55	0.41	0.30	0.31	0.36	0.36	0.33	0.48	0.39	0.55	0.30	0.08	8
Fecal Coliform	MPN/100 mL	350	1600	540	920	350	350	540	13	353	1600	13		8
Total Coliform	MPN/100 mL	350	1600	540	920	350	350	540	13	353	1600	13		8
Salmonella	1/0	1	1	0	0	1	0	0	0		3			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = *millimhos per centimeter*
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-1. Pre-Construction Water Quality Data

Analyte	Units	Station 7 (Wadley Pass)								Station 7 (Wadley Pass)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	07:30	12:45	07:30	11:20	05:42	11:00	06:00	09:45					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	18.73	18.60	18.91	18.79	16.44	17.27	13.59	17.53	17.48	18.91	13.59	1.69	8
Specific Conductance	mmhos/cm	0.339	2.090	4.100	0.439	1.630	0.490	0.630	0.296	1.252	4.100	0.296	1.242	8
Salinity	‰	0.16	1.08	2.21	0.18	0.83	0.21	0.28	0.10	0.63	2.21	0.10	0.68	8
Hydrogen Ion Activity (pH)	su	7.18	7.00	7.30	7.63	7.78	7.28	7.47	7.52	7.33	7.78	7.00	0.24	8
Dissolved Oxygen (DO)	mg/L	6.96	7.54	6.86	7.46	8.01	7.21	8.06	7.04	7.39	8.06	6.86	0.43	8
DO Saturation	%	74%	80%	74%	79%	82%	75%	77%	73%	77%	82%	73%	0.03	8
Oxidation-Reduction Potential	V	0.173	0.175	0.139	0.168	0.171	0.119	0.201	0.134	0.160	0.201	0.119	0.025	8
Transparency	m	0.9			1.2		1.1		1.0	1.1	1.2	0.9	0.1	4
Nitrogen, Nitrate+Nitrite	mg/L-N	0.8	0.874	0.891	0.971	0.888	0.881	0.861	0.707	0.859	0.971	0.707	0.072	8
Nitrogen, Total Kjeldahl	mg/L-N	0.38	0.40	0.35	0.52	0.41	0.32	0.30	0.43	0.39	0.52	0.30	0.06	8
Fecal Coliform	MPN/100 mL	240	540	170	540	220	49	23	70	146	540	23		8
Total Coliform	MPN/100 mL	240	540	170	540	220	49	23	70	146	540	23		8
Salmonella	1/0	0	0	0	0	0	0	0	0		0			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-1. Pre-Construction Water Quality Data

Analyte	Units	Station 8 (Alligator Pass)								Station 8 (Alligator Pass)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	07:55	12:55	07:40	11:40	05:55	11:15	06:15	10:00					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	18.65	18.55	18.93	18.69	16.59	17.24	13.78	17.53	17.50	18.93	13.78	1.61	8
Specific Conductance	mmhos/cm	0.316	0.730	2.440	0.439	0.860	1.057	0.406	0.455	0.838	2.440	0.316	0.651	8
Salinity	‰	0.12	0.34	1.28	0.18	0.41	0.52	0.16	0.19	0.40	1.28	0.12	0.36	8
Hydrogen Ion Activity (pH)	su	7.19	7.04	7.34	7.67	7.85	7.15	7.50	7.46	7.33	7.85	7.04	0.26	8
Dissolved Oxygen (DO)	mg/L	6.87	7.62	6.77	7.53	7.93	7.21	8.11	7.08	7.39	8.11	6.77	0.46	8
DO Saturation	%	73%	81%	73%	80%	81%	75%	86%	74%	78%	86%	73%	0.04	8
Oxidation-Reduction Potential	V	0.162	0.172	0.136	0.157	0.176	0.124	0.200	0.160	0.161	0.200	0.124	0.022	8
Transparency	m	0.7	0.9		1.1		1.0		0.9	0.9	1.1	0.7	0.1	5
Nitrogen, Nitrate+Nitrite	mg/L-N	0.811	0.882	0.916	0.988	0.910	0.844	0.867	0.694	0.864	0.988	0.694	0.081	8
Nitrogen, Total Kjeldahl	mg/L-N	0.40	0.43	0.44	0.46	0.70	0.34	0.29	0.45	0.44	0.70	0.29	0.11	8
Fecal Coliform	MPN/100 mL	240	280	240	41	350	46	49	46	112	350	41	120	8
Total Coliform	MPN/100 mL	240	280	240	41	350	46	49	46	112	350	41	120	8
Salmonella	1/0	1	1	1	1	1	1	1	1		8			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-1. Pre-Construction Water Quality Data

Analyte	Units	Station 9 (East Pass)								Station 9 (East Pass)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	08:40	13:35	08:15	12:25	06:35	12:00	07:00	10:45					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	18.95	18.55	19.20	18.64	17.50	17.40	14.12	17.50	17.73	19.20	14.12	1.52	8
Specific Conductance	mmhos/cm	0.291	0.312	0.342	0.350	0.288	0.290	0.292	0.250	0.302	0.350	0.250	0.030	8
Salinity	‰	0.10	0.11	0.13	0.13	0.10	0.10	0.10	0.08	0.11	0.13	0.08	0.02	8
Hydrogen Ion Activity (pH)	su	7.09	6.77	7.24	7.60	7.67	7.16	7.49	7.41	7.21	7.67	6.77	0.28	8
Dissolved Oxygen (DO)	mg/L	6.69	7.50	6.69	7.34	7.61	7.06	7.96	7.10	7.24	7.96	6.69	0.42	8
DO Saturation	%	71%	80%	72%	78%	78%	73%	77%	74%	75%	80%	71%	0.03	8
Oxidation-Reduction Potential	V	0.174	0.202	0.158	0.166	0.191	0.125	0.219	0.139	0.172	0.219	0.125	0.030	8
Transparency	m	0.9	1.0	1.1	1.2		1.1		1.0	1.1	1.2	0.9	0.1	6
Nitrogen, Nitrate+Nitrite	mg/L-N	0.817	0.900	1.01	0.981	0.926	0.881	0.882	0.716	0.889	1.01	0.716	0.086	8
Nitrogen, Total Kjeldahl	mg/L-N	0.44	0.39	0.27	0.46	0.24	0.33	0.29	0.42	0.36	0.46	0.24	0.08	8
Fecal Coliform	MPN/100 mL	33	920	350	170	46	31	33	33	85	920	31	291	8
Total Coliform	MPN/100 mL	33	920	350	170	46	31	49	33	90	920	31	290	8
Salmonella	1/0	1	1	1	1	1	1	1	1		8			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-1. Pre-Construction Water Quality Data

Analyte	Units	Station 10 (Suwannee River Control)								Station 10 (Suwannee River Control)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/18	11/25	12/02	12/09	12/16	12/23	12/30					
Time	EST	08:20	13:20	08:05	12:05	06:30	11:45	06:45	10:30					
Suwannee River Flow near Wilcox, FL	cfs	8810	6820	5980	7430	8200	7440	7890	8520	7636	8810	5980	868	8
Water Temperature	°C	18.99	18.63	19.23	18.67	17.50	17.51	14.07	17.47	17.76	19.23	14.07	1.54	8
Specific Conductance	mmhos/cm	0.290	0.312	0.327	0.349	0.334	0.289	0.293	0.250	0.306	0.349	0.250	0.029	8
Salinity	‰	0.10	0.11	0.12	0.13	0.12	0.10	0.10	0.08	0.11	0.13	0.08	0.01	8
Hydrogen Ion Activity (pH)	su	7.11	7.01	7.27	7.60	7.61	7.19	7.48	7.54	7.30	7.61	7.01	0.22	8
Dissolved Oxygen (DO)	mg/L	6.70	7.54	6.77	7.47	7.56	6.94	7.93	6.96	7.23	7.93	6.70	0.42	8
DO Saturation	%	72%	80%	73%	79%	78%	72%	77%	72%	75%	80%	72%	0.03	8
Oxidation-Reduction Potential	V	0.162	0.167	0.163	0.186	0.185	0.131	0.215	0.142	0.169	0.215	0.131	0.025	8
Transparency	m	0.9	0.9	1.0	1.6		1.1		1.0	1.1	1.6	0.9	0.2	6
Nitrogen, Nitrate+Nitrite	mg/L-N	0.831	0.927	1.01	1.01	0.926	0.857	0.872	0.716	0.894	1.01	0.716	0.091	8
Nitrogen, Total Kjeldahl	mg/L-N	0.47	0.38	0.19	0.44	0.36	0.39	0.31	0.42	0.37	0.47	0.19	0.08	8
Fecal Coliform	MPN/100 mL	23	250	130	170	49	23	33	11	52	250	11		8
Total Coliform	MPN/100 mL	23	250	130	170	49	23	33	11	52	250	11		8
Salmonella	1/0	1	1	1	1	1	1	1	1		8			8

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 1 (Monitor Well)												Station 1 (Monitor Well)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	17:40	11:32	17:10	10:00	15:42	10:10	14:50	09:47	13:45	09:09	12:45	08:33					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	22.61	20.56	20.27	20.85	19.83	16.72	19.67	16.82	19.59	17.95	18.73	17.35	19.25	22.61	16.72	1.71	12
Spec. Cond.	mmhos/cm	0.611	0.399	0.530	0.620	0.389	0.305	0.441	0.119	0.412	0.396	0.363	0.334	0.410	0.620	0.119	0.130	12
Salinity	‰		0.16	0.23	0.28	0.15	0.11	0.18	0.01	0.17	0.16	0.14	0.12	0.16	0.28	0.01	0.07	11
pH	su	6.37	6.55	6.14	6.19	6.26	6.11	6.33	7.05	6.32	6.20	6.27	6.38	6.30	7.05	6.11	0.24	12
DO	mg/L		1.89	2.26	2.15	2.10	2.86	2.38	2.34	2.01	2.78	3.00	1.94	2.34	3.00	1.89	0.37	11
DO Saturation	%		21%	25%	24%	23%	29%	26%	24%	22%	29%	32%	20%	25%	32%	20%	0.04	11
ORP	V	-0.233	-0.126	-0.150	-0.202	-0.183	0.024	-0.202	-0.119	-0.139	-0.101	-0.063	-0.042	-0.128	0.024	-0.233	0.071	12
Transparency	m																	
Nitrate+Nitrite	mg/L-N	0.034	0.236	0.019	0.002	0.002	0.668	0.062	0.336	0.072	0.002	0.002	0.005	0.120	0.668	0.002	0.194	12
Kjeldahl-N	mg/L-N	6.86	2.25	6.24	8.23	4.12	1.64	4.07	1.35	3.01	3.07	2.37	1.89	3.76	8.23	1.35	2.14	12
Fecal Coliform	MPN/100 mL	1.9	2.0	1.9	2.0	1.9	2.0	2.0	2.0	2.0	1.9	2.0	1.9	2	2	2		12
Total Coliform	MPN/100 mL	2.0	4.5	2.0	2.0	2.0	4.5	2.0	4.5	4.5	1.9	2.0	1.9	3	5	2		12
Salmonella	1/0	0	0	0	0	0	0	0	0	0	0	0	0		0			12

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 2 (Canal) Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Station 2 (Canal) Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	14:51	08:17	14:19	06:57	12:39	07:12	11:47	06:04	11:02	06:11	09:50	05:12					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	16.94	14.90	16.10	16.35	14.14	13.02	14.32	12.68	14.95	13.78	15.15	14.05	14.70	16.94	12.68	1.25	12
Spec. Cond.	mmhos/cm	0.372	0.508	0.301	0.215	0.227	0.223	0.171	0.168	0.191	0.147	0.150	0.160	0.238	0.508	0.147	0.103	12
Salinity	‰	0.15	0.22	0.11	0.06	0.07	0.07	0.04	0.04	0.05	0.02	0.03	0.04	0.08	0.22	0.02	0.06	12
pH	su	6.86	6.85	6.60	6.65	6.80	6.71	6.67	6.55	6.08	6.40	6.61	6.61	6.56	6.86	6.08	0.20	12
DO	mg/L	6.53	6.27	6.72	6.38	6.60	7.47	7.36	7.02	7.24	6.66	6.64	6.39	6.77	7.47	6.27	0.39	12
DO Saturation	%	67%	62%	68%	65%	64%	71%	71%	66%	71%	64%	66%	62%	66%	71%	62%	0.03	12
ORP	V	0.254	0.152	0.183	0.253	0.258	0.224	0.248	0.232	0.298	0.297	0.285	0.302	0.249	0.302	0.152	0.044	12
Transparency	m	0.8	0.7	0.7	0.7	0.7	0.7	0.7		0.5		0.7		0.7	0.8	0.5	0.1	9
Nitrate+Nitrite	mg/L-N	0.180	0.183	0.154	0.125	0.201	0.071	0.152	0.121	0.101	0.114	0.150	0.145	0.141	0.201	0.071	0.036	12
Kjeldahl-N	mg/L-N	0.64	0.69	0.81	0.73	0.65	0.68	0.76	0.71	0.71	0.60	0.66	0.73	0.70	0.81	0.60	0.05	12
Fecal Coliform	MPN/100 mL	540	540	130	240	540	350	540	540	920	350	240	350	393	920	130		12
Total Coliform	MPN/100 mL	540	540	130	240	540	350	540	540	920	540	240	540	422	920	130		12
Salmonella	1/0	0	0	1	0	0	0	0	0	0	0	0	0		1			12

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 3 (Canal)												Station 3 (Canal)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	15:02	08:30	14:32	07:10	12:59	07:23	11:59	06:19	11:17	06:23	10:01	05:26					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	17.52	14.64	16.04	16.05	14.66	12.71	13.45	12.53	13.24	13.50	14.92	13.39	14.39	17.52	12.53	1.47	12
Spec. Cond.	mmhos/cm	0.174	0.461	0.198	0.374	0.144	0.150	0.103	0.093	0.084	0.090	0.116	0.114	0.175	0.461	0.084	0.115	12
Salinity	‰	0.04	0.19	0.05	0.15	0.02	0.03	0.00	0.00	0.00	0.00	0.01	0.01	0.04	0.19	0.00	0.06	12
pH	su	6.92	6.85	6.70	6.68	6.80	6.76	6.60	6.57	6.12	6.47	6.65	6.62	6.59	6.92	6.12	0.20	12
DO	mg/L	6.83	6.71	7.32	6.82	7.10	7.89	8.12	7.66	7.79	7.44	7.21	7.46	7.36	8.12	6.71	0.43	12
DO Saturation	%	71%	66%	74%	69%	69%	74%	77%	72%	74%	71%	71%	71%	72%	77%	66%	0.03	12
ORP	V	0.269	0.155	0.198	0.260	0.258	0.222	0.265	0.239	0.310	0.285	0.281	0.297	0.253	0.310	0.155	0.042	12
Transparency	m	0.8	0.7	0.6	0.6	0.7	0.7	0.7						0.7	0.8	0.6	0.1	7
Nitrate+Nitrite	mg/L-N	0.181	0.228	0.150	0.123	0.214	0.091	0.150	0.133	0.098	0.146	0.166	0.180	0.155	0.228	0.091	0.040	12
Kjeldahl-N	mg/L-N	0.64	0.50	0.62	0.68	0.59	0.62	0.75	0.66	0.66	0.52	0.58	0.67	0.62	0.75	0.50	0.07	12
Fecal Coliform	MPN/100 mL	920	79	130	170	220	130	170	170	240	220	170	130	184	920	79		12
Total Coliform	MPN/100 mL	920	79	170	220	240	240	170	170	240	220	170	130	204	920	79		12
Salmonella	1/0	0	0	0	1	0	0	0	0	1	0	0	0		2			12

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 4 (Canal)												Station 4 (Canal)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	16:42	10:46	16:28	09:20	14:57	09:23	13:55	08:54	13:25	08:30	12:03	07:39					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	18.45	15.66	17.26	16.68	14.15	13.16	15.47	13.95	16.72	14.51	15.79	14.77	15.55	18.45	13.16	1.47	12
Spec. Cond.	mmhos/cm	1.000	0.444	0.375	0.268	0.284	0.296	0.326	0.288	0.274	0.215	0.175	0.186	0.344	1.000	0.175	0.210	12
Salinity	‰	0.49	0.18	0.15	0.09	0.10	0.10	0.12	0.10	0.09	0.06	0.04	0.05	0.13	0.49	0.04	0.11	12
pH	su	6.78	6.88	6.23	6.46	6.24	6.43	6.32	6.67	6.34	6.45	6.45	6.74	6.45	6.88	6.23	0.21	12
DO	mg/L	9.39	5.45	5.10	5.41	5.36	7.00	5.82	5.33	6.60	5.04	5.70	5.78	6.00	9.39	5.04	1.16	12
DO Saturation	%	100%	54%	53%	55%	52%	66%	58%	51%	67%	49%	57%	57%	60%	100%	49%	0.13	12
ORP	V	0.206	0.162	0.228	0.294	0.332	0.287	0.313	0.335	0.287	0.294	0.366	0.387	0.291	0.387	0.162	0.062	12
Transparency	m	0.8								0.9								
Nitrate+Nitrite	mg/L-N	0.095	0.086	0.098	0.092	0.103	0.070	0.110	0.096	0.068	0.064	0.067	0.056	0.084	0.110	0.056	0.017	12
Kjeldahl-N	mg/L-N	0.58	0.66	0.79	0.81	0.74	0.65	0.78	0.88	0.84	0.80	0.68	0.71	0.74	0.88	0.58	0.08	12
Fecal Coliform	MPN/100 mL	130	350	170	240	130	540	240	350	130	540	280	540	264	540	130		12
Total Coliform	MPN/100 mL	240	350	170	280	240	540	240	350	240	540	280	920	326	920	170		12
Salmonella	1/0	1	0	0	1	0	0	1	0	1	1	0	0		5			12

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 5 (Canal)												Station 5 (Canal)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	14:39	08:05	14:08	06:47	12:28	07:02	11:35	05:53	10:50	06:01	09:36	05:02					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	17.42	14.52	15.71	16.11	14.27	12.90	13.77	12.52	13.53	13.68	15.00	13.57	14.42	17.42	12.52	1.36	12
Spec. Cond.	mmhos/cm	0.184	0.344	0.179	0.206	0.187	0.178	0.109	0.104	0.090	0.098	0.122	0.124	0.160	0.344	0.090	0.068	12
Salinity	‰	0.04	0.13	0.04	0.06	0.05	0.04	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.13	0.00	0.04	12
pH	su	6.81	6.89	6.67	6.69	6.88	6.77	6.71	6.59	6.08	6.49	6.72	6.65	6.60	6.89	6.08	0.21	12
DO	mg/L	6.60	6.78	7.49	6.75	6.91	7.71	8.08	7.62	7.81	7.18	6.93	7.33	7.27	8.08	6.60	0.46	12
DO Saturation	%	68%	66%	75%	68%	67%	73%	78%	71%	75%	69%	68%	70%	71%	78%	66%	0.03	12
ORP	V	0.255	0.155	0.220	0.269	0.247	0.210	0.239	0.229	0.269	0.305	0.281	0.309	0.251	0.309	0.155	0.042	12
Transparency	m	0.6	0.6	0.6		0.6		0.7		0.8		0.7		0.7	0.8	0.6	0.1	7
Nitrate+Nitrite	mg/L-N	0.174	0.191	0.146	0.126	0.206	0.087	0.152	0.133	0.095	0.139	0.169	0.170	0.149	0.206	0.087	0.034	12
Kjeldahl-N	mg/L-N	0.70	0.50	0.74	0.71	0.63	0.63	0.69	0.64	0.68	0.54	0.59	0.69	0.65	0.74	0.50	0.07	12
Fecal Coliform	MPN/100 mL	1600	240	170	540	540	240	920	240	540	350	240	540	413	1600	170		12
Total Coliform	MPN/100 mL	1600	240	220	540	540	240	920	240	540	430	240	540	429	1600	220		12
Salmonella	1/0	1	0	0	1	0	1	1	0	0	0	1	1		6			12

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 6 (Canal)												Station 6 (Canal)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	14:22	07:49	13:52	06:33	12:17	06:49	11:23	05:37	10:35	05:47	09:21	04:49					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	17.38	15.70	15.28	16.27	14.42	13.09	13.68	12.34	13.70	13.78	15.06	13.90	14.55	17.38	12.34	1.37	12
Spec. Cond.	mmhos/cm	0.200	0.162	0.106	0.156	0.171	0.144	0.112	0.120	0.095	0.097	0.118	0.121	0.134	0.200	0.095	0.031	12
Salinity	‰	0.05	0.03	0.00	0.03	0.04	0.02	0.01	0.01	0.00	0.00	0.01	0.01	0.02	0.05	0.00	0.02	12
pH	su	6.85	7.04	6.70	6.66	6.93	6.82	6.70	6.64	5.90	6.55	6.72	6.61	6.56	7.04	5.90	0.27	12
DO	mg/L	6.48	6.63	7.51	5.68	6.52	7.58	7.80	7.11	7.55	6.93	6.94	7.02	6.98	7.80	5.68	0.57	12
DO Saturation	%	67%	66%	74%	57%	63%	72%	75%	66%	72%	66%	68%	68%	68%	75%	57%	0.05	12
ORP	V	0.264	0.201	0.227	0.281	0.254	0.234	0.255	0.247	0.304	0.312	0.271	0.324	0.265	0.324	0.201	0.035	12
Transparency	m	0.7	0.6	0.6		0.7		0.7		0.8		0.7		0.7	0.8	0.6	0.1	7
Nitrate+Nitrite	mg/L-N	0.151	0.219	0.125	0.068	0.193	0.088	0.144	0.109	0.093	0.129	0.158	0.159	0.136	0.219	0.068	0.042	12
Kjeldahl-N	*mg/L-N*	0.61	0.64	0.68	0.76	0.63	0.62	0.62	0.65	0.70	0.56	0.62	0.71	0.65	0.76	0.56	0.05	12
Fecal Coliform	MPN/100 mL	540	79	130	130	240	350	170	170	130	130	540	240	199	540	79		12
Total Coliform	MPN/100 mL	1600	79	130	170	240	540	170	240	130	170	540	240	243	1600	79		12
Salmonella	1/0	1	0	1	0	0	1	1	0	1	1	1	1		8			12

Notes:
% = *percent*
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 7 (Wadley Pass)												Station 7 (Wadley Pass)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	15:21	08:53	14:50	07:32	13:18	07:39	12:18	06:40	11:40	06:40	10:22	05:49					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	17.11	15.70	15.13	15.98	14.82	13.06	13.27	12.86	13.34	13.94	14.91	13.60	14.48	17.11	12.86	1.29	12
Spec. Cond.	mmhos/cm	0.158	0.164	0.132	0.137	0.164	0.119	0.105	0.090	0.085	0.089	0.115	0.109	0.122	0.164	0.085	0.028	12
Salinity	‰	0.03	0.03	0.02	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.00	0.01	12
pH	su	6.74	6.87	6.67	6.78	6.83	6.71	6.56	6.47	6.12	6.42	6.64	6.62	6.57	6.87	6.12	0.20	12
DO	mg/L	7.06	7.09	7.73	7.11	7.12	7.92	8.22	7.70	7.91	7.21	7.25	7.55	7.49	8.22	7.06	0.38	12
DO Saturation	%	73%	71%	76%	72%	70%	75%	78%	72%	75%	75%	71%	72%	73%	78%	70%	0.02	12
ORP	V	0.245	0.158	0.186	0.244	0.238	0.234	0.250	0.236	0.278	0.293	0.266	0.302	0.244	0.302	0.158	0.039	12
Transparency	m	0.4	0.4	0.6	0.7	0.6	0.8	0.7		0.8		0.7		0.6	0.8	0.4	0.1	9
Nitrate+Nitrite	mg/L-N	0.194	0.245	0.146	0.160	0.217	0.100	0.151	0.142	0.097	0.150	0.174	0.184	0.163	0.245	0.097	0.041	12
Kjeldahl-N	mg/L-N	0.77	0.57	0.66	0.63	0.66	0.62	0.81	0.71	0.71	0.48	0.62	0.66	0.66	0.81	0.48	0.08	12
Fecal Coliform	MPN/100 mL	240	79	79	49	130	110	110	79	110	49	130	220	103	240	49		12
Total Coliform	MPN/100 mL	350	79	110	79	130	110	130	79	110	49	130	280	117	350	49		12
Salmonella	1/0	0	1	0	0	0	1	0	0	0	1	0	1		4			12

Notes:
% = percent
1/0 = presence (1) or absence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 8 (Alligator Pass)												Station 8 (Alligator Pass)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	15:35	09:10	15:01	07:50	13:32	07:58	12:30	06:57	11:54	06:54	10:34	06:05					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	17.05	15.67	15.05	15.92	14.84	13.09	13.22	12.77	13.16	14.04	14.88	13.62	14.44	17.05	12.77	1.28	12
Spec. Cond.	mmhos/cm	0.129	0.153	0.114	0.129	0.144	0.112	0.098	0.090	0.078	0.089	0.114	0.107	0.113	0.153	0.078	0.022	12
Salinity	‰	0.01	0.03	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.00	0.01	12
pH	su	6.71	6.80	6.62	6.72	6.75	6.71	6.53	6.45	6.10	6.42	6.63	6.66	6.54	6.80	6.10	0.19	12
DO	mg/L	7.12	7.06	7.73	7.08	7.12	7.94	8.25	7.66	7.89	7.08	7.14	7.49	7.46	8.25	7.06	0.40	12
DO Saturation	%	73%	71%	76%	71%	70%	75%	78%	72%	75%	68%	70%	72%	73%	78%	68%	0.03	12
ORP	V	0.258	0.150	0.183	0.238	0.248	0.231	0.246	0.230	0.286	0.295	0.255	0.291	0.243	0.295	0.150	0.041	12
Transparency	m	0.5	0.4	0.7	0.7	0.6	0.6	0.7		0.8		0.7		0.6	0.8	0.4	0.1	9
Nitrate+Nitrite	mg/L-N	0.180	0.248	0.144	0.158	0.219	0.106	0.150	0.143	0.096	0.150	0.175	0.185	0.163	0.248	0.096	0.041	12
Kjeldahl-N	mg/L-N	0.68	0.62	0.66	0.67	0.67	0.69	0.80	0.70	0.65	0.52	0.61	0.68	0.66	0.80	0.52	0.06	12
Fecal Coliform	MPN/100 mL	540	17	49	79	49	79	49	79	130	79	49	220	79	540	17	137	12
Total Coliform	MPN/100 mL	540	17	49	110	79	130	79	130	130	79	79	220	99	540	17	131	12
Salmonella	1/0	1	1	1	1	1	1	1	1	1	1	1	1		12			12

Notes:
% = percent
1/0 = presence (1) or absence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 9 (East Pass)												Station 9 (East Pass)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	16:14	09:55	15:42	08:32	14:08	08:34	13:06	07:42	12:30	07:39	11:12	06:47					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	16.80	16.00	14.80	16.06	14.76	13.15	13.06	12.90	12.90	14.02	14.85	13.51	14.40	16.80	12.90	1.30	12
Spec. Cond.	mmhos/cm	0.109	0.137	0.100	0.126	0.134	0.113	0.097	0.088	0.078	0.089	0.114	0.110	0.108	0.137	0.078	0.018	12
Salinity	‰	0.00	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.01	12
pH	su	6.64	6.89	6.51	6.72	6.71	6.68	6.40	6.44	6.08	6.40	6.63	6.73	6.51	6.89	6.08	0.21	12
DO	mg/L	7.10	6.76	7.62	6.73	7.02	7.78	8.22	7.58	7.83	7.10	7.07	7.44	7.35	8.22	6.73	0.44	12
DO Saturation	%	73%	68%	75%	68%	69%	74%	78%	71%	74%	68%	69%	71%	71%	78%	68%	0.03	12
ORP	V	0.256	0.150	0.194	0.232	0.247	0.227	0.240	0.222	0.290	0.275	0.246	0.355	0.245	0.355	0.150	0.048	12
Transparency	m	0.4	0.3	0.6	0.7	0.7	0.8	0.6		0.8	0.7	0.7		0.6	0.8	0.3	0.2	10
Nitrate+Nitrite	mg/L-N	0.190	0.248	0.140	0.158	0.215	0.108	0.144	0.146	0.098	0.155	0.173	0.187	0.164	0.248	0.098	0.041	12
Kjeldahl-N	mg/L-N	0.76	0.56	0.60	0.71	0.66	0.67	0.73	0.71	0.67	0.51	0.60	0.69	0.66	0.76	0.51	0.07	12
Fecal Coliform	MPN/100 mL	350	22	49	79	79	79	130	79	49	130	110	130	86	350	22	80	12
Total Coliform	MPN/100 mL	350	22	49	79	130	110	130	79	79	130	110	130	96	350	22	78	12
Salmonella	1/0	1	1	0	1	1	1	1	1	1	1	0	1		10			12

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

Table B-2. Post-Construction Water Quality Data

Analyte	Units	Station 10 (Suwannee River Control)												Station 10 (Suwannee River Control)				
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Mean	Max.	Min.	SD	No.
Date	1997-98	11/10	11/17	11/24	12/01	12/08	12/15	12/22	12/29	01/05	01/12	01/19	01/26					
Time	EST	16:02	09:35	15:28	08:16	13:56	08:21	12:52	07:27	12:15	07:22	11:01	06:32					
River Flow	cfs	11500	12000	13800	13200	13000	14500	15800	18000	20800	22000	21000	21500	16425	22000	11500	3833	12
Water Temp.	°C	16.70	15.96	14.75	16.05	14.73	13.14	13.06	12.93	12.86	14.03	14.83	13.49	14.38	16.70	12.86	1.28	12
Spec. Cond.	mmhos/cm	0.108	0.136	0.097	0.126	0.134	0.113	0.098	0.088	0.079	0.089	0.113	0.109	0.107	0.136	0.079	0.017	12
Salinity	‰	0.00	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.01	12
pH	su	6.68	6.95	6.55	6.70	6.70	6.69	6.50	6.57	6.17	6.43	6.63	6.77	6.57	6.95	6.17	0.19	12
DO	mg/L	7.17	6.87	7.65	6.85	7.16	7.84	8.13	7.62	7.86	7.04	7.03	7.42	7.39	8.13	6.85	0.41	12
DO Saturation	%	73%	69%	75%	69%	70%	74%	77%	72%	74%	68%	69%	71%	72%	77%	68%	0.03	12
ORP	V	0.259	0.146	0.198	0.233	0.235	0.257	0.241	0.225	0.291	0.285	0.248	0.285	0.242	0.291	0.146	0.039	12
Transparency	m	0.6	0.6	0.7	0.7	0.8	0.8	0.7		0.7	0.7	0.7		0.7	0.8	0.5	0.1	10
Nitrate+Nitrite	mg/L-N	0.180	0.246	0.142	0.159	0.210	0.107	0.144	0.155	0.096	0.152	0.180	0.190	0.163	0.246	0.096	0.040	12
Kjeldahl-N	mg/L-N	0.74	0.57	0.65	0.66	0.60	0.69	0.84	0.70	0.70	0.52	0.57	0.69	0.66	0.84	0.52	0.08	12
Fecal Coliform	MPN/100 mL	79	130	49	79	110	79	49	110	49	110	79	79	79	130	49		12
Total Coliform	MPN/100 mL	130	130	49	110	130	79	79	130	49	170	110	79	97	170	49		12
Salmonella	1/0	1	1	1	1	1	1	1	1	1	1	1	1		12			12

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1998.

APPENDIX C

US MICROBIOLOGICAL ANALYSIS RESULTS FOR PRE- AND POST-CONSTRUCTION SAMPLING PERIOD AND AUGUST 1997 RECONNAISSANCE

Table C-1. Total and Fecal Coliform MPN for Suwannee River Water Samples Collected November 6, 1996 through December 30, 1996

November 6, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 4D	E. B.
Total	< 2.0	79	350	79	540	49	130	49	70	33	540	< 2.0
Fecal	< 2.0	79	350	79	540	49	130	49	70	33	540	< 2.0

November 7, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 6D	E. B.
Total	49	130	130	130	920	240	79	240	79	49	240	NR*
Fecal	49	130	130	130	920	240	79	240	79	49	240	NR

November 8, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 2D	E. B.
Total	11	350	540	130	> 1,600	1,600	540	350	920	540	350	< 2.0
Fecal	11	350	540	130	> 1,600	1,600	540	350	920	540	350	< 2.0

November 9, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 5D	E. B.
Total	79	350	350	130	920	540	920	170	110	110	1,600	NR
Fecal	79	350	350	130	920	540	920	170	110	110	1,600	NR

November 10, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 3D	E. B.
Total	33	49	33	110	170	79	130	33	33	49	130	NR
Fecal	33	49	33	110	170	79	130	33	33	33	130	NR

November 11, 1996 - *Group I* (Low Tide)

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 3D	E. B.
Total	> 1,600	350	130	1,600	> 1,600	350	240	240	33	23	49	NR
Fecal	> 1,600	350	130	1,600	> 1,600	350	240	240	33	23	49	NR

Table C-1. **Total and Fecal Coliform MPN for Suwannee River Water Samples Collected November 6, 1996 through December 30, 1996 (Continued, Page 2 of 3)**

November 11, 1996 - *Group II* (Flood Tide)

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 7D	E. B.
Total	23	33	23	> 1,600	23	70	540	110	11	13	130	< 2.0
Fecal	4.5	33	23	> 1,600	23	70	540	110	11	13	130	< 2.0

November 11, 1996 - *Group III* (High Tide)

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 8D	E. B.
Total	170	130	920	920	240	70	49	130	49	170	920	< 2.0
Fecal	49	130	280	920	240	70	49	49	49	110	540	< 2.0

November 12, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 10D	E. B.
Total	23	920	220	920	79	350	49	79	110	33	33	< 2.0
Fecal	23	920	220	920	79	350	49	79	70	33	33	< 2.0

November 18, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 1D	E. B.
Total	13	920	1,600	350	> 1,600	1,600	540	280	920	250	4.5	< 2.0
Fecal	13	920	1,600	350	> 1,600	1,600	540	280	920	250	4.5	< 2.0

November 25, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 5D	E. B.
Total	7.3	540	1,600	350	920	540	170	240	350	130	1,600	NR
Fecal	7.3	540	1,600	350	920	540	170	240	350	130	920	NR

Table C-1. Total and Fecal Coliform MPN for Suwannee River Water Samples Collected November 6, 1996 through December 30, 1996 (Continued, Page 3 of 3)

December 2, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 3D	E. B.
Total	130	920	350	130	350	920	540	41	170	170	240	< 2.0
Fecal	130	920	350	130	350	920	540	41	170	170	240	< 2.0

December 9, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 9D	E. B.
Total	49	920	180	540	220	350	220	350	46	49	79	NR
Fecal	49	920	180	540	220	350	220	350	46	49	79	NR

December 16, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 6D	E. B.
Total	33	79	49	130	110	350	49	46	31	23	220	< 2.0
Fecal	33	79	49	130	110	350	49	46	31	23	220	< 2.0

December 23, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 5D	E. B.
Total	33	180	350	350	170	540	23	49	49	33	220	NR
Fecal	13	180	350	350	170	540	23	49	33	33	170	NR

December 30, 1996

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 2D	E. B.
Total	6.3	33	79	23	110	13	70	46	33	11	240	< 2.0
Fecal	6.3	33	79	13	110	13	70	46	33	11	130	< 2.0

Note: E.B. = equipment blank.

Table C-2. Total and Fecal Coliform MPN for Suwannee River Water Sample Collected August 7, 1997

August 7, 1997 - Thursday

	Sta. 2	Sta. 5	Sta. 6	Sta. 8	Sta. 9	Sta. 10	Sta. 11	Sta. 12	Sta. 13	Sta. 15	Sta. 14	Sta. 16
Total	49	240	130	23	79	23	79	23	22	33	33	49
Fecal	49	240	130	23	79	23	79	23	22	33	17	49

Table C-3. Total and Fecal Coliform MPN for Suwannee River Water Samples Collected November 10, 1997 to January 26, 1998

November 10, 1997

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 8D	E. B.
Total	2.0	540	920	240	1,600	1,600	350	540	350	130	540	< 1.8
Fecal	< 1.8	540	920	130	1,600	540	240	540	350	79	350	< 1.8

November 17, 1997

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	St. 3D	E. B.
Total	4.5	540	79	350	240	79	79	17	22	130	240	NA
Fecal	2.0	540	79	350	240	79	79	17	22	130	240	NA

November 24, 1997

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta.8D	E. B.
Total	2.0	130	170	170	220	130	110	49	49	46	33	< 1.8
Fecal	< 1.8	130	130	170	170	130	79	49	49	46	33	< 1.8

December 1, 1997

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 10	E. B.
Total	2.0	240	220	280	540	170	79	110	79	110	220	NA
Fecal	2.0	240	170	240	540	130	49	79	79	79	110	NA

December 8, 1997

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. D	E. B.
Total	2.0	540	240	240	540	240	130	79	130	130	543	< 1.8
Fecal	< 1.8	540	220	130	540	240	130	49	79	110	350	< 1.8

December 15, 1997

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta 7D	E. B.
Total	4.5	350	240	540	240	540	110	130	110	79	240	< 1.8
Fecal	2.0	350	130	540	240	350	110	79	79	79	130	< 1.8

Table C-3. Total and Fecal Coliform MPN for Suwannee River Water Samples Collected November 10, 1997 to January 26, 1998 (Continued, Page 2 of 3)

December 22, 1997

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 1D	E. B.
Total	2.0	540	170	240	920	170	170	79	130	79	2.0	NA
Fecal	2.0	540	170	240	920	170	110	49	130	49	< 1.8	NA

December 29, 1997

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 9D	E. B.
Total	4.5	540	170	350	240	350	79	130	79	130	110	< 1.8
Fecal	2.0	540	170	350	240	170	79	79	79	110	110	< 1.8

January 5, 1998

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 6D	E. B.
Total	4.5	920	240	240	540	130	110	130	79	49	110	NA
Fecal	2.0	920	240	130	540	130	110	130	49	49	79	NA

January 12, 1998

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 8D	E. B.
Total	< 1.8	540	220	540	430	170	49	79	130	170	79	< 1.8
Fecal	< 1.8	350	220	540	350	130	49	79	130	110	79	< 1.8

January 19, 1998

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 6D	E. B.
Total	2.0	240	170	280	240	540	130	79	110	110	1,600	NA
Fecal	2.0	240	170	280	240	540	130	49	110	79	920	NA

Table C-3. Total and Fecal Coliform MPN for Suwannee River Water Samples Collected November 10, 1997 to January 26, 1998 (Continued, Page 3 of 3)

January 26, 1998

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Sta. 2D	E. B.
Total	< 1.8	540	130	920	540	240	280	220	130	79	350	< 1.8
Fecal	< 1.8	350	130	540	540	240	220	220	130	79	350	< 1.8

Note: E.B. = equipment blank.

Table C-4. Indication of Salmonella Presence for Suwannee River Water Samples Collected November 6, 1996 through December 30, 1996.

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Dupl.	E. B.	Total +/Date
Nov. 6, 1996	No	No	No	No	No	Yes	No	Yes	Yes	Yes	No	No	4
Nov. 7, 1996	No	No	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	5
Nov. 8, 1996	No	No	No	No	Yes	Yes	No	Yes	Yes	Yes	No	No	5
Nov. 9, 1996	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	3
Nov. 10, 1996	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	3
Nov. 11, '96 - *Group I*	No	No	No	No	Yes	Yes	No	Yes	Yes	Yes	No	No	5
Nov. 11, '96 - *Group II*	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	3
Nov. 11, '96 - *Group III*	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No	3
Nov. 12, 1996	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No	3
Nov. 18, 1996	No	No	No	No	Yes	Yes	No	Yes	Yes	Yes	No	No	5
Nov. 25, 1996	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	3
Dec. 2, 1996	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	3
Dec. 9, 1996	No	No	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	5
Dec. 16, 1996	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	3
Dec. 23, 1996	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	3
Dec. 30, 1996	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	3
Total +/station	0	0	0	0	5	6	0	16	16	16			

Note: E.B. = equipment blank.

Table C-5. Indication of Salmonella Presence for Suwannee River Water Samples Collected August 7, 1997

Sta. 2	Sta. 5	Sta. 6	Sta. 8	Sta. 9	Sta. 10	Sta. 11	Sta. 12	Sta. 13	Sta. 14	Sta. 15	Sta. 16
Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Table C-6. Salmonella Serotype by Station for Suwannee River Water Samples Collected August 7, 1997.

Sta. 2	Sta. 5	Sta. 6	Sta. 8	Sta. 9	Sta. 10	Sta. 11	Sta. 12	Sta. 13	Sta. 14	Sta. 15	Sta. 16
NS	NS	NA	*Rubislaw*	*Hartford*	*Inverness*	*Muenchen*	*Tallahassee*	*Rubislaw*	*Gaminara*	NA	*Javiana*

NS - Not Salmonella NA - Not Analyzed

Table C-7. Indication of Salmonella Presence for Suwannee River Water Samples Collected November 10, 1997 through January 26, 1998

	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	Dupl.	E. B.	Total +/Date
Nov. 10, 1997	No	No	No	Yes 4	Yes 9	Yes 15	No	Yes 27	Yes 39	Yes 49	(8) Yes	No	6
Nov. 17, 1997	No	No	No	No	No	No	Yes 23	Yes 28	Yes 40	Yes 50	(3) No	No E.B.	4
Nov. 24, 1997	No	Yes 1	No	No	No	Yes 16	No	Yes 29	No	Yes 51	(8) Yes	No	4
Dec. 1, 1997	No	No	Yes 2	Yes 5	Yes 10	No	No	Yes 30	Yes 41	Yes 52	(10) Yes	No E.B.	6
Dec. 8, 1997	No	No	No	No	No	No	No	Yes 31	Yes 42	Yes 53	(2) No	No	3
Dec. 15, 1997	No	No	No	No	Yes 11	Yes 17	Yes 24	Yes 32	Yes 43	Yes 54	(7) Yes	No	6
Dec. 22, 1997	No	No	No	Yes 6	Yes 12	Yes 18	No	Yes 33	Yes 44	Yes 55	(1) No	No E.B.	6
Dec. 29, 1997	No	No	No	No	No	No	No	Yes 34	Yes 45	Yes 56	(9) Yes	No	3
Jan. 5, 1998	No	No	Yes 3	Yes 7	No	Yes 19	No	Yes 35	Yes 46	Yes 57	(6) Yes	No E.B.	6
Jan. 12, 1998	No	No	No	Yes 8	No	Yes 20	Yes 25	Yes 36	Yes 47	Yes 58	(8) Yes	No	6
Jan. 19, 1998	No	No	No	No	Yes 13	Yes 21	No	Yes 37	No	Yes 59	(6) Yes	No E.B.	4
Jan. 26, 1998	No	No	No	No	Yes 14	Yes 22	Yes 26	Yes 38	Yes 48	Yes 60	(2) No	No	6
Total +/Station	0	1	2	5	6	8	4	12	10	12			

Note: E.B. = equipment blank.

Table C-8. Salmonella Serotype by Station for Suwannee River Water Samples Collected November 10, 1997 through January 26, 1998

Culture #	Sample #	Station	Date	Serotype
1	1A	2	11/24/97	NS
2	1B	2	11/24/97	NS
3	2A	3	12/1/97	NS
4	2B	3	12/1/97	NS
5	3A	3	1/5/98	NS
6	3B	3	1/5/98	NS
7	4A	4	11/10/97	Hartford
8	4B	4	11/10/97	Hartford
9	5A	4	12/5/97	Hartford
10	5B	4	12/5/97	Muenchen
11	6A	4	12/22/97	Muenchen
12	6B	4	12/22/97	Muenchen
13	7A	4	1/5/98	Muenchen
14	7B	4	1/5/98	Hartford
15	8A	4	1/12/98	Muenchen
16	8B	4	1/12/98	Muenchen
17	9A	5	11/10/97	Javiana
18	9B	5	11/10/97	Rubislaw
19	10A	5	12/1/97	Rubislaw
20	10B	5	12/1/97	Rubislaw
21	11A	5	12/15/97	Rubislaw
22	11B	5	12/15/97	Rubislaw
23	12A	5	12/22/97	CC
24	12B	5	12/22/97	Rubislaw
25	13A	5	1/19/98	CC
26	13B	5	1/19/98	Rubislaw
27	14A	5	1/26/98	CC
28	14B	5	1/26/98	Rubislaw
29	15A	6	11/10/97	CC
30	15B	6	11/10/97	CC
31	16A	6	11/24/97	Hartford
32	16B	6	11/24/97	Hartford
33	17A	6	12/15/97	Hartford
34	17B	6	12/15/97	Hartford
35	18A	6	12/22/97	CC
36	18B	6	12/22/97	CC
37	19A	6	1/5/98	Inverness
38	19B	6	1/5/98	CC
39	20A	6	1/12/98	CC
40	20B	6	1/12/98	Hartford
41	21A	6	1/19/98	Hartford
42	21B	6	1/19/98	Hartford
43	22A	6	1/26/98	CC
44	22B	6	1/26/98	Hartford
45	23A	7	11/17/97	CC
46	23B	7	11/17/97	CC
47	24A	7	12/15/97	CC
48	24B	7	12/15/97	CC
49	25A	7	1/12/98	Muenchen
50	25B	7	1/12/98	Muenchen
51	26A	7	1/26/98	CC

Table C-8. Salmonella Serotype by Station for Suwannee River Water Samples Collected November 10, 1997 through January 26, 1998 (Continued, Page 2 of 3)

52	26B	7	1/26/98	Muenchen
53	27A	8	11/10/97	Inverness
54	27B	8	11/10/97	Inverness
55	28A	8	11/17/97	Rubislaw
56	28B	8	11/17/97	Inverness
57	29A	8	11/24/97	NS
58	29B	8	11/24/97	SU
59	30A	8	12/1/97	SU (AZ)
60	30B	8	12/1/97	Inverness
61	31A	8	12/8/97	Hartford
62	31B	8	12/8/97	Inverness
63	32A	8	12/15/97	Rubislaw
64	32B	8	12/15/97	SU (AZ)
65	33A	8	12/22/97	Allandale
66	33B	8	12/22/97	Rubislaw
67	34A	8	12/29/97	SU
68	34B	8	12/29/97	Inverness
69	35A	8	1/5/98	Inverness
70	35B	8	1/5/98	Inverness
71	36A	8	1/12/98	SU (AZ)
72	36B	8	1/12/98	Inverness
73	37A	8	1/19/98	Inverness
74	37B	8	1/19/98	Rubislaw
75	38A	8	1/26/98	NS
76	38B	8	1/26/98	Hartford
77	39A	9	11/10/97	Allandale
78	39B	9	11/10/97	Allandale
79	40A	9	11/17/97	Inverness
80	40B	9	11/17/97	Allandale

81	41A	9	12/1/97	Hartford
82	41B	9	12/1/97	Allandale
83	42A	9	12/8/97	Muenchen
84	42B	9	12/8/97	Allandale
85	43A	9	12/15/97	Inverness
86	43B	9	12/15/97	Inverness
87	44A	9	12/22/97	Allandale
88	44B	9	12/22/97	BIT
89	45A	9	12/29/97	Hartford
90	45B	9	12/29/97	Inverness
91	46A	9	1/5/98	Gaminara
92	46B	9	1/5/98	Inverness
93	47A	9	1/12/98	Allandale
94	47B	9	1/12/98	Allandale
95	48A	9	1/26/98	Hartford
96	48B	9	1/26/98	Hartford
97	49A	10	11/10/97	BIT
98	49B	10	11/10/97	Allandale
99	50A	10	11/17/97	Montevideo
100	50B	10	11/17/97	Montevideo
101	51A	10	11/24/97	Allandale
102	51B	10	11/24/97	Montevideo
103	52A	10	12/1/97	Allandale
104	52B	10	12/1/97	BIT
105	53A	10	12/8/97	BIT
106	53B	10	12/8/97	Inverness
107	54A	10	12/15/97	Hartford
108	54B	10	12/15/97	Allandale
109	55A	10	12/22/97	Muenchen

Table C-8. Salmonella Serotype by Station for Suwannee River Water Samples Collected November 10, 1997 through January 26, 1998 (Continued, Page 3 of 3)

110	55B	10	12/22/97	Inverness
111	56A	10	12/29/97	Allandale
112	56B	10	12/29/97	Hartford
113	57A	10	1/5/98	Inverness
114	57B	10	1/5/98	Allandale
115	58A	10	1/12/98	Inverness
116	58B	10	1/12/98	Montevideo
117	59A	10	1/19/98	Montevideo
118	59B	10	1/19/98	Tallahassee
119	60A	10	1/26/98	Javiana
120	60B	10	1/26/98	Inverness

NS - Not Salmonella CC - Contaminated Culture SU - Salmonella Untypable BIT - Broken in Transit AZ = *arizonae*

APPENDIX D

TIDAL CYCLE AND DAILY SAMPLING CONDUCTED BY ECT DURING PRE-CONSTRUCTION SAMPLING PERIOD

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 1 (Monitor Well) Low	Flood	High	Station 1 (Monitor Well) Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	09:15	13:00	17:00					
Water Temperature	°C	19.92	20.83	20.82	20.52	20.83	19.92	0.43	3
Specific Conductance	mmhos/cm	0.840	0.853	0.861	0.851	0.861	0.840	0.009	3
Salinity	‰	0.40	0.41	0.41	0.407	0.410	0.400	0.005	3
Hydrogen Ion Activity (pH)	su	6.34	6.31	6.35	6.33	6.35	6.31	0.02	3
Dissolved Oxygen (DO)	mg/L	3.74	2.35	2.68	2.92	3.74	2.35	0.59	3
DO Saturation	%	41%	26%	30%	32%	41%	26%	0.06	3
Oxidation-Reduction Potential	V	-0.062	0.083	-0.106	-0.028	0.083	-0.106	0.081	3
Transparency	m	-----	-----	-----	-----	-----	-----	-----	-----
Nitrogen, Nitrate+Nitrite	mg/L-N	0.030	0.025	0.015	0.023	0.030	0.015	0.006	3
Nitrogen, Total Kjeldahl	mg/L-N	3.64	4.34	5.29	4.42	5.29	3.64	0.68	3
Fecal Coliform	MPN/100 mL	1601	4.5	49	71	1601	4.5		3
Total Coliform	MPN/100 mL	1601	23	170	184	1601	23		3
Salmonella	1/0	0	0	0		0			3
Total Suspended Solids	mg/L	194	197	210	200	210	194	7	3
Total Organic Carbon	mg/L	14.6	23.6	13.8	17.3	23.6	13.8	4.4	3

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 2 (Canal)			Station 2 (Canal)				
		Low	Flood	High	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	06:50	10:35	14:30					
Water Temperature	°C	17.85	18.60	19.50	18.65	19.50	17.85	0.67	3
Specific Conductance	mmhos/cm	0.460	0.362	0.426	0.416	0.460	0.362	0.041	3
Salinity	‰	0.19	0.14	0.17	0.17	0.19	0.14	0.02	3
Hydrogen Ion Activity (pH)	su	6.98	7.05	7.04	7.02	7.05	6.98	0.03	3
Dissolved Oxygen (DO)	mg/L	6.36	6.75	7.00	6.70	7.00	6.36	0.26	3
DO Saturation	%	67%	72%	76%	72%	76%	67%	0.04	3
Oxidation-Reduction Potential	V	0.159	0.096	0.111	0.122	0.159	0.096	0.027	3
Transparency	m	0.9	0.5	0.9	0.8	0.9	0.5	0.2	3
Nitrogen, Nitrate+Nitrite	mg/L-N	0.737	0.778	0.774	0.763	0.778	0.737	0.018	3
Nitrogen, Total Kjeldahl	mg/L-N	0.48	1.63	0.58	0.90	1.63	0.48	0.52	3
Fecal Coliform	MPN/100 mL	350	33	130	115	350	33		3
Total Coliform	MPN/100 mL	350	33	130	115	350	33		3
Salmonella	1/0	0	0	0		0			3
Total Suspended Solids	mg/L	2	2	6	3	6	2	2	3
Total Organic Carbon	mg/L	13.2	13.1	13.2	13.2	13.2	13.1	0.0	3

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 3 (Canal) Low	Flood	High	Station 3 (Canal) Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	07:03	10:50	14:40					
Water Temperature	°C	17.43	18.75	20.12	18.77	20.12	17.43	1.10	3
Specific Conductance	mmhos/cm	0.555	0.332	0.405	0.431	0.555	0.332	0.093	3
Salinity	‰	0.24	0.12	0.16	0.17	0.24	0.12	0.05	3
Hydrogen Ion Activity (pH)	su	7.01	7.06	7.05	7.04	7.06	7.01	0.02	3
Dissolved Oxygen (DO)	mg/L	5.99	6.76	6.76	6.50	6.76	5.99	0.36	3
DO Saturation	%	62%	72%	74%	69%	74%	62%	0.05	3
Oxidation-Reduction Potential	V	0.168	0.095	0.129	0.131	0.168	0.095	0.030	3
Transparency	m	0.9	1.0	0.9	0.9	1.0	0.9	0.0	3
Nitrogen, Nitrate+Nitrite	mg/L-N	0.724	0.790	0.771	0.762	0.790	0.724	0.028	3
Nitrogen, Total Kjeldahl	mg/L-N	0.52	0.41	0.49	0.47	0.52	0.41	0.05	3
Fecal Coliform	MPN/100 mL	130	23	280	94	280	23		3
Total Coliform	MPN/100 mL	130	23	920	140	920	23		3
Salmonella	1/0	0	0	0		0			3
Total Suspended Solids	mg/L								
Total Organic Carbon	mg/L								

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 4 (Canal) Low	Flood	High	Station 4 (Canal) Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	09:15	13:00	16:45					
Water Temperature	°C	16.92	18.32	18.52	17.92	18.52	16.92	0.71	3
Specific Conductance	mmhos/cm	0.680	0.686	0.661	0.676	0.686	0.661	0.011	3
Salinity	‰	0.31	0.31	0.30	0.31	0.31	0.30	0.00	3
Hydrogen Ion Activity (pH)	su	6.55	6.68	6.88	6.68	6.88	6.55	0.14	3
Dissolved Oxygen (DO)	mg/L	5.58	5.64	5.92	5.71	5.92	5.58	0.15	3
DO Saturation	%	57%	60%	63%	60%	63%	57%	0.02	3
Oxidation-Reduction Potential	V	0.156	0.157	0.172	0.162	0.172	0.156	0.007	3
Transparency	m	----	----	----	----	----	----	----	----
Nitrogen, Nitrate+Nitrite	mg/L-N	0.342	0.349	0.365	0.352	0.365	0.342	0.010	3
Nitrogen, Total Kjeldahl	mg/L-N	0.70	0.68	0.80	0.73	0.80	0.68	0.05	3
Fecal Coliform	MPN/100 mL	1600	1601	920	1331	1601	920		3
Total Coliform	MPN/100 mL	1600	1601	920	1331	1601	920		3
Salmonella	1/0	0	0	0		0			3
Total Suspended Solids	mg/L	3	<2	<2	1	3	0	1	3
Total Organic Carbon	mg/L	18.5	18.2	17.5	18.1	18.5	17.5	0.4	3

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 5 (Canal)			Station 5 (Canal)				
		Low	Flood	High	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	06:37	10:20	14:15					
Water Temperature	°C	17.71	17.32	19.37	18.13	19.37	17.32	0.89	3
Specific Conductance	mmhos/cm	0.431	0.512	0.350	0.431	0.512	0.350	0.066	3
Salinity	‰	0.18	0.22	0.13	0.18	0.22	0.13	0.04	3
Hydrogen Ion Activity (pH)	su	6.90	6.90	7.03	6.94	7.03	6.90	0.06	3
Dissolved Oxygen (DO)	mg/L	6.62	6.00	7.04	6.55	7.04	6.00	0.43	3
DO Saturation	%	69%	62%	76%	69%	76%	62%	0.06	3
Oxidation-Reduction Potential	V	0.173	0.071	0.117	0.120	0.173	0.071	0.042	3
Transparency	m	0.6	0.9	0.9	0.8	0.9	0.6	0.1	3
Nitrogen, Nitrate+Nitrite	mg/L-N	0.732	0.708	0.789	0.743	0.789	0.708	0.034	3
Nitrogen, Total Kjeldahl	mg/L-N	0.39	0.57	0.51	0.49	0.57	0.39	0.07	3
Fecal Coliform	MPN/100 mL	1601	23	240	207	1601	23		3
Total Coliform	MPN/100 mL	1601	23	240	207	1601	23		3
Salmonella	1/0	1	0	0		1			3
Total Suspended Solids	mg/L								
Total Organic Carbon	mg/L								

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 6 (Canal) Low	Flood	High	Station 6 (Canal) Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	06:20	10:10	14:00					
Water Temperature	°C	17.27	18.69	19.30	18.42	19.30	17.27	0.85	3
Specific Conductance	mmhos/cm	0.420	0.303	0.307	0.343	0.420	0.303	0.054	3
Salinity	‰	0.17	0.11	0.11	0.13	0.17	0.11	0.03	3
Hydrogen Ion Activity (pH)	su	6.67	6.90	6.93	6.82	6.93	6.67	0.12	3
Dissolved Oxygen (DO)	mg/L	5.70	6.78	6.92	6.47	6.92	5.70	0.55	3
DO Saturation	%	59%	72%	74%	68%	74%	59%	0.07	3
Oxidation-Reduction Potential	V	0.218	0.110	0.092	0.140	0.218	0.092	0.056	3
Transparency	m		1.0	1.0	1.0	1.0	1.0	0.0	2
Nitrogen, Nitrate+Nitrite	mg/L-N	0.543	0.788	0.804	0.712	0.804	0.543	0.119	3
Nitrogen, Total Kjeldahl	mg/L-N	0.55	0.40	0.47	0.47	0.55	0.40	0.06	3
Fecal Coliform	MPN/100 mL	350	70	70	120	350	70		3
Total Coliform	MPN/100 mL	350	70	70	120	350	70		3
Salmonella	1/0	1	0	0		1			3
Total Suspended Solids	mg/L								
Total Organic Carbon	mg/L								

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 7 (Wadley Pass) Low	Flood	High	Station 7 (Wadley Pass) Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	07:30	11:10	14:55					
Water Temperature	°C	18.73	18.76	17.10	18.20	18.76	17.10	0.78	3
Specific Conductance	mmhos/cm	0.339	0.461	19.000	6.600	19.000	0.339	8.768	3
Salinity	‰	0.13	0.19	11.29	3.87	11.29	0.13	5.25	3
Hydrogen Ion Activity (pH)	su	7.18	7.07	7.00	7.08	7.18	7.00	0.07	3
Dissolved Oxygen (DO)	mg/L	6.96	7.05	7.99	7.33	7.99	6.96	0.47	3
DO Saturation	%	74%	75%	88%	79%	88%	74%	0.06	3
Oxidation-Reduction Potential	V	0.173	0.132	0.148	0.151	0.173	0.132	0.017	3
Transparency	m	0.9	1.0	0.9	0.9	1.0	0.9	0.0	3
Nitrogen, Nitrate+Nitrite	mg/L-N	0.800	0.798	0.352	0.650	0.800	0.352	0.211	3
Nitrogen, Total Kjeldahl	mg/L-N	0.38	0.38	0.38	0.38	0.38	0.38	0.00	3
Fecal Coliform	MPN/100 mL	240	540	49	185	540	49		3
Total Coliform	MPN/100 mL	240	540	49	185	540	49		3
Salmonella	1/0	0	0	0		0			3
Total Suspended Solids	mg/L	5	<2	24	10	24	0	10	3
Total Organic Carbon	mg/L	12.9	14.2	11.2	12.8	14.2	11.2	1.2	3

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 8 (Alligator Pass) Low	Flood	High	Station 8 (Alligator Pass) Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	07:55	11:30	15:20					
Water Temperature	°C	18.65	18.93	18.30	18.63	18.93	18.30	0.26	3
Specific Conductance	mmhos/cm	0.316	0.323	4.810	1.816	4.810	0.316	2.117	3
Salinity	‰	0.12	0.12	2.61	0.95	2.61	0.12	1.17	3
Hydrogen Ion Activity (pH)	su	7.19	7.11	7.34	7.20	7.34	7.11	0.10	3
Dissolved Oxygen (DO)	mg/L	6.87	7.05	8.41	7.44	8.41	6.87	0.69	3
DO Saturation	%	73%	75%	90%	79%	90%	73%	0.08	3
Oxidation-Reduction Potential	V	0.162	0.123	0.129	0.138	0.162	0.123	0.017	3
Transparency	m	0.7	1.0	0.8	0.8	1.0	0.7	0.1	3
Nitrogen, Nitrate+Nitrite	mg/L-N	0.811	0.817	0.725	0.784	0.817	0.725	0.042	3
Nitrogen, Total Kjeldahl	mg/L-N	0.40	0.56	0.50	0.49	0.56	0.40	0.07	3
Fecal Coliform	MPN/100 mL	240	110	49	109	240	49		3
Total Coliform	MPN/100 mL	240	110	130	151	240	110		3
Salmonella	1/0	1	1	1		3			3
Total Suspended Solids	mg/L								
Total Organic Carbon	mg/L								

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (*geometric for bacteria*)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 9 (East Pass)			Station 9 (East Pass)				
		Low	Flood	High	Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	08:40	12:25	16:07					
Water Temperature	°C	18.95	19.26	19.43	19.21	19.43	18.95	0.20	3
Specific Conductance	mmhos/cm	0.291	0.291	0.297	0.293	0.297	0.291	0.003	3
Salinity	‰	0.10	0.10	0.10	0.10	0.10	0.10	0.00	3
Hydrogen Ion Activity (pH)	su	7.09	7.09	7.26	7.14	7.26	7.09	0.08	3
Dissolved Oxygen (DO)	mg/L	6.69	6.70	6.80	6.73	6.80	6.69	0.05	3
DO Saturation	%	71%	72%	73%	72%	73%	71%	0.01	3
Oxidation-Reduction Potential	V	0.174	0.132	0.155	0.154	0.174	0.132	0.017	3
Transparency	m	0.9	1.0	0.9	0.9	1.0	0.9	0.0	3
Nitrogen, Nitrate+Nitrite	mg/L-N	0.817	0.819	0.838	0.825	0.838	0.817	0.009	3
Nitrogen, Total Kjeldahl	mg/L-N	0.44	0.42	0.49	0.45	0.49	0.42	0.03	3
Fecal Coliform	MPN/100 mL	33	11	49	26	49	11		3
Total Coliform	MPN/100 mL	33	11	49	26	49	11		3
Salmonella	1/0	1	1	1		3			3
Total Suspended Solids	mg/L								
Total Organic Carbon	mg/L								

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-1. Tidal Cycle Surface Water Quality Data

Analyte	Units	Station 10 (Suwannee River Control) Low	Flood	High	Station 10 (Suwannee River Control) Mean	Max.	Min.	SD	No.
Date	1996	11/11	11/11	11/11					
Time	EST	08:20	12:10	15:50					
Water Temperature	°C	18.99	19.23	19.43	19.22	19.43	18.99	0.18	3
Specific Conductance	mmhos/cm	0.290	0.290	0.295	0.292	0.295	0.290	0.002	3
Salinity	‰	0.10	0.10	0.10	0.10	0.10	0.10	0.00	3
Hydrogen Ion Activity (pH)	su	7.11	7.11	7.35	7.18	7.35	7.11	0.11	3
Dissolved Oxygen (DO)	mg/L	6.70	6.78	6.87	6.78	6.87	6.70	0.07	3
DO Saturation	%	72%	73%	74%	73%	74%	72%	0.01	3
Oxidation-Reduction Potential	V	0.162	0.144	0.135	0.147	0.162	0.135	0.011	3
Transparency	m	0.9	1.2	1.0	1.0	1.2	0.9	0.1	3
Nitrogen, Nitrate+Nitrite	mg/L-N	0.831	0.831	0.839	0.834	0.839	0.831	0.004	3
Nitrogen, Total Kjeldahl	mg/L-N	0.47	0.42	0.50	0.46	0.50	0.42	0.03	3
Fecal Coliform	MPN/100 mL	23	13	110	32	110	13		3
Total Coliform	MPN/100 mL	23	13	170	37	170	13		3
Salmonella	1/0	1	1	1		3			3
Total Suspended Solids	mg/L	5	<2	<2	2	5	0	2	3
Total Organic Carbon	mg/L	12.3	12.6	14.8	13.2	14.8	12.3	1.1	3

Notes:
--- = dimensionless
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geometric for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter @25 °C
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/ 100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 1 (Monitor Well)							Station 1 (Monitor Well)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	19:18	19:12	19:15	08:55	09:30	09:15	09:30					
Suwannee River Flow near Wilcox, FL	*cfs*	*8860*	*8250*	*7780*	*9310*	*8540*	*8810*	*9010*	8651	9310	7780	473	7
Water Temperature	°C	23.00	24.18	20.29	20.96	19.84	19.92		21.37	24.18	19.84	1.65	6
Specific Conductance	mmhos/cm	0.306	0.293	0.379	0.989	0.365	0.840	0.880	0.579	0.989	0.293	0.285	7
Salinity	‰	0.11	0.10	0.15	0.48	0.14	0.40		0.23	0.48	0.10	0.15	6
Hydrogen Ion Activity (pH)	su	6.68	6.40	6.26	6.24	6.26	6.34	6.65	6.37	6.68	6.24	0.17	7
Dissolved Oxygen (DO)	mg/L	1.81	2.48	2.58	1.99	4.70	3.74		2.88	4.70	1.81	1.02	6
DO Saturation	%	21%	29%	28%	22%	51%	41%		32%	51%	21%	0.11	6
Oxidation-Reduction Potential	V	-0.096	-0.109	0.117	0.103	-0.068	-0.062		-0.019	0.117	-0.109	0.093	6
Transparency	m	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Nitrogen, Nitrate+Nitrite	mg/L-N	<0.004	<0.004	<0.004	0.024	0.019	0.030	0.009	0.012	0.030	0.000	0.012	7
Nitrogen, Total Kjeldahl	mg/L-N	5.21	4.88	14.6	14.3	7.58	3.64	6.21	8.06	14.6	3.64	4.19	7
Fecal Coliform	MPN/100 mL	1.9	49	11	79	33	1601	23	37	1601	1.9		7
Total Coliform	MPN/100 mL	1.9	49	11	79	33	1601	23	37	1601	1.9		7
Salmonella	1/0	0	0	0	0	0	0	0		0			7
Total Suspended Solids	mg/L	370	159	288	378	386	194	258	290	386	159	85	7
Total Organic Carbon	mg/L	15.3	17.2	20.6	18	17.2	14.6	12.5	16.5	20.6	12.5	2.4	7

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 2 (Canal)							Station 2 (Canal)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	16:14	16:10	16:25	05:50	06:25	06:50	07:10					
Suwannee River Flow near Wilcox, FL	cfs	8860	8250	7780	9310	8540	8810	9010	8651	9310	7780	473	7
Water Temperature	°C	23.58	22.04	21.89	19.62	18.33	17.85		20.55	23.58	17.85	2.09	6
Specific Conductance	mmhos/cm	0.320	0.357	0.612	0.719	0.645	0.460	0.449	0.509	0.719	0.320	0.140	7
Salinity	‰	0.12	0.14	0.27	0.33	0.29	0.19		0.22	0.33	0.12	0.08	6
Hydrogen Ion Activity (pH)	su	7.29	7.24	7.13	6.87	6.83	6.98	7.32	7.05	7.32	6.83	0.19	7
Dissolved Oxygen (DO)	mg/L	6.17	5.83	5.87	4.84	6.68	6.36		5.96	6.68	4.84	0.58	6
DO Saturation	%	72%	66%	66%	52%	71%	67%		66%	72%	52%	0.07	6
Oxidation-Reduction Potential	V	0.202	0.200	0.180	0.156	0.204	0.159		0.184	0.204	0.156	0.020	6
Transparency	m	0.7	0.8	0.9	----	----	0.9	0.8	0.6	0.9	0.0	0.4	7
Nitrogen, Nitrate+Nitrite	mg/L-N	0.646	0.628	0.572	0.561	0.658	0.737	0.771	0.653	0.771	0.561	0.072	7
Nitrogen, Total Kjeldahl	mg/L-N	0.48	0.52	0.46	0.52	0.52	0.48	0.48	0.49	0.52	0.46	0.02	7
Fecal Coliform	MPN/100 mL	79	130	350	350	49	350	920	213	920	49		7
Total Coliform	MPN/100 mL	79	130	350	350	49	350	920	213	920	49		7
Salmonella	1/0	0	0	0	0	0	0	0		0			7
Total Suspended Solids	mg/L	3	6	<2	<2	6	2	<2	2	6	0	2	7
Total Organic Carbon	mg/L	17.2	16.9	17.4	16.8	17.2	13.2	12	15.8	17.4	12.0	2.1	7

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 3 (Canal)							Station 3 (Canal)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	16:30	16:25	16:45	06:10	06:47	07:03	07:25					
Suwannee River Flow near Wilcox, FL	cfs	8860	8250	7780	9310	8540	8810	9010	8651	9310	7780	473	7
Water Temperature	°C	21.94	22.48	21.70	19.29	17.80	17.43		20.11	22.48	17.43	2.03	6
Specific Conductance	mmhos/cm	0.305	1.021	1.127	0.800	0.554	0.555	0.624	0.712	1.127	0.305	0.267	7
Salinity	‰	0.11	0.50	0.55	0.38	0.24	0.24		0.34	0.55	0.11	0.15	6
Hydrogen Ion Activity (pH)	su	7.27	7.19	7.08	6.97	6.98	7.01	7.25	7.09	7.27	6.97	0.12	7
Dissolved Oxygen (DO)	mg/L	5.93	6.14	5.94	5.91	7.29	5.99		6.20	7.29	5.91	0.49	6
DO Saturation	%	67%	70%	67%	64%	76%	62%		68%	76%	62%	0.04	6
Oxidation-Reduction Potential	V	0.173	0.205	0.210	0.163	0.195	0.168		0.186	0.210	0.163	0.018	6
Transparency	m	0.8	0.7	0.5		0.9	0.9	0.9	0.8	0.9	0.5	0.1	6
Nitrogen, Nitrate+Nitrite	mg/L-N	0.642	0.635	0.688	0.589	0.708	0.724	0.728	0.673	0.728	0.589	0.049	7
Nitrogen, Total Kjeldahl	mg/L-N	0.45	0.46	0.48	0.52	0.51	0.52	0.46	0.49	0.52	0.45	0.03	7
Fecal Coliform	MPN/100 mL	350	130	540	350	33	130	220	187	540	33		7
Total Coliform	MPN/100 mL	350	130	540	350	33	130	220	187	540	33		7
Salmonella	1/0	0	0	0	0	0	0	0		0			7
Total Suspended Solids	mg/L												
Total Organic Carbon	mg/L												

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 4 (Canal)							Station 4 (Canal)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	19:10	19:17	19:05	08:35	09:30	09:15	09:30					
Suwannee River Flow near Wilcox, FL	cfs	8860	8250	7780	9310	8540	8810	9010	8651	9310	7780	473	7
Water Temperature	°C	24.71	23.58	21.40	19.35	18.01	16.92		20.66	24.71	16.92	2.83	6
Specific Conductance	mmhos/cm	0.516	0.463	0.484	0.555	0.665	0.680	0.672	0.576	0.680	0.463	0.087	7
Salinity	‰	0.22	0.19	0.21	0.24	0.30	0.31		0.25	0.31	0.19	0.05	6
Hydrogen Ion Activity (pH)	su	7.40	7.18	6.90	6.63	6.63	6.55	7.44	6.84	7.44	6.55	0.35	7
Dissolved Oxygen (DO)	mg/L	6.50	6.20	5.26	4.94	5.86	5.58		5.72	6.50	4.94	0.53	6
DO Saturation	%	77%	72%	59%	53%	62%	57%		63%	77%	53%	0.08	6
Oxidation-Reduction Potential	V	0.195	0.084	0.246	0.193	0.205	0.156		0.180	0.246	0.084	0.050	6
Transparency	m	NC	NC	NC	NC	NC	NC	NC	0.0	0.0	0.0	0.0	7
Nitrogen, Nitrate+Nitrite	mg/L-N	0.262	0.324	0.368	0.314	0.339	0.342	0.393	0.335	0.393	0.262	0.039	7
Nitrogen, Total Kjeldahl	mg/L-N	0.67	0.63	0.64	3.00	0.65	0.70	1.16	1.06	3.00	0.63	0.81	7
Fecal Coliform	MPN/100 mL	79	130	130	130	110	1600	920	224	1600	79		7
Total Coliform	MPN/100 mL	79	130	130	130	110	1600	920	224	1600	79		7
Salmonella	1/0	0	0	0	0	0	0	0		0			7
Total Suspended Solids	mg/L	<2	4	7	126	4	3	5	21	126	0	43	7
Total Organic Carbon	mg/L	22.3	20.3	20.6	29.2	19.7	18.5	17.0	21.1	29.2	17.0	3.7	7

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 5 (Canal)							Station 5 (Canal)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	16:00	15:55	16:10	05:35	06:15	06:37	07:00					
Suwannee River Flow near Wilcox, FL	cfs	8860	8250	7780	9310	8540	8810	9010	8651	9310	7780	473	7
Water Temperature	°C	22.40	22.42	21.89	19.42	18.20	17.71		20.34	22.42	17.71	1.97	6
Specific Conductance	mmhos/cm	0.313	0.355	2.560	0.891	0.568	0.431	0.452	0.796	2.560	0.313	0.742	7
Salinity	‰	0.11	0.14	1.34	0.43	0.25	0.18		0.41	1.34	0.11	0.43	6
Hydrogen Ion Activity (pH)	su	7.20	7.18	6.79	6.60	6.76	6.90	7.20	6.89	7.20	6.60	0.23	7
Dissolved Oxygen (DO)	mg/L	6.10	5.94	5.90	5.84	7.10	6.62		6.25	7.10	5.84	0.46	6
DO Saturation	%	70%	68%	67%	63%	75%	69%		69%	75%	63%	0.04	6
Oxidation-Reduction Potential	V	0.193	0.190	0.187	0.151	0.206	0.173		0.183	0.206	0.151	0.017	6
Transparency	m	0.6	0.7	0.5	NC	NC	0.6	0.9	0.5	0.9	0.0	0.3	7
Nitrogen, Nitrate+Nitrite	mg/L-N	0.642	0.632	0.567	0.571	0.688	0.732	0.755	0.655	0.755	0.567	0.068	7
Nitrogen, Total Kjeldahl	mg/L-N	0.55	0.48	0.49	0.49	0.49	0.39	0.47	0.48	0.55	0.39	0.04	7
Fecal Coliform	MPN/100 mL	540	920	1601	920	170	1601	79	553	1601	79		7
Total Coliform	MPN/100 mL	540	920	1601	920	170	1601	79	553	1601	79		7
Salmonella	1/0	0	1	1	0	0	1	0		3			7
Total Suspended Solids	mg/L												
Total Organic Carbon	mg/L												

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 6 (Canal)							Station 6 (Canal)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	15:37	15:27	15:50	05:18	05:50	06:20	06:57					
Suwannee River Flow near Wilcox, FL	cfs	8860	8250	7780	9310	8540	8810	9010	8651	9310	7780	473	7
Water Temperature	°C	22.40	22.63	21.79	19.62	18.10	17.27		20.30	22.63	17.27	2.10	6
Specific Conductance	mmhos/cm	0.366	0.658	0.705	0.492	0.417	0.420	0.377	0.491	0.705	0.366	0.127	7
Salinity	‰	0.14	0.30	0.33	0.21	0.17	0.17		0.22	0.33	0.14	0.07	6
Hydrogen Ion Activity (pH)	su	7.20	6.96	6.75	6.35	6.60	6.67	7.16	6.72	7.20	6.35	0.29	7
Dissolved Oxygen (DO)	mg/L	4.80	5.59	5.61	4.86	6.41	5.70		5.50	6.41	4.80	0.55	6
DO Saturation	%	55%	64%	63%	53%	67%	59%		60%	67%	53%	0.05	6
Oxidation-Reduction Potential	V	0.194	0.161	0.206	0.185	0.225	0.218		0.198	0.225	0.161	0.021	6
Transparency	m	0.7	0.9	0.5				0.9	0.8	0.9	0.5	0.2	4
Nitrogen, Nitrate+Nitrite	mg/L-N	0.471	0.599	0.554	0.432	0.566	0.543	0.655	0.546	0.655	0.432	0.069	7
Nitrogen, Total Kjeldahl	mg/L-N	0.45	0.52	0.54	0.54	0.57	0.55	0.39	0.51	0.57	0.39	0.06	7
Fecal Coliform	MPN/100 mL	49	240	1600	540	79	350	350	268	1600	49		7
Total Coliform	MPN/100 mL	49	240	1600	540	79	350	350	268	1600	49		7
Salmonella	1/0	1	1	1	0	0	1	0		4			7
Total Suspended Solids	mg/L												
Total Organic Carbon	mg/L												

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 7 (Wadley Pass)							Station 7 (Wadley Pass)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	17:02	16:45	17:00	06:30	07:10	07:30	07:40					
Suwannee River Flow near Wilcox, FL	cfs	8860	8250	7780	9310	8540	8810	9010	8651	9310	7780	473	7
Water Temperature	°C	21.51	22.00	21.68	20.39	19.15	18.73		20.58	22.00	18.73	1.26	6
Specific Conductance	mmhos/cm	0.329	0.396	1.327	0.370	0.396	0.339	0.362	0.503	1.327	0.329	0.337	7
Salinity	‰	0.12	0.16	0.66	0.14	0.16	0.16		0.23	0.66	0.12	0.19	6
Hydrogen Ion Activity (pH)	su	7.42	7.36	7.10	7.11	7.07	7.18	7.31	7.20	7.42	7.07	0.13	7
Dissolved Oxygen (DO)	mg/L	6.44	6.50	6.63	6.15	7.53	6.96		6.70	7.53	6.15	0.44	6
DO Saturation	%	72%	74%	75%	68%	81%	74%		74%	81%	68%	0.04	6
Oxidation-Reduction Potential	V	0.160	0.184	0.210	0.165	0.176	0.173		0.178	0.210	0.160	0.016	6
Transparency	m	0.8				0.6	0.9	0.8	0.8	0.9	0.6	0.1	4
Nitrogen, Nitrate+Nitrite	mg/L-N	0.704	0.696	0.632	0.743	0.764	0.800	0.833	0.739	0.833	0.632	0.063	7
Nitrogen, Total Kjeldahl	mg/L-N	0.46	0.47	0.71	0.47	0.50	0.38	0.24	0.46	0.71	0.24	0.13	7
Fecal Coliform	MPN/100 mL	130	79	540	920	130	240	49	186	920	49		7
Total Coliform	MPN/100 mL	130	79	540	920	130	240	49	186	920	49		7
Salmonella	1/0	0	0	0	0	0	0	0		0			7
Total Suspended Solids	mg/L	2	7	27	<2	<2	5	7	7	27	0	9	7
Total Organic Carbon	mg/L	17.3	17.7	16.4	15.0	15.3	12.9	12.7	15.3	17.7	12.7	1.8	7

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 8 (Alligator Pass)							Station 8 (Alligator Pass)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	17:15	17:10	17:20	06:47	07:30	07:55	07:50					
Suwannee River Flow near Wilcox, FL	cfs	8860	8250	7780	9310	8540	8810	9010	8651	9310	7780	473	7
Water Temperature	°C	21.62	22.08	21.56	20.31	19.34	18.65		20.59	22.08	18.65	1.27	6
Specific Conductance	mmhos/cm	0.299	0.333	0.594	0.343	0.327	0.316	0.301	0.359	0.594	0.299	0.097	7
Salinity	‰	0.11	0.12	0.27	0.13	0.12	0.12		0.15	0.27	0.11	0.06	6
Hydrogen Ion Activity (pH)	su	7.40	7.37	7.20	7.05	7.07	7.19	7.30	7.21	7.40	7.05	0.13	7
Dissolved Oxygen (DO)	mg/L	6.44	6.36	6.43	6.17	7.46	6.87		6.62	7.46	6.17	0.43	6
DO Saturation	%	72%	72%	72%	68%	80%	73%		73%	80%	68%	0.04	6
Oxidation-Reduction Potential	V	0.197	0.222	0.212	0.189	0.156	0.162		0.190	0.222	0.156	0.024	6
Transparency	m	0.8				0.5	0.7	0.9	0.7	0.9	0.5	0.1	4
Nitrogen, Nitrate+Nitrite	mg/L-N	0.697	0.686	0.674	0.750	0.782	0.811	0.851	0.750	0.851	0.674	0.063	7
Nitrogen, Total Kjeldahl	mg/L-N	0.57	0.48	0.53	0.42	0.49	0.40	0.38	0.47	0.57	0.38	0.06	7
Fecal Coliform	MPN/100 mL	49	240	350	170	33	240	79	123	350	33		7
Total Coliform	MPN/100 mL	49	240	350	170	33	240	79	123	350	33		7
Salmonella	1/0	1	1	1	1	1	1	1		7			7
Total Suspended Solids	mg/L												
Total Organic Carbon	mg/L												

Notes:

% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = *number of observations*
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts

Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 9 (East Pass)							Station 9 (East Pass)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	18:06	18:05	18:30	07:28	08:20	08:40	08:30					
Suwannee River Flow near Wilcox, FL	cfs	8860	8250	7780	9310	8540	8810	9010	8651	9310	7780	473	7
Water Temperature	°C	21.41	21.98	21.45	20.55	19.56	18.95		20.65	21.98	18.95	1.09	6
Specific Conductance	mmhos/cm	0.270	0.277	0.279	0.292	0.296	0.291	0.279	0.283	0.296	0.270	0.009	7
Salinity	‰	0.09	0.09	0.10	0.10	0.10	0.10		0.10	0.10	0.09	0.00	6
Hydrogen Ion Activity (pH)	su	7.38	7.34	7.17	7.11	7.07	7.09	7.33	7.20	7.38	7.07	0.12	7
Dissolved Oxygen (DO)	mg/L	6.41	6.16	6.24	6.09	7.45	6.69		6.51	7.45	6.09	0.47	6
DO Saturation	%	72%	70%	70%	67%	81%	71%		72%	81%	67%	0.04	6
Oxidation-Reduction Potential	V	0.216	0.233	0.221	0.186	0.169	0.174		0.200	0.233	0.169	0.025	6
Transparency	m					0.9	0.9	0.9	0.9	0.9	0.9	0.0	3
Nitrogen, Nitrate+Nitrite	mg/L-N	0.713	0.696	0.656	0.757	0.810	0.817	0.852	0.758	0.852	0.658	0.066	7
Nitrogen, Total Kjeldahl	mg/L-N	0.48	0.44	0.47	0.48	0.45	0.44	0.40	0.45	0.48	0.40	0.03	7
Fecal Coliform	MPN/100 mL	70	79	920	110	33	33	70	89	920	33		7
Total Coliform	MPN/100 mL	70	79	920	110	33	33	110	94	920	33		7
Salmonella	1/0	1	1	1	1	1	1	1		7			7
Total Suspended Solids	mg/L												
Total Organic Carbon	mg/L												

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.

Table D-2. Daily Surface Water Quality Data

Analyte	Units	Station 10 (Suwannee River Control)							Station 10 (Suwannee River Control)				
		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Mean	Max.	Min.	SD	No.
Date	1996	11/06	11/07	11/08	11/09	11/10	11/11	11/12					
Time	EST	17:47	17:45	18:15	07:12	08:05	08:20	08:10					
Suwannee River Flow near Wilcox, FL	cfs	8860	8250	7780	9310	8540	8810	9010	8651	9310	7780	473	7
Water Temperature	°C	21.40	21.91	21.42	20.47	19.54	18.99		20.62	21.91	18.99	1.06	6
Specific Conductance	mmhos/cm	0.269	0.276	0.279	0.293	0.297	0.290	0.277	0.283	0.297	0.269	0.010	7
Salinity	‰	0.09	0.09	0.10	0.10	0.10	0.10		0.10	0.10	0.09	0.00	6
Hydrogen Ion Activity (pH)	su	7.38	7.41	7.22	7.13	7.06	7.11	7.31	7.21	7.41	7.06	0.13	7
Dissolved Oxygen (DO)	mg/L	6.39	6.37	6.28	6.14	7.38	6.70		6.54	7.38	6.14	0.41	6
DO Saturation	%	72%	72%	70%	68%	80%	72%		72%	80%	68%	0.04	6
Oxidation-Reduction Potential	V	0.205	0.226	0.208	0.170	0.187	0.162		0.193	0.226	0.162	0.022	6
Transparency	m	0.8				0.9	0.9	1.0	0.9	1.0	0.8	0.1	4
Nitrogen, Nitrate+Nitrite	mg/L-N	0.732	0.715	0.740	0.758	0.812	0.831	0.852	0.777	0.852	0.715	0.050	7
Nitrogen, Total Kjeldahl	mg/L-N	0.45	0.45	0.46	0.43	0.46	0.47	0.36	0.44	0.47	0.36	0.03	7
Fecal Coliform	MPN/100 mL	33	49	540	110	33	23	33	59	540	23		7
Total Coliform	MPN/100 mL	33	49	540	110	49	23	33	62	540	23		7
Salmonella	1/0	1	1	1	1	1	1	1		7			7
Total Suspended Solids	mg/L	<2	5	<2	5	5		<2	3	5	0	3	6
Total Organic Carbon	mg/L	17.4	16.1	16.0	18.0	14.7		12.3	15.8	18.0	12.3	1.9	6

Notes:
% = percent
1/0 = presence (1) or abscence (0)
°C = degrees celsius
EST = Eastern Standard Time
m = meters
Mean = arithmetic mean (geo. mean for bacteria)
Max. = maximum
Min. = minimum
SD = standard deviation
No. = number of observations
mL = milliliters
mg/L = milligrams per liter
mg/L-N = milligrams per liter as nitrogen
mmhos/cm = millimhos per centimeter
MPN/100 mL = most probable number per 100 mL
"1.9" = <2.0 & "1601" = >1600 MPN/100 mL
‰ = parts per thousand
su = standard pH units
V = volts
Source: ECT, 1997.